LiveAction®

# Omnipeek

User Guide

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# Contents

CHAPTER 1

# Introduction

## In this chapter:

# About Omnipeek

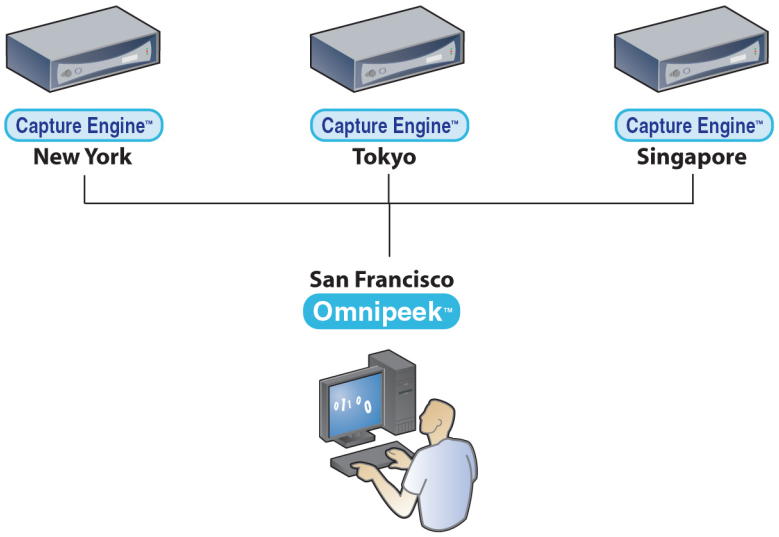
Welcome to Omnipeek, the network software analyzer from LiveAction! Omnipeek functions both as a portable network analyzer as well as a software console for distributed Capture Engines for Omnipeek installed at strategic locations across the network.

## Omnipeek as a portable analyzer

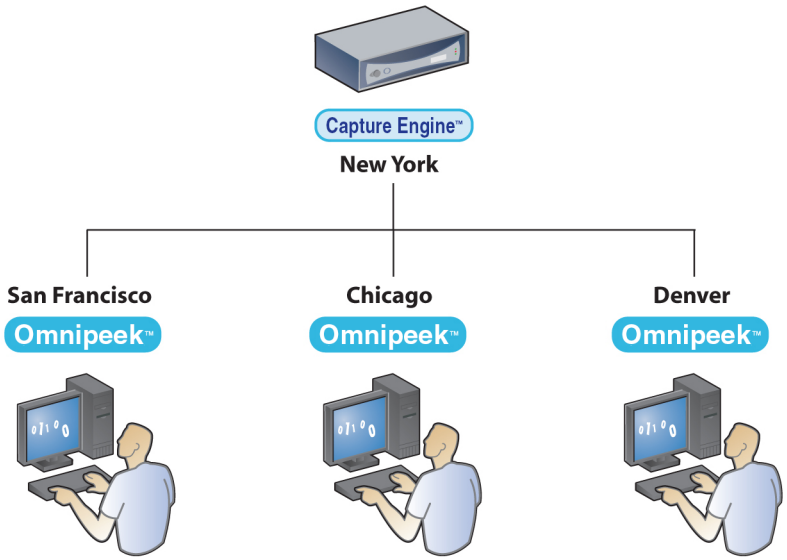
As a portable analyzer, Omnipeek offers an intuitive, easy-to-use graphical interface that engineers can use to rapidly analyze and troubleshoot enterprise networks. Omnipeek supports local captures from multiple interfaces and data collection from any network topology, including 1 Gigabit and 10 Gigabit networks, wireless networks, and local matrix switches.

## Omnipeek with distributed Capture Engines

As a software console for Capture Engines, Omnipeek can also manage and interact with an unlimited number of Capture Engines performing independent capture and analysis at any location across the network. Omnipeek allows network engineers to troubleshoot problems and perform statistical analysis on remote segments from a single location, as shown in the diagram below.




A single Capture Engine can also link to multiple installations of Omnipeek, allowing simultaneous connection and collaboration, as shown in the following diagram.




In addition, because Capture Engines put the processing power at the point of capture, multiple connections and diverse configurations can be used without creating a strain on network bandwidth.

The separately purchased Capture Engines have no user interface of their own, and rely on Omnipeek to provide a user interface through the **Capture Engines** window. For more information, see Chapter 2, *Using Capture Engines with Omnipeek*. See also the *Capture Engine for Omnipeek Getting Started Guide* that ships with the product or the online help in the Capture Engine Manager application.

## Network forensics

Network forensics is the retrospective analysis of network traffic for the purpose of conducting an investigation. You can use Omnipeek to capture, store, and data mine large volumes of traffic data in order to investigate items such as network problems, security attacks, HR policy violations, and more. See the following chapters and sections for more information on how to use Omnipeek in different ways to perform forensics on your own network.

- *Forensics capture on a Capture Engine* on page 54
- *Forensic search from the Files tab* on page 121
- *Forensic search from the Forensics tab* on page 124
- *Forensic search from the 'Forensics Capture' window* on page 131
- *Compass dashboard* on page 65
- Chapter 7, *Post-capture Analysis*
- Chapter 10, *Web Analysis*

## Voice and video over IP analysis

Voice and video over IP is available for call signaling and media analysis in the **Voice & Video** views of capture windows, providing simultaneous analysis of voice and video data traffic with subjective and objective quality metrics. For more information, see Chapter 11, *Voice & Video Analysis*.

## Compass dashboard

The Omnipeek **Compass** dashboard provides an interactive forensics view of key network statistics, which can be graphed, dynamically interacted with, and reported on. The **Compass** dashboard provides network engineers with more visibility and insight into their networks.

The Compass dashboard offers both real-time and post-capture monitoring of high-level network statistics with drill down capability into packets for the selected time range. Using the **Compass** workspace, multiple files can be aggregated and analyzed simultaneously. For information, see *Compass dashboard* on page 65.

### Multi-segment analysis

Multi-Segment Analysis (MSA) provides visibility and analysis of application flows across multiple network segments, including network delay, packet loss, and retransmissions. It can quickly pinpoint problems and their root causes across multiple segments, bring problematic flows together, and create an analysis session, report anomalies, and provide graphical visualization of multiple segments across the network. For information, see Chapter 9, *Multi-Segment Analysis*.

## System requirements

The system requirements for Omnipeek are:

- Windows 11, Windows 10, Windows 8.1 64-bit, Windows 7 64-bit, Windows Server 2019, Windows Server 2016, Windows Server 2012, Windows Server 2012 R2, Windows Server 2008 R2 64-bit

> **Note** For Windows 7 and Windows Server 2008 R2, SHA-2 code signing is required to run Omnipeek. Typically, for users that are updated automatically using Microsoft Update, this is installed automatically; otherwise, you will need to install the SHA-2 update manually. See Microsoft *KB3033929*.

Omnipeek supports most rack mount, desktop and portable computers as long as the basic system requirements to run the supported operating systems are met. Depending on traffic and the particular usage of Omnipeek, the requirements may be substantially higher.

The following system is recommended for Omnipeek:

- Intel Core i3 or higher processor
- 4 GB RAM
- 40 GB available hard disk space

Factors that contribute towards superior performance include high speed CPU, number of CPUs, amount of RAM, high performance disk storage subsystem (RAID 0), and as much additional hard disk space as is required to save the trace files that you plan to manage.

Supported operating systems require users to have Administrator level privileges in order to load and unload device drivers, or to select a network adapter for the program's use in capturing packets.

For more information, please see our Web site at *https://www.liveaction.com/products*.

## Supported adapters

Omnipeek requires a supported network adapter installed on your network in order to capture packets. Omnipeek supports a wide variety of Ethernet and wireless network adapters.

LiveAction has developed a set of driver APIs which can be used to write drivers that extend adapter capabilities. Drivers that use these APIs have been developed for some of the leading WLAN, Ethernet, and Gigabit analyzer cards. Omnipeek and the Capture Engines ship with a number of drivers that support the Omnipeek API. These drivers must be installed separately on the machine in which the card is installed. For more information, see the *Readme* file located in the *Drivers* folder in the program directory or visit *https://www.liveaction.com/support/technical-support*.

### Ethernet

Omnipeek supports NDIS 3 or higher compatible Ethernet, Fast Ethernet, or Gigabit promiscuous mode network adapters from 3Com, Intel, Xircom, SMC, and many others. LiveAction has developed a set of driver

APIs which can be used to write drivers that extend adapter capabilities for Ethernet cards that use particular chipsets. For more information, see the *Readme* file located in the *Drivers* folder in the program directory or visit *https://www.liveaction.com/support/technical-support*.

## Wireless

For wireless packet capture, Omnipeek requires the installation of a special NDIS driver to capture wireless management, control, and data packets. This driver also provides complete support for network services when the application is not being used.

LiveAction has tested Atheros, and Ralink chipsets for wireless capture. For more information and to download other compatible wireless drivers, please visit *https://www.liveaction.com/support/frequently-asked-questions/.*

The LiveAction Wireless Driver supports advanced functionalities such as WPA/WPA2 decryption, noise measurement and hardware time-stamping. For driver installation instructions, please refer to the Readme file included with the driver.

To configure wireless channel settings and 802.11 security settings for your WLAN adapter, see *Configuring wireless channels and encryption* on page 303.

**Important!** Some cards supported by Omnipeek may not be usable for network services. 802.11 WLAN cards cannot be used for network services while they are in RF Monitor mode. The LiveAction Capture Adapters are optimized for capture and do not send packets. They cannot be used for network services.

# Installing Omnipeek

**To install Omnipeek, follow these steps:**

1. Run the Omnipeek installer (e.g., *Omnipeek_xx.x.x.msi*). The installer removes any previous versions of Omnipeek.
2. Follow the installation instructions that appear on the screen.

   During installation you are asked to enter a valid product key. When prompted, you can select from the following:

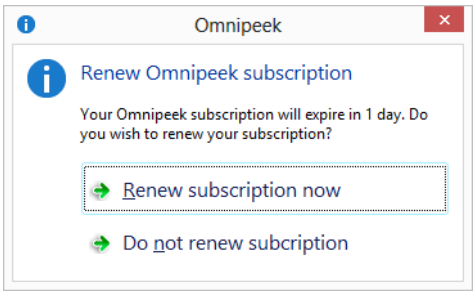
   - **Automatic**: The installer uses your Internet connection to send an encrypted message to an activation server, which retrieves and installs a license file.
   - **Manual**: The installer guides you through generating a license file through a web page. Follow the instructions to access the web activation page, fill in the required information, and you are provided with a license file. The installer then guides you through installing the license file.

   For more information about the product activation process, please see our Web site at: *https://www.liveaction.com/support/frequently-asked-questions/*.
3. When the Installer has finished installing the program files, you can choose to view the *Readme* or launch the program. For a description of installed components, see Appendix C, *Omnipeek Installed Components*.

**Note** The Capture Engine Manager is installed by default with Omnipeek. This application lets you configure and update settings for separately purchased Capture Engines. Please see *Configuring and updating Capture Engine settings* on page 19.

# Renewing or upgrading subscription versions of Omnipeek

If you are using a subscription version of Omnipeek, when your subscription is at least 30 days from expiring, and whenever you start Omnipeek, you are prompted to renew your Omnipeek subscription with a dialog similar to the following:




- Click *Renew subscription now* to open the Omnipeek activation dialog where you can renew your existing license, or update to a new license.
- Click *Do not renew subscription* to continue to use Omnipeek until your subscription expires.

# Installing a Capture Engine

For complete instructions on how to install, configure, and update software and settings for Capture Engines, see the *Getting Started Guide* that ships with the Capture Engine.

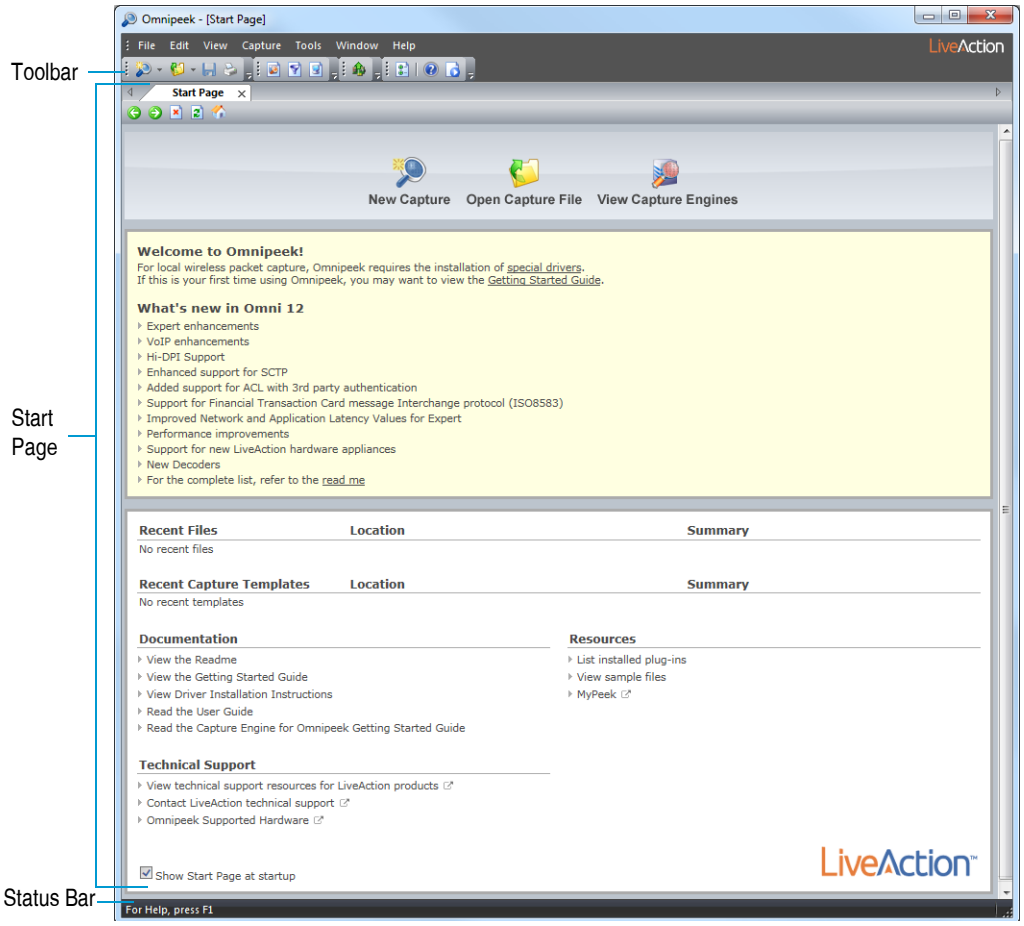
**Note** Some users want to install both an Omnipeek console and a Capture Engine on the same machine. The only console that was designed to work simultaneously with a Capture Engine is the Omnipeek Connect console.

# Main program window and Start Page

**To start Omnipeek:**

- On the **Start** menu, click **LiveAction Omnipeek**.

The main program window and Start Page appears. The parts of the main program window are described below.




- *Toolbar:* Provides buttons for frequently-used tasks in Omnipeek. To display different toolbars or to customize toolbar options, on the **View** menu, click **Toolbars**.
- *Start Page:* Provides buttons for creating a new capture, opening saved capture files, and viewing the Capture Engines window. Additionally, the *Start Page* lists 'What's new' in the version of Omnipeek, and also provides links to useful resources, both local and online.
- *Status Bar:* Shows brief context-sensitive messages on the left and the current capture adapter on the right. To toggle the display of the status bar, on the **View** menu, click **Status Bar**.

# Commonly used terms

The following table contains descriptions of frequently used terms.

| Term | Description |
|---|---|
| Capture window | Packets are captured into configurable capture windows, each with its own selected adapter, its own dedicated capture buffer and its own settings for filters, triggers, and statistics output. See Chapter 5, *Viewing and Decoding Packets*. |
| Capture file | Capture windows can be saved as capture files (also called Trace files). See *Opening saved capture files* on page 47. |
| Capture Engines window | The user interface that Omnipeek provides for the Capture Engines. See Chapter 2, *Using Capture Engines with Omnipeek*. |
| Forensics Capture | A template on a Capture Engine optimized for captures used for forensic analysis. See *Forensics capture on a Capture Engine* on page 54. |
| Capture Options dialog | The dialog used to configure settings for individual capture windows. See *Configuring capture options* on page 28. |

CHAPTER 2

# Using Capture Engines with Omnipeek

## In this chapter:

# About Capture Engines

If you are using Omnipeek as a console for distributed Capture Engines, you will need to connect to the Capture Engines from the **Capture Engines** window in Omnipeek. (If you are using Omnipeek as a network analyzer only, and not as a console for distributed Capture Engines, you do not need to review this chapter.)

Capture Engines let you capture and analyze data at any location across the network. Capture Engines perform real-time network analysis from the Omnipeek console on traffic from one or more network interfaces, including Ethernet, 802.11 a/b/g/n/ac wireless, 1 Gigabit, 10 Gigabit, and 40 Gigabit. Capture Engine features include:

- Statistical and packet analysis, including packet flows and details about nodes, applications, protocols, and sub-protocols. See Chapter 8, *Expert Analysis* and Chapter 12, *Displaying and Reporting Statistics*.
- Application layer expert diagnoses and application response time analysis. See *Expert Applications view* on page 146.
- Expert systems diagnoses, including streams-based packet analysis and correlations between events and conversations. Chapter 8, *Expert Analysis*.
- VoIP signaling and media analysis. See Chapter 11, *Voice & Video Analysis*.

The **Capture Engines** window in Omnipeek lets you view and interact with Capture Engines, which do not have a user interface of their own. Capture Engines are configured with the Capture Engine Configuration Wizard, either from the computer on which they are installed or from the Omnipeek computer using the Capture Engine Manager application. Please see *Configuring a Capture Engine* on page 19.

> **Note** To configure Capture Engine for Omnipeek (Linux), you must configure it from the Omnipeek computer using the Capture Engine Manager for Omnipeek application.

The **Capture Engines** window in Omnipeek lets you:

- Connect, disconnect, or reconnect to one or more Capture Engines
- View summaries of all captures on each connected Capture Engine
- Create and manage captures on any connected Capture Engine
- Manage filters, alarms, and notifications on any connected Capture Engine

> **Note** For information on how to install, configure, and update settings and software on one or more Capture Engines, see *Configuring and updating Capture Engine settings* on page 19. For detailed instructions, refer to the *Capture Engine for Omnipeek Getting Started Guide* that ships with the Capture Engine or the online help in the Capture Engine Manager application.

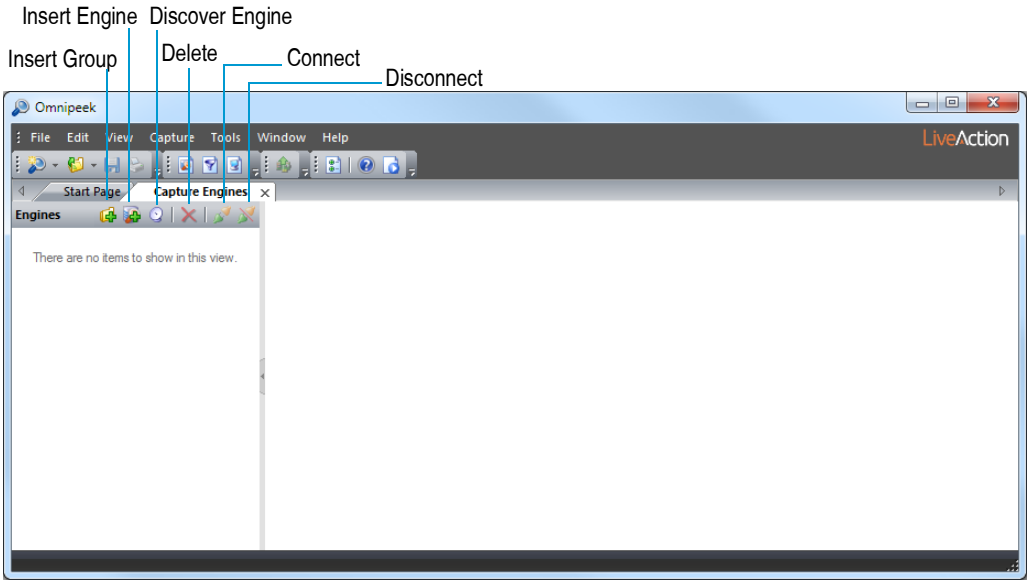
# Displaying the Capture Engines window

**Do one of the following to display the Capture Engines window:**

- On the Start Page, click **View Capture Engines**
- On the **View** menu, click **Capture Engines**

The **Capture Engines** window appears and displays the list of currently defined Capture Engines.

> **Note** Both Omnipeek and Capture Engine Manager maintain the same list of Capture Engines. Making a change in either program automatically updates the list in the other program.




The clickable buttons in the **Capture Engines** window are described here:

- *Insert Group:* Click to create a group folder that allows you to more easily organize Capture Engines.
- *Insert Engine:* Click to insert and connect to a new Capture Engine.
- *Discover Engines:* Click to search for all engines installed on the local segment of your network. See *Discovering Capture Engines* on page 14.
- *Delete:* Click to remove the selected Capture Engine from the list of Capture Engines.
- *Connect:* Click to connect to the selected Capture Engine.
- *Disconnect:* Click to disconnect from the selected Capture Engine.

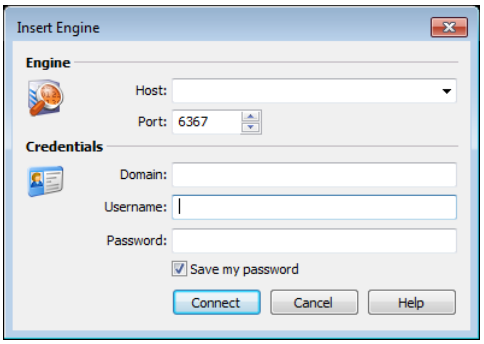
**Note** Right-click inside the list of Capture Engines to display a context-menu with additional options for displaying the list of Capture Engines; inserting and discovering Capture Engines; editing, deleting, or renaming Capture Engines; connecting and disconnecting Capture Engines; forgetting all passwords; and importing and exporting Capture Engines.

# Connecting to a Capture Engine

In order to view packets and data from a Capture Engine, you must first connect to it from Omnipeek.

**To connect to a Capture Engine:**

1. From the **Capture Engines** window, click *Insert Engine*. The **Insert Engine** dialog appears.

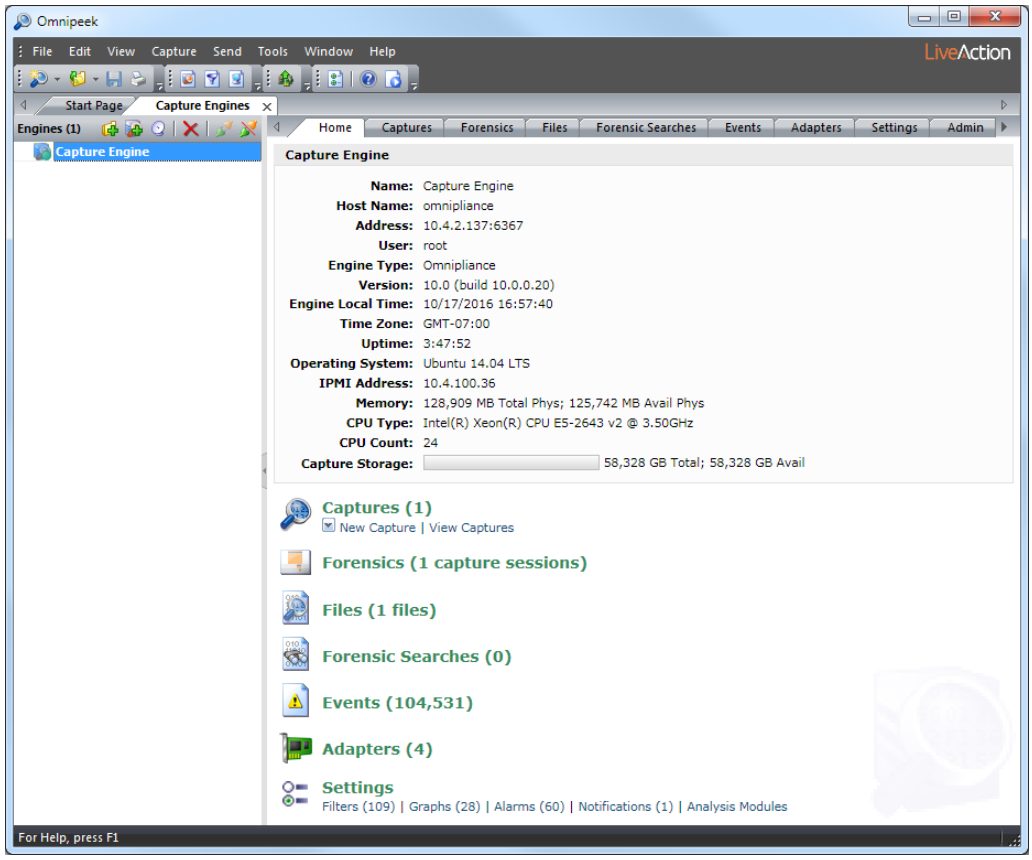



2. Complete the dialog:
   - *Host:* Enter the IP address or DNS name of the engine that you want to connect to.

- *Port:* Enter the TCP/IP Port used for communications. The default port for the LiveAction WP Omni protocol is 6367.
- *Domain:* Type the Domain for login to the engine. If the Capture Engine is not a member of any Domain, leave this field blank.
- *Username:* Type the Username for login to the Capture Engine.
- *Password:* Type the Password for login to the Capture Engine.

3. Click **Connect**. When the connection is established, the Capture Engine appears in the list of engines.

**Note** The **Insert Engine** dialog will attempt to resolve DNS names, using the DNS server(s) specified in the network settings of the computer from which you are trying to connect.




**Note** If your Capture Engine is installed on a computer that has a configured Intelligent Platform Management Interface (IPMI) port used for remotely accessing and troubleshooting the computer, the Capture Engine *Home* tab displays an *IPMI Address* entry that lists the IP address of the IPMI port on the Capture Engine. Clicking the IP address opens your browser and navigates to the IPMI login page.

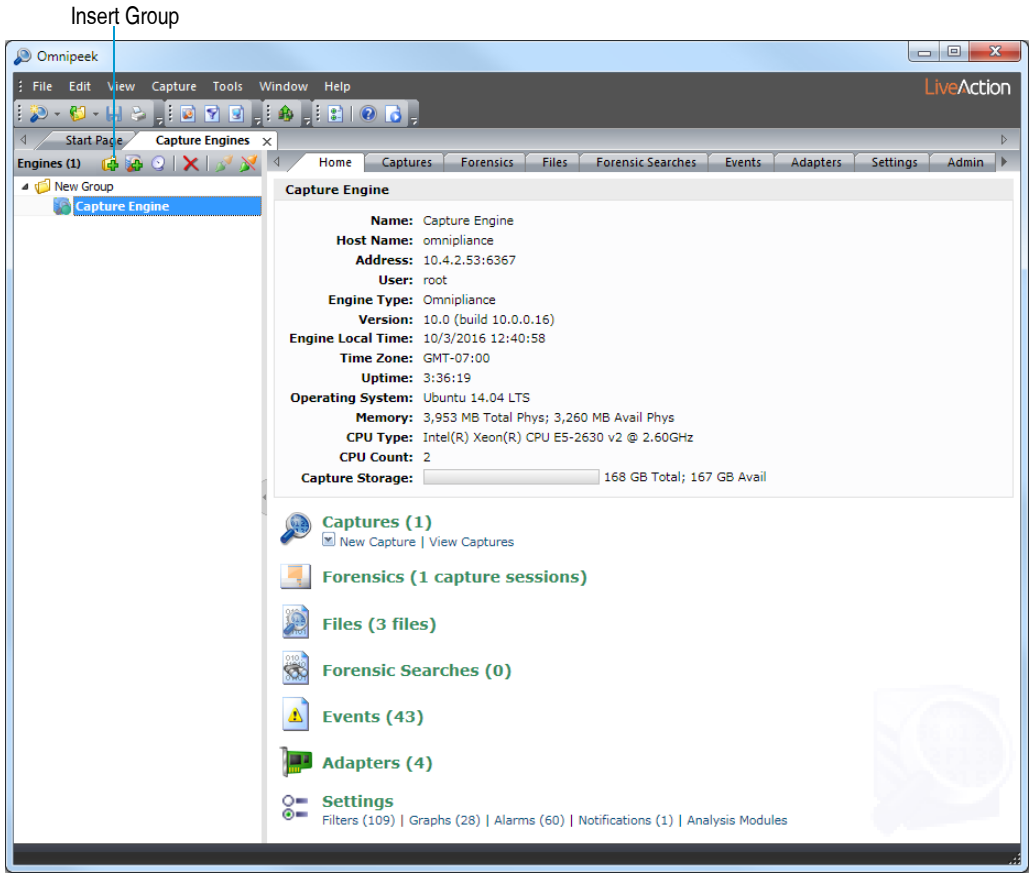
# Organizing Capture Engines by groups

You can add multiple engines to the **Capture Engines** window. To make it easier to manage multiple engines, you can organize them into groups.

**To organize Capture Engines by groups:**

1. Click **Insert Group**. A *New Group* appears in the list of engines.

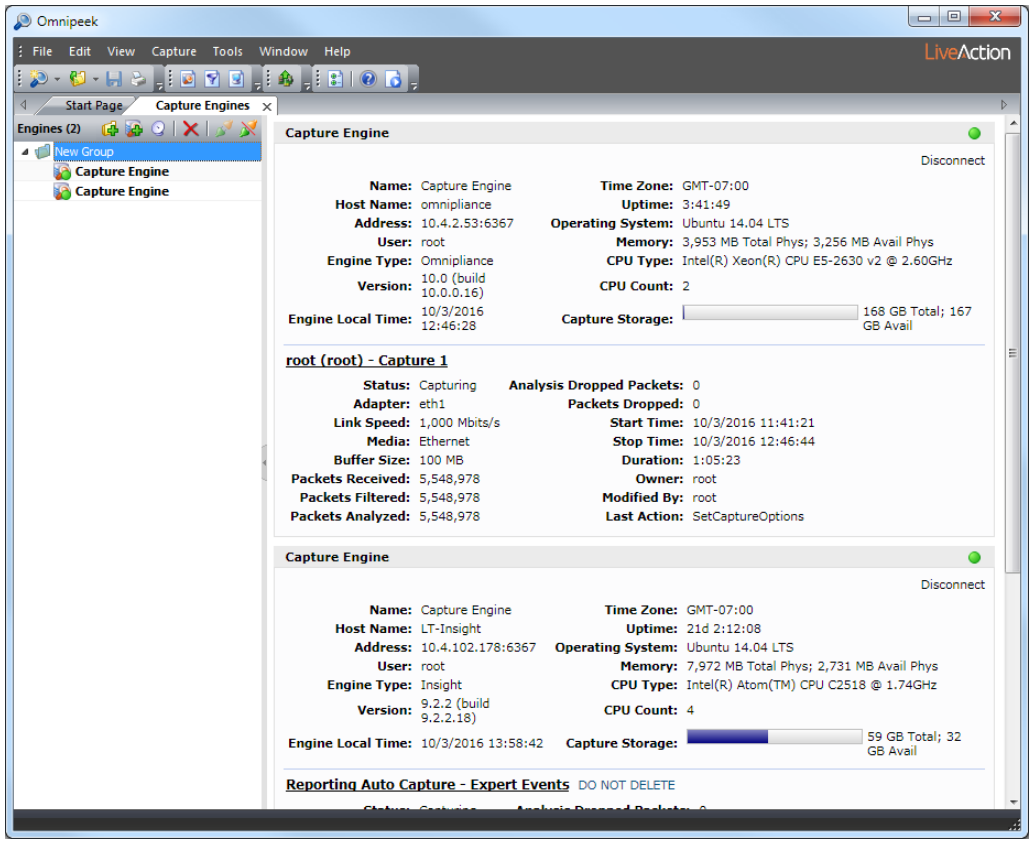
2. Rename the *New Group*.




3. With the *New Group* selected, click **Insert Engine** to add a Capture Engine to the group.

**Note** Selecting a folder in the list of engines displays a summary of each engine listed in the folder. For Capture Engines that are currently connected, a summary similar to the *Home* tab summary is displayed. For Capture Engines that are disconnected, a summary that lists the name, address, and last login date and time is displayed.

If you had selected the *Save my password* option when you had originally connected to the Capture Engine, you can connect to the Capture Engine by clicking **Connect** from within the summary. The *Save my password* option must have been selected; otherwise, the connection fails. You can also disconnect from a Capture Engine by clicking **Disconnect** from within the summary.

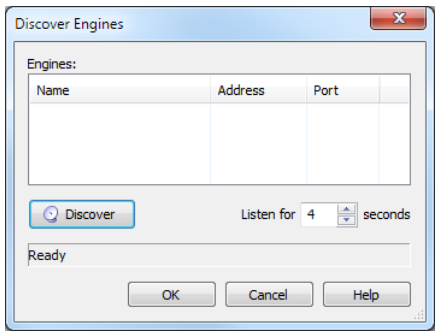



# Discovering Capture Engines

Clicking the **Discover Engine** lets you search for all engines installed on the local segment of your network. You can then insert one or more of the engines that are found into the **Capture Engines** window, and then connect to those engines.

**To insert and connect to Capture Engines using Discover:**

1. From the **Capture Engines** window, click **Discover Engines**. The **Discover Engines** dialog appears.



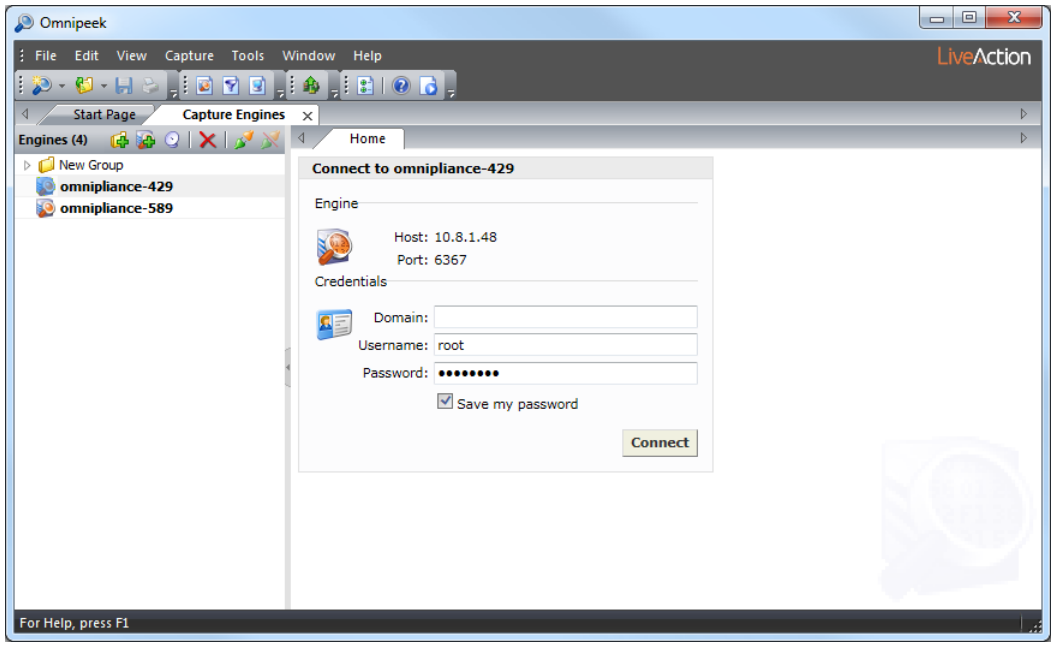

2. Click **Discover** on the dialog. All Capture Engines found on the local segment of your network are displayed in the *Engines* list.

   Adjusting the *Listen for* time lets you specify how much time is spent listening for responses to the discovery request. You can enter a minimum of 2 and a maximum of 60 seconds.

3. Clear the check boxes of the Capture Engines that you do not want to add to the *Engines* list and click **OK** (by default, the check boxes are selected for all Capture Engines that are discovered). The selected Capture Engines are added to the **Capture Engines** window.

**Tip** Right-click in the *Engines* pane of the **Discover Engines** dialog and select **Uncheck all** to clear the check boxes of all Capture Engines.

4. From the **Capture Engines** window, select the engine that you want to connect to. The *Home* tab appears and displays the *Connect to Capture Engine* screen.

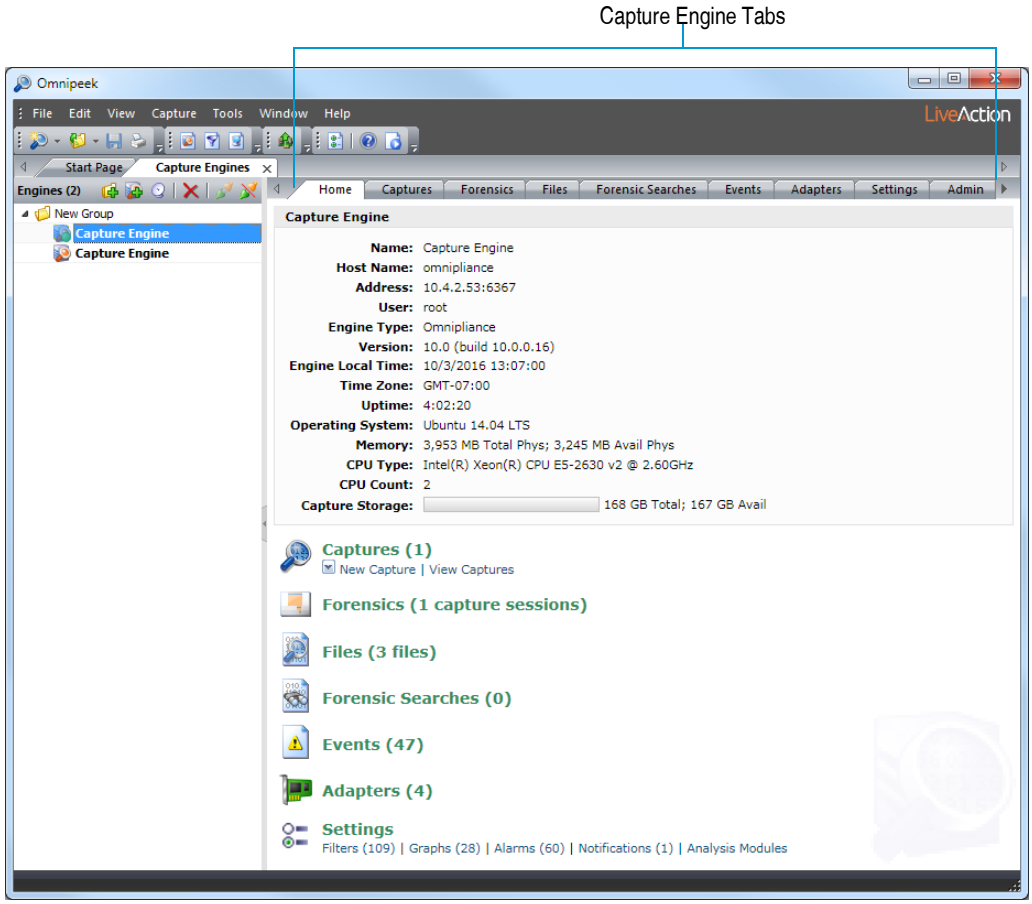



5. Complete the login information on the screen:
   - *Domain:* Type the Domain for login to the Capture Engine. If the Capture Engine is not a member of any Domain, leave this field blank.
   - *Username:* Type the Username for login to the Capture Engine.
   - *Password:* Type the Password for login to the Capture Engine.
6. Click **Connect**. When the connection is established, the engine appears in the **Capture Engines** window along with all of the tabs appropriate for that Capture Engine.

# The Capture Engines window tabs

Once you are connected to one or more Capture Engines, the **Capture Engines** window displays each Capture Engine (by name, IP address, and port) and the tabs that allow you to configure properties for the currently selected Capture Engine.

**Important!** Opening or closing the **Capture Engines** window does not change the connection state for any of the Capture Engines displayed.




# Capture Engine tabs

The following tabs allow you to configure properties for a connected Capture Engine:

- *Home*: This tab displays a summary of Capture Engine properties and network settings. Graphical links allow you to quickly access other available tabs for the Capture Engine.

  **Note** The *Capture Storage* summary displayed in the *Home* tab displays the amount of space available for storing capture data on the Capture Engine. This amount is the free space available on the Capture Engine less a reserve of additional unused disk space. The reserve is calculated as the sum of 11 GB plus 3% of the total disk space on the Capture Engine (a minimum of 5 GB, and a maximum of 1 TB). See *Configuring general options* on page 31 to allocate the amount of disk space for a capture.

- *Captures*: This tab lists all defined captures, along with summary information about each capture where 'Capture to Disk' was enabled. See *Capture Engine Captures tab* on page 76.
- *Forensics*: This tab displays the capture sessions available on the Capture Engine. You can select one of the capture sessions, display its data in the Timeline graph, and then perform a forensic search on specific parts of the data. See *Forensics capture on a Capture Engine* on page 54 and *Forensic search from the Forensics tab* on page 124.
- *Files*: This tab displays all capture files saved to the Capture Engine. The data folder for saving these files is defined in the **General** view of the Capture Engine Wizard. See *Configuring and updating Capture Engine settings* on page 19.

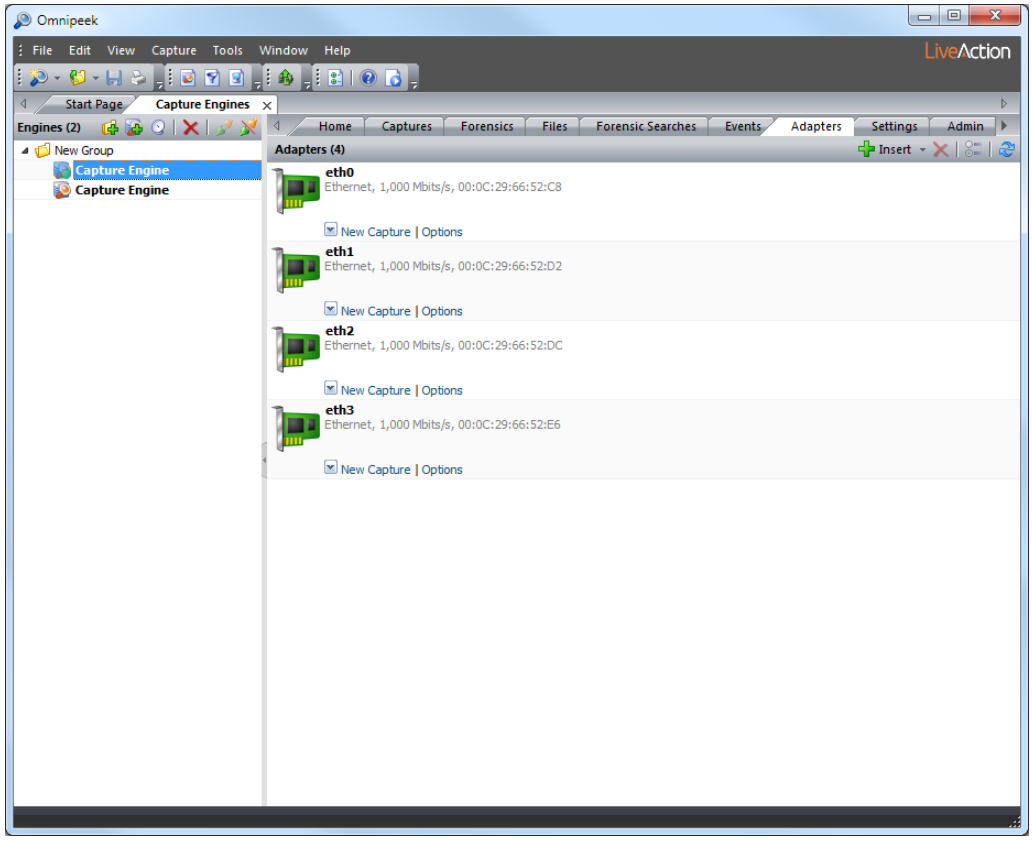
  You can select one or more of the capture files and then perform a forensic search on the files. See *Forensics capture on a Capture Engine* on page 54 and *Forensic search from the Files tab* on page 121.

- *Forensic Searches*: This tab displays all forensic searches, whether in progress or complete, on the Capture Engine. Forensic search listings are displayed in the *Forensic Searches* tab until you close a forensic search window and delete the search when prompted, or select the forensic search listing and click *Delete*.

  When a forensic search is complete, a notification is sent using the 'Forensic Search.' If you have set up a notification using that source, you are notified with whatever action type you set up (email, SNMP, trap, etc.) when the search is complete.

- *Log*: This tab provides a log which collects messages from program processes and events, including program start and stop, notifications, etc. See *Capture Engine global events* on page 287.

- *Adapters*: This tab displays all available recognized capture adapters for the Capture Engine. Multiple captures can use the same adapter, or each a different adapter, as long as each capture has one valid adapter selected.




To select an adapter for an individual capture, see *Configuring adapter options* on page 34.

- *Settings*: This tab displays the following sub-tabs:

  - *Graphs*: This tab allows you to create and manage graph templates, which can be used by any Capture Engine capture window on that engine. See *Capture Engine graph templates* on page 254.

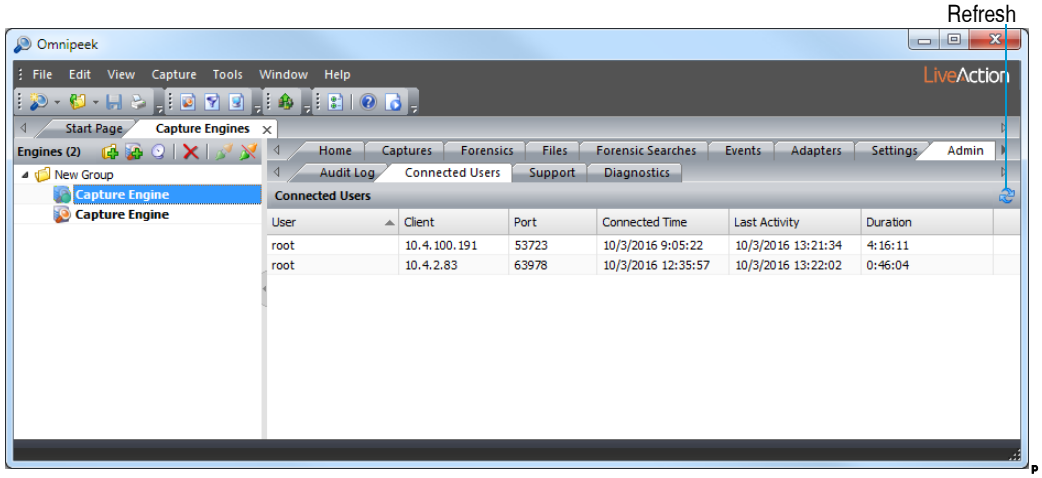
  - *Filters*: This tab displays a list of all filters present on the Capture Engine and a means of managing them independent of any particular Capture Engine capture window. See *Capture Engine filters tab* on page 95.

  - *Alarms*: This tab provides a list of all the alarms present on the Capture Engine and a means of managing them independent of any particular Capture Engine capture window. See *Capture Engine alarms tab* on page 262.

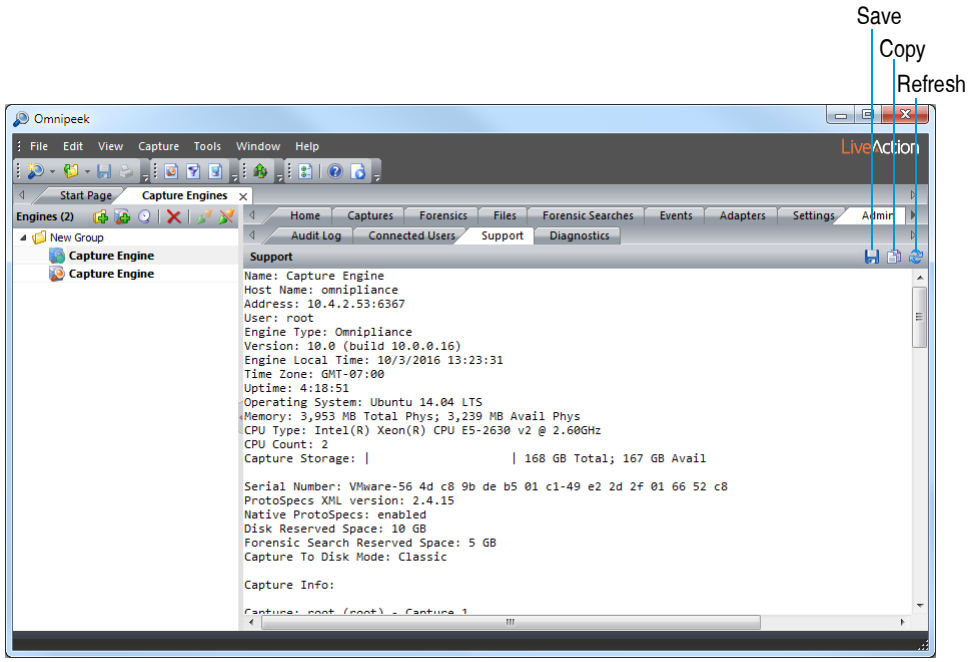
  - *Notifications*: This tab provides a means of defining Actions (responses to a notification) and invoking these Actions when a notification of a specified severity is generated by an event or process running on a Capture Engine. See Chapter 16, *Sending Notifications*.

- *Protocol Translations*: This tab provides a list of all the protocol translations defined on the Capture Engine. You can create, edit, duplicate, and delete protocol translations. See *Protocol translations* on page 225.
- *Analysis Modules*: This tab displays summary information about each analysis module installed on the Capture Engine. See *Capture Engine analysis modules* on page 295.

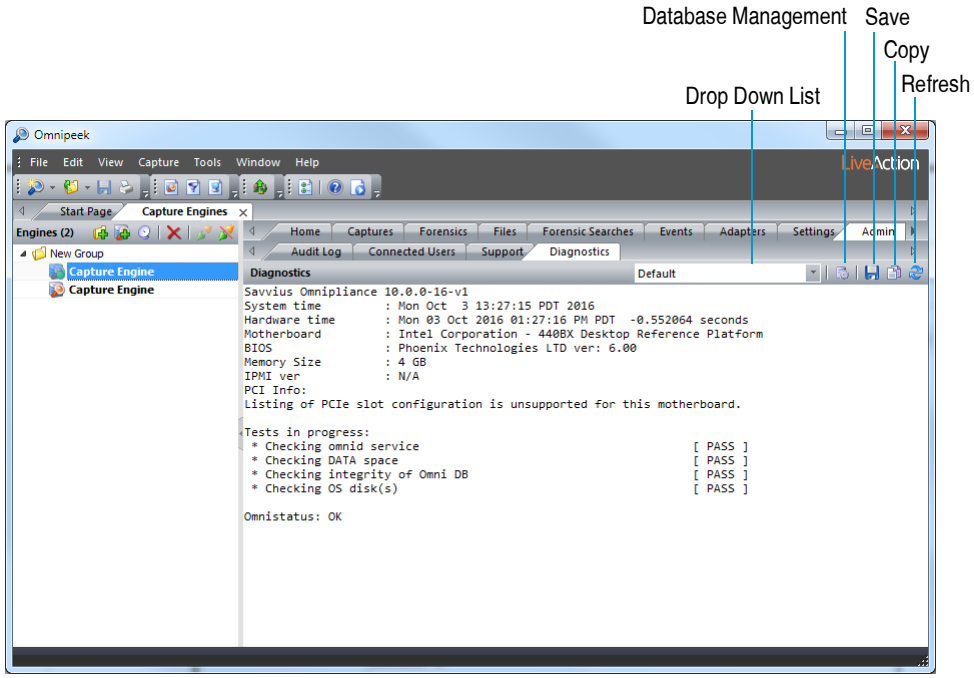
- *Admin*: This tab displays the following sub-tabs:
  - *Audit Log*: This tab lists all available information regarding events taking place on the Capture Engine. See *Capture Engine audit log* on page 291.
  - *Connected Users*: This tab shows all users currently connected to the Capture Engine. Click **Refresh** to refresh the list.




  - *Support*: This tab displays support information that is useful in troubleshooting your Capture Engine. You can save the support information to a text file, copy selected text, and refresh the current view.




- *Diagnostics*: This tab allows you to run a diagnostic test on the connected engine and display the results inside a text box. You can save the diagnostics information to a text file, copy selected text, and refresh the current view. Additionally, you can perform database management which does an integrity check on the database, vacuums (cleans) the database, and reindexes the database.




- *Trust Table* (Capture Engine for Omnipeek (Windows) only): This tab allows you to associate 802.11 WLAN addresses with a trust value: *Trusted*, *Known*, or *Unknown*. These values are used by the **WLAN** and **Summary** views of a Capture Engine capture window. See Chapter 17, *Using the Name Table*.

# Configuring and updating Capture Engine settings

The Capture Engine Manager, installed with Omnipeek, allows you to configure a single Capture Engine, as well as perform simultaneous global updates to a group of Capture Engines.

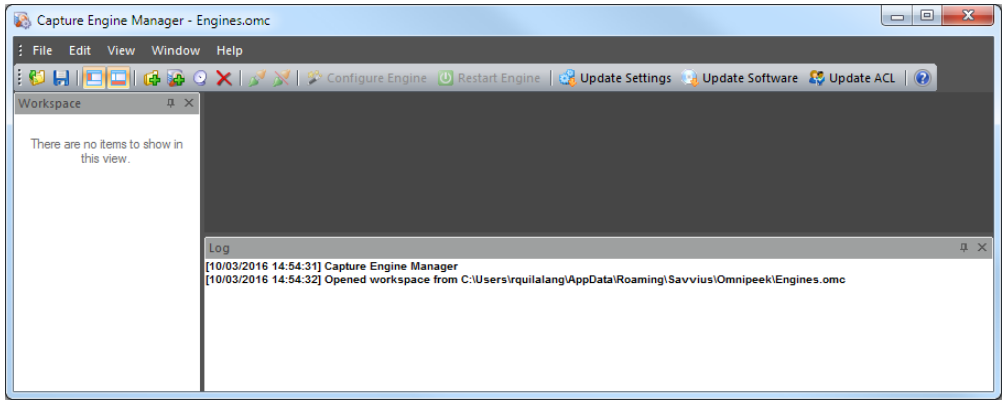
## Configuring a Capture Engine

Run the Capture Engine Wizard of Capture Engine Manager to configure a Capture Engine.

**Note** To configure Capture Engine for Omnipeek (Linux), you must run Capture Engine Manager from an Omnipeek computer connected to the network.

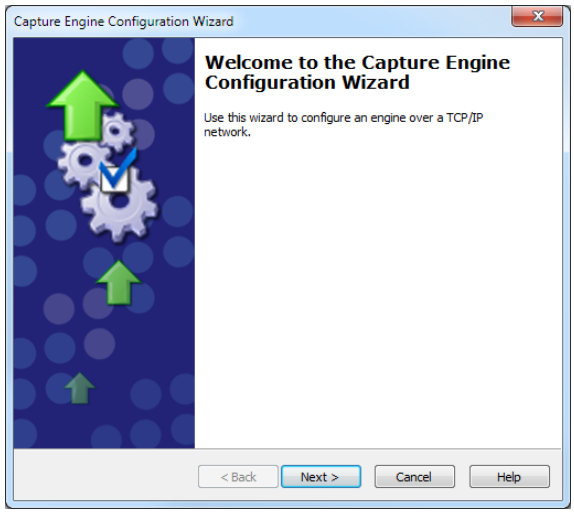
### To configure a Capture Engine using the Capture Engine Wizard:

1. On the **Start** menu, click **LiveAction Capture Engine Manager for Omnipeek**. The Capture Engine Manager appears.



2. Connect to a Capture Engine in the *Workspace* area and click **Configure Engine** in the toolbar. The Capture Engine Configuration Wizard appears.

**Note** You can also start the Capture Engine Wizard directly from the **Capture Engines** window in Omnipeek. Simply right-click a connected Capture Engine in the **Capture Engines** window, and select *Configure Engines...*. The Capture Engine Configuration Wizard appears.




3. Configure the Capture Engine settings:
   - *General:* These settings set the name, IP address and port of a Capture Engine, capture restart, and location of the *Data* folder. All packet files saved during capture are stored in the *Data* folder.
   - *Security:* These settings set encryption, third-party authentication, and data compression for the data stream between Omnipeek and a Capture Engine. You can also enable auditing, creating a log of Capture Engine access events.
   - *Access Control:* These settings lets you control access to a Capture Engine and its features by associating users (username and password pairs defined in the operating system security settings) with classes of tasks on the Capture Engine called *Policies*. Policies include such tasks as starting or modifying a capture created by another user, viewing results, and so forth.

For detailed instructions on how to configure Capture Engine settings, see the *Capture Engine for Omnipeek Getting Started Guide* or the online help in the Capture Engine Manager application.

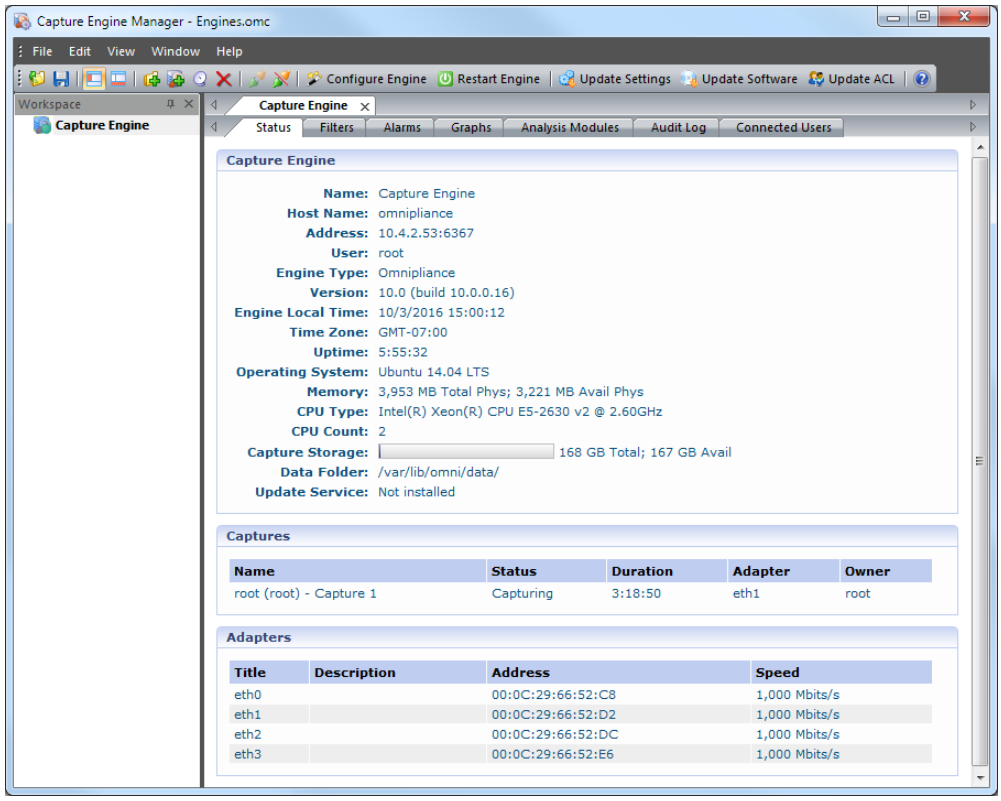
## Updating software and settings

The Capture Engine Manager allows you to perform simultaneous global updates to a group of Capture Engines by:

- Scheduling and running remote software updates for multiple Capture Engines.
- Distributing settings for filters, alarms, and graph templates across multiple Capture Engines.
- Distributing Access Control Lists (ACLs) to multiple Capture Engines in a single Domain.

**To open the Capture Engine Manager:**

1. On the **Start** menu, click **LiveAction Capture Engine Manager for Omnipeek**. The Capture Engine Manager appears.




2. Click **Update Software** to update the Capture Engine software for one or more Capture Engines using the Engine Update service.

> **Note** Updating Capture Engine software with the Capture Engine Manager is not supported in Capture Engine for Omnipeek (Linux).

3. Click **Update Settings** to update the settings for filters, alarms, or remote graph templates for one or more Capture Engines.
4. Click **Update ACL** to distribute a single Access Control List (ACL) to multiple Capture Engines running on machines belonging to the same Domain.

For detailed instructions on how to update the software or settings for a group of Capture Engines, see the *Capture Engine for Omnipeek Getting Started Guide* or the online help in the Capture Engine Manager application.

CHAPTER 3

# The Capture Window

## In this chapter:

# About capture windows

Capture windows are the main interface for presenting traffic analysis information about your network. Omnipeek lets you create capture windows for local captures, as well as remotely from multiple interfaces to an unlimited number of distributed Capture Engines.

You can create multiple configurable capture windows, each with its own selected adapter and its own capture settings. The number of capture windows you can have open at one time is limited only by the amount of available system resources.

When configuring a capture window's capture settings, keep in mind that the window's capture performance can be directly related to the number and type of capture options that you have enabled. For example, enabling more options may give you more data, but may come at the price of a greater likelihood of not capturing all the data.

The things that determine how much data (and therefore how many capture options) a capture can handle is determined by the system memory and CPU power of the Omnipeek or Capture Engine computer, the amount and kind of data that is being captured, and the number of capture options and analysis modules that are enabled. Enabling capture options, such as *Capture to disk*, *Expert Analysis*, and *Graphs*; and enabling an analysis module such as *VoIP Analysis* consumes much more machine resources than others.

# Creating an Omnipeek capture window

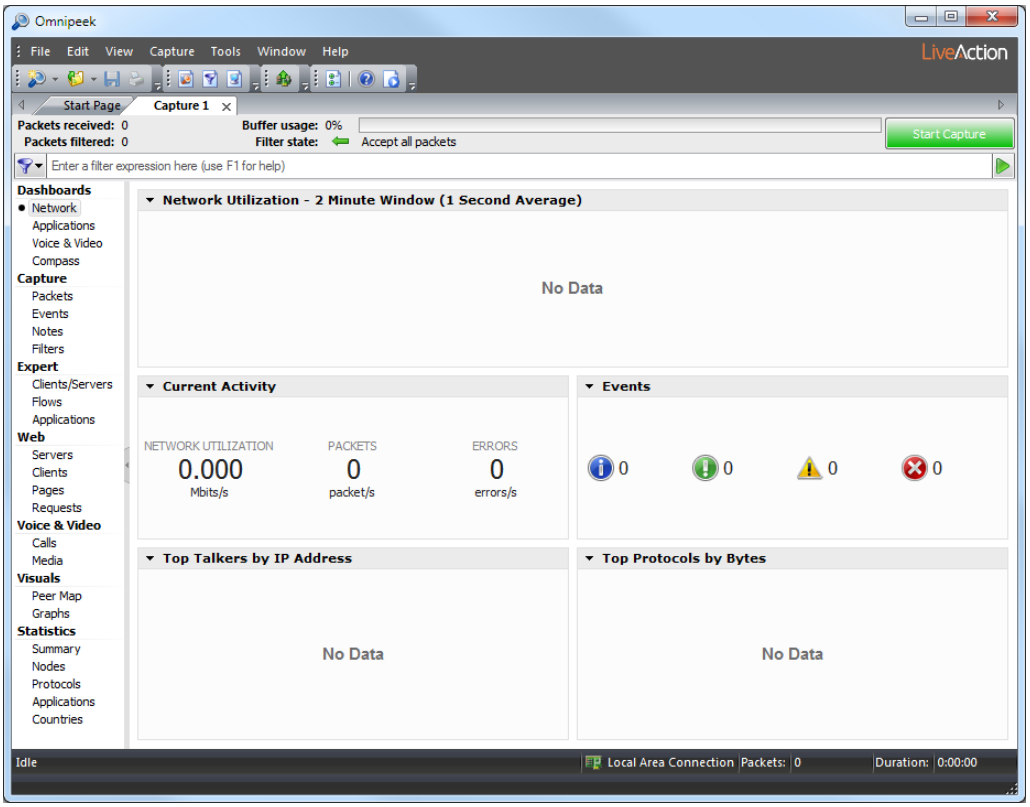
Creating an Omnipeek capture window lets you capture traffic locally from a variety of adapter sources. For example, you can create a new capture window by starting a capture from a supported network adapter, by replaying an existing capture file, by aggregating traffic from multiple wired or wireless sources, and by streaming packets from Aruba and Cisco access points. See *Configuring adapter options* on page 34 for more information.

**To create an Omnipeek capture window:**

1. To start a new capture, do one of the following:
   - Click **New Capture** on the Start Page
   - On the **File** menu, click **New Capture...**

   The **General** options of the Omnipeek **Capture Options** dialog appears.
2. Configure the **General** options. Click **Help** on the dialog or see *Configuring general options* on page 31 for more information.
3. Choose an adapter in the **Adapter** Options. Click **Help** on the dialog or see *Configuring adapter options* on page 34 for more information.

   **Note** For a description of other configuration options, see *Configuring capture options* on page 28.
4. Click **OK**. A new Omnipeek capture window appears.




See *Capture window views* on page 45 to learn more about the different views available from the navigation pane of every capture window.

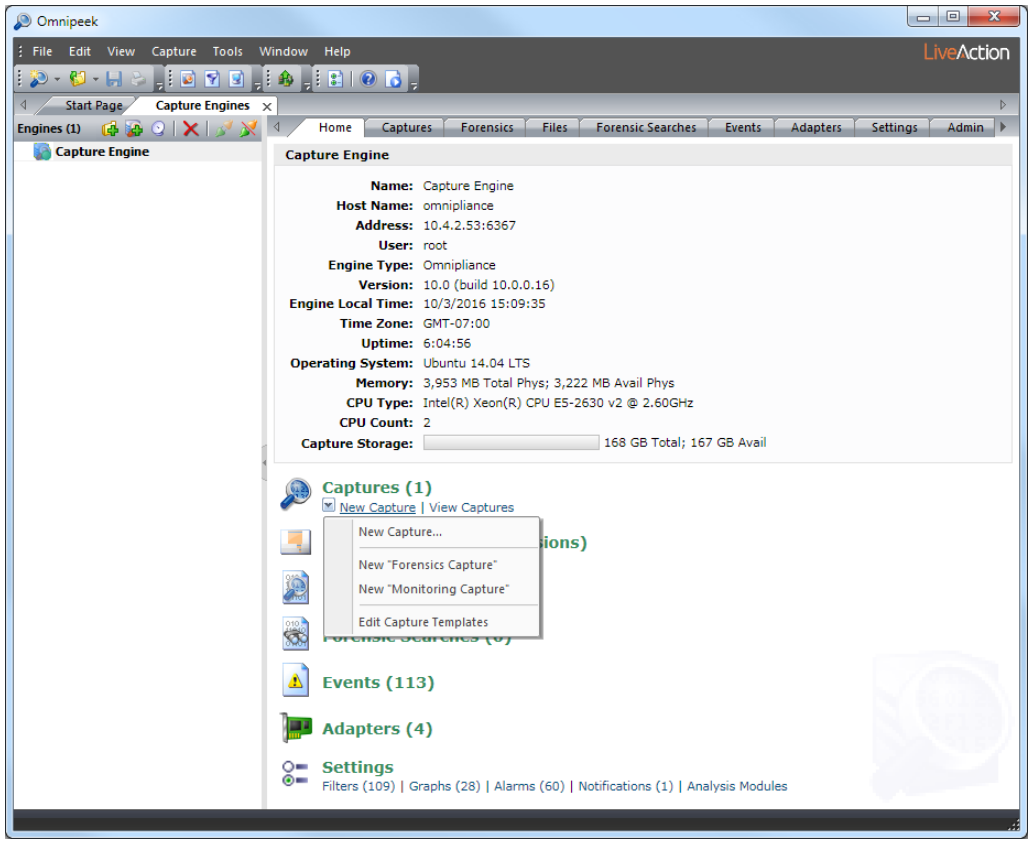
# Creating a Capture Engine capture window

Creating a Capture Engine capture window lets you capture traffic remotely from an unlimited number of distributed Capture Engines. Capture Engines can perform real-time network analysis on traffic from one or more network interfaces, including Ethernet, 802.11 a/b/g/n/ac wireless, 1 Gigabit, 10 Gigabit, 20 Gigabit, and 40 Gigabit. Capture Engine capture windows lets you capture and analyze data in real-time, and record data for post-capture analysis. Using Capture Engine capture windows, network engineers can record and monitor their entire enterprise-wide network and quickly identify and remedy performance bottlenecks, even those occurring at remote locations, without leaving the office.

**To create a Capture Engine capture window:**

1. Do one of the following to open the **Capture Engines** window:
   - On the Start Page, click **View Capture Engines**
   - On the **View** menu, click **Capture Engines**

   The **Capture Engines** window appears.
2. Connect to a Capture Engine. (To connect to a Capture Engine, see *Connecting to a Capture Engine* on page 11.) The *Home* tab for the Capture Engine appears.




3. From the *Home* tab, click *New Capture* and select the type of capture window that you would like to create:

   - *New Capture...*: This option lets you create a new Capture Engine capture window based on the capture settings that you define. See *Configuring capture options* on page 28.
   - *New "Forensics Capture"*: This option lets you create a new Capture Engine capture window based on a forensic capture template configured for post-capture forensic analysis. See *Forensics capture on a Capture Engine* on page 54.
   - *New "Monitoring Capture"*: This option lets you create a new Capture Engine capture window based on a monitoring capture template configured to view higher level expert and statistical data in a continuous real-time capture. See *Monitoring capture on a Capture Engine* on page 55.
   - *Edit Capture Templates*: This option opens the **Capture Templates** dialog and allows you to create new or edit existing capture templates. See *Capture Engine capture templates* on page 53.

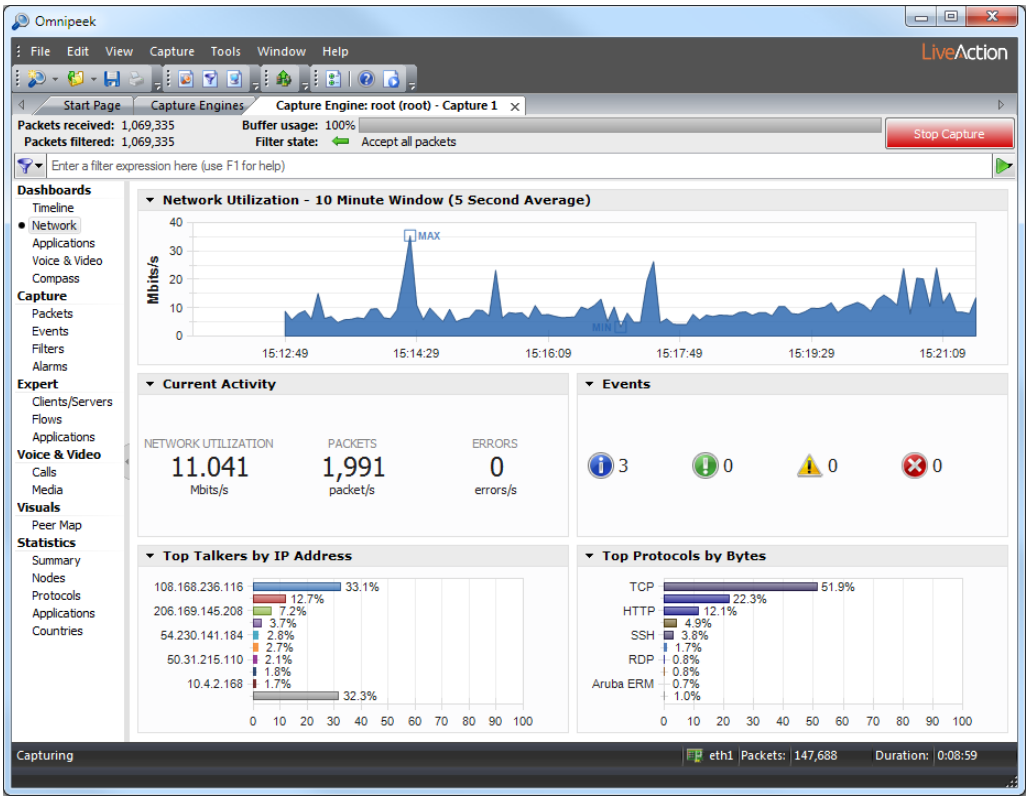
   The *General* options of the Capture Engine **Capture Options** dialog appears.

**Note** You can also select the above options from the **Insert** drop-down list available from the *Captures* tab, and from the *New Capture* options available from the *Adapters* tab.

4. Configure the *General* options. Click **Help** on the dialog or see *Configuring general options* on page 31.
5. Choose a capture adapter in *Adapter* options. See *Configuring adapter options* on page 34.

**Note** For a description of the other views available from the **Capture Options** dialog, see *Configuring capture options* on page 28.

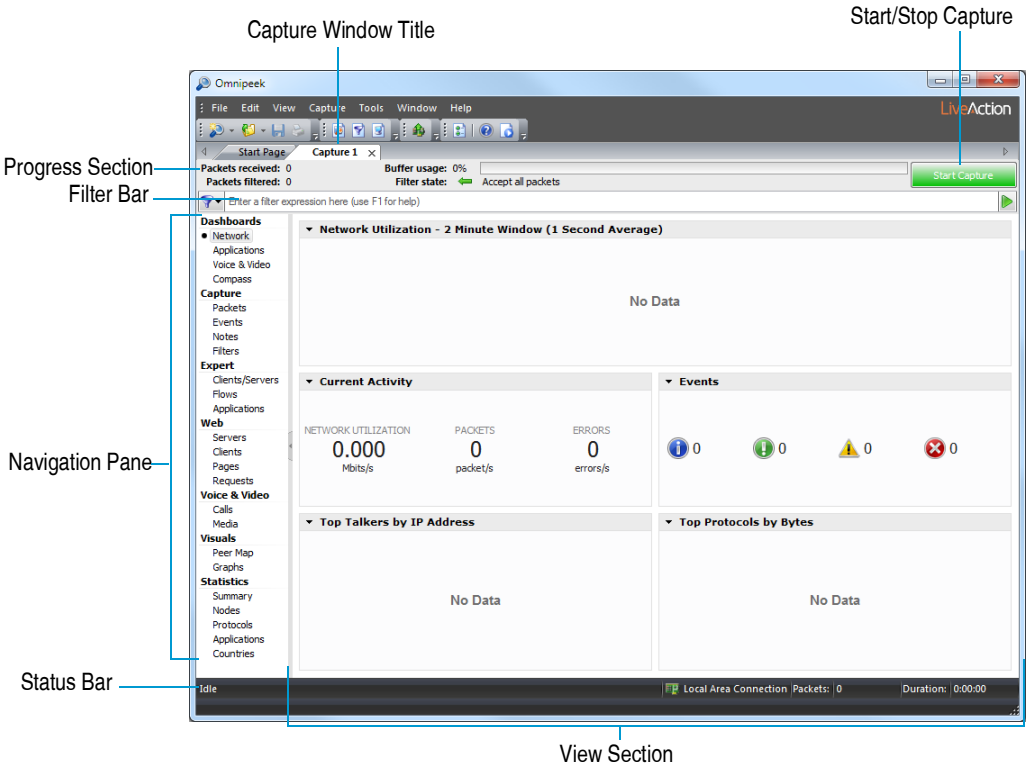
6. Click **OK**. A new Capture Engine capture window appears.




See *Capture window views* on page 45 to learn more about the different views available from the navigation pane of every capture window. See *Navigating a capture window* on page 26 to learn more about the parts of the capture window.

# Navigating a capture window

The parts of the capture window are identified below.



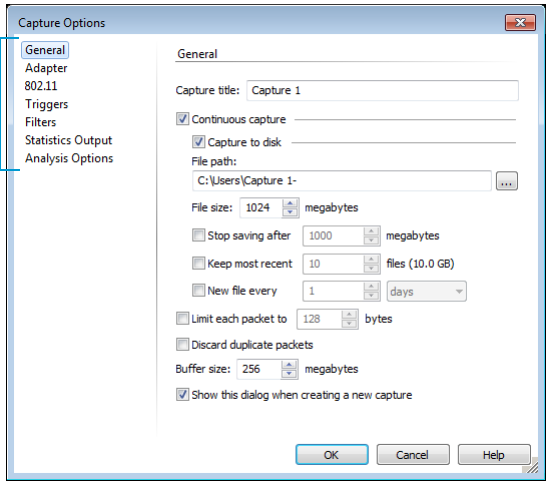

- *Capture Window Title:* Displays the user-defined (or default) title of the capture window.
- *Progress Section:* Displays packet, memory, and filter information:
  - *Packets received:* Displays the total number of packets received since the capture was initiated.
  - *Packets filtered:* Displays the total number of packets received for this capture window that have passed any enabled filters.
  - *Buffer usage:* Displays the percentage of capture buffer memory used for this capture window.
  - *Filter state:* Summarizes any enabled filter conditions.
- *Start/Stop Capture:* Starts or stops a capture. When a trigger is set for the capture window, this button is labeled Start/Stop Trigger. See *Setting triggers* on page 266.
- *Filter bar:* This area lets you quickly create advanced filters directly in a capture window. See *Creating filters using the filter bar* on page 106.
- *Navigation Pane:* Displays available views for the capture window. The available views are dependent on which capture options are enabled. For descriptions of available capture window views, see *Capture window views* on page 45.
  - *Navigation pane right-click options:*
    - *Undock:* Undock the selected view from the capture window, making it easier to display and organize views. To dock the view back to the capture window, close the undocked view.
    - *Default View:* Sets the selected view as the default view for subsequent capture windows.
- *Status Bar:* Displays status information:
  - *Capture status:* Displays state of the capture process.
  - *Current adapter:* Displays adapter currently selected as the capture adapter.
  - *Packets:* Displays the number of packets in the capture buffer.
  - *Duration:* Displays the difference between the earliest and the most recent packet in the capture buffer.

- *View Section:* Displays the contents of the selected view.

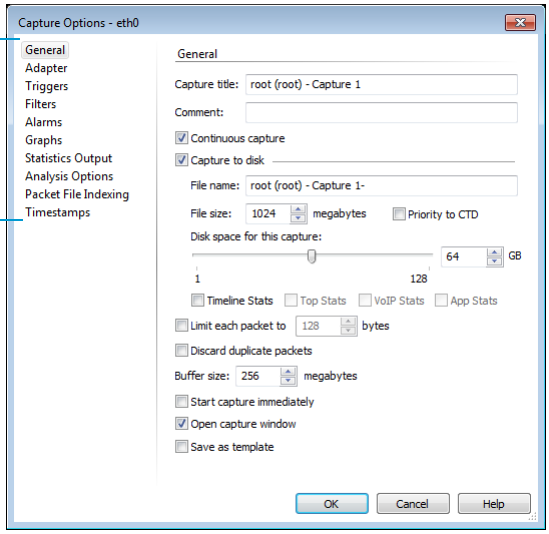
# Configuring capture options

You can have multiple capture windows open simultaneously, capturing and displaying data in real time. The various capture options in the Omnipeek and Capture Engine **Capture Options** dialog let you configure each of these windows to have their own capture settings.

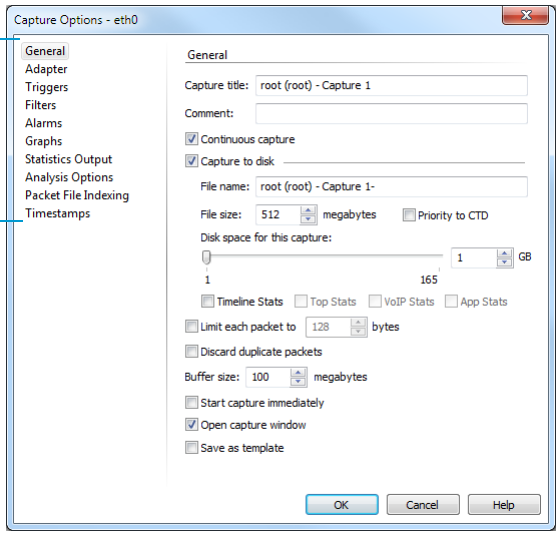
Omnipeek capture options



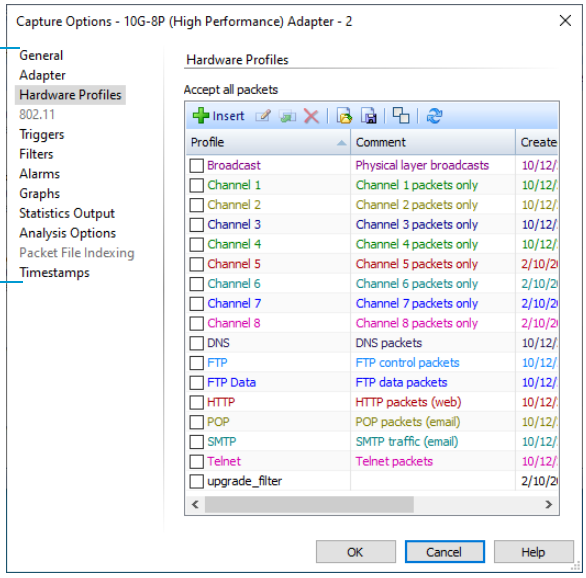

Capture Engine capture options



Capture Engine capture options




Capture Engine capture options (hardware profiles supported)




The **Capture Options** dialog lets you configure capture options for the following:

- *General:* General options let you name the capture and set various packet capture parameters. See *Configuring general options* on page 31.
- *Adapter:* Adapter options let you select and configure the adapter used for captures. All available recognized adapters are displayed in this view. In most cases, multiple captures can use the same adapter, or a different adapter, as long as each capture has a valid adapter selected. See *Configuring adapter options* on page 34.
- *Hardware Profiles (Capture Engine only):* Hardware profiles tell a capture adapter or a capture the type of traffic to capture and how to manage that traffic. Hardware profiles are available when the selected adapter or capture supports hardware profiles. See *Configuring hardware profiles* on page 313.
- *802.11 (Omnipeek only):* 802.11 options let you control channel selection and security for the selected wireless adapter. See *Configuring wireless channels and encryption* on page 303.
- *Triggers:* Trigger options let you set triggers to start and stop a capture based on a time event or a filter match. See *Setting triggers* on page 266.
- *Filters:* Filter options let you enable or disable filters used for capturing packets. See *Enabling filters from the Capture Options dialog* on page 98.
- *Alarms (Capture Engine only):* Alarm options let you enable or disable individual alarms for a particular Capture Engine capture window. See *Capture Engine capture window alarms* on page 263.

- *Graphs (Capture Engine only):* Graph options let you manage all aspects of remote statistics graphing capabilities. See *Capture Engine graphs capture options* on page 251.
- *Statistics Output:* Statistic output options let you control the periodic output of statistics reports while the capture is running. You can choose from several groups of statistics in a variety of report and file output formats. See *Generating statistics output reports* on page 234.
- *Analysis Options:* Analysis options let you specify capture performance by selectively disabling certain functions and freeing up system resources, specific to networking areas such as VoIP, Expert, nodes, and protocols. See *Optimizing capture performance* on page 300.

  Analysis options let you view detailed analysis of your capture data in real time. Enabling analysis options will impact the performance of any capture, as indicated by the Capture Performance bar.
- *Packet File Indexing (Capture Engine only):* Packet file indexing options let you increase performance for forensic searches that use software filters by allowing you to specify the packet characteristics that you are most likely to use in a forensic search software filter.

  In order for packet file indexing to improve forensic search performance, the forensic search must include a filter expression that incorporates the packet file indexing characteristics configured here. For example, if the capture is creating packet file indexes for IPv6 addresses, a forensic search that includes a software filter on IPv6 addresses might see an improvement in speed because of packet file indexing. See the various forensic search options in Chapter 7, *Post-capture Analysis* for including a software filter in your forensic search.

  Packet file indexing works best when the resulting packets from a forensic search using software filters are sparsely located within the packet files being searched. If the resulting packets exist throughout most of the packet files being searched, then the performance gains realized by packet file indexing are greatly minimized.

  **Note** NOT clauses and address clauses that include wildcard characters in the forensic search filter expression cannot improve forensic search performance using packet file indexing.

  **Note** The *Capture to disk* setting in the *General* capture options, must be enabled in order for the *Packet File Indexing* option to become available. If *Capture to disk* is disabled, then packet file indexing is also disabled and ignored.
- *Timestamps (Capture Engine only):* Timestamps options let you specify the smart tap manufacturer whose hardware timestamp formats are supported by Omnipeek and displayed in the capture. You can choose from the list of supported manufacturers, or you can select 'Default.' For example, if 'Gigamon' is selected, then Capture Engine and Omnipeek decodes the appended trailer timestamp added to the packet by the smart tap. The decoded timestamp replaces any existing Omnipeek timestamp and is displayed as the 'Timestamp' in the packet's 'Packet Info.'

  If you select 'Default,' or if any of the selected manufacturer's timestamp formats are not supported by the hardware, then the packet's timestamp reverts to the local system time of the Capture Engine for when the packet was captured by the Capture Engine.

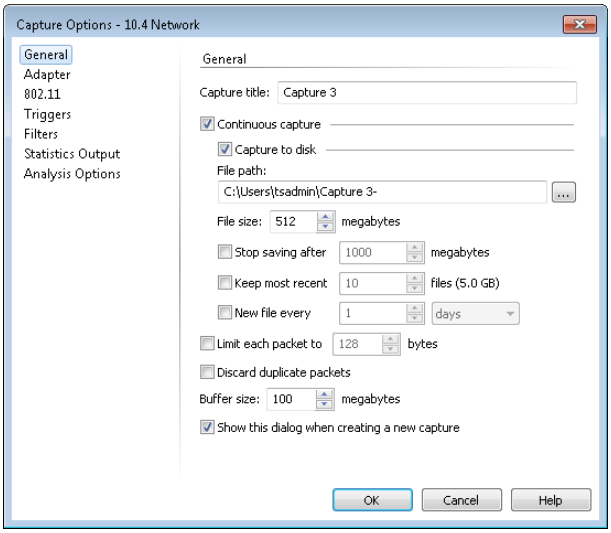
**Important!** If a vendor's timestamp option is selected, then the capturing adapter must be connected to that vendor's corresponding smart tap.

Additionally, It's important to ensure that the Capture Engine's clock time is as close as possible to the smart tap's clock time. For this reason we suggest using NTP with the same time zone on all smart taps and Capture Engines. If your Capture Engine is capturing aggregated data (e.g., using an adapter for LiveCapture) from multiple smart taps, it is important that the smart taps have their clock times synchronized and set to the same time zone.

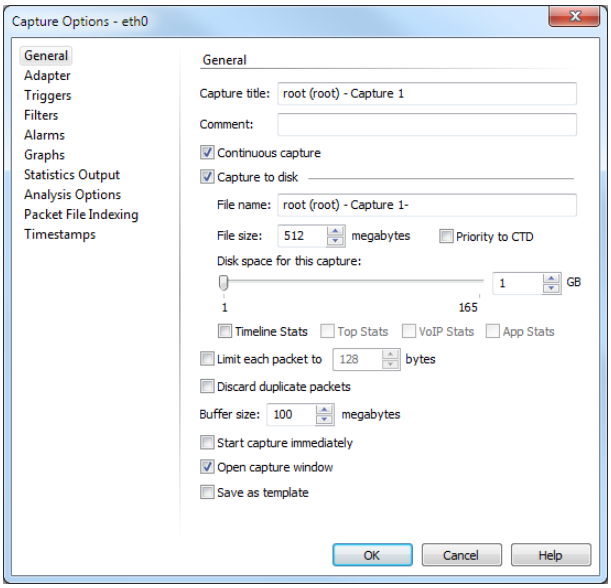
# Configuring general options

The *General* options of the **Capture Options** dialog lets you name the capture and set various packet capture parameters for each capture window that you create. The capture options that are available when capturing locally from Omnipeek or remotely from a Capture Engine, differ slightly as shown below.

Omnipeek General Options




Capture Engine General Options




Here are descriptions of each of the *General* capture options:

- *Capture title:* Type a descriptive name for the capture window. Unique names can help you to identify and organize your capture windows.
- *Comment (Capture Engine only):* Enter any optional comments for the capture window. A comment that describes the capture's settings and purpose is often a useful reminder to yourself and others of the data provided by the Capture Engine.
- *Continuous capture:* Select this option to enable the continuous capture of packets into the capture buffer. If this option is enabled, older data in the capture buffer is replaced with newer data as the capture buffer becomes full. Capture does not stop until stopped by the user or by a stop trigger.

**Important!** When you select *Continuous Capture*, statistics for the capture window will reflect all of the packets seen since it last began capturing. If you did not also choose *Capture to disk*, only the packets currently in the buffer are available for analysis.

- *Capture to disk:* Select this option to save packet files on your disk. Packet files saved to your hard disk can be opened and analyzed at a later time with Omnipeek. If you are more interested in speeding up analysis of the data and conserving hard disk space, you may want to disable *Capture to disk*.

  In a Capture Engine, the packets are saved to the data folder configured when you set up the Capture Engine. See the *Capture Engine for Omnipeek Getting Started Guide* that ships with your Capture Engine, or the online help in the Capture Engine Manager application.

  **Note** *Capture to disk* options in the *General* capture options of a Capture Engine are not available if a reserve of free (unused) disk space is not available on the Capture Engine. The reserve is calculated as the sum of 11GB plus 3% of the total disk space on the Capture Engine (a minimum of 5GB, and a maximum of 1TB).'

  - *File path (Omnipeek only):* Type, or browse to, the location for saving capture files.
  - *File name (Capture Engine only):* Type the name used as a base file name prefix for each capture file that is created using the *Capture to disk* option. Additionally, each capture file is appended with a timestamp indicating the date and time the file was saved. The format of the timestamp is *YYYY-MM-DD-HH.MM.SS.mmm*.

    **Note** You can save capture files directly to a Libpcap (**.pcap,*.cap, *.dmp,* or **.appcap*) or PcapNG (**.pcapng* or **.ntar*) file format by appending the file name entered in the *File path* or *File name* fields with the desired file format extension. By default, if no file format extension is specified, then the capture file is saved as a LiveAction packet file (**.pkt).*

    **Tip** By default, the timestamp reflects local time and is placed immediately after the file name you entered. You can specify an alternate location of the timestamp within the file name by using the # character as a token for the timestamp. To have the timestamp written in Coordinated Universal Time (UTC) instead of local time, place the letter *z* immediately after the hash symbol. When UTC is in use, the letter *z* will appear at the end of the timestamp.

    - *File size:* Enter or select the maximum file size before a new file is created.
    - *Priority to CTD (Capture Engine only):* Select this option so that real-time analysis doesn't impact the capture-to-disk (CTD) performance. When this option is enabled, it is less likely that packets are dropped when they are captured to disk. If capturing all the packets to disk is desirable, enable *Priority to CTD*. If analysis is more important, disable *Priority to CTD*.
    - *Stop saving after (Omnipeek only):* Select this option and specify a size limit, in megabytes, for the amount of disk space reserved for all capture files that are created using the *Capture to disk* option. Once the size limit has been reached, the capture continues, but no more capture files are saved to disk.
    - *Keep most recent:* Select this option and specify a limit for the number of capture files that are created using the *Capture to disk* option. Once the file limit has been reached, the oldest capture file is replaced with a newer capture file.
    - *Disk space for this capture (Capture Engine only):* Move the slider control (or enter a value in the text box) to set the amount of hard disk space allocated for the capture. The minimum value of the slider is the minimum size of disk space a capture can occupy. If *Continuous capture* is also enabled, the capture continues forever, and the disk space set here is used as a

ring buffer (similar to old Keep Most Recent option, and similar to Timeline). If *Continuous capture* is disabled, the capture stops when this amount of disk space has been filled.

- *New file every:* Select this option and specify the longest amount of time (*Minutes*, *Hours*, *Days*) that may elapse before the open file is closed and a new file is created.

- *Timeline Stats (Capture Engine only):* Select this option to populate the Capture Engine database with capture data and basic network statistics such as utilization, size, distribution, etc. These statistics are then made available through the Capture Engine Forensics tab. See *Forensic search from the Forensics tab* on page 124 or *Forensic search from the 'Forensics Capture' window* on page 131 for information on view types.
- *Top Stats (Capture Engine only):* Select this option to populate the Capture Engine database with top nodes and top protocols statistics. These statistics are then made available through the Capture Engine Forensics tab.
- *VoIP Stats (Capture Engine only):* Select this option to populate the Capture Engine database with VoIP call quality and call volume statistics. These statistics are then made available through the Capture Engine Forensics tab. See *Forensic search from the Forensics tab* on page 124 or *Forensic search from the 'Forensics Capture' window* on page 131 for information on view types.

**Note** Selecting the *VoIP Stats* option may affect capture performance, especially when there are more than 2000 simultaneous calls on the network. Selecting the *Top Stats* option may affect capture performance, especially when there are more than 10,000 active nodes captured on the network.

- *App Stats (Capture Engine only):* Select this option to populate the Capture Engine database with applications statistics which are made available through the various 'application' displays.
- *Limit each packet to:* Select this option and specify a size limit, in bytes, for capturing only a portion of each packet. This is called *Packet Slicing* and allows you to save space in the capture buffer and disk storage (if *Capture to disk* is enabled). For example, entering a value of 128 will capture only the first 128 bytes of each packet. We recommend this value of 128 to ensure that the entire packet header is captured.
- *Discard duplicate packets:* Select this option to discard duplicate packets from the capture buffer as the packets are captured. Duplicate packets are often encountered when capturing from a SPAN or mirrored port on a managed switch.
- *Buffer size:* Enter a buffer size, in megabytes, for the amount of memory dedicated for the capture buffer. The capture buffer is where packet are placed for analysis. The default is 100 megabytes. A larger buffer can reduce or eliminate packet loss due to spikes in traffic. When *Capture to disk* is enabled and all *Analysis Options* are disabled, the *Buffer size* option is unavailable.
- *Show this dialog when creating a new capture window (Omnipeek only):* Select this option to display the *General* options of the **Capture Options** dialog whenever a new capture window is created.

**Tip** Clear the *Show this dialog when creating a new capture window* check box to have subsequent capture windows created using the same settings you have just set in the **Capture Options** dialog. Each time you create a new capture window, it opens immediately using these settings.

- *Start capture immediately (Capture Engine only):* Select this option to immediately begin capturing packets once **OK** is clicked.
- *Open capture window (Capture Engine only):* Select this option to immediately display the capture window once **OK** is clicked.
- *Save as template (Capture Engine only):* Select this option to create a new Capture Engine capture template based on the current capture option settings. A saved capture template can be selected

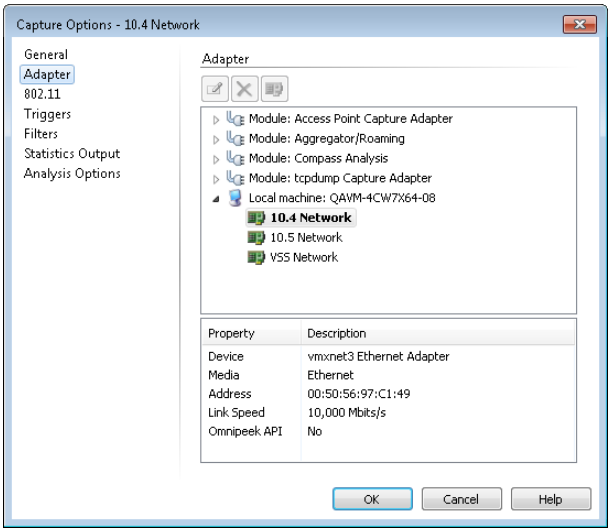
whenever you create a capture window and want that capture to have the same settings as those in the capture template.

## Configuring adapter options

The *Adapter* options of the **Capture Options** dialog lets you choose an adapter for the capture.

**To select an adapter for an Omnipeek capture:**

1. Click the *Adapter* options of the Omnipeek **Capture Options** dialog.




2. Select the capture adapter:

- *File:* Select a file or choose *New File Adapter* to simulate network conditions without having to be connected to a network. This option allows you to choose a LiveAction capture file and then 'play back' the packets into a capture's capture buffer. This allows you to replay the packets as if they were a real, active capture.

**Note** The *File* capture adapter is hidden by default. To display the *File* capture adapter, right-click inside the dialog and choose **Show File Adapters**.

- *Module: Access Point Capture Adapter:* Choose *New Adapter* to set up a capture that will accept incoming packets from an access point, and then stream those packets into a running wireless capture window in Omnipeek. To begin streaming packets, you will need to create a new access point capture adapter entry, and then select the new adapter as the adapter for a capture window. See *Capturing Packets from an Access Point Capture Adapter* on page 36.
- *Module: Aggregator/Roaming:* Choose *New Adapter* to select the adapters used to aggregate data. The Aggregator/Roaming adapter lets you capture traffic from multiple sources. For wireless traffic, it captures wireless packets from multiple channels simultaneously (without scanning), measures vital statistics on each channel separately, and calculates the latency of devices roaming between access points. For wired traffic, it aggregates packets from multiple wired adapters. See *Capturing Packets from an Aggregator/Roaming Adapter* on page 36.

**Note** You can also create RPCap interfaces that allow you to capture wired and 802.11 wireless traffic in Omnipeek. See *Capturing Packets from an RPCap Interface* on page 37.

- *Module: Compass Analysis:* Choose *New Compass Workspace* to select a Compass remote adapter. The Compass workspace lets you aggregate statistics from any number of capture files (**.pkt*, **.apc*, **.pcap* [Libpcap format only], **.wcap* [Libpcap format only], **.cap* [Libpcap format only], **.wpz*, and

*.pcapng*) over a reasonable period of time, and then display those statistics in the **Compass** dashboard. See *Compass dashboard* on page 65.

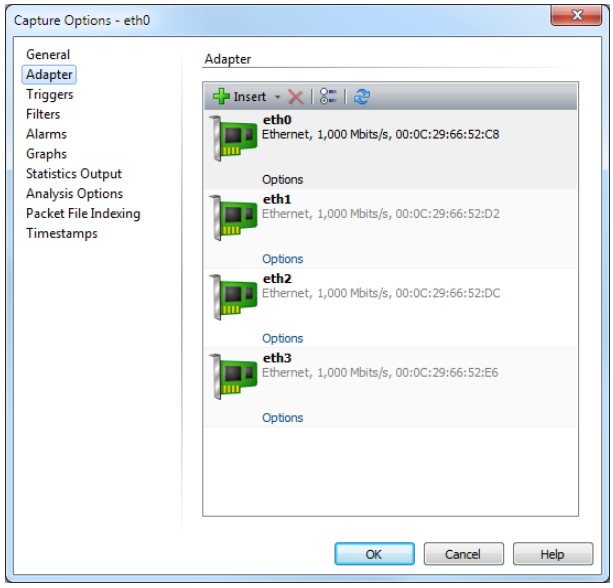
- *Module: tcpdump Capture Adapter:* Choose *New Adapter* to select an tcpdump Capture Adapter that lets you capture packets from remote computers that have the 'tcpdump' packet capture utility, into a running capture window in Omnipeek. To begin capturing packets, you will need to create a new tcpdump Capture Adapter entry, and then select the new adapter as the adapter for a capture window. See *Capturing Packets from a tcpdump Capture Adapter* on page 38.
- *Local machine:* Select a network adapter installed on the Omnipeek computer. All locally installed network adapters are listed; however, only a supported network adapter can be selected for a capture.

Information about the selected Omnipeek adapter is displayed below the list of adapters. For example, if you are capturing packets on a WLAN, only 802.11 wireless adapters that support the LiveAction API can be used to capture packets. If the description for *Omnipeek API* is *Yes*, the adapter can be used; if it is *No*, the adapter may not be a supported 802.11 wireless adapter, or it may not have the LiveAction driver installed yet. See *Supported adapters* on page 4.

**Tip** You can right-click an adapter to configure certain settings such as network speed options (the available options are dependent on the type of adapter). In certain cases you may want to override the network speed default setting (Auto sense). For example, you may wish to set a nominal network speed for a particular adapter to ensure consistent statistics reporting.

### To select an adapter for a Capture Engine capture:

1. Click the *Adapter* options of the Capture Engine **Capture Options** dialog.




2. Select the capture adapter.

**Tip** You can right-click a Capture Engine adapter to rename the adapter.

3. Click *Options* to open the **Adapter Options** dialog, where you can configure 802.11, adapter for LiveCapture, network speed, and buffer options (the available options are dependent on the type of adapter selected). For more information:
   - See *Configuring wireless channels and encryption* on page 303
   - See *Configuring hardware profiles* on page 313

**Note** Click **Help** on the **Adapter Options** dialog to learn more about the available settings.

## *Capturing Packets from an Access Point Capture Adapter*

The *Access Point Capture Adapter* lets you stream packets from one or more supported access points into a running wireless capture window in Omnipeek. To begin streaming packets, you will need to create a new *Access Point Capture Adapter* entry, and then select the new adapter as the adapter for a capture window. You can enable, disable, and configure *Access Point Capture Adapter* functionality in Omnipeek from the **Analysis Modules** view of the **Options** dialog. See *Access Point Capture Adapter* on page 361.

**To capture packets from an access point:**

1. Create a new capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.
3. Double-click *New Adapter* below the *Module: Access Point Capture Adapter* entry. The **Access Point Capture Adapter Properties** dialog appears.
4. Enter a Name and IP Address for the capture adapter. The name can be anything and the IP address should be that of the access point. Leave the IP address blank if you want to capture packets from all access points configured to send packets to the IP address of the Omnipeek computer.
5. Click **OK** to close the **Access Point Capture Adapter Properties** dialog.
6. Select the new adapter and click **OK** to close the **Capture Options** dialog. A new capture window appears that has **Start / Stop AP Capture** in the upper right corner.
7. Click **Start AP Capture**. Packets will not populate the capture window until the access point begins sending packets to the Omnipeek computer as noted below.

**Important!** To send packets from an access point to the IP address of the Omnipeek computer, you need to configure the access point through the user interface of the access point.

While the access point is sending packets to the Omnipeek computer, it is not operating as a true access point. When you want to stop sending packets, you must configure the access point to stop sending packets; otherwise, the Omnipeek computer will send an *ICMP Destination Port Unreachable* for every incoming packet received. This will impact the performance of the Omnipeek computer and possibly your network. Refer to your access point documentation for instructions.

8. Click **Stop AP Capture** to stop capturing packets. No additional packets are allowed into the capture buffer.

**Note** Any Aruba and Cisco access point remote adapters created in versions of Omnipeek prior to Omnipeek 8.1, will need to be recreated as new access point adapter entries in Omnipeek 8.1 and above.

## *Capturing Packets from an Aggregator/Roaming Adapter*

The *Aggregator/Roaming Adapter* lets you capture traffic from multiple wired or wireless sources. This is especially useful if you want to capture traffic from multiple 802.11 channels simultaneously, and then want to stream that data into a single capture window.

You can enable or disable the Aggregator/Roaming Adapter functionality in Omnipeek from the **Analysis Modules** view of the **Options** dialog. See *Aggregator/Roaming Adapter* on page 362.

**Note** You can also create RPCap interfaces that allow you to capture wired and 802.11 wireless traffic in Omnipeek. See *Capturing Packets from an RPCap Interface* on page 37.

Capturing packets from an Aggregator/Roaming Adapter is not supported from a Capture Engine.

**To capture packets from an Aggregator/Roaming Adapter:**

1. Create a new capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.
3. Double-click *New Adapter* below the *Module: Aggregator/Roaming* entry. The **Aggregator Settings** dialog appears.
4. Enter a name for the Aggregator/Roaming adapter.
5. Select either the Wired Connections or Wireless Connections option. A list of wired or wireless adapters is displayed in the window. Any wireless adapter that is not using the LiveAction API will also show up under wired connections.

   If a wireless network adapter is selected, the *Channel* drop down menu is enabled, allowing the selection of a wireless channel. You can also select *Scan* mode to enable *Scan Options* for selecting multiple wireless channels.
6. Select the check box of one or more adapters that you want to use to capture and analyze traffic.
7. Click **OK** to close the **Aggregator Settings** dialog.
8. Click **OK** to close the **Capture Options** dialog. A new capture window appears that has **Start / Stop Aggregator** in the upper right corner.
9. Click **Start Aggregator**.
10. Click **Stop Aggregator** to stop capturing packets. No additional packets are allowed into the capture buffer.

**Note** An aggregator capture window using wireless adapters displays roaming latency data in the three **Roaming** views. See *Roaming latency analysis* on page 308.

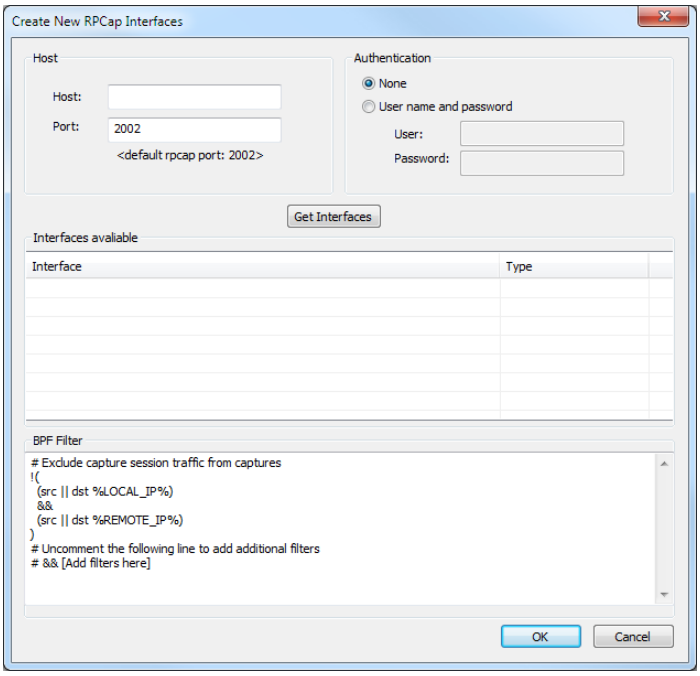
### *Capturing Packets from an RPCap Interface*

If you have WinPcap installed on a computer, or if you have an access point that supports RPCap, you can create RPCap interfaces that allow you to capture wired and 802.11 wireless traffic, and then stream the traffic back to Omnipeek where it can be displayed. In Omnipeek you create and select RPCap interfaces from within the **Aggregator Settings** dialog.

**To capture packets from an RPCap interface:**

1. Create a new capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.
3. Double-click *New Adapter* below the *Module: Aggregator/Roaming* entry. The **Aggregator Settings** dialog appears.
4. Enter a name for the Aggregator/Roaming adapter.
5. Click *Create RPCap Interfaces*. The **Create New RPCap Interfaces** dialog appears.

**Note** The **Create RPCap Interfaces** button is available only if the WinPcap driver and libraries are installed on your computer. You can install the driver and libraries by going to *www.WinPcap.org*.




6. Enter the Host and Authentication settings for the computer where the RPCap interface is located.
7. Click **Get Interfaces**. The RPCap interfaces available from the host are listed under *Interfaces available*.

**Note** You can enter a pcap-filter expression in the BPF Filter section to filter the packets from the RPCap interfaces displayed in Interfaces available. A pcap-filter expression is made up using the guide found at **http://www.manpagez.com/man/7/pcap-filter/.** Individual filter expressions applied to an interface will override the global BPF filter only on that interface.

8. Click **OK** to close the **Create New RPCap Interfaces** dialog. Any available RPCap interfaces are now listed in the **Aggregator Settings** dialog.
9. Select the check box of one or more RPCap interfaces that you want to use to capture and analyze traffic.

   If a wireless network adapter is selected, the *Channel* drop down menu is enabled, allowing the selection of a wireless channel.
10. Click **OK** to close the **Aggregator Settings** dialog.
11. Click **OK** to close the **Capture Options** dialog. A new capture window appears that has **Start / Stop Aggregator** in the upper right corner.
12. Click **Start Aggregator** to begin capturing packets.
13. Click **Stop Aggregator** to stop capturing packets. No additional packets are allowed into the capture buffer.

## *Capturing Packets from a tcpdump Capture Adapter*

The *tcpdump Capture Adapter*, lets you capture packets from remote computers that have the 'tcpdump' packet capture utility, into a running capture window in Omnipeek. Essentially all UNIX-family systems, including Linux and Mac OS X, have the 'tcpdump' packet capture utility.

Before capturing packets using the *tcpdump Capture Adapter*, make sure the prerequisites on the remote host are met, as described below.

To begin capturing packets, you will need to create a new *tcpdump Capture Adapter* entry, and then select the new adapter as the adapter for a capture window. The steps to create a tcpdump Capture Adapter entry are described below for both the Omnipeek console and a Capture Engine. See *tcpdump Capture Adapter on an Omnipeek console* on page 39 and *tcpdump Capture Adapter on a Capture Engine* on page 41.

**Note** You can enable or disable the *tcpdump Capture Adapter* functionality in Omnipeek in the **Analysis Modules** view of the **Options** dialog.

### *Prerequisites on remote host*

Before capturing packets, the following requirements must be met on the remote host:

- 'sudo' utility must be installed
- Disable terminal (tty) for 'sudo' to run 'tcpdump' command. Please refer to your remote host's operating system documentation for instructions on how to disable 'tty'
- The remote user's default shell should point to a bourne or bourne-like shell; for example, bash, dash, tcsh, etc. (but NOT C-shell (csh))

### *Prerequisites on Ubuntu 16 remote host (and non-root user)*

If your remote host is Ubuntu 16 (and above), and your user account is non-root, then the following prerequisites are required on the remote host:

1. Create a dedicated group, e.g., 'pcap,' for users who should be able to run tcpdump and add your user (e.g., linda) to it:

   *groupadd pcap*
   *usermod -a -G pcap linda*

2. Modify the group ownership and permissions of the tcpdump binary so that only users in the pcap group can run it:

   *chgrp pcap /usr/sbin/tcpdump*
   *chmod 750 /usr/sbin/tcpdump*

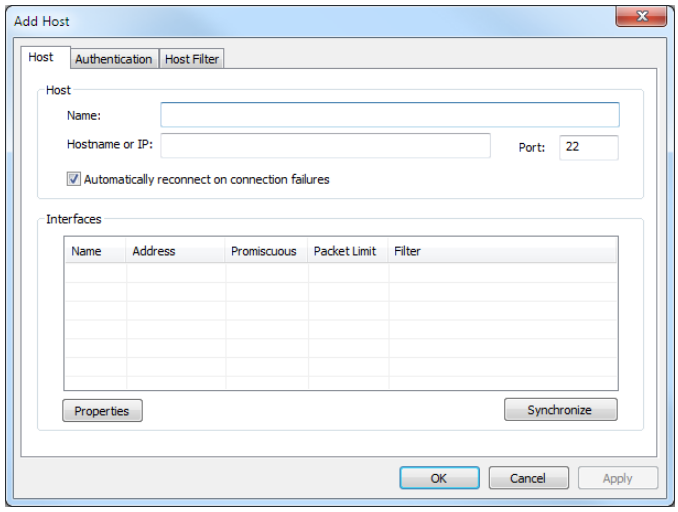
3. Set the CAP_NET_RAW and CAP_NET_ADMIN capabilities on the tcpdump binary to allow it to run without root access (these options allow raw packet captures and network interface manipulation):

   *setcap cap_net_raw,cap_net_admin=eip /usr/sbin/tcpdump*

### *tcpdump Capture Adapter on an Omnipeek console*

**To capture packets from a tcpdump Capture Adapter on an Omnipeek console:**

1. Create a new capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.
3. Double-click *New Adapter* below the *Module: tcpdump Capture Adapter* entry. The **Host Properties** dialog appears. At a minimum, you must configure settings on the *Host* and *Authentication* tabs.




4. Configure the **Host Properties** dialog. :

- *Host* tab: This tab lets you enter a name and address of the remote host
  - *Name*: Enter a name for the remote host computer.
  - *Hostname or IP*: Enter an IP address of the remote host computer.
  - *Automatically reconnect on connection failures*: Select this option to automatically attempt to reconnect to the remote host computer whenever a connection is lost.
  - *Interfaces*: Displays the interfaces synchronized with the remote host adapter.
  - *Properties*: Displays the properties for the selected interface. You can define *Simple* or *Advanced* tcpdump commands for the interface here.

    *Simple*: Select this option if you want to define promiscuous and slice settings for the tcpdump commands.

    *Don't put the interface into promiscuous mode (-p). (Required for some VM interfaces.)*: Select this option if you do not want the interface put into promiscuous mode (-p). This may be required for some VM interfaces.

    *Limit each packet to _____ bytes. (Default snaplen is 65535).*: Select this option to change the slice value for each packet from the default (65535), and then enter the desired slice value in bytes. tcpdump **snaplen** includes the header, but Omnipeek does not consider the header in the slice.

    *Filter (BPF)*: Enter or select additional filters for the tcpdump commands.

    *Advanced*: Select this option to add or define additional tcpdump commands in the text box below. If you add or define additional commands, you must redirect your output to Standard Output (*stdout*).
  - *Synchronize*: Click to query the interface list from the remote host computer. If you did not configure the settings on the *Authentication* tab, you are prompted to enter *username* and *password* authentication settings for the remote host computer.
- *Authentication* tab: This tab lets you enter authentication settings for the remote host computer.
  - *Username*: Enter the username for the remote host computer.
  - *Password*: Enter the password for the remote host computer.
  - *Save Host Password*: Select this check box if you want to save the password for the remote host computer.

- *Login Script*: Use this text box to run any additional setup steps (Linux commands) prior to doing a tcpdump capture.

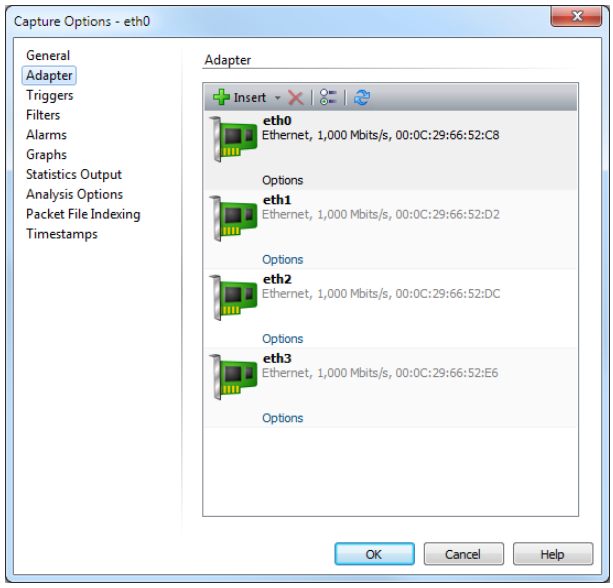
- *Host Filter* tab: This tab lets you define the filter that removes unwanted SSH traffic from the remote host capture. The 'Host Filter' is part of the tcpdump commands in the *Simple* and *Advanced* properties for each interface.
  - *Host Filter (BPF)*: This text box defines the 'Host Filter' for tcpdump captures. You can modify the filter by editing the text inside the text box.
  - *Restore Default*: Click to reset the 'Host Filter' to its default.
  - *Macros*: Displays the macros used in the 'Host Filter.'

5. Click **Apply** to apply the settings.
6. Click **OK** to close the **Host Properties** dialog.
7. Select one of the newly created tcpdump capture adapters as the capture adapter for the new capture window.
8. Click **OK** to close the **Capture Options** dialog. A new capture window appears that has **Start / Stop tcpdump** in the upper right corner.
9. Click **Start tcpdump**.
10. Click **Stop tcpdump** to stop capturing packets. No additional packets are allowed into the capture buffer.

### *tcpdump Capture Adapter on a Capture Engine*

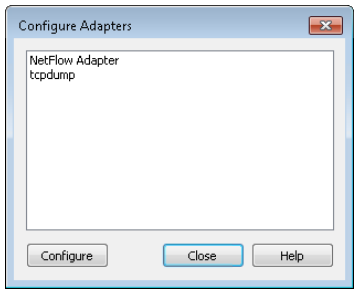
**To capture packets from a tcpdump Capture Adapter on a Capture Engine:**

1. Create a new Capture Engine capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.

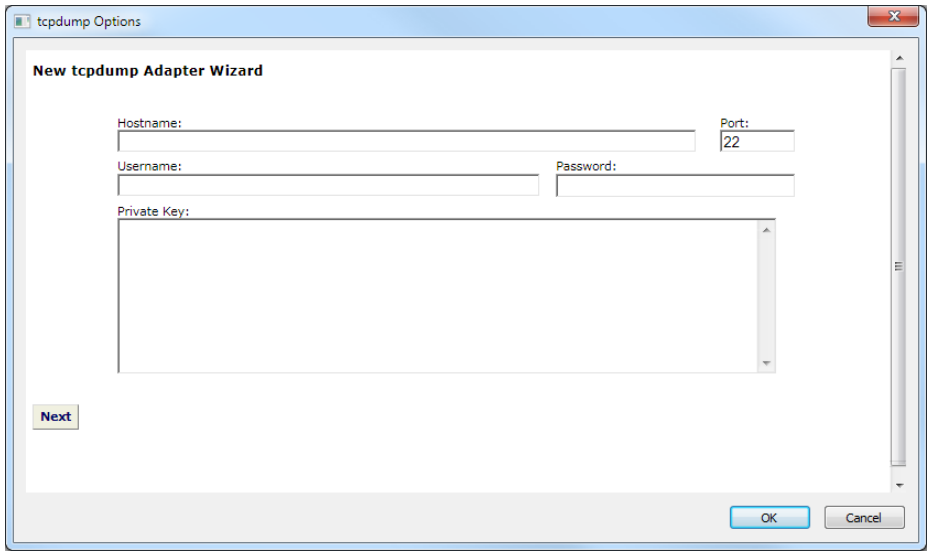



3. Click **Insert**. The **Configure Adapters** dialog appears.

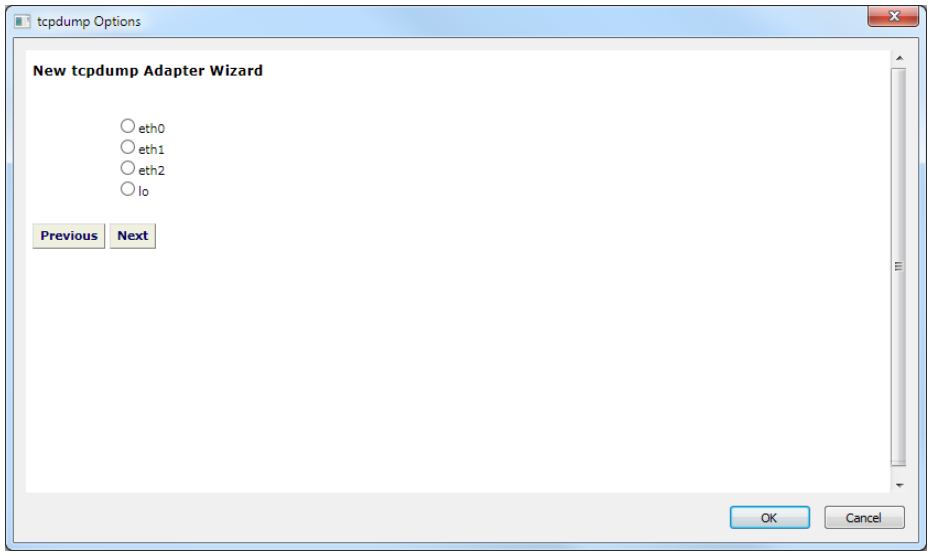
**Note** You can also click **Insert** from the *Adapters* tab in the **Capture Engines** window.



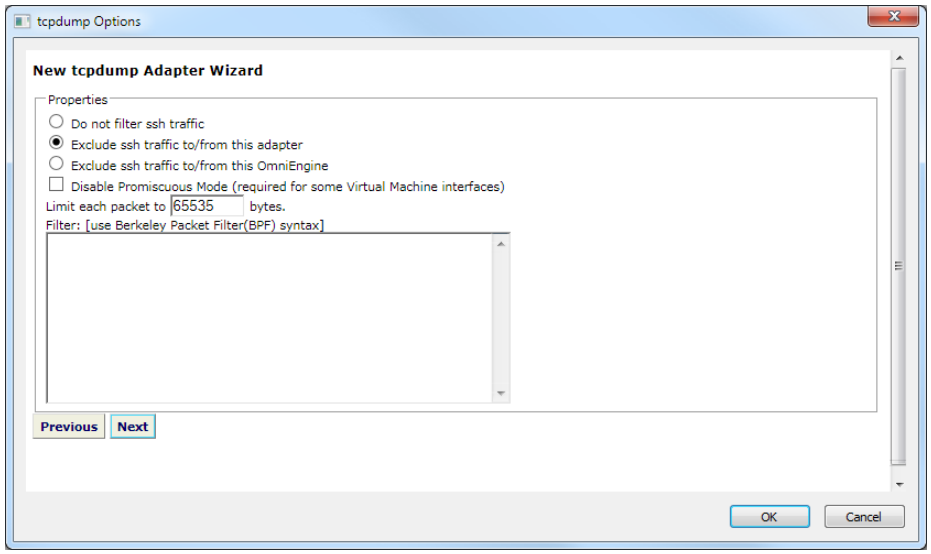

4. Select *tcpdump*, and click **Configure**. The **tcpdump Options** dialog appears.




5. Configure the **tcpdump Options** dialog:
   - *Hostname*: Enter the IP address of the remote host computer.
   - *Port*: Enter the port for the remote host computer. The default port is 22.
   - *Username*: Enter the username for the remote host computer.
   - *Password*: Enter the password for the remote host computer.
   - *Private Key*: Enter the private key if one is used for the remote host computer.
6. Click **Next**.
7. Click **Next** again. A list of available wired and/or wireless interfaces synchronized with the remote host adapter appears.




8. Select the interface that you want to configure, and click **OK**. The properties page for the selected interface appears.




9. Configure the properties page for the selected interface:
   - *Do not filter ssh traffic*: Select this option if you do not want to filter SSH traffic from traffic captured on the interface.
   - *Exclude ssh traffic to/from this adapter*: Select this option if you want to filter SSH traffic from traffic captured on the interface. SSH traffic from other tcpdump adapters and sources will appear in the capture.
   - *Exclude ssh traffic to/from this Capture Engine*: Select this option if you want to filter SSH traffic from traffic captured on the interface, other tcpdump adapters, and other SSH sessions from the Capture Engine to the remote host.
   - *Capture all traffic on interface (Promiscuous Mode)*: Select this option if you want to capture all traffic visible to the interface. If this option is not selected, then only traffic destined for the interface is captured.
   - *Monitor Mode (only applies to wireless interfaces)*: Select this option to place the wireless interface into monitor mode. The interface is able to listen to traffic but is not able to send/receive packets.

- *Limit each packet to _____ bytes*: Enter the maximum size packets that are allowed, Packets larger than this value will be sliced so that they do not exceed the value. The value must be a whole number between 1 and 65535. The default is 65535.
- *Filter*: In the text box, define any additional filters (BPF) that you want applied to the selected interface. If one of the 'exclude ssh' options are enabled, that 'SSH' filter is appended to any filter specified in the *Filter* text box.

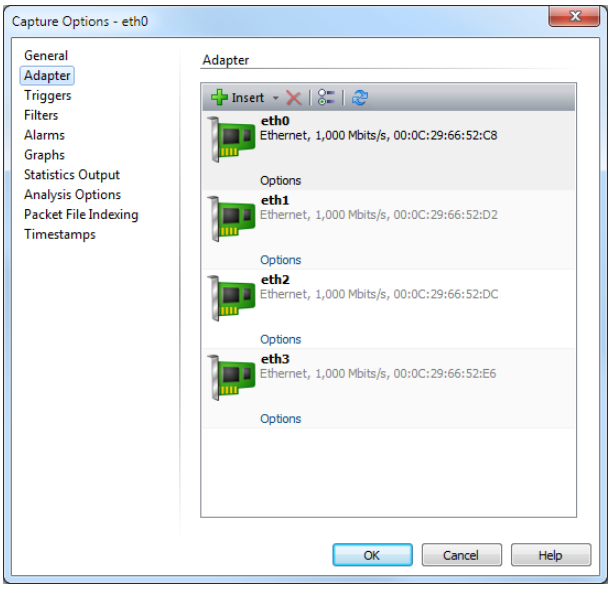
10. Click **OK** to close the **tcpdump Options** dialog and return you to the **Configure Adapters** dialog.
11. Click **Close** to close the **Configure Adapters** dialog and return you to the **Capture Options** dialog.
12. Select one of the newly created tcpdump capture adapters as the capture adapter for the new Capture Engine capture window.
13. Click **OK** to close the **Capture Options** dialog. A new capture window appears that has **Start / Stop tcpdump** in the upper right corner.
14. Click **Start tcpdump**.
15. Click **Stop tcpdump** to stop capturing packets. No additional packets are allowed into the capture buffer.

## *Capturing packets from a NetFlow/IPFIX adapter on a Capture Engine*

For supported Capture Engines (LiveCapture), a NetFlow/IPFIX adapter allows you to capture NetFlow/IPFIX data (NetFlow v5, NetFlow v9, and IPFIX) from a network device. The NetFlow Adapter listens on a port for NetFlow packets. Each NetFlow/IPFIX packet contains some number of NetFlow/IPFIX records. Each NetFlow/IPFIX record represents certain information and statistics about a network flow for that interval. The network statistics are displayed in the appropriate Omnipeek windows and in the Omnipeek reporting dashboards.

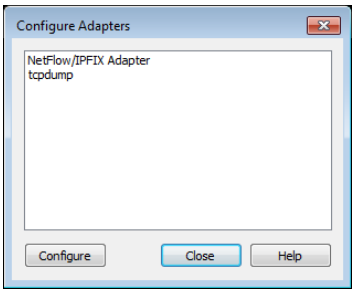
**To capture packets from a NetFlow/IPFIX capture adapter on a Capture Engine:**

1. Create a new Capture Engine capture window in Omnipeek. The **Capture Options** dialog appears.
2. Select the *Adapter* options.




3. Click **Insert**. The **Configure Adapters** dialog appears.

**Note** You can also click **Insert** from the *Adapters* tab in the **Capture Engines** window.




4. Select *NetFlow/IPFIX Adapter*, and click **Configure**. The **NetFlow/IPFIX Adapter Options** dialog appears.
5. Configure the port in the dialog, and then click *Create Adapter* and click **OK**. The NetFlow adapter is added to the list of capture adapters and is available for capture use.

# Capture window views

The navigation pane of every capture window presents the views that display information about the capture data. A capture window can have the following views:

- *Dashboards:* These dashboards display graphical data about your network summarized into several easy-to-read displays.
  - *Timeline:* This dashboard provides an overview of the top talkers, top protocols, and network utilization for the Capture Engine. See *Timeline dashboard* on page 58.
  - *Applications:* This dashboard provides key statistics for applications in the capture window. See *Applications dashboard* on page 61.
  - *Network:* This dashboard provides an overview of network statistics for the capture. See *Network dashboard* on page 60.
  - *Voice & Video:* This dashboard provides a visual display of several VoIP-related statistics for the capture window. See *Voice & Video dashboard* on page 63.
  - *Compass:* This dashboard lets you view network utilization, and top statistics from a real-time capture occurring on an Omnipeek network analyzer, from a single supported capture file, or from multiple Omnipeek capture files. See *Compass dashboard* on page 65.
- *Capture:* These views display information about packets captured into the capture buffer.
  - *Packets:* This view lists all of the packets placed in the buffer of a capture window (or capture file). The Decode and Hex panes show the contents of the selected packet decoded or in hexadecimal and ASCII. See *Viewing captured packets* on page 77.
  - *Events:* This view collects messages generated by events relating to the particular capture window. These events include the results of notifications generated by the triggers or analysis modules selected for the capture window. See Chapter 18, *Viewing Logs and Events*.
  - *Notes:* This view displays a listing of all notes associated with packets in a capture file. You can edit or delete notes, or you can jump to the packet list selecting the packet to which each note is attached from the Notes view. See *Adding notes to packets* on page 90 and *Viewing packet notes* on page 91.
  - *Filters:* This view lets you enable, disable, add, edit, and delete filters used for capturing packets into the capture window buffer. See Chapter 6, *Creating and Using Filters*.
  - *Alarms (Capture Engine only):* This view lets you query a specified statistics function once per second, testing for user-specified problem and resolution conditions. On matching any of these tests, the alarm function sends a notification of user-specified severity. See Chapter 15, *Setting Alarms and Triggers*.
- *Expert:* These views provide expert analysis of delay, throughput, and a wide variety of network events in a conversation-centered view of traffic in a capture window. See Chapter 8, *Expert Analysis*.

    - *Clients/Servers:* This view makes it easy to track events and to see them in the context of peer-to-peer or client-server traffic patterns. See *Expert Clients/Servers view* on page 144.
    - *Flows:* This view displays each flow independently in a flat view. This simplified view allows you to compare flows to one another, regardless of the node pair to which they belong. See *Expert Flows view* on page 145.
    - *Application:* This view allows you to categorize each flow by application. This view allows you to see who is using each application on your network and how each application is performing. See *Expert Applications view* on page 146.
- *Web (Omnipeek only):* These views let you display web page requests and responses, allowing you to track client/server activity within a capture. The same web data is presented in four formats.
    - *Servers:* This view lets you focus on which servers are being used. See *Servers view* on page 189.
    - *Clients:* This view lets you focus on which clients are using which servers. See *Clients view* on page 190.
    - *Pages:* This view displays a list of web pages with each individual request nested underneath. See *Pages view* on page 191.
    - *Requests:* This view displays a flat list of individual HTTP requests. See *Requests view* on page 191.
- *Voice & Video:* These views let you display the voice and video data in the following formats:
    - *Calls:* This view displays one row for each call. See *Calls view* on page 202.
    - *Media:* This view displays one row for each media flow. See *Media view* on page 203.
- *Visuals:* These views graphically display network traffic and statistics.
    - *Peer Map:* This view lets you visualize network traffic by displaying nodes and the traffic between the nodes. The lines indicate traffic between two nodes. The relative thickness of the lines indicate the volume of traffic occurring. See Chapter 13, *Using the Peer Map*.
    - *Graphs:* This view displays graphs of individual items from the other statistics views in real time. The data from these graphs can also be saved as tab-delimited or comma-delimited text, or as XML \ HTML. On a Capture Engine, this view must be enabled in the **Graphs** options of the **Capture Options** dialog. See *Omnipeek capture window graphs* on page 248.
    - *Files:* This view displays files extracted from reassembled HTTP payloads of capture files opened in Omnipeek. This view lets you quickly see the files that are being transmitted across your network. See *Working in the Files view* on page 50.
- *Statistics:* These views display various statistical data about your network.
    - *Nodes:* This view displays real-time data organized by network node. You can choose to display the nodes in a nested hierarchical view (logical addresses nested beneath their physical address), or in a variety of flat tabular views. Right-click the column header to add or remove various columns. See *Nodes statistics* on page 221.
    - *Protocols:* This view displays network traffic volume as a percentage of total bytes, broken down by protocol and subprotocol. You can choose to display the protocols in either a nested **Clients/Servers** view or a **Flows** view. See *Protocols statistics* on page 223.
    - *Summary:* This views lets you view key network statistics in real time and save those statistics for later comparison. Summary statistics are also extremely valuable in comparing the performance of two different networks or network segments. See *Summary statistics* on page 219.
    - *Applications:* This views lets you view basic statistics about applications for a capture window. See *Applications statistics* on page 227.
    - *Countries:* This views lets you view a geographical breakdown of traffic based on IP address for a capture window. See *Countries statistics* on page 228.
- *Wireless:* These views display information about your wireless network.

- *WLAN:* This view displays an SSID (Service Set Identifier) tree view of wireless nodes. See *WLAN statistics* on page 229.
- *Channels:* This view displays a variety of statistics and counts for each wireless channel. See *Channel statistics* on page 232.
- *Signal:* This view displays continuously updated graphs of signal strength (or related measures) for traffic in the capture window. See *Signal statistics* on page 233.

- *Roaming:* These views display roaming latency—the amount of time it takes for a wireless device to move from one access point to another.
  - *Log:* This view displays a log entry each time a wireless roaming device is detected. See *Log* on page 309.
  - *by Node:* This view displays an entry for each wireless roaming device, and calculates an average latency value for that device. See *by Node* on page 309
  - *by AP:* This view displays an entry for each wireless access point, and calculates an average latency value for that access point. See *by AP* on page 310.

**Important!** Your version of the software may not include all of the views listed here. Please visit our web site at *https://www.liveaction.com* for details about how to order the features that precisely fit the needs of your network.

# Opening saved capture files

Capture files, or trace files, are capture windows that were saved to a variety of supported capture file formats. You can open capture files to load and process packets back into *Omnipeek*. See *Save file formats* on page 83 for a description of the supported capture file formats.

## Omnipeek capture files

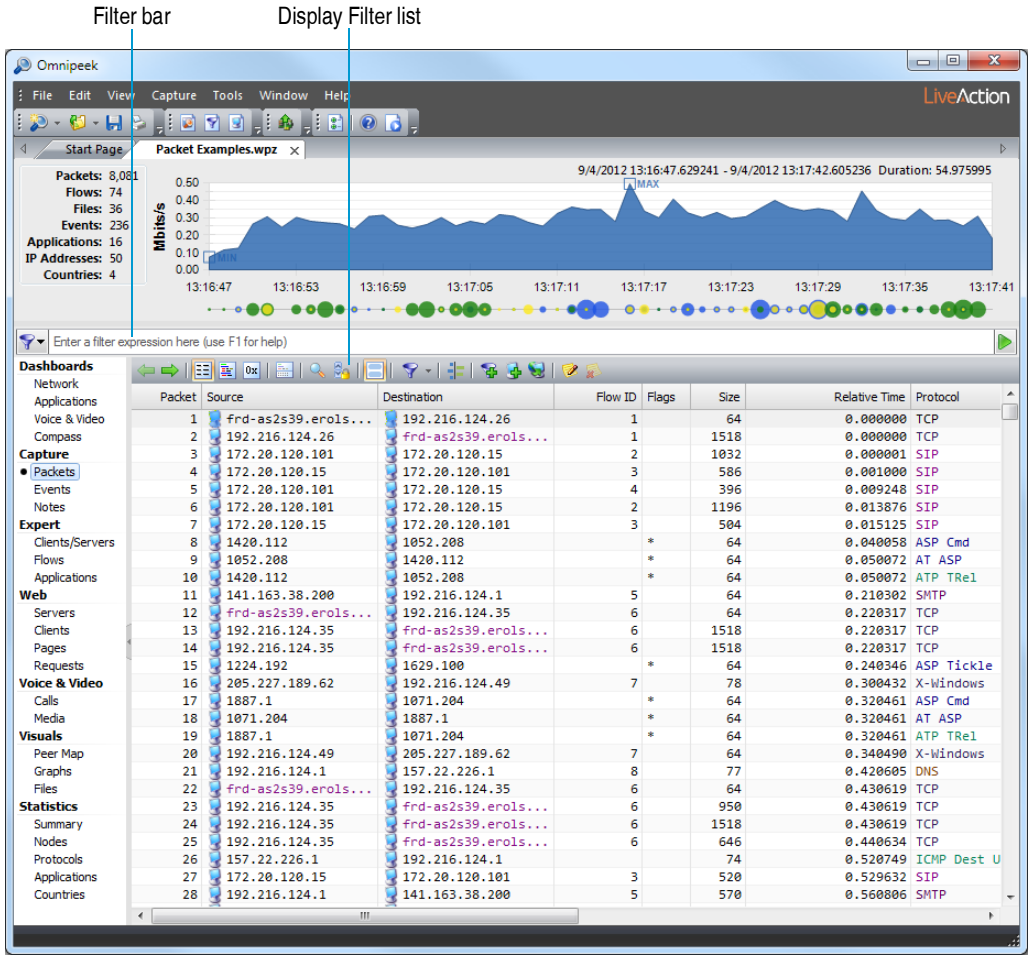
**To open an Omnipeek capture file:**

1. Do one of the following:
   - On the Start Page, click **Open Capture File**. The **Open** dialog appears.
   - On the **File** menu, click **Open**. The **Open** dialog appears.
2. Select the capture file and click **Open**.

**Note** When opening large files, a progress bar in the status bar of the file window appears displaying the progress of packet processing.

**Tip** From the **Open** dialog, you can click the **Filter** button to open the **Filter** dialog, which allows you to select both the filters and analysis options to apply to each of the files that you select to open. By applying one or more filters, you can greatly reduce the amount data you are opening to only the data you are interested in analyzing. For example, if you want to load only the packets from the files which match a particular IP address, you can create a simple filter from the dialog and then select that filter when opening the files.

By disabling analysis options, you can free up system resources resulting in faster performance. These analysis options are typically displayed in the navigation pane of a capture window. Enabling/disabling analysis options is also available from the **Capture** menu (on the **Capture** menu, click **Analysis Options**).




3. Click the **Packets** view in the navigation pane.

**Note** Triggers and capture filters are not available from a capture file. However, you can use "display filters" and filters created in the *Filter Bar* to view subsets of the traffic in the same window or copied to a new window. See Chapter 7, *Post-capture Analysis*. See also *Display filters* on page 96 and *Creating filters using the filter bar* on page 106.

## Capture Engine capture files

Capture Engine capture files are saved to the *Data folder* you specified when configuring the engine. See *Configuring and updating Capture Engine settings* on page 19.

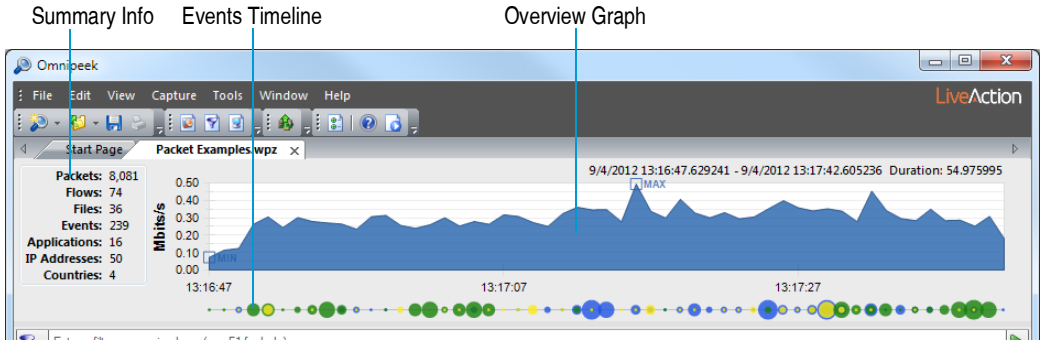
The *Files* tab in the **Capture Engines** window displays a listing of all the capture files saved to the Capture Engine computer. From this tab, you can perform network forensic analysis using the data from one or more selected files. See *Forensics capture on a Capture Engine* on page 54 and *Forensic search from the Files tab* on page 121.

**Note** You can also perform network forensic analysis from the *Forensics* tab. See *Forensic search from the Forensics tab* on page 124.

## Overview graph for capture files

Whenever you open a capture file in Omnipeek, an overview graph is displayed at the top of the files window. The overview graph allows you to 'zoom' in on a portion of a file by selecting a time range and repro-

cessing all statistics within the selected time range. The reprocessed statistics are then displayed in the lower half of the files window.




The overview graph is comprised of three parts:

- *Overview Graph*: The overview graph initially displays data for the entire capture file. When a selection is made by clicking inside the graph and dragging a desired time range, the displayed packets (and the analysis of those packets) are limited to the selected time range. The beginning and end of the selection can be dragged to expand or contract the selection range. Additionally, the selection can be dragged horizontally, moving it while leaving the duration constant.
- *Events Timeline*: The events timeline is a small line below the overview graph which visualizes the volume and severity of events in the capture file. It represents event counts by size (the larger the dot, the more events in that range), and color (representing the severity of those events). You can right-click inside the overview graph to show or hide the events timeline.
- *Summary Info*: The summary info located to the left of the overview graph displays the time range and various counts (packets, flows, files, events, applications, IP addresses, countries) in the capture file. When a selection is made in the overview graph, the summary info is updated and displays the counts for the selection, as well as the totals for the entire capture file.

**Tip** You can show/hide the Overview graph from the **View** menu: On the **View** menu, click **Overview**.

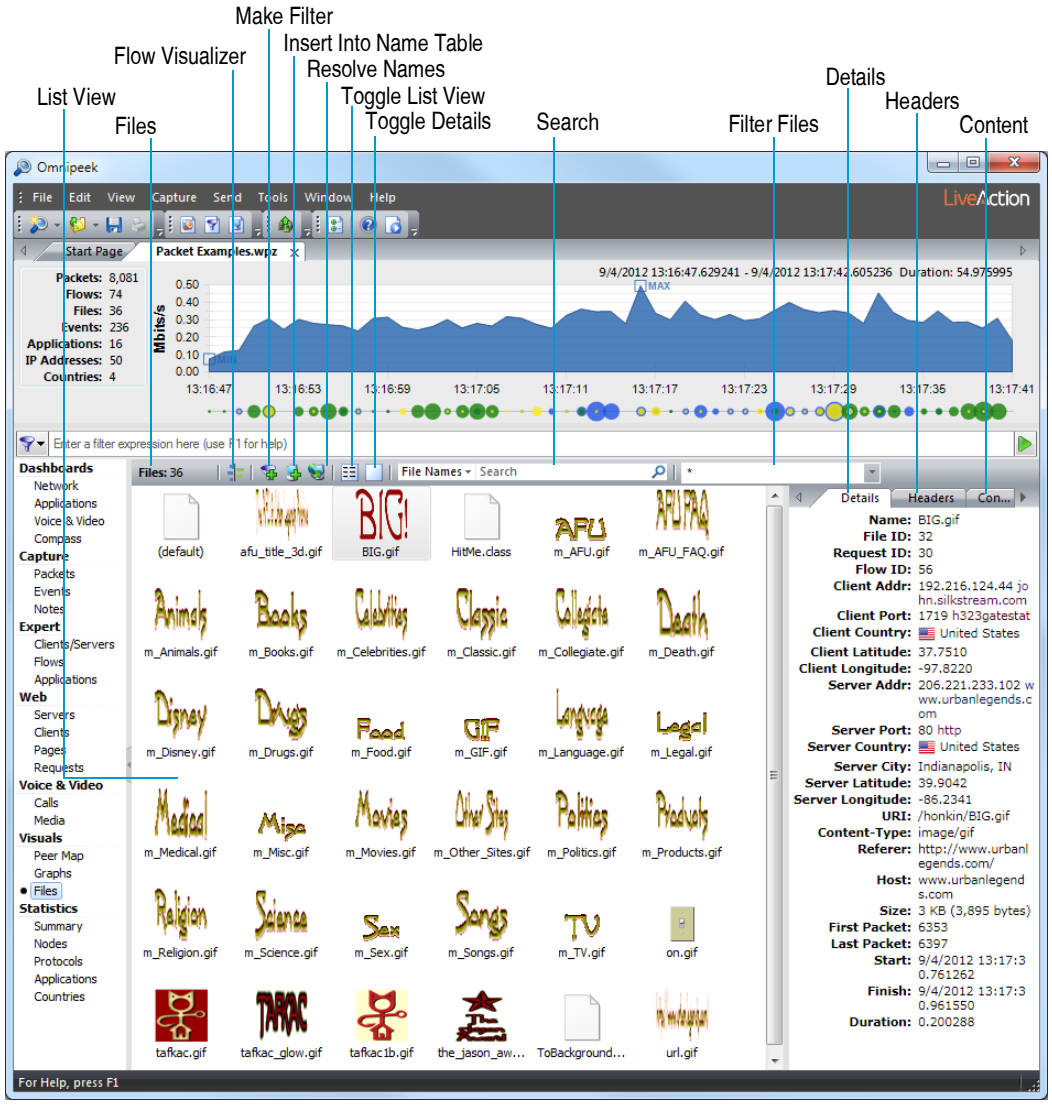
Right-click inside the overview graph for the following options:

- *Clear Selection*: Removes any selected time range from the overview graph and displays data for the entire capture file. You can also clear the selection by pressing the Esc key on your keyboard.
- *Network Utilization*: Displays the overview graph as network utilization counts.
- *Events*: Displays the overview graph as event counts.
- *Events Timeline*: Shows or hides the *Events timeline* from the display.
- *Column*: Displays the overview graph as a column graph.
- *Skyline*: Displays the overview graph as a skyline graph.
- *Area*: Displays the overview graph as an area graph.
- *Line*: *Area*: Displays the overview graph as an line graph.
- *Line/Points*: Displays the overview graph as an line/points graph.
- *Linear*: Displays the overview graph as a linear display.
- *Logarithmic*: Displays the overview graph as a logarithmic display.
- *Show Min/Max*: Displays the minimum and maximum values of overview graph.
- *Synchronize Events*: Updates the overview graph based on the current set of events in the **Events** view.

# Working in the Files view

The **Files** view displays files extracted from reassembled HTTP payloads of capture files opened in Omnipeek. This view lets you quickly see the files that are being transmitted across your network. To narrow your search, you can even filter files by its content-type.

**Note** The **Files** view is not supported in Capture Engines and in Omnipeek Professional.




The parts of the **Files** view are described below.

- *Files*: Displays the total number of files in the capture file.
- *List View*: Displays the files in the capture file.
- *Flow Visualizer*: Opens the selected file in a Flow Visualizer tab (see *Flow Visualizer* on page 154).
- *Make Filter:* Opens the **Insert Filter** dialog to create a filter based on the selected file.
- *Insert Into Name Table:* Opens a dialog to add the client and server node addresses of the selected file into the Name Table.
- *Resolve Names:* Checks the DNS server for a name to match the client and server addresses of the selected file.
- *Toggle List View*: Toggles the list view between the options below:

    - *Extra Large Icons*: Displays files in the list view as small icons. Images are displayed as the actual image, while other files are displayed with the icon corresponding to the content-type for the file. Hovering over a file in an icon mode displays a tooltip showing additional details of the file.
    - *Large Icons*: Displays files in the list view as large icons. Images are displayed as the actual image, while other files are displayed with the icon corresponding to the content-type for the file. Hovering over a file in an icon mode displays a tooltip showing additional details of the file.
    - *Details*: Displays files in the list view as a details list with multiple columns. You can click a column header to sort the files by that column. You can right-click a column header to add or remove columns. You can also view this information in the *Details* tab of the details pane. See *Files view columns* on page 348 for a list of available column headings in the list view.
- *Toggle Details*: Toggles the details pane to appear either below or to the right of the list view (or hidden completely). You can also resize the details pane by dragging the resize control located between the details pane and list view. The details pane consists of the following tabs:
    - *Details*: Displays various information about the selected file. You can also view this information in the list view by toggling the list view to the *Details* option. To copy any text within this tab to the clipboard, select the text, right-click, and click **Copy**.
    - *Headers*: Displays request and response headers for the selected file. To copy any text within this tab to the clipboard, select the text, right-click, and click **Copy**.
    - *Contents*: Displays file contents as an image, text, or binary data. You can right-click inside the tab to change the display mode to *Auto*, *Image*, *Text*, or *Binary*. Selecting *Auto* will pick the best mode depending on the type of file. In *Image* mode, at the top of the contents tab, a small area displays information about the image (proportions and color information). In *Text* mode, there are additional options to set the text encoding used. In *Binary* mode, there are additional options to change the display of data and offsets. To copy any text within this tab to the clipboard, select the text, right-click, and click **Copy**.
- *Search*: Allows you to search the list of files for the text string that you enter in the text box. You can search file names, request/response headers, or file contents by selecting the option from the drop-down list to left of the text box.
- *Filter Files*: Allows you to filter the file list by content-type. The drop-down list contains common content-types (for example, *image/**, *text/**). Additionally, you can type in any content-type (for example, *image/png*) to filter files by that content-type. This essentially acts as a display filter—only files which are of the type specified are displayed; non-matching files are hidden.

You can also right-click a file to access the following options:

- *Flow Visualizer*: Opens the selected file in a Flow Visualizer tab (see *Flow Visualizer* on page 154).
- *Save Payload "xxx"*: Saves the selected file to your hard disk.
- *Open Payload "xxx" in Associated Viewer*: Opens the selected file in the viewer associated with the content-type.
- *Select Related Packets*: Selects related packets by various options. See *Selecting related packets* on page 115.
- *Select Related Flows*: Selects related flow. See *Selecting related flows* on page 116.
- *Select Related Requests*: Selects related HTTP requests in the Web **Requests** view. See *Selecting related requests* on page 116.
- *Multi-Segment Analysis*: Starts a Multi-Segment Analysis project. See Chapter 9, *Multi-Segment Analysis*.
- *Make Filter:* Opens the **Insert Filter** dialog to create a filter based on the selected file.
- *Insert Into Name Table:* Opens a dialog to add the client and server node addresses of the selected file into the Name Table.
- *Resolve Names:* Checks the DNS server for a name to match the client and server addresses of the selected file.

- *View*: Allows you to display the list view as *Extra Large Icons*, *Large Icons*, or *Details*.
- *Details*: Allows you to display the details pane to the *Bottom* or *Right* of the list view. You can also select *None* if you want to hide the details pane.

**Note** Files that can't be completely reconstructed (due to missing segments), will not be displayed in the **Files** view. If the file with missing segments was embedded within an HTTP flow, the Web **Requests** view may still display some information about the file.

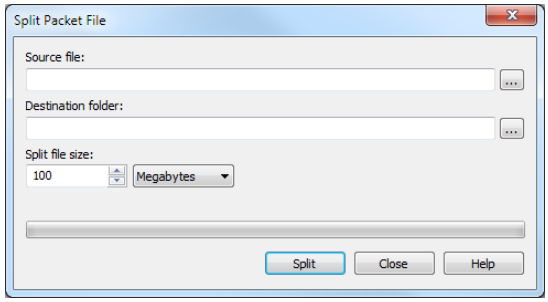
Additionally, the **Files** view will not display anything for HTTP responses that fall outside of the 2xx range of HTTP status codes. For complete details on all HTTP requests and responses, see the **Web** views.

# Splitting saved packet files

If you have a large LiveAction formatted packet file, you can easily split it into smaller manageable packet files. You can specify file sizes by byte size or packet count.

**To split a large packet file:**

1. On the **Tools** menu, click **Split Packet File**. The **Split Packet File** dialog appears.




2. Select the source file, destination folder, file size, and file size unit (*Megabytes*, *Kilobytes*, or *Packets*) and click **Split**.

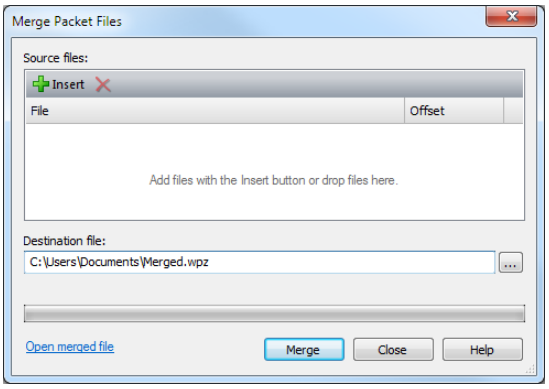
   The file sizes of the smaller files are approximately equal to the file size you specify, with possibly the exception of the last file created. This is necessary in instances where the original file cannot be divided equally by the file size specified.

# Merging saved packet files

If you have multiple packet files, you can merge the files into a single larger packet file. The files must be of a supported LiveAction packet file format (**.pkt*, **.wpz*, **.apc*, **.wpc*), and also of the same media type (Ethernet or wireless).

**To merge packet files:**

1. On the **Tools** menu, click **Merge Packet Files**. The **Merge Packet Files** dialog appears.




2. Add the files you want to merge by clicking **Insert** or by dragging files into the list of files.
3. Specify the name and location of the merged file.
4. Click **Merge**.

**Note** Click *Open merged file* to open the merged file. If not available, a beep will sound to indicate no merged file is available.

# Using capture templates

Capture templates let you use pre-defined settings for creating a new capture window. You can save any capture window as a capture template. The steps for creating and using capture templates differ in Omnipeek and Capture Engine.

## Omnipeek capture templates

**To create and use a capture template from Omnipeek:**

1. Make the capture window the active window.
2. On the **File** menu, click **Save Capture Template...**. The **Save As** dialog appears.
3. Name the template and save it in the *Capture Template* format (**.ctf*).
4. To use the capture template, on the **File** menu, click **New From Template...** and select the desired template.

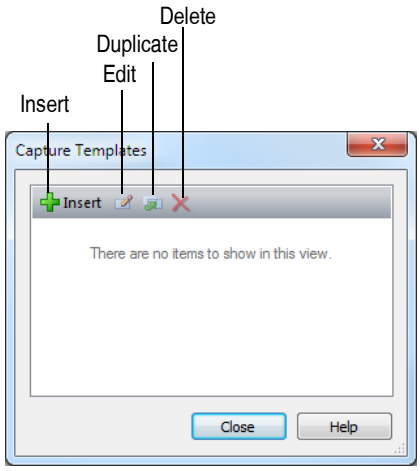
**Note** Capture windows created from templates are created without first opening the **Capture Options** dialog, regardless of whether the check box labeled *Show this dialog when creating a new capture window* is checked or unchecked.

## Capture Engine capture templates

**To create and use a capture template from Capture Engine:**

1. For a connected Capture Engine, do one of the following:
   - On the *Home* tab, select **Edit Capture Templates** under New Capture.
   - On the *Capture* tab, click the arrow to the right of **Insert** and select **Edit Capture Templates**.
   - On the *Adapters* tab, select **Edit Capture Templates** under *New Capture*.

   The **Capture Templates** dialog appears. The clickable buttons are described below.




- *Insert:* Click to open the **Capture Options** dialog, where you can configure settings for a new template. When you click **OK**, your new template will be listed in the Capture Engine **Capture Templates** dialog and will also be available as an option when creating a new capture window.
- *Edit:* Click to open the selected template. The Capture Engine **Capture Options** dialog appears, where you can change the capture settings.
- *Duplicate:* Click to duplicate the selected template.
- *Delete:* Click to delete the selected template.

2. To use the capture template, select the template name from the *Home*, *Capture*, and *Adapters* tabs described in Step 1 above.

## Multiple capture windows from a single template

You can also create a single named template that creates multiple capture windows, each with its own individual capture options.

**Note** Creating multiple capture windows from a single template is not supported from a Capture Engine.

**To create multiple capture windows from a single capture template:**

1. Create or open the Omnipeek capture windows you wish to include in the template. Make sure only the capture windows you wish to include are open.
2. Hold down the **Ctrl** key and on the **File** menu, click **Save All as Capture Template...**.
3. Name the template and save it in the *Capture Template* format (**.ctf*).

   The saved template will include all the open capture windows.
4. On the **File** menu, click **New From Template...** and select the desired capture template.

# Forensics capture on a Capture Engine

The *Forensics capture* template available in Omnipeek is configured for post-capture forensic analysis. The template allows you to create and save forensic captures stored as packet files on the Capture Engine. You can then use these forensics captures to perform a more detailed investigation of the data to identify and troubleshoot items such as network problems, security attacks, HR policy violations, and more.

The *Forensics Capture* template is available from various tabs in the **Capture Engines** window. The basic steps on how to perform forensic analysis using the *Forensics Capture* template are described below. For more detailed instructions, see *Forensic search from the 'Forensics Capture' window* on page 131.

**To start a forensics capture on a Capture Engine:**

1. From a connected Capture Engine in the **Capture Engines** window, do one of the following:
   - On the *Home* tab, click **New Capture**, and then click **New** "**Forensics Capture**."
   - On the *Capture* tab, click the arrow to the right of **Insert**, and then click **New** "**Forensics Capture**."
   - On the *Adapters* tab, click **New Capture**, and then click **Start** "**Forensics Capture**."

   The *General* options of the **Capture Options** dialog appears. See *Configuring general options* on page 31. See also *Configuring adapter options* on page 34 to select a capture adapter.

   **Note** Since a 'Forensics Capture' is optimized for post capture forensics analysis, click the **Analysis Options** view from the **Capture Options** dialog and notice that all options are disabled by default. This helps to ensure packets are captured at the fastest rates possible.

2. Click **OK** from the **Capture Options** dialog. A new Capture Engine capture window appears.
3. Click **Start Capture** to start capturing packets.
4. Click **Stop Capture** to stop capturing packets.
5. Once capture files are available on your Capture Engine, you can begin performing forensic analysis on the files by doing the following:
   - On the *Forensics* tab, select the capture session you wish to search either from the *Timeline* or *Details* nested tab, drag to select the area of the capture session you wish to search in the Timeline graph, and then click **Forensics Search**. See *Forensic search from the Forensics tab* on page 124.
   - On the *Files* tab, select one or more files that are from the desired time range, and then click **Forensics Search**. See *Forensic search from the Files tab* on page 121.

   **Note** You can also perform forensic analysis directly from a 'Forensics Capture' window. See *Forensic search from the 'Forensics Capture' window* on page 131.

# Monitoring capture on a Capture Engine

On a Capture Engine, you can create a new monitoring capture window based on pre-configured capture settings configured to view higher level expert and statistical data in a continuous real-time capture.

**To start a monitoring capture:**

1. From a connected Capture Engine, do one of the following:
   - On the *Home* tab, select **New "Monitoring Capture"** under New Capture.
   - On the *Capture* tab, click the arrow to the right of **Insert** and select **New "Monitoring Capture"**.
   - On the *Adapters* tab, select **Start "Monitoring Capture"** under *New Capture*.

   The *General* options of the **Capture Options** dialog appears. See *Configuring general options* on page 31. See also *Configuring adapter options* on page 34 to select a capture adapter.

   **Note** Since a monitoring capture is optimized to view and analyze expert and statistical data, click the **Analysis Options** view from the **Capture Options** dialog and notice that all statistics are enabled. This helps to ensure optimum analysis of the data.

2. Click **OK** from the **Capture Options** dialog. A new Capture Engine capture window appears
3. From the new monitoring capture window, try the following:

- Click the **Network** dashboard to see network statistics for the capture. See *Network dashboard* on page 60.
- Click the statistics views to see various displays of the statistics data for the capture. To analyze the data obtained from a monitoring capture, see *Displaying and Reporting Statistics* on page 217.

# Dashboards

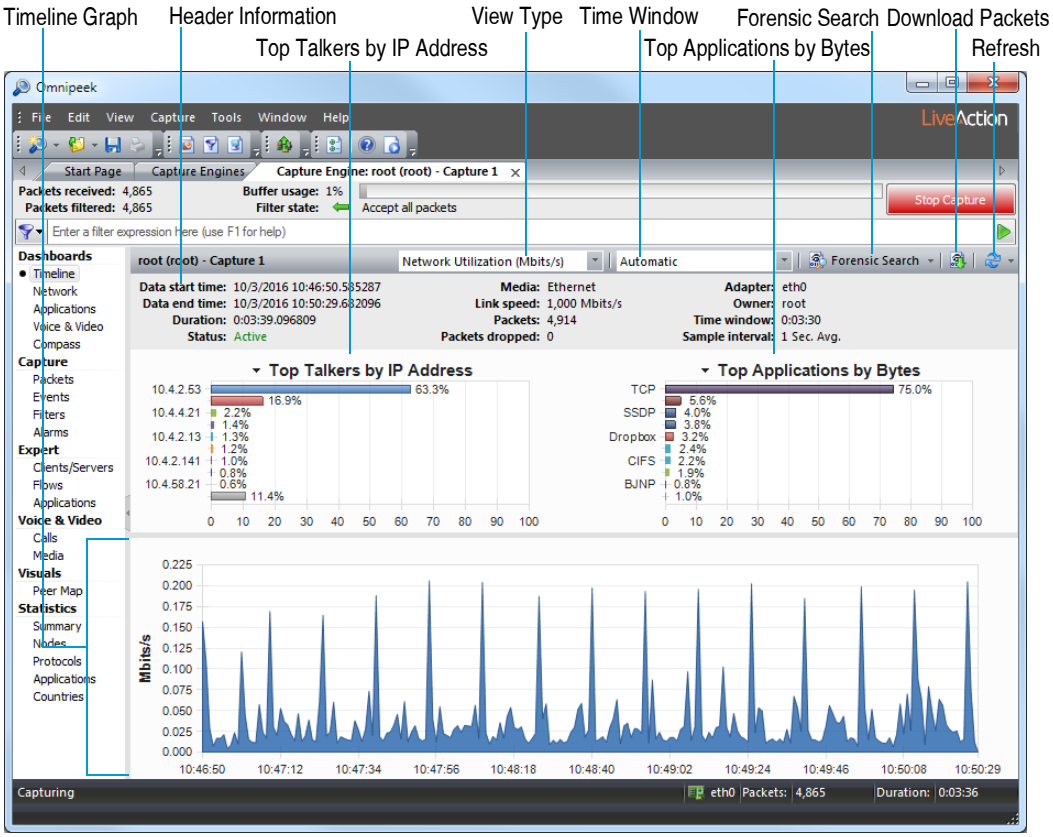
## In this chapter:

# About dashboards

The Omnipeek dashboards display graphical data about your network summarized into several easy-to-read displays. There are fivedashboards available from Omnipeek and Capture Engine capture windows: *Timeline* (Capture Engine only), *Network*, *Applications*, *Voice & Video*, and *Compass*.

# Timeline dashboard

The **Timeline** dashboard is available from Capture Engine capture windows that have any of the *Timeline Stats* options enabled in the **Capture Options** dialog. The dashboard displays top talkers, top protocols, and network utilization for the Capture Engine.




The parts of the **Timeline** dashboard are described below.

- *Header Information*: The header information displays statistics for the capture session (data start time, data end time, duration, status, packets, packets dropped, adapter, etc.).
- *Top Talkers by IP Address:* This display shows a graph of top "talkers" on the network for the selected area in the Timeline graph, broken out by node. You can right-click inside the display to display top talkers by *Physical Address*, *IP Address*, or *IPv6 Address*; or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the node.
- *Top Applications by Bytes*: This display shows a graph of top applications on the network for the selected area in the Timeline graph. You can right-click inside the display to toggle the display with the Top Protocols display, or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application.
- *Top Protocols by Bytes:* This display shows a graph of top protocols on the network for the selected area in the TimeLine graph. You can right-click inside the display to toggle the display with the Top Applications display, or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the protocol.

- *Timeline graph*: The Timeline graph displays the data of the selected capture session. Only one capture session at a time can be displayed inside the graph. By default, the graph shows network utilization in Mbits/s, but other statistics can be graphed as well by selecting the *View* type.

  Here are descriptions of other parts of the Timeline graph:

  - Right-click inside the graph to perform a forensic search (see *Forensic search from the 'Forensics Capture' window* on page 131), download selected packets to a capture file, refresh the window, or choose a different graph format: *Bar*, *Stacked Bar, Skyline, Area*, *Stacked Area, Line*, *Line/Points*, *Linear*, and *Logarithmic*. Additionally, you can also toggle displaying the minimum and maximum points for each series on the graph.
  - Mouse over a data point in the graph to view a tooltip displaying timestamp and size information (e.g., time and rate, time and packet size, etc.).
  - Any time there is more data than can be displayed on the screen, a scroll bar appears below the graph and allows you to view different points of time in the graph. (If the *Time window* is set to *Automatic*, the scroll bar will never appear.)
  - If the *Time window* is set to anything other than *Automatic*, a scroll bar appears below the graph and allows you to view different points of time in the graph.
- *View type*: Select the type of statistics to display in the Timeline graph. You can select from:
  - *Network Utilization (Mbits/s)*
  - *Network Utilization (Packets/s)*
  - *Unicast/Multicast/Broadcast*
  - *Packets sizes*
  - *VLAN/MPLS*
  - *Protocols (Mbits/s)*
  - *Protocols (Packets/s)*
  - *Applications (Mbits/s)*
  - *Applications (Packets/s)*
  - *Call Quality*
  - *Call vs. Network Utilization*
  - *Wireless Packets (Packets/s)* (Capture Engine for Omnipeek (Windows) only)
  - *Wireless Retries (Packets/s)* (Capture Engine for Omnipeek (Windows) only)

  **Note** To display statistics for either the *Call Quality* or *Call vs. Network Utilization* view type, the *VoIP Stats* option must be selected when you first create the capture and configure the *General* options of the **Capture Options** dialog. See *Configuring general options* on page 31.

- *Time window*: Select the time interval to display in the Timeline graph. By default, *Automatic* is selected to display the optimum window based on the available data. Intervals from *5 Minutes (1 Sec. Avg.)* to *24 Hours (5 Min. Avg.)* are also available.
- *Forensic search*: Click to display the **Forensic Search** dialog where you can adjust the forensic search settings. Click the small down arrow next to **Forensic Search** to display custom or pre-configured settings for performing a forensic search. You can change any option prior to clicking **OK**:
  - *Custom*: Creates a **Forensic Search** window based on the customized settings that you configure.
  - *Overview*: Creates a **Forensic Search** window based on settings that display an overview of the selected data in the capture session.
  - *Packets*: Creates a **Forensic Search** window containing a packets-only view.

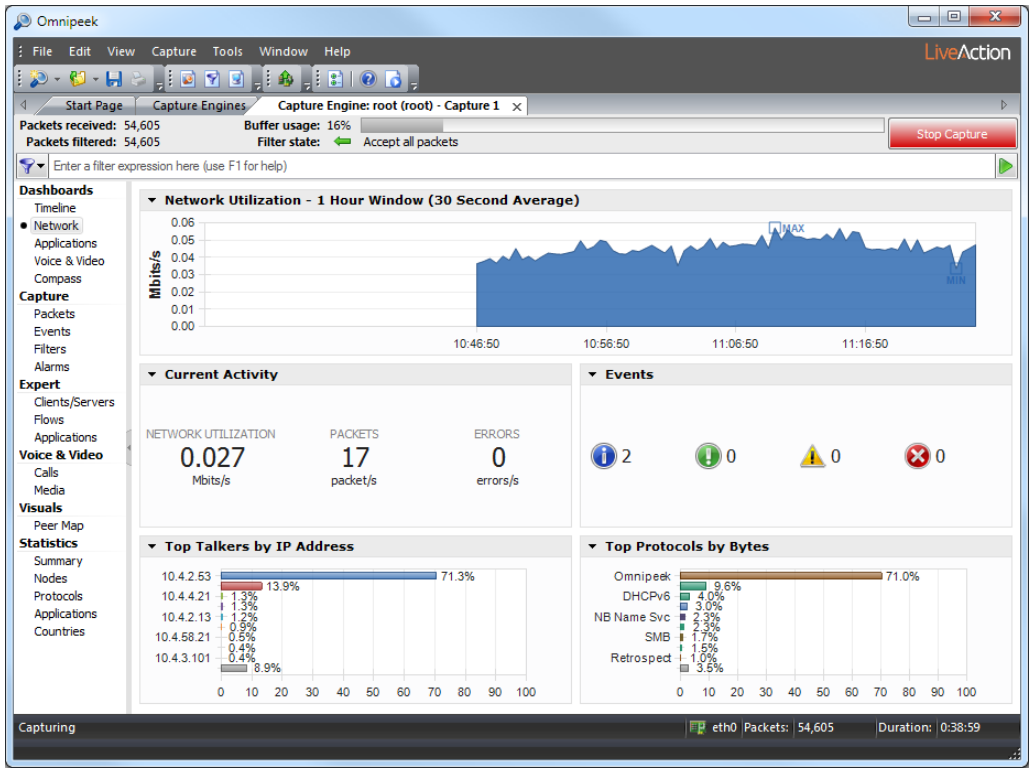
- *Expert*: Creates a **Forensic Search** window based on settings that are optimized for *Expert* analysis.
- *Voice & Video*: Creates a **Forensic Search** window based on settings that are optimized for *Voice & Video* analysis.

- *Download Packets*: Click to download the packets from the selected capture session, in the selected time range.
- *Refresh*: Click to refresh the screen. For an active capture session, you can also set an automatic refresh interval by selecting an interval from the drop-down list to the right of the **Refresh** button.

# Network dashboard

The **Network** dashboard displays key statistics for the capture.

**Note** To have a fully functional **Network** dashboard that displays data in all of its displays, enable the *Network Statistics*, *Node Statistics*, *Protocol Statistics*, *Traffic History Statistics*, and *Wireless Channel Statistics* (for wireless captures) analysis options in the *Analysis Options* of the **Capture Options** dialog.




The parts of the **Network** dashboard are described below.

- *Network Utilization:* This display graphs network traffic in Mbits/second. You can right-click inside the display to drill-down to selected packets, to select a *Column*, *Skyline*, *Area*, *Line*, or *Line/Points* display, or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display.
- *Wireless Signal:* This display graphs wireless signal and/or noise strength (as a percentage) for the wireless channel you are capturing on, or all channels you have configured the capture to scan. This display is available only when a wireless adapter is selected as the capture adapter, or for a wireless capture file. You can right-click inside the display to select the parameters to display. Hovering over a channel will display a tooltip with additional channel information.
- *Current Activity:* This display shows network utilization (as a percent of capacity), traffic volume (in packets per second), and error rate (total errors per second). You can right-click inside the display to

display values as numbers or as gauges, or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display.

- *Events:* This display shows the number of notifications generated by level of severity. You can right-click inside the display to select an *Automatic, Light, Dark*, or *Clean* background theme for the display. Clicking a severity icon navigates to the **Events** view and displays those events corresponding to the severity clicked.
- *Top Talkers by IP Address:* This display shows a graph of top "talkers" on the network, broken out by node. You can right-click inside the display to display top talkers by *Physical Address*, *IP Address*, *IPv6 Address*, or *Country*, to select a *Bar, Column, Pie* or *Donut* display; to select an *Auto Scale* or *Fixed Scale* display; to select to display a *Country Name* or *Country Code*; or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. Clicking a bar (or slice) of the graph opens a Detail Statistics window populated with details for the node clicked.

**Note** This feature is automatically enabled for Capture Engine captures based on the Monitoring Capture template. Top talkers are displayed as *Not Available* for Capture Engine captures using the Forensic Capture template. See *Forensics capture on a Capture Engine* on page 54 and *Monitoring capture on a Capture Engine* on page 55.

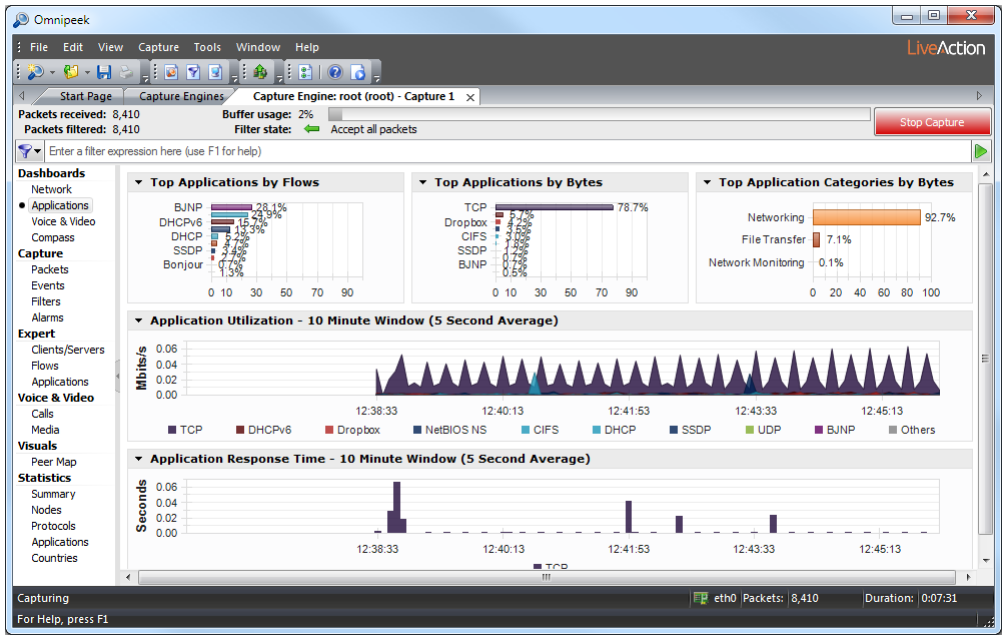
- *Top Applications*: This display shows a graph of top applications on the network. You can right-click inside the display to toggle the display with the *Top Protocols* display, or to select a *Bar, Column, Pie* or *Donut* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application. Clicking a bar (or slice) of the graph opens a Detail Statistics window populated with details for the application clicked.
- *Top Protocols:* This display shows a graph of top protocols on the network. You can right-click inside the display to toggle the display with the *Top Applications* display, or to select a *Bar, Column, Pie* or *Donut* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the protocol. Clicking a bar (or slice) of the graph opens a Detail Statistics window populated with details for the protocol clicked.

**Tip** Several of the displays inside the Network dashboard support tooltips. Hover over the display to view a tooltip with additional information.

You can also access additional options for viewing each display by clicking the small arrow in the upper left corner of each display, or by right-clicking inside each display.

# Applications dashboard

The **Applications** dashboard displays key applications statistics for the capture. This application visibility provides insight into user behavior and traffic patterns on the network at certain times of day, week, month, or year. It helps the analysts to better understand who is going to what web sites and using which applications when.



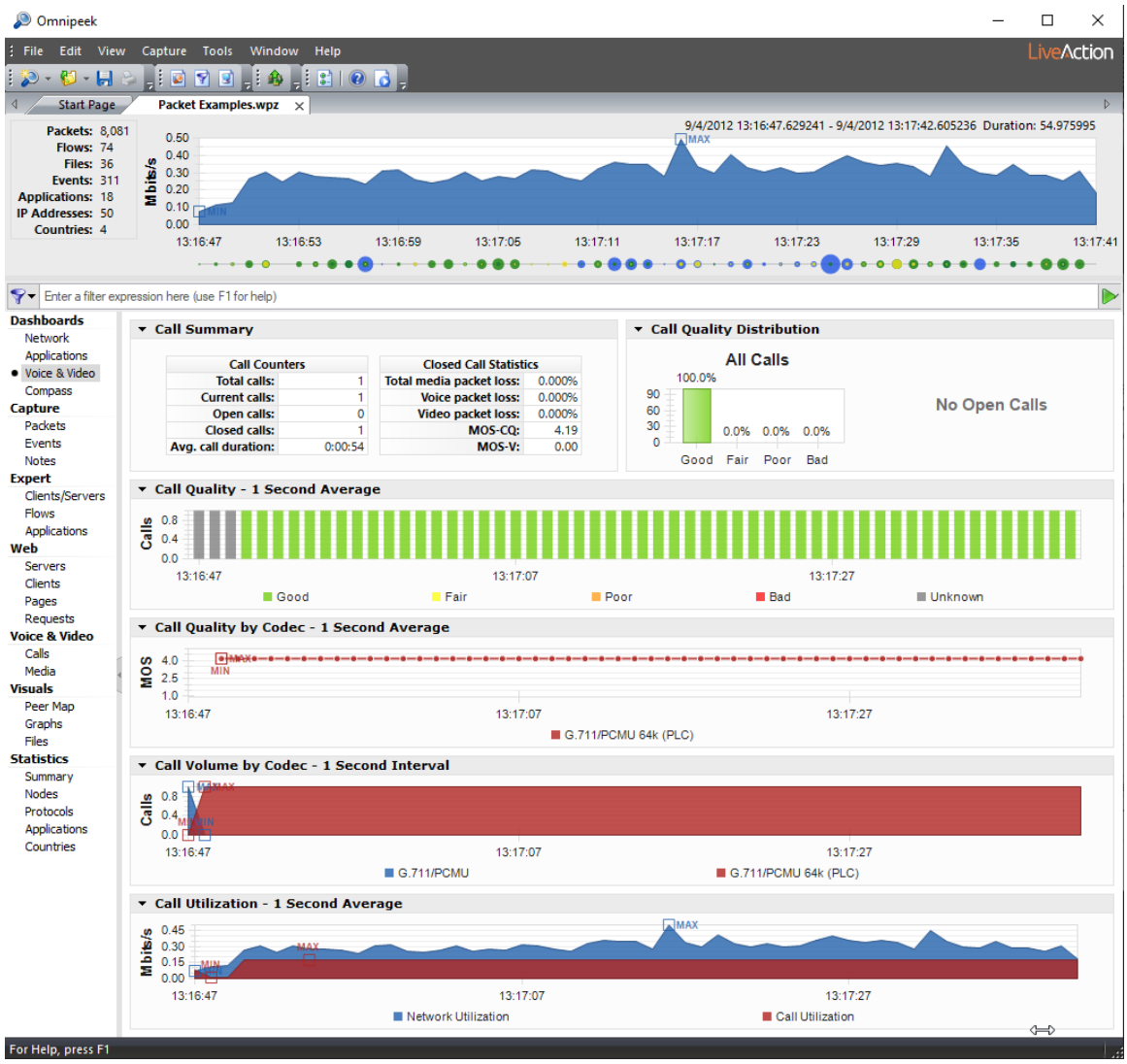

- *Top Applications by Flows:* This display shows a graph of top applications by flow count. Clicking any application in this display lets you drill-down to that application in the Expert **Applications** view. You can right-click inside the display to select a *Bar, Column, Pie* or *Donut* display; select *Auto Scale* or *Fixed Scale*; or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display.
- *Top Applications by Bytes*: This display shows a graph of top applications by bytes. You can right-click inside the display to toggle the display with the *Top Protocols by Bytes* display; select a *Bar, Column, Pie* or *Donut* display; select *Auto Scale* or *Fixed Scale*; or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application. Clicking a bar (or slice) of the graph opens a Detail Statistics window populated with details for the application clicked.
- *Top Protocols by Bytes:* This display shows a graph of top protocols by bytes. You can right-click inside the display to toggle the display with the *Top Applications by Bytes* display; select a *Bar, Column, Pie* or *Donut* display; select *Auto Scale* or *Fixed Scale*; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the protocol. Clicking a bar (or slice) of the graph opens a Detail Statistics window populated with details for the protocol clicked.
- *Top Application Categories by Bytes:* This display shows a graph of top application categories by bytes. You can right-click inside the display to select a *Bar, Column, Pie* or *Donut* display; select *Auto Scale* or *Fixed Scale*; or to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application categories.
- *Application Utilization:* This display shows the top applications by bits per second. You can right-click inside the display to select a *Stacked Column, Skyline, Stacked Skyline, Area, Stacked Area, Line*, or *Line/Points* display; select whether the display is *Linear* or *Logarithmic*; show *Min/Max* values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can select an area of the graph, right-click and choose *Select Packets*. Only packets available in the capture buffer will be accessible for *Select Packets*.
- *Application Response Time:* This display shows response time of the top applications by largest response time. You can right-click inside the display to select a *Skyline, Area, Line, Line/Points* or *Points* display; select whether the display is *Linear* or *Logarithmic*; show Min/Max values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can select an area of the graph, right-click and choose *Select Packets*. Only packets available in the capture buffer will be accessible for *Select Packets*.

**Tip** Several of the displays inside the Applications dashboard support tooltips. Hover over the display to view a tooltip with additional information.

You can also access additional options for viewing each display by clicking the small arrow in the upper left corner of each display, or by right-clicking inside each display.

# Voice & Video dashboard

The **Voice & Video** dashboard provides a visual display of voice and video call summary information, as well as useful graphs and statistics to troubleshoot and analyze voice and video traffic.




The parts of the **Voice & Video** dashboard are described below.

- *Call Summary:* This display shows "Call Counter" information and "Closed Call Statistics" on voice and video packet loss. In addition, the *Call Summary* displays the *Max Call Time* which is the point and time when the maximum call limit was reached. The *Max Call Time* is displayed in red text and will dynamically appear. You can right-click inside the display to select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display.

**Note** *Max Call Time* only appears when the max call limit has been reached. See *Summary voice and video statistics* on page 215.

- *Call Quality Distribution:* This display shows open and closed calls by quality based on MOS scores. You can right-click inside the display to select a *Bar, Column, Pie*, or *Donut* display; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display.

  MOS scores are calculated for each media flow independently, and each call's quality is the lowest MOS score of any of its associated media flows. Voice media is scored with MOS-CQ and video media with MOS-V.

  The quality thresholds are as follows:

  - <2.6 = Bad (displayed in Red)
  - >=2.6 to <3.1 = Poor (displayed in Orange)
  - >=3.1 to <3.6 = Fair (displayed in Yellow)
  - >=3.6 = Good (displayed in Green)

  Media flows with unsupported codecs are not included in the display since we cannot obtain MOS values for these calls. Additionally, the display reflects that same data present in the Calls and Media views, and therefore is affected by the 2000 call limit.

- *Call Quality*: This display shows call quality over time for calls classified as good, fair, poor, bad, and unknown. You can right-click inside the display to select a *Stacked Column, Skyline, Stacked Skyline, Area*, *Stacked Area, Line*, *Line/Points,* or *Points* display; show *Min/Max* values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can also select an area of the *Call Quality* graph, right-click and choose *Select Packets*.

- *Call Quality by Codec*: This display shows a line graph of the quality for each codec in use over time. You can right-click inside the display to select a *Line, Line/Points*, or *Points* display; show *Min/Max* values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can also select an area of the *Call Quality* graph, right-click and choose *Select Packets*.

  MOS scores are used for the quality measurement. Voice media shall be scored with MOS-CQ and video media with MOS-V.

  The quality for a time period shall be the average of the MOS scores for all open media flows for that time period. In addition, this graph will only display MOS scores for supported codecs as unsupported codecs do not provide MOS measurements.

- *Call Volume by Codec*: This display shows a graph of open calls (per codec) over time for voice and video calls. This graph reflects all calls from the **Calls** and **Media** view, and unlike the other graphs in the dashboard, the **Call Volume** graph includes data for calls using unsupported codecs. You can right-click inside the display to select a *Stacked Column, Skyline, Stacked Skyline, Area*, *Stacked Area, Line*, *Line/Points,* or *Points* display; show *Min/Max* values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can also select an area of the *Call Volume* graph, right-click and choose *Select Packets*.

- *Call Utilization:* This display shows a graph of overall network utilization compared to network utilization by VoIP protocols. You can right-click inside the display to select a *Skyline, Area*, *Line*, or *Line/Points* display; select whether the display is *Linear* or *Logarithmic*; show *Min/Max* values; or select an *Automatic*, *Light*, *Dark*, or *Clean* background theme for the display. You can also select an area of the *Call Utilization* graph, right-click and choose *Select Packets*.

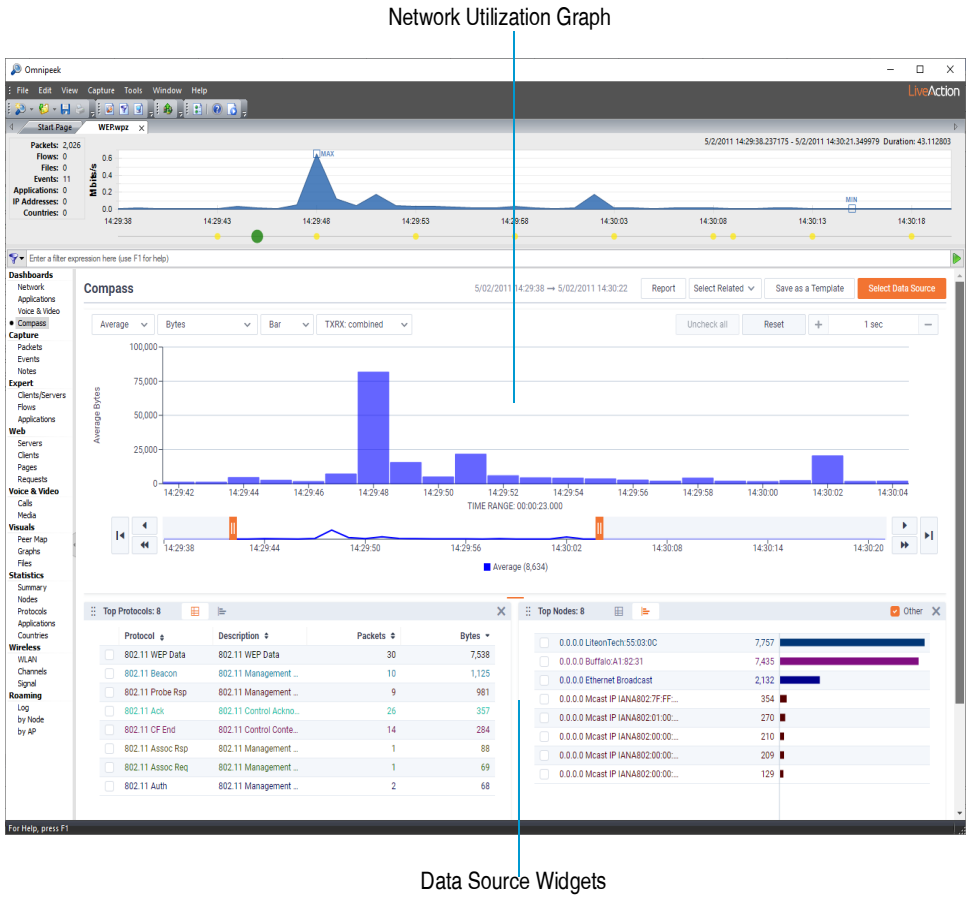
  This graph displays two legends: *Network Utilization* and *Call Utilization*. Utilization values are displayed in Mbits/second. The VoIP utilization shall be the total utilization for all VoIP packets (i.e., signaling, media RTP/RTCP, and unsupported codecs).

**Tip** Several of the displays inside the Voice & Video dashboard support tooltips. Hover over the display to view a tooltip with additional information.

You can also access additional options for viewing each display by clicking the small arrow in the upper left corner of each display, or by right-clicking inside each display.

# Compass dashboard

The **Compass** dashboard is an interactive forensics dashboard that displays network utilization over time including event, protocol, flow, node, channel, WLAN, VLAN, data rate, application, and country statistics. These statistics are displayed in selectable Data Source widgets which can be viewed from a real-time capture or from a single supported capture file.




The parts of the **Compass** dashboard are described below.

- *Network Utilization Graph*: Displays two interactive timeline graphs that allow you to select and display a range of data. See *Network utilization graph* on page 65.
- *Data Source Widgets*: Displays enabled statistics widgets (events, protocols, flows, nodes, channels, WLAN, VLAN, data rates, applications, and countries). See *Network utilization graph* on page 65 and *Data Source widgets* on page 70.

**Tip** You can use the orange horizontal splitter located between the network utilization graph and the Data Source widgets to resize the displays.

## Network utilization graph

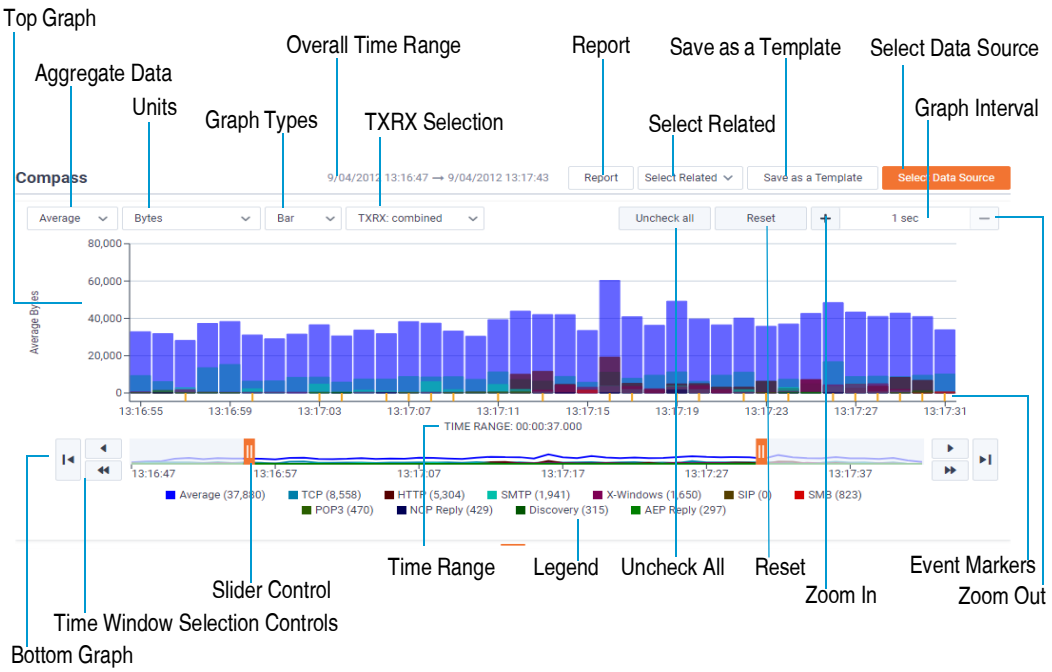
The network utilization graph in the **Compass** dashboard consists of two interactive timeline graphs that allow you to view a specific area of interest. The top (larger) graph displays utilization over a selected time

range, while the bottom graph displays utilization over the total time period. You will need to drag and select a time range in the top graph in order to display the bottom graph.

You can zoom into or out of the selected time range so that granularity is in milliseconds, seconds, minutes, hours, or days (initially the time range adjusts accordingly depending on how large of a capture needs to be displayed) by using the **Zoom In** and **Zoom Out** controls (not available in real-time captures).

As you change the selected time range, the Data Source widgets will update accordingly to reflect the new period. See *Compass dashboard viewing tips* on page 72 for additional information on using your mouse to navigate inside the network utilization graph.

**Tip** For best results, it is recommended to zoom in on a selected time range until you can see the details of the area of interest.




The parts of the network utilization graph are described below:

- *Top graph*: Displays network utilization as a line, scatter, bar, or area graph over a selected time range. Drag left or right inside the graph to select and display a specific time range (you can also use the bottom graph to select the time range). The selected data is then reflected in the bottom graph and also in the Data Source widgets at the bottom.
- *Bottom graph*: Displays network utilization as a line graph over the total time period. The bottom graph is always displayed if the top graph is not at full select, and always hidden if the top graph is at full select.

  Use both the slider controls and time window selection controls to select a specific time range. The data for the selected time range is then reflected in the top graph and also in the Data Source widgets at the bottom.
- *Overall Time Range*: Displays the overall time range, from start date and time to stop date and time, of the trace file, capture, or forensic search.
- *Report*: (Omnipeek only) Saves the data currently displayed inside the **Compass** dashboard to an HTML report that can be viewed from inside a browser window, to multiple CSV files, or to a PDF file.
- *Select Related*: Filters packets related to selected items from the Data Source widget and from the time range currently selected in the network utilization graph. You will need to also select between AND or OR filtering logic when using Select Related (multiple items selected within the same Data Source

widget will always use OR logic since AND logic will always nullify the entire expression, but items from different Data widgets will use the selected filtering logic). See also *Select related packets* on page 73.

- *Save as a Template*: Saves the contents of the current Compass display as a template so that it can be used again with other data sets. The type of widgets displayed, the location of the widgets, and the size of the widgets are retained in the template. You can select saved templates by clicking *Select Data Source*.
- *Select Data Source*: Enables/disables the Data Source widgets displayed inside the Compass dashboard. If any Compass templates have been saved, you can select them from here.

  Each Data Source widget displays statistics appropriate to the selected data source and for the selected time range in the network utilization graph. The widget can be viewed as a List or Bar chart. See also *Data Source widgets* on page 70.

  The available Data Source widgets include:

  - Expert Events
  - Protocols
  - Flows
  - Nodes
  - Channels
  - WLAN
  - VLAN
  - Data Rates
  - Applications
  - Countries

  **Note** For wired captures, the following Data Source widgets are not available: *Channels*, *WLAN*, and *Data Rates*. For wireless captures, the *VLAN* Data Source widget is not available.

- *Aggregate Data*: Allows you to display the Y axis in the top and bottom graphs, Data Source widgets, and legend as an aggregate of average, total, or maximum values:
  - *Average*: In the top and bottom graphs, the average value for each time interval is graphed. In the various Data Source widgets, the average value for the statistic over the selected time range is graphed. If *Bits*, *Bytes*, *Mbits*, *Gbits*, *Packets*, or *Retransmission Rate* is the selected unit type, then average calculations include non-values; otherwise, non-values are not included in the calculations. Average calculations for *Bits*, *Bytes*, *Mbits*, *Gbits*, *Packets*, *Signal Strength %*, *Noise Level %*, and *Expert Events* are rounded to the nearest whole number.
  - *Total*: In the top and bottom graphs, the total value for each time interval is graphed. In the various Data Source widgets, the total value for the statistic over the selected time range is graphed. If *2-Way Latency*, *Response Time*, *Signal Strength %*, *Signal Strength dBm*, *Noise Level %*, *Noise Level dBm*, *SNR*, or *Data Rate* is the selected unit type, then *Total* values are unavailable.
  - *Maximum*: In the top and bottom graphs, the maximum value for each time interval is graphed. In the various Data Source widgets, the maximum value for the statistic over the selected time range is graphed.
- *Units*: Allows you to set the unit type in the Y axis of the top and bottom graphs, Data Source widgets, and legend. Depending on the packet type and how they are aggregated, the available unit types include:
  - *Bits*. Displays byte count in bits.
  - *Bytes*. Displays byte count in bytes.

- *Mbits*. Displays byte count in Mbits.
- *Gbits*. Displays byte count in Gbits.
- *Packets*. Displays the packet count.
- *2-Way Latency*. Displays 2-way latency. 2-way latency is the delta time between a request from the client, and a response from the server.
- *Response Time*. Displays response time. Response time is the delta time between a request packet from the client, and a response packet with data from the server.
- *Signal Strength %* (Wireless traffic only). Displays signal strength of the wireless data transmission, expressed as a percentage.
- *Signal Strength dBm* (Wireless traffic only). Displays signal strength of the wireless data transmission, expressed in dBm (decibel-milliWatts).
- *Noise Level %* (Wireless traffic only). Displays noise level reported of the wireless data transmission, expressed as a percentage.
- *Noise Level dBm* (Wireless traffic only). Displays noise level reported of the wireless data transmission, expressed in dBm (decibel milliWatts).
- *SNR* (Wireless traffic only). Displays Signal to Noise Ratio (SNR) of the wireless data transmission. Basically, it is a measure of signal strength relative to background noise.
- *Data Rate* (Wireless traffic only). Displays data rate of the wireless data transmission.
- *Retransmission Rate* (Wireless traffic only). Displays retransmission rate percentage of the wireless data transmission.
- *Expert Events*. Displays the total number of Expert events. Only the Expert events whose Event type severity button is enabled and are selected in the Expert Events Data Source widget are included in the count. If no Expert events are selected in the Expert event view, then all events whose Event type severity button is enabled are included.

**Note** Selecting a unit type of *Mbits* or *Gbits*, and also selecting an aggregate value of *Average*, displays data in the graphs, Data Source widgets, and legend as a graph average, and not as the *Average Utilization (bit/s)*. To see the *Average Utilization (bit/s)*, click the **Summary** view under *Statistics* in the navigation pane of a capture window, and view the *Network* statistics.

- *Graph Type*: Displays the top graph as a line, scatter, bar, or area graph.
- *TXRX Selection*: Enables or disables graphing of both the inbound and outbound utilization values for the selected statistics (except for flows). The outbound values appear as a slightly lighter color than the inbound values in both the graphs view and legend. Inbound and outbound values are not available for the 2-Way latency mode, Response Time mode, and Expert Events mode.
- *Uncheck All*: Click to clear the check boxes of all the selected items in each of the Data Source widgets.
- *Reset*: Click to reset the Network Utilization Graph to its original state as if it was fully selected.
- *Zoom In*: For selected time ranges of a certain length, Zoom In (+ sign) is enabled and allows you to zoom into the selected time range so that you can increase granularity in milliseconds, seconds, minutes, hours, and days. You can hover the mouse over *Zoom In* to display a tooltip that contains the maximum time range that can be zoomed into. Selecting a time range less than or equal to it will enable Zoom In. (See also *Graph Interval* below).

  For example, if the graph is in seconds with a one second average, you can zoom into milliseconds with a particular millisecond average; or, if the graph is in hours you can zoom into minutes. See the Graph Interval table below for more information as to what the graph interval will be for a particular time. Zoom In is not available in real-time capture mode.

- *Zoom Out*: Zoom Out (- sign) brings you back out of the previous Zoom In selection. Zoom Out is not available in real-time capture mode.
- *Graph Interval*: Graph Interval is the amount of time for each data point in the graph and is automatically adjusted based on the duration of the selected time range. The Graph Interval is updated according to the following chart:

| Graph Interval | Maximum Time Duration |
|---|---|
| 1 millisecond | 1800 milliseconds |
| 50 milliseconds | 1.5 minutes |
| 250 milliseconds | 7.5 minutes |
| 500 milliseconds | 15 minutes |
| 1 second | 30 minutes |
| 5 seconds | 2.5 hours |
| 15 seconds | 7.5 hours |
| 30 seconds | 15 hours |
| 1 minutes | 1 day 6 hours |
| 5 minutes | 6 days 6 hours |
| 15 minutes | 2 weeks 4 days 18 hours |
| 30 minutes | 5 weeks 2 days 12 hours |
| 1 hour | 10 weeks 5 days |
| 6 hours | 64 weeks 2 days |
| 12 hours | 128 weeks 4 days |
| 1 day | 357 weeks 1 day |
| 2 days | 514 weeks 2 days |
| 4 days | 1028 weeks 4 days |
| (doubles)... | (doubles)... |

**Note** The graph interval chart is also valid for determining the minimum and maximum ranges of time that can be zoomed into when viewing capture files. See also *Zoom In* above.

Additionally, millisecond graph intervals are not automatic and only occur during Zoom In and are not valid for live captures.

- *Event Markers*: Indicates triggered Expert events in the selected time range. The event markers are color coded to the Expert event severities displayed in the Expert Events Data Source widget.
- *Time Range*: The time range indicator below the X axis of the top graph indicates the duration of the currently selected time range. Use the arrow and slider controls to adjust the selected time range.
- *Time Window Selection Controls*: The single arrow and double arrow selection controls allow you to move the selected time range in the top and bottom graph left or right in one unit increments (single arrows) or in increments of the entire selection (double arrows). The single arrow with a line selection control allows you to move the selected time range in the top and bottom graph all the way to the left or right.

- *Slider Controls*: The two slider controls allow you to widen and narrow the selected time range in the top and bottom graph. In a real-time capture, the slider controls work as follows:
  - If the left and right sliders are pushed all the way to the left and right (respectively), new data is displayed on the right as it becomes available, and old data on the left remains. Thus, the duration of the selected time range continuously increases.
  - If the left and right sliders are not pushed all the way to the left and right (respectively), new data is not displayed on the right as it becomes available, and old data on the left remains. Thus, the duration of the selected time range is maintained.
  - If the left slider is pushed all the way to the left but the right slider is not pushed all the way to the right, new data is not displayed on the right as it becomes available, and old data on the left remains. Thus, the duration of the selected time range is maintained.
  - If the left slider is not pushed all the way to the left but the right slider is pushed all the way to the right, new data is displayed on the right as it becomes available, and the old data is removed from the left. Thus, the duration of the selected time range is maintained.

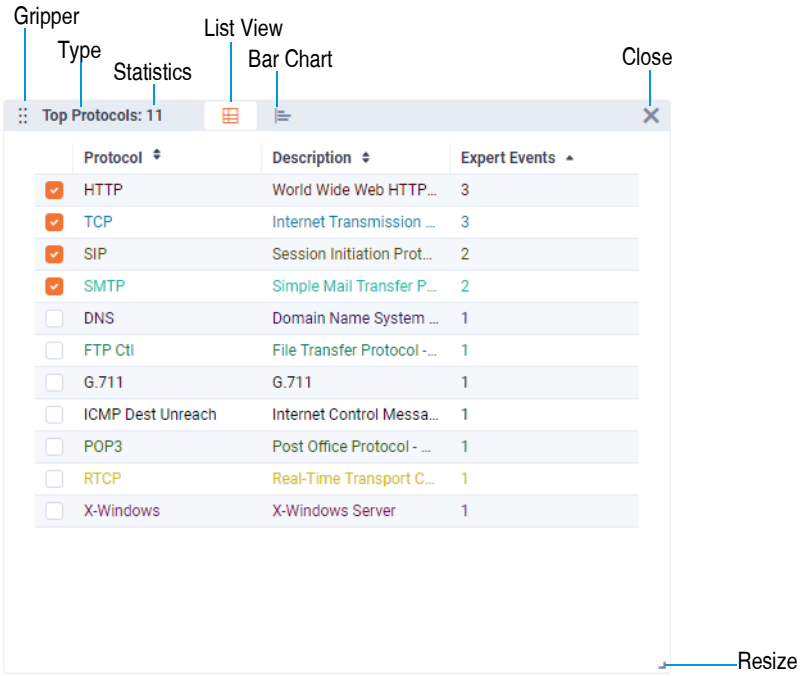
  **Tip** You can drag the area between the slider controls left or right to select different parts of the top and bottom graph.

- *Legend*: Displays a legend of the graphed items. The values in the legend are displayed as a total, average, or maximum depending on what is selected in the Aggregate Data drop-down list. Click the color boxes in the legend to show or hide entries from the graphs.
- *Pause/Play (real-time capture only)*: Toggles between updating and not updating the graphs in real time.

## Data Source widgets

The Data Source widgets display statistics for Expert Events, protocols, flows, nodes, channels, WLAN, VLAN, data rates, applications, and countries. Each widget displays statistics appropriate to the selected data source and for the selected time range in the network utilization graph. You can display these widgets in a list view or bar chart.

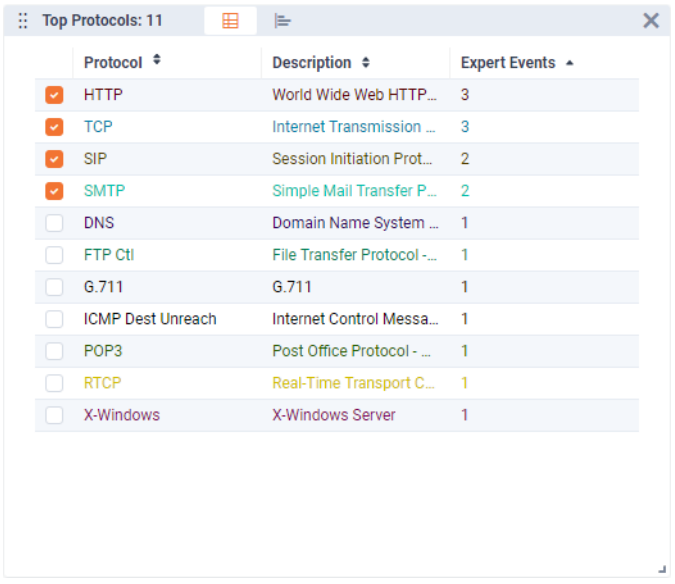
The list view and bar chart are always in sync. Enabling an item in one of the widget will be reflected in all of the other widgets. Using a Protocols Data Source widget as an example, the parts of a Data Source widgets are described below.




- *Gripper*: Allows you to drag the widget to a different location within the dashboard.
- *Type*: Displays the type of Data Source widget.
- *Statistics*: Displays the number of statistics over the selected time range within the top limit count.
- *List View*: Displays statistics in a list view.
- *Bar Chart*: Displays statistics in a bar chart.
- *Resize*: Drag to resize the Data Source widget.
- *Close*: Click to disable the widget from the dashboard.

## *List view*

In the list view, the columns appropriate for the statistic and unit selected are displayed. By default, only the top 50 items are listed. This limit can be adjusted through the Compass options dialog.

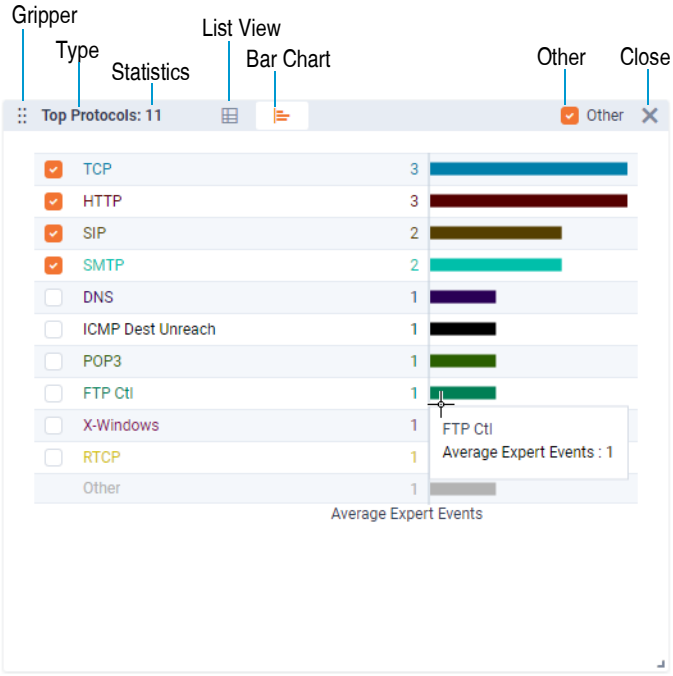



In the list view, you can:

- Click a column header to sort in ascending or descending order.
- Use the check boxes to enable or disable graphing of a specific statistics in the network utilization graph. Enabling a check box in the list view enables the same statistics in the top statistics bar chart.

### *Bar chart*

The statistics bar chart displays the top 10 statistics, with all other statistics grouped as 'Others.'




In the bar chart, you can:

- Click a check box in the bar chart to toggle the display of statistics in the network utilization graph. Additionally, clicking a check box (except for *Others*) selects the check box of the same statistic in the list view.
- Mouse over a bar to see details about a specific statistic.
- Select or clear the 'Others' check box to show or hide 'Others' from the bar chart.

## Compass dashboard viewing tips

Here are some useful tips when viewing the **Compass** dashboard:

- Hovering over an Expert event marker displays the following event specifics in a tooltip:
  - The date and time for the graph point where the Expert event(s) have occurred.
  - A list of Expert event types with the associated count of occurrences for that point in the graph.
- If the unit type is set to *Expert Events*:
  - The network utilization graph and Data Source widget represent the Expert event severities that are enabled.
  - If no Expert events are selected in the Expert event views, the network utilization graph represents all Expert events, and the Data Source widgets display all items that are associated with any Expert event.
  - If any Expert events are selected in the Expert event views, the network utilization graph represents the selected events, and the Data Source widgets only display those items that are associated with the selected Expert events.

- You may only select a maximum combination of 10 statistical items (in the Data Source widgets) at one time.
- In the statistics list views, you can sort selected items by clicking above the check box column. This allows you to keep selected items together at either the top or bottom of the list views.

## Compass dashboard limitations

Here are some limitations when viewing the Compass dashboard:

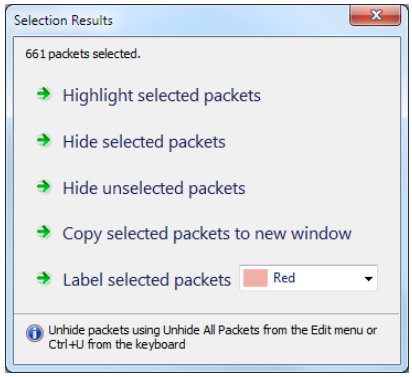
- A Compass dashboard has a limit of 1,000,000 statistic items (protocols, flows, nodes, channels, WLAN, VLAN, data rates, applications) per second.
- For real-time captures, the Compass dashboard shows only the latest four hours of data. Every 10 minutes after the four hour mark, Compass slices off the first 10 minutes of available data. This limit can be adjusted through the Compass options dialog.
- Compass expects to receive packets in ascending order—a packet received with a timestamp earlier than the previous packet is discarded.
- There must be at least 500MB of free disk space or Compass stops generating/saving statistic information until enough disk space is made available.

## Select related packets

You can use the 'Select Related Packets' feature to filter selected items from the Data Source widgets and network utilization graph.

**To select related packets:**

1. Select one or more statistic items from the Data Source widgets, and adjust the time range currently selected in the network utilization graph.
2. Click **Select Related Packets** at the top of the graphs and select the desired AND or OR logic. Packets matching the selected statistic item are filtered and highlighted in the **Packets** view, and the **Selection Results** dialog appears.




3. Click **Highlight selected packets**, **Hide selected packets**, **Hide unselected packets**, **Copy selected packets to new window**, or **Label selected packets**.

**Note** Selecting packets based on protocols will include child protocols in the protocol hierarchy.

CHAPTER 5

# Viewing and Decoding Packets

## In this chapter:

# About packets

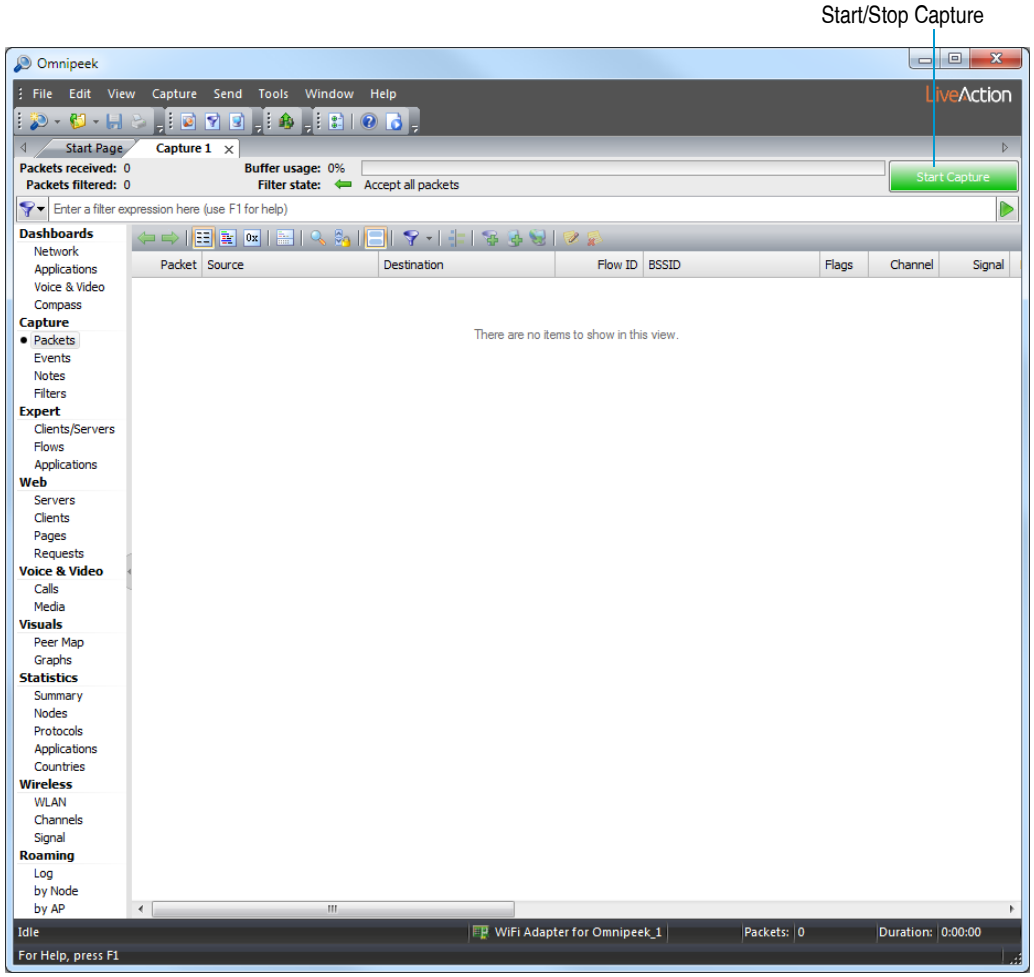
Packets, the units of data carried on the network, are the basis for all higher level network analysis. When troubleshooting network problems, it is important to be able to drill down into the packets themselves by looking at their individual decodes as well as use the packets captured into the buffer as the foundation for expert and statistical analysis. The **Packets** view of a capture window is where you can view information about the individual packets transmitted on your network.

Packets can be captured in multiple configurable capture windows, each with its own selected adapter, its own dedicated capture buffer, and its own settings for filters, triggers, and statistics output. With Omnipeek, you can have capture windows for capturing packets locally from Omnipeek, and remotely from a Capture Engine. The number of capture windows you can have open at one time is only limited by the amount of available memory.

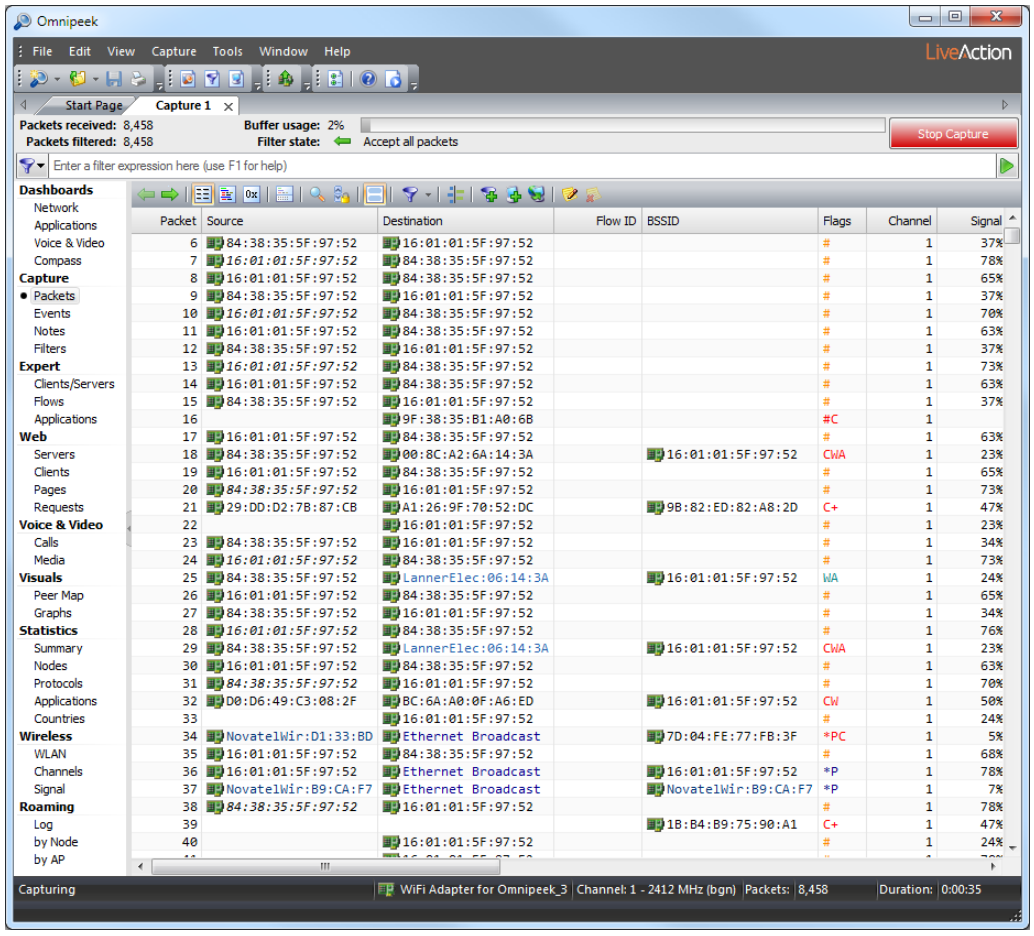
# Capturing packets into a capture window

**To capture packets:**

1. Create a new capture as defined in *Creating an Omnipeek capture window* on page 23.
2. Select the **Packets** view of the capture window.




3. Click **Start Capture** to begin capturing packets. **Start Capture** changes to the **Stop Capture** and packets begin populating the capture window.



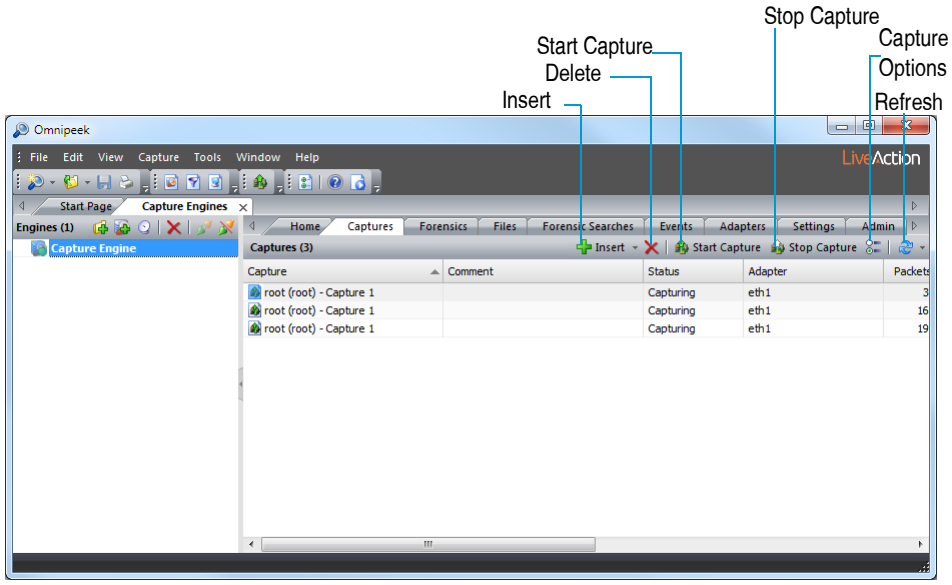

**Tip** You can right-click a column heading to hide or display column headings. See *Packet list columns* on page 336 for a list of available columns.

4. Click **Stop Capture** when you want to stop capturing packets. You have various options for saving captured packets. See *Saving captured packets* on page 82.

**Tip** To resume capturing from where you left off, hold down the *Alt* key and click **Start Capture**. To empty the capture buffer and start a new capture, simply click **Start Capture** again.

## Capture Engine Captures tab

The *Captures* tab in the Capture Engines window is where you create and manage the captures taking place on a particular Capture Engine.




The *Captures* tab lists all the currently defined captures for a particular Capture Engine. Right-click any column header to display a list of available columns to display. See *Capture Engine capture tab columns* on page 354 for a description of the available columns.

The clickable buttons in the toolbar of the Capture Engines window are described below:

- *Insert:* Creates a new Capture Engine capture window.

**Important!** When you create a Capture Engine capture, that capture continues to exist on the Capture Engine until you delete it, regardless of whether its Capture Engine capture window is open. By contrast, when you close an Omnipeek console capture window, the capture is stopped.

- *Delete:* Deletes the selected capture.
- *Start Capture:* Starts capturing packets for the selected capture. **Start Capture** also works when the Capture Engine capture window is open. When a Capture Engine capture window is open in Omnipeek, you can also click **Start Capture** to start capture.
- *Stop Capture:* Stops capturing packets for the selected captures. **Stop Capture** also works when the Capture Engine capture window is open. When a Capture Engine capture window is open in Omnipeek, you can also click **Stop Capture** to stop capture.
- *Capture Options:* Displays the Capture Options dialog for the selected capture.
- *Refresh:* Updates the information in the **Captures** view, retrieving the most current information from a Capture Engine. You can also set an automatic refresh interval by selecting an interval from the drop-down list to the right of **Refresh**.

**Important!** Users that do not have permission to create or modify Capture Engine capture windows will find features grayed out, missing, or will receive an error message indicating the task is not allowed. For details, see the *Capture Engine for Omnipeek Getting Started Guide* or the online help in the **Omni Management Console** application.

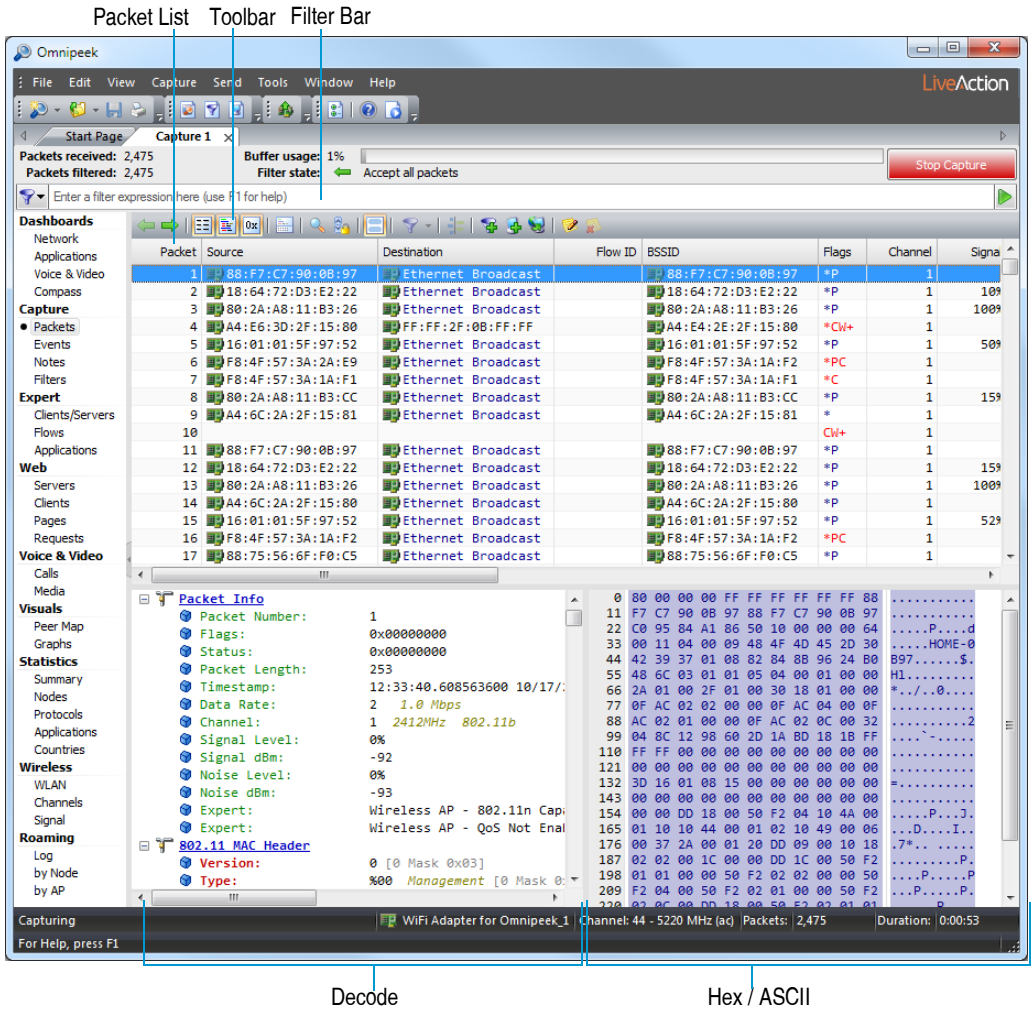
YADA YADA YADA

# Viewing captured packets

The **Packets** view displays details about each packet, including information provided by the Expert function and Analysis Modules. You can show or hide the Decode and Hex panes of the packets view to see a decode, as well as the raw hexadecimal and ASCII values of the selected packet.

# Navigating the Packets view

The **Packets** view can display any combination of the Packet List, Decode, Hex, and ASCII panes. The toolbar lets you show or hide the panes. The filter bar lets you create a wide variety of advanced filters quickly and directly from the capture window. See *Creating filters using the filter bar* on page 106.




The buttons in the **Packets** view toolbar are described here:

- *Decode Previous:* Decodes the previous packet.
- *Decode Next:* Decodes the next packet.
- *Show Packet List:* Shows or hides the Packet List view.
- *Show Decode View:* Shows or hides the Decode view.
- *Show Hex View:* Shows or hides the Hex view.
- *Toggle Orientation:* Changes the orientation of how the Decode and Hex views are displayed.
- *Zoom Pane:* Shows only the view of what is currently selected.
- *Toggle Mark Packets:* Toggles the highlighting of packets from the same flow as the selected packet. You can enable/disable this feature from the **Packet List Options** dialog.
- *Auto Scroll:* Enables or disables the scrolling of packets when packets are being captured. Alternatively, you can press **CTRL+K** to enable or disable scrolling.

- *Display Filter:* Displays in the packet list only the packets that pass (match) the selected filter. Choosing *All* shows all packets. This functionality is available with capture windows; however, it cannot be used while capturing (you must stop the capture first). See *Display filters* on page 96.

**Tip** Hold down the **Shift** key to show only those packets which do NOT match the selected filter for the entire buffer. Hold down the **Ctrl** key to apply the filter for only those packets which are currently visible. Hold down both **Shift** and **Ctrl** together to hide any currently visible packets which do not match the selected filter.

- *Flow Visualizer:* Opens the Flow Visualizer, which presents a variety of ways to look at an individual flow, providing a snapshot all of the packets that were in the buffer for a particular flow at the time the window was created. See *Flow Visualizer* on page 154.
- *Make Filter:* Opens the **Insert Filter** dialog to create a filter based on the selected packet.
- *Insert Into Name Table:* Opens a dialog to add the selected packet into the Name Table. From the dialog, you can also select Node type icons that will appear to the left of the selected packet. For example, *Workstation*, *Server*, *Router*, or *Access Point*.
- *Resolve Names:* Checks the DNS server for a name to match the supplied address.
- *Edit Note:* Opens the **Edit Note** dialog to add a note to the selected packet.
- *Delete Note:* Deletes any note entered for the selected packet.

The **Packets** view panes are described here:

- **Packet List:** This pane displays information about each packet in a table with user-configurable columns. Right-click a column head to show or hide other available columns. You can also drag column heads to other positions within the table. See *Packet list columns* on page 336. You can also right-click a packet for additional options, including *Select Related Packets* and *Select Related Flow*. See *Selecting related packets* on page 115 or *Selecting related flows* on page 116.

**Important!** By selecting, hiding, and unhiding packets in the Packet List, you can force a recalculation of statistics in other views of the window, based only on the packets that remain visible. See also *Copying selected packets to a new window* on page 114.

- **Decode:** This pane displays detailed information about the selected packet. Click a detail and the corresponding hexadecimal values and ASCII characters are automatically highlighted in the **Hex** pane. See *Decoding packets* on page 84 for more information.

**Tip** You can double-click a packet to display its Decode window.

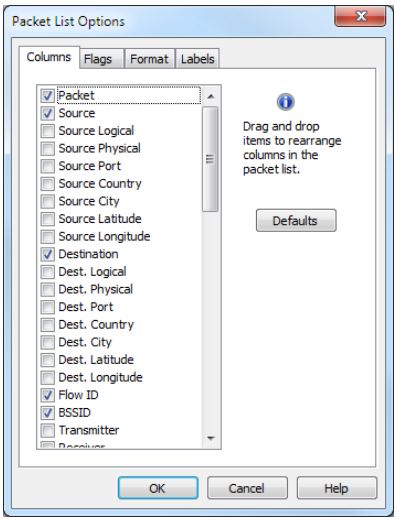
- **Hex:** This pane displays the selected packet as raw hexadecimal values and ASCII characters. Click a hexadecimal value or an ASCII character and the corresponding details are automatically highlighted in the **Decode** pane.

## Customizing packet views

You can customize the way packets are displayed in the **Packets** view by using the **Packet List Options** dialog.

**To open the Packet List Options dialog:**

- Click a column head in the Packet List pane. The **Packet List Options** dialog appears.




- *Columns:* This tab lets you show, hide, and rearrange columns. See *Packet list columns* on page 336 for descriptions.
- *Flags:* This tab lets you define both the flag character and the color associated with flagged packets.
- *Format:* This tab lets you set the timestamp format (in milliseconds, microseconds, nanoseconds), as well as configure properties for how packets are displayed.
- *Labels:* This tab lets you define the color labels for packets displayed in the **Packets** view of an Omnipeek capture window. Adding color labels to selected packets lets you visually group packets inside the **Packets** view so that they are easy to identify.

**Tip** You can add/remove multiple decode columns to the **Packets** view. See *Adding decode columns to the Packets view* on page 87.

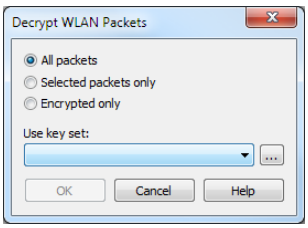
**Note** Click **Help** in each of these tabs to learn more about specific options and settings.

# Applying decryption in the Packets view

You can apply a particular key set to decrypt all or some of the encrypted wireless packets in a capture window. An encrypted packet appears in the **Packets** view with a *W* in the *Flag* column and *802.11 TKIP Data, 802.11 Encrypted Data,* or *802.11 WEP Data* in the *Protocols* column.

**To apply decryption in the packets tab:**

1. On the **Tools** menu, click **Decrypt WLAN Packets...**. The **Decrypt WLAN Packets** dialog appears.




2. Select *All packets*, *Selected packets only*, or those packets in the current window which are *Encrypted only*. Your key set will be applied to this selection of packets.

**Important!** If you are using a WPA/WPA2 key set, you must select *All packets* to ensure the inclusion of the four-way handshake authentication that established the PTK (Pairwise transient key) and GTK (Group transient key) used to encrypt the target packets.

3. Select an existing key set under *Use key set* or browse to open the **Key Set** options to create a new key set.
4. When you have made your selections, click **OK** to apply the chosen key set to the chosen packets. A new capture window opens containing the results of the decryption. This new window has the name of the original target window, with the string "- *Decrypted*" appended to it.

**Note** An 802.11 key set cannot be changed while capture is under way. A new key set will not be applied until a capture is stopped and a new capture is created.

# Applying SSL decryption to packets

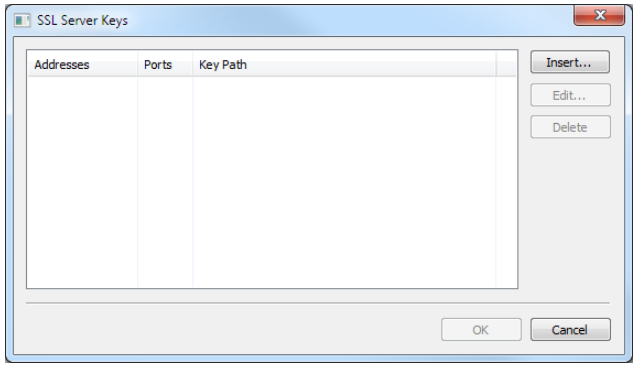
You can apply a particular key set to decrypt SSL encrypted packets in a capture window. There are four pieces of information that are needed to decrypt SSL encrypted packets:

- The IP address of the server
- The port being used for SSL data
- The file path to a PEM file (*.pem) that contains the server's SSL private key
- The password to decrypt the private key if it is encrypted

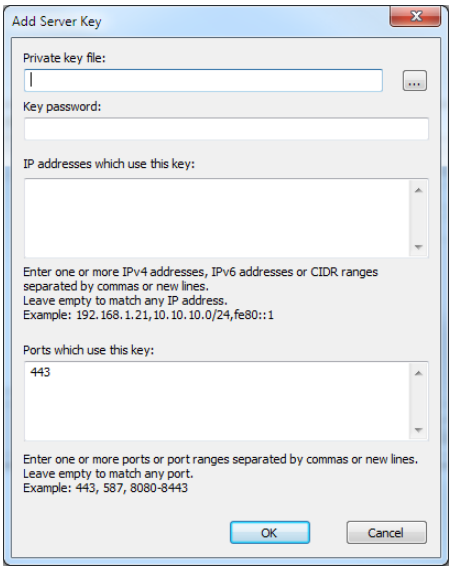
**Note** Ciphersuites that use 'Diffie Hellman' or 'Ephemereal Diffie Hellman' are not currently supported.

**To apply or edit SSL decryption in the packets tab:**

1. Make sure the capture is stopped (for example, click **Stop Capture** from the capture window).
2. On the **Tools** menu, click **Decrypt SSL Packets...**. The **SSL Server Keys** dialog appears.




3. Click **Insert** or **Edit**. The **Add Server Key** dialog appears.




4. Complete the dialog:
   - *Private key file*: The file (*.pem) that contains the server's SSL private key.
   - *Key password*: The password (if needed) to decrypt the private key if it is encrypted.
   - *IP addresses which use this key*: The IP address of the servers that use the key. Enter one or more IPv4 addresses, IPv6 addresses, or CIDR ranges separated by commas or new lines. Leave this field blank to match any IP address.
   - *Port which use this key*: The port being used for SSL data. The default is port 443, which is the port commonly used for SSL decryption.
5. Click **OK**.

   A copy of the capture window is made and each packet in the new capture window that matches the criteria specified goes through the SSL decryption process. If the SSL packet has encrypted data, the data is decrypted and the output is placed in the packet.

**Note** If an encrypted packet is received before the packet processor has generated the decryption keys, the packet will not be decrypted.

# Saving captured packets

You can save captured packets to a supported file format for later examination and comparison. You can choose to save all packets currently visible in the active window, or just the packets currently selected.

**To save all packets:**

1. On the **File** menu, click **Save All Packets...**.
2. Select the file format and click **Save**. (See *Save file formats* on page 83 for a description of the available file formats.)

**To save selected packets:**

1. Select the desired packets.
2. On the **File** menu, click **Save Selected Packets...**.
3. Select the file format and click **Save**. (See *Save file formats* on page 83 for a description of the available file formats.)

# Save file formats

You can save packets to the supported file formats below.

## *Capture file formats*

The capture file formats are:

- *Omnipeek Packet File (*.pkt)*—The packets are saved to a Omnipeek packet file format, with a **.pkt* extension.
- *Omnipeek Packet File (compressed) (*.wpz)*—The packets are saved to a compressed Omnipeek packet file format used to save disk space. This file format uses a *.wpz extension.
- *Omnipeek Wireless Packet File (*.apc)*—The packets are saved to a Omnipeek wireless packet file format, with a **.apc* extension.
- *Omnipeek Classic Packet File (*.pkt)*—The packets are saved to an Omnipeek packet file format compatible with older LiveAction programs, such as older versions of AiroPeek, EtherPeek SE (5.0 and earlier), EtherPeek NX (2.0 and earlier). This file format uses a **.pkt* extension.

> **Note** The compressed Packet File format (**.wpz*) is not supported for automatic file creation during packet capture. The compressed format can be used normally to **Save All Packets...** or **Save Selected Packets...** from any capture window.

## *Other file formats*

In addition to the capture file formats above, you can save packets from any media type to the following formats.

- *Packet List (Tab delimited, UTF-8) (*.txt)*—The packets and columns displayed in the Packet List are saved to a tab-delimited text file in UTF-8 encoding.
- *Packet List (Comma delimited, ASCII) (*.csv)*—The packets and columns displayed in the Packet List are saved to a comma-delimited text file in ASCII encoding.
- *Decoded Packets (*.txt)*—The packets are decoded and saved to a plain text file.
- *Decoded Packets (*.rtf)*—The packets are decoded and saved to an RTF file that preserves the text formatting and page layout of the same packets in the **Decode** view of the **Packet Decode** window.
- *Decoded Packets (*.htm)*—The packets are decoded and saved to an HTML file that preserves the text formatting and page layout of the same packets in the **Decode** view of the **Packet Decode** window.
- *Libpcap (Wireshark, AirPcap, tcpdump, etc.) (*.pcap, *.pcap.gz, *.cap, *.dmp, *.appcap, *.appcapz)*—The packets are saved to a binary format compatible with many free/open source programs such as tcpdump and Wireshark.
- *PcapNG (Wireshark, etc.) (*.pcapng, *.pcapng.gz, *.ntar, *.ntar.gz)*—The packets are saved to a binary format compatible with many free/open source programs such as tcpdump and Wireshark.
- *NG Sniffer DOS file (*.enc)*—The packets are saved as a Sniffer® trace file in DOS format. This file format uses a **.enc* extension.
- *Raw Packet Data (*.txt)*—The packets are saved to a file as raw text. The file includes raw hexadecimal and ASCII data, 16 bytes per line, hex on the left, ASCII on the right.
- *TCP/UDP/RTP Data File (*.*)*—The part of the packet that is after the end of the TCP, UDP, or RTP header, up to and including the data at the offset specified by the Total Length field of the IP header is saved to a filename and file format that you must specify. This part of the packet typically contains the application data for file transfers. If multiple packets are selected, their contents are saved as one continuous file, in packet number order.

### Deleting all packets

You can only choose to delete all packets, and not a selected group of packets.

**Note** There is no direct command to delete packets from a Capture Engine capture window. If you restart a capture in the Capture Engine capture window, all existing packets are deleted first. Capture files already saved to disk are not affected. Capture files saved to disk can be managed through the *Files* tab of the **Capture Engines** window.

**To delete all packets, including any hidden packets:**

- On the **Edit** menu, click **Clear All Packets**.

**Tip** You can choose **Copy Selected Packets to New Window** from the context menu in the **Packets** view to isolate a selected group of packets. See *Copying selected packets to a new window* on page 114.

## Printing packet lists and packet decode windows

You have several options for printing packets from a capture window.

**To print the packets currently displayed in the Packets view:**

- On the **File** menu, click **Print...**.

**Note** For more on selecting, hiding, and unhiding packets, see Chapter 7, *Post-capture Analysis*.

**To print selected packets as decoded packets:**

- On the **File** menu, click **Print Selected Packets...**.

The packets are decoded and saved to an RTF file that preserves the text formatting and page layout of the same packets in the **Decode** view of the **Packet Decode** window.

**Tip** You can also save the packets as decoded packets in an RTF or HTML format, and then print them from another application that can read and print those file types. This alternative preserves the formatting of the **Packet Decode** window and allows multiple packets to be printed on individual pages.

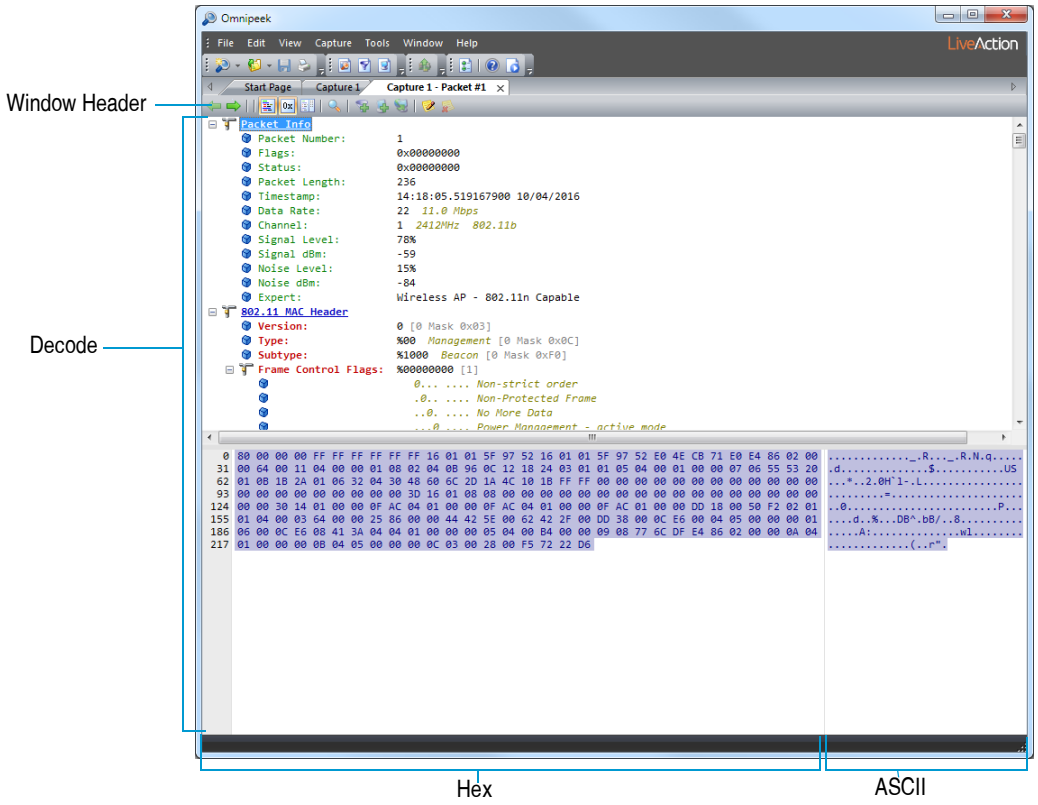
## Decoding packets

When troubleshooting your network or tracking down a security breach, analyzing the details of a packet can be very useful. You can view the details of a packet by opening the packet in a Packet Decode window.

The **Packet Decode** window makes packet headers readable and understandable.

**To open a packet in a Packet Decode window:**

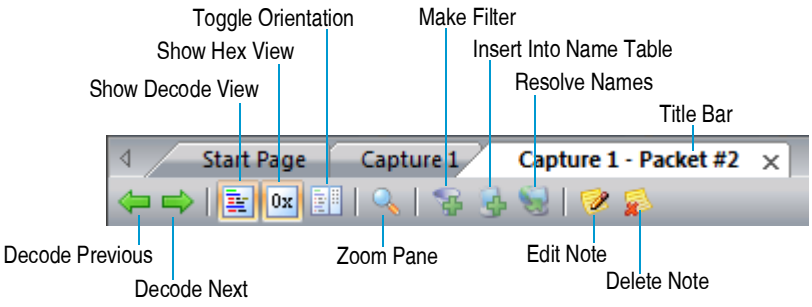
- Double-click a packet in the Packet List.




**Tip** You can open **Packet Decode** windows for up to 10 packets at once—simply select multiple packets in the active Packet List and press **Enter**.

## Window header

The window header has the following parts:




- *Decode Previous:* Displays the previous packet (you can also press **F7** to display the previous packet)
- *Decode Next:* Displays the next packet (you can also press **F8** to display the next packet)
- *Show Decode View:* Shows or hides the Decode view
- *Show Hex View:* Shows or hides the Hex view
- *Toggle Orientation:* Changes the orientation of both the Decode and Hex view, when both views are displayed.
- *Zoom Pane:* Displays only the currently active view (the view with the current active highlight). Click *Zoom Pane* again to toggle back to the previous view.

- *Make Filter:* Makes a filter based on the selected item in the Decode view. See *Creating filters with the Make Filter command* on page 101.
- *Insert Into Name Table:* Opens the **Edit Name** dialog. See *Adding entries to the name table* on page 278.
- *Resolve Names:* Substitutes name for logical address. See *Omnipeek name resolution* on page 280.
- *Title bar:* Displays the capture window name and the number of the packet.
- *Edit Note:* Inserts a note. See *Adding notes to packets* on page 90.
- *Delete Note:* Deletes an existing note for the packet. See *Adding notes to packets* on page 90.

## Decode view

The *Decode* view displays decoded packet data in byte order from top to bottom. Click the minus or plus signs to collapse or expand the view of any header section. In collapsed mode, you get a summary of the layer.

The *Packet Info* (in green) at the top is generated automatically by Omnipeek. The following table lists the parameters that may appear in *Packet Info*.

| Parameter | Description |
|---|---|
| Flags | Denotes the flag of a packet. Packets can be flagged, based on their match with a variety of conditions. Flags vary from one network medium to another. |
| Status | Indicates any one of several conditions, including that the packet was truncated or sliced. Shows a value of *0x00* when the packet does not have any of these other conditions. |
| Packet Length | The number of bytes that the card retrieved off the network for this packet, including all header information and FCS. |
| Slice Length | When *Slice Length* appears, it indicates the number of bytes of the packet which were captured. This is shown only if packet slicing was used on a packet, or if data was truncated because it was unavailable. |
| Timestamp | The time the packet was received. |
| Data Rate | The data rate at which the body of the 802.11 WLAN packet was transmitted. |
| Channel | The 802.11 WLAN channel number and radio frequency at which the packet was transmitted. |
| Signal Level | The signal strength of the transmission in which the 802.11 WLAN packet was received, expressed as the RSSI normalized to a percentage. |
| Signal dBm | The signal strength of the transmission in which the 802.11 WLAN packet was received, expressed in dBm (decibel-milliWatts). If the packet was captured on an adapter that does not report values for signal level in dBm, this item will not be shown. |
| Noise Level | The noise level reported in the receipt of this 802.11 WLAN packet, expressed as a percentage. If the packet was captured on an adapter that does not report values for noise, this will show as *0%*. |
| Noise dBm | The noise level reported in the receipt of this 802.11 WLAN packet, expressed in dBm (decibel milliWatts). If the packet was captured on an adapter that does not report values for noise in dBm, this item will not be shown. |

**Note** Omnipeek decodes hundreds of network, transport, application and device control protocols, displaying both the commands and their meaning. When the data portion of the packet is listed toward the end of the **Decode** view simply as *data*, Omnipeek has reached a layer of the packet that it cannot decode with the current or default decoder. For details about selecting an alternative decoder, see *Choosing a decoder* on page 88. If you are writing your own protocols and wish to write your own decoders, see *Writing your own decoders* on page 89.

## Adding decode columns to the Packets view

Many parameter names listed in the *Decode* view appear as column headings in the **Packets** view; however, there are many parameters that don't. From the *Decode* pane in the **Packets** view, or from the *Decode* view itself, you can right-click a parameter and have that parameter appear as a column heading in the **Packets** view. This allows you to have multiple decode columns appear in the **Packets** view at the same time for easy comparison of decode data.

**To add a decode parameter as a column in the Packets view:**

- In the *Decode* view, or in the **Decode** pane in the **Packets** view, right-click the desired decode parameter and click **Add As A Decode Column**.

**To remove a decode parameter as a column in the Packets view:**

1. In the **Packets** view, click the packets column heading. The *Columns* tab of the **Packet List Options** dialog appears.
2. Scroll down to decode heading you want to remove, and deselect the check box of the decode heading.
3. Click **OK**. The decode column heading is removed from the **Packets** view and also from the *Columns* tab of the **Packet List Options** dialog.

## Hex and ASCII views

The Hex view displays the actual packet contents as raw hexadecimal values and its ASCII (or EBCDIC) equivalent.

Color coding is used to link the **Decode** view with the **Hex** view for both Hex and its ASCII equivalent. The Hex and ASCII views are in turn linked to the color of the protocol shown in the Protocols column of the Packet List.

When you highlight a section of the **Decode** view, the corresponding portion of the hex data and the ASCII data in the **Hex** view is shown in gray. Conversely, if you highlight a section in the **Hex** view, the corresponding portion of the **Decode** view is also highlighted.

You can choose display options by right-clicking inside the Hex and ASCII views and selecting from the following options:

- *Copy:* Copies the selected data in the **Decode**, **Hex**, and **ASCII** views. If a data field is selected in the **Decode** view, the data field and value is copied. If a Hex value is selected in the **Hex** view, the data field and value is copied. If an ASCII value is selected in the **ACSCII** view, the ASCII value is copied.
- *ASCII:* Displays the text portion of the **Hex** view as ASCII
- *UTF-8:* Displays the text portion of the **Hex** view as UTF-8.
- *More Encodings:* Lets you choose from various encoding options for displaying text inside the *Contents* tab.
- *Decimal Offsets:* Displays the offsets to the left of the hexadecimal values as decimal values
- *Hexadecimal Offsets:* Displays the offsets to the left of the hexadecimal values as hexadecimal values
- *Show Offsets:* Hides or displays the Offset values
- *Show Hex:* Hides or displays the hexadecimal values
- *Show ASCII:* Hides or displays the ASCII values
- *Show Colors:* Hides or displays color
- *Bytes Per Row:* Controls the width of the **Hex** view

**Important!** Many protocols, especially the older Internet protocols such as HTTP, POP3, FTP, Telnet, and others transmit packet data in plain ASCII text. To prevent unauthorized access to this data, controlling access to Omnipeek should be a normal part of your security routine.

# Showing data offsets and mask information

Offsets are a measure of location within a packet, counted as the distance in bytes from the first byte of the packet. The offset of the first byte is "0," that of the second byte is "1," and so on.

The mask is a mathematical way of defining a particular bit or bits within a byte. The offset and mask information is especially useful when developing protocols, constructing filters, and in a variety of other detailed packet analysis tasks.

**To hide or display offsets in the Decode view:**

- Right-click inside the Decode view and select **Show Offsets**.

**Tip** You can quickly create a filter that matches the value found at a particular point in a packet, directly from the **Decode** view. Highlight the item you wish to match and click **Make Filter**, or right-click and choose **Make Filter...**.

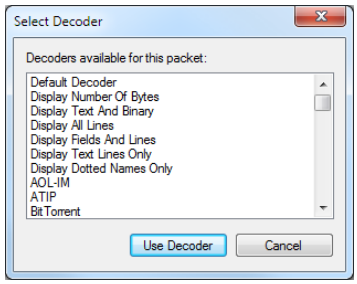
# Choosing a decoder

Decoders provide the instructions required to display packet contents, based on the type of protocols used. For certain packets, you can choose a decoder directly from the Decode view. Choosing a decoder is particularly useful in environments where new protocols are under development, or where TCP or UDP applications are using non-standard ports.

When the **Choose Decoder** option is available for a certain packet, the **Choose Decoder** option is available when you right-click inside the Decode view.

**To choose a decoder for the packet:**

1. Right-click inside the Decode view and select **Choose Decoder**. The **Select Decoder** dialog appears with a list of decoders available for the packet.




2. Select the desired decoder and click **Use Decoder**.

   The decoder you choose will be used for the current packet and all subsequent packets of the same type.

**Important!** To restore the default, select *Default Decoder* from the **Select Decoder** window.

**Note** LiveAction provides decoders for hundreds of protocols and subprotocols (see *https://www.liveaction.com/support/technical-support/*). The modules that decode packets are installed in the *Decodes* folder where the program is installed.

## Line decoders

The **Select Decoder** window shows a context-sensitive list of decoders which can be applied to the current packet. If the packet contains TCP or UDP, this list will include generic line decoders such as *Display Number Of Bytes*. The following table lists the available line decoders and their behavior.

| Decoder | Shows |
|---|---|
| Default Decoder | When you select this decoder, the program returns to its default behavior when decoding packets of the current type. Use this selection to stop using any decoder previously selected in the **Select Decoder** window and restore the program's ability to choose its own decoder. |
| Display Number Of Bytes | This line decoder displays only the number of bytes in the UDP or TCP payload of the packet. |
| Display Text And Binary | This line decoder displays 0x00 through 0x1F as their code equivalents (0x00, for example, is *<NULL>*), displays (non-extended) ASCII characters as ASCII text, and displays any other values as a dot (.).<br><br>In contrast, the ASCII part of the **Hex** view displays the extended ASCII character set (which includes accented characters, for example) and displays all non-ASCII values as dots. |
| Display All Lines | This line decoder displays only (non-extended) ASCII characters, plus line feed / carriage return (0x0D and 0x0A). When it encounters the first value outside this set, the decoder stops and displays the number of bytes remaining in the payload portion of the UDP or TCP packet. |
| Display Fields And Lines | This line decoder searches for lines containing semi-colons (;). Each line with a semi-colon is split in two, with the part before the semi-colon treated as the label and the part to the right of the semi-colon treated as the data. Lines containing text without semi-colons are treated as for the *Display All Lines* decoder above. That is, non-extended ASCII text is displayed until the first non-ASCII character is reached. The decoder then displays the number of bytes remaining in the payload of the TCP or UDP packet.<br><br>This decoder is particularly useful for scanning through the Label;Value pairs found in HTTP and FTP packets, particularly when the transactions are taking place on ports other than the default port 80 (HTTP) or port 21 (FTP). |
| Display Text Lines Only | This line decoder displays all the non-extended ASCII characters, plus line feeds and carriage returns (LF/CR), ignoring all other characters. If no LF/CR is encountered, lines are automatically wrapped at 120 characters. |
| Display Dotted Names Only | This line decoder searches for lines of non-extended ASCII text containing the period character(.). It displays each such line. All other lines are ignored. This decoder is useful when scanning for file names and IP names and addresses that use dotted notation. |

## Writing your own decoders

If you find proprietary protocols on your network for which LiveAction does not supply decoders, or if you are developing your own protocols, you may want to write your own decoders. See *https://www.liveaction.com/support/frequently-asked-questions/* for information on writing decoders.

# Applying decryption from the packet decode window

You can decrypt WPA or WEP-encrypted packets directly from the Packet Decode window.

**To decrypt a WPA or WEP-encrypted packet:**

1. Right-click inside the Packet Decode window and select **Apply Decryption**. The **Decrypt WLAN Packets** dialog appears.
2. Follow the steps in *Applying decryption in the Packets view* on page 80.

# Decode reassembled PDU

The PDU is the Protocol Data Unit: the payload of a network application packet. When a web page, for example, is sent over the Internet, the page is broken into convenient sized pieces and transmitted in a

series of packets. You can attempt to locate all of the other pieces of this page, decode them, and present the results in a single temporary **Packet Decode** window.

**Note** Decode reassembled PDU is not supported from a Capture Engine.

**To decode and reassemble a PDU:**

- Right-click a packet containing one of the fragments of the web page and choose **Decode Reassembled PDU**

  An attempt is made to locate all of the other pieces of the page and decode them; the results are presented in a single temporary **Packet Decode** window. The title bar of the window shows a packet number, followed by **(Reassembled PDU)**. The packet number is the packet identified as the one containing the first part of the PDU.

**Tip** You can choose to save or print the decode of the individual **Packet Decode** window containing the reassembled PDU (choose **Save Packet...**, or **Print** from the **File** menu).

**Note** The **Packet Decode** window containing the decoded reassembled PDU is temporary. If you close the window without saving, the information is discarded. In any case, creating a reassembled PDU does not change the contents of any of the packets in the capture window.

# Adding notes to packets

You can add descriptive notes to individual packets. When adding a note to a packet, a note icon is displayed next to the packet number, and hovering over the icon displays the contents of the notes as a tooltip. If the note contains hyperlinks, you can click them in the tooltip to open the link in your default browser. The note is also shown in the *Packet Info* section of the packet decode.

The notes are saved in a file separate from the packet file whenever the capture window is saved to any of the native Omnipeek capture file formats (saved in the same directory, with the extension *.ann*), with the exception of the *.pcapng* format. If a capture window is saved to the *.pcapng* format, the notes are embedded within the *.pcapng* file. See *Save file formats* on page 83 for a list of supported capture file formats.

You can view all of the capture window notes from within the **Notes** view. See *Viewing packet notes* on page 91.

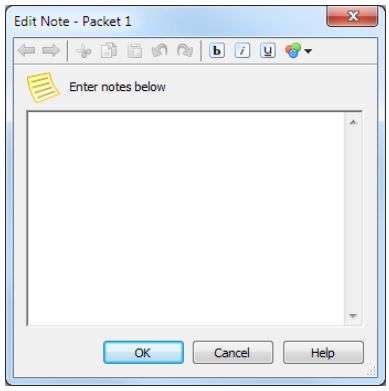
**Note** Adding notes to packets is not supported in the **Packets** view of a Capture Engine capture window.

**To add a note to the packet:**

1. Right-click the packet from the **Packets** view or **Packet Decode** window.

   **Note** You can also add notes to packets from the **Packets** or **Payload** tabs in the Flow Visualizer. See *Flow Visualizer* on page 154.

2. Click **Edit Note**. The **Edit Note** dialog appears. (You can also click the **Note** icon in the toolbar of the Packet view or Packet Decode window.)




3. Type the text for the note and click **OK**. Use any of the formatting tools in the dialog to format the text.

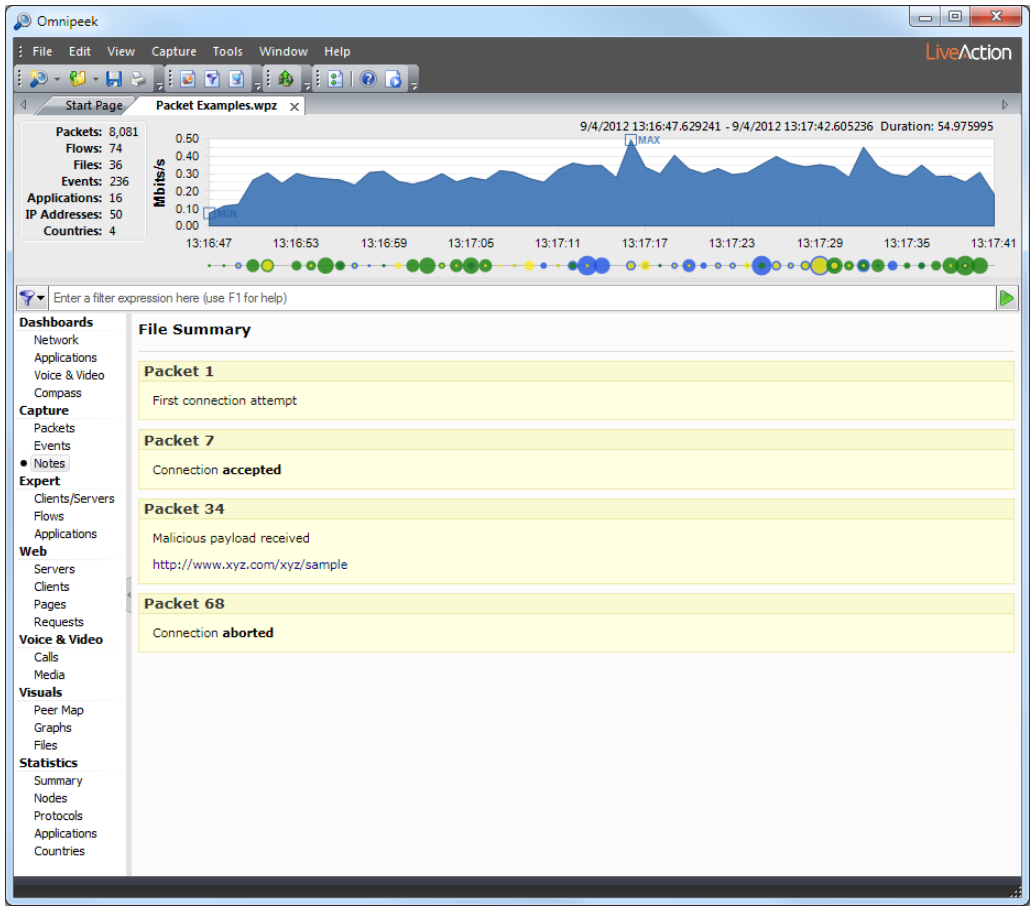
**Tip** You can also add a note to the capture window or file properties by entering text in the **Properties** dialog. To open the **Properties** dialog, on the **File** menu, click **Properties**.

# Viewing packet notes

The **Notes** view displays all of notes annotated to packets in the capture window or capture file. You can edit or delete notes from the **Notes** view, or you can go to the packet in the **Packets** view to which the note is attached.

Additionally, you can import events from supported file formats into the **Notes** view. Typically, these events are from a supported IDS/IPS, such as Snort® or Suricata. To import an events file from Snort or Suricata, you must first save the events from Snort as a Snort Fast log file, and save the events from Suricata as an EVE JSON file. The events in the events file must correspond to packets contained within the capture file.

**Note** The **Notes** view is not supported in a Capture Engine capture window.




The parts of the **Notes** view are described here:

- *File Summary:* Displays any notes associated with capture window or file. Hover over the *File Summary* to access *File Properties*, where you can add additional notes for the capture window or file, and import events from supported file formats.
- *Packet Notes:* Display all notes associated with the packets of a capture window or file. Hover over the packet note to access controls for editing, deleting, or 'jumping' to the packet in the **Packets** view. If the note contains hyperlinks, you can click them and open the link in your default browser.

CHAPTER 6

# Creating and Using Filters

## In this chapter:

# About filters

Filters are used to isolate particular types of traffic on the network for troubleshooting, analysis, and diagnostics. If you want to check a problem between two particular devices, perhaps a computer and a printer, address filters can capture just the traffic between these two devices. If you are having a problem with a particular function on your network, a protocol filter can help you locate traffic related to that particular function.

Filters work by testing packets against the criteria specified in the filter. If the contents or attributes of a packet match the criteria specified in a filter, the packet is said to "match" the filter. You can build filters to test for just about anything found in a packet: addresses, protocols, sub-protocols, ports, error conditions, and more.

**Note** Filters created from a connected Capture Engine are available to that Capture Engine only. If you are not connected to a Capture Engine and you create a filter, that filter is available for local captures only.

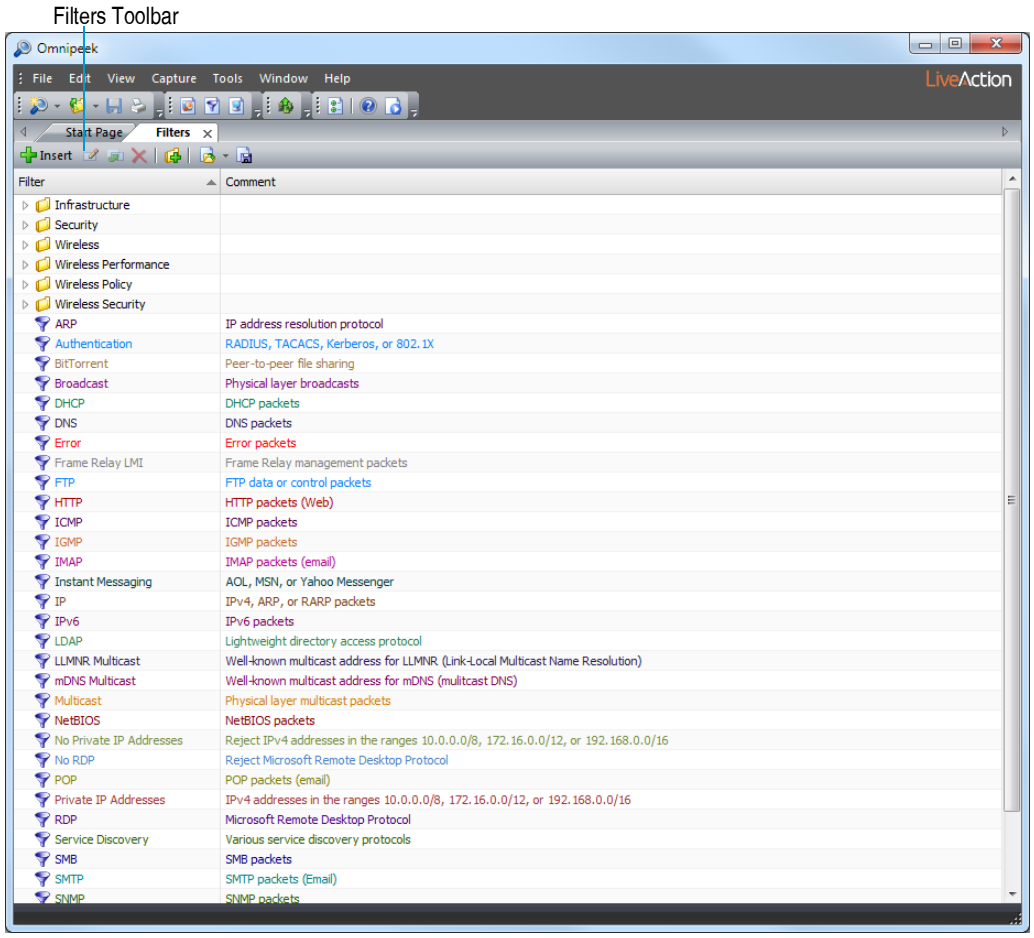
# Viewing filters

The **Filters** window in Omnipeek displays all of the filters available in the program. These include predefined filters as well as any that you have modified or created. The *Filters* tab of a connected Capture Engine displays all of the filters available for that particular Capture Engine.

## Omnipeek filters window

**To open the Omnipeek Filters window, do one of the following:**

- Click **Filters** in the main program window toolbar
- On the **View** menu, click **Filters**




The clickable buttons in the filters toolbar are described below:

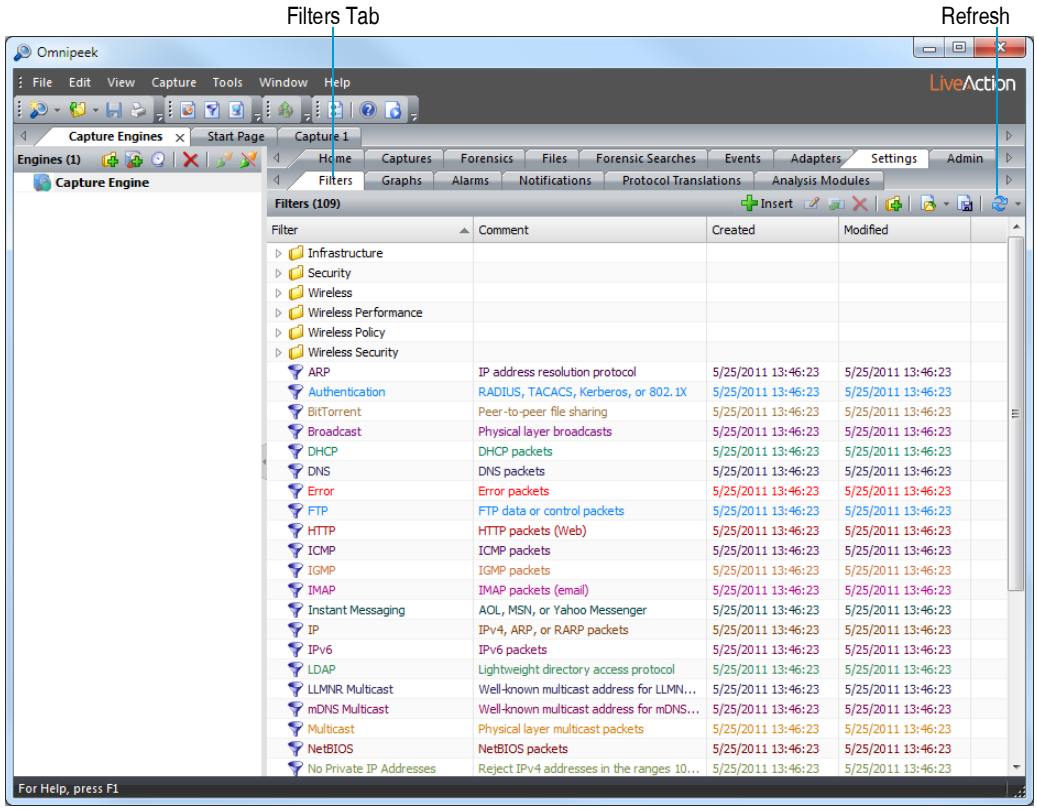
- *Insert:* Click to create a new simple or advanced filter.
- *Edit:* Click to make to changes to the selected filter.
- *Duplicate:* Click to make a copy of the selected filter. This is useful when you want to use an existing filter as a starting point for more modifications.
- *Delete:* Click to delete the selected filter.
- *Add Group:* Click to open the **Add Group** dialog in which you can create a new group folder. You can drag filters into and out of group folders. Grouping filters with similar functions can help organize a large filter set.
- *Import:* Click to import filters from a filter file with an *.flt extension. The Import function can be useful as a backup tool or to help transfer filters from one machine to another.
- *Export:* Click to save all filters, or a set of selected filters to a filter file with an *.flt extension. The Export function can be useful as a backup tool or to help transfer filters from one machine to another.

## Capture Engine filters tab

The *Filters* tab in the **Capture Engines** window displays the filters available for a particular Capture Engine.

**To view filters available for a Capture Engine:**

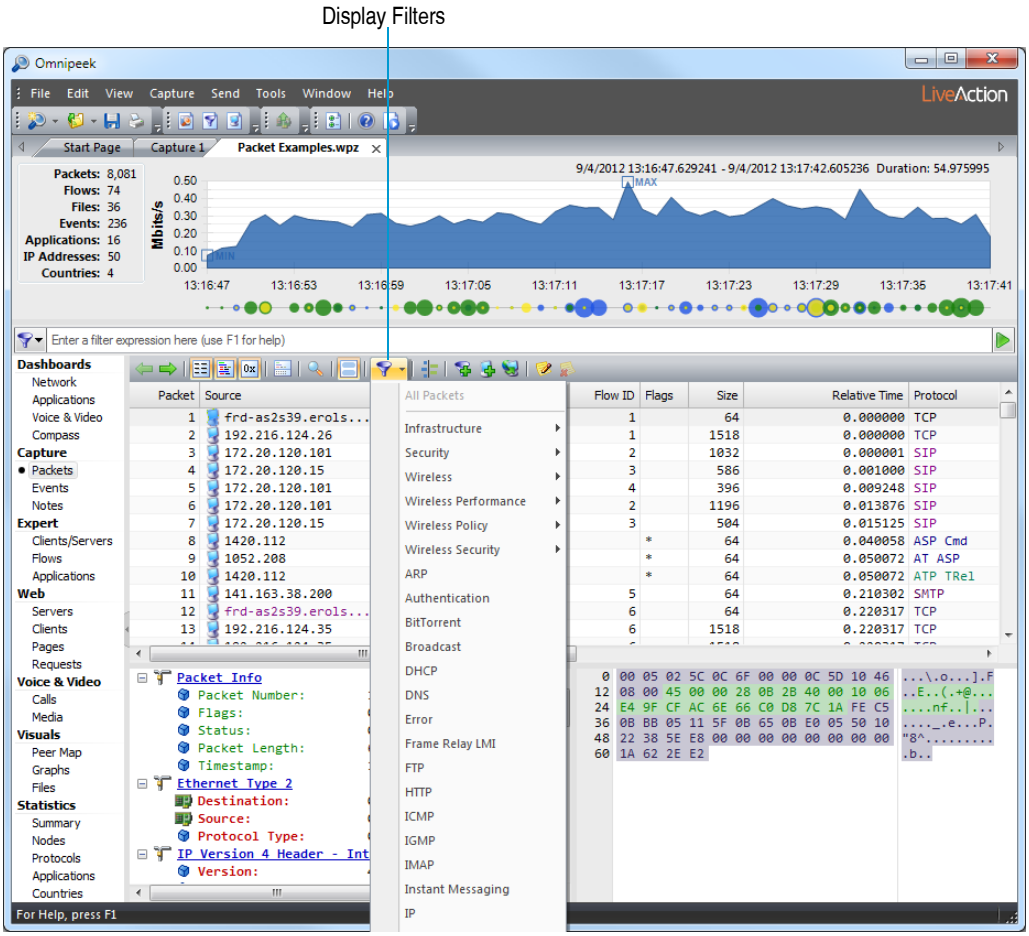
- Select the *Settings* tab, and then the *Filters* tab of a connected Capture Engine. (See *Connecting to a Capture Engine* on page 11.)




In addition to the same buttons available from the Omnipeek **Filters** window, the Capture Engine *Filters* tab also allows you to refresh the list of filters.

# Display filters

The capture filters described in this chapter restrict the flow of packets into the buffer of a capture window. Display Filters, by contrast, are used simply to isolate and view a particular subset of the captured packets in a capture window or in a saved capture file for post-capture analysis.




**To view a subset of captured packets:**

4. Click **Stop Capture** in the **Packets** view of a capture window.
5. Click **Display Filter** in the toolbar. A drop-down list appears.
6. Select the filter you wish to use.

   The capture window now displays only packets passing (matching) this filter.

> **Tip** Hold down the **Shift** key to show only those packets which do NOT match the selected filter for the entire buffer. Hold down the **Ctrl** key to show only those packets which match the selected filter for the entire buffer. Hold down both **Shift** and **Ctrl** together to hide any currently visible packets which do not match the selected filter.

Display filters are available from active capture windows only after the capture is stopped. They are always available from saved capture files. For more information, see *Opening saved capture files* on page 47.

# Enabling a filter

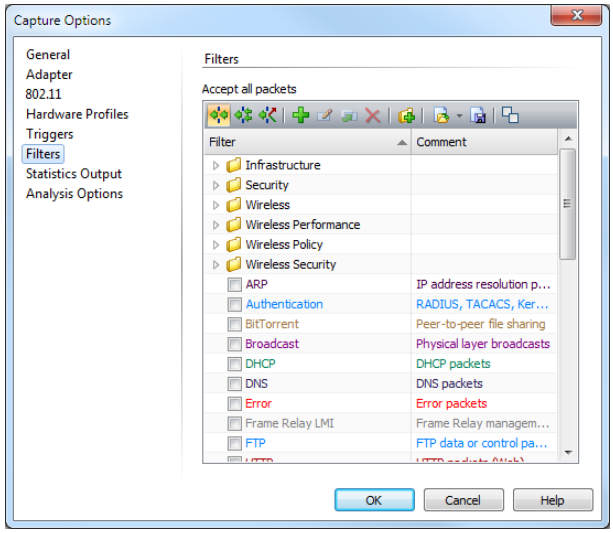
In addition to the filters that you can create, numerous pre-defined filters are included with the application. You can enable one or more of these filters in the following ways:

- From the *Filters* options of the **Capture Options** dialog, allowing you to control which packets are added to the capture buffer of a new capture window
- From the **Filters** view of a capture window, allowing you to control which packets are added to the capture buffer of an existing capture window starting when the filter(s) is selected

# Enabling filters from the Capture Options dialog

### To enable filters from the Omnipeek Capture Options dialog:

1. Do one of the following to open the **Capture Options** dialog:
   - On the Start Page, click **New Capture**
   - On the **File** menu, click **New Capture...**
   - On the **Capture** menu, click **Capture Options** from an open capture window
2. Click the **Filters** options.

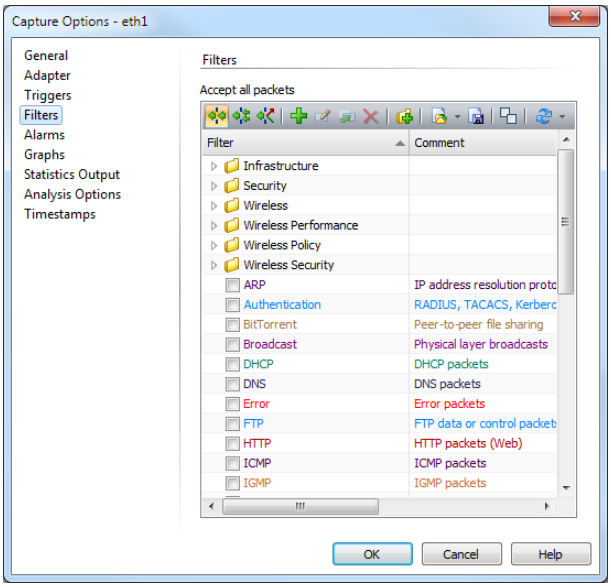



3. Select the filters that you want to enable.
4. Click **OK**.
5. Click **Start Capture** to begin capturing packets. Any packets that match the filters that are enabled are placed into the capture buffer.

> **Note** Alternately, you can choose to place the packets that do not match the filter in the capture buffer by clicking **Reject Matching**.

### To enable filters from the Capture Engine Capture Options dialog:

1. Do one of the following to open the **Capture Options** dialog:
   - Click **Insert** in the **Captures** view of the **Capture Engines** window
   - Select an existing capture in the **Captures** view of the **Capture Engines** window and click **Capture Options**.
2. Click the **Filters** options.



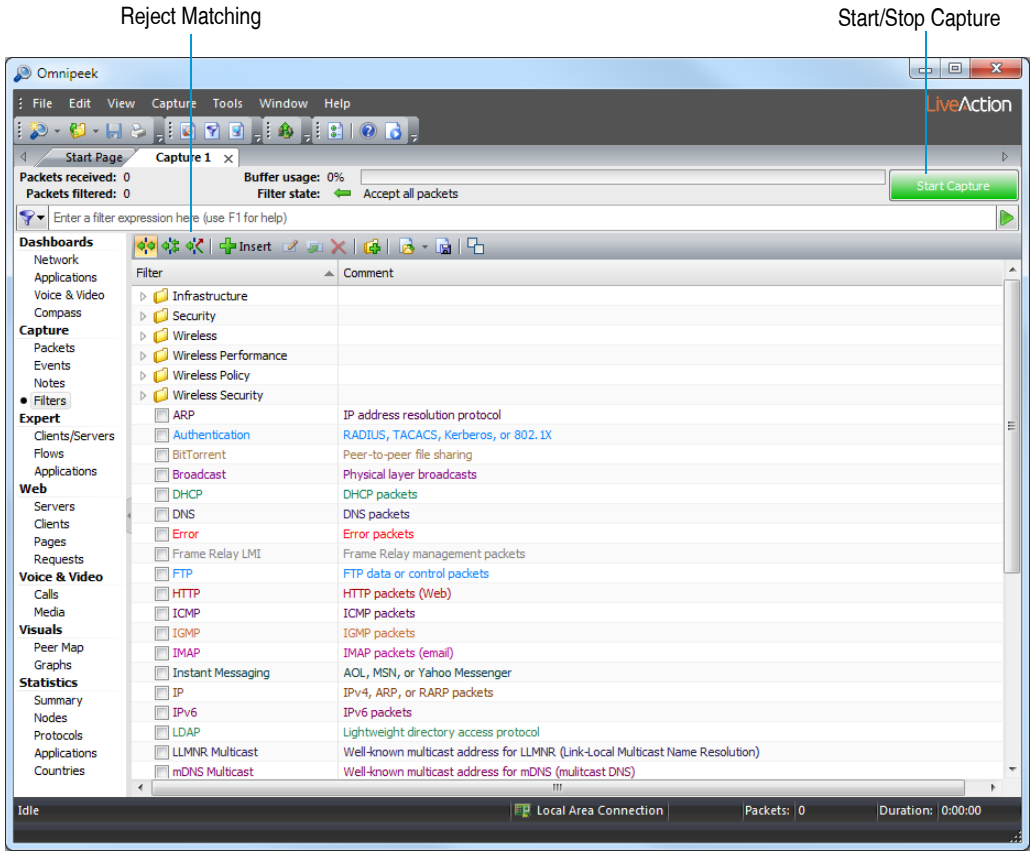

3. Select the filters that you want to enable.
4. Click **OK**. A capture window appears.
5. Click **Start Capture** to begin capturing packets. Any packets that match the filters that are enabled are placed into the capture buffer.

> **Note** Alternately, you can choose to place the packets that do not match the filter in the capture buffer by clicking **Reject Matching**.

## Enabling filters from the capture window

### To enable filters from an Omnipeek capture window:

1. Click the **Filters** view of a capture window.

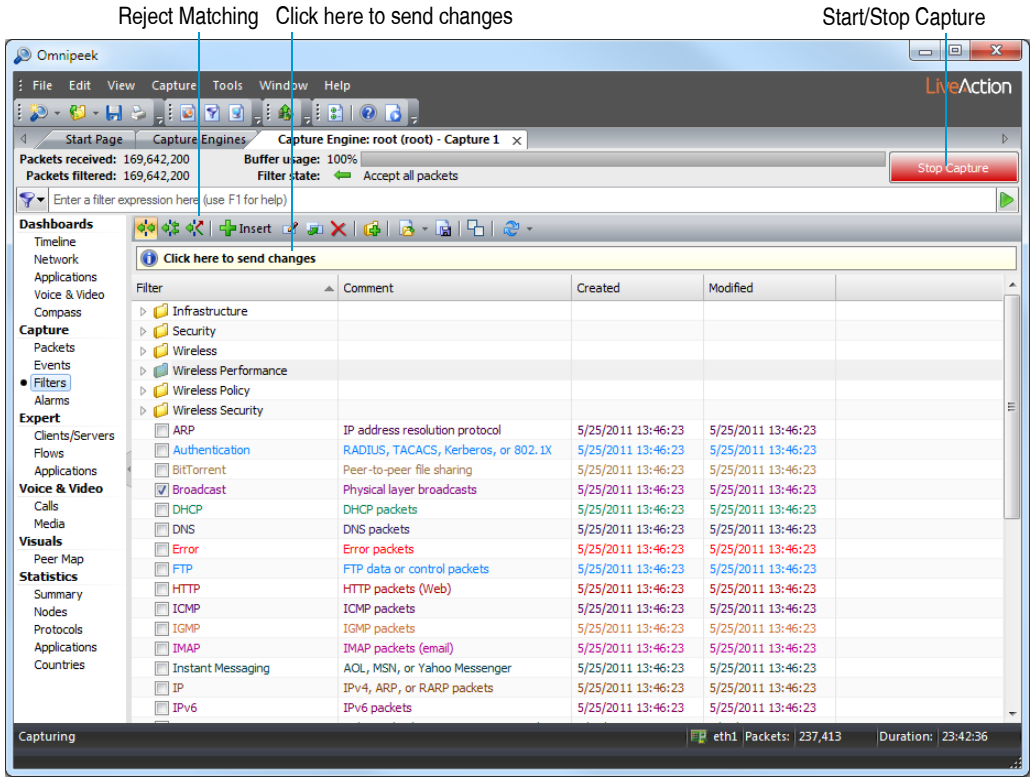



2. Select the filters that you want to enable.
3. Click **Start Capture** to begin capturing packets. Any packets that match the filters that are enabled are placed into the capture buffer.

> **Note** Alternately, you can choose to place the packets that do not match the filter in the capture buffer by clicking **Reject Matching**.

### To enable filters from a Capture Engine capture window:

1. Click the **Filters** view of a capture window.




2. Select the filters that you want to enable.
3. Click **Start Capture** to begin capturing packets. Any packets that match the filters that are enabled are placed into the capture buffer.
4. Send your selections to the Capture Engine by clicking the bar below the toolbar labeled *Click here to send changes*.

# Creating filters with the Make Filter command

You can use the Make Filter command to easily create a filter based on the address, protocol, and port settings of an existing packet, node, protocol, conversation, or packet decode.

**To create a filter with the Make Filter command:**

1. Right-click a packet, node, protocol, conversation, or packet decode item from one of the views available in a capture window and choose **Make Filter**.

   The **Insert Filter** dialog appears with the Address, Protocol, and Port settings already configured with information obtained from the selected packet.

2. Enter a new name in the *Filter* text box and make any additional desired changes.

   **Note** Click **Help** on the dialog to learn about the available options and settings.

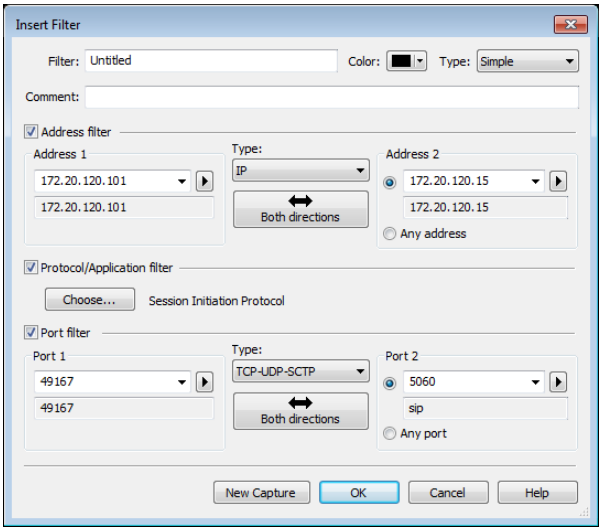
3. Click **OK**. The new filter is now available whenever a list of available filters is displayed.
4. To enable the new filter in your capture window, click the **Filters** view and select the check box of the new filter. The filter is applied immediately, even if a capture is already under way.

# Creating a simple filter

You can create a simple filter by manually entering the parameters for the filter that you want to create. Unlike creating a filter using the Make Filter command, you will have to manually define one or more of the parameters (address, protocol, and port settings) for the filter you want to create.

**To create a simple filter by defining any combination of address, protocol, and port:**

1. Do one of the following to display the list of filters:
   - On the **View** menu, click **Filters**
   - Click the **Filters** view in an open capture window
   - Click the *Filters* options from the Capture Engine **Capture Options** dialog
2. Click **Insert**. The **Insert / Edit Filter** dialog appears.




3. Complete the dialog and click **OK**. The new filter is now available whenever a list of available filters is displayed.

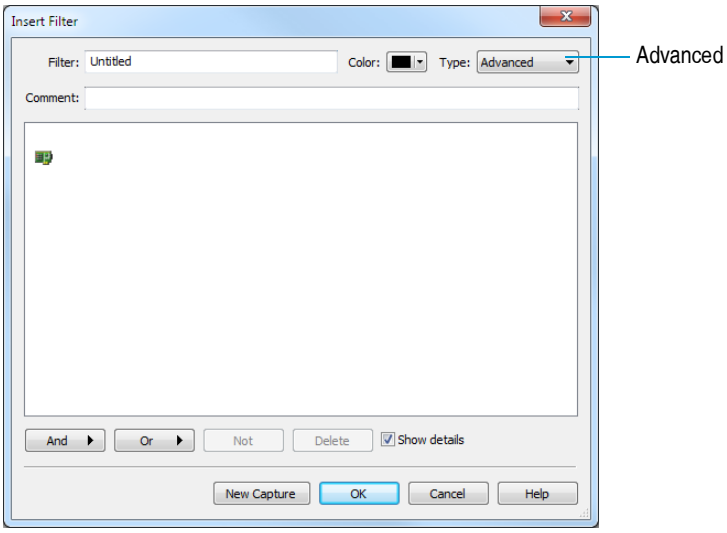
> **Note** Click **Help** on the dialog to learn about the available options and settings.

# Creating an advanced filter

You can create an advanced filter that allows you to create very precise conditions in a single filter. To create an advanced filter, you must define one or more parameters (or filter nodes) joined with logical AND, logical OR, or logical NOT statements.

**To create an advanced filter:**

1. Do one of the following to display the list of filters:
   - On the **View** menu, click **Filters**
   - Click the **Filters** view in an open capture window
   - Click the *Filters* options in the Capture Engine **Capture Options** dialog
2. Click **Insert**. The **Insert Filter** dialog appears.
3. Select *Advanced* in the Type list. The Advanced view of the **Insert Filter** dialog appears. The dialog displays a green icon representing a network adapter.




4. Define one or more filter nodes by **And>** or **Or>** and selecting and defining one of the available filter parameters. See also *Filter types* on page 105 for a description of the available filter types.

   Each time you create a filter node, a dialog appears that lets you define the filter node. Each filter node added to the filter is displayed showing the relationship between the network adapter and the capture buffer (represented by a computer icon). See also *Logical AND, OR, and NOT operators in advanced filters* on page 103.

   **Note** Click **Help** on the dialog to learn more about the available options and settings.

5. Complete the rest of the **Insert Filter** dialog and click **OK**. The new filter is now available whenever a list of available filters is displayed.

## Logical AND, OR, and NOT operators in advanced filters

The **Advanced** view of the **Edit Filter** or **Insert Filter** dialog shows the parameters defined for the Advanced filter:

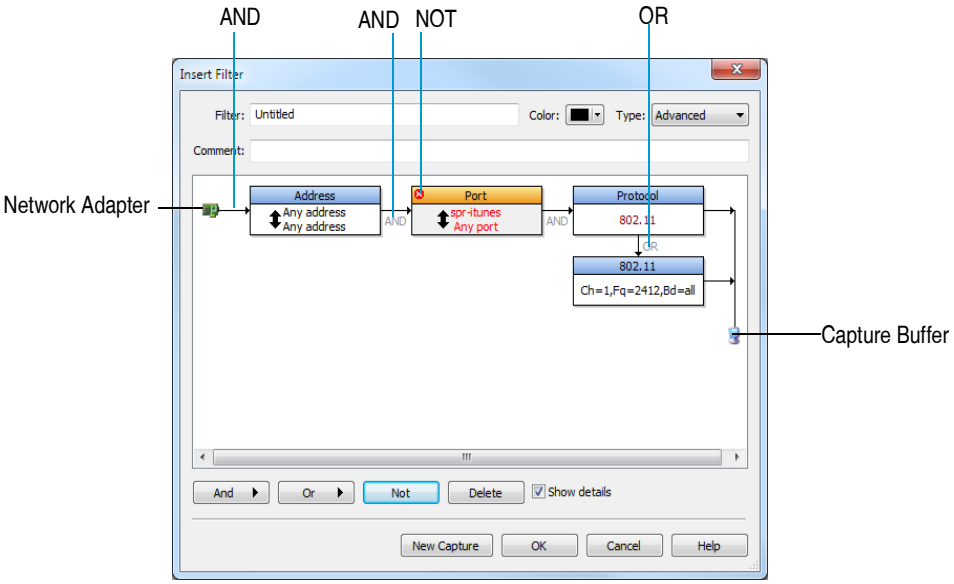
- A rectangular box represents each parameter (or filter node) that is added to the filter. If the *Show details* check box is selected, the details of the filter node are also displayed inside the box.
- Arrows indicate the flow of data through each filter node. A single arrow between filter nodes indicates an AND condition; any packets that match the filter node are allowed to pass through to the next stage. Multiple arrows between filter nodes indicate an OR condition (filter nodes stacked on top of each also indicates an OR condition); packets that match any of the filter nodes defined by the OR condition are allowed to pass through to the next stage.
- A red circle with an "X" inside a filter node indicates a NOT condition. All packets that do not match the filter node are allowed to pass through to the next stage.
- Right-click a filter node for the following options:
  - *And*: Adds a new AND filter node to the currently selected node. Click the sub-menu arrow to the select the type of filter node.
  - *Or*: Adds a new OR filter node to the currently selected node. Click the sub-menu arrow to the select the type of filter node.
  - *Not*: Toggles the NOT condition of the currently selected node. A red circle with an "X" inside the filter node indicates a NOT condition. All packets that do not match the filter node are allowed to pass through to the next stage.
  - *Comment*: Displays a dialog that allows you to add/edit a comment for the currently selected

- *Swap And/Or*: Toggles the currently selected node between an AND or OR filter node.
- *Cut*: Copies the currently selected node to the clipboard, and deletes the node.
- *Copy*: Copies the currently selected node to the clipboard.
- *Copy Tree*: Copies the currently selected node, and that node's AND and OR nodes to the clipboard.
- *Paste And*: Pastes the nodes currently in the clipboard as an AND node to the currently selected node.
- *Past Or*: Pastes the nodes currently in the clipboard as an OR node to the currently selected node.
- *Delete*: Deletes the selected node.

- Right-click inside a blank area of the dialog for the following options:
  - *Show Details*: Toggles displaying filter node details.
  - *Show Comment in Title*: Toggles displaying comments added to filter nodes.
  - *Zoom In*: Zooms in on the display.
  - *Zoom Out*: Zooms out on the display.
  - *Zoom Reset*: Resets the display.

**Tip** You can also zoom in and out of the display by pressing the CTRL key while using your mouse's scroll wheel.

An example of an Advanced filter is shown below:




The dialog displays a green icon representing a network adapter. Each parameter (or filter node) added to the filter is displayed showing the relationship between the network adapter and the capture buffer (represented by a computer icon).

# Creating a new capture window based on a filter

You can create a new capture window that uses the filter that you are defining in the **Insert / Edit Filter** dialog as the only enabled filter. This allows you to quickly capture packets based solely on the new filter that you are creating.

**To create a new capture window based on a filter:**

1. Do one of the following to display the list of filters:

- On the **View** menu, click **Filters**
- Click the **Filters** view in an open capture window
- Click the *Filters* options from the Capture Engine **Capture Options** dialog

2. Click **Insert**. The **Insert / Edit Filter** dialog appears.
3. Create a simple or advanced filter. See *Creating a simple filter* on page 101 or *Creating an advanced filter* on page 102.
4. Click **New Capture**. The **Capture Options** dialog appears.

> **Note** In the *Filters* options of the **Capture Options** dialog, the filter you created in the **Insert / Edit Filter** dialog, is the only filter selected.

5. Complete the **Capture Options** dialog as you normally would.
6. Click **OK**.

# Filter types

The following table contains the filter types available for creating simple and advanced filters. Not all filter types are available for creating simple filters.

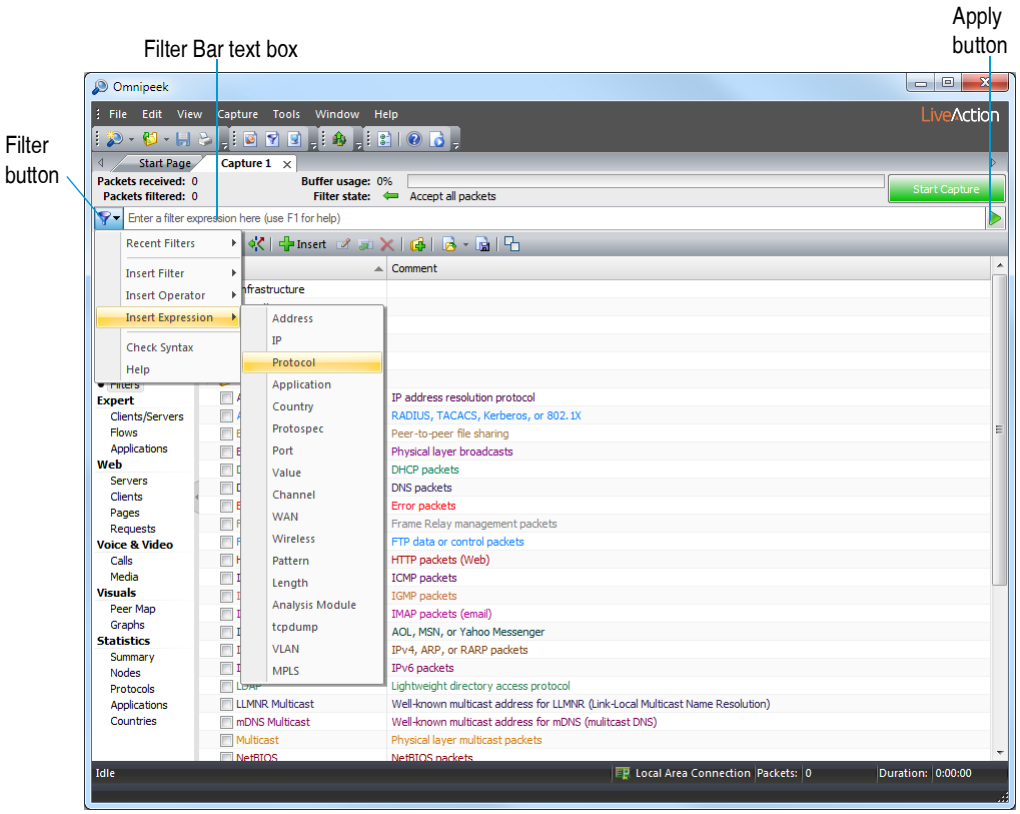
| Filter Type | Description |
|---|---|
| 802.11 | Filters by channel, data rate, encryption state and more, based on information provided in the headers of 802.11 WLAN packets. |
| Address | Filters by identity of the network node, either receiving or sending, for that packet. This can be a physical address, or a logical address under a particular protocol.<br><br>You can use the asterisk * character as a wildcard when specifying addresses. The program will replace the asterisk with its most inclusive equivalent.<br><br>Address filters support CIDR for the IP address space. You can use the /x designation to define a smaller range of addresses (Sub-net) on which to filter. |
| Analysis Module | Packets handled by the specified Analysis Module will match the filter. |
| Application | Filters by application. |
| Channel | Filters by adapter for LiveCapture port. |
| Country | Filters by country. |
| Direction | For WAN connections, allows you to match traffic bound in the to DTE direction (coming in from the WAN) or in the to DCE direction (going out onto the WAN). |
| Error | Filters by one or more of four error conditions: CRC errors, Frame Alignment errors, Runt packets, and Oversize packets. |
| Length | Filters by the length of the packet and matches those within the range you set, specified in bytes. |
| Pattern | Filters by the presence of a particular character string (ASCII. hexadecimal, EBCDIC format, or regular expression) in each packet. Can be constrained to search within a specified location for greater efficiency. |
| Port | Filters by port (or socket) within a particular protocol. IP, FTP, and HTTP provide services at different ports or sockets on the server. The default port for Web traffic under TCP, for example, is port 80. Omnipeek assumes that sub-protocols are using the standard default ports (well known ports in TCP and UDP, for example), but you can also set filters to test explicitly for traffic to and/or from particular ports, or from a range of ports (e.g., 80-100). When creating filters with multiple ports, you may use any combination of port numbers and names and a space, comma, or semi-colon as port delimiters (e.g., 'http; ftp, 23 67' could be used in a filter). |
| Protocol | Filters by protocol and sub-protocols. For example, FTP is a sub-protocol of TCP, which is itself a sub-protocol of IP. |

| Filter Type | Description |
|---|---|
| tcpdump | Filters against a pcap-filter expression. A pcap-filter expression is made up using the guide found at *http://www.man-pagez.com/man/7/pcap-filter/*. |
| Value | Filters by numerical value of a particular part of each packet (at a particular offset with a particular mask) for its relation (greater than, less than, equal to, and so forth) to the value you specify. |
| VLAN-MPLS | Filters by VLAN IDs and MPLS labels. |

# Creating filters using the filter bar

The Filter Bar allows you to create a variety of advanced filters quickly and directly in capture window views and in the Capture Engine **Forensic Search** dialog (see *Navigating a capture window* on page 26 and Chapter 7, *Post-capture Analysis*).

The parts of the Filter Bar are described below.




- *Filter button:* Click to display Filter Bar menu options.
  - *Recent Filters:* Select a recently defined filter from this list.
  - *Insert Filter:* Select a filter from this list.
  - *Insert Operator:* Select an operator from this list: *& (And), | (Or), ! (Not), () (Group)*
  - *Insert Expression:* Select a filter type expression from this list.
  - *Check Syntax:* Select this option for a tooltip describing the syntax of your filter. For example, a correctly defined filter will display *Filter OK* in the tooltip.
  - *Help:* Select this option to display information about how to use the filter bar.
- *Filter Bar text box:* The filters, operators, and expressions chosen from the Filter button menu appear in this text box as you select them. The filter bar text box background changes color as you type into it to indicate whether a valid filter is entered:

  - Valid filter=green
  - Invalid filter=red
  - Empty=white
- *Apply Filter button:* Click to apply your filter to the packets in the capture buffer of this capture window.

## Using the filter bar

**To create a filter with the filter bar:**

1. Type the filter expression into the text box.

   To automatically populate the text box, click **Filter** at the far left of the Filter Bar and make your choices from the menu items described above: *Recent Filters*, *Insert Filter*, *Insert Operator*, *Insert Expression*.
2. Click **Apply** at the far right of the Filter Bar to enable the filter in the capture window. The **Selection Results** dialog appears.
3. Click **Hide selected packets**, **Hide unselected packets**, **Copy selected packets to new window**, or **Close**.

   For more information, see *Hiding and unhiding packets* on page 114 and *Selecting related packets* on page 115.

## Filter bar syntax

This section defines and describes the operators, filter types, and argument names used in creating Omnipeek and Capture Engine filter bar filters.

- *syntax:* exp [op exp]*

  *Examples:* SMB, smb | netbios, pspec(http) & (!pspec('802.3'))

  where:

  - **op** is an operator, one of: **&** (and) **|** (or)
  - **exp** is an expression: (!**exp**), (**exp**), or **keyword[(arglist)]**
  - **keyword** is either a **filter type** or **named filter** from the filter list
  - **arglist** is a list of arguments: **arg [, arg]***
  - **arg** is an argument: **[arg-name ':'] arg-value**. The first part is optional for some filters where a default **arg-name** is assumed.
  - **arg-name** is dependent on the **filter type** (see *Filter expression table*)
  - **arg-value** is a **value** or **value list** (comma separated) for the arg-name, **value** or **'value'** (see *Filter expression table*). If **value** has reserved characters (single-quote space comma) it must be quoted.

-

## *Filter expression table*

**Note** For **filter expressions** and **arg-names**: [] indicate optional arguments.

| Filter Expression | Description | Arguments | Argument Description | Examples |
|---|---|---|---|---|
| addr | Filter by address | type: address type<br>addr1: address<br>[addr2: address]<br>[dir: direction])<br>*or*<br>address type: address | address type = ip, ipv6, ethernet,<br>wireless<br>direction = 1to2, 2to1, or both (default) | addr(ip:'10.4.3.*')<br>addr(ethernet:'3com:*.*.*')<br>addr(type: ip, addr1: 10.4.3.1, addr2: 10.5.1.1, dir: 1to2) |
| app | Filter by application (by name) | application name (no named arguments) | application name is case insensitive (e.g., 'ebay', and 'EBAY' will all work correctly) | app('eBay')<br>app('instagram') |
| channel | Filter by channel number (wired only) | num: number (default) | | channel(2) |
| country | Filter by country | 1 or 2 country codes or names<br>[dir: direction] | country code as specified by ISO 3166-1 alpha-2 or country name from "countrynames.txt"<br><br>direction = 1to2, 2to1, or both (default) | country('US')<br>country('United States', 'China')<br>country('US', 'RU', dir: 1to2) |
| filter | Filter using existing filter | filter name (no named arguments) | filter keyword is optional | filter('SMB')<br>SMB |
| ip | Filter by IP Address | ip address specifier list (no named arguments) | | ip(10.4.3.6)<br>ip('10.4.3.*')<br>ip('10.4.3.*', '192.168.*.*')<br>ip('www.liveaction.com') |
| length | Filter on a size of the packet | (only one is required)<br>min: min length<br>max: max length | Either min or max is required, or a single numeric value for exact length matches | length(64)<br>length(min: 128)<br>length(max: 256)<br>length(min:128,max:256) |
| mpls | Filter by MPLS Label | mpls(label1, [label2, ...labelx]) | label is a number (0-1048575) or label-range | mpls(10)<br>mpls(10, 20-50) |
| pattern | Filter by pattern | search type:'search string'<br>[case: boolean value]<br>[start: integer value]<br>[end: integer value]<br>[layer: string value] | search type = ASCII (default), Unicode, Hex, RegEx, EBCDIC, UTF-8<br>boolean value = yes, no, true, false, on, off, 1, 0<br>case on means to use a case sensitive match<br>start, end are the offsets within the packet to start or end the search<br>layer is the name of the protocol at which the search should start (optionally suffixed with 'header' or 'payload') | pattern(ascii: 'smb', case: off)<br><br>pattern('SMB')<br>pattern(hex: FF464D50)<br>pattern('GET', layer: 'tcp payload') |
| plugin | Filter by plugin | plug-in name (no named arguments) | | plugin('FTP Analysis') |

| Filter Expression | Description | Arguments | Argument Description | Examples |
|---|---|---|---|---|
| port | Filter by port | [type: port type]<br>[port1: port]<br>[port2: port]<br>[dir: direction] | port type = tcpudp (default), netware, atalk<br><br>port = number or name table port specifier (port1 is default)<br><br>direction = 1to2, 2to1, or both (default) | port(80)<br>port(80, 8080)<br>port(tcpudp: 80)<br>port(port1: 80, port2: 1523, dir:1to2) |
| protocol | Filter by protocol | protocol type: protocol | protocol type = protospec, Ethernet.Protocol, LSAP, SNAP, LAP, DDP, WAN.PPP, WAN.Frame.Relay | protocol(protospec: http)<br>protocol(protospec:1418)<br>see also pspec |
| pspec | Filter by protospec | protocol list<br>(no named arguments) | | pspec(http)<br>pspec(HTTP)<br>pspec(HTTP, 'NB Sess Init')<br>pspec(1418, 6018) |
| tcpdump | Filter using tcpdump filter syntax | See tcpdump syntax online | See tcpdump syntax online | tcpdump('tcp src port 80') |
| value | Filter on a value in the packet | '([s/u][n/b]off[8/16/32](offset) & mask) operator value'<br>[layer: string value]<br><br>off8, off16, off32, off64<br>soff8, soff16, soff32, soff64<br>snoff8, snoff16, snoff32, snoff64<br>sboff8, sboff16, sboff32, sboff64<br>uoff8, uoff16, uoff32, uoff64<br>unoff8, unoff16, unoff32, unoff64<br>uboff8, uboff16, uboff32, uboff64 | s = signed compare<br>u = unsigned compare (default)<br>n = network byte order<br>b = big endian order<br>8, 16, 32, 64 = bit size of the value in the packet<br>offset = offset into the packet<br>mask = value mask (e.g. 0xff, 0b11111111, 255)<br>operator = comparison operator, < <= > >= ==<br>value = value to compare against (same format as mask)<br>layer: name of the protocol to which the offset is relative (optionally suffixed with 'header' or 'payload') | value('off8(20) == 0x10')<br><br>compares the 8 bits 20 bytes into the packet against the value 0x10 (16)<br><br>value('unoff16(0) == 0', layer:'tcp payload')<br><br>compares the 16 bits (in network byte order, treated as unsigned), at offset 0 relative to the TCP payload, against 0 |
| vlan | Filter by VLAN Identifier | vlan(id1, [id2, ...idx]) | id is a number (0-4095) or id-range | vlan(100)<br>vlan(100, 200-210) |

| Filter Expression | Description | Arguments | Argument Description | Examples |
|---|---|---|---|---|
| wan | Filter by wan attribute | dir: direction | direction = dte, dce | wan(dir: dte) |
| wireless | Filter by wireless attribute | (only one is required)<br>media: media type<br>channelband: band type<br>channelnum: numeric value<br>datarate: numeric value<br>minsignal: numeric value<br>maxsignal: numeric value<br>mindbmsignal: numeric value<br>maxdbmsignal: numeric value<br>minnoise: numeric value<br>maxnoise: numeric value<br>mindbmnoise: numeric value<br>maxdbmnoise: numeric value<br>encrypted: boolean value<br>decrypterr: boolean value<br>bssid: bssid value<br>sourceap: ip address<br>flagsn: bit mask specifying 802.11n flags | media type = 802.11b, 802.11a, 802.11 (default)<br>band type = a, b, bg, n, at (a turbo), gt (g turbo), sg (super g), s1 (licensed A 1MHz), s5 (licensed A 5MHz), s10 (licensed A 10MHz), s15 (licensed A 15MHz), s20 (licensed A 20MHz)<br>boolean value = yes, no, true, false, on, off, 1, 0 | wireless(media:'802.11b', channelnum: 1, encrypted: 1) |

# Editing filters

You can edit an existing filter from any dialog that displays a list of available filters (for example, the **Filters** view of a capture window or *Filters* options in the **Capture Options** dialog).

**To edit a filter:**

1. From any dialog that displays a list of available filters, do any of the following to display the **Edit Filter** dialog:
   - Select the filter and click **Edit** on the toolbar.
   - Right-click the filter and select **Edit**.
   - Double-click the filter.

   **Note** The **Edit Filter** dialog is essentially identical to the **Insert Filter** dialog used to create a Simple or Advanced filter.

2. Make the desired edits in the **Edit Filter** dialog and click **OK**.

   **Note** Click **Help** on the dialog to learn about the available options and settings.

# Duplicating filters

Duplicating a filter allows you to make a new filter based on an existing filter. Once a filter is duplicated, you can edit the duplicate with the settings required for the new filter.

**To duplicate a filter:**

1. From any dialog that displays a list of available filters (for example, the **Filters** view of a capture window or *Filters* options in the **Capture Options** dialog), do any of the following to make a copy of the desired filter:
   - Select the filter and click **Duplicate** on the toolbar.
   - Right-click the filter and choose **Duplicate**.

   A copy of the filter is created in the list of available filters with the word "*copy*" appended to the end of the original filter name.
2. Edit the copy and save it under a new name. See *Editing filters* on page 110 for information on editing a filter.

# Saving and loading filters

You can save and load filters. This allows you to create multiple sets of filters for different requirements. You can choose to save a whole set of filters or just a group of selected filters. All saved filter files have the **.flt* file extension.

**To save the whole set of filters:**

1. From any dialog that displays a list of available filters (for example, the **Filters** view of a capture window or *Filters* options in the **Capture Options** dialog), do any of the following to save all of the filters displayed in the list:
   - On the **File** menu, click **Save Filters...**.
   - Click **Export** on the toolbar.
   - Right-click any filter and choose **Export**.

   The **Save As** dialog appears.
2. Choose a location and type a name for the filter file and click **Save**.

**To save a one or more selected filters:**

1. From any window that displays a list of available filters, right-click one or more filters and choose **Export Selected**.
2. From the **Save As** dialog, choose a location and type a name for the filter file and click **Save**.

**To load a saved filter file:**

1. From any window that displays a list of available filters, do any of the following to load a saved filter file:
   - Click **Import** on the toolbar.
   - Right-click any filter and choose **Import**.

   A dialog appears asking you to *Delete all filters before importing*.
2. Click **Yes** to delete all existing filters before importing the saved filter file; click **No** to keep all existing filters before importing the saved filter file.

   **Note** Imported filters are added to the existing list of available filters. Filters with the same name and parameters are ignored. Filters with the same name but different parameters are added to the list with "*copy*" added to their names.
3. From the **Open** dialog, select the saved filter file and click **Open**.

   The filters are added to the list of available filters.

# Post-capture Analysis

## In this chapter:

# About post-capture analysis

Much of the work of troubleshooting problems on a network is a process of narrowing down the possibilities, examining first one set of clues and then another. Omnipeek provides a number of tools for selecting, grouping, and sorting packets by a variety of attributes to help the network engineer perform targeted analysis.

The techniques for post-capture analysis are applied to packets that have already been captured and are in the buffer of a capture window. You can apply the techniques described here to select items in most views of a capture window.

**Tip** Standard Windows selection techniques are available throughout Omnipeek. For example, hold down the *Ctrl* key when you click to select multiple items.

## Network forensics

Network forensics is the retrospective analysis of network traffic for the purpose of conducting an investigation. See the following sections for information on how to use Omnipeek in different ways to perform network forensics on your own network.

- *Forensic search from the Files tab* on page 121
- *Forensic search from the Forensics tab* on page 124
- *Forensic search from the 'Forensics Capture' window* on page 131

# Saving packets

You can choose to save all packets currently visible, or just the selected packets in the capture window to a capture file.

**Note** You can save packets in an Omnipeek capture window only when the capture is stopped. In a Capture Engine capture window, you can save packets while the capture is still capturing. When you save packets in a Capture Engine capture window, the packets are saved to a capture file on the Omnipeek computer.

**To save all packets:**

1. Select the desired view to make it active.
2. Make sure the capture window is not currently capturing packets (click Stop Capture).
3. On the **File** menu, click **Save All Packets...** (or right-click inside the capture window and select **Save All Packets...**).
4. Enter a file name and select the file type.
5. Click **Save**.

**To save selected packets:**

1. Select the desired packets in the capture window.
2. On the **File** menu, click **Save Selected Packets...** (or right-click the selected packets and select **Save Selected Packets...**).
3. Enter a file name and select the file type.
4. Click **Save**.

# Copying selected packets to a new window

You can copy selected packets into a new capture window. The packets are renumbered, but the original packet order is retained.

**To copy selected packets to a new window:**

1. Select the desired packets in the capture window.
2. On the **Edit** menu, click **Copy Selected Packets to New Window** (or right-click the selected packets and select **Copy Selected Packets to New Window**). A temporary capture window is created containing only the selected packets.

# Hiding and unhiding packets

To reduce the number of visible packets in the **Packets** view of a capture window, you can hide packets from the view without actually deleting them from a capture window. Hide functions are disabled for capture windows when the capture is still running.

Hidden packets are not processed by Analysis Modules or used when calculating the various capture window statistics. Additionally, they are not printed when the contents of the window are printed, and are not saved when you choose **Save All Packets...** from the **File** menu. They are, however, deleted when you select **Clear All Packets** from the **Edit** menu or press **Ctrl + B**.

Hiding or Unhiding packets causes all packets in the capture window to be reprocessed by any enabled Analysis Modules and causes statistics to be recalculated based on the changed visible contents of the capture window's buffer.

**Note** The hide and unhide functions are not supported for a Capture Engine capture window. The packets from a Capture Engine capture window must first be brought into an Omnipeek capture window in order to use the hide functions. See *Using hide and unhide on a Capture Engine*.

**To use the hide and unhide functions:**

- To hide the selected packets, on the **Edit** menu, click **Hide Selected Packets** (or press **Ctrl + H**).
- To hide unselected packets, on the **Edit** menu, click **Hide Unselected Packets** (or press **Ctrl + Shift + H**).
- To restore all hidden packets to view, on the **Edit** menu, click **Unhide All Packets** (or press **Ctrl + U**). You can continue to selectively hide additional packets but cannot selectively unhide packets.

## Using hide and unhide on a Capture Engine

The hide functions (choosing **Hide Selected Packets**, **Hide Unselected Packets**, or **Unhide All Packets** from the **Edit** menu) are not supported directly from a Capture Engine capture window. You must first bring the packets into an Omnipeek capture window. There are several ways to do this:

- Select the relevant packets in the Capture Engine capture window, then on the **File** menu, click **Save Selected Packets...** to save the packets to an Omnipeek capture file. *Saving packets* on page 113.
- Select the relevant packets in the Capture Engine capture window, then on the **File** menu, click **Copy Selected Packets to New Window** to save the packets to an Omnipeek capture file. *Copying selected packets to a new window* on page 114.
- Make the **Packets** view of the Capture Engine capture window active, then on the **File** menu, click **Save All Packets...** to save the contents of the capture window buffer to an Omnipeek capture file. See *Saving packets* on page 113.
- From the **Files** tab of the **Capture Engines** window, transfer the remote packet file to the Omnipeek computer, then open the file in a capture window. For details, see *Forensic search from the Files tab* on page 121.

# Selecting related packets

To find packets that are like, or related to the packet or data item currently selected, you can use the **Select Related Packets** functions. The **Select Related Packets** functions offer a set of selection criteria based on the parameter you choose and on the values found in the currently selected item. It then tests all the visible packets in the **Packets** view of the capture window against those criteria and selects all of the packets that match the criteria.

> **Tip** In capture windows, you can use the Filter Bar to create a wide variety of advanced filters that allow you to quickly and directly select packets similar to using the **Select Related Packets** functions. See *Creating filters using the filter bar* on page 106.

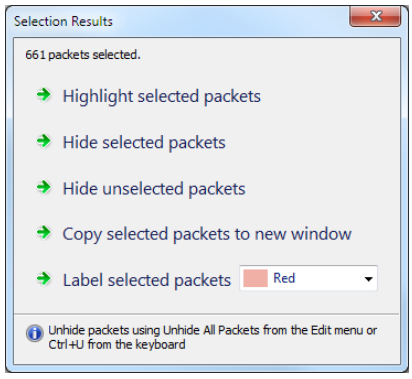
**To select related packets:**

1. Select the item(s) in the **Packets**, **Expert**, **Nodes**, **Protocols**, **WLAN**, or **Peer Map** views of a capture window.
2. On the **Edit** menu, click **Select Related Packets** (or right-click and select **Select Related Packets**).
3. Select a choice from the submenu:

> **Note** The submenu is context-sensitive and only allows selections appropriate for the item you selected.

- *By Source:* Selects packets matching the source address.
- *By Destination:* Selects packets matching the destination address.
- *By Source and Destination:* Selects packets matching both the source and destination addresses.
- *By VLAN:* Selects packets matching the VLAN (Virtual LAN).
- *By Protocol:* Selects packets matching the protocol.
- *By Client:* Unique to the **Expert** view, selects all packets to or from the address shown in the *Client Addr* column.
- *By Server:* Unique to the **Expert** view, selects all packets to or from the address shown in the *Server Addr* column.
- *By Client and Server:* Unique to the **Expert** view, selects all packets between the selected Client and Server addresses.
- *By Port:* Selects packets matching the port address.
- *By Application:* Selects packets matching the application.
- *By Flow:* Selects packets sent between two nodes (in either direction), using the matching protocol and port.
- *By Source Country:* Selects packets matching the source country address.
- *By Destination Country:* Selects packets matching the destination country address.
- *By Source or Destination Country:* Selects packets matching both the source and destination country addresses.

The **Selection Results** dialog appears, showing the number of packets selected that match the related packets.




4. Click one of the following on the dialog:
   - *Highlight selected packets:* Click to highlight all items that were found that do match the related packets.
   - *Hide selected packets:* Click to hide all items that were found that do match the related packets.
   - *Hide unselected packets:* Click to hide all items that were found that do not match the related packets.
   - *Copy selected packets to new window:* Click to copy all items that were found that do match the related packets into a new capture window.

     This creates a temporary capture window called *[capture window name] - Selection*, containing only the related packets. The packets are renumbered, but the original packet order is retained.
   - *Label selected packets:* Click to label the selected packets with the selected highlight color.

**Note** To unhide packets, use *Unhide All Packets* from the **Edit** menu. You can also press **Ctrl + U** from the keyboard.

## Selecting related flows

To find a flow related to the packet or data item currently selected, you can use the **Select Related Flow** function. The **Select Related Flow** function allows you to easily navigate from a selected packet in the **Packets** view, a selected item (Request, Page, etc.) in one of the **Web** views, or a selected file in the **Files** view to the related flow inside the Expert **Flows** view.

**To select related flows:**

1. Select the item in the **Packets**, **Web**, or **Files** views of a capture window.
2. Right-click and select **Select Related Flow**. The **Flows** view appears, with the related flow highlighted.

**Note** The **Select Related Flow** menu item is not available or disabled when selecting an item which is not associated with any flow.

## Selecting related requests

To find a request related to a file currently selected in the **Files** view, you can use the **Select Related Request** function. The **Select Related Request** function allows you to easily navigate from a selected file in the **Files** view to the related request inside the **Requests** view.

**To select related requests:**

1. Select the item in the **Files** views of a capture window.

2. Right-click and select **Select Related Request**. The **Requests** view appears, with the related request highlighted.

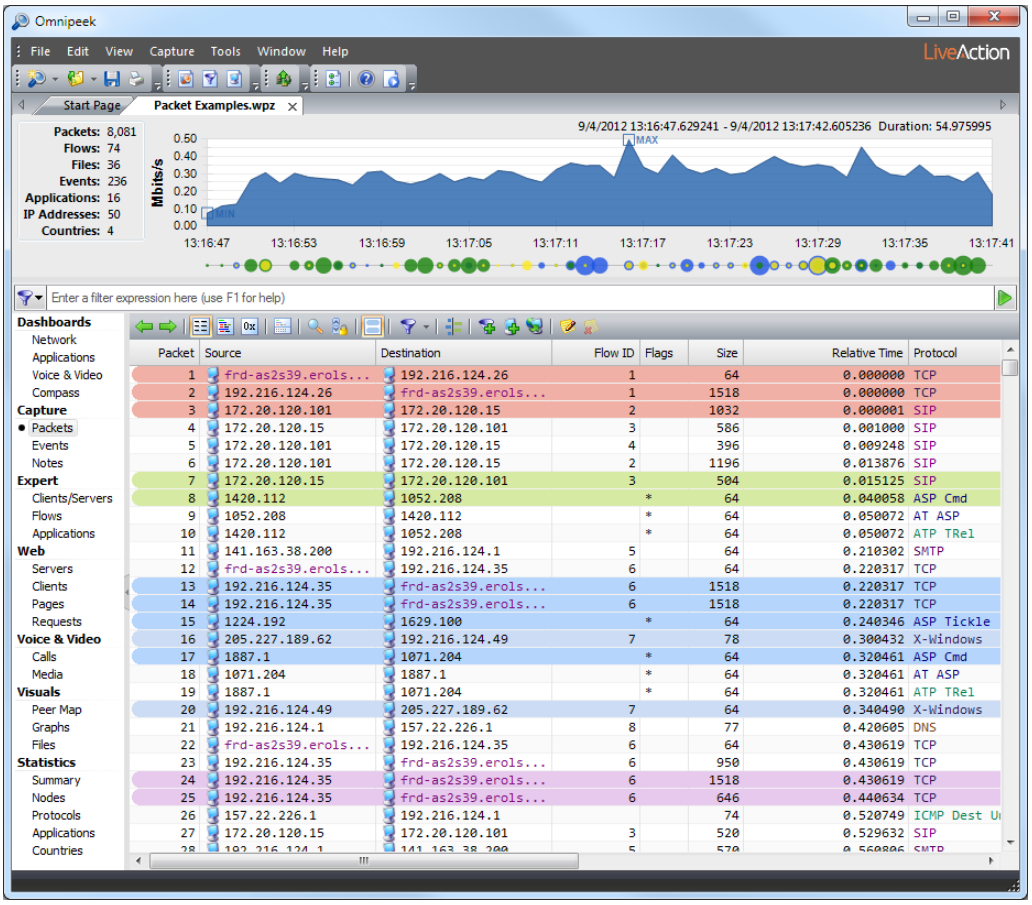
**Note** The **Select Related Request** menu item is not available or disabled when selecting an item which is not associated with any request.

# Label selected packets

For packets displayed in the **Packets** view of an Omnipeek capture window, you can right-click one or more packets and select from the context menus to add, select, or clear colored labels (Red, Orange, Yellow, Green, Blue, Purple and Gray) to or from the packets. The colored label appears as a colored highlight across the entire row of the packet. When a row has a colored label applied to it, and the row is currently selected, a colored globe the same color as the colored highlight appears to the left of the packet number.

Adding colored labels to packets lets you visually group those packets inside the **Packets** view so that they are easy to identify. For example, you can select all the TCP packets with a SYN flag and add the same colored label to them. This will let you easily identify the start of a flow since a flow always starts with a TCP packet that has the SYN flag.

**Tip** When used in combination with the 'Select Related' feature, the 'Label' packets feature lets you easily drill down into the packets that are of most interest to you in analyzing. See *Selecting related packets* on page 115.




**To add a label to packets:**

1. Select the **Packets** view of an Omnipeek capture window.

2. Right-click one or more packets you wish to label, and on the context menu, point to **Label Selected Packets**, and then click the desired label color to apply to the selected packets. Selecting 'None' from this menu removes any colored label applied to the selected packets. Selecting a color from this menu applies that color label across the entire row of the selected packets.

**To select labeled packets:**

1. Select the **Packets** view of an Omnipeek capture window.
2. Right-click one or more packets that are labeled with the color you wish to select, and on the context menu, point to **Select Labeled Packets**, and then click the desired label color. Selecting 'All' from this menu selects all packets that have a colored label applied to them. Selecting a color from this menu selects only the packets labeled with that color.

**To clear a label from packets:**

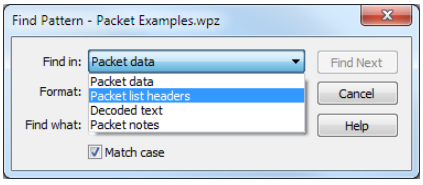
1. Select the **Packets** view of an Omnipeek capture window.
2. Right-click one or more packets, and on the context menu, point to **Clear Labels**, and then click the desired label color. Selecting 'All' from this menu removes the colored label from all packets that have a colored label applied to them. Selecting a color from this menu clears the colored label from only the packets labeled with that color.

# Finding strings in packets

You can search for string patterns found in the packet data of an Omnipeek capture window.

**To find string patterns:**

1. Select the **Packets** view of a capture window.
2. On the **Edit** menu, click **Find Pattern** (or press **Ctrl + F**). The **Find Pattern** dialog appears.




3. Complete the dialog:
   - *Find in:* Select the location where you would like to search.
     - *Packet data:* Searches for a string using the chosen format anywhere in the raw data of the packet.
     - *Packet list headers:* Searches for a match with a string found in the packet list headers; that is, with the text shown in the current set of columns in the Packet List pane of the **Packets** view for that packet.
     - *Decoded text:* Searches for a match with a string found in the text of the decoded packet. This is like doing a text search in the Decode view portion of the text file which would be created by choosing Save Selected Packets as Text for the currently selected packets.
     - *Packet notes:* Searches for a match with a string found in any Note associated with any packet in the Packet List pane. This is like doing a search in the optional Notes column of the **Packets** view.
   - *Format*: Select the format of the pattern you wish to match. You can choose to test for a match in *Default Text*, *UTF-8*, *Hex Data*, or *More Encodings* (many other encodings).
   - *Find what:* Type or select the string pattern you would like to find.
   - *Match case:* Select this check box to match the string exactly as typed.
4. Click **Find Next**.

The first packet matching the string will be highlighted in the **Packets** view. To find the next matching packet in the sequence, on the **Edit** menu, click **Find Next** (or press **F3**).

**Tip** The **Find Pattern** and **Find Next** commands search the packets in packet number order, starting from, but not including, the currently selected packet.

**Note** The **Find Pattern** and **Find Next** commands are not supported from a Capture Engine capture window. In order to use these techniques, you must first save the packets to an Omnipeek capture file. See *Using hide and unhide on a Capture Engine* on page 114.

# Selecting packets matching user-defined criteria

You can use the **Select...** command and **Select** dialog to select captured packets based on various selection criteria. You can choose to select either all packets matching your criteria, or all packets not matching your criteria. Only the visible packets displayed in the active capture window can be selected.

The selection criteria includes the following:

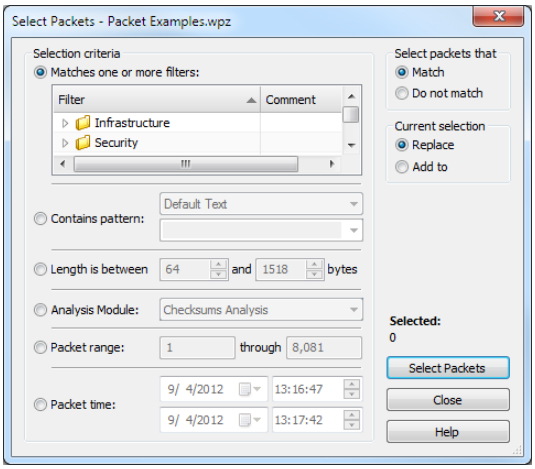
- Packets matching one or more filters
- Packets containing a certain ASCII or hex string
- Packets that are of a certain length
- Packets that match a specific Analysis Module

**Note** In a Capture Engine capture window, the **Select** dialog selects all matching packets in the capture buffer resident on the Capture Engine.

**Important!** Packet slicing can affect the operation of some selection tools. When used from the **Select** dialog, filters, Analysis Modules and other selection tools read packet contents from the captured packets to determine protocols, addresses and related information. If the packet slice value was set in such a way as to discard some of the information these tools expect to find, they will not be able to identify packet attributes correctly.

**To use the Select dialog to select packets:**

1. On the **Edit** menu, click **Select Packets...**. The **Select Packets** dialog appears.




2. Complete the dialog:

- *Matches one or more filters:* Select this option to select packets that match one or more filters, and then select which filters that you want to match in the filter box below this option. When multiple filters are enabled simultaneously, the result is the equivalent of a logical OR statement: a packet matching any one of the enabled filters will be considered a match.
- *Contains ASCII:* Select this option to select packets that contain a specific ASCII string, and then enter the ASCII string in the box next to this option.
- *Contains hex:* Select this option to select packets that contain a specific hex value, and then enter the hex value in the box next to this option.

**Note** The *Contains ASCII* and *Contains hex* options search through the raw packet data, not the packet decode. In the raw packet data, ASCII text will only be present when the packet contains application data which uses that encoding, such as the body of an email message, a web page, and so forth. Packet headers, including source and destination addresses, are hexadecimal.

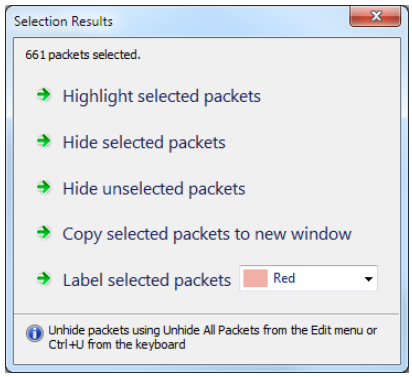
- *Length is between ____ and _____ bytes:* Select this option to select packets that are of a certain length, and then type or enter the minimum and maximum number of bytes
- *Analysis Module:* Select this option to select packets that match an Analysis Module, and then select which Analysis Module that you want to match from the list.

**Note** When you open the **Select** dialog for a Capture Engine capture window, only the relevant Analysis Modules available on the Capture Engine will be shown. If you disabled Analysis Modules for this Capture Engine capture window in the **Analysis Options** view of the remote **Capture Options** dialog, no packets will be selected when you choose the *Analysis Modules* option in the **Select** dialog.

- *Packet range:* Select this option to select packets that are within a range of packets, and then enter the desired range.
- *Packet time:* Select this option to select packets that are within a specific time range, and then specify the time range by selecting or entering both the starting and ending dates and times.
- *Match:* Select this option to select packets that match your selection criteria.
- *Do not match:* Select this option to select packets that do not match your selection criteria.
- *Replace:* Select this option to display only the newly selected packets.
- *Add to:* Select this option to display any packets currently selected and the newly selected packets.
- *Selected:* Displays the number of packets selected.
- *Select Packets:* Click to select packets that match your selection criteria. Once you click *Select Packets*, a **Selection Results** dialog appears noting how many packets were selected. You can then choose the option to **Hide selected packets**, **Hide unselected packets**, **Copy selected packets to new window**, or **Close** to simply close the dialog without further action.

3. Click **Select Packets** to perform the selection.

   The **Selection Results** dialog appears, showing the number of packets selected that match the selection criteria.




4. Click one of the following on the dialog:
   - *Highlight selected packets:* Click to highlight all items that were found that do match the related packets.
   - *Hide selected packets:* Click to hide all items that were found that do match the related packets.
   - *Hide unselected packets:* Click to hide all items that were found that do not match the related packets.
   - *Copy selected packets to new window:* Click to copy all items that were found that do match the related packets into a new capture window.

     This creates a temporary capture window called *[capture window name] - Selection*, containing only the related packets. The packets are renumbered, but the original packet order is retained.
   - *Label selected packets:* Click to label the selected packets with the selected highlight color.

**Note** To unhide packets, use *Unhide All Packets* from the **Edit** menu. You can also press **Ctrl + U** from the keyboard.

# Forensic search from the Files tab

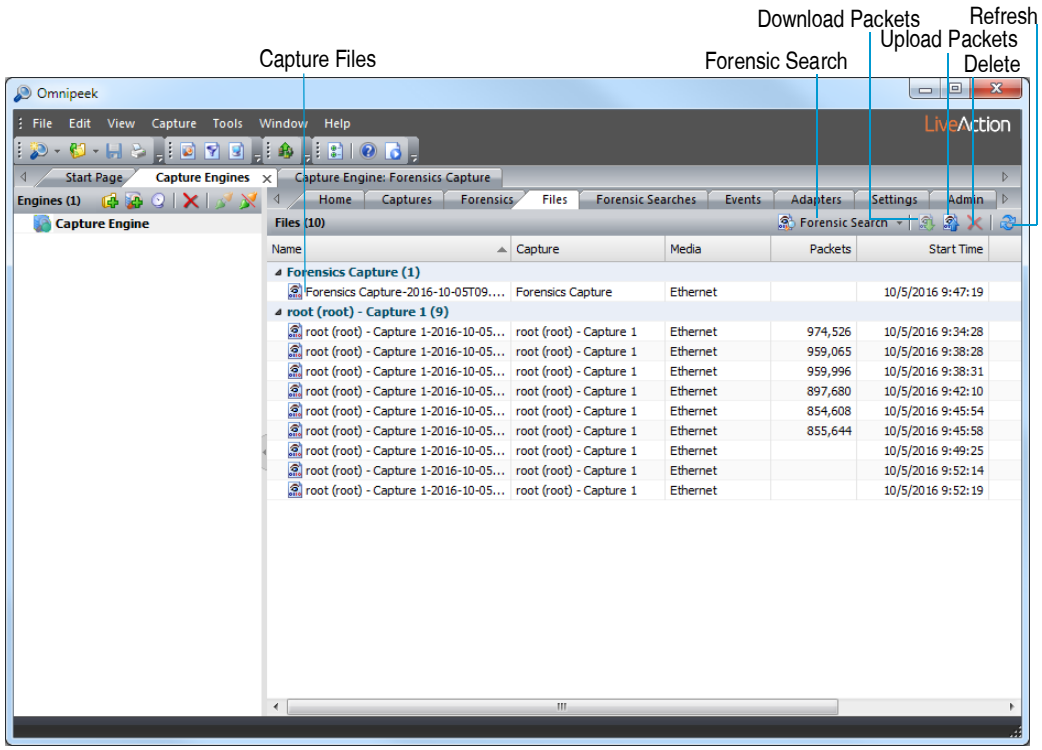
The *Files* tab in the **Capture Engines** window displays a listing of all the capture files saved to the Capture Engine. Performing a forensic search from the Files tab lets you sort through hours or even days worth of network traffic, from one or more Capture Engine capture files, for specific data you wish to analyze further.

**Note** You can also perform a forensic search from the Forensics tab and from the **Forensics Capture** window. See *Forensic search from the Forensics tab* on page 124 and *Forensic search from the 'Forensics Capture' window* on page 131.

**Important!** One or more capture files saved to the Capture Engine are required before you can perform a forensic search. See *Capture Engine capture files* on page 48 and *Forensics capture on a Capture Engine* on page 54.

**To perform a forensic search from the Files tab:**

1. From the **Capture Engines** window, select the *Files* tab of a connected Capture Engine.




The parts of the *Files* tab are described here:

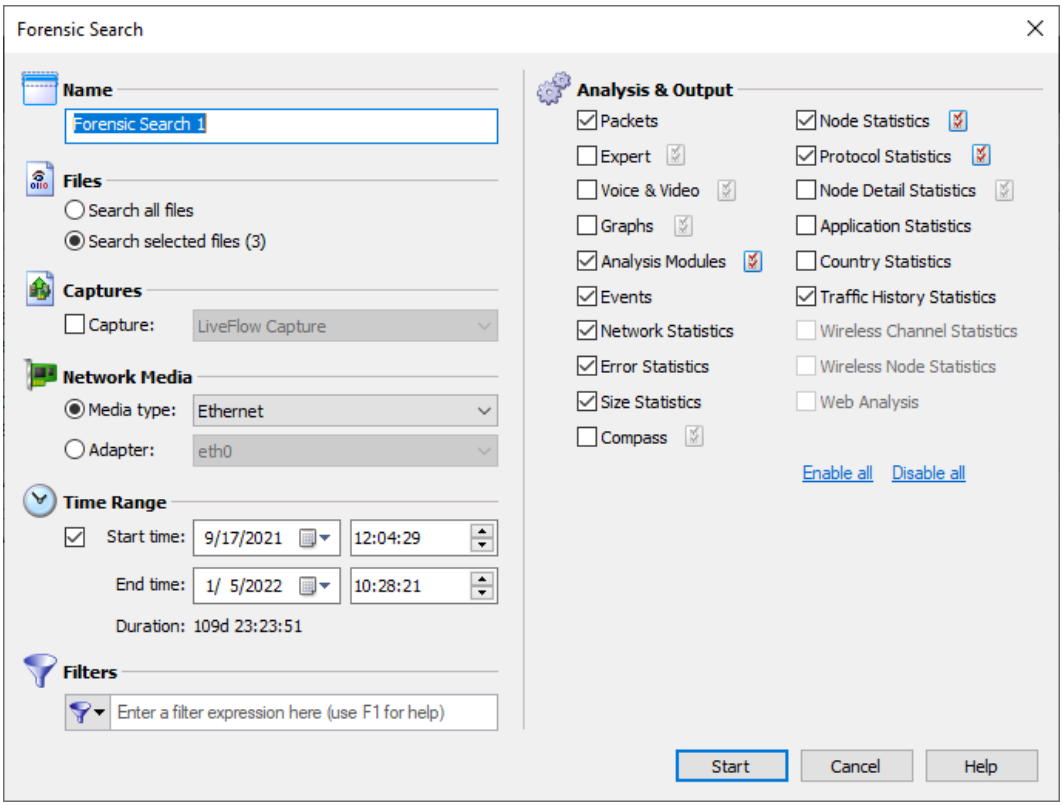
- *Capture files*: Displays all of the Capture Engine capture files saved to the Capture Engine.
- *Forensic search*: Click to display the **Forensic Search** dialog where you can adjust the forensic search settings. Click the small down arrow next to *Forensic search* to display custom or pre-configured settings for performing a forensic search. You can change any option prior to clicking **Start**:
  - *Custom*: Creates a **Forensic Search** window based on the customized settings that you configure.
  - *Overview*: Creates a **Forensic Search** window based on settings that display an overview of the selected data in the capture session.
  - *Packets*: Creates a **Forensic Search** window containing a packets-only view.
  - *Expert*: Creates a **Forensic Search** window based on settings that are optimized for *Expert* analysis.
  - *Voice & Video*: Creates a **Forensic Search** window based on settings that are optimized for *Voice & Video* analysis.
- *Download Packets*: Click to copy the selected capture files to a location on your local Omnipeek computer.
- *Upload Packets*: Click to choose a packet file on your local Omnipeek computer and send it to the Capture Engine. The packet file then appears in the *Files* tab along with the capture file that had been already saved to the Capture Engine.
- *Delete*: Click to delete the selected files from the list of files.
- *Refresh*: Click to refresh the screen.

**Tip** Right-click inside the list of files for additional options for performing a forensic search, grouping files, uploading and downloading packets, deleting files, synchronizing files to the file system on the hard disk, and refreshing the display.

2. Select one or more capture files you wish to search.

3. Click **Forensic Search** (or click the small down arrow next to **Forensic Search** and select the type of forensic search you wish to perform). The **Forensic Search** dialog appears.

**Note** Selecting one of the pre-defined types of forensic searches displays the **Forensic Search** dialog with the *Analysis & Output* options pre-configured for that type of forensic search. You can change any option prior to clicking **Start**.




4. Complete the dialog to specify the criteria for extracting data from the selected capture files:
   - *Name:* Enter a name for the forensic search.
   - *Files:* Choose one of the following:
     - *Search all files:* Select this option to search through all of the files listed in the *Files* tab.
     - *Search selected files:* Select this option to search through only the selected files in the *Files* tab.
   - *Captures:* Select this option and then select the capture to search from those listed in the Capture column of the *Files* tab.
   - *Network Media:* Choose one of the following:
     - *Media type:* Select this option and then select the media type to extract only the data of a specific media type.
     - *Adapter:* Select this option and then select the adapter to extract only the data captured by a specific adapter.
   - *Time Range:* Select this option and then configure the start and end times to extract the data.
     - *Start time:* Set the start date and time for extracting data.
     - *End time:* Set the end date and time for extracting data.
     - *Duration:* Displays the amount of time between the specified start and end times.

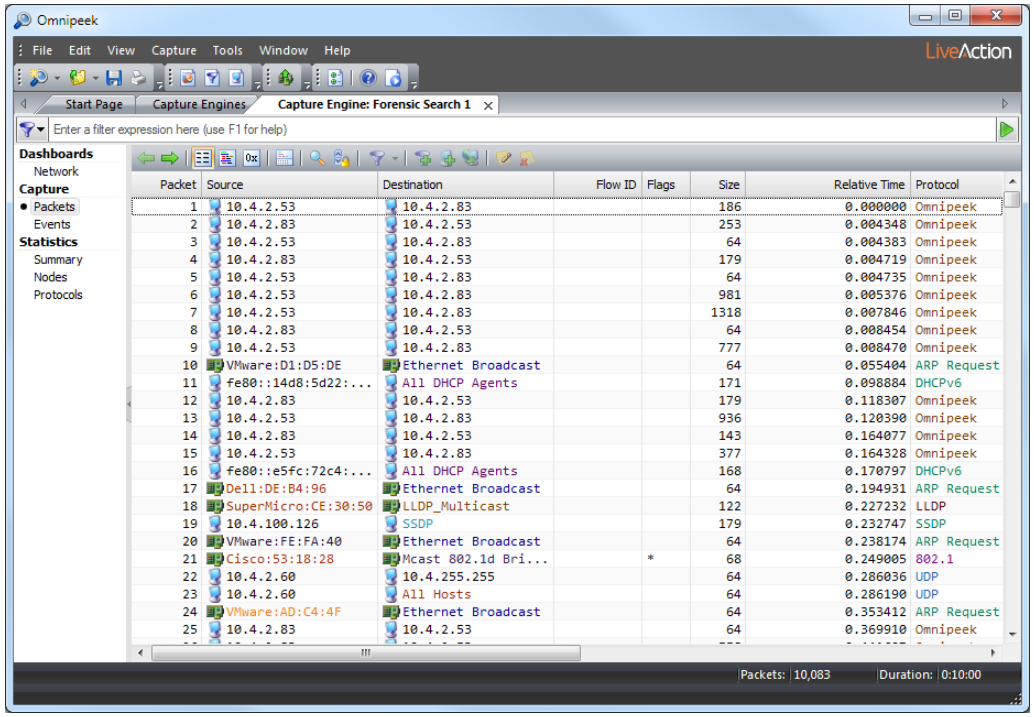
- *Filters:* Click to select a filter from the display list. All packets will be accepted if no filters are applied to the forensic search.

  To create an advanced filter, click *Filters* and select *Insert filter*, *Insert Operator*, or *Insert Expression* from the display. For detailed instructions, please see *Creating filters using the filter bar* on page 106.

- *Analysis & Output:* Select one or more of the options to enable and display that particular view in the new **Forensic Search** window. For various *Analysis & Output* options that have additional configurable settings, click submenu to the right of the option.

5. Click **Start**. A new **Forensic Search** window appears along with two progress bars at the top of the window. (Clicking **Stop** stops the search and then completes the processing of the packets.)

   Once the processing of the packets is complete, the progress bars go away and the new **Forensic Search** window is populated with the data found based on the criteria you selected above.




6. From the new **Forensic Search** window, you can further narrow down the data by performing any of the post-capture analysis methods described earlier.

# Forensic search from the Forensics tab

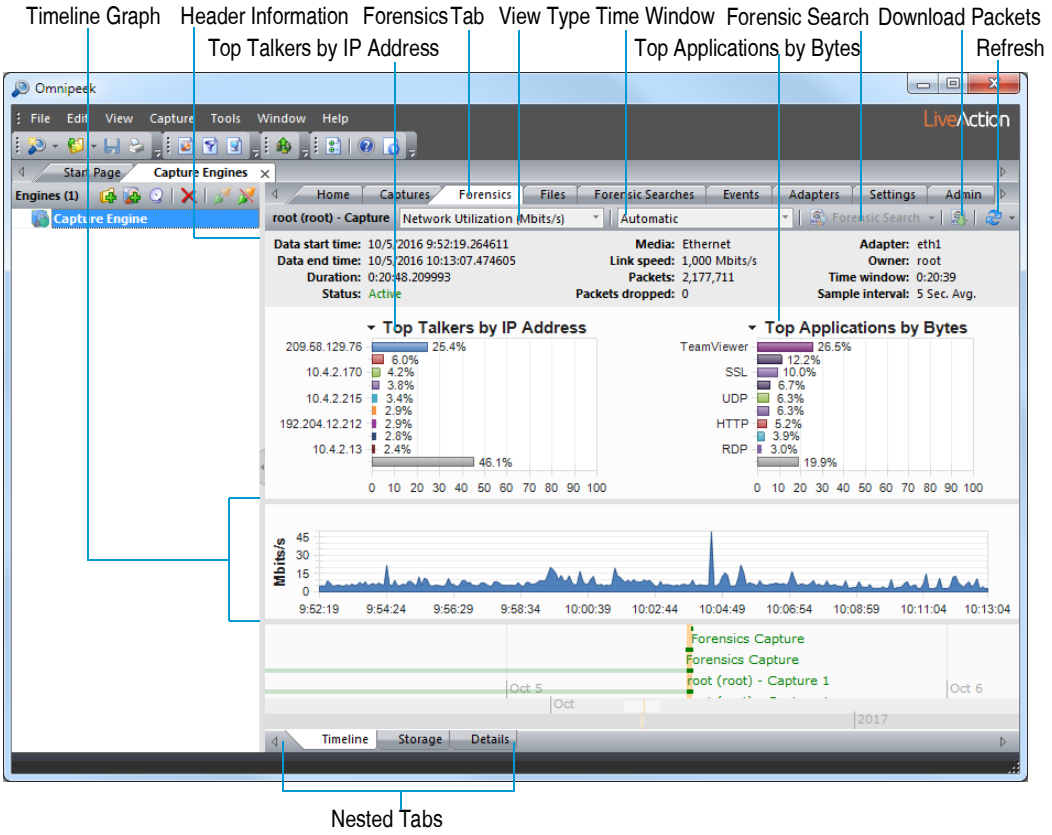
The *Forensics* tab in the **Capture Engines** window displays the capture sessions available on the Capture Engine. Performing a forensic search from the *Forensics* tab lets you select one of the capture sessions, display its data in the Timeline graph, and then perform a forensic search on specific parts of the data.

**Note** You can also perform a forensic search from the *Files* tab and from the **Forensics Capture** window. See *Forensic search from the Files tab* on page 121 and *Forensic search from the 'Forensics Capture' window* on page 131.

**Important!** One or more capture files saved to the Capture Engine are required before you can perform a forensic search. See *Capture Engine capture files* on page 48 and *Forensics capture on a Capture Engine* on page 54.

**To perform a forensic search from the Forensics tab:**

1. From the **Capture Engines** window, select the *Forensics* tab of a connected Capture Engine. The *Forensics* tab displays the data currently available from the capture storage space of the Capture Engine.




The parts of the *Forensics* tab are described here:

- *Header Information*: The header information displays statistics for the capture session (data start time, data end time, duration, status, packets, packets dropped, adapter, etc.).
- *Top Talkers by IP Address*: This display shows a graph of top "talkers" on the network, broken out by node for the selected area in the Timeline graph below. You can right-click inside the display to display top talkers by *Physical Address*, *IP Address*, or *IPv6 Address*; or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the node.
- *Top Applications*: This display shows a graph of top applications on the network for the selected area in the Timeline graph below. You can right-click inside the display to toggle the display with the Top Protocols display, or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application.
- *Top Protocols*: This display shows a graph of top protocols on the network for the selected area in the Timeline graph below. You can right-click inside the display to toggle the display with the Top Applications display, or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the protocol.
- *Timeline graph*: The Timeline graph displays the data of the selected capture session. Only one capture session at a time can be displayed inside the graph. By default, the graph shows network utilization in Mbits/s, but other statistics can be graphed as well by selecting the *View* type.

  Here are descriptions of other parts of the Timeline graph:

  - Right-click inside the graph to perform a forensic search (see *Forensic search* below), download selected packets to a capture file, refresh the window, or choose a different graph format: *Bar*,

*Stacked Bar*, *Skyline*, *Area*, *Stacked Area*, *Line*, *Line/Points*, *Linear*, and *Logarithmic*. Additionally, you can also toggle displaying the minimum and maximum points for each series on the graph.

- Mouse over a data point in the graph to view a tooltip displaying timestamp and size information (e.g., time and rate, time and packet size, etc.).
- Any time there is more data than can be displayed on the screen, a scroll bar appears below the graph and allows you to view different points of time in the graph. (If the *Time window* is set to *Automatic*, the scroll bar will never appear.)
- If the *Time window* is set to anything other than *Automatic*, a scroll bar appears below the graph and allows you to view different points of time in the graph.

- *View type*: Select the type of statistics to display in the Timeline graph. You can select from:
  - *Network Utilization (Mbits/s)*
  - *Network Utilization (Packets/s)*
  - *Unicast/Multicast/Broadcast*
  - *Packets Sizes*
  - *VLAN/MPLS*
  - *Protocols (Mbits/s)*
  - *Protocols (Packets/s)*
  - *Applications (Mbit/s)*
  - *Applications (Packets/s)*
  - *Call Quality*
  - *Call vs. Network Utilization*
  - *Wireless Packets (Packets/s)*
  - *Wireless Retries (Packets/s)*

**Note** To display statistics for a *Call Quality* or *Call vs. Network Utilization* view type, the *VoIP Stats* option must be selected when you first create the capture and configure the *General* options of the **Capture Options** dialog. See *Configuring general options* on page 31.

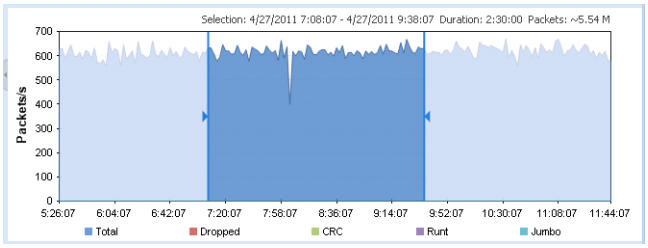
- *Time window*: Select the time interval to display in the Timeline graph. By default, *Automatic* is selected to display the optimum window based on the available data. Intervals from *5 Minutes (1 Sec. Avg.)* to *24 Hours (5 Min. Avg.)* are also available.
- *Forensic search*: Click to display the **Forensic Search** dialog where you can adjust the forensic search settings. Click the small down arrow next to **Forensic Search** to display custom or pre-configured settings for performing a forensic search. You can change any option prior to clicking **Start**:
  - *Custom*: Creates a **Forensic Search** window based on the customized settings that you configure.
  - *Overview*: Creates a **Forensic Search** window based on settings that display an overview of the selected data in the capture session.
  - *Packets*: Creates a **Forensic Search** window containing a packets-only view.
  - *Expert*: Creates a **Forensic Search** window based on settings that are optimized for *Expert* analysis.
  - *Voice & Video*: Creates a **Forensic Search** window based on settings that are optimized for *Voice & Video* analysis.

- *Download Packets*: Click to download the packets from the selected capture session, in the selected time range.
- *Refresh*: Click to refresh the screen. For an active capture session, you can also set an automatic refresh interval by selecting an interval from the drop-down list to the right of **Refresh**.
- *Nested tabs*: There are three nested tabs available from within the *Forensics* tab: *Timeline*, *Storage*, and *Details*. Each tab allows you to view and select the capture data you wish to search in various formats. The *Timeline*, *Storage*, and *Details* tabs are described in detail below.

2. From any of the nested tabs, click (double-click from the *Details* tab) the capture session you wish to search. The selected capture session is displayed in orange to indicate it is selected, and the data for the capture session is loaded into the *Timeline* graph at the top.

**Important!** A *session* represents a contiguous period of time when packets are captured from a particular interface. A session is created each time you start a capture. A capture can have multiple sessions, and each session can be separated by periods of inactivity (from stopping and starting the capture). Forensic analysis can then be performed on each session. *Sessions* are displayed in the nested tabs available from the *Forensics* tab.

3. In the Timeline graph, drag to select the area of the selected capture you wish to search. If no area of the graph is selected, the entire capture is selected by default.

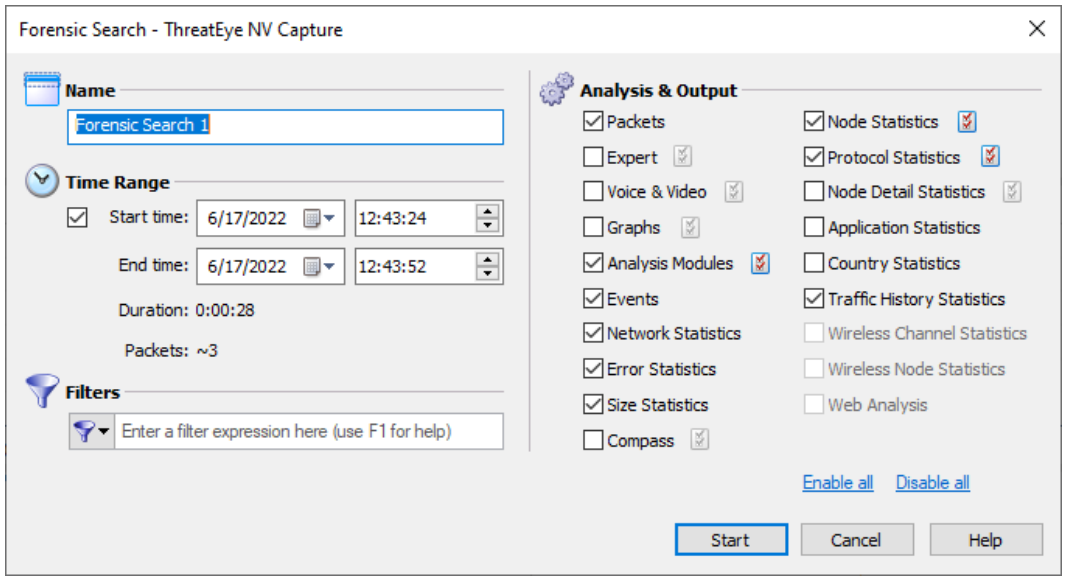



**Note** The packet count displayed above the Timeline graph is an approximation of the packets currently selected.

**Tip** You can adjust the exact time range from the **Forensic Search** dialog.

4. Click **Forensic Search** (or click the small down arrow next to **Forensic Search** and select the type of forensic search you wish to perform). The **Forensic Search** dialog appears.

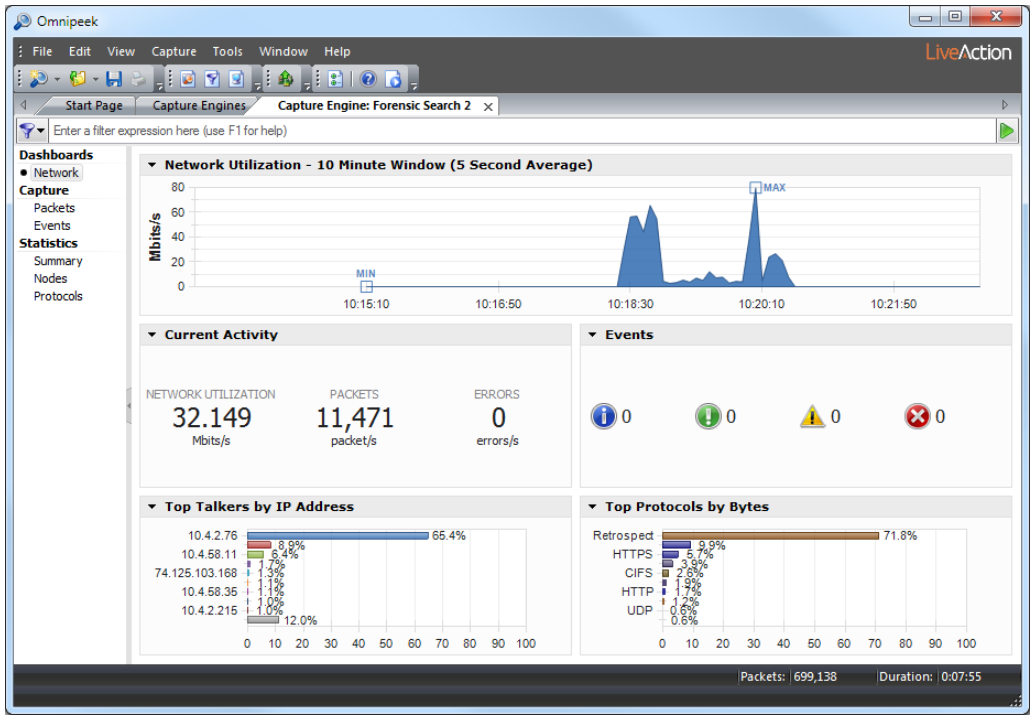
**Note** Selecting one of the pre-defined types of forensic searches displays the **Forensic Search** dialog with the *Analysis & Output* options pre-configured for that type of forensic search. You can change any option prior to clicking **Start**.




5. Complete the dialog to specify the criteria for extracting data from the selected capture:
   - *Name:* Enter a name for the forensic search.
   - *Time Range:* Select this option and then configure the start and end times to extract the data.
     - *Start time:* Set the start date and time for extracting data.
     - *End time:* Set the end date and time for extracting data.
     - *Duration:* Displays the amount of time between the specified start and end times.
   - *Filters:* Click to select a filter from the display list. All packets will be accepted if no filters are applied to the forensic search.

     To create an advanced filter, click *Filters* and select filters, operators, or expressions from the display. For detailed instructions, please see *Creating filters using the filter bar* on page 106.
   - *Analysis & Output:* Select one or more of the options to enable and display that particular view in the new **Forensic Search** window. For various *Analysis & Output* options that have additional configurable settings, click the submenu to the right of the option.
6. Click **Start**. A new **Forensic Search** window appears along with two progress bars at the top of the window. (Clicking **Stop** stops the search and then completes the processing of the packets.)

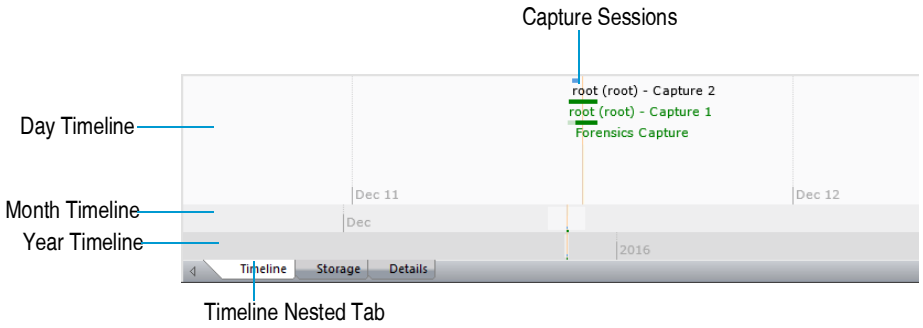
   Once the processing of the packets is complete, the progress bars go away and the new **Forensic Search** window is populated with the data found based on the criteria you selected above.




7. From the new **Forensic Search** window, you can further narrow down the data by performing any of the post-capture analysis methods described earlier.

## *Timeline nested tab*

The *Timeline* nested tab has three bands of timelines (Day, Month, Year) that are used to display the capture sessions available from the storage space on the Capture Engine. You can select a capture session from the day band to display the session in the Timeline graph above.




Here are some useful notes for using the *Timeline* nested tab:

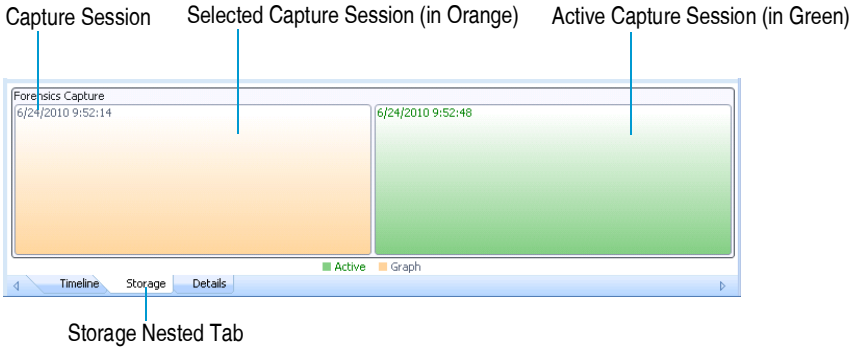
- Capture sessions are represented with a horizontal green or blue bar and the name of the main parent capture. Simply click a capture session to view its data within the Timeline graph above.
- Only one capture session at a time can be selected and displayed in the Timeline graph.
- A capture session that is highlighted with an orange vertical bar indicates it is currently selected. A capture session that has green colored text indicates it is currently active and is capturing packets.
- Capture sessions may be overwritten by another session in the same capture if the capture was created as a 'continuous capture,' and the session 'wraps' after exceeding the disk space allocated for the capture. See *Configuring general options* on page 31.

  If a capture session 'wraps,' the horizontal green or blue bar appears with a lighter color to indicate that capture sessions were overwritten. Any data that is overwritten is no longer available for analysis.

- Drag inside a timeline band to view different points of time within the timeline band. The other timeline bands will move accordingly.
- Right-click inside a timeline band to quickly move to various points within the timeline. You can select from:
  - *Go to Current*: Moves all three timeline bands so that the currently selected capture session is centered inside the display.
  - *Go to Now*: Moves all three timeline bands so that the current time is centered inside the display.
  - *Go to Earliest*: Moves all three timeline bands so that the earliest available capture session is centered inside the display.
  - *Go to Latest*: Moves all three timeline bands so that the latest available capture session is centered inside the display.

## *Storage nested tab*

The *Storage* nested tab displays each capture session from the storage space on the Capture Engine as a container nested within a larger parent container.

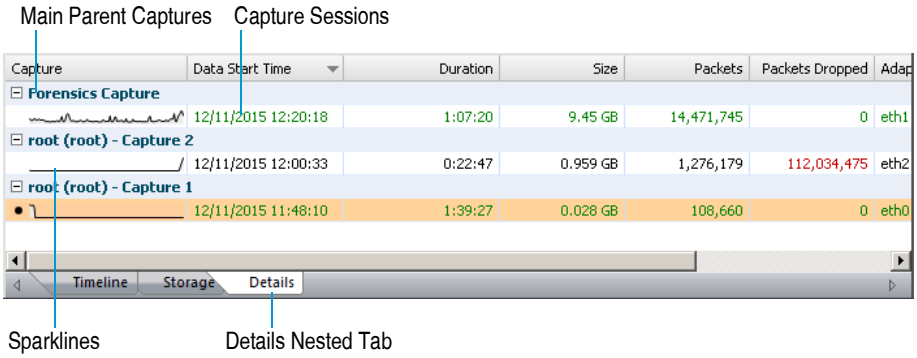



Here are some useful notes for using the *Storage* nested tab:

- A capture session that is colored orange indicates it is currently selected. A capture session that is colored green indicates it is currently active and is capturing packets.
- Capture sessions may be overwritten by another session in the same capture, if the capture was created as a 'continuous capture' and the session 'wraps' after exceeding the disk space allocated for the capture. See *Configuring general options* on page 31. When data from a capture session is overwritten with new data, the old data is no longer available for analysis.
- Only one capture session at a time can be selected and displayed in the Timeline graph.
- Mouse-over a capture session container to view a tooltip displaying details about the capture session.
- Right-click a capture session to display the following options:
  - *View*: Loads the selected capture session into the Timeline graph above.
  - *Delete*: Removes the selected capture and all of its capture sessions, packet data, and statistics from the capture storage space on the Capture Engine. You will be prompted to verify any deletions. Only a parent capture, and not individual capture sessions, can be deleted from the list.
  - *Delete All*: Removes all captures, capture sessions, packet data, and statistics from the capture storage space on the Capture Engine. You will be prompted to verify any deletions.
  - *Show Unreserved Space*: Displays the amount of space that is not currently being used as capture storage space on the Capture Engine.
  - *Show Legend*: Displays a color-coded legend for the capture sessions.

### *Details nested tab*

The *Details* nested tab displays capture sessions available from the storage space on the Capture Engine as a list in tabular format. Each capture session is displayed under its main parent capture. The main parent capture is a collapsible list that can be expanded or collapsed to show and hide its capture sessions.




Here are some useful notes for using the *Details* nested tab:

- The small graph below the name of a capture is a sparkline—a small version of the Timeline graph for each capture session which makes it easier to see the status of multiple capture sessions at a glance.
- A capture session that is colored orange indicates it is currently selected. A capture session that is colored green indicates it is currently active and is capturing packets.
- Capture sessions may be overwritten by another session in the same capture, if the capture was created as a 'continuous capture' and the session 'wraps' after exceeding the disk space allocated for the capture. See *Configuring general options* on page 31. An overwritten capture session is no longer available for analysis.
- Only one capture session at a time can be selected and displayed in the Timeline graph.
- Right-click a column heading to display or hide a specific column. Click a column heading to sort its data. See *Capture Engine details tab columns* on page 356 for a description of the available columns.
- Right-click a capture session or parent capture to display the following options:
  - *View*: Loads the selected capture session into the Timeline graph above. Only a capture session, and not a parent capture, can be loaded into the Timeline graph.
  - *Delete*: Removes the selected capture and all of its capture sessions, packet data, and statistics from the capture storage space on the Capture Engine. You will be prompted to verify any deletions. Only a parent capture, and not individual capture sessions, can be deleted from the list.
  - *Delete All*: Removes all captures, capture sessions, packet data, and statistics from the capture storage space on the Capture Engine. You will be prompted to verify any deletions.
  - *Expand All*: Expands the list so that all capture sessions are displayed below the parent capture.
  - *Collapse All*: Collapses the list so that all capture sessions are hidden below the parent capture.

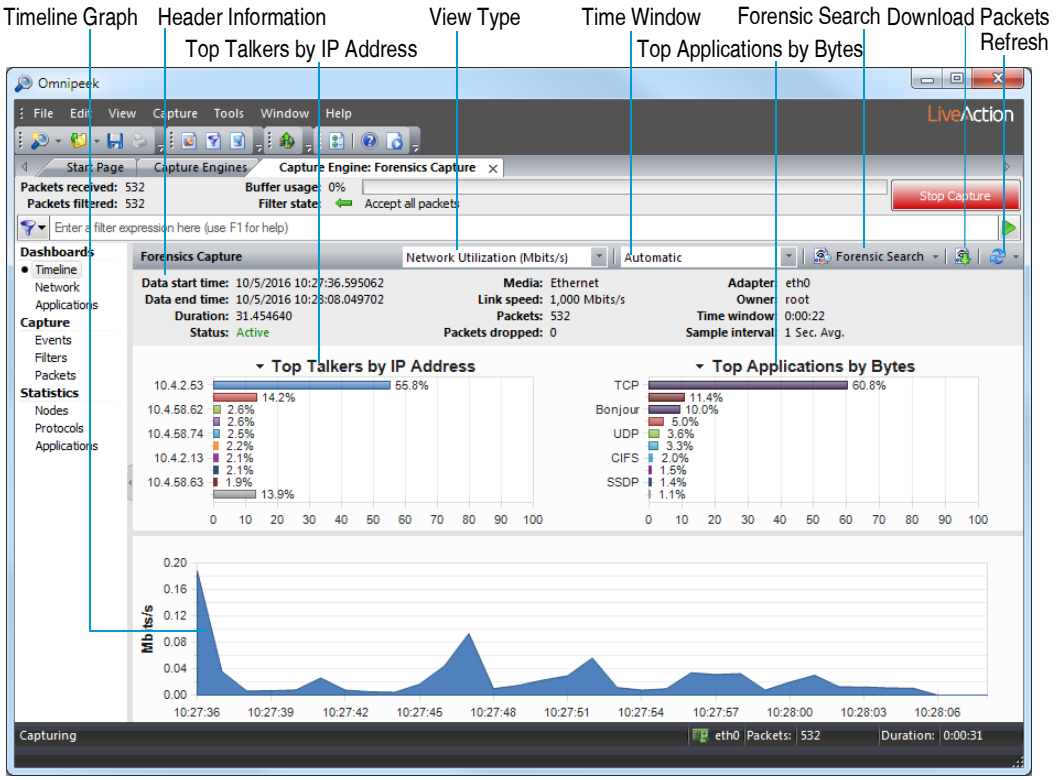
# Forensic search from the 'Forensics Capture' window

If you created a 'Forensics Capture' window (see *Forensics capture on a Capture Engine* on page 54), you can perform a forensic search directly from the capture window. Performing a forensic search from a 'Forensics Capture' window creates a new **Forensic Search** window.

**Note** You can also perform a forensic search from the *Files* or *Forensics* tab. See *Forensic search from the Files tab* on page 121 and *Forensic search from the Forensics tab* on page 124.

**To perform a forensic search from the 'Forensics Capture' window:**

1. Create a 'Forensics Capture' window as described in *Forensics capture on a Capture Engine* on page 54.
2. Click the *Timeline* dashboard to display the new 'Forensics Capture' window.




The parts of the Timeline graph are described here:

- *Header Information*: The header information displays statistics for the capture session (data start time, data end time, duration, status, packets, packets dropped, adapter, etc.).
- *Top Talkers by IP Address*: This display shows a graph of top "talkers" on the network, broken out by node for the selected area in the Timeline graph below. You can right-click inside the display to display top talkers by *Physical Address*, *IP Address*, or *IPv6 Address*; or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the node.
- *Top Applications*: This display shows a graph of top applications on the network for the selected area in the Timeline graph below. You can right-click inside the display to toggle the display with the Top Protocols display, or to select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the application.
- *Top Protocols*: This display shows a graph of top protocols on the network for the selected area in the Timeline graph below. You can right-click inside the display to toggle the display with the Top Applications display, or select a *Bar* or *Pie* display. Mouse over a bar (or slice) of the graph to view a tooltip with additional details for the protocol.
- *Timeline graph*: The Timeline graph displays the data of the capture window. By default, the graph shows utilization in Mbits/s, but other statistics can be graphed as well by selecting the *View* type.

  Here are descriptions of other parts of the Timeline graph:

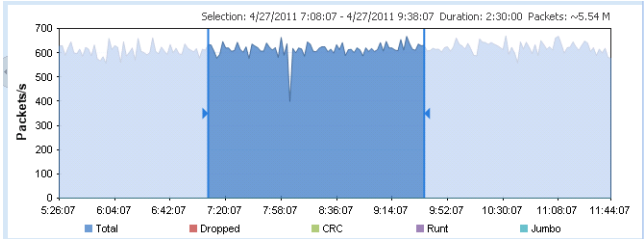
  - Right-click inside the graph to perform a forensic search (see *Forensic search* below), download selected packets to a capture file, refresh the window, or choose a different graph format: *Bar*, *Stacked Bar*, *Skyline*, *Area*, *Stacked Area*, *Line*, *Line/Points*, *Linear*, and *Logarithmic*. Additionally, you can also toggle displaying the minimum and maximum points for each series on the graph.

  - Mouse over a data point in the graph to view a tooltip displaying timestamp and size information (e.g., time and rate, time and packet size, etc.).
  - Any time there is more data than can be displayed on the screen, a scroll bar appears below the graph and allows you to view different points of time in the graph. (If the *Time window* is set to *Automatic*, the scroll bar will never appear.)
  - If the *Time window* is set to anything other than *Automatic*, a scroll bar appears below the graph and allows you to view different points of time in the graph.
- *View type*: Select the type of statistics to display in the Timeline graph. You can select from:
  - *Network Utilization (Mbits/s)*
  - *Network Utilization (Packets/s)*
  - *Unicast/Multicast/Broadcast*
  - *Packets Sizes*
  - *VLAN/MPLS*
  - *Protocols (Mbits/s)*
  - *Protocols (Packets/s)*
  - *Applications (Mbits/s)*
  - *Call Quality*
  - *Call vs. Network Utilization*
  - *Wireless Packets (Packets/s)*
  - *Wireless Retries (Packets/s)*

**Note** To display statistics for a *Call Quality* and *Call vs. Network Utilization* view type, the *VoIP Stats* option must be selected when the capture was created and configured in the *General* options of the **Capture Options** dialog. See *Configuring general options* on page 31.

- *Time window*: Select the time interval to display in the Timeline graph. By default, *Automatic* is selected to display the optimum window based on the available data. Intervals from *5 Minutes (1 Sec. Avg.)* to *24 Hours (5 Min. Avg.)* are also available.
- *Forensic search*: Click to display the **Forensic Search** dialog where you can adjust the forensic search settings. Click the small down arrow next to *Forensic search* to display custom or pre-configured settings for performing a forensic search. You can change any option prior to clicking **Start**:
  - *Custom*: Creates a **Forensic Search** window based on the customized settings that you configure.
  - *Overview*: Creates a **Forensic Search** window based on settings that display an overview of the selected data in the capture session.
  - *Packets*: Creates a **Forensic Search** window containing a packets-only view.
  - *Expert*: Creates a **Forensic Search** window based on settings that are optimized for *Expert* analysis.
  - *Voice & Video*: Creates a **Forensic Search** window based on settings that are optimized for *Voice & Video* analysis.
- *Download Packets*: Click to download the packets from the selected time range.
- *Refresh*: Click to refresh the screen. For an active capture session, you can also set an automatic refresh interval by selecting an interval from the drop-down list to the right of **Refresh**.

3. In the Timeline graph, drag to select the area of the capture you wish to search. If no area of the graph is selected, the entire capture is selected by default.



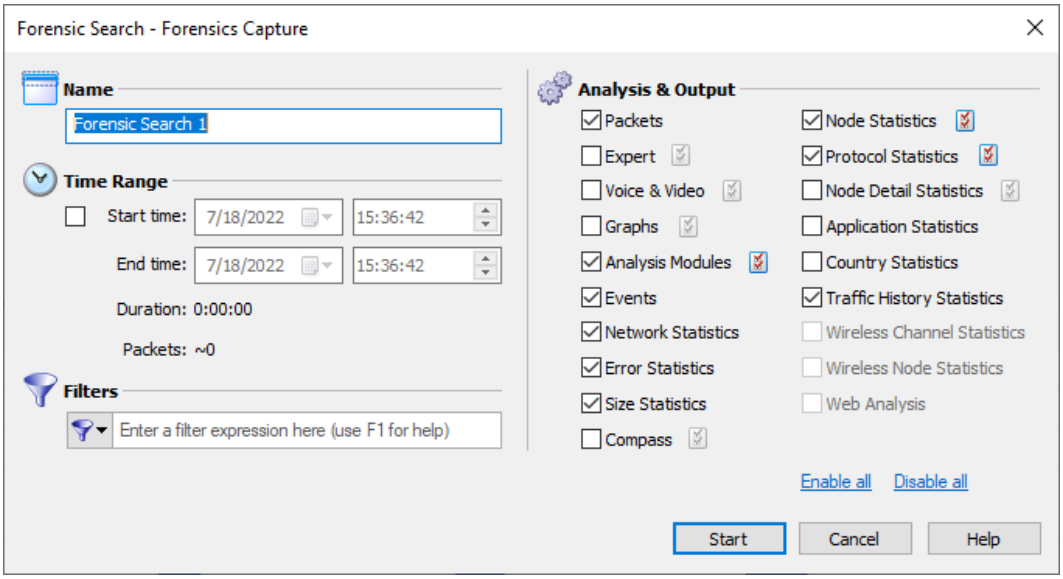

**Note** The packet count displayed above the Timeline graph is an approximation of the packets currently selected.

**Tip** You can adjust the exact time range from the **Forensic Search** dialog.

To select the entire capture-to-disk range on a Timeline graph, simply press the Escape key on the keyboard.

4. Click **Forensic Search** (or click the small down arrow next to **Forensic Search** and select the type of forensic search you wish to perform). The **Forensic Search** dialog appears.

**Note** Selecting one of the pre-defined types of forensic searches displays the **Forensic Search** dialog with the *Analysis & Output* options pre-configured for that type of forensic search. You can change any option prior to clicking **Start**.



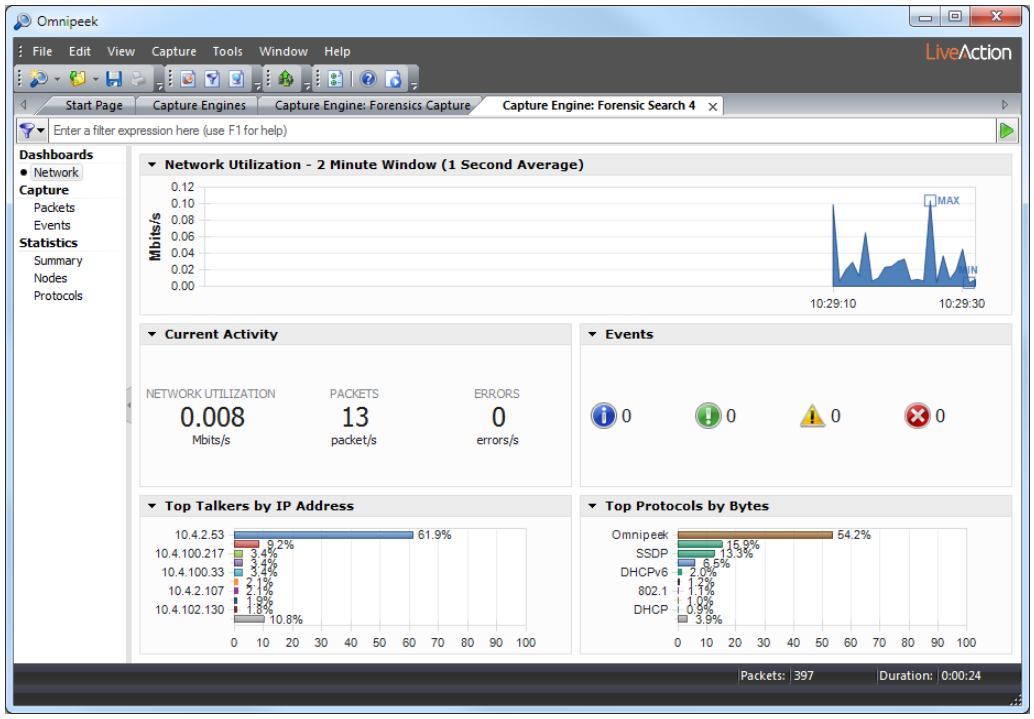

5. Complete the dialog to specify the criteria for extracting data from the selected capture:
   - *Name:* Enter a name for the forensic search.
   - *Time Range:* Select this option and then configure the start and end times to extract the data.
     - *Start time:* Set the start date and time for extracting data.
     - *End time:* Set the end date and time for extracting data.
     - *Duration:* Displays the amount of time between the specified start and end times.
   - *Filters:* Click to select a filter from the display list. All packets will be accepted if no filters are applied to the forensic search.

To create an advanced filter, click *Filters* and select filters, operators, or expressions from the display. For detailed instructions, please see *Creating filters using the filter bar* on page 106.

- *Analysis & Output:* Select one or more of the options to enable and display that particular view in the new **Forensic Search** window. For various *Analysis & Output* options that have additional configurable settings, click the submenu to the right of the option.

6. Click **Start**. A new **Forensic Search** window appears along with two progress bars at the top of the window. (Clicking **Stop** stops the search and then completes the processing of the packets.)

   Once the processing of the packets is complete, the progress bars go away and the new **Forensic Search** window is populated with the data found based on the criteria you selected above. The name of the **Forensic Search** window is added to the list of currently active forensic searches in the *Forensic Searches* tab.




7. From the new **Forensic Search** window, you can further narrow down the data by performing any of the post-capture analysis methods described earlier.

# Using the Distributed Forensic Search wizard

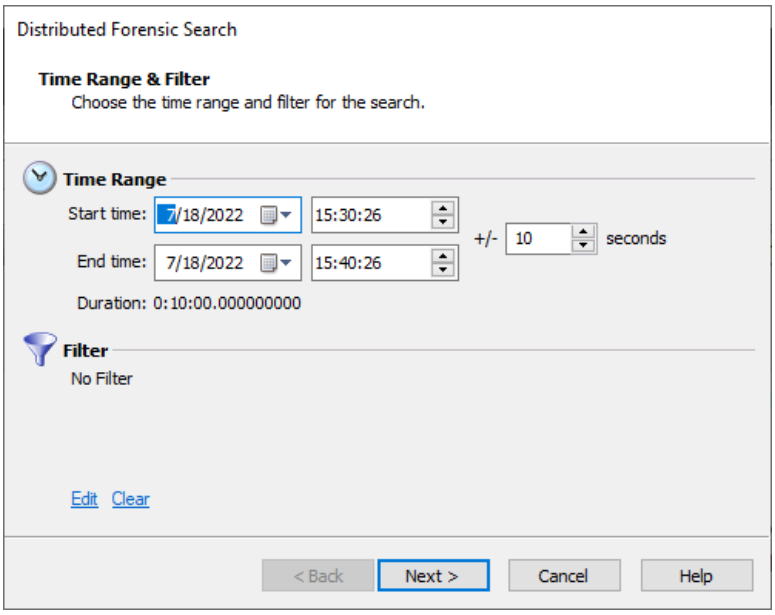
The Distributed Forensic Search wizard lets you perform a forensic search across multiple Capture Engines, download packet files from selected Capture Engines, and then combine the downloaded packet files into a single larger merged packet file.

**To access the Distributed Forensic Search wizard:**

- On the **Tools** menu, click **Distributed Forensic Search**.... The **Time Range & Filter** dialog of the Distributed Forensic Search wizard appears. See *Time range & filter* on page 135.

## Time range & filter

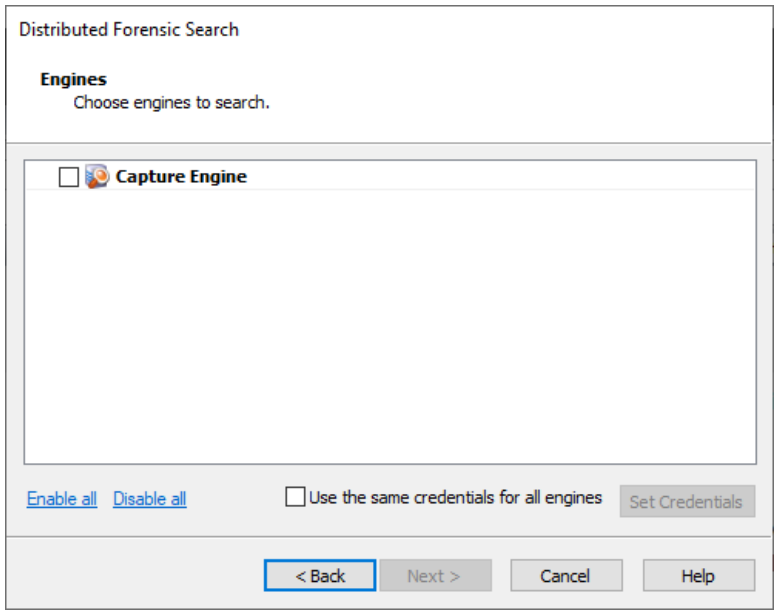
The **Time Range & Filter** dialog of the wizard lets you choose a time range and filter to apply to your search.




- *Start time*: Select or enter the start date and time of the range you wish to search.
- *End time*: Select or enter the end date and time of the range you wish to search.
- *+/- seconds*: Select or enter the number of seconds to add to the search both before the start time and after the end time.
- *Duration*: Displays the amount of time between the start and end time specified.
- *Filter*: Displays any filters currently defined for the search.
- *Edit*: Click to display the Edit Filter dialog, where you can define simple and advanced filters based on any combination of addresses, protocols, and ports. A packet must match all of the conditions specified in order to match the filter.
- *Clear*: Click to remove any filters currently defined for the search.

## Engines

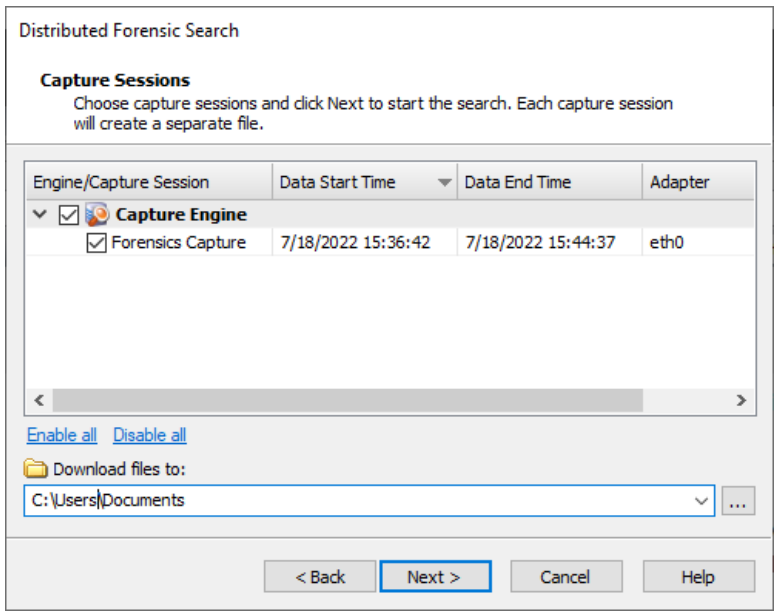
The **Engines** dialog of the wizard displays the groups and Capture Engines currently listed in the Omnipeek Capture Engines window.




- Select the check box of the Capture Engines you want to include in your forensic search. If you are not already connected to the Capture Engine, you are first prompted to connect to the Capture Engine by entering domain, username, and password information.
- *Enable all*: Click this option to select the check box of all groups and Capture Engines displayed in the dialog.
- *Disable all*: Click this option to clear the check boxes of all groups and Capture Engines displayed in the dialog.

## Capture sessions

The **Capture Sessions** dialog of the wizard displays the capture sessions which are available on the selected Capture Engines during the specified time frame.




- *Column header*: Displays the column headings currently selected. Right-click the column header to enable/disable columns. Here are the available columns:

- *Engine/Capture Session*: The capture sessions available from the Capture Engines selected earlier. Select the check box of the capture sessions you want to include in your search. Capture Engine captures that have both '*Capture to disk*' and '*Timeline Stats*' enabled in the capture options appear in the *Capture Sessions* dialog.
- *Session Start Time*: The start time of the capture.
- *Data Start Time*: The start time of the capture session data.
- *Data End Time*: The end time of when data last appeared in the capture session.
- *Size*: The size (in MB) of the capture session.
- *Packets*: The number of packets in the capture session.
- *Packets Dropped*: The number of dropped packets in the capture session.
- *Media*: The media type of the capture session.

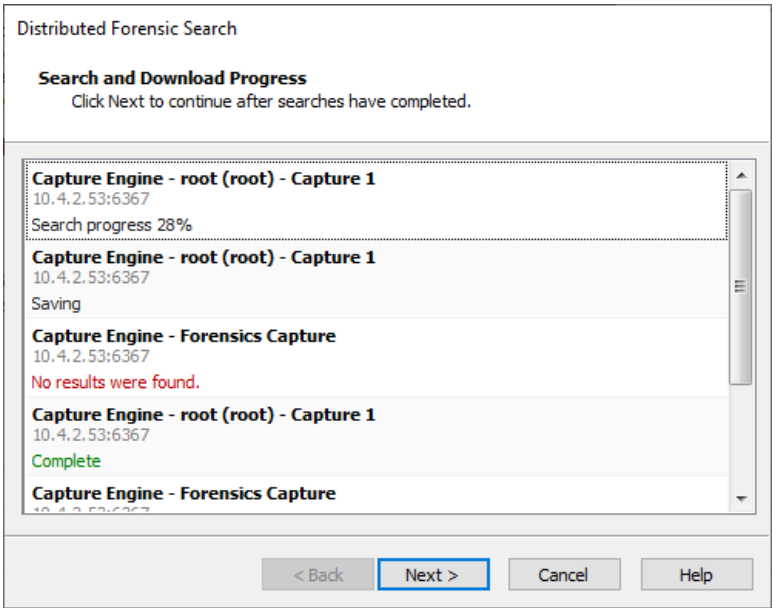
**Note** Although you can download packet files of different media types, you can only merge packet files of the same media type (Ethernet or wireless).

- *Adapter*: The name of the adapter used for the capture session.
- *Adapter Address*: The address of the adapter used for the capture session.
- *Link Speed*: The link speed of the adapter used for the capture session.
- *Owner*: The owner name of the adapter used for the capture session.

- *Enable all*: Click this option to select the check box of all Capture Engines and capture sessions displayed in the dialog.
- *Disable all*: Click this option to clear the check box of all Capture Engines and capture sessions displayed in the dialog.
- *Download files*: Choose the location of where to save **.wpz* files created for each of the selected capture sessions.

## Search and Download Progress

The **Search and Download Progress** dialog of the wizard displays the status for saving **.wpz* files used for forensic searches.



Each entry in the dialog lists the following:

- Capture Engine and capture session name
- IP address and port
- Current status for each file

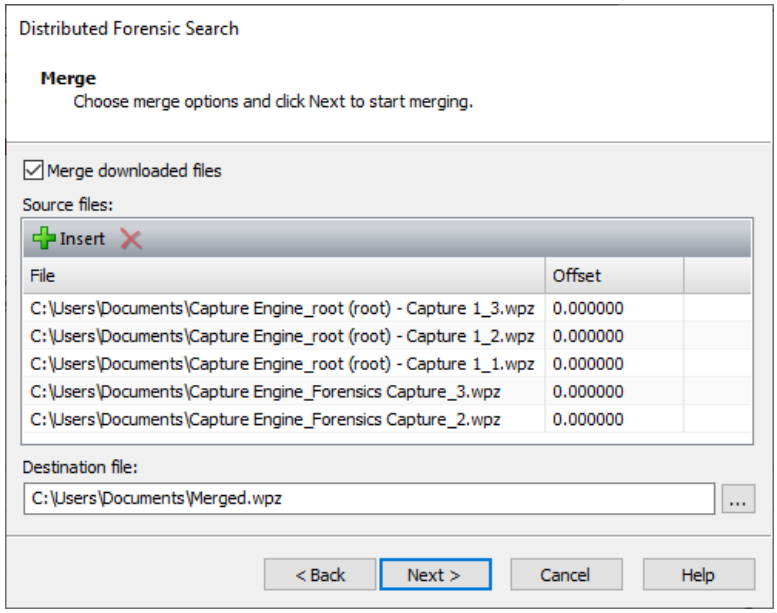
The progress status messages are as follows:

- *Search Progress*: Progress of the forensic search, based on the time range and filter specified in the Wizard
- *Saving*: Search results are saved as a *.wpz* file on the engine
- *Deleting Search*: The forensic search is deleted on the engine
- *Download Progress*: The *.wpz* file is downloaded to the Omnipeek computer
- *Deleting Remote File*: The *.wpz* file is deleted from the engine
- *Complete*: The entire process is complete. Once you see *Complete* for all capture segments, click **Next** to continue
- *No results were found*: The forensic search did not find any packets that matched the defined forensic search parameters.

> **Tip** You can cancel the progress of any one of the capture segments by right-clicking and selecting **Cancel**. You can cancel any of the above stages, except for the *Saving* stage.

## Merge

The **Merge** dialog of the wizard lets you configure merge options for the downloaded packet file(s). You can choose to keep the packet files separate (one per engine), or merge them into a single larger packet file.



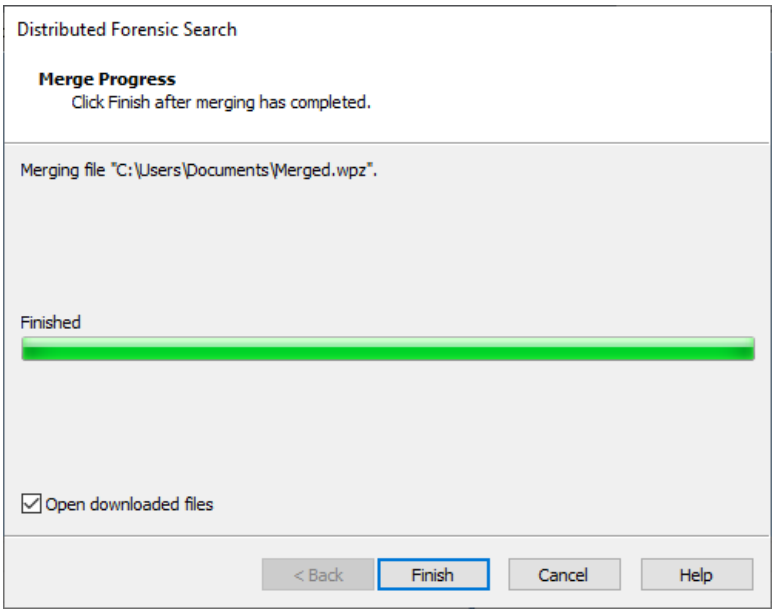

- *Merge downloaded files*: Select this check box to merge the packets in the downloaded packet files together into a single larger packet file, sorted by the times in the packets (adjusted by the time offsets, if applicable). If this option is not selected, the packet files are not merged and each downloaded packet file is opened in its own capture window.
- *Insert*: Click to add one or more packet files to the list of files (you can also drag files into the list of files). The files must be of a supported LiveAction packet file format (**.pkt, *.wpz, *.apc, *.wpc*).

Additionally, if you want to merge the packet files, the files must be of the same media type (Ethernet or wireless).

- *Delete*: Click to remove the selected packet file from the list of files.
- *File*: Displays the name of the packet file.
- *Offset*: Displays and allows you to edit the offset value (in seconds) of the packet file. Offset values are used to accommodate for different times on different Capture Engines. To change the offset value, click inside the *Offset* field for the packet file.
- *Destination file*: Displays the name and location for the merged packet file. To name and choose the location for the merged packet file, click the selection box to the right of this field.

## Merge Progess

This **Merge Progress** dialog of the wizard displays merge status. Once the merge has completed, click **Finish**.




- *Open downloaded files*: Opens the merged file in Omnipeek.

CHAPTER 8

# Expert Analysis

## In this chapter:

# About Expert analysis

The Expert views in Omnipeek and Capture Engines provide expert analysis of response time, throughput, and network applications in a flow-centered view of captured traffic. Expert views also provide a detailed view of every transaction, noting any events encountered in each individual conversation or flow. You can drill down to select the packets associated with a particular event or with any conversation in **Expert** views.

The **Expert EventFinder** scans traffic in a capture window, looking for key events. Individual network events are included in the Expert EventFinder, which displays and explains anomalies and sub-optimal performance at all layers of the network. See *Expert EventFinder* on page 152.

The **Flow Visualizer** presents a variety of ways to look at an individual flow, providing a snapshot all of the packets that were in the buffer for a particular flow at the time the window was created. See *Flow Visualizer* on page 154.

The **Network Policy** dialog allows you to configure network policies and find violations of these policies in a capture window. Network Policy is only supported for wireless captures. See *Network policy settings* on page 167.

# Expert views and tabs

The **Expert** view of a capture window has two data areas. The upper pane displays conversations or flows in the following formats:

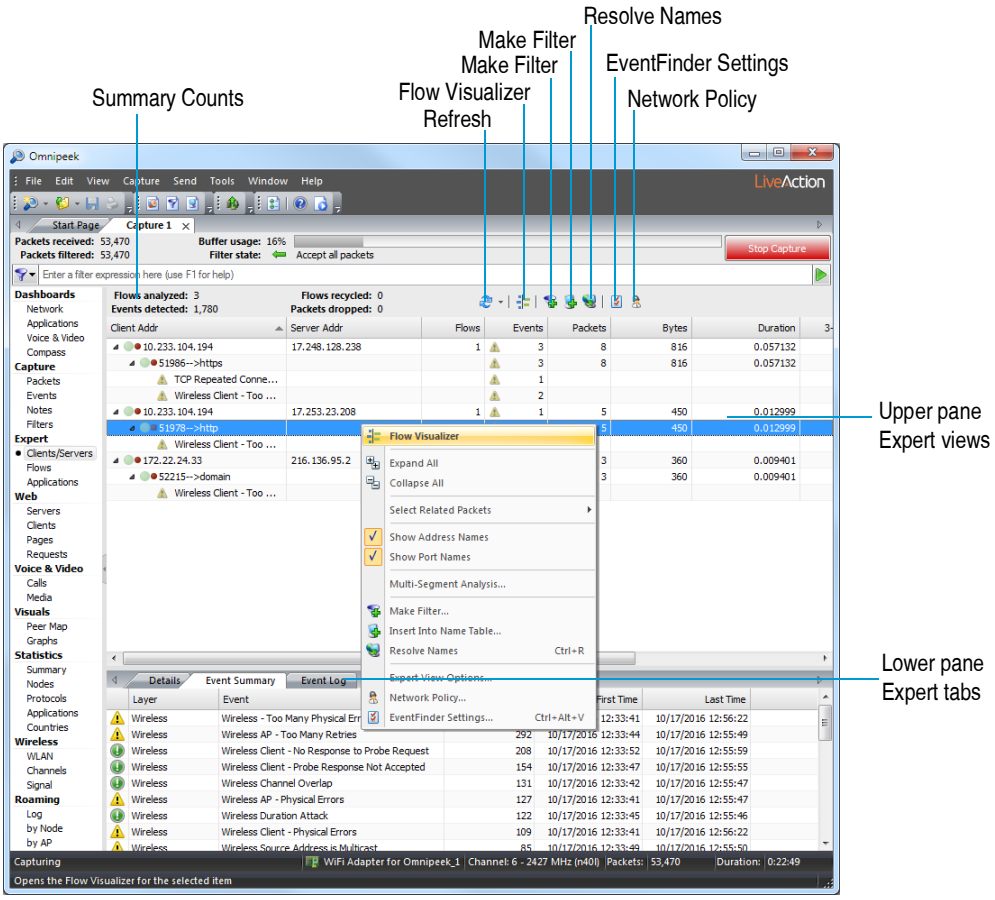
- *Expert Clients/Servers view*
- *Expert Flows view*
- *Expert Applications view*

The lower pane contains three tabs which present additional information about the selected rows in the upper pane:

- *Details tab*
- *Event Summary tab*
- *Event Log tab*

**Note** The terms "conversation," "stream," and "flow" are synonymous. For example, the end-to-end IP address and UDP or TCP ports form a unique conversation, stream, or flow for a given application.

The parts of the **Expert** view window are identified below.




- *Flows analyzed, Events detected:* Shows summary counts in this capture.
- *Flows recycled, Packets dropped:* Shows summary counts which relate to the Expert's use of memory. See *Expert memory usage* on page 153.
- *Refresh*: Updates the Expert with the latest packet information contained in the capture buffer. You can also choose a refresh interval from the drop-down list.
- *Flow Visualizer*: Displays the Flow Visualizer, which presents a variety of ways to look at individual flows from the **Packets**, **Expert** and **Web** views, providing a static snapshot of the packets that were in the buffer for a particular flow at the time the window was created.
- *Make Filter:* Opens the **Insert Filter** dialog to create a filter based on the selected packet.
- *Insert Into Name Table:* Opens a dialog to add the selected item into the Name Table. From the dialog, you can also select Node type icons that will appear to the left of the selected packet. For example, *Workstation*, *Server*, *Router*, or *Access Point*.
- *Resolve Names:* Checks the DNS server for a name to match the supplied address.
- *Expert EventFinder Settings:* Opens the **Expert EventFinder Settings** window, in which you can configure individual expert events. See *Expert EventFinder* on page 152.
- *Network Policy:* Opens the **Network Policy** dialog, in which you can configure expected behavior for the program and compare this to actual events. See *Network policy settings* on page 167.
- *Right-click options:* These options include:
  - *Flow Visualizer* (see *Flow Visualizer* on page 154)
  - *Save Flow Statistics* (see *Expert save functions* on page 151)
  - *Select Related Packets* (see *Expert view packet selection* on page 151)
  - *Expert View Options* dialog (see *Expert view options dialog* on page 149)

- *Column display:* To sort, hide, or rearrange column display, see *Configuring column display* on page 149.

  For a complete list and description of the columns available in **Expert** views, see *Expert view columns* on page 339.

  **Tip** To toggle this option directly in the **Expert** views, on the **View** menu, point to **Display Format**, and then click **Show Port Names**.

## Expert events

For a complete list of expert events, see Appendix E, *Expert Events*.

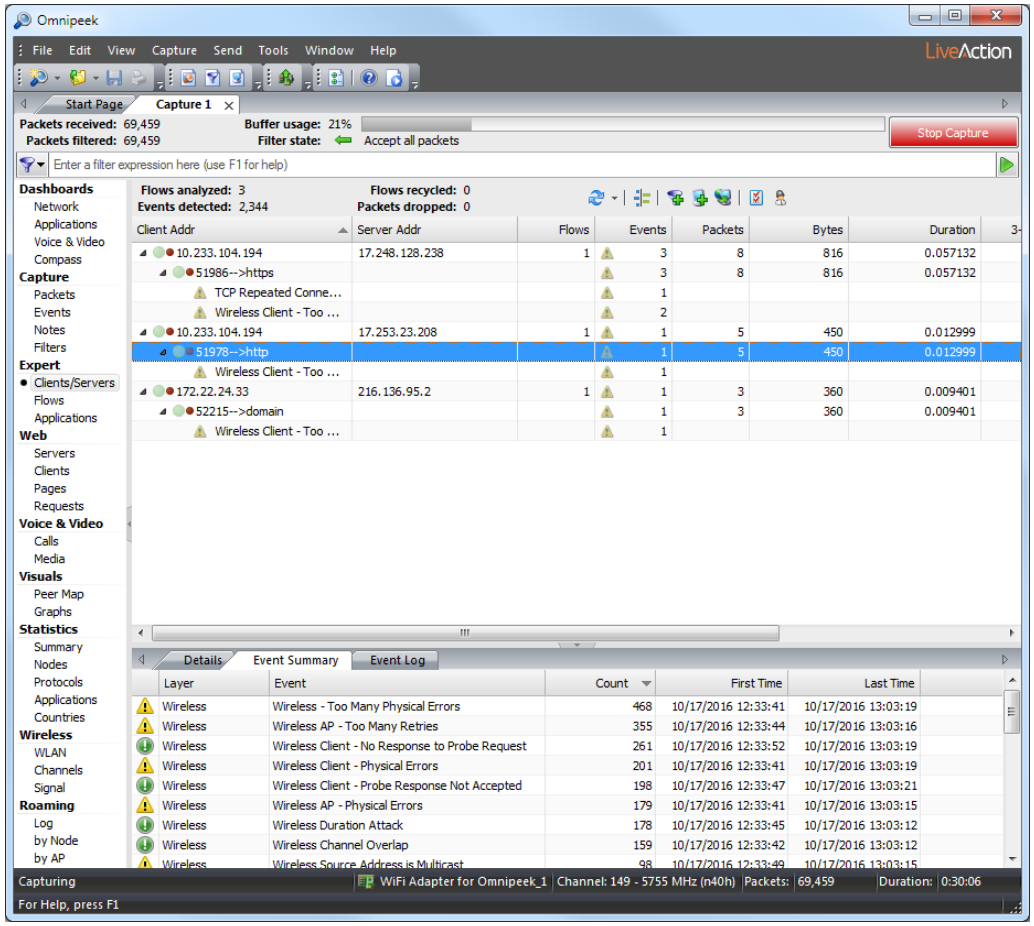
## Expert Clients/Servers view

The Expert **Clients/Servers** view makes it easy to track events and to see them in the context of peer-to-peer or client-server traffic patterns.

### To display the Clients/Servers view:

Select *Clients/Servers* under **Expert** in the navigation bar of a capture window. The hierarchy of information in this view is displayed as follows:

- Pairs of nodes (addresses)
  - Individual flows between these addresses
    - Individual events under specific flows.



**Tip** Right-click in the upper pane and choose **Expand All** to display the hierarchical levels

The Expert *Clients/Servers* view shows green or white traffic indicator lights showing activity for the related nodes:

- A green light indicates that the node is "active" (a packet has been received in the last few seconds).
- A light green light indicates that the node is "inactive" (a packet has not been received in the last few seconds).

Smaller LED lights appear to the right of the traffic indicators when an event has been detected:

- A red LED indicates one or more events whose severity is Major or Severe.
- A yellow LED indicates one or more events whose severity is Informational or Minor.

**Tip** Place the cursor over these indicators to show a data tip with details of recent activity and the severity of the events detected.

The Events column of the Expert *Clients/Servers* view shows an icon for the most severe event detected.

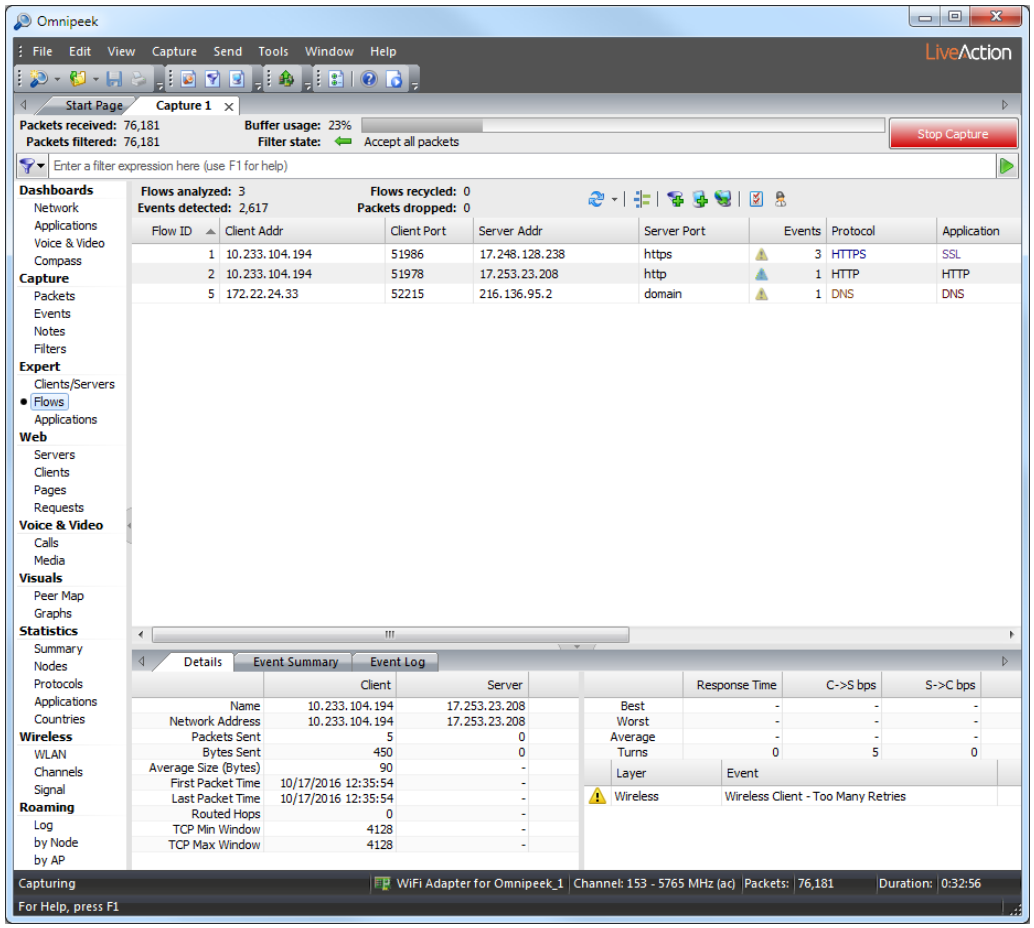
For a complete list and description of the columns available in the *Clients/Servers* view, see *Expert clients/servers, flows, and application view columns* on page 339.

## Expert Flows view

The Expert *Flows* view displays each flow independently in a flat table. Flows are numbered in the *Flow ID* column in the order in which they are identified by the expert. This simplified view allows you to compare flows to one another, regardless of the node pair to which they belong.

**To display the Flows view:**

- Select *Flows* under **Expert** in the navigation bar of a capture window.




For a complete list and description of the columns available in the *Flows* view of the expert, see *Expert clients/servers, flows, and application view columns* on page 339.

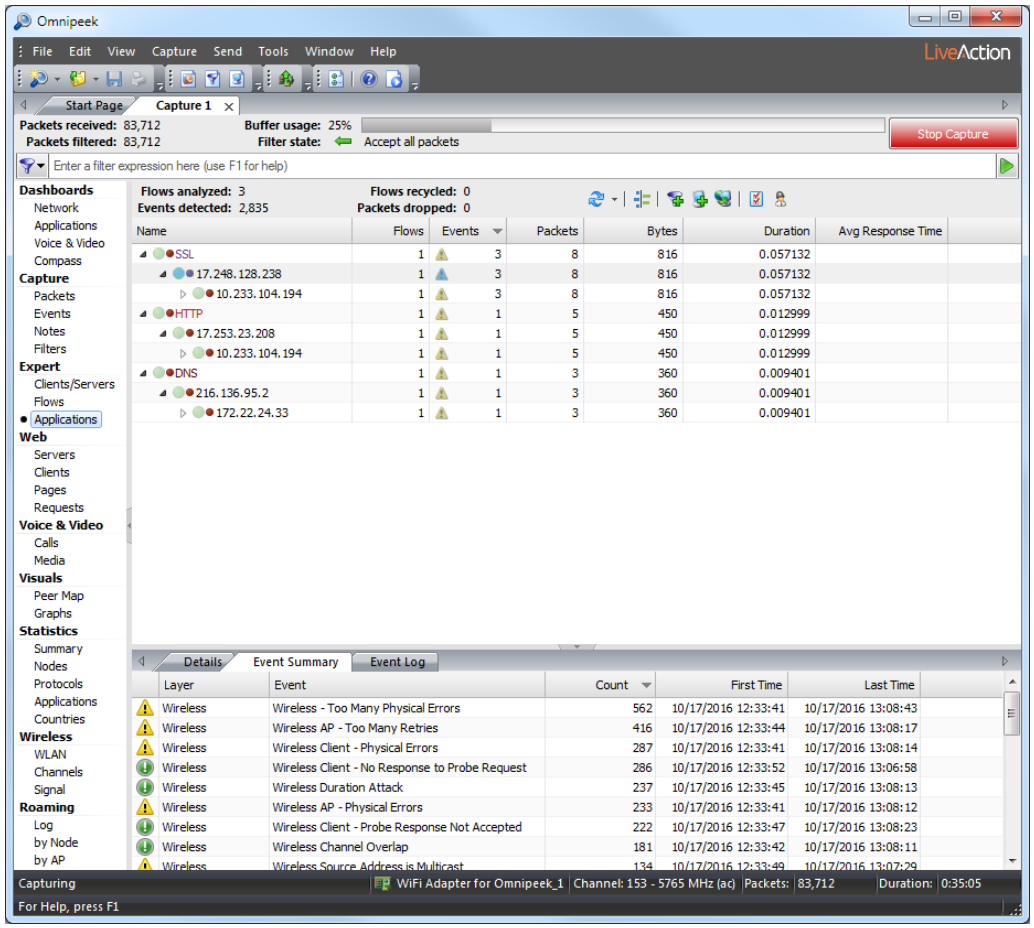
## Expert Applications view

The Expert *Applications* view categorizes each flow by application. Flows are grouped together by application, providing a hierarchical view of the use of each application, first by server, then by client, and then by port. This view allows you to see who is using each application on your network and how each application is performing. The hierarchy in the *Applications* view is displayed as follows:

- Application: applications like 'eBay,' 'Facebook,' 'Instagram,' etc.
  - Server: IP addresses of servers using above protocol
    - Client: IP addresses of clients connected to above server (followed by Individual flows between IP addresses and Individual Events)

µ Qpsu; Qpsu beesfttft pg uif dmjfou boe tfsw
qpsu mjtufe jt uif tfswfs qpsu/ Uif bsspx c

To display the *Applications* view, select *Applications* under **Expert** in the navigation bar of a capture window.




For a complete list and description of the columns available in the **Applications** view, see *Expert clients/servers, flows, and application view columns* on page 339.

## Expert lower pane tabs

Additional information is provided in the nested tabs for a row selected in the upper panes of the **Expert** views.

### *Details tab*

The *Details* tab contains additional details for a single flow or a single pair of nodes selected in the upper pane, identified as *Client* and *Server*.

For complete descriptions of the items in the *Node details* tab, see *Expert node details tab rows and columns* on page 342.

> **Tip** Set the units for throughput in the **Expert View Options** dialog. See *Expert view options dialog* on page 149.

### *Event Summary tab*

The *Event Summary* tab shows the number of times each type of event was encountered. The header shows the *Total* number of events identified. The *Event Summary* columns are described below.

- *Severity Icon:* The severity of the event, as set in the *Expert EventFinder* window.
- *Layer:* The network layer to which events of this type belong.

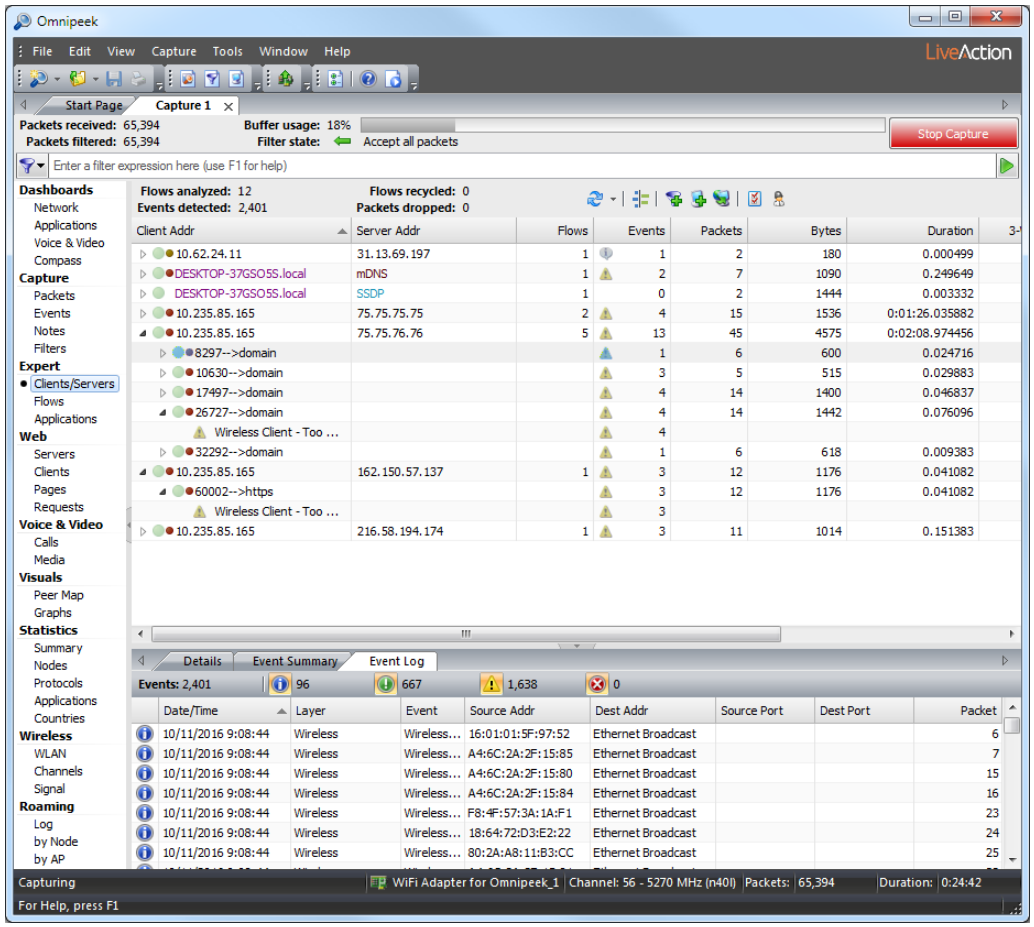
- *Event:* The EventFinder event definition which identified this packet as an event (for example, *TCP Retransmission*).
- *Count:* The number of events of this type observed so far.
- *First Time:* The date and time of the first time the event of this type was observed.
- *Last Time:* The date and time of the last time the event of this type was observed.

## Event Log tab

The *Event Log* tab shows a count of total *Messages* in the log, and counts of events classified by their level of severity. These counts are shown beside the icon for that severity level (Informational, Minor, Major, and Severe).

Click the buttons associated with each level of severity to toggle the display of events.

**Note** The counts will continue to update, even if you choose not to display events of a particular severity.




The **Event Log** can display up to 50,000 entries, subject to the limits you established in the *Memory Usage* section of the *Expert EventFinder*. See *Expert memory usage* on page 153.

For a complete list and description of the information available in each of the columns, see *Expert event log columns* on page 341.

# Configuring Expert views

The Expert **Columns** dialog let you show, hide, or rearrange columns in **Expert** views. The **Expert View Options** dialog and the **Client/Server Colors** and **Units** options of the Omnipeek **Options** dialog allow you to control the appearance and colors of **Expert** view features. You can select subsets of packets for further analysis according to a variety of options and save flow statistics and summary data in several formats.

## Configuring column display

**To rearrange display of columns in Expert views:**

- Sort the contents of any column in ascending or descending order.
- Double-click the right edge of a column header to automatically resize the column area. Hold down the **Shift** key and double-click the right edge of any column header to automatically resize all of the columns.
- Use drag and drop in the upper pane of the **Expert** view to change column order.

**To show or hide columns in Expert views:**

- Right-click the column headers to select the columns you wish to display. You can select **Show all Columns** to display all available columns.
- Alternatively, right-click the column header and choose **Columns...**. The **Columns** dialog appears.
  a. Check or uncheck individual column titles to show or hide those columns. You can also:
     - Drag individual columns up or down to change their order in the view.
     - Right-click in the **Columns** dialog and choose **Check All** or **Uncheck All** to show or hide all columns.
  b. Click **OK** to apply your changes to the **Expert** views.

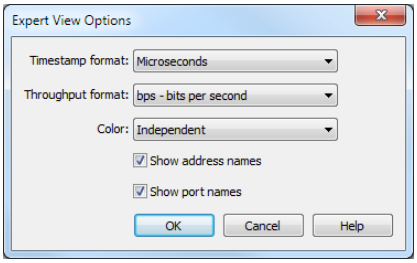
> **Note** For a complete list and description of available columns in **Expert** views, see *Expert view columns* on page 339.

## Expert view options dialog

The **Expert View Options** dialog allows you to control the appearance of the upper pane of the **Expert** view.

**To use the Expert View Options dialog, follow these steps:**

1. Right-click in Expert View and choose **Expert View Options...**. The **Expert View Options** dialog appears.




2. Fill in the timestamp, throughput, and color parameters. You can also choose to show address or port names.

> **Note** Click **Help** on the dialog to learn about the available options and settings.

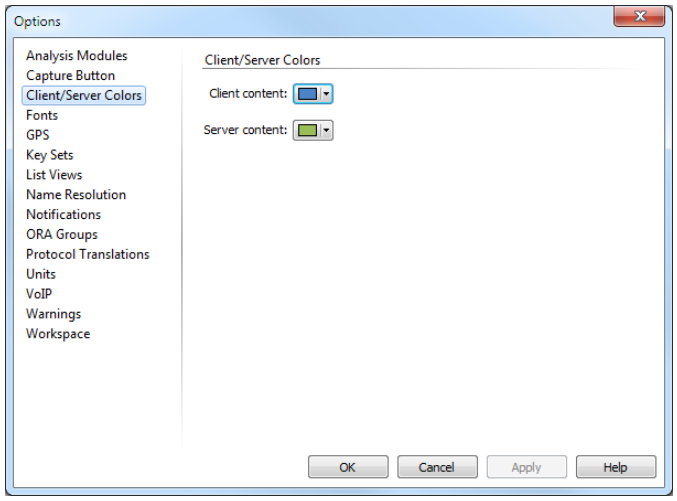
3. Click **OK** to accept your changes.

# Setting client/server colors

The **Client/Server Colors** options of the **Options** dialog lets you control the appearance of client/server data displayed in capture windows.

**To select color display of clients and servers:**

1. On the **Tools** menu, click **Options**.
2. Select the **Client/Server Colors** options.




3. Select colors for clients and servers.

   These color settings appear in all **Expert** views and **Flow Visualizer** tabs that have client/server displays. For example, see *Packets tab* on page 154. They also appear in **Web** views that have client/server displays. For example, see *Requests view* on page 191.

4. Click **OK**.

> **Note** You can also configure global client/server color options in the **Flow Visualizer Options** and **Expert View Options** dialogs.

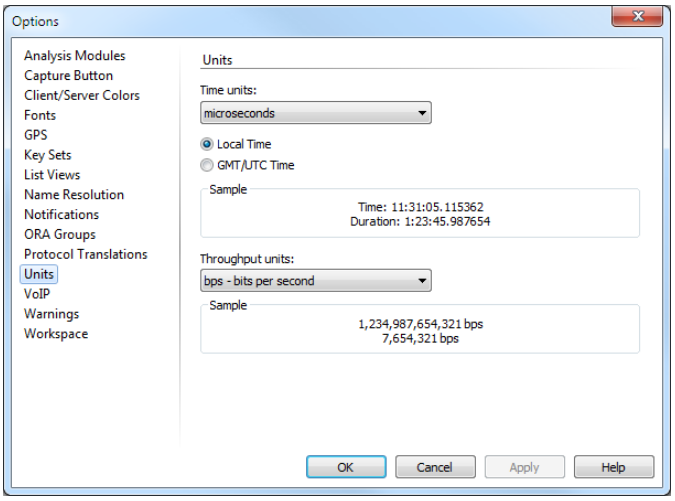
# Setting units for time and throughput

The **Units** options of the **Options** dialog lets you choose the precision for all time displays in milliseconds, microseconds, or nanoseconds in capture windows.

> **Note** Some views, such as **Flow Visualizer** graphs, ignore the time/throughput settings and automatically choose an appropriate display precision. See the **Flow Visualizer** *Graphs tab* on page 158.

**To select units for time and throughput:**

1. On the **Tools** menu, click **Options**.
2. Select the **Units** options.




3. Complete the dialog:
   - *Time units:* Select milliseconds, microseconds, or nanoseconds.
   - Select *Local Time* or *GMT/UTC Time* (or, on the **View menu**, point to **Display Format**, and then click **Local Time**).
   - *Throughput units:* Choose the units for throughput displays from the drop-down list.
4. Click **OK**.

**Note** You can also configure global time unit options in the **Packet List Options** dialog, **Flow Visualizer Options** dialog, and **Expert View Options** dialog.

**Note** Omnipeek time precision settings do not affect Capture Engine data.

## Expert view packet selection

Right-click and choose **Select Related Packets** by one of the following options:

- *By Client:* This option selects all packets to or from the client IP address.
- *By Server:* This option selects all packets to or from the server IP address.
- *By Client and Server:* This option selects all packets between the client and server IP addresses.
- *By Port:* This option selects all packets between the client and server IP address and ports. (This option will usually produce the same results as selecting *By Flow*, unless a node pair reuses ports for multiple TCP connections.)
- *By Flow ID:* This option selects all packets by Flow ID.
- *By Event Type:* This option selects all packets flagged with the selected event. Choosing **Select Related Packets** from the *Event Summary* tab provides the same results.

For more information on how to select related packets, see *Selecting related packets* on page 115.

## Expert save functions

Right-click and choose **Save Flow Statistics...** in the *Clients/Servers*, *Flows*, or *Application* views of the Expert to open a **Save As** dialog with the following file format choices:

- *Text (view delimited) *.txt*
- *CSV (Comma delimited) *.csv*

You can also right-click and choose **Save Event Summary...** or **Save Event Log...** in the *Event Summary* or the *Event Log* tabs. The same two file format types are supported.

The content and arrangement of the saved files match the content of the pane being saved. You can hide or display optional columns or change column order to control the information that will be included in the saved file.

**Note** The **Save As** dialogs for the Capture Engine **Expert** view will offer to save the files on the Omnipeek console computer.

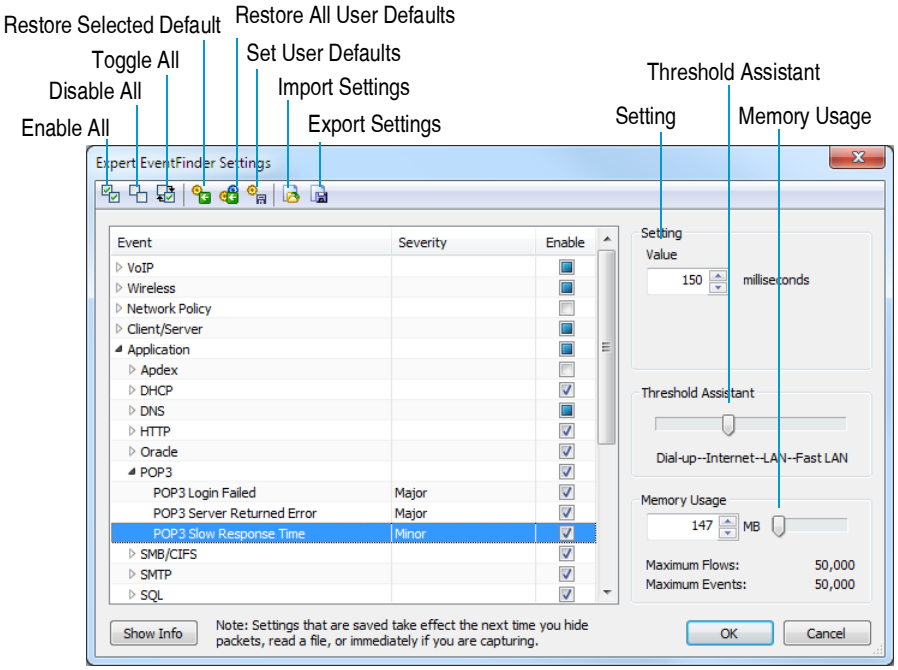
# Expert EventFinder

The EventFinder scans traffic in a capture window, looking for network anomalies and sub-optimal performance at all layers of the network, from application to physical. It also shows network events associated with VoIP calls. For a complete list of expert events, see Appendix E, *Expert Events*.

To open the **Expert EventFinder Settings** window, choose one of the following:

- Click **Expert EventFinder Settings** in the toolbar of the **Expert** view.
- Right-click and choose **EventFinder Settings...**.

The parts of the **Expert EventFinder Settings** window are identified below. The window is context-sensitive and displays only parts relevant to the selected event.




- *Enable All:* Select all of the events to be scanned in a capture window.
- *Disable All:* Deselect all of the events (none will be scanned).
- *Toggle All:* Reverse state of events between *Enable All* and *Disable All*.
- *Restore Selected Defaults:* Highlight an event or events and click to restore default values.
- *Restore All User Defaults:* Restore default values to all events.
- *Set User Defaults:* Establish the current settings as the new (user-defined) default EventFinder settings on the Omnipeek console or the Capture Engine.
- *Import Settings:* Restores a previously saved group of settings. Click **Import Settings** and navigate to the location of an *.xml settings file.

- *Export Settings:* Saves the current EventFinder settings as an *.xml file.

> **Note** When you **Import Settings** or **Export Settings** on a Capture Engine, the **Open** and **Save As** dialogs will refer to the Omnipeek console computer.

- *Event:* This column shows the events arranged under their network layers.
- *Severity:* This column shows the level of severity of notification the Expert will send when it encounters a matching event. Click the entry in the *Severity* column to set the level of severity of these notifications. See Chapter 16, *Sending Notifications*.
- *Enable:* This column allows you to enable or disable individual events or network layers by selecting the check box(es) for that layer. When only some events within a layer are enabled, a square appears in the check box for that layer.
- *Setting:* Set the *Value* and units that mark the threshold of the condition for the selected event. For example, if the *Setting Value* for *POP3 Slow Response Time* is *150 milliseconds*, then when this event is enabled, it will report any response time greater than 150 milliseconds as an event. Note that not all events require a setting value. Some, such as *DHCP Request Rejected*, simply check for a particular occurrence or packet type.
- *Threshold Assistant:* This setting helps you choose settings that can be expected to vary with network bandwidth. For example, with *POP3 Slow Response Time* as the selected event, moving the slider bar to the left will increase the setting value, allowing for the slower POP3 response times that you would expect over a *Dial-up* connection. If you move the slider bar to the right, the *Value* decreases, reflecting the faster POP3 response times you would expect over a *LAN* or *Fast LAN*, appropriate for POP3 connections over the Internet.
- *Memory Usage*: Set the maximum memory by entering the value directly in the edit box in *MB* (megabytes), or by using the slider bar to the right of the edit box. See *Expert memory usage* on page 153.
- *Show Info:* Click to see a more complete description of the event, including possible causes and remedies.

> **Tip** Click **Show Info** to display the *Description*, *Possible Causes*, and *Possible Remedies* for a selected event.

## Expert memory usage

You can set an upper limit on the system resources available to Expert Analysis functions in each individual capture window. For a Capture Engine, these resources are resident on the computer on which the particular Capture Engine capture window was created.

The *Memory Usage* section of the **Expert EventFinder Settings** window has two ways to set the maximum memory

- Enter the value directly in *MB* (megabytes)
- Use the slider bar to set the value

Values for the *Maximum Flows* and *Maximum Events* that can be analyzed using the amount of memory you have selected appear below the edit box and slider bar.

The *Maximum Flows* and *Maximum Events* represent two separate limits. When the maximum number of flows is reached, older, closed flows will be dropped to make room for new ones. If there are more active flows than this limit, no new flows will be added, but the Expert will continue to analyze existing flows, as well as look for non-flow events for all network traffic.

The *Memory Usage* feature allows the Expert to be used continuously, always presenting the most recent findings, and logging the results to the Event Log.

# Flow Visualizer

The **Flow Visualizer** presents a variety of ways to look at individual flows from the **Packets**, **Expert** and **Web** views, providing a static snapshot of the packets that were in the buffer for a particular flow at the time the window was created.

**Note** The **Flow Visualizer** is not supported from a Capture a Engine capture window.

**To open the Flow Visualizer:**

1. From a capture window (make sure the capture is stopped) or opened capture file, choose one of the following:
   - In the **Flows** view, right-click any flow and choose **Flow Visualizer** (or double-click any single flow line).
   - In the **Clients/Servers** and **Application** views, expand the list and select a flow. Right-click and choose **Flow Visualizer** (or double-click an event row).
   - In the **Packets** view, right-click a packet and choose **Flow Visualizer**.
   - In any of the **Web** views, right-click an item (Request, Page, etc.) and choose **Flow Visualizer**.

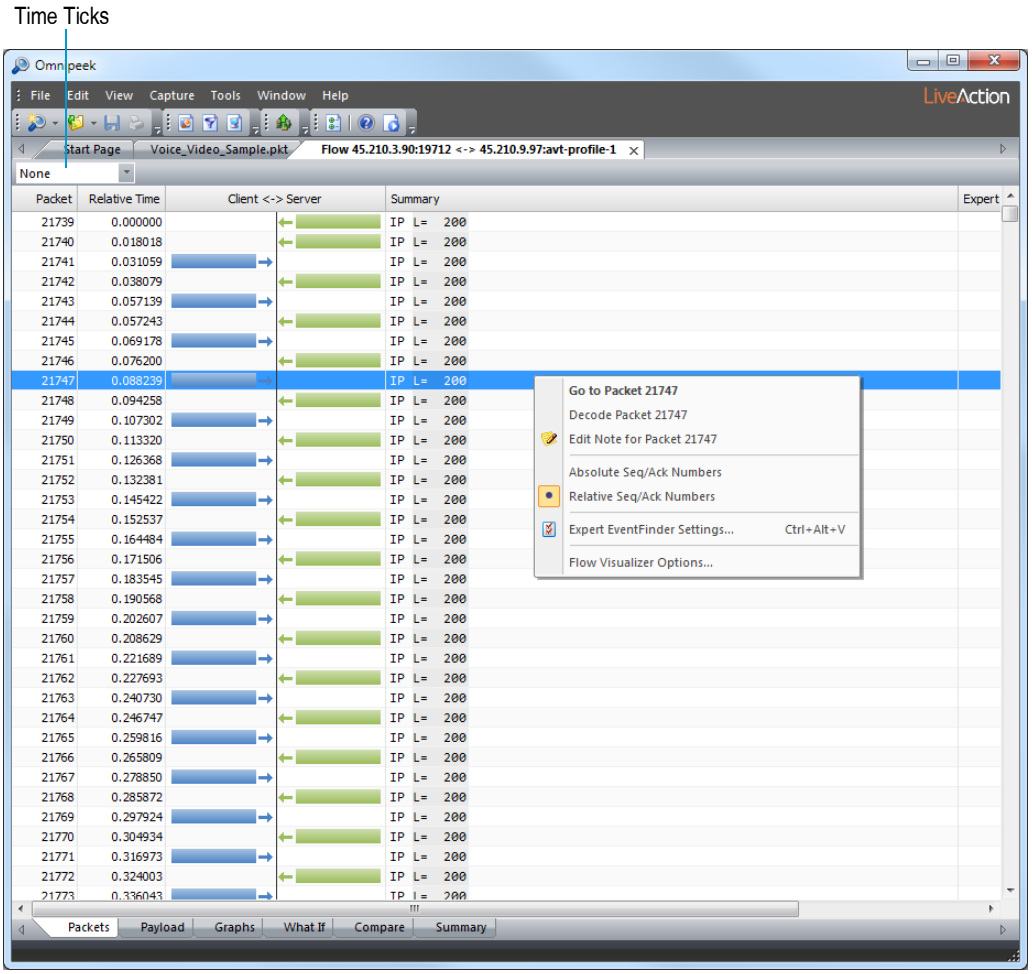
**Note** The **Flow Visualizer** menu item is not available or disabled when selecting an item which is not associated with any flow.

There are six tabs at the bottom of the **Flow Visualizer**:

- *Packets tab*
- *Payload tab*
- *Graphs tab*
- *What If tab*
- *Compare tab*
- *Summary tab*

## Packets tab

The *Packets* tab displays all of the packets for both sides of a flow.




Packets are displayed as horizontal bars in client/server colors, with arrow and position cues to show in which direction each packet was sent. In the toolbar, the Ticks drop-down list lets you display time as a vertical separation between packets. Sliced packets appear with their sliced portion dimmed.

For a complete list and description of the columns available in the *Packets* tab, see *Flow Visualizer Packets tab columns* on page 342.

## Time ticks

To create a vertical time axis within the *Packets* tab, choose a value other than *None* in the *Time Ticks* drop-down list. In the *Client <-> Server* column, the inserted tick mark rows show the delta time from the previous packet. Low-latency packets will be tightly clustered, while slow-responding, high-latency packets will be separated by a larger number of tick-mark rows.

**Note** After 9 tick-mark rows, the a final ellipsis (...) and the actual delta time is inserted.

## Relative SEQ/ACK numbers

The *Packets* tab displays SEQ and ACK numbers in the Summary column. You can use the context menu to toggle between a shorter and a longer version of these numbers.

The actual sequence (SEQ) and acknowledgement (ACK) numbers are typically 9-digit numbers from a large initial random value. For most purposes, only their sequence is significant.

Right-click and enable **Relative SEQ/ACK Numbers** in the context menu to shorten the numbers while preserving their sequence (display shows SEQ and ACK numbers starting at zero, subtracting the lowest observed number from each subsequent number).

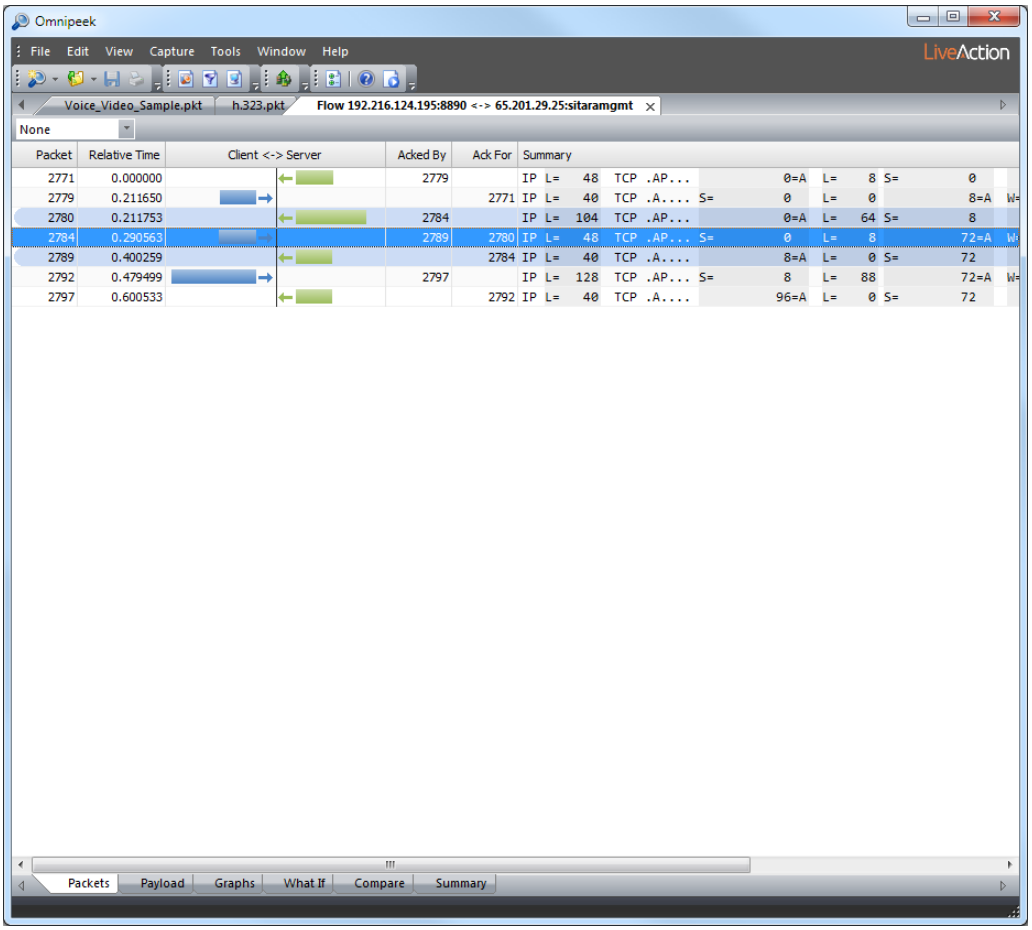
Disable **Relative SEQ/ACK Numbers** to display the actual SEQ/ACK number values found in the packets.

**Note** The *Sequence*, *TCP Trace*, and *TCP Window* graphs in the *Graphs* tab display sequence numbers as a vertical axis. You can also use the context menu to toggle between relative and absolute values for SEQ/ACK numbers in these graphs.

## *Highlighting SEQ/ACK relationships*

As you select different rows in the *Packets* tab list, a blue highlight appears to help you follow SEQ/ACK relationships. The packets acknowledged by the selected packet are highlighted light blue, above the selected packet. The first packet that acknowledges the selected packet is also highlighted in light blue, below the selected packet.

You can also see this ACK relationship by showing the *Acked By* and *Ack For* columns, as in the following figure.

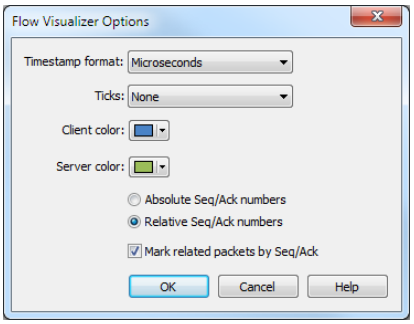



## *Flow Visualizer options dialog*

The **Flow Visualizer Options** dialog lets you set display options for the *Packets* tab.

**To set Flow Visualizer display options, follow these steps:**

1. Right-click in the *Packets* tab and choose **Flow Visualizer Options**.




2. Fill in the parameters of your choice.

> **Note** Click **Help** in the dialog to learn about the available options and settings.

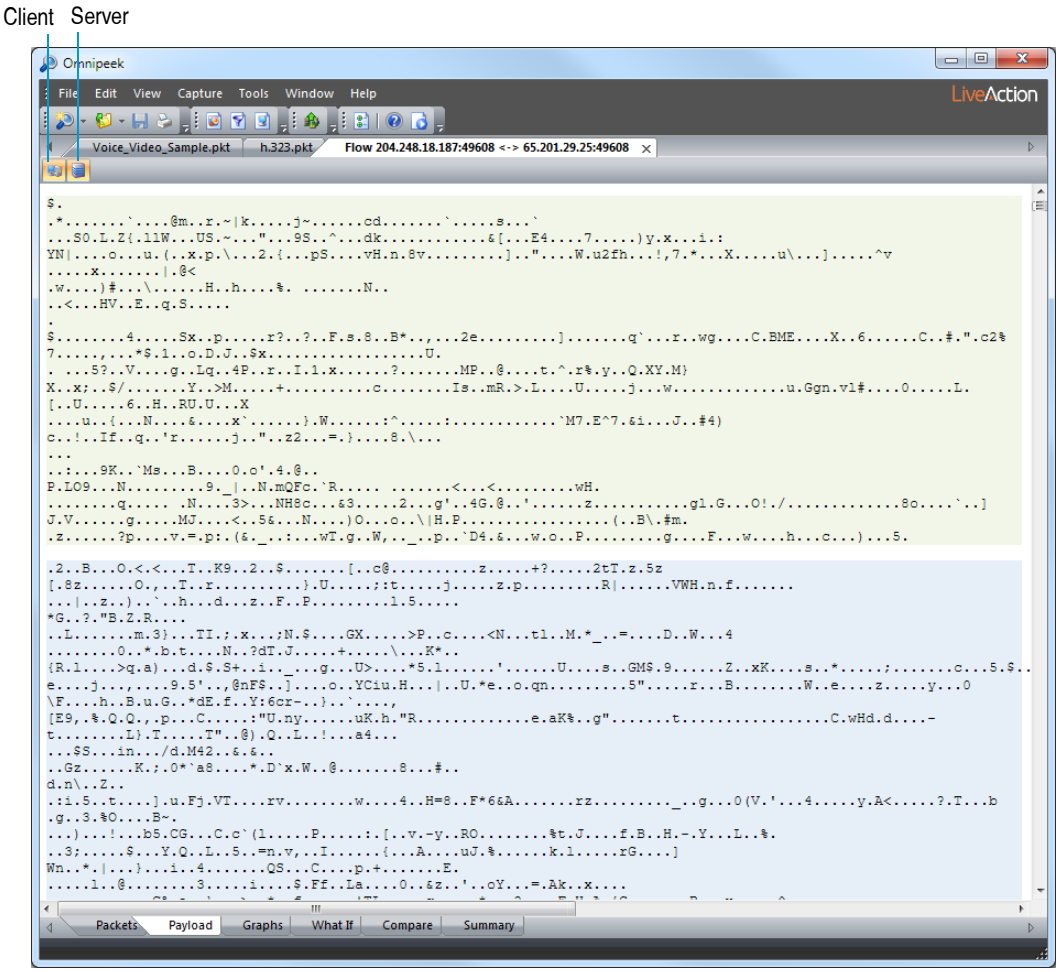
3. Click **OK** to accept your changes.

## Payload tab

The *Payload* tab of the **Flow Visualizer** reconstructs the TCP data without the header information. It keeps track of TCP sequence numbers, reassembling out-of-sequence and retransmitted packets. Text protocols such as POP3, SMTP, and HTTP can be read as text, while non-text characters are converted to dots.

The toolbar for **Client** and **Server** allow you to show or hide client/server data in the *Payload* tab.

> **Tip** If you mouse over a character, a data tip appears identifying which packet contains the displayed data.




**Tip** You can use the **Find** dialog to search through the reassembled payload. To display the **Find** dialog, on the **Edit** menu, click **Find**.

You can set background colors for client and server data in the **Flow Visualizer Options** dialog (see *Flow Visualizer options dialog* on page 156), or on the **Tools** menu, click **Options**, and then select **Client/Server Colors** (see *Setting client/server colors* on page 150).

### *Missing or sliced data*

The *Payload* tab keeps track of TCP sequence numbers, allowing it to report missing, repeated, out-of-sequence, and sliced data. It shows missing and sliced data with *[...### bytes missing...]* or *[...### bytes sliced...]*. If only a few bytes are missing or sliced, this message is truncated to *[.....]* with one dot for each missing byte.

Sliced and missing data appears with a faded background color. Missing (but not sliced) data appears in grey text. Repeated data appears in red.

### *Saving payload data*

Right-click in the *Payload* tab and choose **Save Client Data...** or **Save Server Data...** to create a text file with all of the binary data for that side of the conversation.

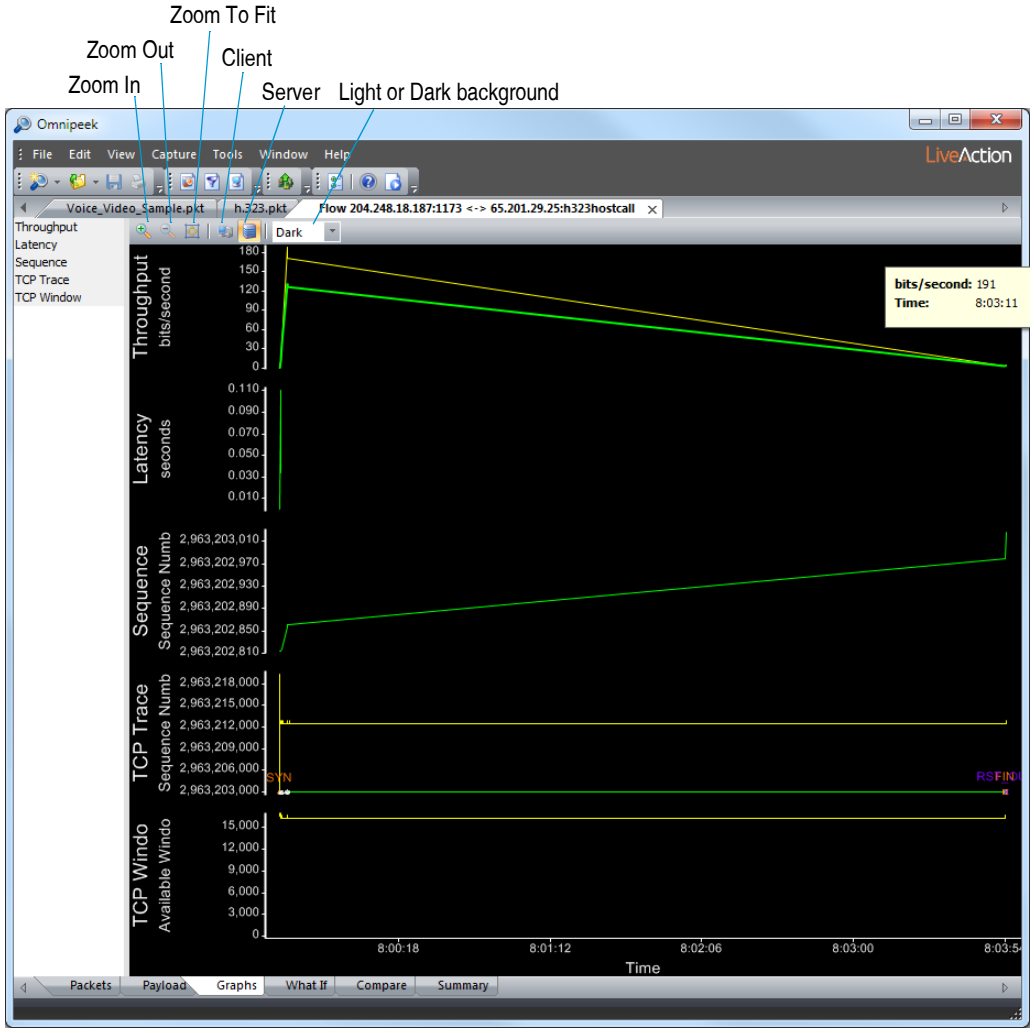
## Graphs tab

The *Graphs* tab of the **Flow Visualizer** displays graphs of data across time.

To show a graph for display, select the graph type. Multiple graphs can be displayed simultaneously.

There are five types of graphs:

- *Throughput graph*
- *Latency graph*
- *Sequence graph*
- *TCP Trace graph*
- *TCP Window graph*




The parts of the *Graphs* tab are identified below.

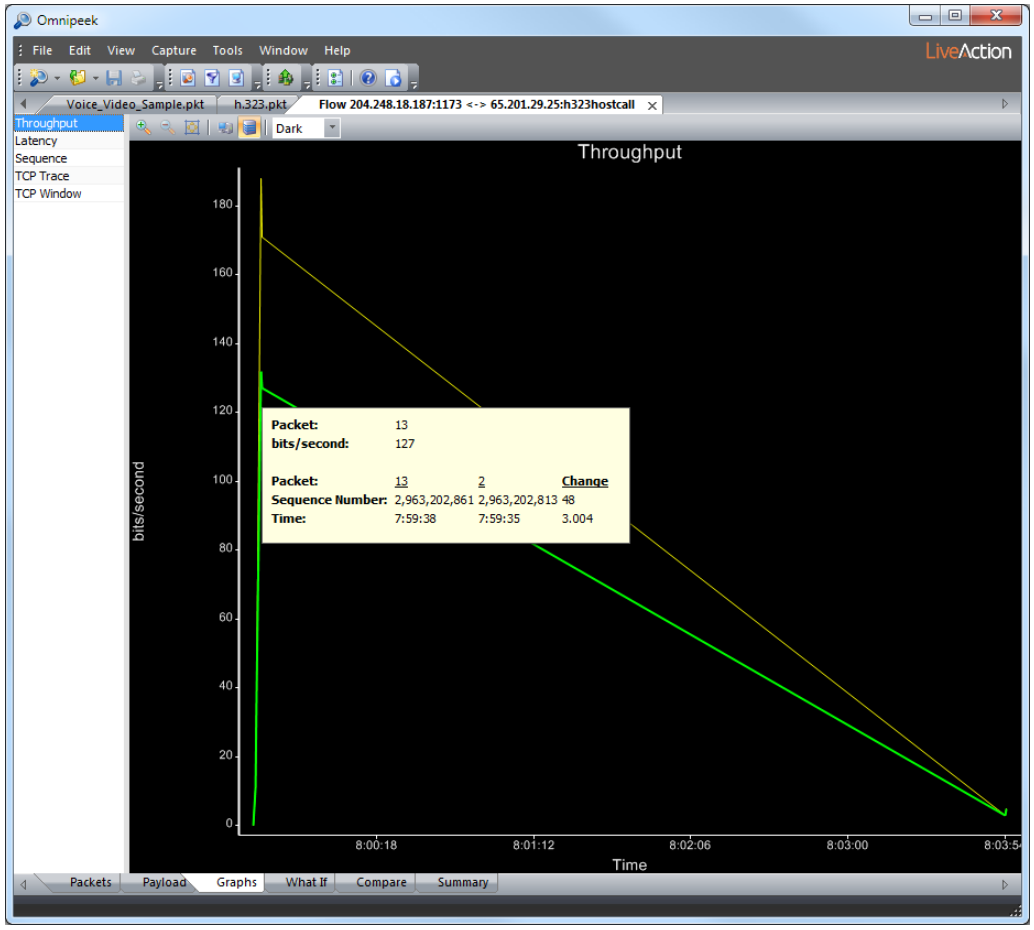
- *Zoom In:* Click and drag a rectangle across the portion you want to see to zoom into a specific portion of the graph.
- *Zoom Out:* Click to decrease size of graph.
- *Zoom to Fit:* Renders the entire graph within the available screen space.
- *Client*: Click to switch graph display to direction from client to server.
- *Server:* Click to switch graph display to direction from server to client.
- *Light* or *Dark:* Select a background for graphs from the drop-down list in the toolbar.

Some graphs (*Sequence, TCP Trace*) display sequence numbers as a vertical axis. To show relative values, right-click and enable **Relative SEQ/ACK Numbers**. See *Relative SEQ/ACK numbers* on page 155.

- *Right-click options:*
  - *Relative Time:* Displays a horizontal axis with time relative to the first packet in this flow.
  - *Absolute Time:* Displays a horizontal axis with clock time.
- *Data tips:* Hold the mouse cursor still over a point on any graph to display a data tip for that point.
  - For an axis, this shows the value of that axis at the current cursor.
  - For empty graph areas or lines between graph points, this shows the vertical and horizontal values for that point.
  - For graph points, this shows graph-specific data about that point.
- *Magnifier lens:* To magnify the graph area around the cursor, hold down the **Shift** key or press the **Caps Lock** key. A small view magnified by 4x appears in the lower right corner.

## *Throughput graph*

The *Throughput* graph displays the rolling average throughput for the flow, in TCP Sequence Number order over time.




**Note** While most throughput calculations display the total number of bytes over time, the *Throughput* graph ignores IP/TCP headers and checksums. It includes only actual TCP payload data in its calculations.

There are two lines in the *Throughput* graph.

- The thin yellow line shows the rolling 1-second average value of throughput. This line tends to change frequently.

- The thicker green line shows the rolling 10-second average value of throughput. This line changes more slowly.

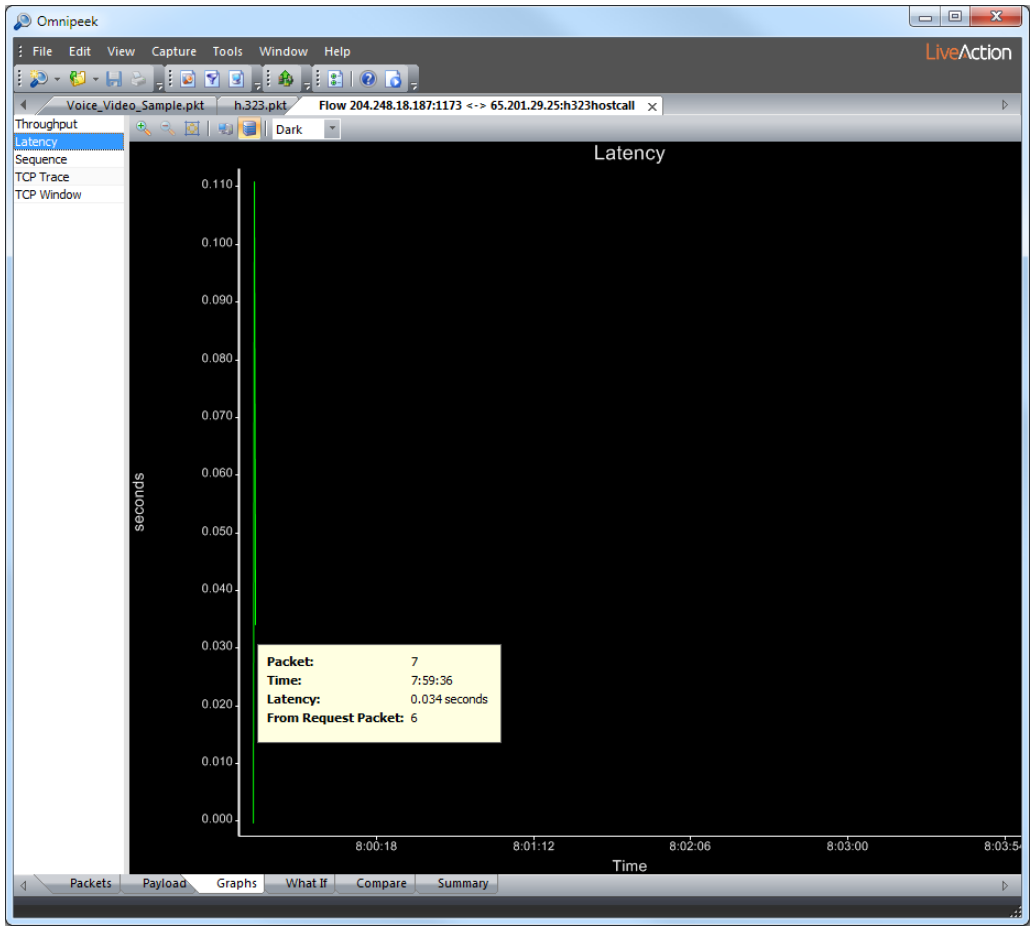
**Note** The *Throughput* graph does not display data for the first 0.5 seconds of data. There is not enough data collected during this period, and the graph tends to display incorrect values until after 0.5 seconds.

Both the 1-second and 10-second lines will display data before 1- and 10-seconds have elapsed. In this case, the graphed data is the average throughput up to that time. Both the 1- and 10-second lines show the same data up to the 1-second mark.

The *Throughput* graph only calculates points when there is a packet. Long spans without packets create long spans with straight horizontal lines. Sawtooth waves are common for flows that have bursts of large packets interspersed with zero-data packets.

## *Latency graph*

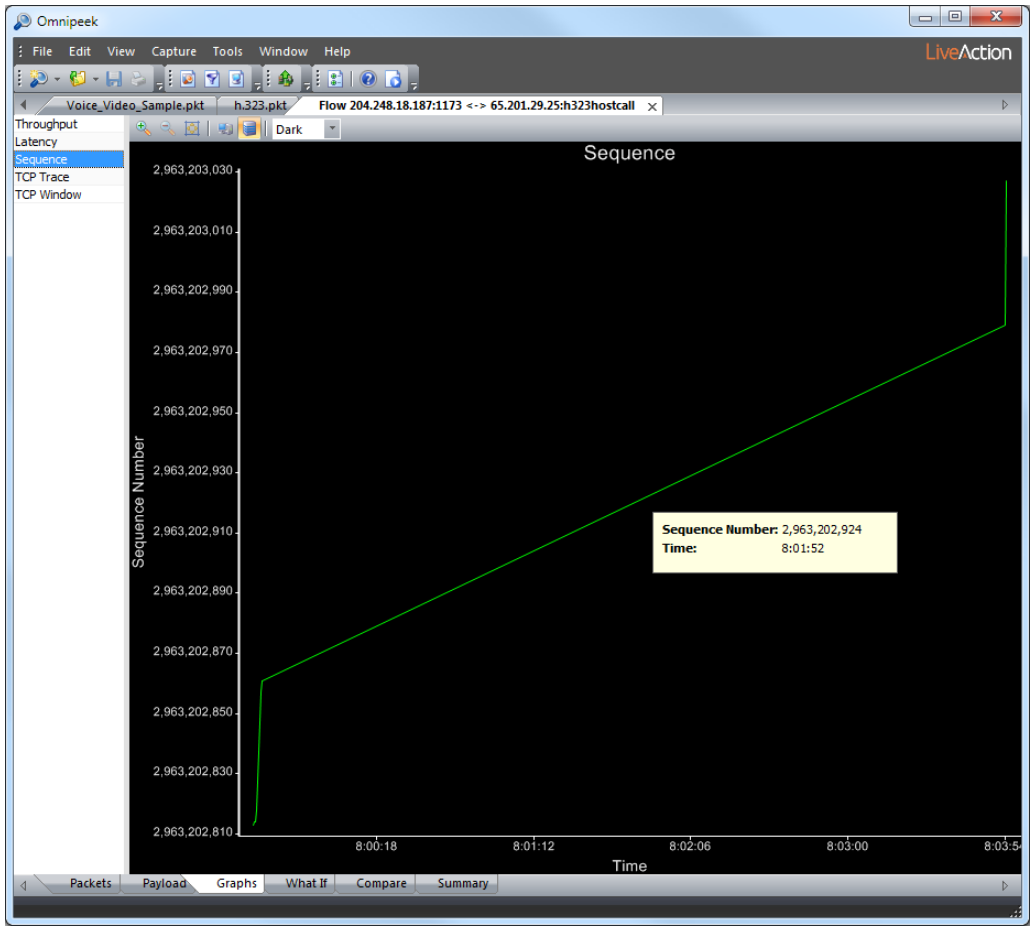
The *Latency* graph displays the time between a packet and the request packet that it acknowledges.




**Note** Not all flows have latency data. If a flow direction does not have an increasing SEQ number, then the other direction does not have anything to ACK, so the other direction will not have latency data.

## *Sequence graph*

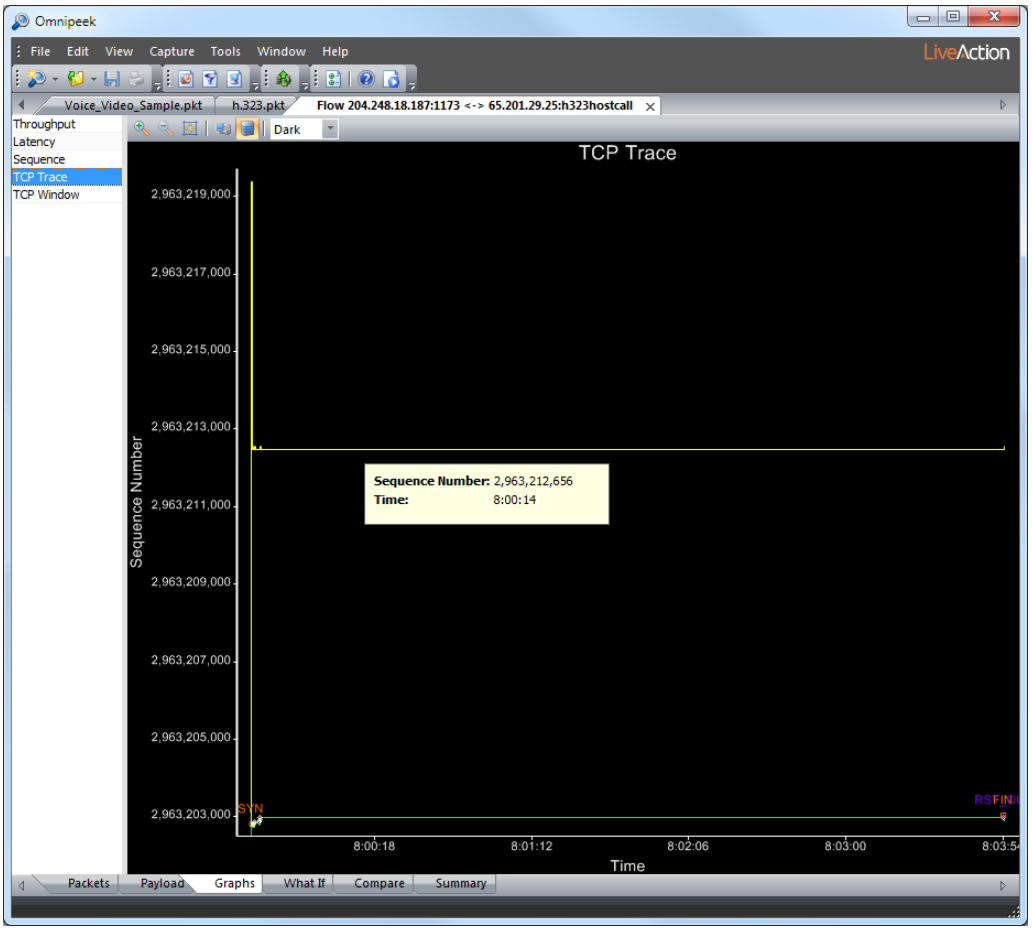
The *Sequence* graph displays TCP SEQ numbers across time. It displays a simple version of the information in the *TCP Trace* graph.




Sharp increases in SEQ indicate a burst of high throughput. Flat horizontal lines indicate zero TCP data throughput. Downward sloping lines indicate out-of-sequence or repeated data.

## *TCP Trace graph*

The *TCP Trace* graph creates a rich visualization of a TCP flow, showing two stairstep lines, representing current ACK'ed data (green) and available window (yellow). This shows how well the client is keeping up with data.




Vertical white arrows indicate each sent data packet, showing how and when the server is talking. As the client ACKs data, the green stairstep line bumps up.

If the client sends an ACK without increasing the ACK number, the *TCP Trace* graph notes this with a small green tick mark.

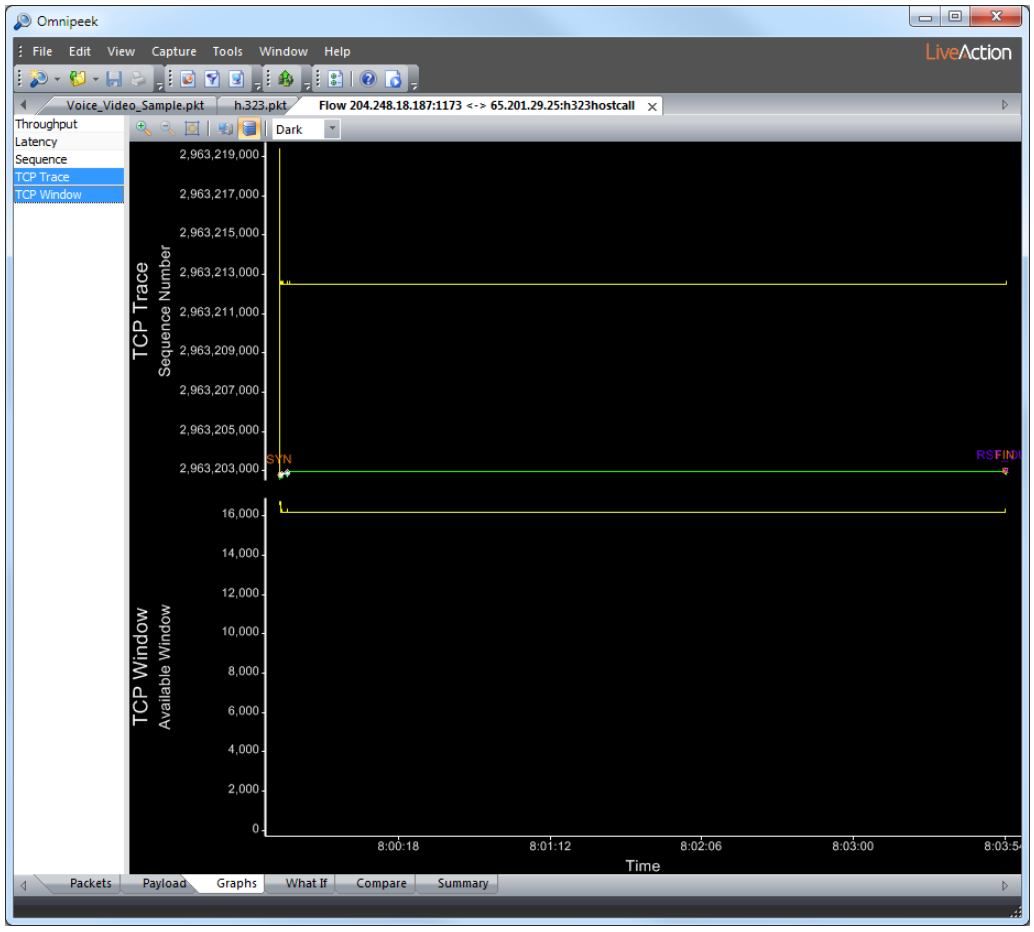
As the client slides its window forward or increases its window, the yellow stairstep line bumps up. If the client sends an ACK without moving the window forward, the *TCP Trace* graph notes this with a yellow tick mark.

As the server sends data, white arrows appear. Each arrow starts at the packet's SEQ number and goes up to span that packet's TCP payload size. Packets without payloads appear as small white X marks (the arrowheads for both SEQ and ACK land on the same point).

The *TCP Trace* graph shows all TCP flags. For a complete list and description, see *Flow Visualizer TCP Trace graph flags* on page 343.

## *TCP Window graph*

The *TCP Window* graph (shown below the *TCP Trace* graph in the following figure) shows the size of the available TCP window as it expands and contracts through the course of the TCP session in the current flow.

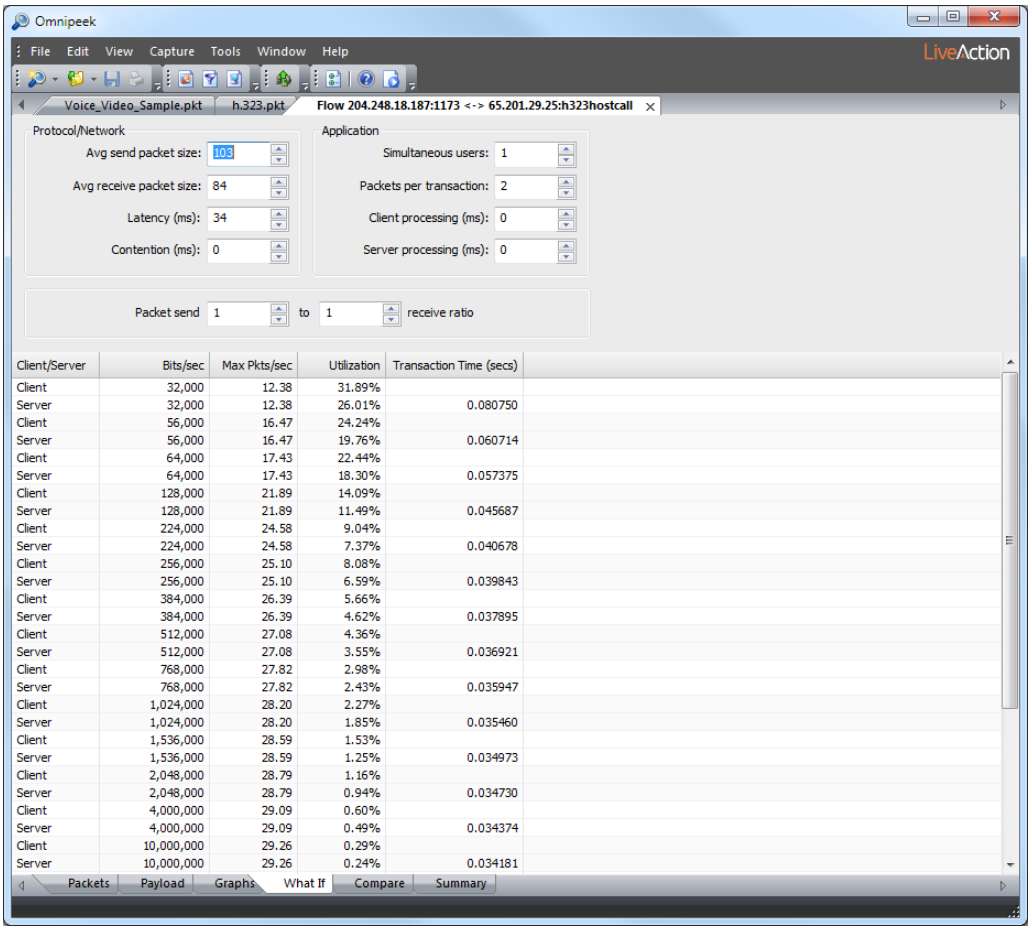



The TCP window is the amount of unACK'ed data a particular TCP session will allow on the wire. When a receiver is keeping up with the sender, the available window floats near the top of its range, typically around 64K. As the receiver buffers more and more data, unable to immediately acknowledge its receipt, the available window shrinks. If it dips too low, the Expert will flag this event. When the available window reaches zero (the window is all used up), the sender stops and throughput suffers. Properly tuning TCP windows can have a significant effect on TCP throughput.

*TCP Window* graphs show data tips, using the same format and information found in *TCP Trace* graphs.

## What If tab

The *What If* tab of the **Flow Visualizer** lets you estimate the effects of changes in various network and application parameters on throughput, utilization, and transaction times in the current flow. As you change the settings at the top of the tab, the values in these columns will change, allowing you to experiment with *what if...* scenarios.




The parts of the *What If* tab are identified below.

You can experiment with changes in three classes of settings at the top of the tab:

- *Protocol/Network* section lets you set *Avg send packet size*, *Avg receive packet size*, and the length of the time intervals for *Latency (ms)*, and *Contention (ms)*.
- *Application* section lets you set the number of *Simultaneous users*, the number of *Packets per transaction*, and the time required for *Client processing (ms)* and *Server processing (ms)*.
- Set the *Packet send ... to ... receive ratio*.

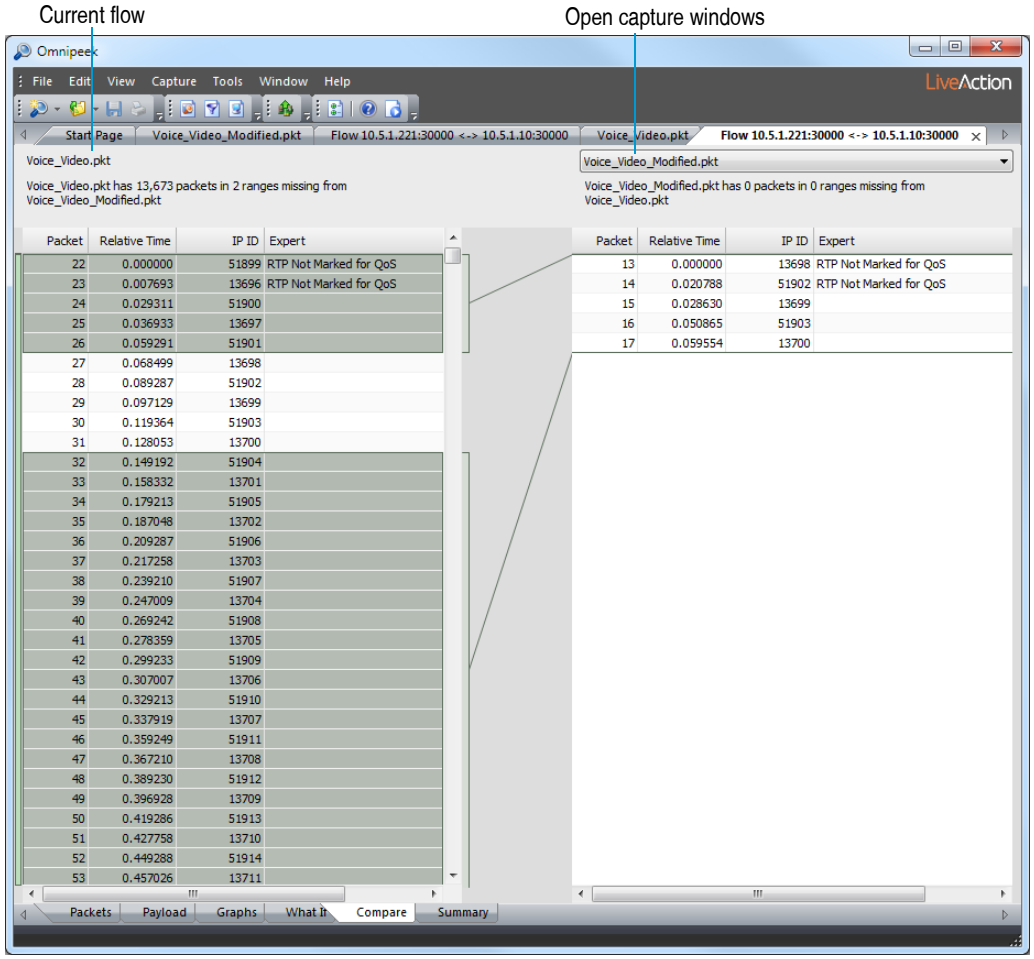
*Right-click options:*

- *Full Duplex:* Select to display *Client* and *Server* each on separate lines of the table.
- *Half Duplex:* Select to display matching client and server transactions on a single line of the table (*Client/Server* column shows *Client/Server* for each line).
- Choose *Client -> Server* or *Server -> Client* to evaluate the flow in either direction.
- Set the precision of the time display to *Milliseconds*, *Microseconds*, or *Nanoseconds*.
- *Restore Original Values*: Select to return to the observed or calculated values when the **What If** tab was opened.
- *Save What If Data...*: Save the data from this tab in either a *Text (view delimited)(*.txt)* or *CSV (Comma delimited)(*.csv)* format.

# Compare tab

When a flow is open in the **Flow Visualizer**, the *Compare* tab can find that same flow in any other open file or capture, and display the two separately captured instances of that flow side by side, noting any detailed differences between the two.

The parts of the *Compare* tab are identified below.




The *Current flow* is displayed on the left. Use the drop-down list in the header section to choose any other open capture window or capture file. The *Compare* tab will search the selected file for a matching flow by IP address and port number pairs and display it on the right.

- *Packet:* The packet number assigned in its capture window or capture file.
- *Relative Time:* Calculated from the first packet in each flow.
- *IPID:* IP address identification.

Packets that appear in one file but not the other are highlighted in green, with a connecting line showing where in the packet sequence the missing packets should appear.

The *Compare* tab can accommodate out of sequence packets, keeping the middle blue line synchronized across the two flows. Short messages above each table summarize the differences between the two.

The *Compare* tab scans ahead to match packets, and can easily accommodate flows in which most packets are out of sequence by tens of places. When scanning a very large file, this may take a moment to finish.

## Summary tab

The *Summary* tab of the **Flow Visualizer** displays the data that appears in the *Node Details* tab of the Expert when the same flow is selected. See *Details tab* on page 147.

# Network policy settings

The **Network Policy** dialog lets you create, edit, save and reload descriptions of the participants and expected behavior of a particular network for the Expert to use in detecting Network Policy violation events. Network policy is only supported for wireless captures.

To open the **Network Policy** dialog, choose one of the following:

- Click **Network Policy** in the **Expert** view toolbar
- Right-click and choose **Network Policy...** from the **Expert**, **WLAN**, or **Channels** views.
- Click **Configure...** in the **Expert EventFinder Settings** window when an individual *Network Policy* event is selected.

There are five network policy events:

- *Vendor ID policy*
- *Channel policy*
- *ESSID policy*
- *WLAN encryption policy*
- *WLAN authentication policy*

Each view describes a particular aspect of a network. When a view is enabled, the Expert notes a Network Policy violation when it sees traffic contrary to the settings in that view.

**Note** You can enable, disable, or set the Severity settings for each view in either the **Network Policy** dialog or the **Expert EventFinder Settings** window. Changes made in either dialog are reflected in the other. See *Expert EventFinder* on page 152.

The Network Policy settings as a whole can be saved or loaded:

- Click **Export...** to save the current settings in the *Expert Settings File (*.exp)* format.
- Click **Import...** to choose a previously saved *.xml file, and use it to replace the current **Network Policy** dialog settings.

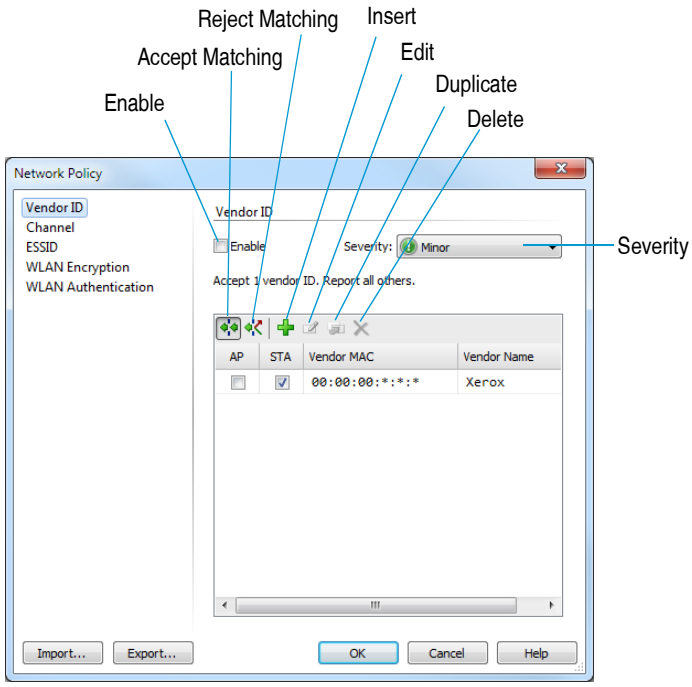
**Note** The Network Policy settings form part of the settings for the Expert EventFinder. When you export or import settings from the **Expert EventFinder Settings** window, the Network Policy settings are also included. When you export from the **Network Policy** dialog, however, only the Network Policy settings are included in the created file.

## Vendor ID policy

The **Vendor ID** policy dialog lets you set a policy based on the MAC addresses of 802.11 WLAN adapters seen by the Expert.

Use the table to create a list of MAC addresses (or blocks of MAC addresses, each defined by its vendor ID), then use the buttons at the top of the table to tell the Expert to **Accept Matching**, or **Reject Matching** MAC addresses.

You can use the asterisk character (*) as a wildcard to represent any byte of the 6-byte MAC address. The Name table ships with a current list of vendor IDs, associating each block of MAC addresses with a particular card vendor name.




**Note** Click **Help** on the dialog to learn about the available options and settings.

## Channel policy

The **Channel** policy dialog lets you set a policy based on the 802.11 WLAN channels in use, as seen by the Expert.

Use the table to create a list of channels, then use the buttons at the top of the table to tell the Expert to **Accept Matching**, or **Reject Matching** channels.

**Note** When you first choose a *Protocol*, the table is populated with the most commonly used channels, including all channels permitted by the regulatory authorities in the United States. Other jurisdictions may permit other channels. To accommodate this, the list of channels is editable.

## ESSID policy

The **ESSID** policy dialog lets you set a policy based on the ESSIDs (Extended Service Set Identifiers) in use, as seen by the Expert. The ESSID is an optional short text string used to identify all access points in a single ESS network.

Use the table to create a list of ESSIDs, then use the buttons at the top of the table to tell the Expert to **Accept Matching**, or **Reject Matching** ESSIDs.

## WLAN encryption policy

The **WLAN Encryption** policy dialog lets you set a policy based on the encryption method in use, as seen by the Expert. The available encryption methods are: *None* (no encryption), *WEP* (Wired Equivalent Privacy), *CKIP* (Cisco Key Integrity Protocol), and *TKIP* (Temporal Key Integrity Protocol).

Use the buttons at the top of the table to tell the Expert to **Accept Matching**, or **Reject Matching** encryption methods.

# WLAN authentication policy

The **WLAN Authentication** policy dialog lets you set a policy based on the authentication method in use, as seen by the Expert. The available authentication methods are:

- *None* (open, unrestricted authentication)
- *LEAP* (Lightweight EAP (Extensible Authentication Protocol))
- *PEAP* (Protected EAP),
- *EAPTLS* (EAP with Transport Layer Security)

Use the buttons at the top of the table to tell the Expert to **Accept Matching**, or **Reject Matching** authentication methods.

**Note** Click **Help** on each dialog to learn more about the available options and settings.

CHAPTER 9

# Multi-Segment Analysis

## In this chapter:

# About Multi-Segment Analysis

Multi-Segment Analysis (MSA) in Omnipeek allows you to quickly and easily locate, visualize, and analyze one or more flows as they traverse several capture points on your network from end-to-end. MSA provides visibility and analysis of application flows across multiple network segments, including network delay, packet loss, and retransmissions.

MSA can quickly pinpoint problems and their root causes across multiple segments, bring problematic flows together, and create an analysis session, report anomalies, and provide graphical visualization of multiple segments across the network.

An easy to use MSA wizard allows you to create MSA projects from either multiple Capture Engines located on your network, or from multiple existing capture packet files. Additionally, MSA projects can be created by right-clicking various views from the navigation pane of a capture window.

**Important!** The time it takes for Omnipeek to build and display an MSA project is dependent on the number of segments, the number of flows, and the number of packets in each flow. MSA includes a limit of 100,000 packets per flow (modifiable from Multi-Segment Analysis Options), but there is no hard limit to the number of segments or flows that can be included in a project. Be selective when choosing data for your MSA projects. If you find that an MSA project is taking too long to build, you can cancel out and reduce your data set.

In order to facilitate the creation of MSA projects based on forensic searches, the following best practices are suggested:

- Each Capture Engine should have a unique name. This can be done via the Capture Engine Manager, or the Capture Engine Wizard.
- Make sure the time is accurate on all of the Capture Engines. If possible, configure the Capture Engine to use an NTP server.
- Give each capture a unique name. For instance, name the captures based on the network segments.
- Once an MSA project (*.msa* file) has been created, you may want to save the packet files that were used to create the MSA project for the following reasons:
  - The packet files will be needed again if you want to add another segment to the MSA project.
  - You may want to open a trace file related to a particular segment, to see different Omnipeek views, such as the Packets or Flows view.
  - It may be necessary to rebuild MSA projects to take advantage of new MSA features in future versions of Omnipeek.

In addition, the following capture option settings must be enabled for MSA-based forensic searches:

- 'Capture to disk'
- 'Timeline Stats'

# MSA project window

Once configured and created using the MSA wizard, an MSA project window is displayed as shown below. The MSA project window consists of the following parts: Flow List, Flow Map, and Ladder.

**Note** When calculating the delay values for the flow map and ladder, MSA assumes that the client is on the left, and the server is on the right. If you create MSA projects that include multiple flows, all of the flows in the project should be initiated from the same direction. For example, flows initiated by two nodes on the private side of a firewall would be suitable to include in a single MSA project. Flows initiated by a node on the private side of a firewall, and flows initiated by a node on the public side of a firewall would not be suitable to include in a single MSA project.


# Flow list

The flow list displays a hierarchical list of flows for each capture source, including relevant information for each flow (client/server addresses and ports, protocols, packet counts, etc.) The flow list is hierarchical, with flows at the top level, and capture segments listed below the flow. Each capture segment includes statistics for that flow. Selecting the check box next to a flow displays that flow in the flow map and ladder diagram below.

**Note** For any MSA project that has multiple flows, only one flow at a time can be selected in the flow list. The flow that is selected is displayed in the flow map and ladder diagram.


- *Column header*: Displays the column headings currently selected. Right-click the column header to enable/disable columns. Here are the available columns:
  - *Flow/Segment*: The name of the flow or segment.
  - *Client Addr*: The address of the client for the flow.
  - *Client Port*: The port on which the Client or Client Addr was communicating in the flow.
  - *Server Addr*: The address of the Server or Server Addr for the flow.
  - *Server Port*: The port on which the Server or Server Addr was communicating in the flow.
  - *Protocol*: The protocol under which the packets in the flow were exchanged.
  - *Packets*: The number of packets in the selected flow.
  - *Client Packets*: The total number packets sent from the Client or Client Addr in the flow.
  - *Server Packets*: The total number of packets sent from the Server or Server Addr in the flow.
  - *Packets Analyzed*: The total number of packets in the flow that were analyzed by Omnipeek's MSA component. 'Packets Analyzed' will be the same as 'Packets,' unless the number of packets in the flow exceeds the packet limit, as configured in MSA options.
  - *Packets Lost*: The number of packets missing in the segment. Packets which are identified as 'lost' in a particular segment appeared in an least one other segment in the MSA project.
  - *Client Packets Lost*: The number of packets lost in the client direction.
  - *Server Packets Lost*: The number of packets lost in the server direction.
  - *Client Retransmissions*: The number of TCP retransmissions sent by the client.

- *Server Retransmissions*: The number TCP retransmissions sent by the server.
- *Start*: The timestamp of the first packet in the flow.
- *Finish*: The timestamp of the final packet in the flow.
- *Duration*: The elapsed time, from the first to the last packet in the flow.
- *TCP Status*: Notes whether the TCP session is open or closed.
- *Columns...*: Displays a dialog that lets you enable/disable and organize columns.
- *Show All Columns*: Displays all available columns.

# Flow map

The flow map displays a graphical representation of the segments of the selected flow. Each segment in the flow is displayed from end-to-end (client on the left and the server on the right), along with timing statistics (average delay, minimum delay, and maximum delay) between each segment. Additionally, the hop count between each segment is also displayed (the little number inside the cloud between the segments).


## *Flow map viewing tips*

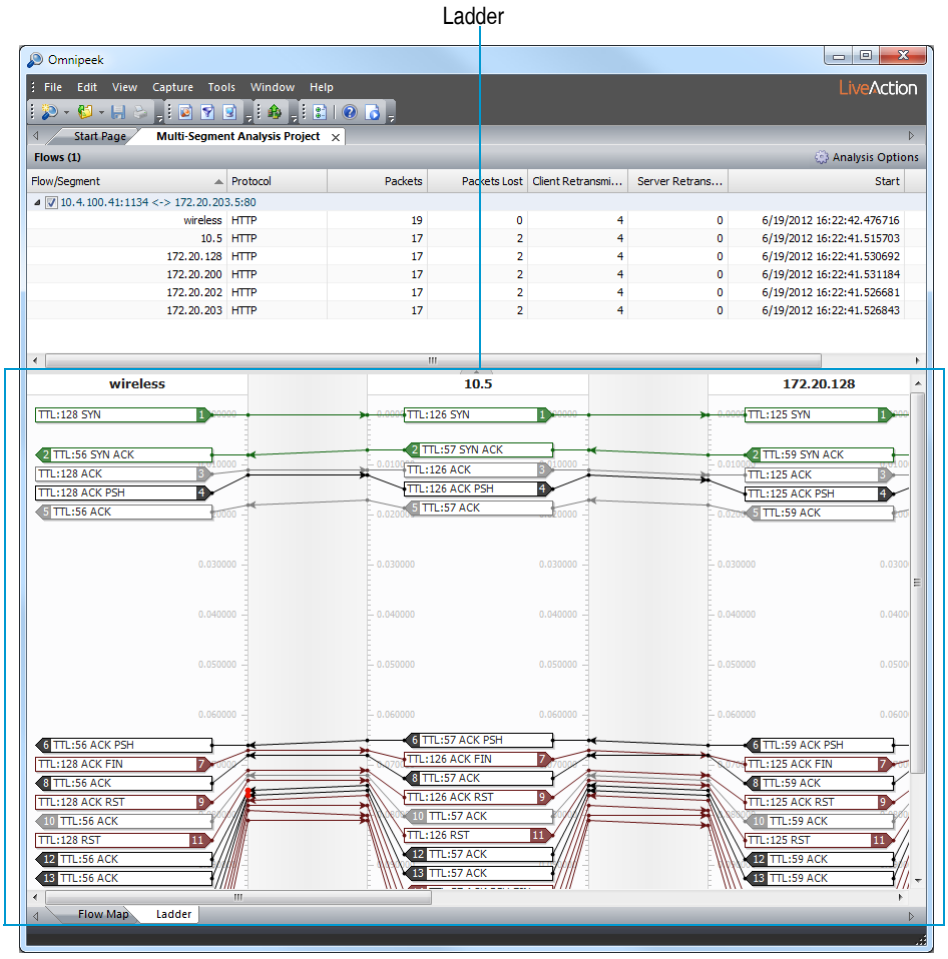
Here are some useful tips when viewing the data inside the flow map:

- Hover over segments names and clouds to view tooltips displaying more data.
- Press the Ctrl key and use your scroll wheel (Ctrl+Wheel) to change segment widths.
- Arrows show the direction in which data flows.

- The client and server arrows use the same colors as from *Client/Server Colors* (on the **Tools** menu, click **Options**, and then click **Client/Server Colors**).
- The number in the clouds are hop counts, as determined by the Time to Live (TTL) values within the packets. If there is one number in the cloud, then both the client and server hops are the same. If there are two numbers in the cloud, then the client and server hops are different, indicating that the client and server paths are different. If there are multiple paths in one direction, no hop count is displayed for this direction. Hop counts greater than one are displayed in red. The TTL of each packet can be displayed in the Ladder diagram.

## Ladder

The ladder diagram displays the flow of packets amongst the segments represented by the capture sources, along with information such as timing.




### *Ladder viewing tips*

Here are some useful tips when viewing the data inside the ladder diagram:

- Hover over packet boxes to view tooltips displaying more data.
- Arrows show the direction in which data flows.
- Green boxes are the packets that open the flow (SYN and SYN-ACK).
- Black boxes are packets with non-zero payload (packets that carry data).
- Gray boxes are packets that have zero payload (probably just ACK packets).
- Red boxes are packets that close the connection (FIN or RST).

- Right-click inside the diagram to show/hide additional statistics, or to adjust the time scale of the ladder.
- The following keyboard/scroll wheel shortcuts are available from the ladder display:
  - Wheel+Ctrl: Changes the time scale.
  - Wheel+Ctrl+Shift: Zoom the time scale.
  - Wheel+Ctrl+Shift+Alt: Change the segment width.
  - Ctrl+Alt+Shift+F9: Save ladder display to text.

# Creating an MSA project

To create an MSA project, you must use the MSA wizard. The MSA wizard guides you through the creation of an MSA project, and includes steps for setting up the project parameters and ultimately, displaying the MSA project window. There are multiple ways to start the MSA wizard. Additionally, depending on which way you start the wizard, there are multiple entry points to the MSA wizard. You can start the MSA wizard in the following ways:

- From the **File** menu, choose **New Multi-Segment Analysis Project**.... The MSA wizard appears, and prompts you to create an MSA project by either searching for packets on remote engines, or using packet files:
  - **Searching for packets on remote engines**: Select this option and the MSA wizard first guides you through choosing a time range to search, and a filter to apply (making a filter for IP/port pairs is recommended, though any filter supported by Omnipeek will work). Additional wizard screens guide you through choosing which Capture Engines and which capture sessions per Capture Engine you wish to search against.

    Finally, the wizard performs the search, and the relevant packets are downloaded to Omnipeek for analysis. From there, it works the same way it does for doing multi-segment analysis from files, except that the files are already entered for you (they're the files downloaded from the Capture Engines). You can reorder the segments, rename the segments, change the time offsets, and save the output to an *.msa* file.
  - **Use packet files**: Select this option and the MSA wizard guides you through choosing which files to use (one file per segment), and the time offsets between them. You can also name each segment, and reorder them. Then you can save the resulting project to an *.msa* file, which can be reloaded later. The *.msa* file contains all the analysis, so you don't have to do any of this setup again.
- From the **Packets** view in the navigation pane: Right-click one or more packets and choose **Multi-Segment Analysis**.... The MSA wizard appears and guides you through the creation of the MSA project, beginning with choosing a time range to search, and a filter to apply.
- From any of the **Expert** views (**Clients/Servers**, **Flows**, and **Applications**) in the navigation pane: Right-click one or more flows and choose **Multi-Segment Analysis**.... The MSA wizard appears and guides you through the creation of the MSA project, beginning with choosing a time range to search, and a filter to apply. The **Multi-Segment Analysis**... option only appears for IPv4 TCP flows. MSA does not support UDP or IPv6 flows.
- From any of the **Web** views (**Servers**, **Clients**, **Pages**, and **Requests**) in the navigation pane: Right-click one or more servers, clients, pages, or requests and choose **Multi-Segment Analysis**.... The MSA wizard appears and guides you through the creation of the MSA project, beginning with choosing a time range to search, and a filter to apply.
- From the **Nodes** and **Protocols** views in the navigation pane: Right-click one or more nodes or protocols and choose **Multi-Segment Analysis**.... The MSA wizard appears and guides you through the creation of the MSA project, beginning with choosing a time range to search, and a filter to apply.

**Important!** The time it takes for Omnipeek to build and display an MSA project is dependent on the number of segments, the number of flows, and the number of packets in each flow. MSA includes a limit of 100,000 packets per flow (modifiable from Multi-Segment Analysis Options),

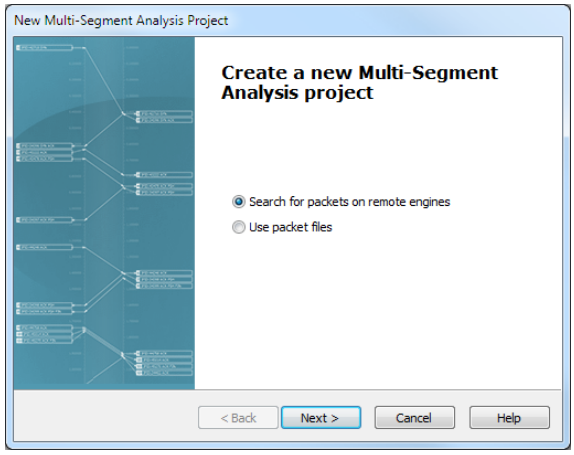
but there is no hard limit to the number of segments or flows that can be included in a project. Be selective when choosing data for your MSA projects. If you find that an MSA project is taking too long to build, you can cancel out and reduce your data set.

# Using the MSA wizard

The MSA wizard guides you through the creation of an MSA project. You can access the MSA wizard in numerous ways as described in *Creating an MSA project* on page 176. This section describes the various screens of the MSA wizard.

## Create a new multi-segment analysis project

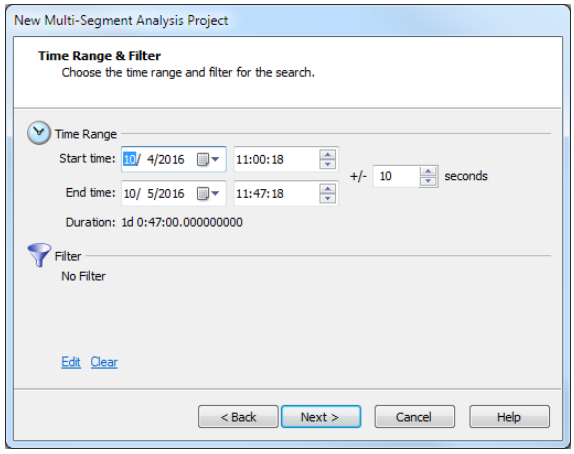
The **Create a new Multi-Segment Analysis project** dialog of the MSA wizard, on the **File** menu, click **New Multi-Segment Analysis**.... The dialog lets you create a new multi-segment analysis project from scratch.




- *Search for packets on remote engines*: Select this option to create an MSA project based on packets obtained from one or more Capture Engines.
- *Use packet files*: Select this option to create an MSA project based on one or more packet files.

## Time range & filter

The **Time Range & Filter** dialog of the MSA wizard lets you choose a time range and filter to apply to your search.

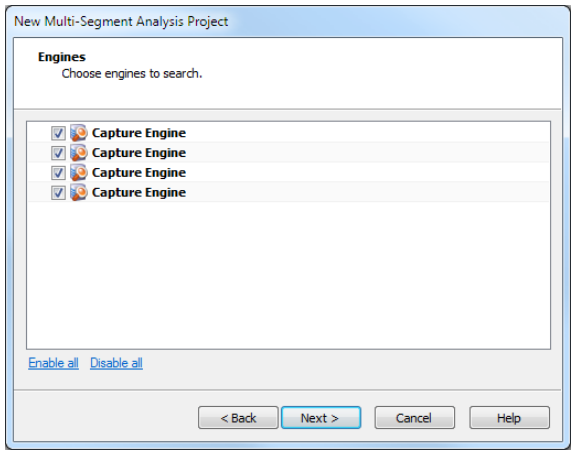



- *Start time*: Select or enter the start date and time of the range you wish to search.
- *End time*: Select or enter the end date and time of the range you wish to search.

- *+/- seconds*: Select or enter the number of seconds to add to the search both before the start time and after the end time.
- *Duration*: Displays the amount of time between the start and end time specified.
- *Filter*: Displays any filters currently defined for the search.
- *Edit*: Click to display the Edit Filter dialog, where you can define simple and advanced filters based on any combination of addresses, protocols, and ports. A packet must match all of the conditions specified in order to match the filter.
- *Clear*: Click to remove any filters currently defined for the search.

## Engines

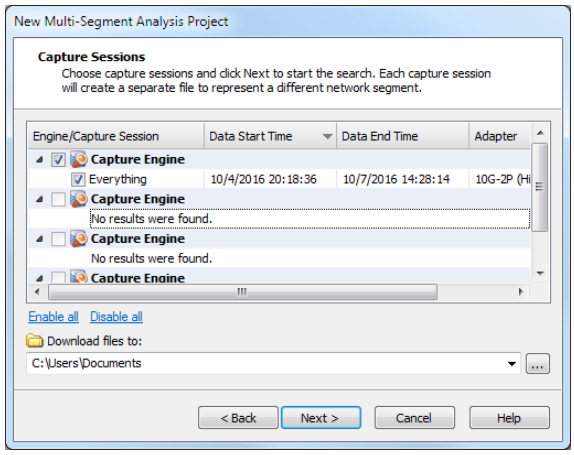
The **Engines** dialog displays the groups and Capture Engines currently listed in the Omnipeek Capture Engines window. If you had selected the option to *Search for packets on remote engines* earlier in the MSA wizard, the **Engines** dialog appears after clicking **Next** in the **Time Range & Filter** dialog of the MSA wizard.




- Select the check box of the Capture Engines you want to search in your MSA project. If you are not already connected to the Capture Engine, you are first prompted to connect to the Capture Engine by entering domain, username, and password information.
- *Enable all*: Click this option to select the check box of all groups and Capture Engine displayed in the dialog.
- *Disable all*: Click this option to clear the check boxes of all groups and Capture Engines displayed in the dialog.

## Capture sessions

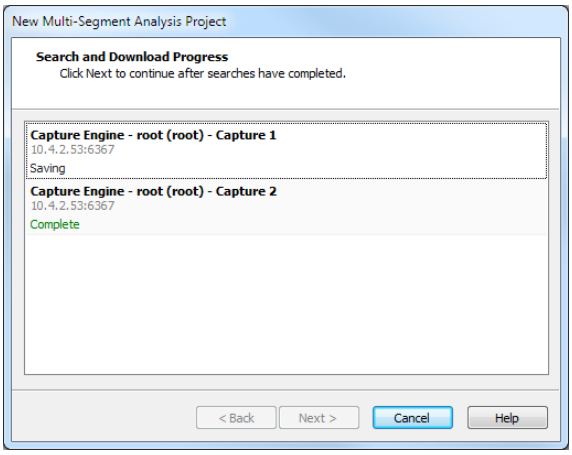
The **Capture Sessions** dialog displays the capture sessions found in each of the of the selected Capture Engines. If you had selected the option to *Search for packets on remote engines* earlier in the MSA wizard, the **Capture Sessions** dialog appears after clicking **Next** in the **Engines** dialog of the MSA wizard. A separate **.wpz* file is created for each capture session selected, and each file represents a different network segment. When performing multi-segment analysis, Omnipeek uses **.wpz* files to build the MSA project.




- *Column header*: Displays the column headings currently selected. Right-click the column header to enable/disable columns. Here are the available columns:
  - *Engine/Capture Session*: The capture sessions available from the Capture Engines selected earlier. Select the check box of the capture sessions you want to search in your MSA project. Capture Engine captures that have both '*Capture to disk*' and '*Timeline Stats*' enabled in the capture options, appear in the Capture Sessions screen. (MSA-based forensic searches require '*Timeline Stats*.')
  - *Session Start Time*: The start time of the capture.
  - *Data Start Time*: The start time of when data first appeared in the capture.
  - *Data End Time*: The end time of when data last appeared in the capture.
  - *Size*: The size (in MB) of the capture session.
  - *Packets*: The number of packets in the capture session.
  - *Packets Dropped*: The number of dropped packets in the capture session.
  - *Media*: The media type of the capture session.
  - *Adapter*: The name of the adapter used for the capture session.
  - *Adapter Address*: The address of the adapter used for the capture session.
  - *Link Speed*: The link speed of the adapter used for the capture session.
  - *Owner*: The owner name of the adapter used for the capture session.
- *Enable all*: Click this option to select the check box of all Capture Engine and capture sessions displayed in the dialog.
- *Disable all*: Click this option to clear the check box of all Capture Engine and capture sessions displayed in the dialog.
- *Download files*: Choose the location of where to save the **.wpz* files created for each of the selected capture sessions.

## Progress

The **Progress** dialog displays the status for saving **.wpz* files used for multi-segment analysis. If you had selected the option to *Search for packets on remote engines* earlier in the MSA wizard, this dialog appears after clicking **Next** in the **Capture Sessions** dialog of the MSA wizard.




Each entry in the dialog lists the following:

- Capture Engine and capture session name
- Capture Engine IP address and port
- Current status for each file

The progress status messages are as follows:

- *Search Progress*: Progress of the forensic search, based on the time range and filter specified in the Wizard
- *Saving*: Search results are saved as a *.wpz* file on the engine
- *Deleting Search*: The forensic search is deleted on the engine
- *Download Progress*: The *.wpz* file is downloaded to the Omnipeek computer
- *Deleting Remote File*: The *.wpz* file is deleted from the engine
- *Complete*: The entire process is complete. Once you see *Complete* for all capture segments, click **Next** to continue building the MSA project

**Tip** You can cancel the progress of any one of the capture segments by right-clicking and selecting **Cancel**. You can cancel any of the above stages, except for the *Saving* stage.

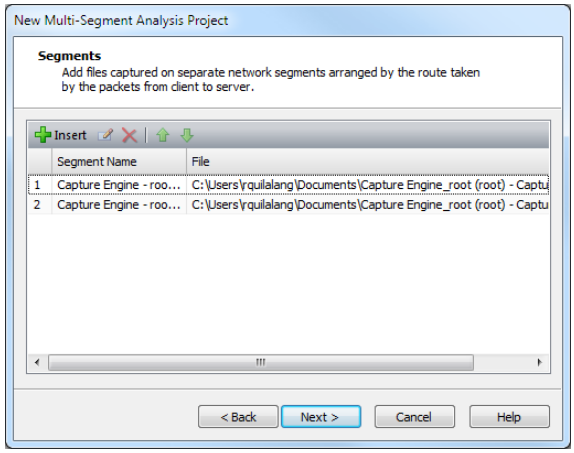
## Segments

This **Segments** dialog lets you add supported capture files captured on separate network segments to your MSA project. In order for the MSA analysis to display correctly in your flow maps and ladder diagrams, each segment file must be properly ordered by the route taken from client to server (when displayed in the flow map and ladder, the client is on the left and the server is on the right). You can manually choose to arrange the files in the dialog.

**Tip** If you do not manually arrange the files by the route taken from client to server, you can use the auto-arrange feature available from the **Analysis Options** dialog. See *MSA project analysis options* on page 182.

**Note** When calculating the delay values for the flow map and ladder, MSA assumes that the client is on the left, and the server is on the right. If you create MSA projects that include multiple flows, all of the flows in the project should be initiated from the same direction. For example, flows initiated by two nodes on the private side of a firewall would be suitable to include in a single

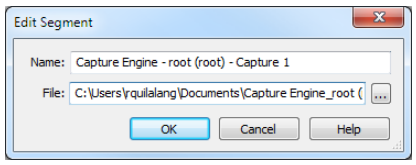
MSA project. Flows initiated by a node on the private side of a firewall, and flows initiated by a node on the public side of a firewall would not be suitable to include in a single MSA project.




- *Insert*: Click to insert a new segment. You will be prompted to name the segment and select a supported capture file.
- *Edit*: Click to edit a selected segment. You can choose to rename the segment or choose another supported file for the segment.
- *Delete*: Click to remove a selected segment.
- *Move Up*: Click to move a selected segment up in the ordered list of segments. You can also press (Shift or Ctrl)+Up Arrow to move the segment up in the list
- *Move Down*: Click to move a selected segment down in the ordered list of segments. You can also press (Shift or Ctrl)+Down Arrow to move the segment down in the list.
- *Column Header*: Displays the column headings currently selected. Right-click the column header to enable/disable columns. Here are the available columns:
  - *Segment Name*: The name of the segment.
  - *File*: The location and file name of the segment.

## Edit segment

This dialog lets you edit a selected segment.

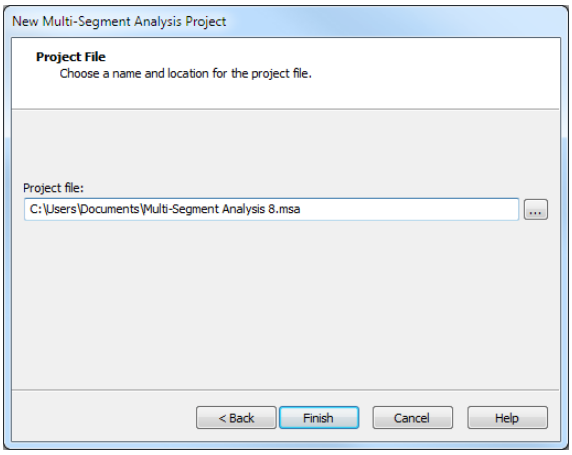



- *Name*: Displays the name of the segment. Type a different name to rename the segment.
- *File*: Displays the location and name of the segment file.

## Project file

This **Project File** dialog lets you save the MSA project file (*.*msa*). Once saved, the MSA project window is displayed.

**Note** If your MSA project window is blank, more than likely you have either selected a flow that is not supported by MSA (for example, UDP or IPv6), or it is a flow with fragmented packets.



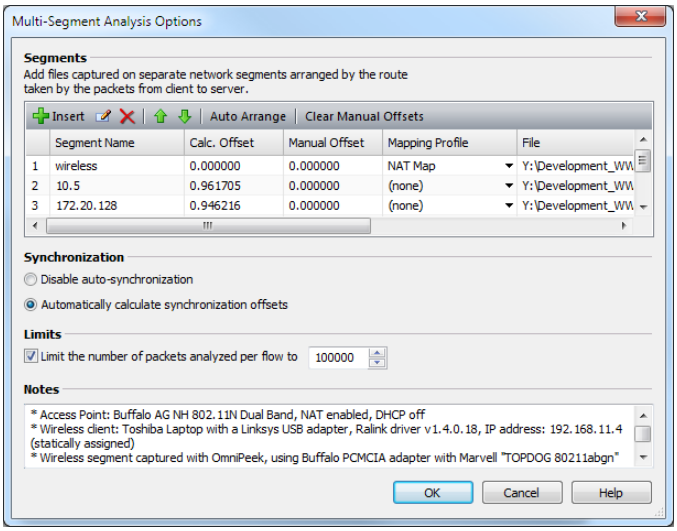

- *Project file*: Displays the location and MSA project file name (**.msa*).

# MSA project analysis options

Once you have created or opened an existing MSA project window, you can access the **Multi-Segment Analysis Options** dialog to edit segment, synchronization, and limit options. Additionally, you can add notes for the project.

**To edit MSA options:**

1. Click **Analysis Options** in the MSA project window. The **Multi-Segment Analysis Options** dialog appears.




2. Complete the dialog:
   - *Insert*: Click to insert a new segment. You will be prompted to name the segment and select a supported capture file.
   - *Edit*: Click to edit a selected segment. You can choose to rename the segment or choose another supported capture file.
   - *Delete*: Click to remove a selected segment.
   - *Move Up*: Click to move a selected segment up in the ordered list of segments.
   - *Move Down*: Click to move a selected segment down in the ordered list of segments.
   - *Auto Arrange*: Click to arrange the segments in order from client to server based on the TTL values in the packets. If you create MSA projects that include multiple flows, all of the flows in the project

should be initiated from the same direction. If you create MSA projects that include NAT (Network Address Translation) segments, apply a Mapping Profile before selecting *Auto Arrange*.

- *Clear Manual Offsets*: Click to set the manual offsets to zero.
- *Column Header*: Displays the column headings currently selected. Right-click the column header to enable/disable columns. Here are the available columns:
  - *Segment Name*: The name of the segment.
  - *Calc. Offset*: The automatically calculated synchronization offset for the segment.
  - *Manual Offset*: The user-specified offset. A manual offset can be used instead of, or in addition to, the automatically calculated offset.
  - *Total Offset*: The calculated offset plus the manual offset.
  - *Mapping Profile*: The mapping profile associated with the segment. A mapping profile can be created to map private addresses/ports to public addresses/ports. See *Creating a mapping profile* on page 183.
  - *File*: The location and packet file on which the MSA segment information is based.
  - *Columns...*: Displays a dialog that lets you enable/disable and organize columns.
  - *Show All Columns*: Displays all available columns.
- *Disable auto synchronization*: Select this option to disable automatically calculating offset values.
- *Automatically calculate synchronization offsets*: Select this option to enable automatically calculating synchronization offset values. All Capture Engines should be set to the correct time, preferably through the use of an NTP server. But, even with the use of NTP servers, offsets may be needed to adjust for slight timing inaccuracies across Capture Engines. Automatic calculation of synchronization offsets is based on the TCP SYN and TCP SYN ACK packets. If a segment does not contain the SYN and SYN ACK packets, there will be a dash (–) in the Calc. Offset field. If the MSA project contains multiple flows, the automatic calculation of synchronization offsets is based on all flows.
- *Limits*: Select this check box to enable the limit on the number of packets analyzed per flow, and then enter or select the number of flows.
- *Notes*: Type any notes to append to the MSA project.

3. Click **OK**.

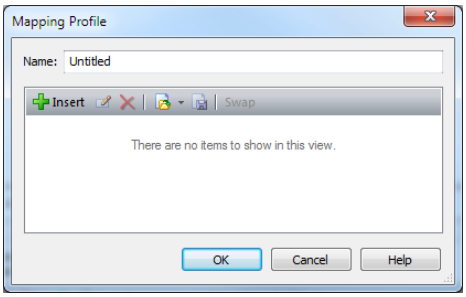
## Creating a mapping profile

A mapping profile is used to map private addresses/ports to public addresses/ports.

**Note** If your project includes a Network Address Translation (NAT) segment, the auto-arrange feature should not be selected until you apply a mapping profile.

**To create a mapping profile:**

1. From the MSA project window, click *Analysis Options* to display the **Multi-Segment Analysis Options** dialog.
2. Click inside the box in the Mapping Profile column for the desired segment. A popup menu appears.
3. Select **New**. The **Mapping Profile** dialog appears.




4. Complete the Mapping Profile dialog:
   - *Name*: Type a name for the profile.
   - *Insert*: Click to display **Address/Port Mapping** dialog. Complete the dialog.
   - *Edit*: Click to edit a selected mapping. The **Address/Port Mapping** dialog appears. Complete the dialog.
   - *Delete*: Click to delete a selected mapping.
   - *Import*: Click to import an MSA mapping file (**.xml*).
   - *Export*: Click to export a mapping profile to an MSA mapping file (**.xml*).
   - *Swap*: Click to swap directions of a selected mapping.
5. Click **OK**.

CHAPTER 10

# Web Analysis

## In this chapter:

# About web analysis

The **Web** views of an Omnipeek capture window display packet flow reconstruction of web requests and responses, allowing you to perform forensic searches by drilling down to individual images, files, and pages. Web data is arranged by server, client, page, or request, providing you with a primary focus for your investigation of the original web content.

You can select an individual HTTP request and immediately view the corresponding details, header information, a graphic representation of an image, or a packet timing graph display of the individual packets and phases of that request. For more information on web packet timing graph displays, see *Timing column* on page 187 and *Timing tab* on page 195.

Saving and opening web payloads or web statistics is immediately available through right-click options. See *Web save functions* on page 198.

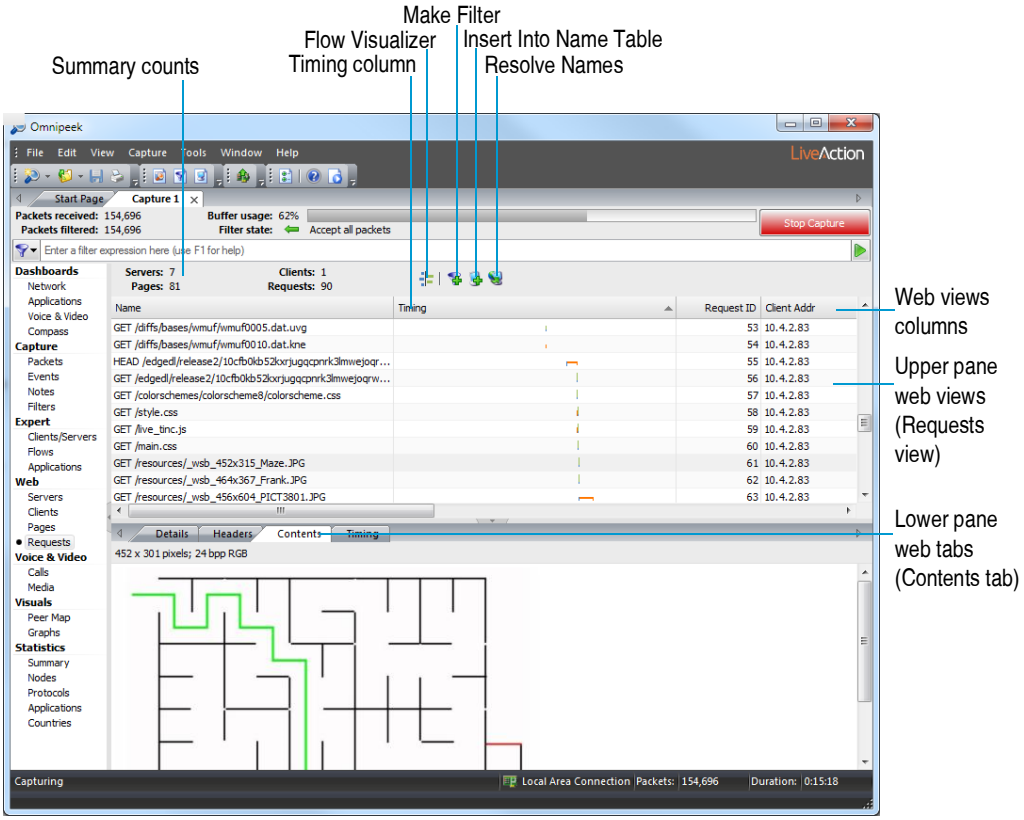
**Note** **Web** views are not supported in Capture Engine capture windows.

# Web view window

The **Web** view window has two data areas. The upper pane displays the same data from four different points of view: by servers, clients, pages, and requests. Expanding the data in **Servers**, **Clients**, and **Pages** views displays the individual requests nested underneath.

The lower pane of the **Web** view window contains four tabs which present additional information about selected rows in the upper panes: web details, client and server headers, the contents of a selected request, or a packet timing graph representing the packets and phases of an individual request.

The parts of the **Web** view window are identified below.




- *Summary counts:* This area displays the total count of servers, clients, pages, and requests in this capture.

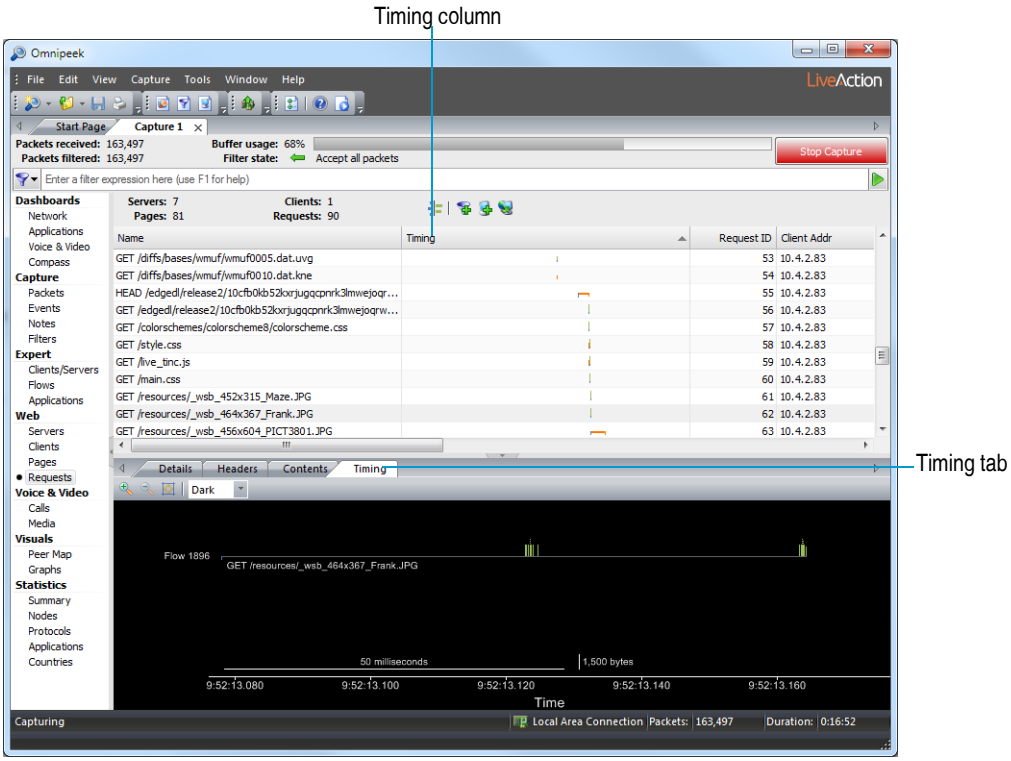
- *Flow Visualizer*: Opens the selected item (Request, Page, etc.) in a Flow Visualizer tab (see *Flow Visualizer* on page 154).
- *Make Filter:* Opens the **Insert Filter** dialog to create a filter based on the selected item.
- *Insert Into Name Table:* Opens a dialog to add the client and server node addresses of the selected item into the Name Table.
- *Resolve Names:* Checks the DNS server for a name to match the client and server addresses of the selected item.
- *Web view columns:* Right-click the column headers to select the columns you wish to display. For more display options, see *Web view columns* on page 197.

  For a complete list and description of the available columns in the **Web** views, see *Web view columns* on page 343.
- *Timing column:* Displays duration, packets, and phases of each HTTP request. The Timing column is hidden by default. To display the column, right-click the column header and select *Timing*. For details, see *Timing column* on page 187.
- *Upper pane web views:* This area displays web data in four formats: by server, client, page, and request. See *Web upper pane views* on page 189.
- *Lower pane web tabs:* This area displays additional information corresponding to a selected row or rows of upper pane data in the following four formats: web details, headers, contents, and packet timing graph. See *Web lower pane tabs* on page 192.
- *Right-click options include:*
  - *Flow Visualizer:* Opens the selected item (Request, Page, etc.) in a Flow Visualizer tab. See *Web save functions* on page 198.
  - *Save Web Statistics...:* Saves Web statistics to a *.txt* or *.csv* file. See *Web save functions* on page 198.
  - *Save Payload...:* Saves payload to the local disk. See *Save payload* on page 198.
  - *Open Payload in Associated Viewer:* Opens payload directly from **Web** view. See *Open payload in associated viewer* on page 198.
  - *Select Related Packets:* Selects related packets by various options. See *Web packet selection* on page 197.
  - *Select Related Flow:* Selects related flow. See *Selecting related flows* on page 116.

# Timing column

The *Timing* column shows abbreviated versions of the full packet timing graph displayed in the *Timing* tab (see *Timing tab* on page 195). These packet timing graphs show the duration, packets, and phases of each HTTP request.

To view the *Timing* column, right-click in the column header and select **Timing**.




The following key describes the colors and phases of the packet timing graph:

- *Orange line:* This represents the idle phase, either after SYN sets up the connection but before first data packet, or after the last data packet but before FIN packets shut down the connection. Often there is little or no idle phase before the first data packet, but a long idle phase after the last packet. This occurs because most clients will keep a connection open in case they need to fetch more data from the server.
- *Blue line (default client color):* This shows the request phase, when the client is sending its HTTP GET and waiting for a response. You can reset the client and server colors in the **Client/Server** view of the **Options** dialog. See *Setting client/server colors* on page 150.
- *Green line (default server color):* This shows the response phase, when the server is sending its data back to the client. You can reset the client and server colors in the **Client/Server** view of the **Options** dialog. See *Setting client/server colors* on page 150.
- *Purple line:* This shows a reset connection, which is the idle period after the last data packet and the TCP RST packet.
- *Tick marks:* Individual server packets appear as tick marks above the packet timing graph. Individual client packets appear as tick marks below the packet timing graph. Tick mark height corresponds to TCP payload length.

The following provides examples of how to read phases of the packet timing graph:

| Example |
| --- |
|  <br>From left to right, an initial orange SYN packet from the client appears below the packet timing graph, which is almost immediately answered with an orange SYN packet from the server above the packet timing graph. There is an idle period where the packet timing graph remains in its orange SYN phase, and then a single blue client request packet appears. The server responds almost immediately with a block of tall green packets.<br><br>Note: This request lacks a final orange FIN phase, so it is likely that this flow was reused for subsequent HTTP requests. The FIN phase appears after the last HTTP request on this same flow. |
|  <br>From left to right, a tiny orange SYN packet appears above the packet timing graph, from the server. This is directly above a tiny blue request packet below the packet timing graph, from the client. An orange SYN packet appears below the packet timing graph, from the client.<br><br>There is a blue phase where the client waits for a response, eventually followed by green tick marks showing response packets from the server. The server then pauses a moment before sending the final packet and finishing the request. |
| <br>In this example, a single blue packet appears below the packet timing graph, followed by a long purple idle period, and eventually a purple TCP RST packet from the client. This shows that the client requested some data, never heard back from the server, and eventually closed the connection with a TCP reset. |

## Packet counts in web views

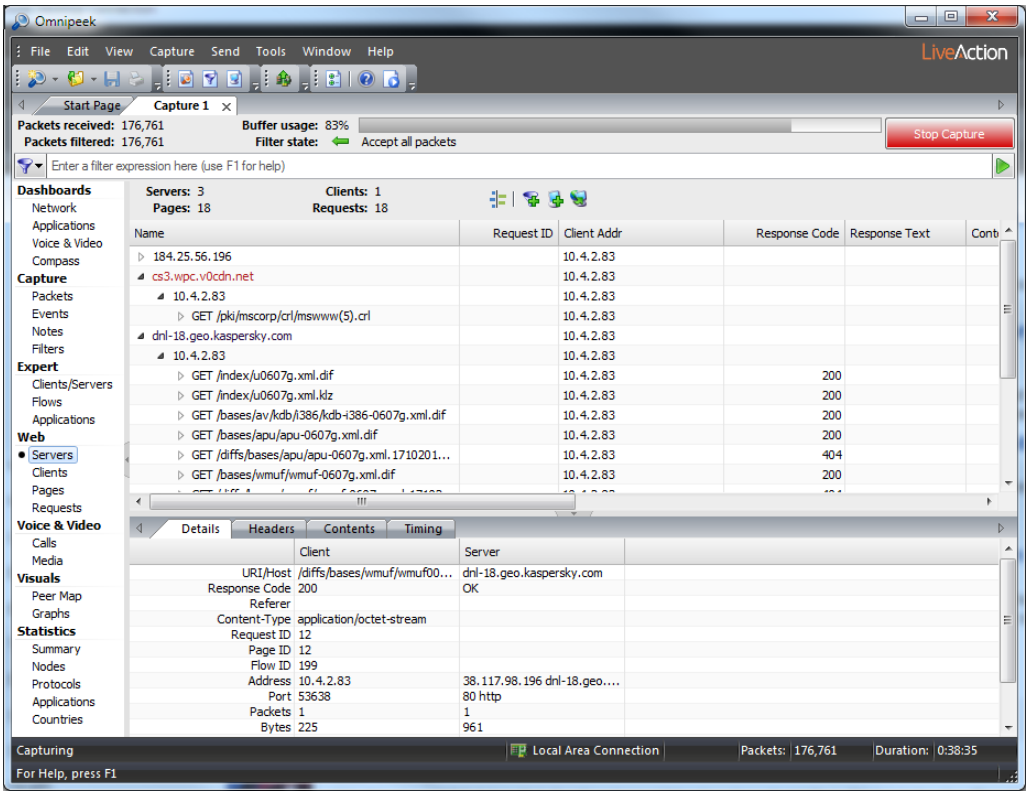
The packet and byte counts in **Web** views will generally be less than those in the more packet-oriented capture window views such as **Nodes** or **Expert** because:

- Packet counters in **Web** views count only TCP data packets and TCP SYN/FIN/RST flags. They ignore ACK-only packets.
- Byte counters in **Web** views count only reassembled TCP payload bytes. They do not include MAC/IP/TCP header, FCS, or repeated data bytes. Byte counts in web views do include HTTP header bytes.

# Web upper pane views

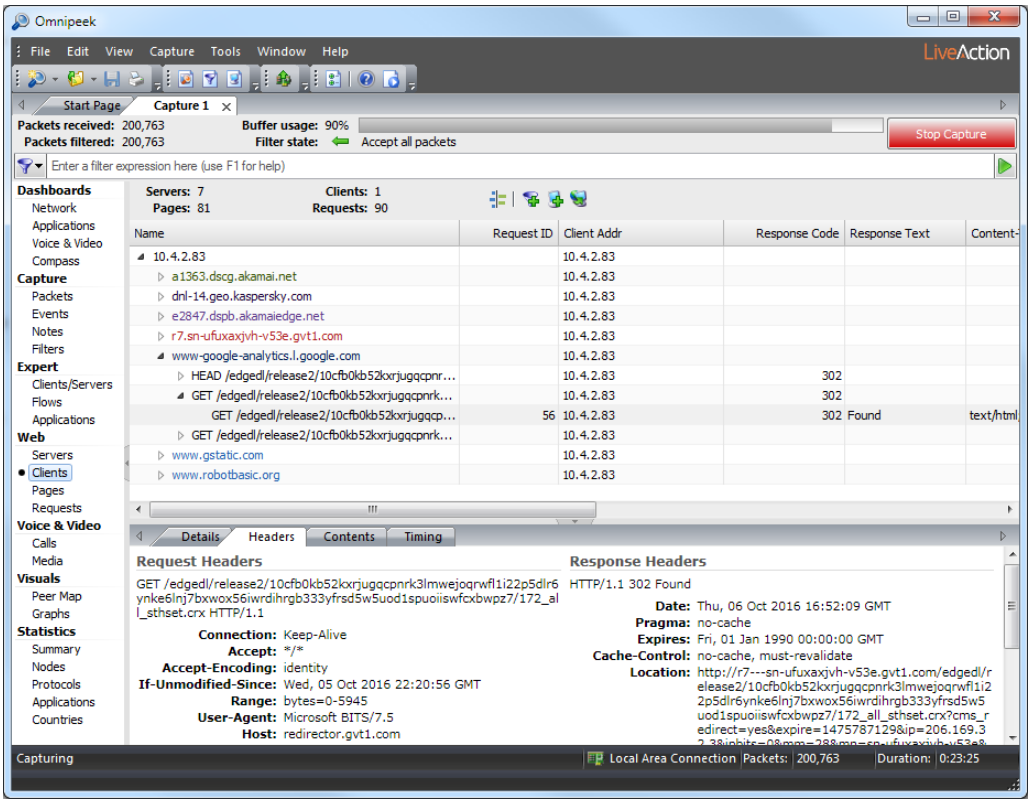
## Servers view

The **Servers** view of a capture window lets you focus on which servers are being used. When the data is expanded, the list of servers is shown with nested information in the following hierarchy: the servers, the clients using those servers, the pages that each client requests, and the individual requests that make up each page.



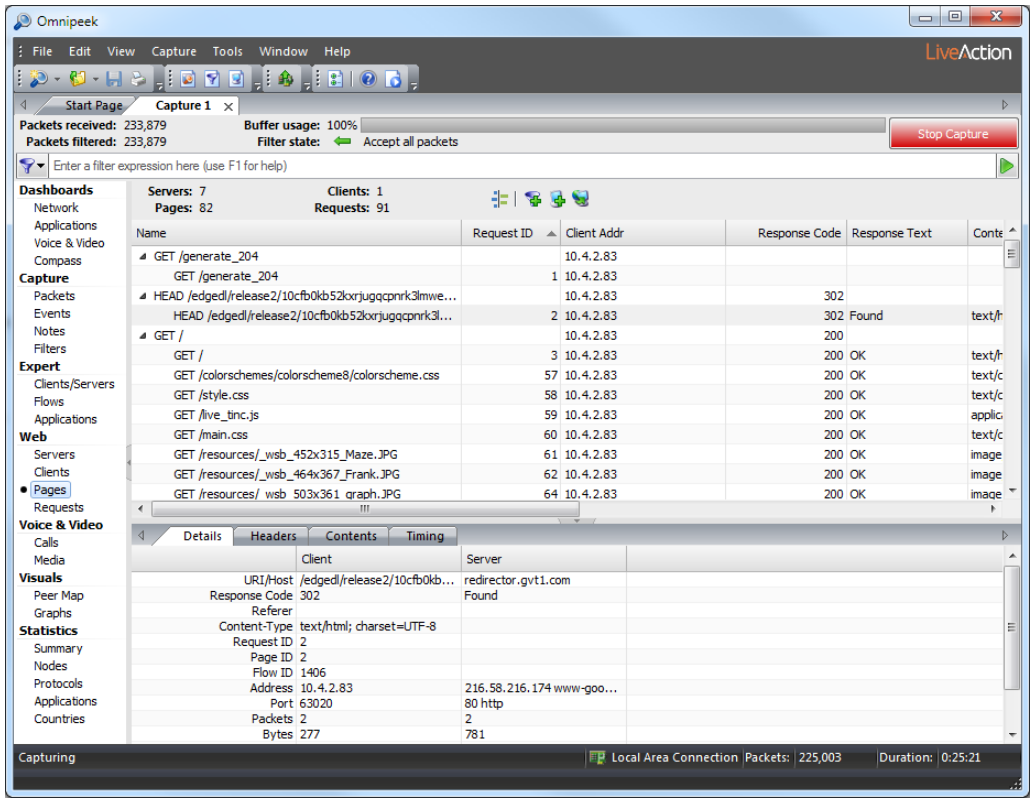

# Clients view

The **Clients** view of a capture window lets you focus on clients first, with nested information in the following hierarchy: the clients, the servers used by the clients, the pages that each client loads from each server, and the individual requests that make up each page.



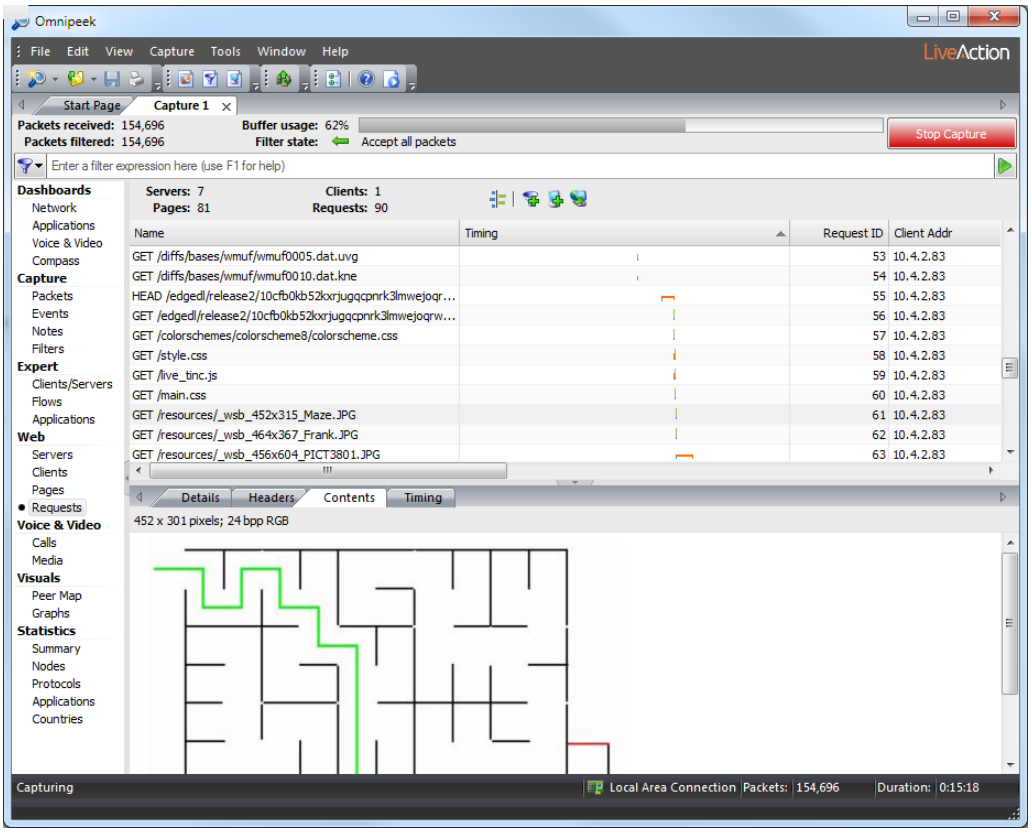
# Pages view

The **Pages** view of a capture window shows a list of pages with each individual request that makes up that page nested underneath. When collapsed, this view presents a sortable list of every web page visit in the capture.




# Requests view

The Web **Requests** view of a capture window shows a flat list of individual HTTP requests (usually HTTP GETs and POSTs). This view shows each image, JavaScript, HTML file, and other HTTP request in the capture nested underneath.



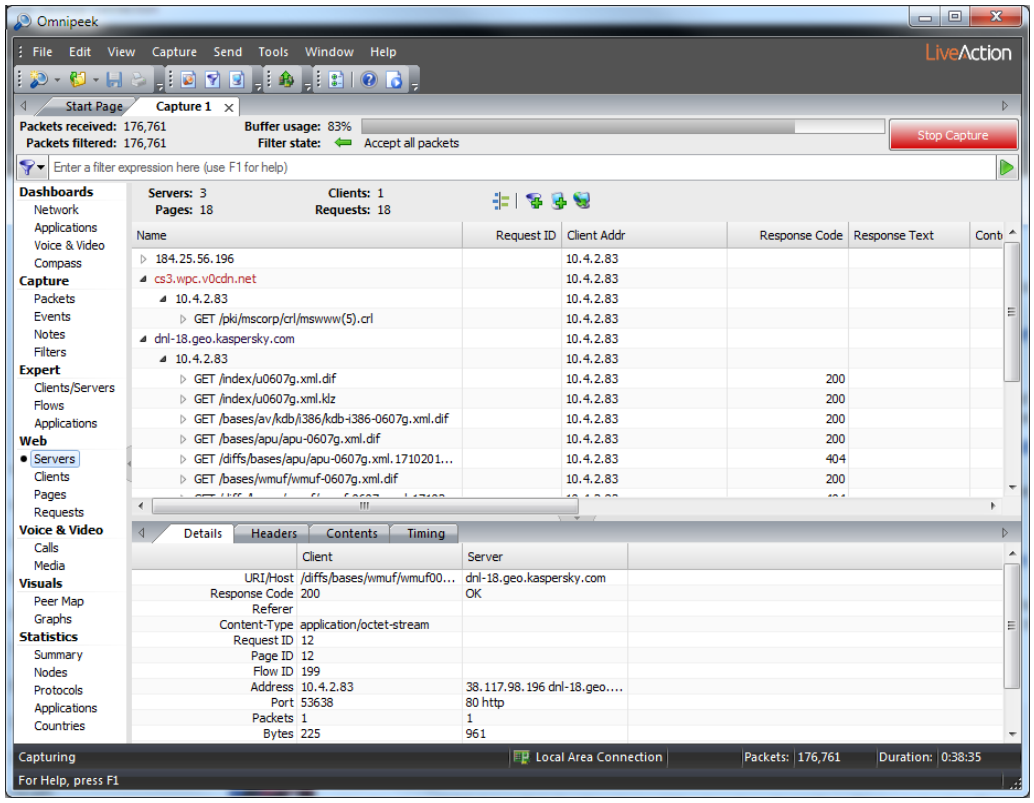

**Tip** Along with relevant filters, this view can provide the quickest way to drill down to the raw data for analysis.

# Web lower pane tabs

Additional information is provided in the four lower pane tabs for each selected row in the upper pane of the **Web** view.

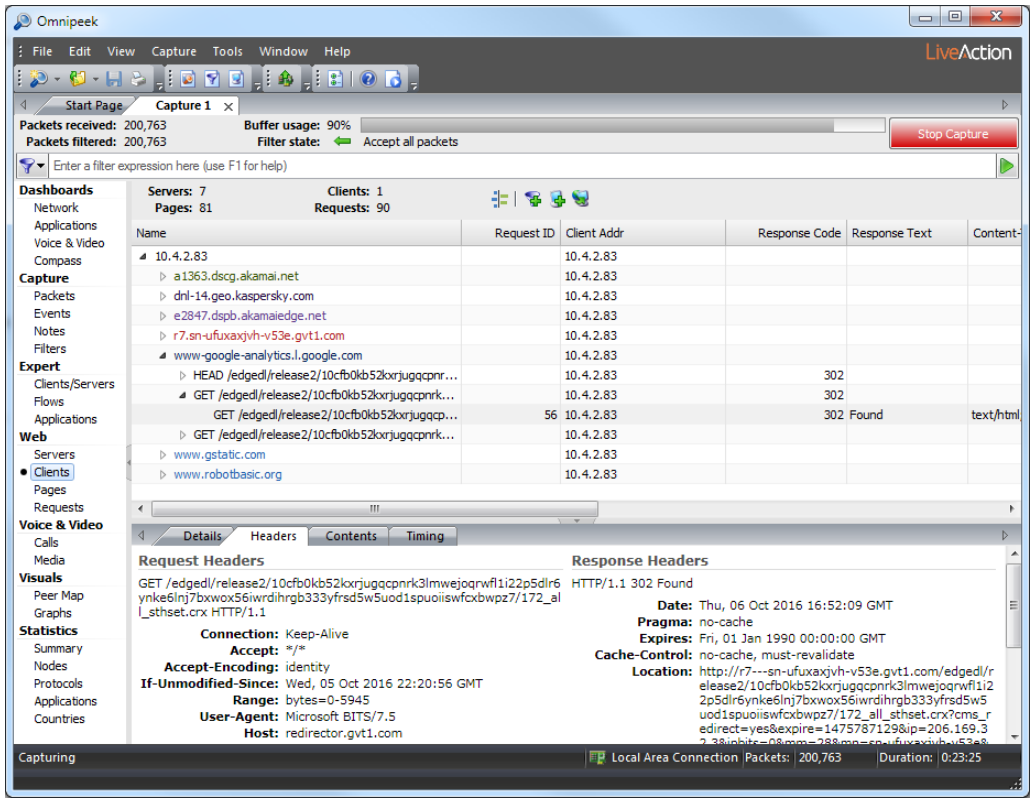
## Details tab

The web *Details* tab lists information about the first selected row in the upper pane, including *Host*, *Response Code*, *Referer*, *Content-Type*, *Request ID*, and *Flow ID*. Data is displayed individually for client and server.




# Headers tab

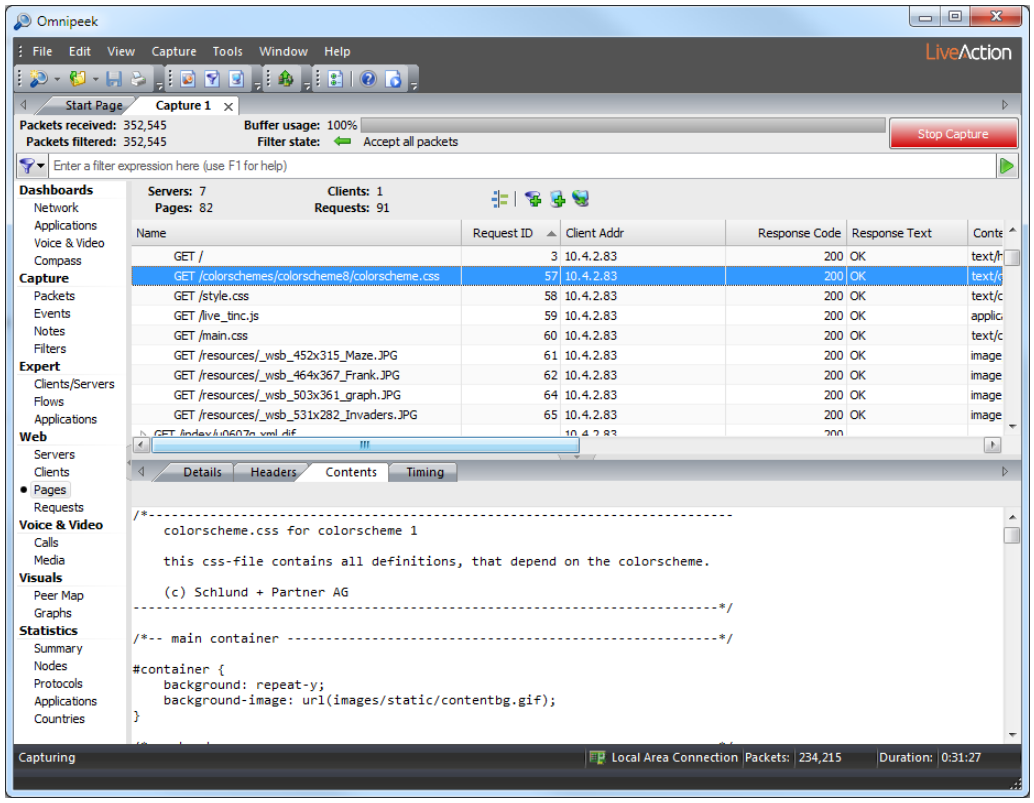
The web *Headers* tab displays HTTP headers for a selected request in client colors and its response in server colors.



**Note** The *Headers* tab displays data only when a single request is selected. Therefore, data in the **Servers**, **Clients**, or **Pages** views must be expanded in order to select a single request.

## Contents tab

The *Contents* tab displays the web page text, image, or HTML source text of the first selected request.




**Note** The *Contents* tab displays data only when a single request is selected. Therefore, data in the **Servers**, **Clients**, or **Pages** views must be expanded in order to select a single request.

### *Contents tab options*

You can right-click inside the Contents tab to enable/disable the following options for viewing the reconstructed document selected in the upper panes:

- *Display HTML as Source Text:* Displays the contents of a reconstructed document as HTML source text.
- *Display HTML as HTML:* Displays the contents of a reconstructed document as it would appear when viewed in your browser.

**Tip** To display a reconstructed document as a complete HTML page, search for and select reconstructed documents that display *"text/html"* in the *Content-Type* column. Please note, however, that not every instance of *"text/html"* in the *Content-Type* column will display a complete HTML page.

- *JavaScript Execution:* Enables embedded or linked scripts (JavaScript, VBScript, etc.) to run in the browser.
- *ActiveX:* Enables ActiveX controls to run in the browser.

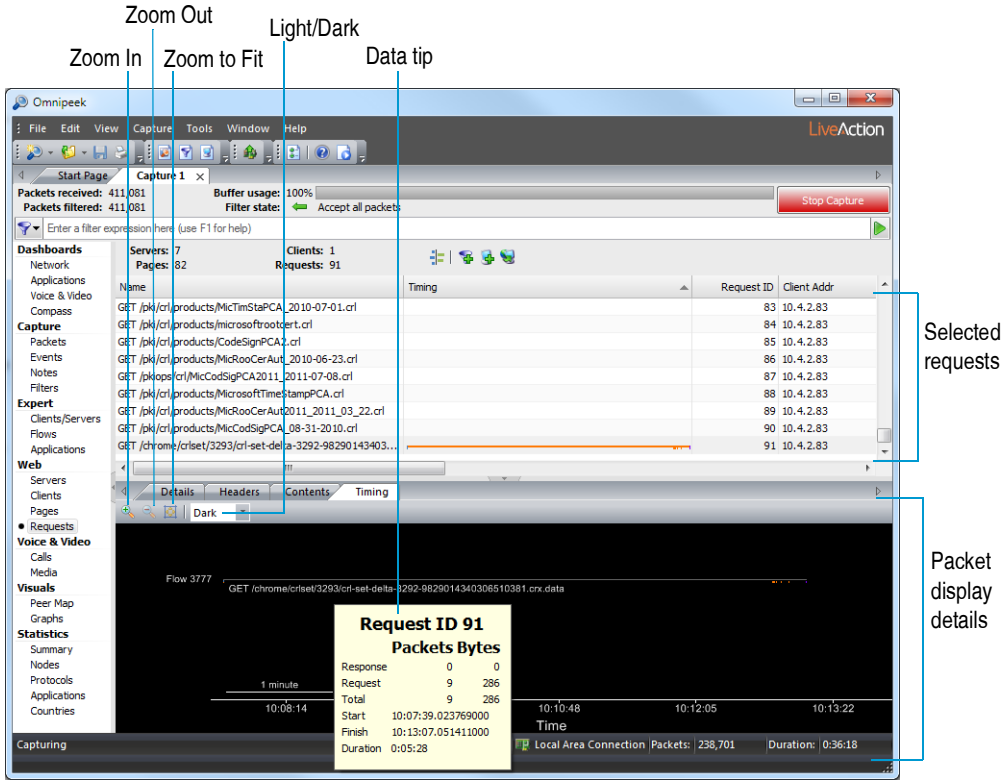
- *Background Sounds:* Enables playing background sounds contained in the reconstructed document.
- *Download Images:* Enables viewing of images contained in the reconstructed document. (Images are not downloaded from the Internet, but from other reconstructed flows.)
- *Encoding:* Lets you choose from various encoding options for displaying text inside the Contents tab.

## Timing tab

The *Timing* tab displays a packet timing graph of all the packets in the selected request row or rows. This tab lets you view all of the requests of a web page simultaneously, across multiple flows, multiple servers, and through time. You can view a complete HTML page load from start to finish, within a single graph, with packet-level precision.

For examples of how to read the information displayed in the *Timing* tab, see *Timing example of single request* on page 196 and *Timing example of multiple requests* on page 196.

The parts of the *Timing* tab display are described below.




- *Zoom In:* Click and drag a rectangle across the portion you want to see to zoom into a specific portion of the graph.
- *Zoom Out:* Click to decrease the display of the packet timing graph.
- *Zoom to Fit:* Click to render the entire packet timing graph within the available screen space.
- *Light/Dark:* Choose a light or dark background color for the packet timing graph display.
- *Data tip:* Hold the cursor over a point on the packet timing graph to view a data tip displaying payload size, relative time, number of requests and responses.
- *Packet display details:*
  - Client request packets appear below the grey packet timing graph.
  - Server response packets appear above the grey packet timing graph.
  - The size of packets are indicated by the size of the tick marks. Larger tick marks indicate larger packets.

- Different packet colors identify TCP flags, HTTP warnings and errors, client and server packets.
- Reference bars at the bottom of the graph give a rough sense of scale.

**Note** HTTP timing graphs share the same tools with **Flow Visualizer** graphs. (See *Flow Visualizer* on page 154.) You can drag a rectangle to zoom, change colors to light or dark, and use the SHIFT or CAPSLOCK key to show a magnifier view of the graph.

## *Timing example of single request*

*Flow 1* in the following example contains a single request to *http://liveaction.com*.


**To view this flow:**

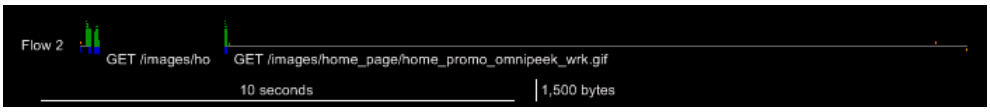
- Select *http://www.liveaction.com* in the upper pane of the **Web** view window.
  - An initial pair of orange SYN packets starts this flow, one below the packet timing graph from the client, and one above the packet timing graph from the server. These are flag-only packets, since they do not touch the grey horizontal packet timing graph.
  - The SYN connection packets are immediately followed by a single blue request packet below the packet timing graph: the request to GET /. The server immediately responds with a yellow warning packet (yellow packets are HTTP 300-399 warning responses). The 302 indicates that the page was found, but at a different location. The browser is therefore being redirected to *http://www.liveaction.com*.

**Note** If this were an HTTP 400+ error such as *404 Page not found*, the packet and number would appear in red.

  - The connection stays open, though idle, for about 15 seconds (1.5 times the length of the *10 seconds* reference bar). A pair of FIN packets then close the TCP connection.

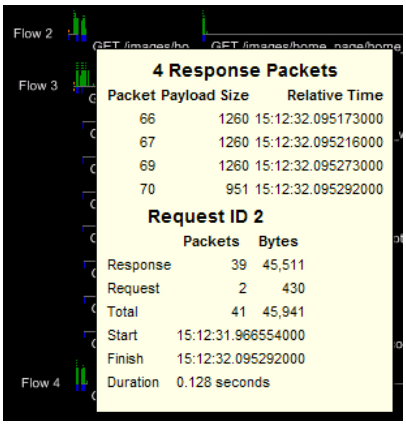
## *Timing example of multiple requests*

*Flow 2* in this example contains multiple consecutive requests, starting with http://liveaction.com:

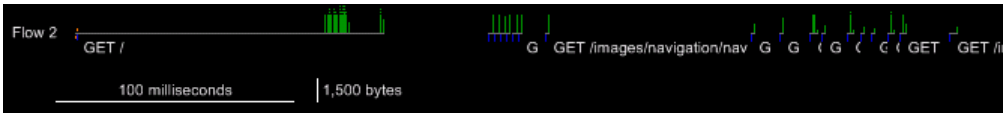



**To view this flow:**

1. Select http://www.liveaction.com in the upper pane of the **Web** view window.
   - The client's initial SYN packet is obscured by the first blue request packet, but the server's SYN response is clearly visible. A blue client request packet is followed by several green response packets. The green response packets are probably maximum size, since they are close in height to the *1500 bytes* reference bar.
   - The cluster of green packets has additional green dots over the packets, indicating that multiple packets occupy the same screen pixel. One dot indicates one additional packet, two dots for two packets, and three dots for three or more additional packets. There are many of green packets here, indicating that this is a sizeable response. If you hold the mouse over the green packets, a tooltip shows that *Request ID 2* squeezes 39 response packets and 45KB into that tiny space.




2. Zoom in to see that there are actually 18 complete request/response sequences in the first 20 pixels of horizontal space. Drag a rectangle around the cluster of packets to view the following image:




It is now possible to see the initial query and its many large response packets, then a series of six tiny requests, each with a short response that fits in a single packet. Eventually more queries fire, with different idle periods between them. You can also see that the time scale has changed, and that a *100 milliseconds* reference bar shows that this entire sequence takes less than around 500 milliseconds.

**Note** All of these request/responses happen on a single horizontal packet timing graph. This implies that the browser never queues up the next request until the previous response completes.

# Configuring web views

You can customize the display of columns in the **Web** views, select packets for further analysis using a variety of options, and save web statistics or payloads in several formats.

## Web view columns

Right-click in the column headers to select the columns you wish to display. Use drag and drop in the upper pane of the **Web** views to change column order.

You can sort the contents of any column in ascending or descending order. Double-click the right edge of a column header to automatically resize the column area. Hold down the **Shift** key and double-click the right edge of any column header to automatically resize all of the columns.

For a complete list and description of the columns common to all the **Web** views of a capture window, see *Web view columns* on page 343.

## Web packet selection

Right-click and choose **Select Related Packets** in **Web** views, and select one of the following options:

- *By Client:* This option selects all packets to or from the client IP address.
- *By Server:* This option selects all packets to or from the server IP address.
- *By Client and Server:* This option selects all packets between the client and server IP addresses.
- *By Port:* This option selects all packets between the client and server IP address and ports. (This option will usually produce the same results as selecting *By Flow*, unless a node pair reuses ports for multiple TCP connections.)

- *By Flow:* This option selects all packets in the flow identified in the Flow ID column.
- *By Request:* This option selects all client packets in the selected HTTP request.
- *By Response:* This option selects all server packets in the selected HTTP response.
- *By Request and Response:* This option selects all packets in the selected HTTP request and response.

**Note** Request, Response, and Request and Response packets also select TCP SYN packets for the first request on a flow, and FIN and RST packets for the last request on a flow. They do not select ACK-only packets.

For more information on how to select related packets, see *Selecting related packets* on page 115.

## Web save functions

You can choose to save web statistics or web requests in the **Web** views of a capture window.

### *Save web statistics*

To save web statistics:

1. Right-click the request file in the upper pane of the **Web** view window and select **Save Web Statistics...**.
2. Save the statistics in one of the following formats:
   - *Text (view delimited) *.txt*
   - *CSV (Comma delimited) *.csv*

The content and arrangement of the saved files match the content of the pane being saved. You can hide or display optional columns or change column order to control the information that will be included in the saved file.

### *Save payload*

You can save a single web request to the local disk.

**To save a file:**

1. Right-click the request file in the upper pane of the **Web** view window and select **Save Payload(s) [***filename***]**.
2. Browse to the location where you want to save the file(s).

   Filenames are automatically generated when multiple requests are selected and saved to the local disk.

### *Open payload in associated viewer*

You can open a single request directly from the **Web** view of a capture window.

**To open a file in the associated viewer:**

- Right-click the request file in the upper pane of the **Web** view window and select **Open Payload in Associated Viewer**.

# Voice & Video Analysis

## In this chapter:

# About Voice & Video analysis

Voice and video over IP signaling and media is available for capture analysis. Voice over IP and Video over IP refer to protocol suites used to set up and maintain two way voice or video communications over the Internet. Voice and video protocol suites include those relating to SIP, SCCP, RTSP, H.323, Avaya, etc. The unit of communication is the *call* and an individual call may be carried in multiple *channels*, some dedicated to signaling and others to carrying the encoded voice data. The encoded data is referred to as *media*, and a call containing such data has media channels. Media channels contain *RTP* (Real-time Transport Protocol) or *RTCP* (RTP Control Protocol) data. The conversion of voice data into digital form and back again is accomplished using a particular *codec* (coder/decoder), specified in the RTP header.

The **Voice & Video** views in capture windows provide simultaneous analysis of voice and video traffic with subjective and objective quality metrics. The **Calls** view displays one row for each call in a capture and the **Media** view displays one row for each RTP media flow in a call.

**Note** Omnipeek voice and video analysis derives its call quality metrics from industry-standard Telchemy technology.

**Tip** To do reliable analysis on VoIP calls, it is best to have the entire set of packets for the calls. For this reason, use filters to capture only VoIP traffic. See *Making a voice or video filter* on page 213.

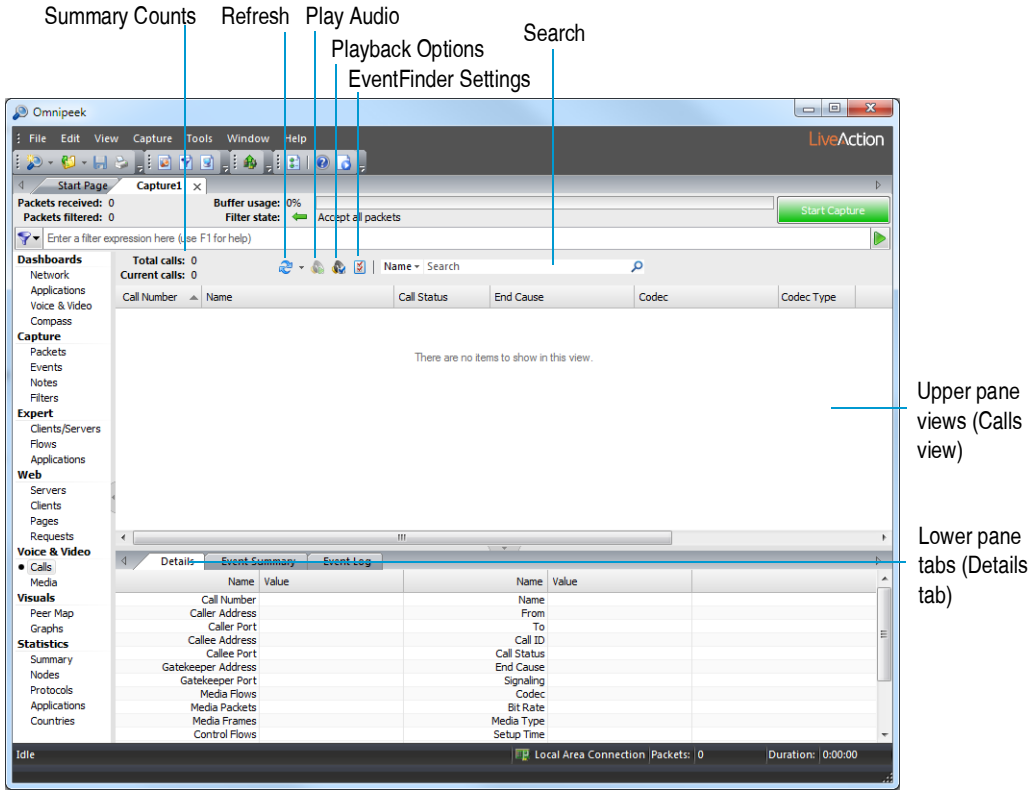
The **Voice & Video Flow Visualizer** displays signal bounce diagrams of the signaling and RTP/RTCP packets of an entire call in a single window. See *Voice & Video Flow Visualizer* on page 208.

# Voice & Video view window

The **Voice & Video** views have two data areas. The upper pane contains voice and video data arranged by call or by the media streams within a call. See *Voice & Video upper pane views* on page 202.

The lower pane contains three tabs which present additional information for a row or rows selected in the upper pane, allowing you to view call details, a summary count of the expert events found in the capture, or a capture log of the individual VoIP expert events. See *Voice & Video lower pane tabs* on page 204.

The parts of the **Voice & Video** view window are identified below.




- *Summary counts:* This area displays the current calls, total calls, and media flows in the capture. *Current Calls* reflect the calls that are currently displayed within the **Calls** view. *Total Calls* reflect all calls that have ever been displayed in the **Calls** view.
- *Refresh:* You can immediately update the currently displayed **Voice & Video** view with the latest information. You can also choose a refresh interval from the drop-down list.
- *Play Audio:* Click to play the audio from a call or media flow that has a playback-supported codec. *Play Audio* is only available when a selected call or media flow has a playback-supported codec.
- *Playback Options:* Click to open the *Media Playback Options* dialog to adjust jitter buffer, DTMF audio, and RTP payload settings:
    - *Use jitter buffer*. A jitter buffer temporarily stores arriving packets in order to minimize delay variations. If packets arrive too late then they are discarded. To hear what the media sounds like with a specific buffer size, select the *Use jitter buffer* check box. To make fine adjustments to the slider bar, click the slider bar control and move it to an approximate position, then use the arrow keys on your keyboard to get the exact value you want. For playback with 'best quality,' clear the *Use jitter buffer* check box. Omnipeek will then play back the media as if there was an infinite jitter buffer. All RTP packets will be played back at a regular interval, and packets that arrive out of sequence will be re-ordered.
    - *Synthesize audio from DTMF events*: Select to play back DTMF tones (keypress events).
    - *Treat RTP Payload as telephone events*: Select if signaling isn't present and you know the payload type of the DTMF audio tone events. Enter the payload type, which is found in the RTP header.
- *EventFinder Settings:* Click to open the Expert EventFinder Settings dialog. The EventFinder scans traffic in a capture window, looking for network anomalies and sub-optimal performance at all layers of the network, from application to physical. It also shows network events associated with VoIP calls.
- *Search:* Enter a term to search in the **Calls** view. Click the small down arrow to specify the type of search to perform (*Name*, *From*, *To*, *Call ID*, *End Cause*, or *MOS Low* <=).

- *Upper pane Voice & Video views:* This area displays voice or video data arranged by calls or media. See *Calls view* on page 202 and *Media view* on page 203. Additional options are available from these views by right-clicking a call or media flow. See *Calls and Media options* on page 207.
- *Lower pane Voice & Video tabs:* This area displays additional information corresponding to a selected row of data in the upper pane. See *Voice & Video lower pane tabs* on page 204.

# Voice & Video upper pane views

The upper pane contains captured voice data arranged in two formats: by individual call or by the individual media streams within a call.

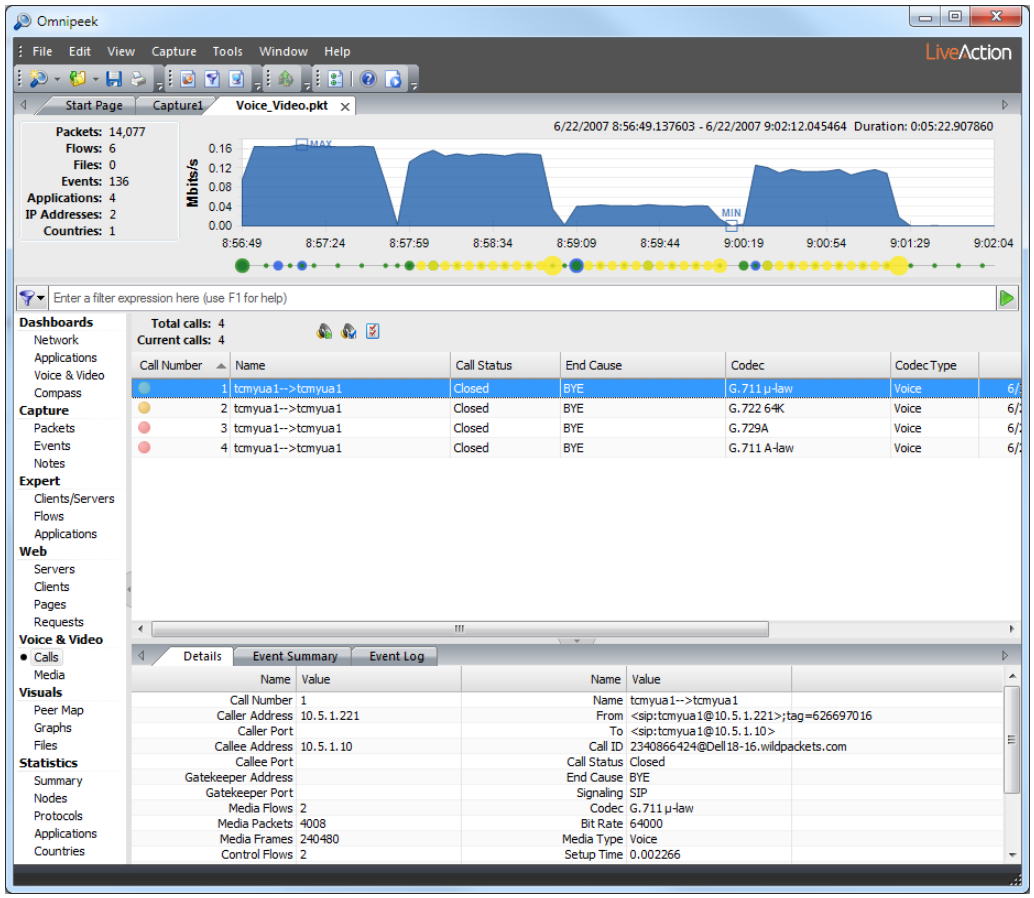
**Tip** In the upper pane, you can hover over one the colored globes for each call or media flow to display a tooltip showing the quality score key. Bright colored globes correspond to an open call. Shaded globes refer to a closed call.

## Calls view

The **Calls** view displays one row for each call. Each call is displayed in the order in which it was captured, with call number, call name, and end cause information. You can click any column header to sort by that column data.

**Note** The **Calls** view has a 2000 call limit. Once the limit is reached, older calls are removed to allow for the new calls.

Right-click the column header to display additional view columns. See *Voice & Video view columns* on page 214 and *Voice & Video view columns* on page 344 for a complete list and description of the available columns.

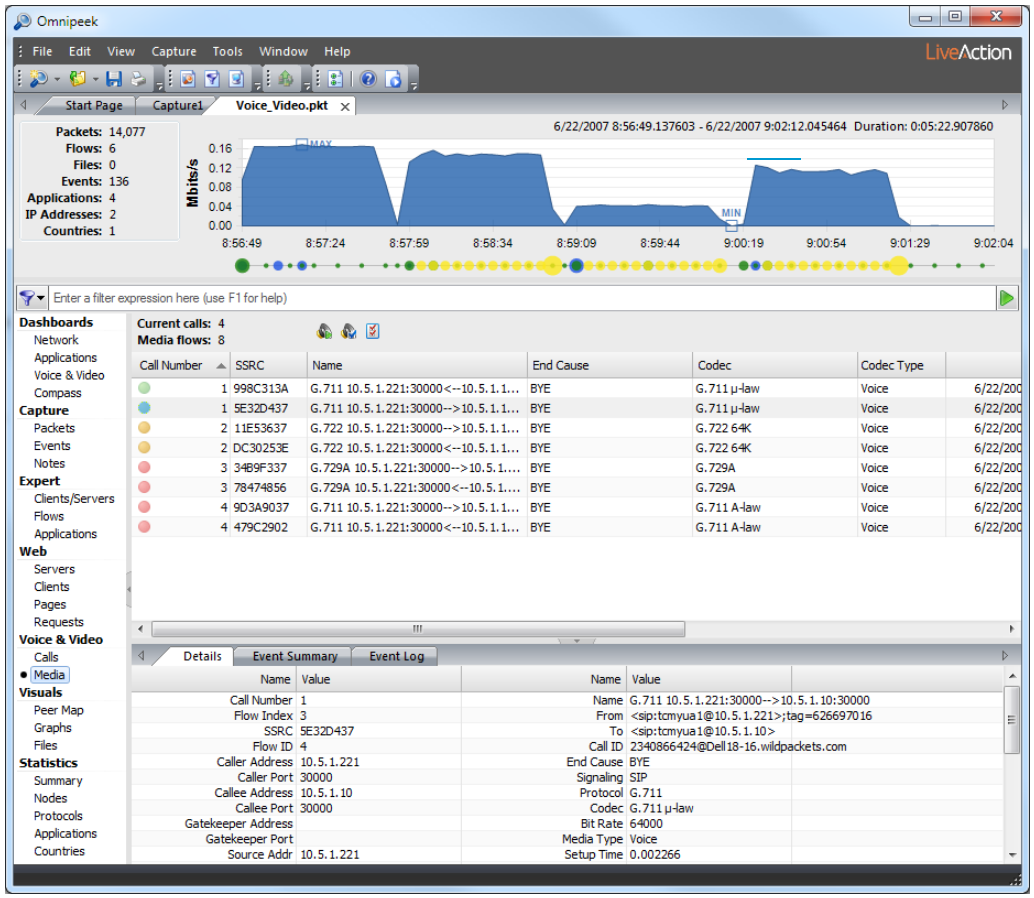



To view a visual display of the call details, right-click a call and select **Voice & Video Flow Visualizer** (or double-click the call). See *Voice & Video Flow Visualizer* on page 208 for more information.

## Media view

The **Media** view displays one row for each RTP media flow in a call. A voice call will usually have two media flows, one for each direction. Video calls will usually have four media flows: two voice and two video.

**Note** For dynamic codecs, if Omnipeek does not have enough RTP packets to heuristically determine the codec type, the *Codec* column displays "*undetermined*." If the *Codec* column displays a codec type plus the word "*undetermined*," it means that Omnipeek did not have enough RTP packets to heuristically determine the codec, but was able to extract the codec type from the call's signaling packets.



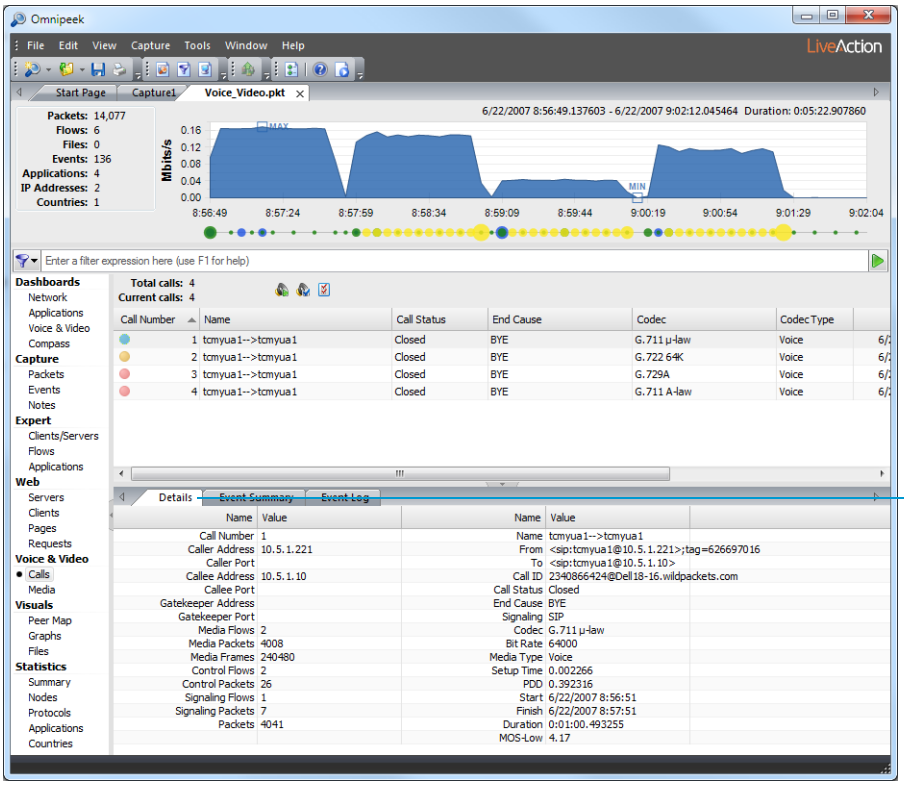

Right-click the column header to display additional view columns. See *Voice & Video view columns* on page 214 and *Voice & Video view columns* on page 344 for a complete list and description of the available columns, including those providing distinct voice and video quality scores.

# Voice & Video lower pane tabs

Additional information is provided in nested tabs for selected calls or media flows displayed in the upper pane of the **Voice & Video** view.

## Voice & Video Details tab

In the **Calls** view, the *Details* tab contains all the information about the call. Every column in the **Calls** view is displayed in the *Details* tab.

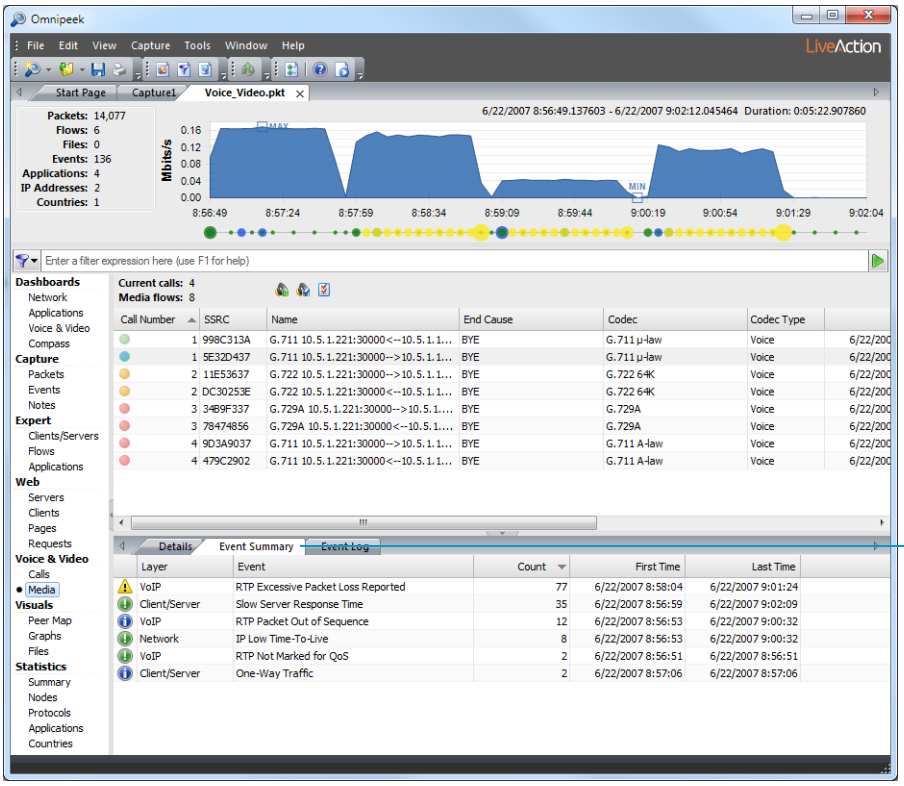



**Note** In the **Media** view, the *Details* tab displays details about the selected media flow and the call that contains it.

## Voice & Video Event Summary tab

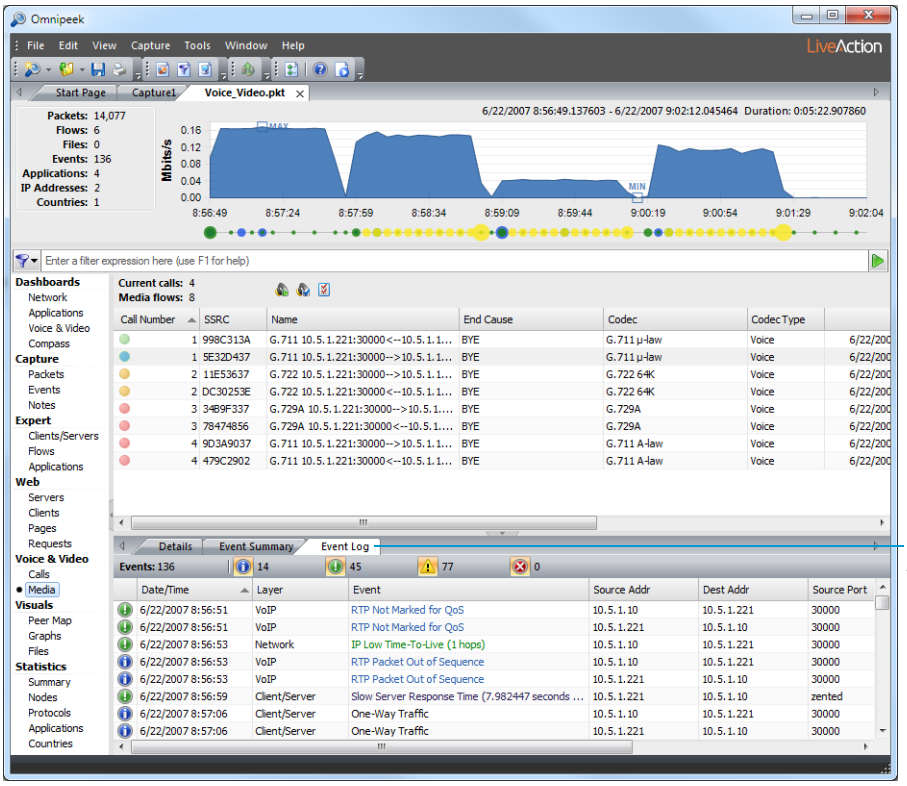
The *Event Summary* tab shows a count of each expert event for this capture. Severity levels configured in the **EventFinder** are displayed to the left of each voice and video expert event. Selecting an event in the *Event Summary* tab will also highlight the corresponding flow or call in the upper pane.

**Note** The Expert EventFinder contains many VoIP expert events, including those relating to H.225, MGCP, RTP, and SIP. For details, see *Expert EventFinder* on page 152.




## Voice & Video Event Log tab

The *Event Log* tab shows a list of all expert events found in this capture. The four toggle buttons in the *Event Log* tab header let you show or hide events by levels of severity. See *Expert EventFinder* on page 152 for instructions on how to configure levels of severity for voice and video expert events.



# Calls and Media options

You can right-click a call or media flow in the **Calls** or **Media** views to display the following options:

- *Voice & Video Flow Visualizer:* Opens a **Voice & Video Flow Visualizer** window for the selected call or media flow. See *Voice & Video Flow Visualizer* on page 208.
- *Save Voice & Video Statistics...:* Saves statistics for the entire list of calls or media flows to a *.txt* or *.csv* file. See *Saving voice and video statistics* on page 212.
- *Play Audio:* Opens the default media player and plays the selected call or media flow. See *Playing calls or media as audio* on page 213.
- *Playback Options:* Opens the *Media Playback Options* dialog where you can adjust the jitter buffer settings.
- *Save Audio WAV File:* Saves the selected call or media flow as a WAV file. See *Saving calls or media as audio WAV files* on page 213.
- *Select Related Packets:* Selects related packets of the selected call or media flow by call-related options. You may then choose to have these packets highlighted or copied to a new capture window for further analysis. See *Selecting voice and video related packets* on page 213.
- *Select Related Call* (**Media** view only)*:* Selects related calls of the selected media flow.
- *Select Related Media* (**Calls** view only)*:* Selects related media of the selected call.
- *Make Filter:* Makes a filter based on the selected call or media flow. See *Making a voice or video filter* on page 213.
- *Insert Into Name Table:* Opens a dialog to add the selected call or media flow into the Name Table. See *Adding entries to the name table* on page 278.
- *Resolve Names:* Checks the DNS server for a name to match the supplied address. See *Omnipeek name resolution* on page 280.
- *Single Call Report* (**Calls** view only)*:* Opens a dialog to create a *Voice & Video Report* for a single call in the **Calls** view. The output format of the report is PDF, and contains the following content:
  - *Call Summary*: Shows basic call info: *Call ID*, *From*, *To*, *Start/Finish/Duration*, *MOS-Low*, and *Setup Time*.
  - *Call Details*: Shows all information for the call (everything listed in the *Details* tab of the **Calls** view).
  - *Event Summary*: Shows summary counts of Expert events relating to the call (like *Event Summary* in the **Calls** view, filtered to show only those events relating to that call).
  - *Events*: Shows the Expert events relating to the call (like *Event Log* in the **Calls** view, filtered to show only those events relating to that call). The table is limited to 100 entries or it displays '*Too many events*.'
  - *Media Flows*: Shows a table of essential information for each media flow.
  - *Media Details*: Shows all the information for each media flow for the call (everything listed in the *Details* tab of the **Media** view). Each section includes a graph of jitter and a quality graph (units differ for voice, audio, or video).

  **Note** The jitter and quality graphs rely on packets in the capture buffer. If any of the packets from the call are missing (because the packets have wrapped out of the capture buffer), the graphs will not populate.

- *All Calls Report* (**Calls** view only)*:* Opens a dialog to create a *Voice & Video Report* for all calls in the **Calls** view. The output format of the report is PDF, and contains the following content:
  - *Summary*: Shows essential statistics for all calls from the *Voice & Video* section of *Summary Statistics*.

  - *Call Quality Distribution*: Summary chart of call quality from the *Voice & Video Dashboard* (the *All Calls* chart).
  - *Quality Overview*: Shows a graph of call quality over time classified as *Good*, *Fair*, *Poor*, *Bad*, and *Unknown*.
  - *QoS Overview*: A graph showing various QoS statistics over time, and the associated data.
  - *Event Summary*: Shows a summary of Expert events (similar to the *Event Summary* tab in the **Expert** views).
- *Show All Calls* (**Calls** view only)*:* Displays all calls in the **Calls** view.
- *Show Open Calls* (**Calls** view only)*:* Displays only the open calls in the **Calls** view. An open call is a call that is in progress.
- *Show Closed Calls* (**Calls** view only)*:* Displays only the closed calls in the **Calls** view. A closed call is a call that is no longer in progress.
- *Show All Media Flows* (**Media** view only)*:* Displays all media flows in the **Media** view.
- *Show Open Media Flows* (**Media** view only)*:* Displays only the media flows associated with open calls.
- *Show Closed Media Flows* (**Media** view only)*:* Displays only the media flows associated with closed calls.

# Voice & Video Flow Visualizer

The **Voice & Video Flow Visualizer** can be accessed by either double-clicking on a call in the **Calls** view or a media flow in the **Media** view, or by right-clicking a call in the **Calls** view or a media flow in the **Media** view and selecting *Voice & Video Flow Visualizer*. The **Voice & Video Flow Visualizer** contains the *Signaling* and *RTP* tab described below.

## *Signaling tab*

The *Signaling* tab of the **Voice & Video Flow Visualizer** displays each individual packet of an entire call within a single window, as well as the RTP packet timing, jitter, and quality score over time. If there are gaps of missing or late RTP packets, these gaps are also displayed, along with their effect on call quality. Signaling and media stream packets are represented by horizontal lines, giving you an immediate overview of the contents of a call. The bounce diagram also includes linear representations as well as numerical measurements of quality and jitter values.

In addition to displaying many of the same columns available in the **Calls** and **Media** views, the **Voice & Video Flow Visualizer** contains columns that allow you to calculate the relative time lapse between individual packets, the signaling sequence method of the call, and more (see *Voice & Video Flow Visualizer columns* on page 347).

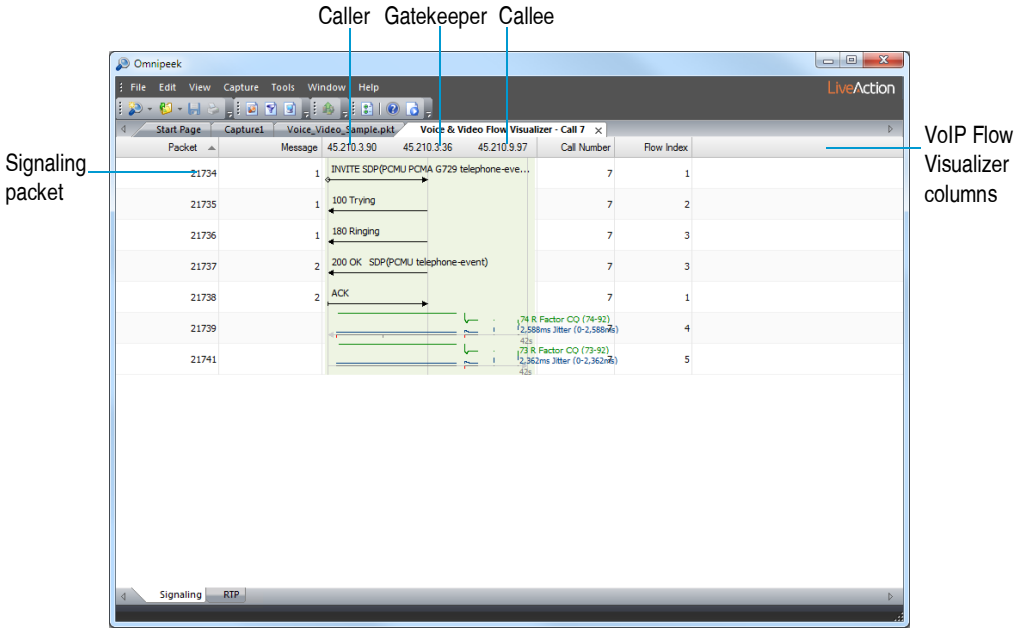
**Note** The **Voice & Video Flow Visualizer** displays only calls, not individual media flows. Opening a **Voice & Video Flow Visualizer** window for one or more media flows is the same as opening their corresponding calls.

Additionally, if any of the packets of a call are missing (because the packets have wrapped out of the capture buffer), the *Signaling* and *RTP* tabs in the **Voice & Video Flow Visualizer** will not populate.

**To view the Voice & Video Flow Visualizer:**

1. Select one or more calls or media flows in the **Calls** or **Media** views of a capture window.
2. Right-click and choose **Voice & Video Flow Visualizer**. The *Signaling* tab for this call or calls appears.

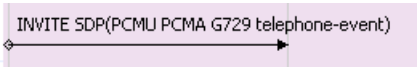
   The parts of the *Signaling* tab are described below.




- *Nodes:* Each node participating in the call gets a vertical line, with the caller usually on the left, the gatekeeper in the middle, and callee on the right.
- *Signaling packets:*
  - Each signaling packet appears as a black horizontal arrow, with a summary above the arrow:

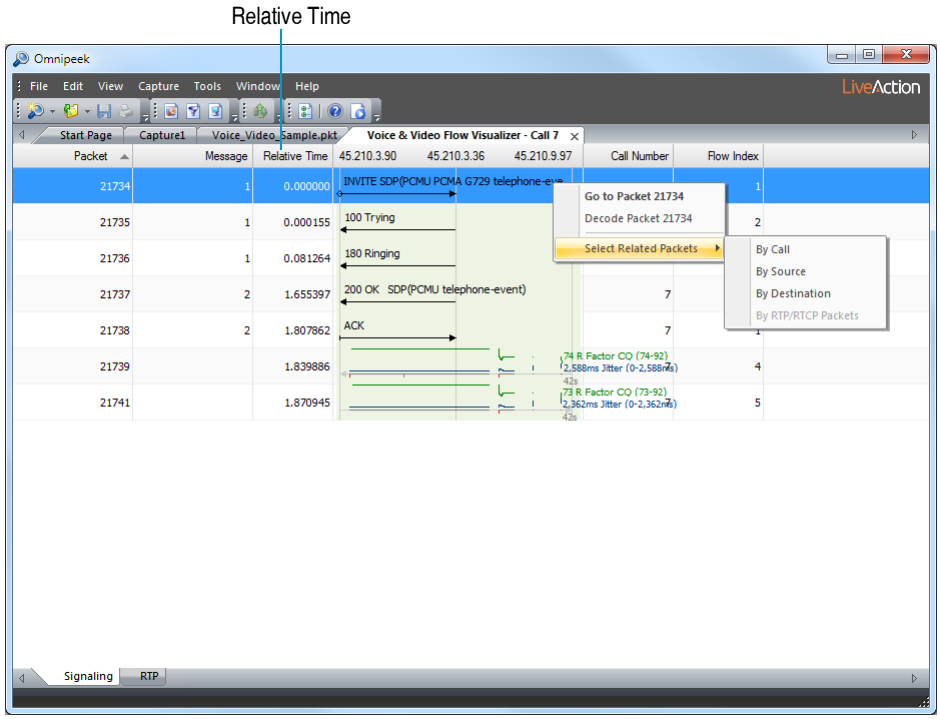
  - Packets that start a call (such as SIP INVITE packets) start with a small diamond:

  - Packets that usually mean the *end of call setup* (such as SIP ACK packets) start with a small bar. The time between these two packets is the *call setup time*.

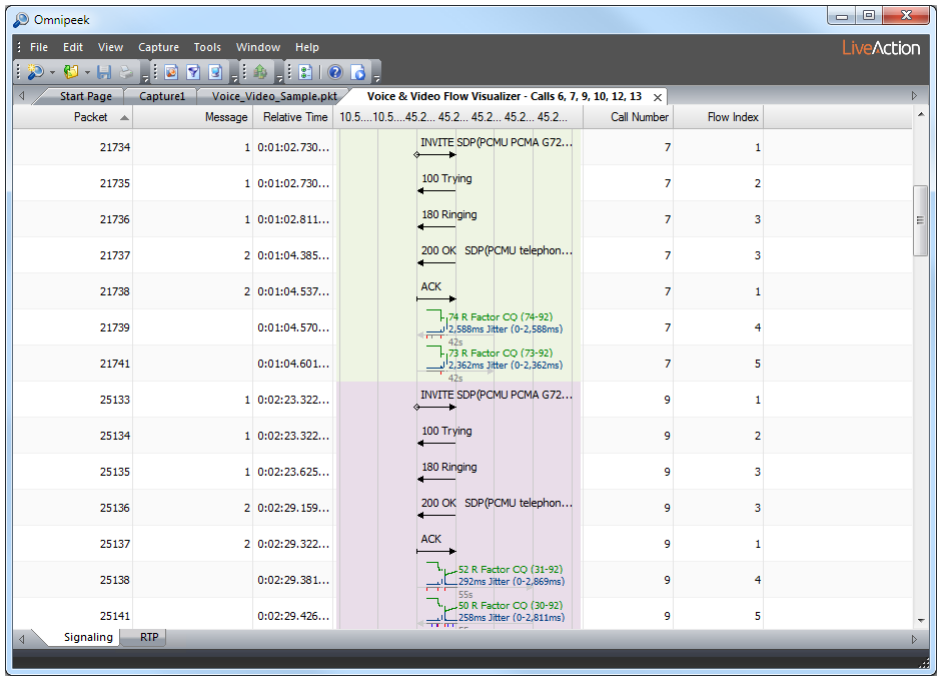
- *RTP/RTCP packets:* RTP/RTCP media packets appear as horizontal light grey arrows, with a green R-Factor and blue jitter line graph above the arrow. See *RTP/RTCP Rows* on page 211.
- *Voice & Video Flow Visualizer columns:* Right-click the column header to display available columns. For example, selecting **Relative Time** displays the time elapsed since the start of the call and the individual signaling and RTP media packets:




For a complete list and description of **Voice & Video Flow Visualizer** columns, see *Voice & Video Flow Visualizer columns* on page 347.

- *Right-click options:*
  - *Go To Packet:* Show a selected packet in the **Packets** view and bring **Packets** view to front.
  - *Decode Packet:* Open a decode window for the selected packet.
  - *Select Related Packets*:
    - *By Call:* All signaling, media, and media control packets for the selected call
    - *By Source:* All packets to or from the source IP address.
    - *By Destination:* All packets to or from the destination IP address.
    - *By RTP/RTCP Packets:* All packets in the RTP/RTCP row.

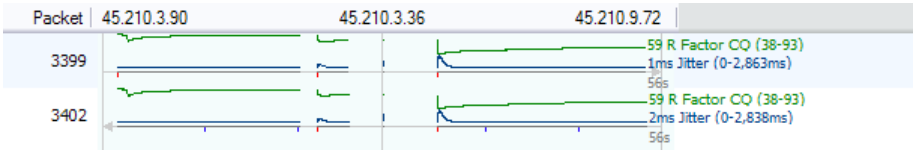
    See *Selecting related packets* on page 115 for more information about using this feature.
- *Call background color:* Each call gets its own background color in the bounce diagram, making it possible to follow several simultaneous calls within a single window:




### *RTP/RTCP Rows*

The media or voice streams (RTP/RTCP packets) within a call display in the *Signaling* tab as rows progressing through time, with the first packet in the row at the left to the last packet at the right. Since most calls are bidirectional, a pair of rows often appears with one row for each direction.

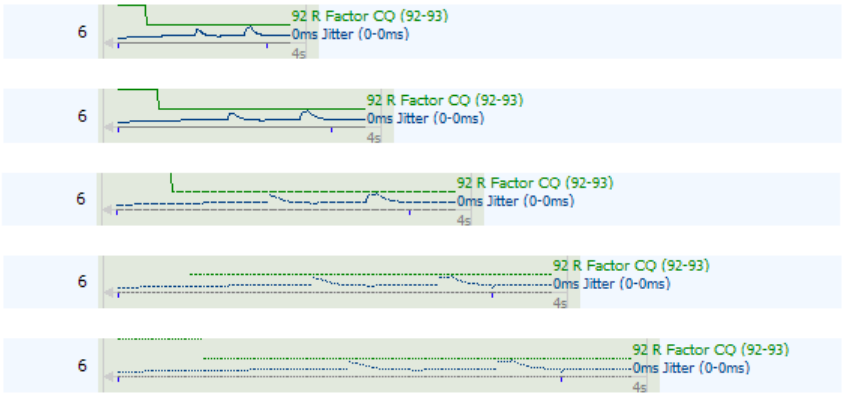
The parts of the RTP/RTCP media packets in a bidirectional call are identified below.




- *Grey arrows and numbers:* Grey horizontal arrows represent the RTP/RTCP media packets. The last packet in the row displays a small grey number showing the entire duration for the row. (Trivial durations are not shown for very brief rows.)
- *Green lines and numbers:* Green horizontal lines show R-Factor conversational values, with the row's final value and minimum-maximum range in green to the right of the last packet in the row.
- *Blue lines and numbers:* Blue lines show jitter values, with the row's final value and minimum-maximum range in blue to the right of the last packet in the row.
- *Blue tick marks:* Blue tick marks represent RTCP packets.
- *Grey tick marks:* Grey tick marks represent out-of-sequence RTP packets.
- *Red tick mark:* Red tick marks show gaps of one or more missing packets.

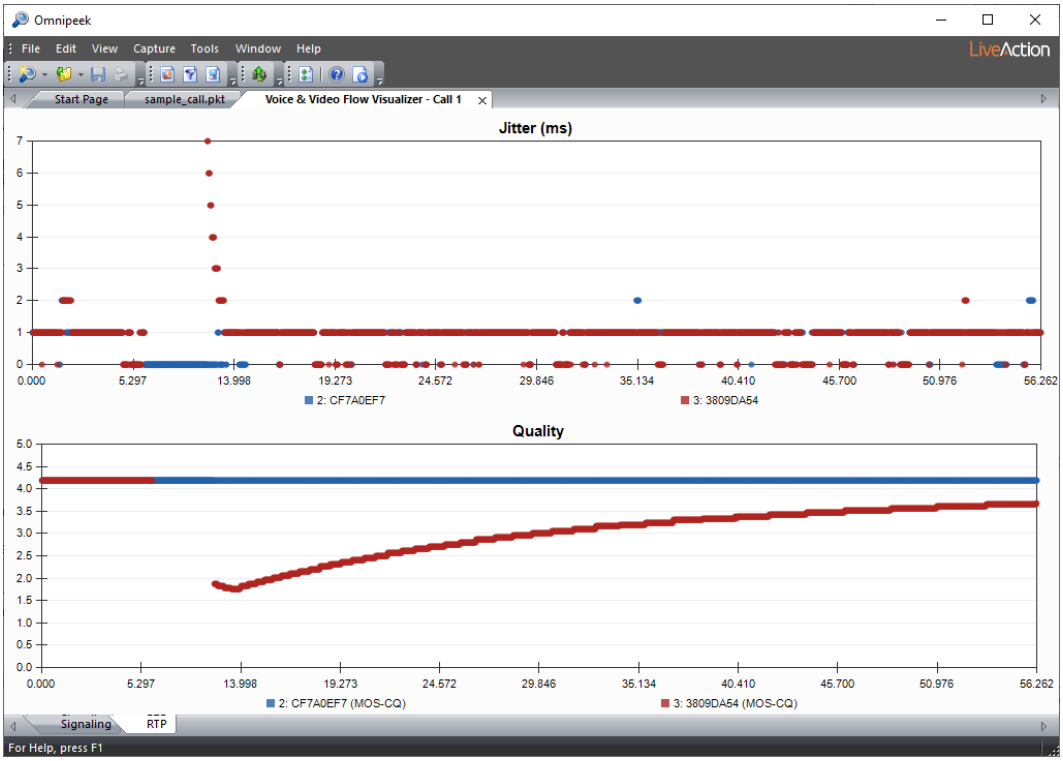
> **Note** Gaps where no packets appear are readily visible, as well as their immediate effects of lowering R-Factor and raising jitter values.

As you widen the bounce diagram column, the **Voice & Video Flow Visualizer** can break an RTP line into its individual packets, as shown below:




### *RTP tab*

The *RTP* tab of the **Voice & Video Flow Visualizer** window displays jitter (ms) and quality graphs of the selected calls in the **Call** or **Media** views. The legend in each of the graphs displays a unique Flow Index followed by the SSRC for the call (for example *3: 3809DA54*).




## Saving voice and video statistics

To save voice and video statistics, right-click the call or media flow in the **Calls** or **Media** views, and choose **Save Voice & Video Statistics...**. You can save statistics in the following formats:

- *Text (tab delimited) *.txt*
- *CSV (Comma delimited) *.csv*

The content and arrangement of the saved files matches the content of the pane being saved. You can hide or display optional columns or change the column order to control the information that will be included in the saved file.

## Playing calls or media as audio

To play the audio, right-click the call or media flow in the **Calls** or **Media** views, and choose **Play Audio** (you can also select the call or media flow and click **Play Audio** in the upper pane header). The default media player starts and begins playing the audio of the selected call.

> **Note** The **Play Audio** option is only available when a selected call or media flow has a playback-supported codec.

You can click **Playback Options** to open the *Media Playback Options* dialog where you can adjust the jitter buffer settings. A jitter buffer temporarily stores arriving packets in order to minimize delay variations. If packets arrive too late then they are discarded. To make fine adjustments to the slider bar, click the slider bar and move to an approximate position, then use the arrow keys to get the exact value you want.

For playback with 'best quality,' clear the *Use jitter buffer* check box. Omnipeek will then play back the media as if there was an infinite jitter buffer. All RTP packets will be played back at a regular interval, and packets that arrive out of sequence will be re-ordered. To hear what the media sounds like with a specific buffer size, select the *Use jitter buffer* check box.

## Saving calls or media as audio WAV files

To save as an audio WAV file, right-click the call or media flow in the **Calls** or **Media** views, and choose **Save Audio WAV File**.

> **Note** The **Save Audio WAV File** option is only available when a selected call or media flow has a playback-supported codec.

## Selecting voice and video related packets

To select related packets, right-click the call or media flow in the **Calls** or **Media** views, and choose **Select Related Packets**. You can select packets using one of the following options:

- *By Call:* All packets in this call. Includes all signaling, media, and media control packets.
- *By Caller:* All packets to or from the caller's IP address
- *By Callee:* All packets to or from the callee's IP address
- *By Port:* All packets between the client and server IP address and ports (usually the same as Flow, but not always if a node pair reuses ports for multiple TCP or UDP connections)
- *By Flow ID:* All packets in the flow identified in the Flow ID column
- *By Media Flow:* All packets in the media flow

For more information on how to select related packets, see *Selecting related packets* on page 115.

## Making a voice or video filter

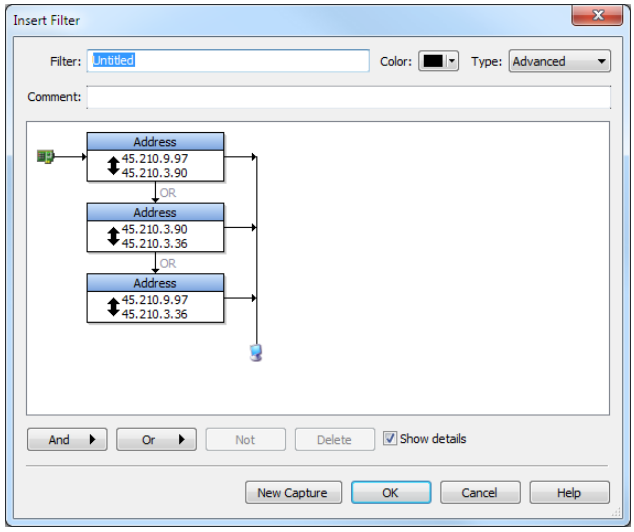
Filters are easy to create for calls and media flows.

For calls, you can create an address filter between caller and callee, caller and gateway, and gateway and callee. If these are three separate nodes, an advanced filter with three bidirectional address filters will be created, as shown in the example below.

**To make a filter for a selected call:**

1. Select a call in the **Calls** view of a capture window.
2. Right-click and choose **Make Filter**. If the call includes a Gatekeeper, the *Advanced* view of the **Insert Filter** dialog appears. In this example, three bidirectional address filters are displayed.

3. Enter a *Name* for your filter.




4. Click **And**, **Or**, or **Not** to further define your filter.
5. Click **OK**. Your filter will now appear in all filter lists in the program.

For media flows, you can create an address or port filter for the selected media flow.

**To create a filter for a media flow:**

1. Select a media flow in the **Media** view of a capture window.
2. Right-click and choose **Make Filter**. The *Simple* view of the **Insert Filter** dialog appears with the address and port details entered for this media flow.
3. Enter a *Name* for your filter.
4. Click **OK**. Your filter will now appear in all filter lists in the program.

**Tip** Choosing **Select Related Packets** by **Call** often results in more precision than creating a filter by media flow. See *Selecting voice and video related packets* on page 213 for more information.

# Configuring options in Voice & Video views

You can customize the display of columns in the **Voice & Video** views, select packets for further analysis using a variety of options, and save voice and video statistics in several formats.

## Voice & Video view columns

**To change the display of columns in the Calls, Media, and Voice & Video Flow Visualizer views:**

- Right-click in the column headers to select the columns you wish to display. You can also select **Show All Columns** to have all columns appear in the **Voice & Video** view.
- Use drag and drop in the upper pane of the **Voice & Video** views to change column order.
- Sort the contents of any column in ascending or descending order.
- Double-click the right edge of a column header to automatically resize the column area.
- Hold down the **Shift** key and double-click the right edge of any column header to automatically resize all of the columns.
- Right-click in the column headers and select **Columns**.... The **Columns** dialog appears. Check the columns you wish to display in the **Voice & Video** views and click **OK**.

**Tip** Right-click to **Check All** or **Uncheck All** columns in the **Columns** dialog.

For a complete list and description of the columns common to the **Voice & Video** views of a capture window, see *Voice & Video view columns* on page 344. For additional columns available only in the **Voice & Video Flow Visualizer**, see *Voice & Video Flow Visualizer columns* on page 347.

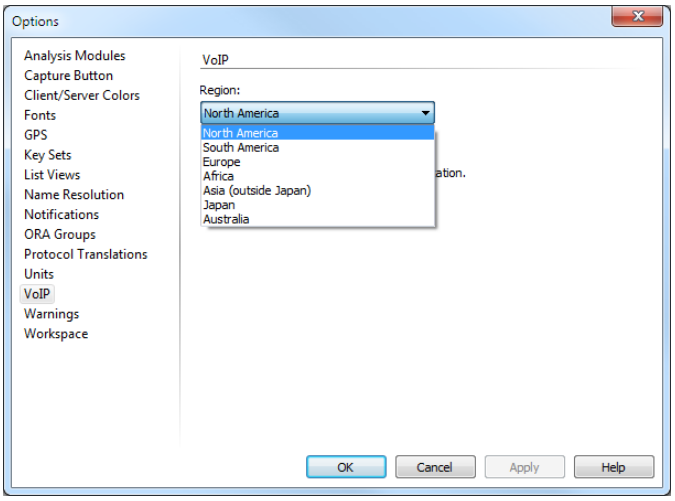
**Note** Some calls lack values for all columns. This is especially true for calls where the RTP media flows are detected, but the signaling protocol associated with the call is not detected or not supported in the **Voice & Video** views.

## Setting VoIP options

You can select a geographical region and VoIP emulation model to use when calculating VoIP quality scores.

**To select a geographical region for Voice & Video views:**

1. On the **Tools** menu, click **Options**. The **Options** dialog appears.
2. Select the **VoIP** options.
3. Select a geographical region from the drop-down list and click **OK**.




4. Restart Omnipeek to enable the new geographical region setting.

# Summary voice and video statistics

Summary voice and video statistics are displayed in the **Summary** view of capture windows and saved capture files. A *Voice & Video* summary statistics group displays values collected and aggregated across all calls within the capture or file.

**Note** If you want statistics for just one call, you must filter the data accordingly.

**To view summary Voice & Video statistics:**

1. Select the **Summary** view in a capture window.
2. Scroll to *Voice & Video* to see summary voice and video statistics for this capture.

The following table describes each voice and video statistic displayed in the **Summary** view:

| Voice and Video Statistic | Description |
|---|---|
| Total Calls | All calls for the capture. Includes opened and closed calls, as well as recycled calls. |
| Current Calls | Calls currently displayed in the **Calls** view. Calls (Current) = Calls (Total) – Calls (Recycled). |
| Open Calls | Open calls currently displayed in the **Calls** view. |
| Closed Calls | Closed calls currently displayed in the **Calls** view. |
| Recycled Calls | Calls that are no longer in the **Calls** view. The call limit is 2000. After 2000 calls, calls are recycled. Calls (Recycled) = Calls (Total) – Calls (Current). |
| Average Call Duration | The average call duration (for all calls). Includes both open and closed calls. |
| Max Calls Time | Max Calls Time references the point in time when Omnipeek's maximum call limit was reached. Once the maximum call limit has been reached, closed calls (and their respective media flows) drop out of the Calls/Media views as new calls come in. |
| Total Media Packet Loss % | Expected but never received packets as a percentage of expected packets (expected - captured) / (expected). Calculated using all media flows (supported codecs only) for all closed calls. |
| Voice Packet Loss % | Expected but never received packets as a percentage of expected packets (expected - captured) / (expected). Calculated using all voice score elements. |
| Voice Score Elements | Total number of voice media flows (supported codecs only) for all closed calls. |
| MOS-LQ | An estimated listening quality Mean Opinion Score, suitable for comparison with published MOS scores. |
| MOS-CQ | An estimated conversational quality Mean Opinion Score, incorporating factors (such as echo and delay) that affect conversational quality. |
| R Factor Listening | Provides an estimate of the effects that packet loss, jitter, and codec type had on listening quality for the call. |
| R Factor Conversational | Provides an estimate of the perceptual quality of the call, incorporating factors that affect conversational quality. |
| R Factor G.107 | The ITU-T G.107 R-factor calculated for the audio stream. |
| Video Packet Loss % | Expected but never received packets as a percentage of expected packets (expected - captured) / (expected). Calculated using all video score elements. |
| Video Score Elements | Total number of video media flows (supported codecs only) for all closed calls. |
| MOS-AV (MOS-Audio Video) | Audiovisual MOS, a 1-5 score that considers the effect of picture and audio quality and audio-video synchronization on overall user experience. |
| MOS-V (MOS-Video) | Video Mean Opinion Score, a 1-5 score that measures the impact of the video codec, image size, frame rate, packet loss distribution, GoP structure, content, and frame loss concealment on viewing quality. |

For more information on voice and video statistics in the **Summary** view of capture windows, see *Summary statistics* on page 219.

CHAPTER 12

# Displaying and Reporting Statistics

## In this chapter:

# About statistics

A variety of key statistics can be calculated in real time and presented in intuitive graphical displays. Statistics are available from each capture window that allow you to monitor just the packets captured into the buffer of that particular capture window.

**Tip** You can save, copy, print, or automatically generate periodic reports on these statistics in a variety of formats. See *Saving statistics output* on page 219.

# Viewing capture window statistics

Capture window statistics are based on the actual packets that are accepted into the buffer of a capture window since the capture began, even if some of the packets may have been dumped, overwritten, or saved to a separate file (depending on the options you set in the **General** view of the **Capture Options** dialog).

**Note** For a Capture Engine, you can use a Monitoring Capture template that lets you create a capture optimized for providing statistics, based on traffic seen on the adapter selected for that remote capture. For details, see *Monitoring capture on a Capture Engine* on page 55.

**To view capture window statistics:**

1. Start a capture to open a capture window. See Chapter 3, *The Capture Window*.
2. From the navigation pane of a capture window, choose the statistic to view:
   - *Summary:* Summary statistics allows you to monitor key network statistics in real time and save those statistics for later comparison. See *Summary statistics* on page 219.
   - *Nodes:* Node statistics display real-time data organized by network node. See *Nodes statistics* on page 221.
   - *Protocols:* Protocols statistics show network traffic volume, in packets and in bytes, broken down by protocol and subprotocol. See *Protocols statistics* on page 223.
   - *Applications:* Applications statistics show basic statistics on applications for the entire capture/file duration, in packets and in bytes. See *Applications statistics* on page 227.
   - *Countries:* Countries statistics show a geographical breakdown of traffic based on IP address for a capture window. See *Countries statistics* on page 228.
   - *WLAN:* When a supported wireless adapter is selected as the monitor adapter, WLAN statistics displays an SSID (Service Set Identifier) tree view of wireless nodes. See *WLAN statistics* on page 229.
   - *Channels:* When a supported wireless adapter is selected as the monitor adapter, Channel statistics show a variety of statistics and counts for each channel of the WLAN band. See *Channel statistics* on page 232.
   - *Signal:* When a supported wireless adapter is selected as the monitor adapter, Signal statistics displays continuously updated graphs of wireless traffic signal strength. *Signal statistics* on page 233.

**Note** *WLAN*, *Channels*, and *Signal* statistics are available only when a supported wireless adapter is selected as the capture adapter in Omnipeek.

# Configuring statistics displays

Various options are available to customize how text and color appear in the different statistics views. Configuring these options allow you to more easily visualize and recognize the data being reported.

### View options for statistics

To customize the display of statistics views, on the **Tools** menu, click **Options** to open the **Options** dialog, and then configure the following options:

- **List Views**: Let you customize background color and the style of vertical and horizontal lines in all list displays.
- **Fonts**: Specifies the font and style of the data text in all views of the program.

### Controlling color in statistics lists

The **Color** submenu of the **View** menu uses the color information from the following sources and applies it to the display of nodes and protocols in statistics lists:

- The **Insert** or **Edit Name** dialog in the **Name Table** can set the color for packets associated with a particular address (node), port, or protocol.
- ProtoSpecs assigns colors to all the protocols it knows how to identify. (See *ProtoSpecs™* on page 224.)

For more about how colors are assigned to packet lists and statistics displays, see *Configuring color options* on page 299.

## Saving statistics output

Capture window statistics can be saved to text files, generated as reports at periodic intervals, or printed out.

### Saving statistics

**To save a statistics view to a text file:**

1. Make the desired statistics view the active window.
2. On the **File** menu, click **Save *X* Statistics**..., where *X* is the name of the statistics window.
3. Save the file as a tab delimited (*.txt) or comma delimited (*.csv) text file.

### Generating statistics reports

Statistics reports can be generated and saved at periodic intervals by using the **Statistics Output** view of the **Capture Options** dialog. You can save these statistics reports as PDF, CSV, or HTML files that can be viewed with a browser, or as text files that you can import into a spreadsheet or database program for further processing. In addition, you can save these statistics reports as a PDF file. See *Generating statistics output reports* on page 234.

### Printing statistics

**To print a capture window statistics view:**

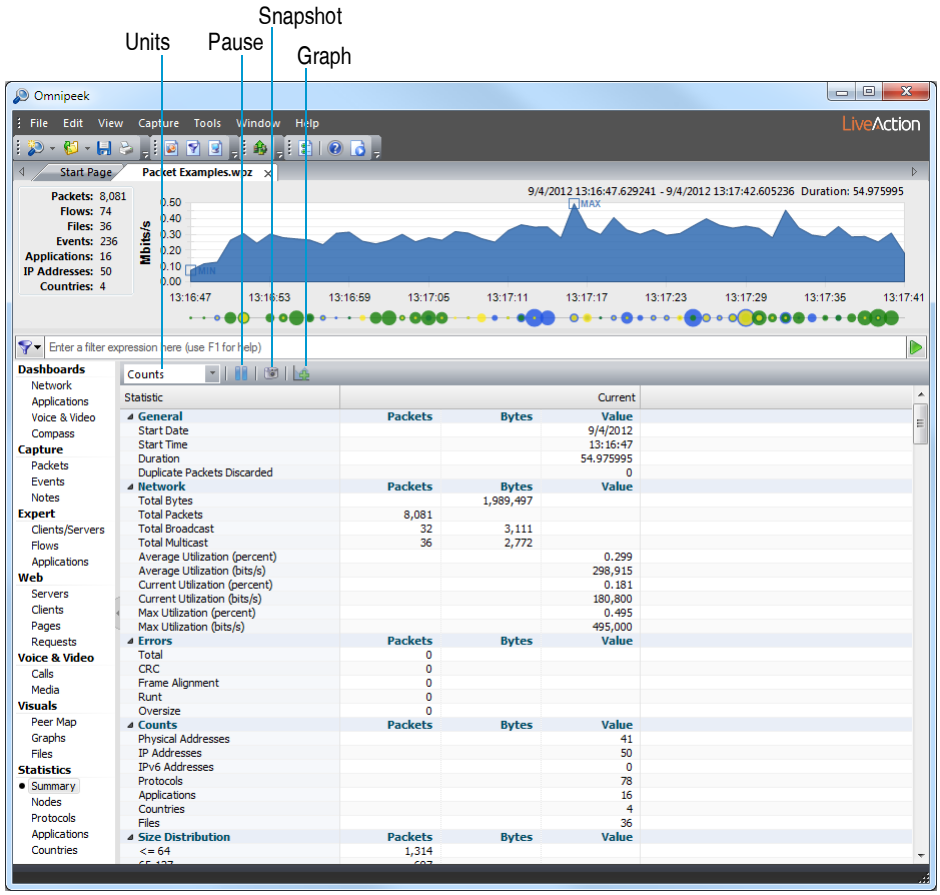
1. Make the desired statistics view the active window.
2. On the **File** menu, click **Print**.

## Summary statistics

Summary statistics allow you to monitor key network statistics in real time and save those statistics for later comparison.

**To view Summary statistics:**

- Click the **Summary** view in the navigation pane of a capture window.




The parts of a **Summary** view are described below.

- *Units:* Select units in which the statistics are displayed.
- *Pause:* (Omnipeek console only) Operates as a toggle to temporarily suspend scrolling or screen re-draw due to data update in the statistics list or graph.
- *Snapshot:* Saves current statistics values for side by side comparison with future values. Unique to the **Summary** tab.
- *Graph:* Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.

Reported statistics will vary depending on the adapter and driver in use.

> **Note** Statistics provided by Analysis Modules and by the Expert must be enabled in the **Analysis Modules** view of the **Options** dialog in order to contribute to the **Summary** view. These functions can be enabled or disabled in the **Analysis Options** view of the **Capture Options** dialog when the individual capture window is created. See *Optimizing capture performance* on page 300.

## Creating snapshots of summary statistics

Use the snapshot feature to baseline normal network activity, save the data as a snapshot, and then compare these saved statistics with those observed during periods of erratic network behavior.

**To create a new Summary Statistics Snapshot:**

- Click **Snapshot**. A new column labeled *Snapshot 1* will appear to the right of the column labeled *Current*. (Click **Snapshot** again to create subsequent snapshots.)

**To delete a Summary Statistics Snapshot:**

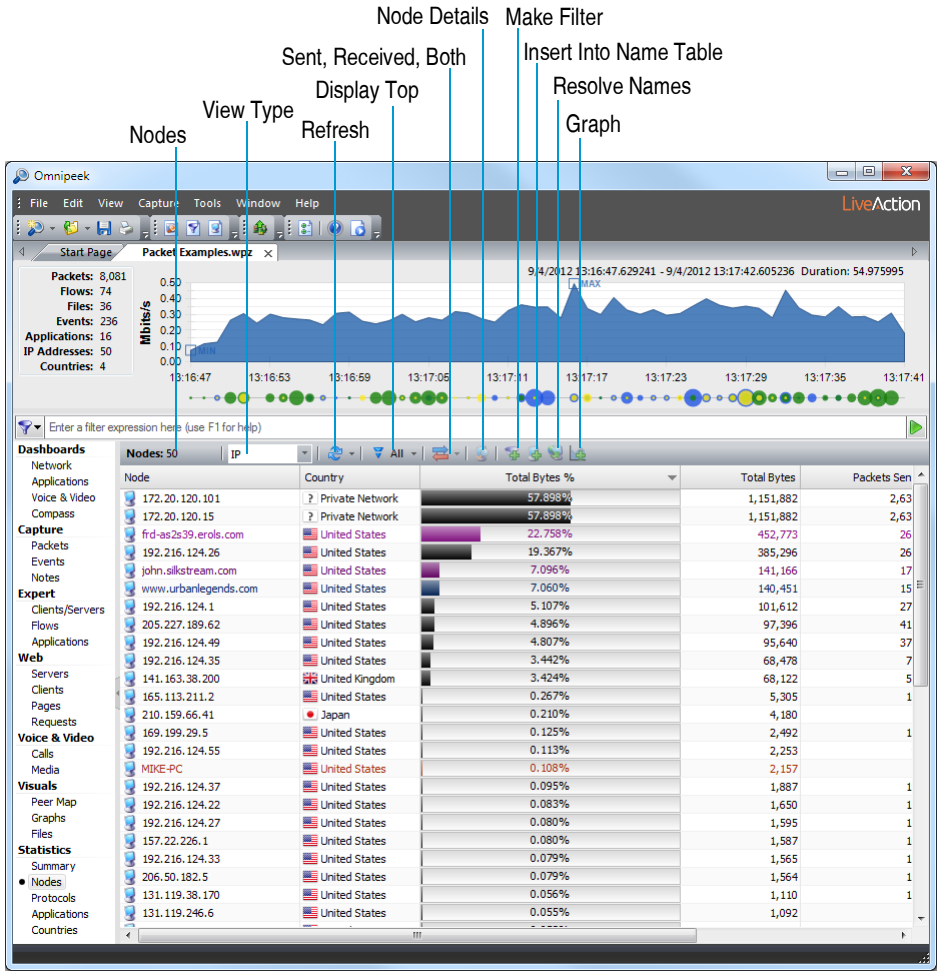
- Right-click the row you wish to delete and choose **Delete** (choose **Delete All Snapshots** to clear all).

# Nodes statistics

Nodes statistics display real-time data organized by network node. You can view nodes statistics in a hierarchy view or in a variety of flat views.

**To view nodes statistics:**

- Click the **Nodes** view in the navigation pane of a capture window.




The parts of the **Nodes** view are described below.

- *Nodes:* Shows total count of nodes seen.
- *View Type:* Choose a *Hierarchy*, or flat type (*Physical*, *IP*, or *IPv6)* of display.
- *Refresh:* Sets display refresh interval. If interval is set to *Manual*, display will update only when **Refresh** is clicked.
- *Display Top:* Limits display to top 5, 10, 20, 50, or 100 nodes seen, as measured by traffic volume.
- *Display Sent/Received/Both:* Limits display to packets Sent, Received, or both.
- *Node Details:* Opens **Detail Statistics** window. See *Viewing details for a network node* on page 222.
- *Make Filter:* Opens **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.
- *Insert Into Name Table:* Opens **Node Address** dialog. See *Adding entries to the name table* on page 278.
- *Resolve Names:* Click to resolve name, if one exists in the Name Table for this address.
- *Graph:* Opens the **Graph Data Options** dialog. See *Graph display options* on page 258.

## Hierarchy view of nodes

To view Node statistics in a hierarchy view, choose the *Hierarchy* display type in the header of the **Nodes** view. The *Hierarchy* display type lists network nodes or devices by their physical address, the associated logical addresses communicating with them, and the statistics associated with those nodes.

See *Nodes statistics columns* on page 349 for a complete list and description of the column headings found in the *Hierarchy* view of Node statistics.

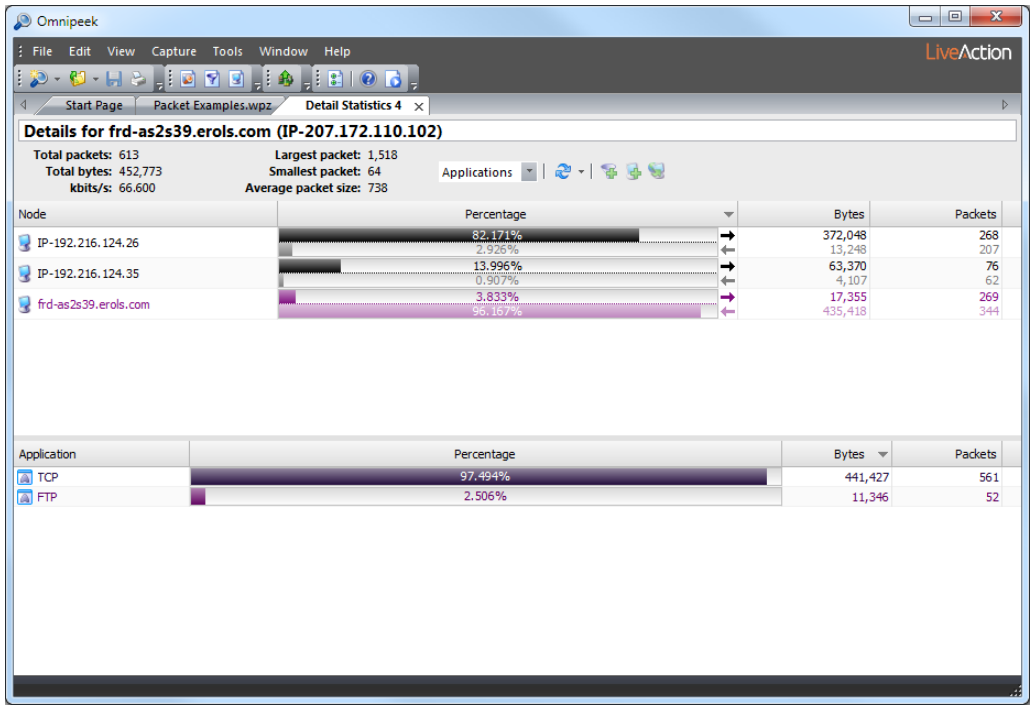
## Flat views of nodes

To view Node statistics in a variety of flat views, choose the *Physical*, *IP*, or *IPv6* display type in the header of the **Nodes** view. These flat views list the nodes of the selected type and the statistics associated with those nodes.

See *Nodes statistics columns* on page 349 for a complete list and description of the column headings found in the flat views of the Node statistics.

## Viewing details for a network node

Double-click a node to see more detail about the activity for the selected node and the protocols it is using (or right-click the node and choose **Node Details**).




The additional detail includes:

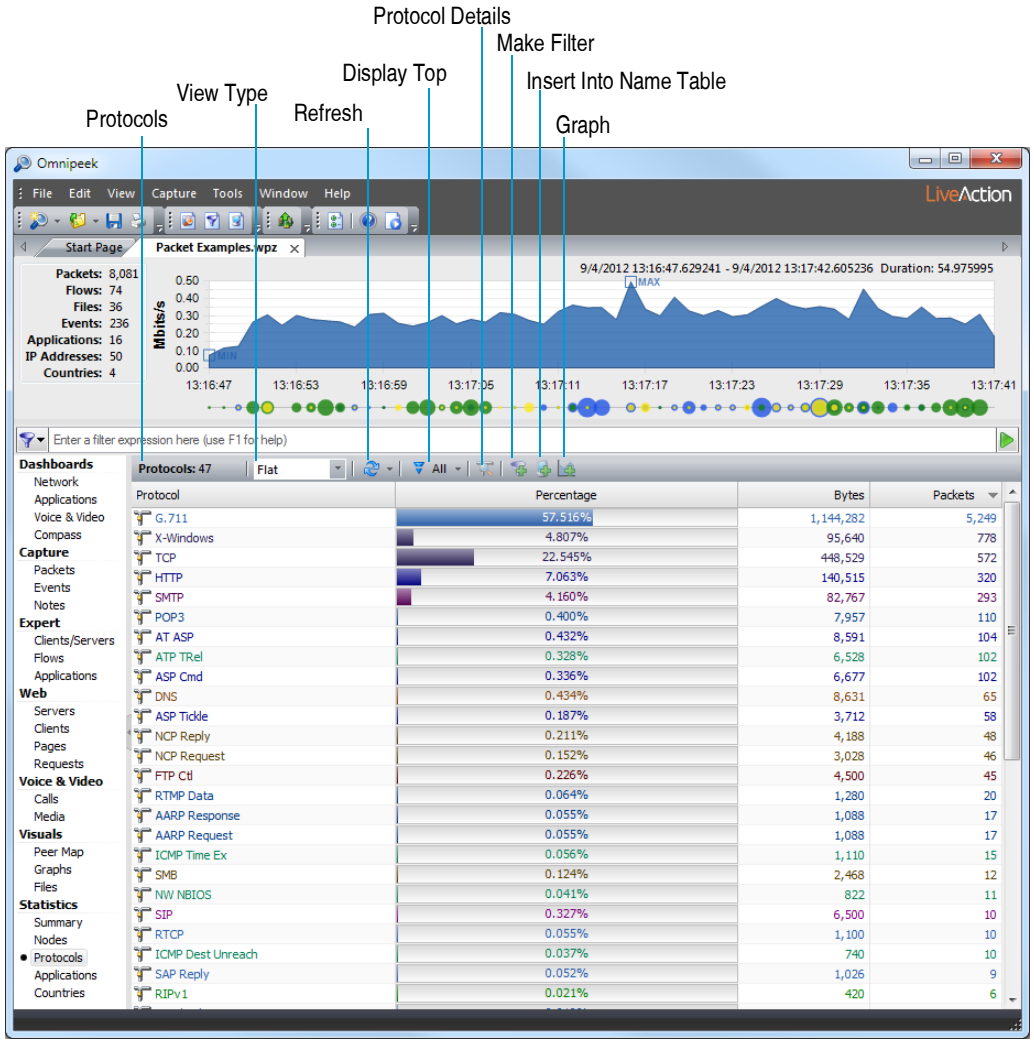
- Details of communications partners for this node.
- A hierarchical list of protocols used by this node and its communications partners. For details on display conventions, see *Protocol utilization statistics* on page 224.
- The *Total packets* and *Total bytes* for this node.
- Network *Load (kbits/s)* attributed to this node.
- *Largest packet*, *Smallest packet* and *Average packet* size for the specific node or protocol.

# Protocols statistics

Protocols statistics show network traffic volume in packets and in bytes, broken down by protocol and sub-protocol. You can view protocol statistics in a hierarchical or flat view.

**To view Protocol statistics:**

- Click the **Protocols** view in the navigation pane of a capture window.




The parts of the **Protocols** view are described below.

- *Protocols:* Shows total count of protocols seen.
- *View Type:* Choose a *Hierarchy* or *Flat* type of display.
- *Refresh:* Sets display refresh interval. If interval is set to *Manual*, display will update only when **Refresh** is clicked.
- *Display Top:* Limits display to top 5, 10, 20, 50, or 100 protocols seen, as measured by traffic volume.
- *Protocol Details:* Opens **Detail Statistics** window.
- *Make Filter:* Opens **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.
- *Insert Into Name Table:* Adds the selected protocol to the Name Table.
- *Graph:* Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.

**Tip** For a description of a particular protocol or subprotocol, right-click the protocol in any window where it is shown, and choose **Protocol Description**.

## Hierarchy view of protocols

To view Protocols statistics in a hierarchy view, choose the *Hierarchical* display type in the header of the Protocols view. In the *Hierarchy* view, subprotocols are nested under more fundamental protocols such as TCP or UDP and IP. The root of each hierarchy is the base protocol (the one closest to the physical layer).

### *Protocol utilization statistics*

When the *Hierarchy* view is collapsed, the utilization statistics show the sum of all subprotocols within that protocol. When the *Hierarchy* view is expanded, utilization statistics are broken out by individual subprotocol. The top-level protocol then shows statistics only for itself and for any subprotocols that seem to be a part of the top-level protocol, but that are not uniquely defined by ProtoSpecs™. Statistics that do not belong to any of the recognized subprotocols are added to the totals for the parent protocol. This allows statistics for unrecognized subprotocols to be included in the totals with as much precision as possible.

## Flat view of protocols

To view protocol statistics in a flat view, choose the *Flat* display type in the header of the **Protocol** view. The *Flat* view of protocol statistics recognizes the same protocols as in the *Hierarchy* view, but displays all protocol information as a flat list.

## ProtoSpecs™

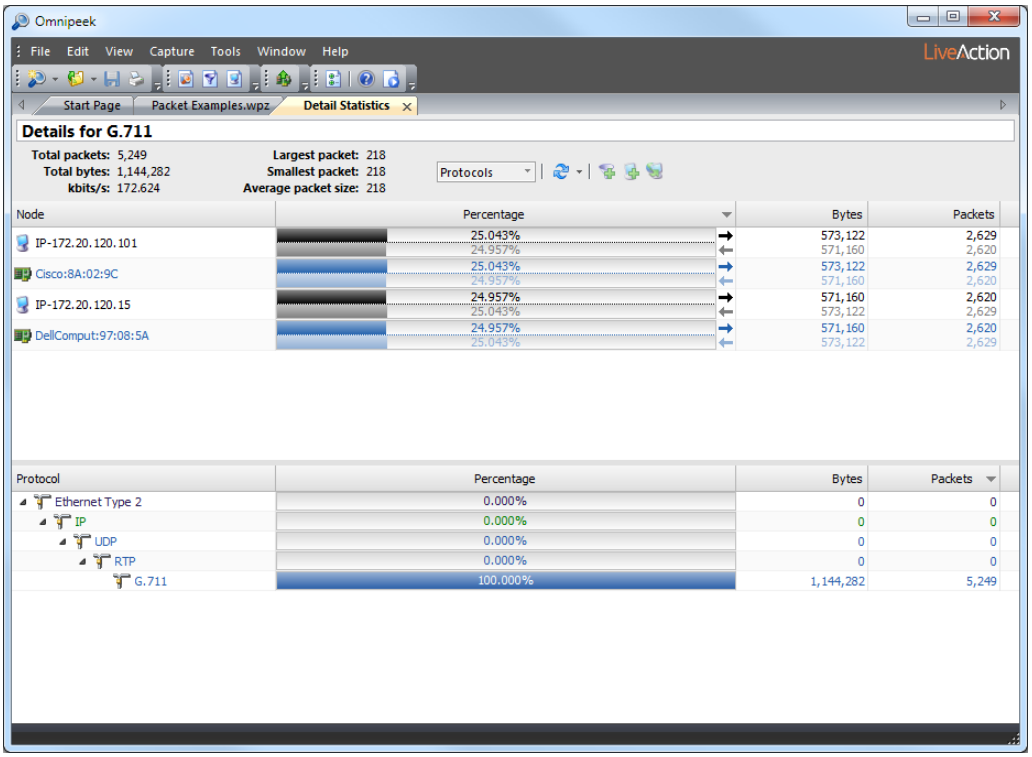
ProtoSpecs is a feature of Omnipeek that quickly and accurately identifies the protocols nested within packets. ProtoSpecs uses multiple identifiers within a packet to create a tree-structure that specifies a top-level protocol (such as IP) and subprotocols that it contains (such as FTP or SNMP). You can see this structure in the *Hierarchy* view of the **Protocols** tab.

The protocol hierarchy is rooted in the network medium of the selected adapter (or the adapter used to capture the file). When the program cannot identify a subprotocol, it lists the protocol with other unidentified types at the highest known protocol level.

You can add new protocol discrimination definitions to the ProtoSpecs hierarchy. Please visit *https://www.liveaction.com/support/frequently-asked-questions/* for SDK information.

## Viewing details for a protocol

You can double-click a protocol to see more detail about the traffic in a particular protocol (or right-click the protocol and choose **Protocol Details**). This opens a **Detail Statistics** window.




This window displays more detail about the nodes and the selected protocol. The additional detail includes:

- Details for nodes communicating in this protocol (and its subprotocols, if any).
- The relative percentage of traffic represented by any subprotocols.
- The *Total packets* and *Total bytes* of traffic for this protocol.
- Network *Load (kbits/s)* used by the protocol (and its subprotocols, if any).
- *Largest packet*, *Smallest packet* and *Average packet size* for the protocol.

**Note** The bar graph in this detail window lists all nodes receiving or sending packets of the selected protocol type, their respective percentage share of the protocol traffic, and the number of packets that percentage represents.

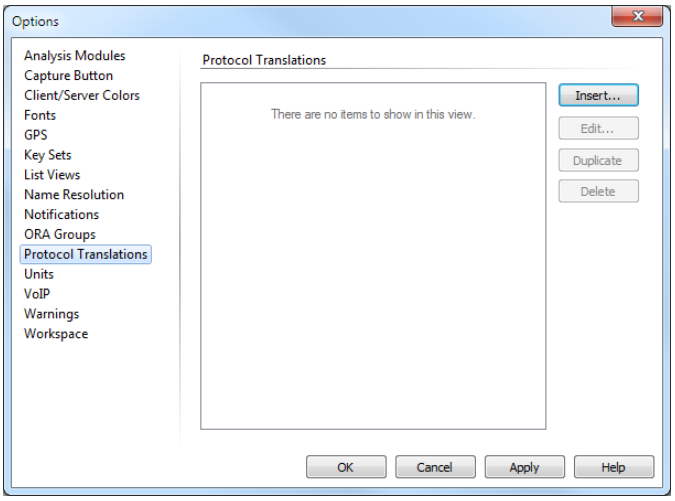
## Protocol translations

You can translate TCP, UDP, and SCTP packets on a specific port (or SCTP payload ID) to a specific protocol. For example, if you want to categorize all TCP traffic occurring on port 32000 as HTTP traffic, you would simply create a protocol translation identifying TCP Port as the type of packet, 32000 as the port number, and HTTP as the protocol the packets are translated to. TCP packets can only be translated to TCP-based protocols, UDP packets to UDP-based protocols, and SCTP packets to SCTP-based protocols.

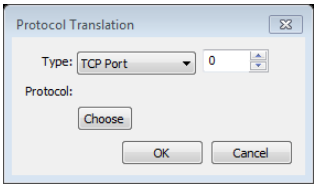
**Note** Protocol translations in Omnipeek are used any place in the program that handles or displays protocols: The *Protocol* column of the **Packets** view and various **Expert** views, protocol statistics, protocol graphs, and protocol filters.

### To create a protocol translation in Omnipeek:

1. On the **Tools** menu, click **Options...**. The **Options** dialog appears.




2. Select the **Protocol Translations** options.
3. Click **Insert** to create the protocol translation. The **Protocol Translation** dialog appears.

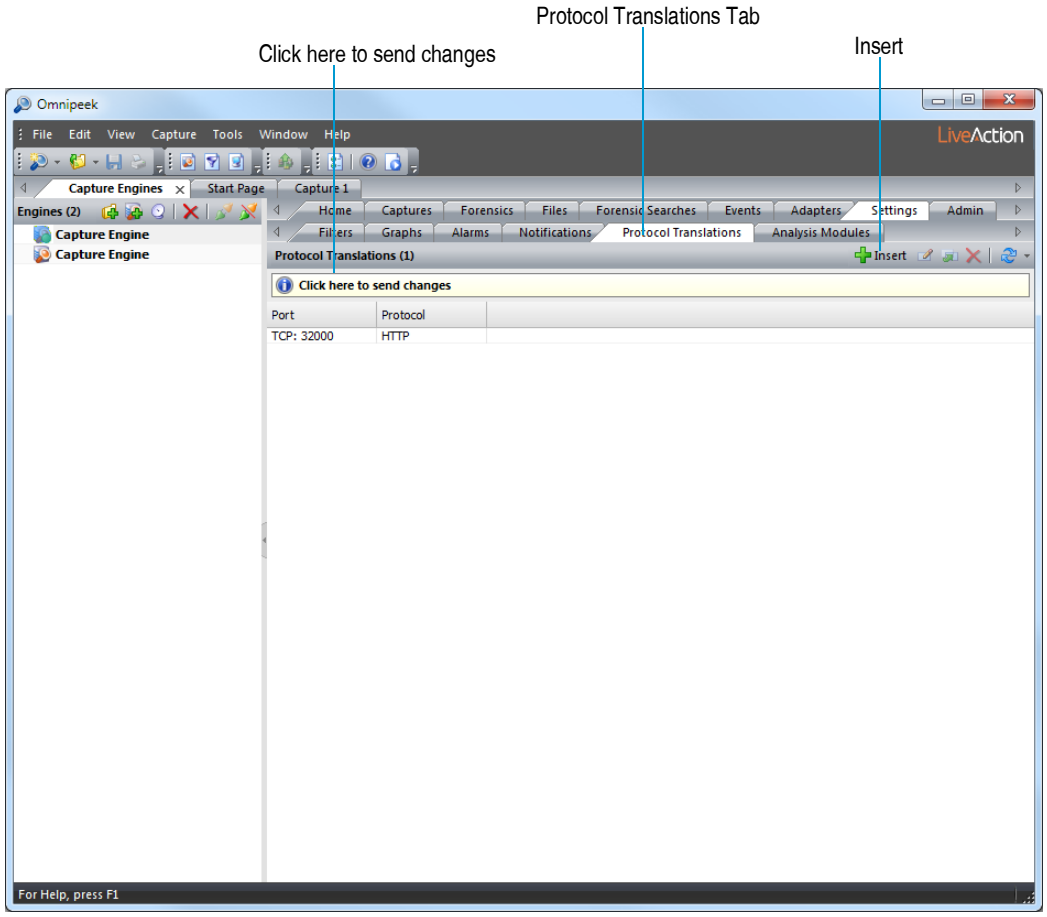



- *Type:* Select *TCP Port, UDP Port, SCTP Port, or SCTP Payload ID*, and enter the port or ID number.
- *Protocol:* Click **Choose** to select the protocol the packets are translated to.

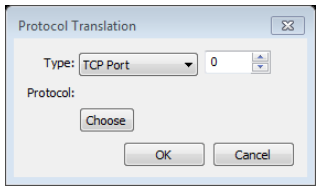
4. Configure the dialog and click **OK**.
5. Click **OK** again to close the **Options** dialog.

**To create a protocol translation in a Capture Engine:**

1. Select the *Settings* tab, and then the *Protocol Translation* tab of a connected Capture Engine.




2. Click **Insert** to create the protocol translation. The **Protocol Translation** dialog appears.




- *Type:* Select *TCP Port, UDP Port, SCTP Port, or SCTP Payload ID*, and enter the port number.
- *Protocol:* Click **Choose** to select the protocol the packets are translated to.

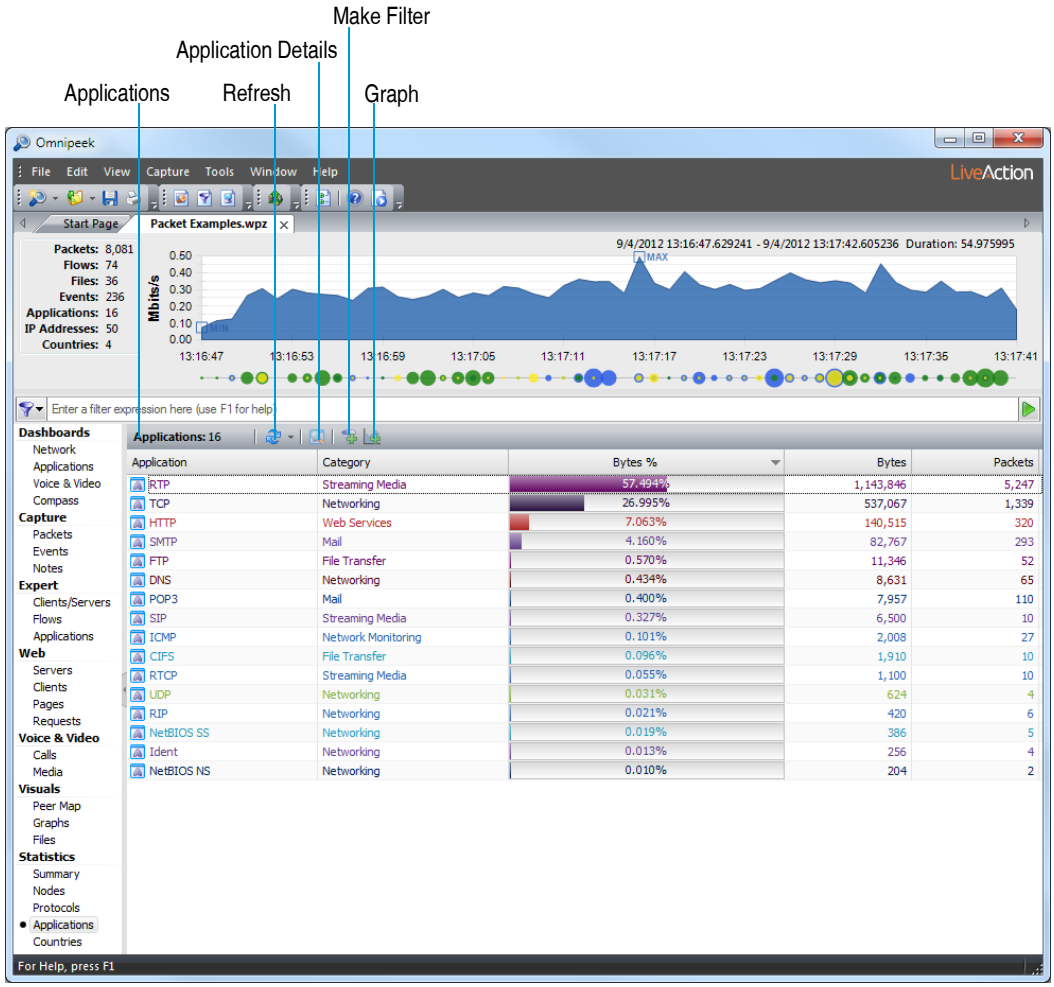
3. Configure the dialog and click **OK**.
4. Click *Click here to send changes* to send the changes to the Capture Engine.

# Applications statistics

Applications statistics show basic statistics about applications for a capture window.

**To view application statistics:**

- Click the **Applications** view in the navigation pane of a capture window.




The parts of the **Applications** view are described below.

- *Applications:* Shows total count of applications observed.
- *Refresh:* Sets display refresh interval. If interval is set to *Manual*, display will update only when **Refresh** is clicked.
- *Application Details:* Opens a *Detail Statistics* tab for the selected application.
- *Make Filter:* Opens the **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.
- *Graph:* Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.

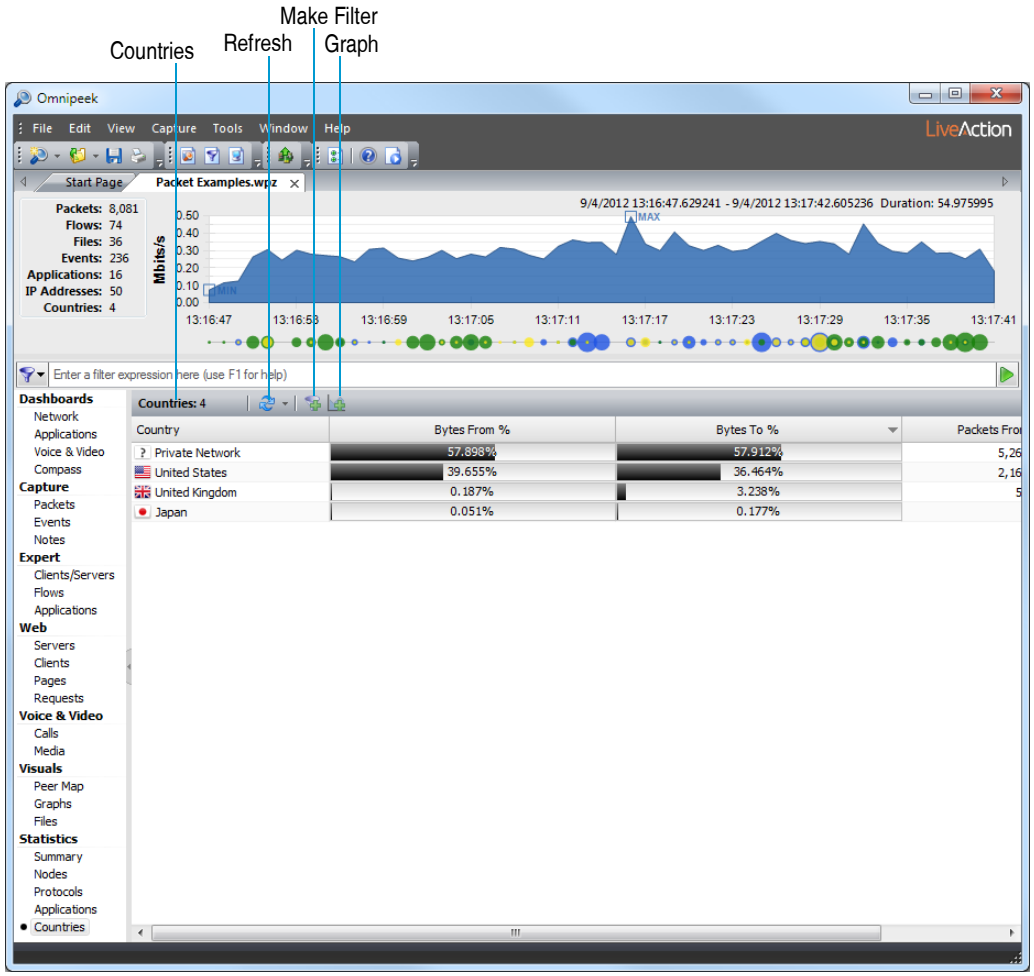
> **Tip** For a description of a particular application, right-click the application in any window where it is shown, and choose **Application Description**.

# Countries statistics

Countries statistics show a geographical breakdown of traffic based on IP address for a capture window. If the source country is not available, then *Private Network*, *Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339.

**To view Countries statistics:**

- Click the **Countries** view in the navigation pane of a capture window.




The parts of the **Countries** view are described below.

- *Countries:* Shows total count of countries observed.
- *Refresh:* (Omnipeek only) Sets display refresh interval. If interval is set to *Manual*, display will update only when **Refresh** is clicked.
- *Make Filter:* Opens the **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.
- *Graph:* (Omnipeek only) Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.

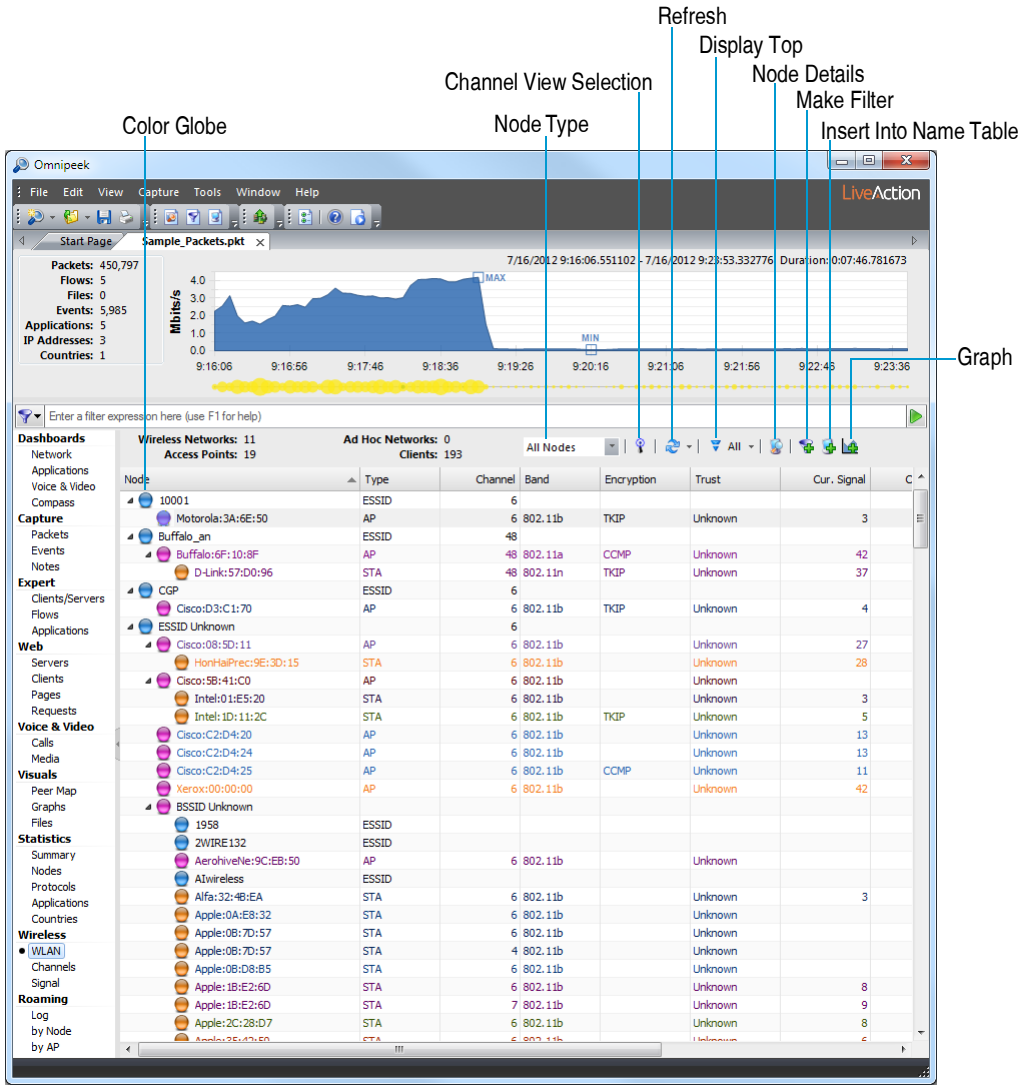
**Note** You can save the country statistics to a tab-delimited text or CSV file by right-clicking inside the **Countries** view and selecting **Save Country Statistics** (or on the **File** menu, click **Save Country Statistics**).

# WLAN statistics

WLAN statistics display an SSID (Service Set Identifier) tree view of wireless nodes. When a supported wireless adapter is the capture adapter, WLAN statistics are available for a capture window.

**To view WLAN statistics:**

- Click the **WLAN** view in the navigation pane of a capture window.




The parts of the **WLAN** view are identified below.

**Note** See *WLAN statistics columns* on page 351 for a description of the columns available in **WLAN** statistics.

- *Wireless Networks:* Displays count of wireless networks found.
- *Ad Hoc Networks:* Displays count of Ad Hoc networks found.
- *Access Points:* Displays count of access points found.
- *Clients:* Displays count of clients found.
- *Node Type:* (Omnipeek console only) Lets you limit the display to selected nodes (*All Nodes*, *Stations*, *Access Points*, *ESSID*, *Ad Hoc*, *Admin*, *Unknown*, and *Channels*).

  When the WLAN hierarchy view is broken out by channels, the root branches of the tree are channels numbers, with individual WLAN hierarchy views underneath it (ESSID, BSSID, nodes, etc).
- *Channel View Selection:* Opens the **WLAN Channels** dialog that allows you to select which channels to display.
- *Refresh:* (Omnipeek console only) Set display refresh interval. If interval set to *Manual*, display will update only when **Refresh** is clicked.

- *Display Top:* (Omnipeek console only) Limit display to top 5, 10, 20, 50, or100 nodes seen, as measured by traffic volume.
- *Node Details:* Opens the **Detail Statistics** window. See *Viewing details for a network node* on page 222.
- *Make Filter:* Opens the **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.
- *Insert Into Name Table:* Opens the **Node Address** dialog. See *Adding entries to the name table* on page 278.
- *Graph:* (Omnipeek console only) Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.
- *Color globes:* Identifies the type of node by color:
  - Blue: ESSID
  - Pink: AP (access point) or Ad Hoc equivalent
  - Orange: STA or client
  - Gray: Admin or otherwise unknown
  - Gray with (?): Indications for a particular node are contradictory or unexpected.
- *Right-click options:* These options include
  - *Locate Node:* (Omnipeek console only) Select the source (STA or AP) and choose **Locate Node**. If you are using Omnipeek on a laptop, you can use signal strength to find a radio source. Omnipeek will create a live signal strength graph for this node in the **Graphs** view, then switch your display to that new graph automatically. The higher the signal strength, the closer you have moved to the source node.
  - *Display Weak Associations:* (Omnipeek console only) Right-click to toggle the display of stations having only a weak association to any AP or Ad Hoc group.
    - When enabled, STAs with weak associations are shown under the AP to which they last sent a packet.
    - When disabled, STAs with weak associations are added to the *ESSID Unknown/BSSID Unknown* group.

**Tip** To save WLAN statistics to a tab-delimited text file, on the **File** menu, click **Save WLAN Statistics,** or right-click inside the **WLAN statistics** window and select **Save WLAN Statistics.**

## Hierarchy of wireless nodes

The hierarchy of wireless nodes is displayed as follows:

- ESSID (Extended Service Set Identifier): the name of a logical group of access points
  - BSSID (Basic Service Set Identifier): a single access point
    - STA (Station): a client associated to the particular access point

Each individual station (*STA*) is arranged under the BSSID of the access point (or equivalent) to which it most recently sent a packet.

Stations which have never sent a packet cannot be assigned to an actual BSSID. Until they send a packet to an access point or to a member of an ad hoc group, these nodes are displayed under *BSSID Unknown*. Three classes of addresses show up in the *ESSID Unknown/BSSID Unknown* category:

- Broadcast and multicast addresses, tagged as *Admin* in the Type column.
- Stations which have sent a Probe Request to a particular ESSID, but which have not associated with any known BSSID.

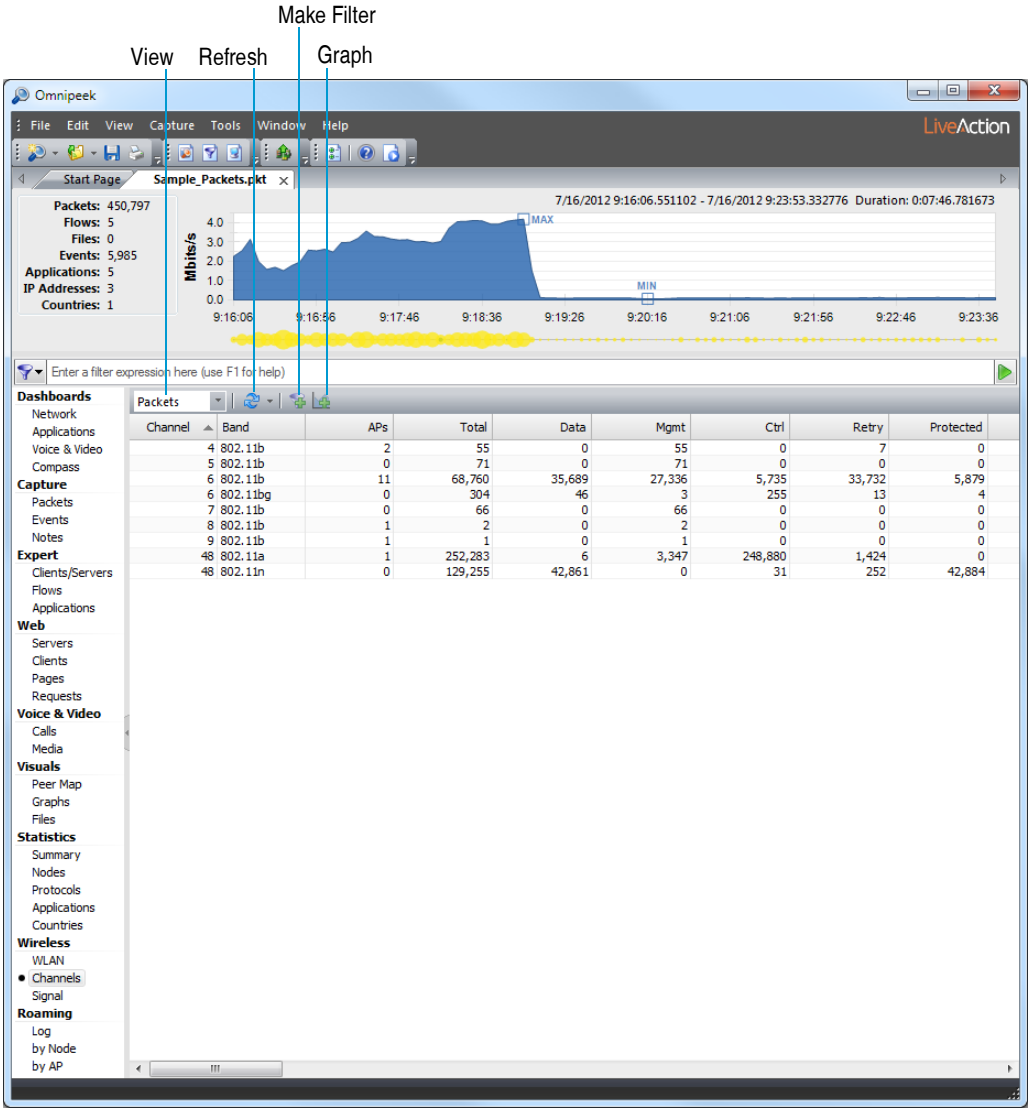
- Nodes which cannot be assigned to any BSSID or ESSID because of the hidden node problem (you can detect only one participant in a conversation, because the other is beyond your range).

# Channel statistics

Channel statistics show a variety of statistics and counts for each channel of the WLAN band. When a supported wireless adapter is the capture adapter, channel statistics are available for a capture window.

**To view Channels statistics:**

- Click the **Channels** view in the navigation pane of a capture window.




The parts of the **Channels** view are described below.

> **Note** See *Channel statistics columns* on page 353 for a complete list and description of the columns available in the **Channels** view.

- *View:* Display information by *All*, *Packets*, or *Bytes*.
- *Refresh:* (Omnipeek console only) Set display refresh interval. If interval is set to *Manual*, the display is updated only when you click **Refresh**.
- *Make Filter:* Opens **Insert Filter** dialog. See *Creating filters with the Make Filter command* on page 101.

- *Graph:* (Omnipeek console only) Opens the **Graph Data Options** dialog. See Chapter 14, *Creating Graphs*.

> **Tip** To save the channels statistics table to a tab-delimited text file, on the **File** menu, click **Save Channels Statistics**, or right-click inside the Channel Statistics window and select **Save Channels Statistics.**

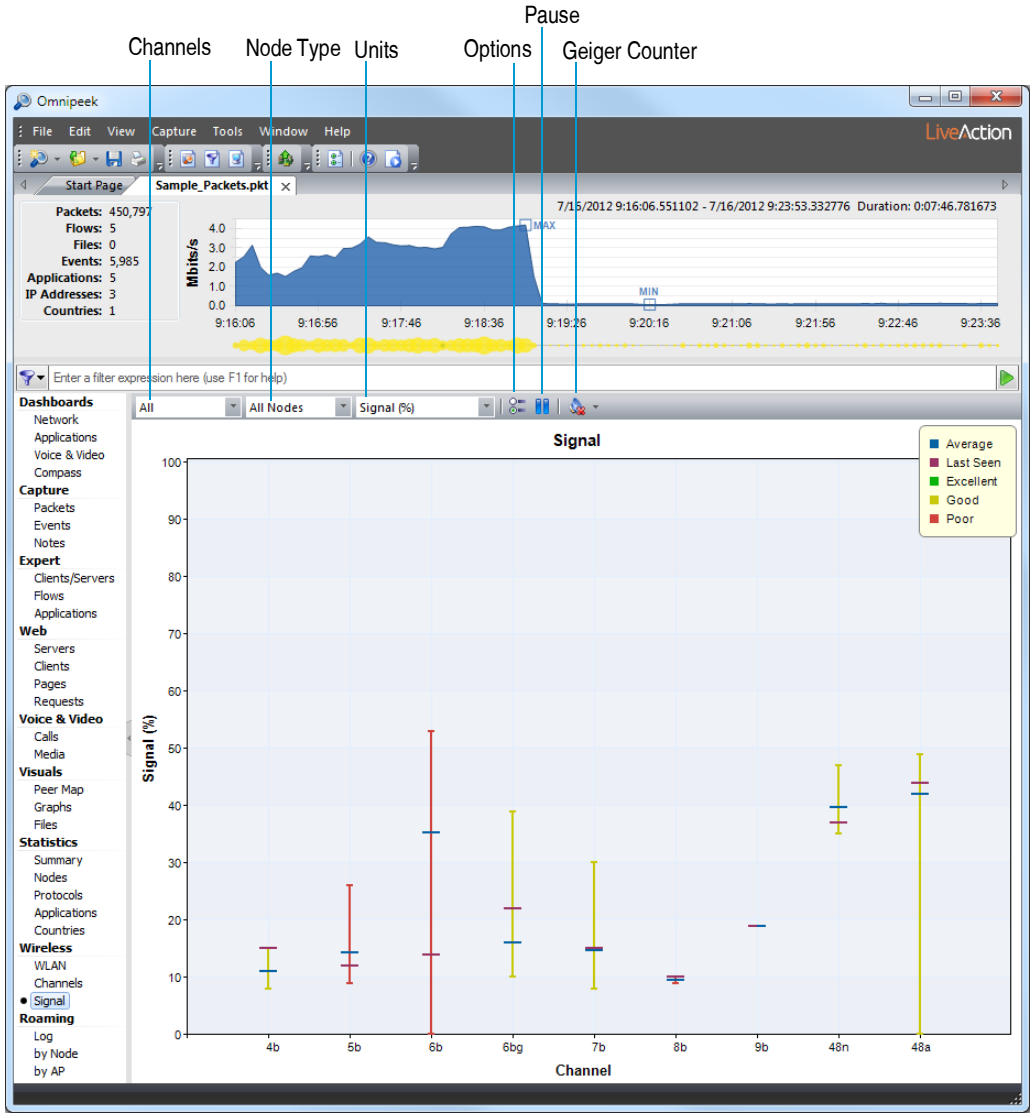
# Signal statistics

Signal statistics display continuously updated graphs of wireless traffic signal strength. When a supported wireless adapter is selected as the capture adapter, signal statistics are available for a capture window.

**To view Signal statistics:**

- Click the **Signal** view in the navigation pane of a capture window.

The parts of the **Signal** view are identified below.




- *Channels:* Choose to show signals on all channels or show only the signals of access points detected on the channels advertised in AP beacon and probe response packets.
  - *All:* Shows the minimum, maximum, average, and most recent values for each channel in the scan.
  - *AP only:* Shows the most recent value for each AP.

- *Node Type:* Limits the display to traffic between certain types of nodes (*All Nodes*, *Client to AP*, *AP to Client*, or *AP to AP*).
- *Units*: Choose the units of display. The *%* (percent) units show the RSSI (Receive Signal Strength Indicator), normalized to a percentage. The *dBm* units are expressed in decibel milliWatts.

> **Note** If the current adapter does not support dBm reporting, the **Signal** view will show readings of zero when any choice including *(dBm)* is selected for the *Units*. Change the *Units* to percentage *(%)* for these adapters.

- *Options:* Opens the **Signal Statistics Options** dialog, where you can choose to *Reset graph occasionally* or to toggle the Legend in the **Signal** view on or off.
- *Pause:* Temporarily suspends the update of the display.
- *Geiger Counter:* Acts as toggle. When enabled, makes an audible click each time the user-specified number of packets is processed on the selected adapter. You can specify a click for each *1*, *10*, *100*, or *1000 Packets*.

# Generating statistics output reports

A variety of statistics output reports can be generated from capture window statistics obtained for a specific capture window. Statistics output reports can be generated at periodic intervals, and saved as XML \ HTML files that can be viewed with a browser, or as text files that you can import into a spreadsheet or database program for further processing.

## Statistics output reports from capture window statistics

**To generate statistics output reports from capture window statistics:**

1. Start a capture to open a capture window. See Chapter 3, *The Capture Window*.
2. On the **Capture** menu, click **Capture Options**. The **Capture Options** dialog appears.
3. Select the *Statistics Output* options in the navigation pane.
4. Configure the *Statistics Output* options:
   - *Save statistics report every:* Select this check box to enable saving statistics. Type or select the frequency interval with which you want to update the statistics files, and then the units of time by selecting *Minutes*, *Hours*, or *Days* from the list.
   - *Report type:* Select the report type (a description of the selected report is displayed in the *Report description* box at the bottom of the dialog):
   - *Report folder (Omnipeek captures only):* Type or browse to the folder where statistics output files are saved.
   - *Reset statistics after output:* Select this option to reset the counts to zero after each statistics report is saved.
   - *Align save to time interval:* Select this option to output a file at the nearest whole unit of time by the clock. For example, if your interval is set to some number of hours, the output will occur on the hour. When this option is cleared, the count begins as soon as you click **OK**, and output occurs when the first interval is reached.
   - *Create new file set:* Select this option to write reports to new file folders, created at an intervals you specify in Set Schedule. See *New file set schedule* on page 235.
   - *Set Schedule:* Click to open the **New File Set Schedule** dialog to specify intervals for your new file sets.
   - *Report description:* Displays a description of the report type selected in *Report type* above.

- *Log output:* Select this option to generate a message in the global log file each time statistics output are generated. Log entries include the path name of the output folder.

5. Click **OK**.

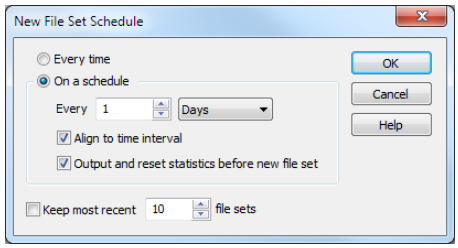
   The statistics output reports are generated at the frequency intervals specified in *Save statistics report every* above.

## New file set schedule

When *Create new file set* is selected in the *Statistics Output* options, a series of new file folders, one at a time, at the intervals you specify are created. Folder names have the form: `FolderNameYYYY-MM-DD hh.mm.ss`, where `FolderName` is the name you specified in *Report folder.*

**To create a schedule for a new file set:**

1. Select *New file set* in the *Statistics Output* options.
2. Click **Set Schedule**. The **New File Set Schedule** dialog appears.




3. Configure the dialog:
   - *Every time:* Select this option to create a new folder each time a new statistics report is generated. The timestamp of each folder will show the time at which each statistics report was created.
   - *On a schedule:* Select this option to establish a schedule for the creation of new folders. Select a number and units of time. The timestamp on each file folder will show the time at which the folder itself was created. Statistics reports continue to overwrite one another in this folder until a new folder is created.
   - *Align to time interval:* Select this option to have the creation of new folders occur on the nearest whole unit of clock time.
   - *Output and reset statistics before new file set:* Select this option to output the next scheduled statistics report, then reset statistics before each new folder is created.
   - *Keep most recent _____ file sets:* Select this option to keep only the specified number of files, discarding older files and folders to make room for newer ones. Type or enter the number of file sets.
4. Click **OK**.

   The current setting for the **New File Set Schedule** dialog appears in the box immediately below **Set Schedule**.

# Viewing statistics output reports

Statistics output reports are generated in the frequency interval specified in *Statistics Output* options. If you selected *XML\HTML Report* as your *Report type*, you can view the generated reports in an XSLT supported browser.

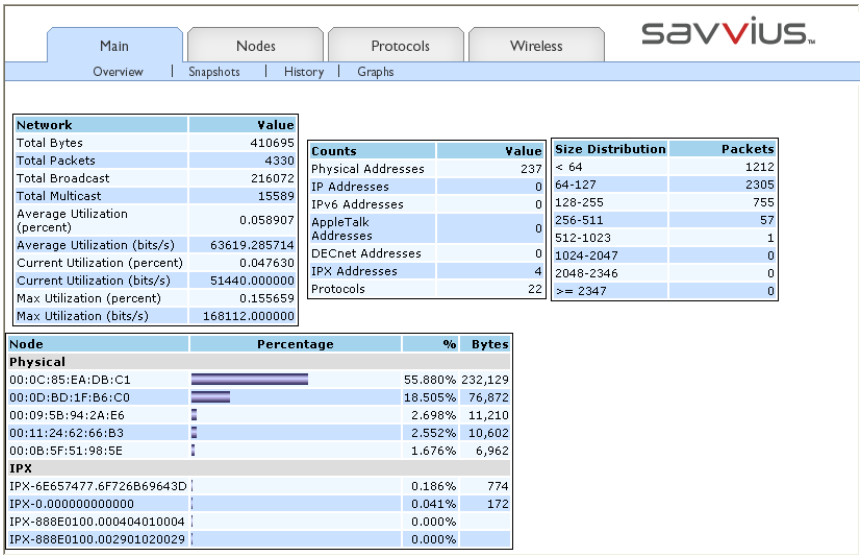
**Note** Selecting *XML\HTML Report* as your *Report type* may affect capture performance. Selecting a *PDF* (default) report type is recommended for best performance.

**To view a statistics output report:**

1. Navigate to the *Report Folder* location specified in *Statistics Output* options.

> **Note** On a Capture Engine, the *Data folder* configured in the **General** view of the Capture Engine Wizard is the *Report folder* location. See the Capture Engine documentation or Capture Engine Manager online help for details.

2. Double-click the *report.htm* file to open it in a browser. The report looks similar to the following:




| Network | Value |
|---|---|
| Total Bytes | 410695 |
| Total Packets | 4330 |
| Total Broadcast | 216072 |
| Total Multicast | 15589 |
| Average Utilization (percent) | 0.058907 |
| Average Utilization (bits/s) | 63619.285714 |
| Current Utilization (percent) | 0.047630 |
| Current Utilization (bits/s) | 51440.000000 |
| Max Utilization (percent) | 0.155659 |
| Max Utilization (bits/s) | 168112.000000 |

| Counts | Value |
|---|---|
| Physical Addresses | 237 |
| IP Addresses | 0 |
| IPv6 Addresses | 0 |
| AppleTalk Addresses | 0 |
| DECnet Addresses | 0 |
| IPX Addresses | 4 |
| Protocols | 22 |

| Size Distribution | Packets |
|---|---|
| < 64 | 1212 |
| 64-127 | 2305 |
| 128-255 | 755 |
| 256-511 | 57 |
| 512-1023 | 1 |
| 1024-2047 | 0 |
| 2048-2346 | 0 |
| >= 2347 | 0 |

| Node | Percentage | % | Bytes |
|---|---|---|---|
| **Physical** | | | |
| 00:0C:85:EA:DB:C1 | | 55.880% | 232,129 |
| 00:0D:BD:1F:B6:C0 | | 18.505% | 76,872 |
| 00:09:5B:94:2A:E6 | | 2.698% | 11,210 |
| 00:11:24:62:66:B3 | | 2.552% | 10,602 |
| 00:0B:5F:51:98:5E | | 1.676% | 6,962 |
| **IPX** | | | |
| IPX-6E657477.6F726B69643D | | 0.186% | 774 |
| IPX-0.000000000000 | | 0.041% | 172 |
| IPX-888E0100.000404010004 | | 0.000% | |
| IPX-888E0100.002901020029 | | 0.000% | |

3. Click a tab and subheading to view the various statistics output reports.

CHAPTER 13

# Using the Peer Map

## In this chapter:

# About the Peer Map

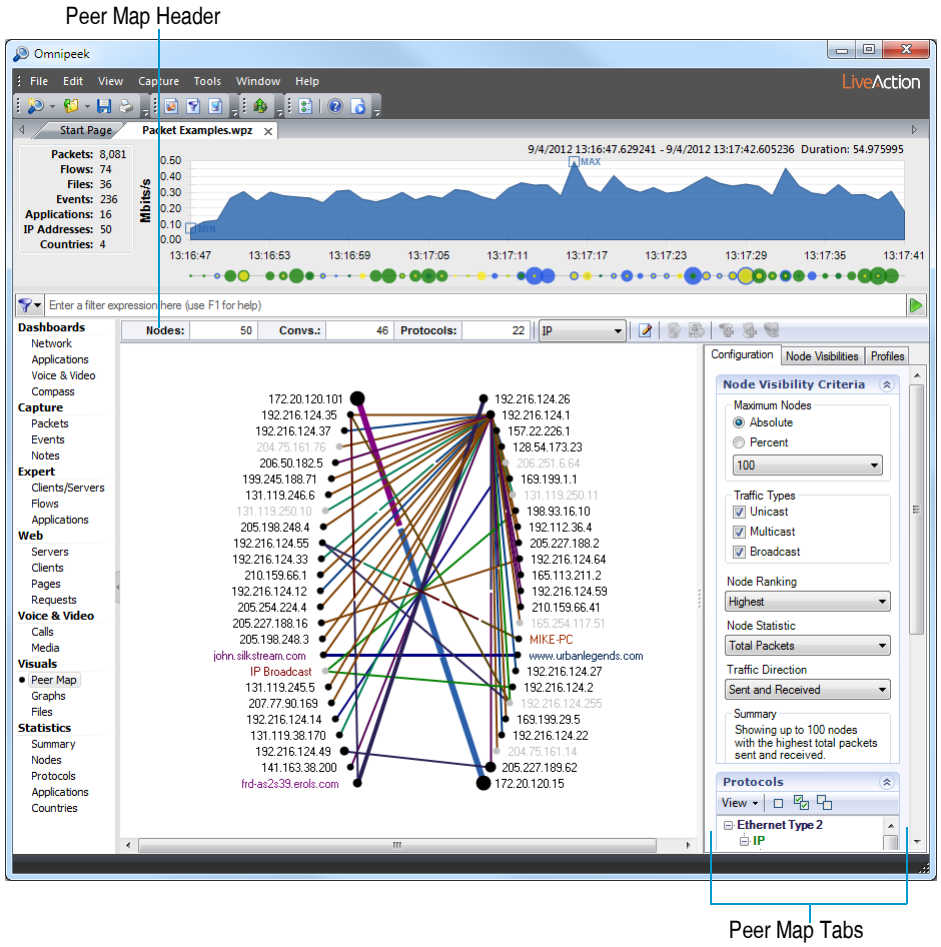
The **Peer Map** view of a capture window lets you visualize network traffic, displaying the nodes around an elongated ellipse. Line weight shows the relative volume of traffic between nodes and line color the protocol in use between nodes. The nodes themselves can be color-coded and displayed as icons, based on node type and Name Table data.

The **Peer Map** tabs contain options to control the display of nodes and types of network traffic. This lets you quickly create a picture of all the traffic that is using a particular protocol. For example, you can show only the nodes sending or receiving multicast traffic.

# The Peer Map view

**To display a Peer Map:**

- From an open capture window, click the **Peer Map** view.




## Nodes and traffic in the Peer Map

Nodes and the traffic occurring between them are represented in the following ways in the Peer Map:

- Each dot represents a particular node. When you hold the cursor over a node, the node is highlighted, and a graphical tooltip appears with more information about the node. See *Displaying node tooltips* on page 245. If you click on one or more nodes, the node is highlighted in orange and becomes the focused object in the Peer Map. Subsequent toolbar button or context menu key presses will apply to the focused node.
- The size of the dot represents the number of packets sent from that node, as a percentage of total packets in the window.

- The lines between nodes represent the traffic (or conversation) between them. When you hold the cursor over a line, the line is highlighted in yellow, and a graphical tooltip appears with more information about the traffic occurring between the two nodes. See *Displaying node tooltips* on page 245. If you click on a line, the line is highlighted in orange and becomes the focused object in the Peer Map. Subsequent toolbar button or context menu key presses will apply to the focused conversation line.
- The color of the line represents the protocol. This matches the protocol colors displayed for each protocol in the *Protocols* task pane of the Configuration tab.
- The thickness of the line represents the volume of the traffic. Specifically, the thickness of the line represents the volume in bytes of the traffic between two nodes, expressed as a percent of all the traffic in the buffer.

**Tip** You can drag one or more nodes and lines to other positions within the Peer Map to make it easier to view network traffic occurring with those nodes and lines. To move a node back to within the ellipse, right-click the node and select *Arrange*. To move all nodes back to within the ellipse, right-click an empty area of the Peer Map and select *Arrange All Nodes*.

## Parts of the Peer Map

### *Peer Map header*

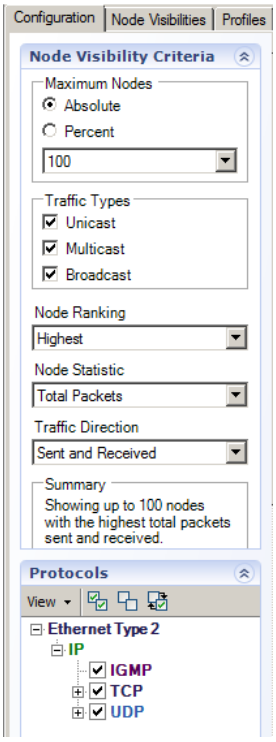
- *Nodes:* Displays the number of unique nodes in the Peer Map.
- *Convs. (Conversations):* Displays the number of conversations in the Peer Map.
- *Protocols:* Displays the number of unique protocols in the Peer Map.
- *Map Type:* Lets you choose whether to display nodes as a Physical, IP, or IPv6 Peer Map.
- Peer Map toolbar:
  - *Options:* Displays the Peer Map Options dialog that lets you control how various items are displayed in the Peer Map. See *Peer Map options* on page 243.
  - *Node Details:* Displays the **Detail Statistics** dialog for the selected node.
  - *Conversation Details:* Displays the **Detail Statistics** dialog for the selected conversation.
  - *Make Filter:* Displays the **Insert Filter** dialog to create a filter based on the selected node or conversation.
  - *Insert Into Name Table:* Displays the **Edit Name** dialog to create an entry into the name table based on the selected node.
  - *Resolve Names:* Resolves the name of the node from the name table.

### *Peer Map tabs*

- *Configuration:* This tab sets the basic parameters of the Peer Map. See *Configuration tab* on page 239.
- *Node Visibilities:* This tab displays node counts, and nodes that are both shown and hidden in the Peer Map. See *Node Visibilities tab* on page 241.
- *Profiles:* This tab lets you create profiles and add a background image to the Peer Map. See *Profiles tab* on page 242.

## Configuration tab

The *Configuration* tab sets the basic parameters of the Peer Map. The *Configuration* tab task panes are described below.




## *Node Visibility Criteria*

The *Nodes Visibility Criteria* task pane lets you control what part of the traffic in the capture window's buffer is displayed in the Peer Map:

- *Maximum Nodes:* Lets you limit the display to no more than the specified number of nodes, expressed as an *Absolute* number or as a *Percent* of all nodes included in the buffer.
- *Traffic Types:* Lets you choose the type of traffic to display. You can choose from any combination of *Unicast*, *Multicast*, or *Broadcast* traffic types.
- *Node Ranking*: Lets you choose whether you want the *Maximum Nodes* to represent the *Highest* or the *Lowest* values in the sample.
- *Node Statistic*: Lets you choose the units to use when evaluating the *Maximum Nodes* and *Node Ranking* criteria. You can choose from *Total Packets* or *Total Bytes*.
- *Traffic Direction*: Lets you choose whether to count the bytes or packets *Sent*, *Received*, or both *Sent and Received*.
- *Summary*: Displays a description of the current view.

**Note** The nodes that do not meet your criteria are removed from the Peer Map and are listed in the *Auto Hidden Nodes* pane under the *Node Visibilities* tab.

## *Protocols*

The *Protocols* task pane displays a list of protocols currently found in the Peer Map and allows you to control the display of the line segments between the various peers. The line segments represent traffic for a particular protocol.

The toolbar lets you control what is displayed:

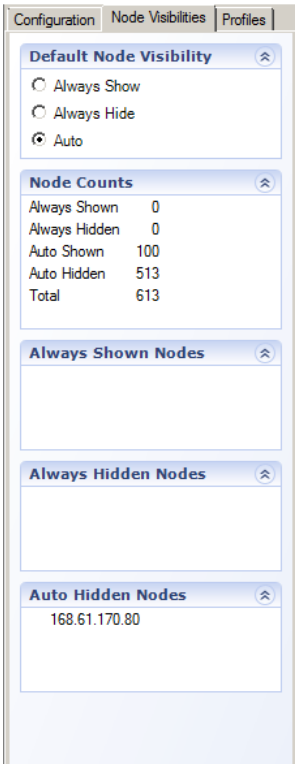
- *View:* Select how you want the protocols displayed in the *Protocols* task pane (*Flat*, *Hierarchical*, or *Condense*).
- *Enable All:* Click to enable the display of all protocols.

- *Disable All:* Click to disable the display of all protocols.
- *Toggle All:* Click to toggle between *Enable All* and *Disable All*.

Each protocol has a color associated with it in ProtoSpecs. Both the entry in the *Protocols* pane and the traffic lines in the Peer Map use the same ProtoSpecs-assigned color to display each particular protocol. See *ProtoSpecs™* on page 224.

## Node Visibilities tab

The Node Visibilities tab displays node counts, and nodes that are both shown and hidden in the Peer Map. The Node Visibilities task panes are described below.




### *Default Node Visibility*

This task pane specifies the default node visibility to assign to nodes that do not have a user-specified visibility. For example, if this option is set to *Always Hide*, then all nodes that have not had their visibility assigned by the user will be hidden. This is useful if, during a live capture, the user doesn't want new nodes to appear on the Peer Map as they are discovered.

### *Node Counts*

This task pane summarizes all of the nodes of the Peer Map into the following categories: *Always Shown*, *Always Hidden*, *Auto Shown*, *Auto Hidden*, and *Total*.

### *Always Shown Nodes*

This task pane lists the nodes that are configured to always be shown and displayed in the Peer Map. Right-click a node in the task pane to display additional options for the selected node.

### *Always Hidden Nodes*

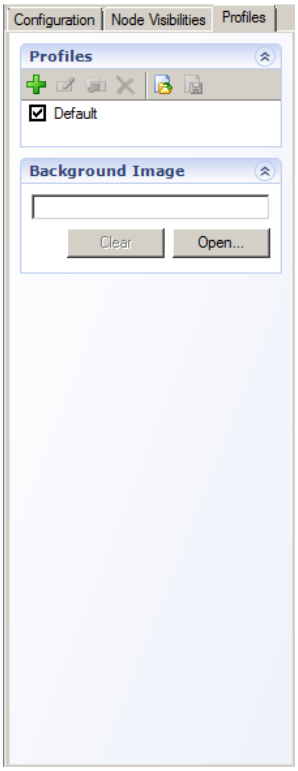
This task pane lists the nodes that are configured to always be hidden and not displayed in the Peer Map. Right-click a node in the task pane to display additional options for the selected node.

### *Auto Hidden Nodes*

This task pane lists the nodes that are currently hidden from the Peer Map. The settings in the Configuration tab determine which nodes appear in this task pane. Right-click a node in the task pane to display additional options for the selected node.

## Profiles tab

The Profiles tab lets you create profiles and add a background image to the Peer Map.




### *Profiles*

The *Profiles* task pane lets you save Peer Map configuration settings into a single profile that controls the appearance and layout of the Peer Map. The toolbar in the task pane allows you to save, edit, duplicate, delete, import, and export profiles. The settings that make up the profile include:

> **Note** Changes to a Peer Map profile are applied globally to all capture windows using that profile.

- User-applied node visibilities (always shown, always hidden)
- Default node visibility
- User-arranged node locations
- Background image

**To enable a profile:**

- Select the check box of the desired profile

### *Background Image*

The *Background Image* task pane lets you apply a background image to the Peer Map. This is useful if you want a more visual representation of the nodes in your Peer Map and your actual network. For example, if you have a graphic image of your network, you can add that image as a background image, and then arrange several key nodes that are experiencing the network problems over the background image to rep-

resent their real-world locations. Additionally, you can then hide all uninteresting nodes so that they don't clutter the arrangement.

**To add a background image:**

1. Click **Open** in the task pane. The **Open Image** dialog appears.
2. Select the background image, and then click **Open**. The image is added to the Peer Map.

# Peer Map options

The Peer Map Options dialog lets you control how various items are displayed in the Peer Map. You can choose to show or hide displayable icons, node visibilities, and protocol line segment gaps.

**To view the Peer Map options dialog:**

- Click **Options** in the Peer Map toolbar. The following options are available:
  - *Show type icons (server, workstation, etc.):* Select this option to display the icon appropriate to that node type (such as *Workstation*, *Router*).
  - *Show visibility icons (thumbtack)*: Select this option to display a node visibility icon (a thumbtack) to indicate that a node visibility (*Always Shown* or *Always Hidden*) is assigned to a node.
  - *Show node tooltips:* Select this option to display a tooltip when hovering over a node.
  - *Show gaps between protocol segments*: Select this option to display gaps in line segments to help distinguish that more than one protocol is in use between nodes.
  - *Show ghost lines when all protocol segments are disabled*: Select this option to display light gray, dashed lines in place of conversation lines when all of their protocol segments have been disabled.
  - *Show conversation tool tips:* Select this option to display a tooltip when hovering over a line.
  - *Improve rendering speed by turning off anti-aliasing when displaying _____ or more conversations:* Select this option to improve how fast the Peer Map is rendered.

# Displaying relevant nodes and traffic

The packets currently in the buffer of the capture window are the source of what is displayed in the Peer Map. You have various right-click options to display only the most relevant nodes and traffic in the Peer Map.

If you right-click a node in the Peer Map and Node Visibilities tab, the following options are available:

- *Arrange* (Peer Map tab only)*:* This option arranges the node back to within the ellipse of the Peer Map.
- *Node Details:* This option opens the **Detailed Statistics** dialog and shows details of the selected node.

> **Tip** You can mouse over a node to display details of the node in a tooltip. See *Displaying node tooltips* on page 245.

- *Visibility:* Displays options for showing and hiding nodes within the Peer Map. Showing and hiding nodes in the Peer Map do not affect how nodes are displayed in other views of a capture window.
  - *Always Show:* This option will always display the node in the Peer Map. When you select this option, a thumbtack icon is displayed with the node in the Peer Map to indicate a node visibility setting has been assigned, and the node is listed in the *Always Shown Nodes* task pane of the *Node Visibilities* tab.
  - *Always Hide:* This option will always hide the node in the Peer Map. When you select this option, the node is removed from the Peer Map and listed in the *Always Hidden Nodes* task pane of the *Node Visibilities* tab.
  - *Auto:* This option reverts any Always Shown or Always Hidden nodes back to their original status.

- *Peers:* Displays options for showing or hiding nodes that are peers to the selected nodes.
  - *Always Show:* This option will always display nodes that are peers in the Peer Map. When you select this option, a thumbtack icon is displayed with the node in the Peer Map to indicate a node visibility setting has been assigned, and the node is listed in the *Always Shown Nodes* task pane of the *Node Visibilities* tab.
  - *Always Hide:* This option will always hide nodes that are peers in the Peer Map. When you select this option, the node is added is removed from the Peer Map and the node is listed in the *Always Hidden Nodes* task pane of the *Node Visibilities* tab.
  - *Auto:* This option reverts any Always Shown or Always Hidden nodes back to their original status.
- *Non-Peers:* Displays options for showing or hiding nodes that are not peers to the selected nodes.
  - *Always Show:* This option will always display nodes that are not peers in the Peer Map. When you select this option, a thumbtack icon is displayed with the node in the Peer Map to indicate a node visibility setting has been assigned, and the node is listed in the *Always Shown Nodes* task pane of the *Node Visibilities* tab.
  - *Always Hide:* This option will always hide nodes that are not peers in the Peer Map. When you select this option, the node is added is removed from the Peer Map and the node is listed in the *Always Hidden Nodes* task pane of the *Node Visibilities* tab.
  - *Auto:* This option reverts any Always Shown or Always Hidden nodes back to their original status.

- *Select Related Packets:* Displays options for showing or hiding nodes that are related to the selected packets by the source or destination IP address.
  - *By Source:* This option displays nodes that are related to the selected node by source IP address. You will have the option to *Hide selected packets*, *Hide unselected packets*, or *Copy selected packets to new window*.
  - *By Destination:* This option displays nodes that are related to the selected node by destination IP address. You will have the option to *Hide selected packets*, *Hide unselected packets*, or *Copy selected packets to new window*.
  - *By Source or Destination:* This option displays nodes that are related to the selected node by both source and destination IP address. You will have the option to *Hide selected packets*, *Hide unselected packets*, or *Copy selected packets to new window*.

**Important!** Unlike the tools for hiding and unhiding nodes in the Peer Map, selection results are shown in the **Packets** view, as with any other **Select Related Packets** operation.

- *Make Filter:* This option opens the **Insert Filter** dialog and lets you create a filter based on the selected node.
- *Insert into Name Table:* This option opens the **Insert Name** or **Edit Name** dialog with the characteristics of the selected node already entered.
- *Resolve Names:* Select this option if name resolution services are available. For more about names, see Chapter 17, *Using the Name Table*.

If you right-click a conversation in the Peer Map, the following options are available:

- *Conversation Details:* This option opens the **Detailed Statistics** dialog and shows details of the selected conversation.
- *Select Related Packets:* Displays the option for showing or hiding nodes that are related to the selected conversation by the source and destination IP address.
  - *By Source or Destination:* This option displays nodes that are related to the selected conversation by both source and destination IP address. You will have the option to *Hide selected packets*, *Hide unselected packets*, or *Copy selected packets to new window*.

**Important!** Unlike the tools for hiding and unhiding nodes in the Peer Map, selection results are shown in the **Packets** view, as with any other **Select Related Packets** operation.

- *Make Filter:* This option opens the **Insert Filter** dialog and lets you create a filter based on the selected conversation.

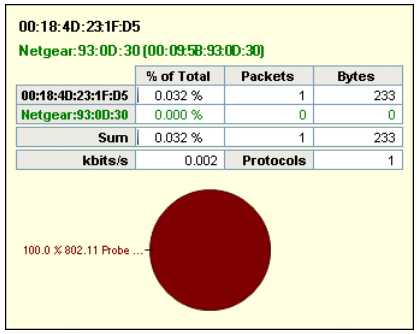
If you right-click anything other than a node or conversation, the following options are available:

- *Arrange All Nodes:* This option arranges nodes back to within the ellipse of the Peer Map.
- *Resolve All Names:* This option renames nodes according to the name table.
- *Copy to Clipboard:* This option copies the Peer Map image to the clipboard.

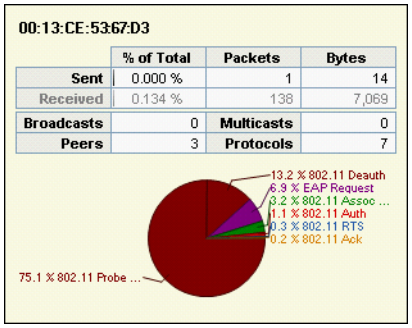
**Tip** You can drag one or more nodes to other positions within the Peer Map to make it easier to view network traffic occurring with those nodes. To move a node back to within the ellipse, right-click the node and select *Arrange*. To move all nodes back to within the ellipse, right-click an empty area of the Peer Map and select *Arrange All Nodes*.

## Displaying node tooltips

When you move your cursor over a node or line in the Peer Map, or node in the *Node Visibilities* tab, a tool-tip appears displaying tabular and graphical information about the node or line:




Line Tooltip




Node Tooltip

CHAPTER 14

# Creating Graphs

## In this chapter:

# About graphs

In addition to the standard statistical displays, Omnipeek and Capture Engine offer speed, power, and flexibility in the display of individual statistical items or groups of statistics in user-defined graphs.

Statistics graphing functions for the Capture Engine captures also allow you to create and manage graph templates, which can be used by any Capture Engine capture window on that Capture Engine. See *Capture Engine graph templates* on page 254.

The following sections describe the tools for graphing statistics from Omnipeek and Capture Engine.

# Omnipeek capture statistics graphs

You can graph most statistics item calculated in the **Summary, Nodes**, **Protocols**, **Applications**, **Countries, WLAN**, **Channels**, or **Signal** views of a capture window in either of two ways:

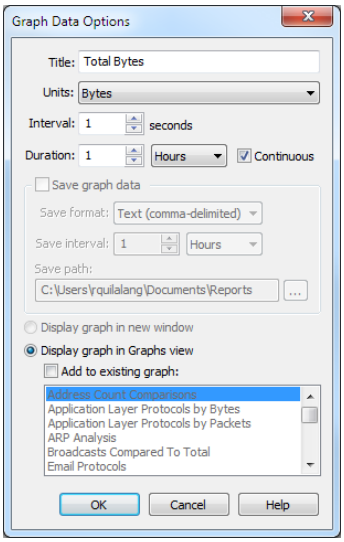
- Create a new statistics **Graph** window showing just the selected statistic.
- Create or add a statistic to a graph already displayed in the **Graphs** view of a capture window or file.

The main distinction between the two types of graphs is in their formatting options and the ability to save and retrieve these formats.

**To create a graph of a statistics item in a capture window, follow these steps:**

1. Highlight the item and choose one of the following:
   - Click **Graph** in the toolbar.
   - Right-click and choose **Graph...**.

   The **Graph Data Options** dialog appears.




2. Complete the **Graph Data Options** dialog.

   **Note** Click **Help** to learn about the available options and settings.

3. Choose one of the following:
   - *Display graph in new window:* Select this option to create the graph in a new window.
   - *Display graph in Graphs view:* Select this option to add the new graph to those already listed in the **Graphs** view of the capture window. See *Omnipeek capture window graphs* on page 248.
     - *Add to existing graph:* Select this option to add the selected statistics item to one of the graphs that already exists in the **Graphs** view. See *Omnipeek capture window graphs* on page 248.

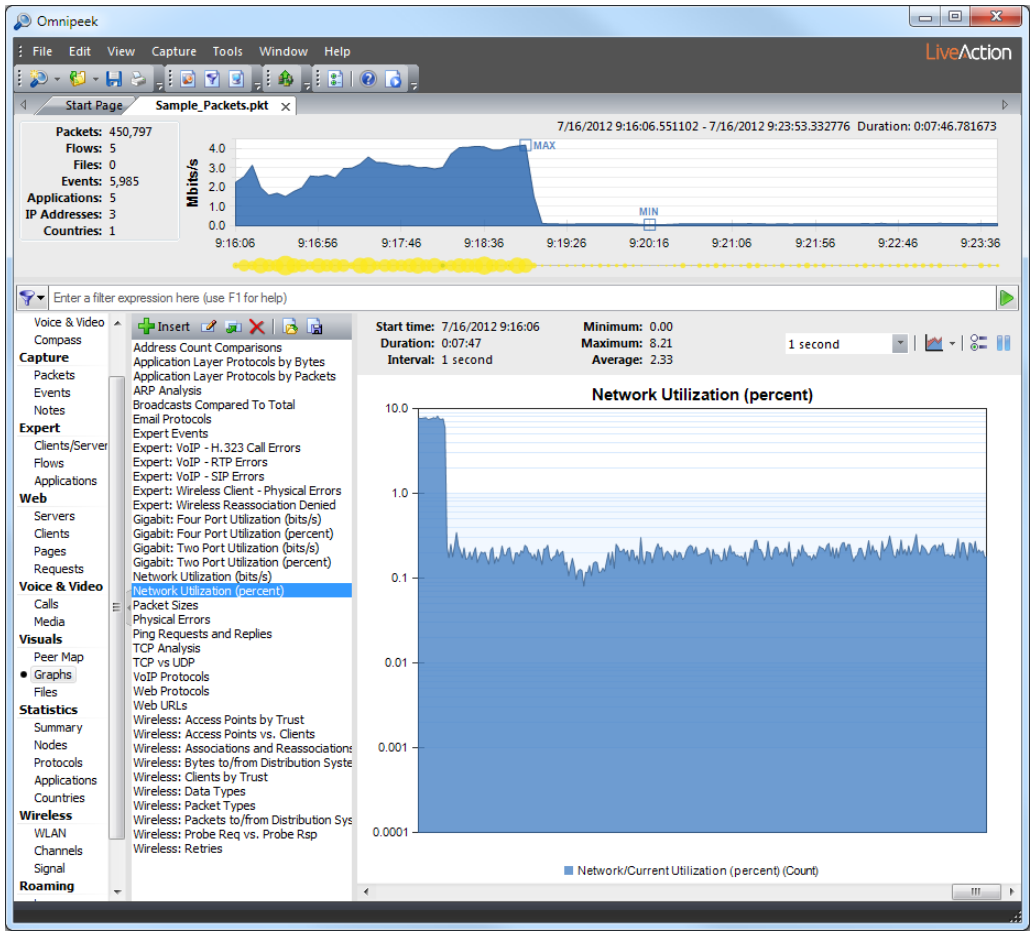
4. Click **OK** to accept your changes.
5. Select the name of the graph from the list at left. The graph will be displayed on the right.

**Note** When you choose to *Display graph in Graphs view*, the *Save graph data* section of the **Graph Data Options** dialog becomes grayed out. This is because the graphs in the **Graphs** view are part of the capture window and this data is saved using **File** > **Save Report...**. You can also use the **Statistics Output** view of the **Capture Options** dialog to configure the periodic output of statistics from graphs. For details, see *Generating statistics output reports* on page 234.

## Omnipeek capture window graphs

The **Graphs** view allows great flexibility in the display of statistics. You can add to, delete, rearrange, create, edit, export, and import graphs of a wide range of formats, each based on single or multiple statistics from the current capture window.

Select any title from the list to display that graph in the right pane.




The parts of the Omnipeek **Graphs** view are identified below.

- *Insert:* Opens the **New Graph: Pick a Statistic** dialog. Click **OK** to add the new graph to the **Graphs** view.
- *Edit:* Opens the **Graph Display Options** dialog for the selected graph. See *Graph display options* on page 258.
- *Duplicate:* Creates a copy of the selected graph and adds it to the list.
- *Delete:* Deletes the selected graph.

- *Import:* When you click **Import**, the program first asks if you would like to delete all graphs before importing? If you choose **Yes**, all the graphs currently shown in the Graphs view will be deleted and replaced by the contents of the imported *.gph file. If you choose **No**, the graphs you import will be added to the current list. Use the file **Open** dialog to navigate to the location of the **.gph* file you wish to import, and click **OK**.
- *Export:* You can export the entire contents of the Graphs view to a **.gph* file, which is a set of parameters for defining all the graphs currently in the Graphs view. This allows you to create and maintain groups of graphs for particular troubleshooting tasks, or for particular environments.
- *Bar:* Click to change the display to a bar graph.
- *Stacked Bar:* Click to change the display to a stacked bar graph.
- *Skyline:* Click to change the display to a skyline graph.
- *Stacked Skyline:* Click to change the display to a stacked skyline graph.
- *Area:* Click to change the display to an area graph.
- *Stacked Area:* Click to change the display to a stacked area graph.
- *Line:* Click to change the display to a line graph.
- *Line/Points:* Click to change the display to a line graph with points.
- *Points:* Click to change the display to a points graph.
- *Pie:* Click to change the display to a pie graph.
- *Donut:* Click to change the display to a donut graph.
- *Column Percentage:* Click to change the display to a column percentage graph.
- *Bar Pie:* Click to change the display to a bar pie graph.
- *Options:* Click to open the **Graph Display Options** dialog, where you can set more configuration options. See *Graph display options* on page 258.
- *Pause:* Click to temporarily suspend scrolling and view data which has scrolled off-screen to the left. Statistics graphs scroll each time data is refreshed so the most recent data appears at the far right of the screen.

  The scroll bar represents the position within a window of the size you set in the *Duration* parameter. For example, if you set a duration of one hour and have been graphing statistics for only ten minutes, only the right-most portion of the scroll bar will show any graphed data.

**Tip** You can restore the default **Graphs** view by importing the *Default Graph.gph* file, located in the *1033\Graphs* directory.

# Capture Engine statistics graphs

The graphs function on a Capture Engine lets you create customized graphs of user-defined statistics from the **Nodes**, **Protocols**, **Applications, WLAN**, and **Summary** statistics views of Capture Engine capture windows.

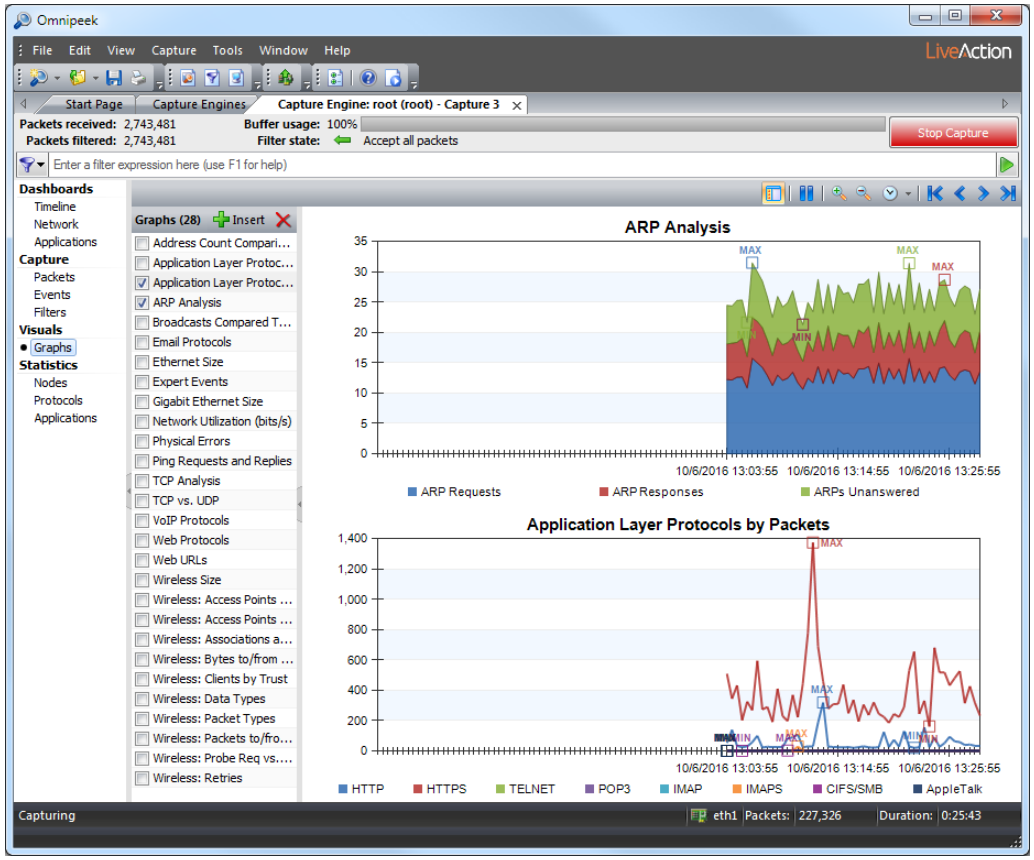
The *Graphs* tab of the **Capture Engines** window also allows you to create and manage graph templates, which can be used by any Capture Engine capture on that particular Capture Engine. See *Capture Engine graph templates* on page 254.

**To view graphs in a Capture Engine capture window:**

1. Start a capture from the *Home* tab or *Capture* tab of a connected Capture Engine. See *Creating a Capture Engine capture window* on page 24.
2. Select *Enable graphs* in the **Graphs** options of the Capture Engine **Capture Options** dialog. See *Capture Engine graphs capture options* on page 251.
3. Click **OK**. A new Capture Engine capture window appears.

4. Click **Start Capture** and then the **Graphs** view of the Capture Engine capture window. See *Capture Engine capture window graphs* on page 252.

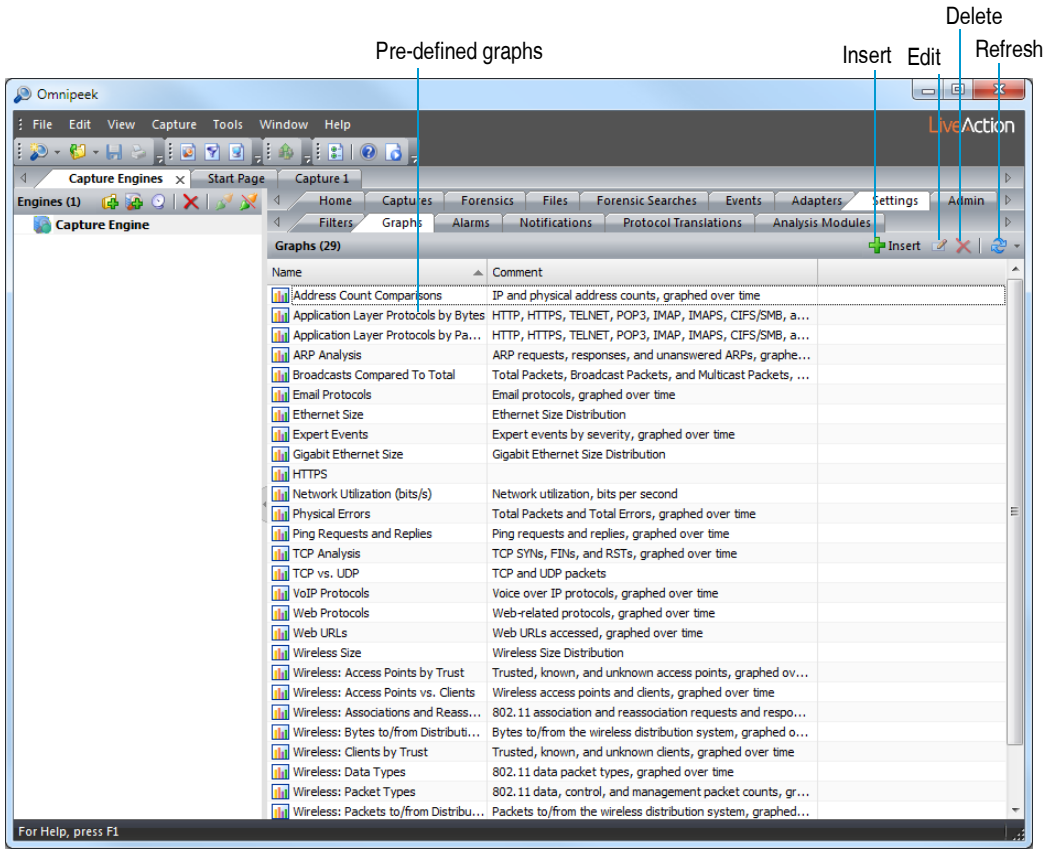
5. Select the graphs you wish to display in the Capture Engine capture window. The example below displays the graphs for ARP analysis and Expert events.




**Tip** Right-click in the graph area to choose from a **Gallery** of graph displays.

## Capture Engine graphs tab

Select the *Settings* tab, and then point to the *Graphs* tab for a connected Capture Engine in the **Capture Engines** window. (See *Connecting to a Capture Engine* on page 11.) A list of pre-defined and created graphs is displayed.



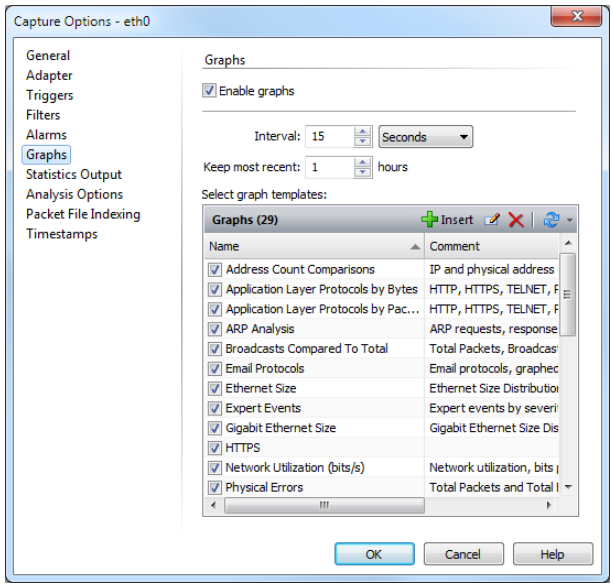

The parts of the Capture Engine *Graphs* tab are described below.

- *Insert:* Opens the **Create Graph Template** dialog. See *Creating a new Capture Engine graph template* on page 254.
- *Edit:* Opens the **Edit Graph Template** dialog. See *Editing a Capture Engine graph template* on page 258.
- *Delete:* Deletes selected graph.
- *Refresh:* Refreshes list of graphs at user-defined intervals.

## Capture Engine graphs capture options

The **Graphs** options of the Capture Engine **Capture Options** dialog lets you manage the graphing capabilities for individual Capture Engine captures.

The parts of the **Graphs** options of the Capture Engine **Capture Options** dialog are identified below.




- *Enable Graphs:* Select this check box in order to have the **Graphs** view appear in the Capture Engine capture window.
- *Interval*: Choose the sampling interval for all statistics used for graph creation in the current Capture Engine capture window. Enter a value and choose the units.

  For any statistics item normally expressed per unit of time, the graphing function creates an average value over the sampling interval you choose.
- *Keep most recent...hours*: Choose number of hours for statistics collection.

  Files are created on the hour. One folder per capture is created, with one *.sts file per hour of preserved graph data. There is an added *.sts file for the data from the current hour. For example, if your *Keep most recent* setting is eight hours, then there will be nine *.sts files.
- *Select Graph Templates:* This section shows all currently defined graph templates and provides tools for creating and managing them. (See *Capture Engine graphs tab* on page 250 for details on creating graph templates.)

  Select one or more graph template(s) to add them to the **Graphs** view of the new Capture Engine capture window.

## Capture Engine capture window graphs

The **Graphs** view of a Capture Engine capture window can show multiple graphs, each one of which can show one or more statistics items from any combination of the following views: **Summary**, **Nodes**, **Protocols**, **Applications**, **Countries**, and **WLAN** statistics.

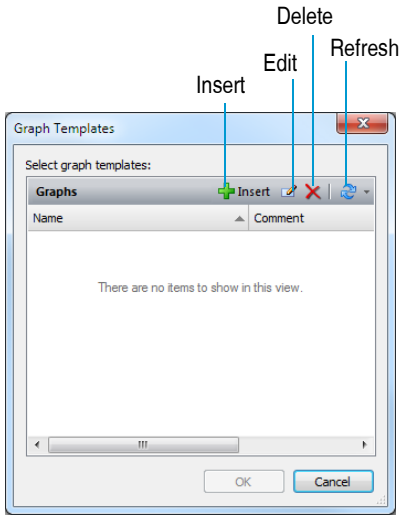
A graph enabled in the *Graphs* list is shown in the right pane. When multiple graphs are enabled, they are stacked vertically. All graphs share the same horizontal time axis.


The parts of the Capture Engine **Graphs** view are described below.

- *Insert:* Click to add an existing graph template to the *Graphs* list by opening the **Graph Templates** dialog.
- *Delete:* Click to remove selected graph template(s) from the *Graphs* list. (The deleted graph template will be restored to the list in the **Graph Templates** dialog.)
- *Graph list:* Click to toggle the display of the *Graphs* list.
- *Pause:* Click to toggle the update of all graphs, preventing them from automatically scrolling to the right at each new sampling interval.
- *Zoom in:* Click to enlarge the size of the display.
- *Zoom out:* Click to reduce the size of the display.
- *Display duration:* Use the drop-down list beside to select the time window (left-right expanse) displayed for all graphs. A shorter interval has the effect of zooming in, a longer interval, of zooming out.
- *First, Previous, Next, Last:* Use these buttons to scroll through the graphs when **Pause** is clicked (active).
- *Right-click options:*
  - *Gallery:* Select alternative graph displays
  - *Options...:* Opens the **Graphs Display Options** dialog. See *Graph display options* on page 258.
  - *Legend:* Toggles display of the graph legend.
  - *Copy:* Copies the graph image to the clipboard.
  - *Print:* Opens the **Print** dialog for printing the graph.

**To add an existing graph template to the Graphs list:**

1. Click **Insert**. The **Graph Templates** dialog appears.




2. Select the check box beside any graph template you wish to add to the *Graphs* list of the Capture Engine capture window.
3. Click **OK**.

**To create a new graph template, choose one of the following:**

- Click **Insert** in the **Graph Templates** dialog.
- Select statistics items directly in the **Nodes**, **Protocols**, or **Summary** views of Capture Engine capture windows and click **Graph** in the toolbar.

The **Create Graph Template** dialog appears. For a details, see *Capture Engine graph templates* on page 254.

**Tip** To open a window that shows only the **Graphs** view of a Capture Engine capture window, right-click its listing in the **Captures** view of the **Capture Engines** window and choose **Graphs**. This allows you to monitor and manage the **Graphs** view of the Capture Engine capture window using minimal bandwidth and processing power.

# Capture Engine graph templates

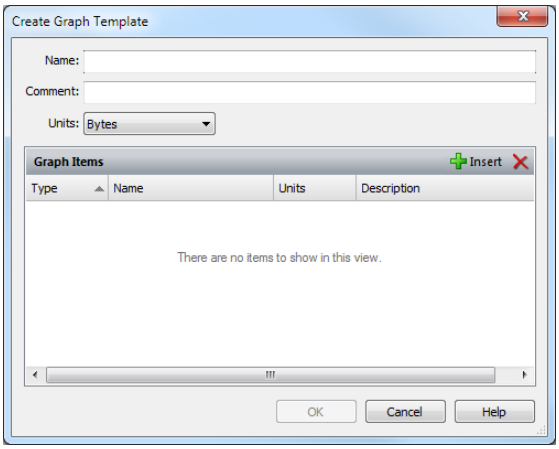
You can create, edit, and manage graph templates in the **Graphs** tabs of the **Capture Engines** window, the Capture Engine **Capture Options** dialog, and any Capture Engine capture window.

**Note** Changes to the graph templates stored on a Capture Engine take effect immediately. Unlike other functions, no separate steps are required to send changes to the Capture Engine.

## Creating a new Capture Engine graph template

**To create a new Capture Engine graph template:**

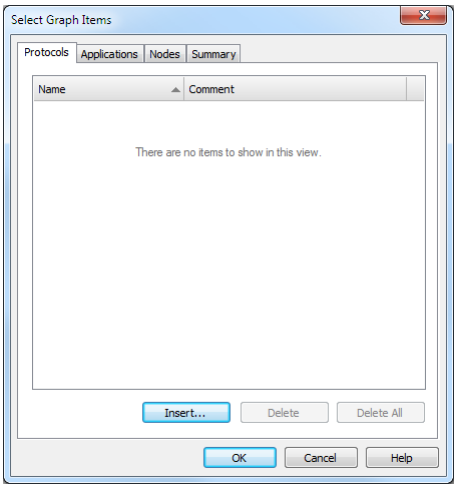
1. Click **Insert** in the **Graphs** tab of the **Capture Engines** window. The **Create Graph Template** dialog appears.




2. Fill in the following fields:
   - Enter a *Name* for the new graph template.
   - You may enter a *Comment* to further describe the graph template.
   - Choose the *Units* (*Bytes* or *Packets*). The same units must be used for all parameters in a single graph template.
3. Click **Insert**. The **Select Graph Items** dialog appears. Alternatively, you can use the list beside **Insert** to open the dialog to a particular tab by choosing *Protocols*, *Nodes*, or *Summary* from the drop-down list.
4. Make your changes on one or more of these tabs. (See instructions for each tab below.)
5. Click **Delete** in the *Graph Items* list to delete selected statistics items.
6. Click **OK** to create the new remote graph template and add it to the list in the *Graphs* tab of the **Capture Engines** window.

**To add a protocol statistics item to the graph template:**

1. Open the *Protocols* tab of the **Select Graph Items** dialog.




2. Click **Insert...** to open the **Protocol Filter** window.
3. Select one of the following methods of defining the protocol by choosing from the drop-down list:
   - *Generic ProtoSpec* is a flat tab of all available ProtoSpec definitions.
   - *Specific ProtoSpec* shows all protocols nested under their physical layer. For more information on these methods of defining protocols, see *ProtoSpecs™* on page 224.

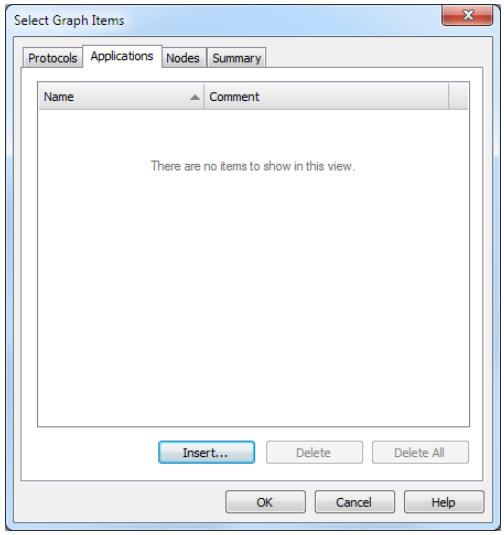
**Tip** Click **Description...** to present a brief description of any protocol selected in either type of ProtoSpec listing.

4. Select a protocol under your preferred method.
5. Click **OK** to add it to the list and close the **Protocol Filter** window.

   The protocol item you selected will appear in the list in the **Protocols** tab of the **Select Graph Items** dialog.
6. Add other protocol items by repeating these steps, or add other types of statistics by opening other tabs of the **Select Graph Items** dialog.
7. Click **OK** to return to the **Create Graph Template** dialog.

**To add an applications statistics item to the graph template:**

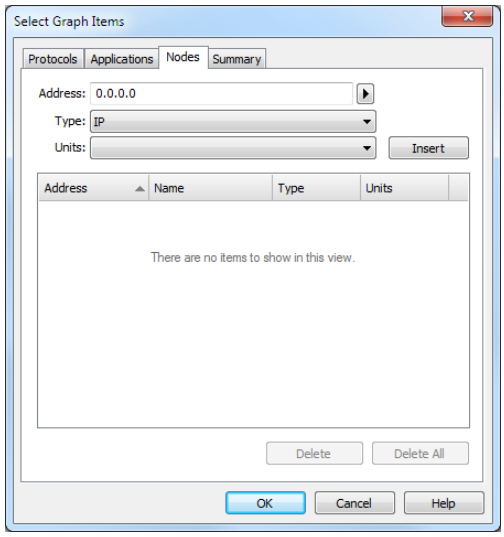
1. Open the *Applications* tab of the **Select Graph Items** dialog.




2. Click **Insert** to add the application to the list in this graph template.
3. Add other applications by repeating these steps or add other types of statistics by opening other tabs of the **Select Graph Items** dialog.
4. Click **OK** to return to the **Create Graph Template** dialog.

**To add a node statistics item to the graph template:**

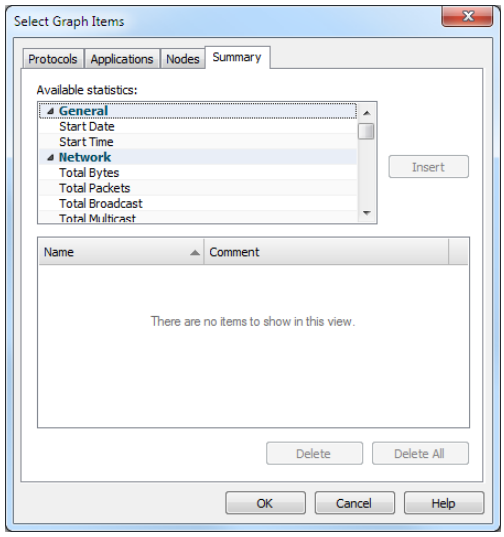
1. Open the *Nodes* tab of the **Select Graph Items** dialog.




2. Enter the *Address* of the node using a format and notation appropriate to the address *Type* selected below. Alternatively, you can click the arrow to the right of the *Address* text entry box and choose:
   - *Name Table...:* Lets you choose an address from the Name Table resident on the local copy of Omnipeek.
   - *Resolve*: Attempts to resolve the IP hostname entered in the *Address* field by querying DNS services from the Omnipeek computer.
3. Choose a *Type* of address from the drop-down list.
4. Choose the *Units* for all statistics items by selecting from the drop-down list.
5. Click **Insert** to add the node just defined to the list in this graph template.
6. Add other nodes by repeating these steps or add other types of statistics by opening other tabs of the **Select Graph Items** dialog.
7. Click **OK** to return to the **Create Graph Template** dialog.

**To add a summary statistics item to the graph template:**

1. Open the *Summary* tab of the **Select Graph Items** dialog.




2. Select a statistics item in the *Available Statistics* pane at the top of the tab. Right-click to **Expand All** or **Collapse All** items in the nested view of available Summary Statistics items.

3. Click **Insert** to add the selected statistics item to the table. (**Insert** is unavailable when you select an unsupported item.)
4. Select an item in the table and click **Delete** to remove the item from the table, or click **Delete All** to clear the entire table.
5. Add other Summary statistics items by repeating these steps, or add other types of statistics by opening other tabs of the **Select Graph Items** dialog.
6. Click **OK** to return to the **Create Graph Template** dialog.

## Editing a Capture Engine graph template

**To edit an existing Capture Engine graph template:**

1. Select the graph you wish to edit in the **Graphs** tab of the **Capture Engines** window. The **Edit Graph Template** dialog appears with existing name, comment, units, and graph items filled in.
2. Make changes to these fields following the instructions for creating Capture Engine graph templates. See *Creating a new Capture Engine graph template* on page 254.

# Configuring and saving graphs

You can control the appearance of graphs in the **Graphs Display Options** dialog and save graphs in several formats.

## Graph display options

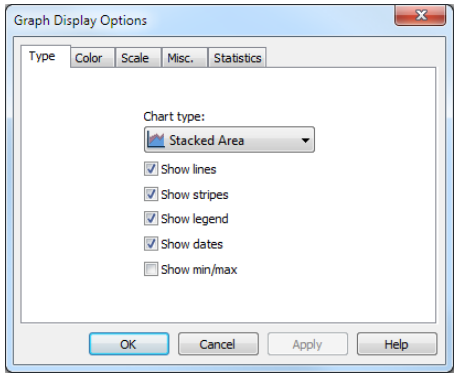
The **Graph Display Options** dialog lets you control how a graph is displayed. The dialog has up to five tabs, depending on the statistical context and whether it is a free-standing window or it is displayed in the **Graphs** view of a capture window or file.

**To open the Graph Display Options dialog in Omnipeek:**

- Click **Options** in the toolbar of a Graphs window. The **Graph Display Options** dialog appears.

**To open the Graph Display Options dialog in Capture Engine:**

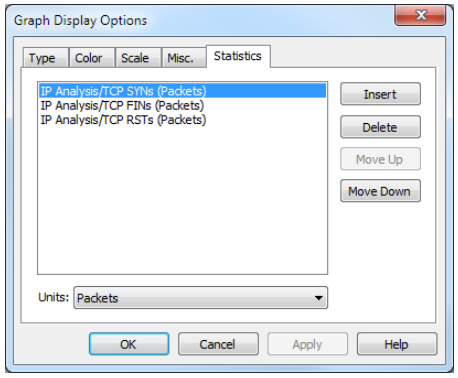
1. Right-click in the graphs area of a Capture Engine capture window.
2. Choose **Options**.... The **Graph Display Options** dialog appears.




- *Type:* This tab lets you choose the type graph to display. The choice of graph types is context sensitive, and only those choices applicable to the graph being modified are available.
- *Color:* This tab lets you control the color of display elements. Click in the color swatches to choose from the palette.
- *Scale:* This tab controls the scale used for the Y-axis (vertical scale) of the graph.

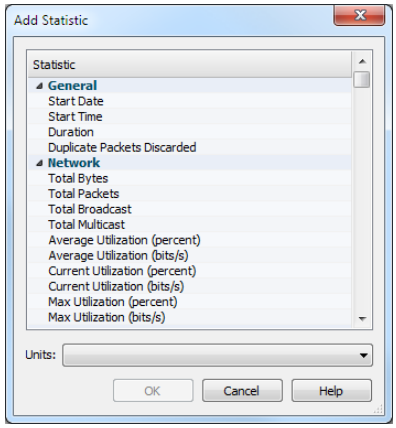
- *Misc.:* This tab allows you to configure additional settings for your graph.
- *Statistics:* This tab presents a list of each statistics item displayed in the current graph. The drop-down list at the bottom of the tab presents alternative choices for the *Units* used to measure the selected statistics item.

**Note** Click **Help** on the dialog to learn more about the available options and settings.




**To add or delete items from the Statistics tab:**

1. Click **Insert** or **Delete** a insert or delete a statistics item. Click **Move Up** or **Move Down** to move the selected item up or down in the display.
2. Click **Insert** to open the **Add Statistic** dialog.




The **Add Statistic** dialog presents a scrollable hierarchical list of all statistics in the **Summary** view and a drop-down list for choosing the appropriate *Units* of display for the highlighted statistics item.

3. Click **OK** to return to the **Graphs Display Options** dialog.

## Saving Omnipeek graphs

You can choose to save either the graph data or the current image of the Omnipeek graph itself.

When an Omnipeek **Graph** window is the active window, on the **File** menu, click **Save Graph...** to open a standard **Save As** dialog from which you can save either the graph data or the current image of the **Graph** window itself.

**Note** For packet size and history statistics graphs, on the **File** menu, click **Save Size Statistics**... or **Save History Statistics**....

**To save the Omnipeek graph data or image:**

1. Right-click in the graph and select **Save...**.
2. Give the file a name.
3. Choose one of the following from the *Save file format* list:
   - *Text (tab delimited)(*.txt)*
   - *CSV (comma delimited)(*.csv)*
   - *XML (*.xml)*
   - *Bitmap image (*.bmp)*
   - *PNG image (*.png)*
   - *PDF document (*.pdf)*

## Saving Capture Engine graphs

To save graph images in Capture Engine, right-click in the graph display and choose **Copy**. Navigate to a program in which you can paste the graph image.

# Setting Alarms and Triggers

## In this chapter:

# About alarms and triggers

Setting alarms and triggers can help you uncover many hard-to-find network problems.

Alarms are only available on Capture Engines. Capture Engine alarms query a specified statistics parameter in a Capture Engine capture window, testing for user-specified problem and resolution conditions. On matching any of theses tests, the alarm function sends a notification of a user-specified severity. See *Creating and editing Capture Engine alarms* on page 265 and *Capture Engine alarms* on page 262.

Triggers are used to start or stop capture at a specified time or network event. They are very useful for pinpointing the origins of intermittent network problems. For example, you can set a start trigger so that capture begins when a problem occurs. Conversely, you can stop capturing when the problem occurs so that you can see exactly what happened just prior to the observed symptom. Alternatively, if you know that problems occur at a particular time, you can set a time event to begin capturing packets during that time. See *Setting triggers* on page 266.

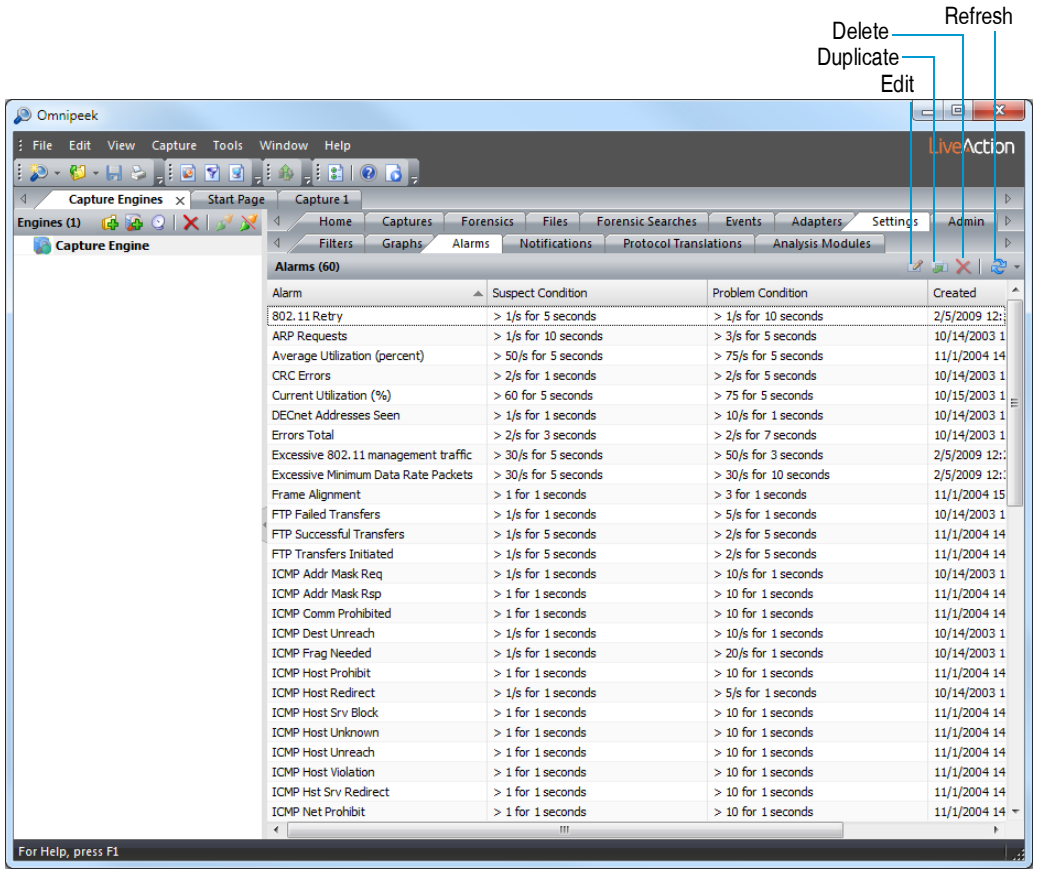
# Capture Engine alarms

Capture Engine alarms can be created, edited, and managed from the following:

- *Capture Engine alarms tab*
- *Capture Engine capture options*
- *Capture Engine capture window alarms*

## *Capture Engine alarms tab*

Select the *Settings* tab, and then point to the **Alarms** tab for a connected Capture Engine in the **Capture Engines** window (see *Connecting to a Capture Engine* on page 11). A list of all the alarms available on that Capture Engine is displayed.

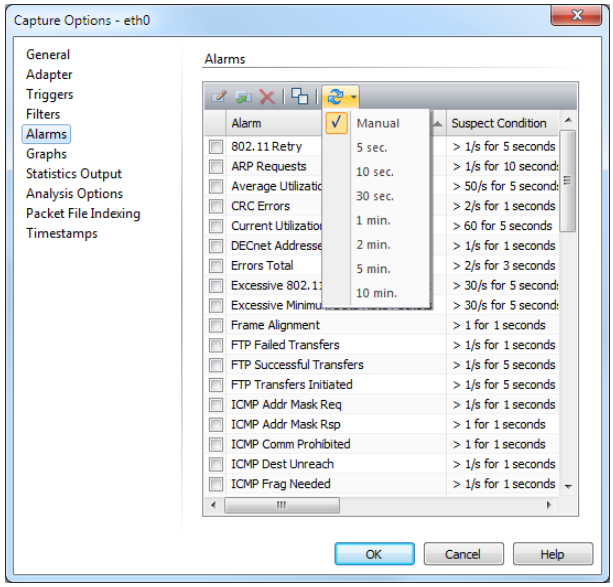



The parts of the **Capture Engines** window **Alarms** tab are identified below.

- *Edit:* Click to open the **Edit Alarm** dialog with the selected alarm's properties ready to edit.
- *Duplicate:* Click to make a copy of a selected alarm.
- *Delete:* Click to delete a selected alarm. This may be useful when you want to delete alarms that are not used in order to make room for new alarms that you create.
- *Refresh:* Click to update the current view with the latest information stored on a Capture Engine. A refresh may be necessary in instances where other users may be accessing the Capture Engine at the same time, and you want to ensure that the most up-to-date information is being displayed.
- *Alarm:* Shows the name of the alarm, which by default is the name of the statistic to be monitored.
- *Suspect Condition:* Shows a shorthand version of the statistics measurements required to trigger this part of the alarm. Alarm conditions which have been triggered are shown in red.
- *Problem Condition:* Like the Suspect Condition column, shows a shorthand version of the statistics measurements required to trigger this part of the alarm. Alarm conditions which have been triggered are shown in red.
- *Created:* Lists the date and time alarm was created.
- *Modified:* Lists the date and time alarm was modified.

## Capture Engine capture options

The **Alarms** options of the Capture Engine **Capture Options** dialog allows you to selectively enable or disable individual alarms for a particular Capture Engine capture window. From these options, you can also manage existing alarms (**Edit**, **Duplicate**, or **Delete** the selected alarm).

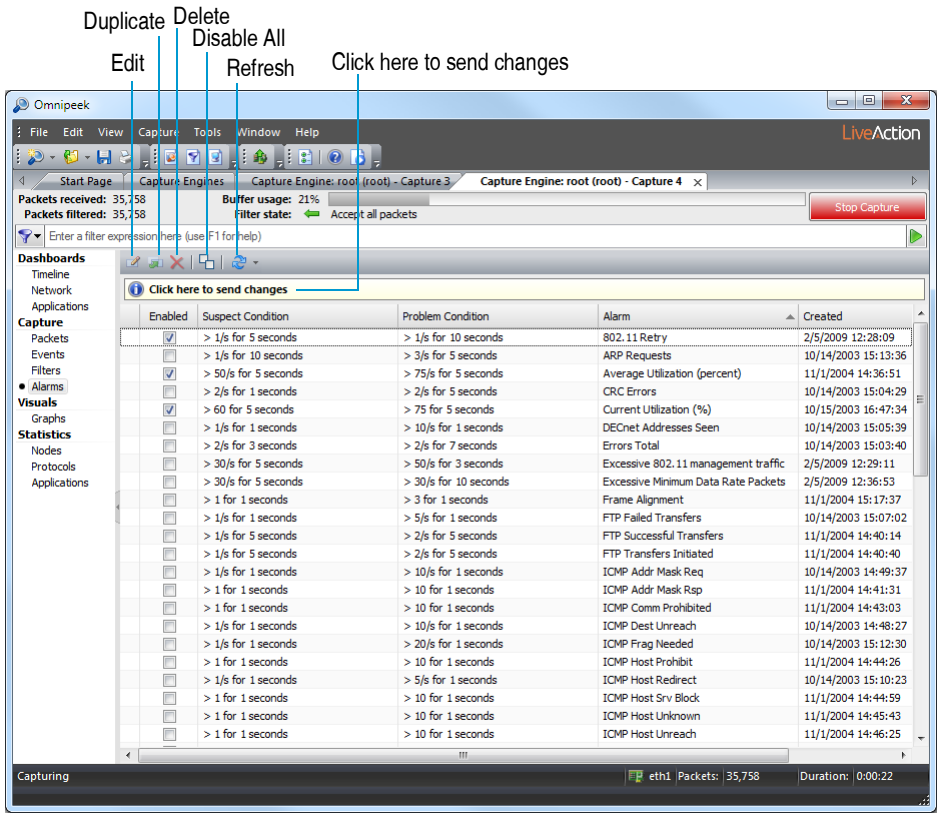



Select the check box at the left of any listed alarm to enable it. Clear the check box of any alarm you want to disable. This may be useful when you no longer wish to have that particular alarm information included in your data. You can click **Disable All** in the header to uncheck all alarms.

**Note** Click **Help** to learn about the available options and settings.

## Capture Engine capture window alarms

The **Alarms** view of a Capture Engine capture window allows you to see the current state of the alarms enabled for this capture window. You can also enable or disable individual alarms for this capture window.




The parts of the **Alarms** view are described below.

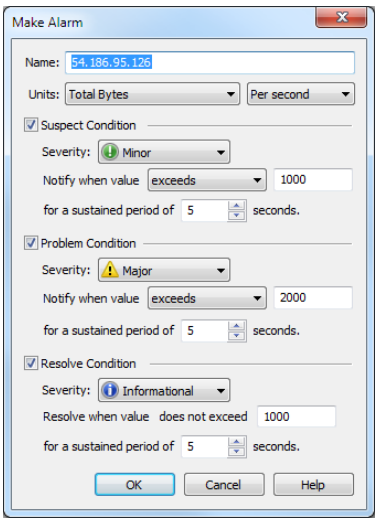
- *Edit:* Click to open the **Edit Alarm** dialog with the selected alarm's properties ready to edit. You can also double-click an alarm to open the **Edit Alarm** dialog with that alarm's properties ready to edit.
- *Duplicate:* Click to make a copy of a selected alarm.
- *Delete:* Click to delete a selected alarm.
- *Disable All:* Click to disable all alarms at once in window.
- *Refresh:* Click to update the current view with the latest information stored on a Capture Engine.
- *Click here to send changes:* Click to send changes to the Capture Engine. Changes to the **Make Alarm** dialog will not take effect on the Capture Engine until this is clicked.
- *Notification column:* Displays an icon representing the severity of any notification sent by an alarm that is in a triggered state.
- *Enabled:* Shows a check mark if the alarm is enabled. Select the check box to enable or uncheck to disable individual alarms. When an alarm is disabled it is shown in grey.
- *Suspect Condition:* Shows a shorthand version of the statistics measurements required to trigger this part of the alarm. This value is set in the **Make Alarm** dialog. Alarm conditions which have been triggered are shown in red.
- *Problem Condition:* Like the Suspect Condition column, shows a shorthand version of the statistics measurements required to trigger this part of the alarm. This value is set in the **Make Alarm**. Alarm conditions which have been triggered are shown in red.
- *Alarm:* Shows the name of the alarm, which by default is the name of the statistic to be monitored. This value is set in the **Make Alarm** dialog.
- *Created:* Lists the date and time alarm was created.
- *Modified:* Lists the date and time alarm was modified.

**Tip** You can change alarm settings while a remote capture is under way. Select the remote capture in the Capture Engine **Capture** tab and open the **Capture Options** dialog. You must click *Click here to send changes* to the Capture Engine to set the alarm in the Capture Engine capture window.

# Creating and editing Capture Engine alarms

**To create and edit a Capture Engine alarm:**

1. From any of the statistics view of a Capture Engine capture window, select the item to be monitored.
2. Click **Make Alarm** in the header, or right-click the item and click **Make Alarm...**. The **Make Alarm** dialog appears.




3. Complete the dialog by specifying the parameters for the alarm:
   - *Name:* Type a name for the alarm. This name is used in the message portion of any notifications. By default, any new alarm is named for the statistical item to be monitored.
   - *Units:* Select the units in which the alarm is testing and the time period over which the units are to be counted.
     - In the list to the left, select the units in which the alarm is testing. This list changes according to the statistical parameter chosen.
     - In the list to the right, select whether the units are to be counted *Per second* or in Total over the time periods set for each condition below.

     In general, only alarms set to watch statistics which are themselves already measured in units per second should be set to *Total*. Alarms for all other statistics should be set to the default Per second
   - *Suspect Condition:* Select this check box to specify the parameters for a Suspect Condition for the current statistics parameter. Suspect conditions are typically used to not less severe states.
     - *Severity:* Select the severity of the notification to be sent when the suspect conditions are met.
     - *Notify when value:* Select *exceeds* or *does not exceed* from the list and enter a value in the adjacent text box.
     - *For a sustained period of ____ seconds:* Type or enter the number of seconds the suspect condition has to be detected before an alarm is sent.
   - *Problem Condition:* Select this check box to specify the parameters for a Problem Condition for the current statistics item. Problem conditions are typically used to note more severe states.
     - *Severity:* Select the severity of the notification to be sent when the problem conditions are met.

- *Notify when value:* Select *exceeds* or *does not exceed* from the list and enter a value in the adjacent text box.
- *For a sustained period of ____ seconds:* Type or enter the number of seconds the problem condition has to be detected before an alarm is sent.

- *Resolve Condition:* Select this check box to specify the parameters for when either the Suspect Condition or Problem Condition has been "stood down" or resolved.
  - *Severity:* Select the severity of the notification to be sent when the resolve conditions are met.
  - *Resolve when value does not exceed:* Enter a value.
  - *For a sustained period of _____ seconds:* Type or enter the number of seconds the resolve condition has to be detected before an alarm is sent.

**Tip** A single alarm can test for two distinct levels: *Suspect Condition* and *Problem Condition*. Both sets of conditions share the same *Resolve Condition*. This allows you to create a yellow alert / red alert / stand down for the same statistics parameter in a single alarm. Alternatively, you can specify only the *Suspect Condition* or only the *Problem Condition* for an alarm.

4. Click **OK** to create the alarm. The alarm is automatically added to all lists of that Capture Engine.

**Tip** A tripped alarm is displayed as an icon in the **Captures** tab of the **Capture Engines** window. The icon matches the severity of the alarm state (i.e., Suspect, Problem, Resolve).

# Setting triggers

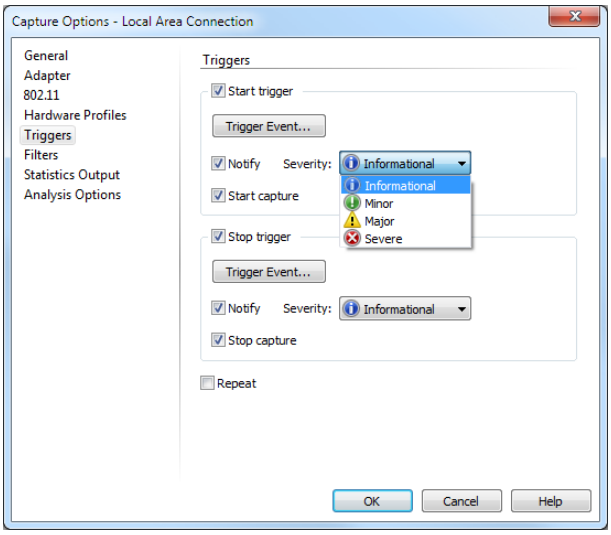
Triggers are used to start or stop captures at a specified time or network event. They are very useful for pin-pointing the origins of intermittent network problems. For example, you can set a start trigger so that the capture begins when a problem occurs. Conversely, you can stop capturing when the problem occurs so that you can see exactly what happened just prior to the observed symptom. Alternatively, if you know that problems occur at a particular time, you can set a time event to begin capturing packets during that time. Start and stop triggers can help you uncover many hard-to-find network problems.

You can create a start trigger, a stop trigger, or both a start and stop trigger for each capture window that you have open.

**Note** To set triggers on a Capture Engine capture window, see *Setting start and stop triggers on a Capture Engine* on page 268.

**To set start and stop triggers:**

1. On the **Capture** menu, click **Capture Options**.... The **Capture Options** dialog appears.
2. Select the **Triggers** options.




3. Select the *Start trigger* check box to enable a start trigger.

   - Click **Trigger Event** to configure the event that will start the capture. You can set the following types of trigger events:

     - *Time*: Capture starts when a user-specified time occurs. Here are the options for setting a time trigger event:

       *Absolute time*: Select this option to set a specific time for a start trigger. Enter the time in the box.

       *Use date also*: Select this option to also set a specific date for a start trigger. The start trigger is activated when both the date and absolute time occurs.

       *Elapsed time*: Select this option to set an elapsed time for a start trigger. Enter an interval defined in days, hours, minutes, and seconds. The count for a start trigger begins when you click the Start Trigger button in the capture window or otherwise start the trigger watch (for example, automatically in repeat mode).

     - *Filter*: Capture starts when the selected filter event(s) occurs.

     **Note** When both a time and filter trigger event option is selected, the capture starts when either of the trigger events occur. To filter packets, make sure you also have filters set up in the capture options.

     - *Bytes captured*: Capture starts when the specified number of bytes are allowed to pass through the capture buffer.

   - *Notify:* Select this option to send a notification of the selected severity when the start trigger is activated. A notification is a message sent to announce and describe the occurrence of specified events on the network.
   - *Start capture:* Select this option to start a capture when the start trigger is activated.

4. Select the *Stop trigger* check box to enable a stop trigger.

   **Note** If you do not select the *Stop trigger* check box, packet capturing started by a start trigger continues indefinitely until it is aborted manually by the user.

   - Click **Trigger Event** to configure the event that will stop (or abort) the capture. You can set any combination of the following types of trigger events:

- *Time*: Capture stops when a user-specified time occurs. Here are the options for setting a time trigger event:

  *Absolute*: Select this option to set a specific time for a stop trigger. Enter the time in the box.

  *Use date also*: Select this option to also set a specific date for a stop trigger. The stop trigger is activated when both the date and absolute time occurs.

  *Elapsed time*: Select this option to set an elapsed time for a stop trigger. Enter an interval defined in days, hours, minutes, and seconds. The count for a stop trigger begins when capture commences.

- *Filter*: Capture stops when the selected filter event(s) occurs.
- *Bytes captured*: Capture stops when the specified number of bytes are allowed to pass through the capture buffer.

- *Notify:* Select this option to send a notification of the selected severity when the stop trigger is activated. A notification is a message sent to announce and describe the occurrence of specified events on the network.
- *Stop capture:* Select this option to stop a capture when the stop trigger is activated.

5. Select the *Repeat mode* check box if you want to reset the start trigger each time the stop trigger is activated. This option is only available when both the *Start trigger* and *Stop trigger* check boxes are selected.

**Note** Repeat mode allows you to capture multiple occurrences of the same event(s) with a single capture window.

6. Click **OK** to close the **Capture Options** dialog and return to the capture window.

   If a start trigger was defined, **Start Capture** in the capture window turns into **Start Trigger** (if no start trigger was defined, **Start Capture** does not change).

**Tip** The status bar at the bottom left of the capture window provides information about the current state of the capture window.

7. Click **Start Trigger** to turn on the triggers. **Start Trigger** turns into the **Abort Trigger**.

**Important!** The actual capturing of packets does not begin until the start trigger event defined above occurs. Once packet capture begins, **Abort Trigger** turns into **Stop Capture**.

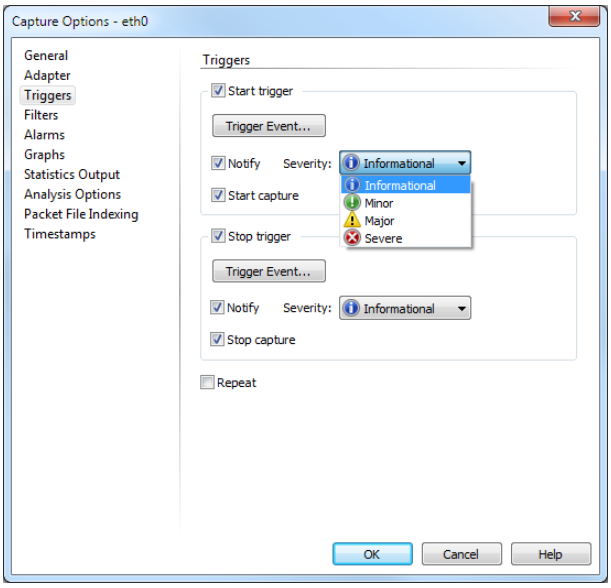
## Setting start and stop triggers on a Capture Engine

You can create a start trigger, a stop trigger, or both a start and stop trigger for each new Capture Engine capture window that you create.

**Note** You cannot set start and stop triggers on an existing Capture Engine capture that was not created with either a start or stop trigger.

**To set start and stop triggers:**

1. Open the **Capture Engines** window and connect to a Capture Engine.
2. Click the **Captures** tab of the Capture Engine.
3. Click **Insert** in the right pane to create a new capture window. The **Capture Options** dialog appears.
4. Select the **Triggers** options.




5. Select the *Start trigger* check box to enable a start trigger.

   - Click **Trigger Event** to configure the event that will start the capture. You can set one or more of the following types of trigger events:

     - *Time*: Capture starts when a user-specified time occurs. Here are the options for setting a time trigger event:

       *Absolute time*: Select this option to set a specific time for a start trigger. Enter the time in the box.

       *Use date also*: Select this option to also set a specific date for a start trigger. The start trigger is activated when both the date and absolute time occurs.

       *Elapsed time*: Select this option to set an elapsed time for a start trigger. Enter an interval defined in days, hours, minutes, and seconds. The count for a start trigger begins when you click the Start Trigger button in the capture window or otherwise start the trigger watch (for example, automatically in repeat mode).

     - *Filter*: Capture starts when the selected filter event(s) occurs.
     - *Bytes Captured*: Capture starts after the specified number of bytes are allowed to pass through the capture buffer.

   **Note** When one or more start trigger event options are selected, capture starts when any of the trigger events occur.

   - Select the *Notify* check box to send a notification of the selected severity when the start trigger event occurs. A notification is a message sent to announce and describe the occurrence of specified events on the network.
   - Select the *Start capture* check box to start a capture when the start trigger event occurs.

6. Select the *Stop trigger* check box to enable a stop trigger.

   **Note** If you do not select the *Stop trigger* check box, packet capturing started by a start trigger continues indefinitely until it is aborted manually by the user.

   - Click **Trigger Event** to configure the event that will stop (or abort) the capture. You can set one or more of the following types of trigger events:

- *Time*: Capture stops when a user-specified time occurs. Here are the options for setting a time trigger event:

  *Absolute time*: Select this option to set a specific time for a stop trigger. Enter the time in the box.

  *Use date also*: Select this option to also set a specific date for a stop trigger. The stop trigger is activated when both the date and absolute time occurs.

  *Elapsed time*: Select this option to set an elapsed time for a stop trigger. Enter an interval defined in days, hours, minutes, and seconds. The count for a stop trigger begins when capture commences.

- *Filter*: Capture stops when the selected filter event(s) occurs.
- *Bytes Captured*: Capture stops after the specified number of bytes are captured into the capture buffer.

- Select the *Notify* check box to send a notification of the selected severity when the stop trigger event occurs. A notification is a message sent to announce and describe the occurrence of specified events on the network.
- Select the *Stop capture* check box to stop a capture when the stop trigger event occurs.

7. Select the *Repeat mode* check box if you want to reset the start trigger each time the stop trigger is activated. This option is only available when both the *Start trigger* and *Stop trigger* check boxes are selected.

**Note** Repeat mode allows you to capture multiple occurrences of the same event(s) with a single capture window.

8. Click **OK** to close the **Capture Options** dialog.

   If a start trigger was defined, **Start Capture** in the capture window turns into **Start Trigger** (if no start trigger was defined, **Start Capture** does not change).

**Tip** The status bar at the bottom left of the capture window provides information about the current state of the capture window.

9. Click **Start Trigger** to turn on the triggers. **Start Trigger** turns into the **Abort Trigger**.

**Important!** If a start trigger was defined, packet capture does not begin until the start trigger event defined above occurs. Once packet capture begins, **Abort Trigger** turns into **Stop Capture**.

CHAPTER 16

# Sending Notifications

## In this chapter:

# About notifications

Notifications are messages sent from triggers, alarms, Analysis Modules, and other parts of the program to announce and describe the occurrence of specified events on the network.

Each notification is assigned a level of severity that indicates the importance of the notification. Whenever a notification is sent, the assigned level of severity will trigger any actions that are configured to start when the level of severity is generated by the program.

There are four levels of severity:

- Informational
- Minor
- Major
- Severe

The level of severity is set by the function generating the notification. For triggers, alarms and some Analysis Modules, the user can set the level of severity directly. Other Analysis Modules are coded to always assign a certain severity to notifications of a particular event. Analysis Modules can also be limited to a capped range of severities, overriding their internal coding.

For information about how functions generate notifications, see *Setting triggers* on page 266 and Chapter 19, *Applying Analysis Modules*.

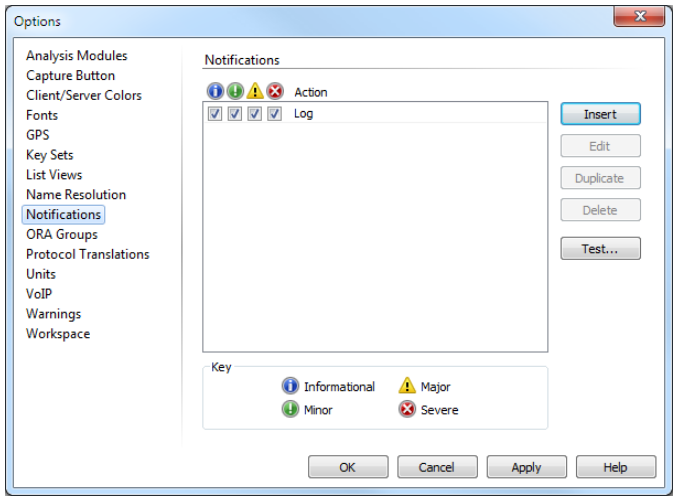
# Configuring notifications

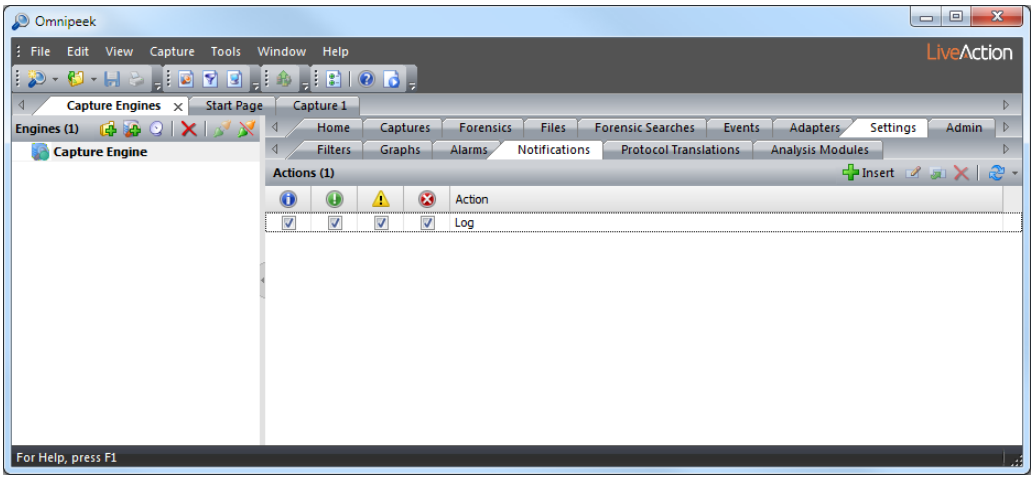
**To configure notifications:**

1. On the **Tools** menu, click **Options**.... The **Options** dialog appears.

> **Note** To configure notifications from a Capture Engine, open the **Capture Engines** window and connect to a Capture Engine.

2. Click the **Notifications** options. (For a Capture Engine, select the *Notifications* tab.)






Any actions currently defined are displayed. By default, the Log action is the only action defined when no other actions have been created.

The buttons in the Notification views are as follows:

- *Insert:* Click to create a new action.
- *Edit:* Click to edit the selected action. (Double-clicking an Action also lets you edit the selected action.)
- *Duplicate:* Click to duplicate the selected action.
- *Delete:* Click to delete the selected action.
- *Test* (Omnipeek console only)*:* Click to edit the long and short messages of a sample notification, set the severity of the test notification, then test the notification settings for that severity level.
- *Refresh* (Capture Engine only)*:* Click to refresh the view.

**Note** Click **Insert** to define a new action. See *Creating a notification action* on page 273.

3. For each action, select the level of severity check box that will start the action whenever the level of severity is generated by the program.

   The four levels of severity are:

   - Informational
   - Minor
   - Major
   - Severe

4. Click **OK**.

**Note** For a Capture Engine, you can right-click inside the *Notifications* tab to access the **Test Notification** dialog. From the dialog, choose a severity and enter a short and long description, and click **OK**. When testing email, the short description becomes the subject line and the long description is the email body.

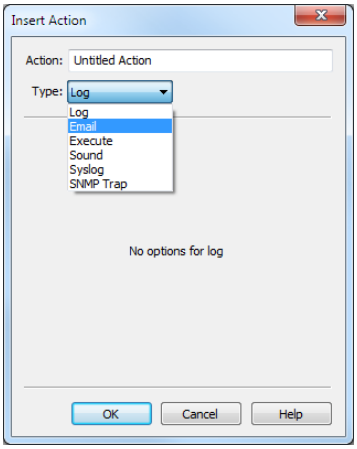
# Creating a notification action

**To create a notification action in Omnipeek:**

1. On the **Tools** menu, click **Options**.... The **Options** dialog appears.

**Note** To create notifications from a Capture Engine, open the **Capture Engines** window and connect to a Capture Engine.

2. Click the **Notifications** options. (For a Capture Engine, select the *Notifications* tab.)
3. Click **Insert**. The **Insert Action** dialog appears.




4. In the Action box, type a name for the new action.
5. In the Type list, select the type of action. You can select from the following:
   - *Log:* This action sends the notification to the log file.
   - *Email:* This action sends notifications as email messages. The text of the notification is included in the body of the message. When selected, you will need to configure the following:
     - *Recipient:* Type the email address of the recipient.
     - *Sender:* Type the email address of the sender.
     - *SMTP Server:* Type the SMTP server for the sender email.
     - *Port:* Type the port for the sender email.
     - *Send Test Email:* Click to send a test email.
   - *Execute:* This action lets you run a program that you specify. When selected, you will need to configure the following:
     - *Command:* Type or browse to the location of the executable file.
     - *Argument:* Enter any arguments for the command.
     - *Initial dir.:* Type or browse to the location of the initial directory.
   - *Text Log:* (Capture Engine only) This action lets you write the notification to a text file stored in the Capture Engine data folder. The data folder is configured in the **General** view of the Capture Engine Configuration Wizard. (See the *Capture Engine for Omnipeek Getting Started Guide* for details.)
   - *Sound:* (Omnipeek only) This action lets you play an audio *.wav file. When selected, you will need to configure the following:
     - *Play Sound:* Type or browse to the *.wav file.
     - *Test Sound:* Click to play the *.wav file.
   - *Syslog:* This action sends a syslog message. The text of the notification is included in the body of the message. When selected, you will need to configure the following:
     - *Recipient:* Type the IP address of the syslog server.

- *SNMP Trap:* This action sends notifications as SNMP trap messages. The text of the notification is included in the body of the message. When selected, you will need to configure the following:
  - *Recipient:* Type the IP address of the SNMP server.
  - *Community:* Type the community for the recipient.

**Note** The MIBs directory contains the MIB file that supports the SNMP Trap action in notifications. In a typical default installation, this directory is at *C:\Program Files\LiveAction*\Omnipeek\MIBs.

**Note** For Capture Engines, the source for a notification must also be specified. See *Sources of Capture Engine notifications* on page 275.

6. Click **OK**. The new action is added to the **Notifications** view.

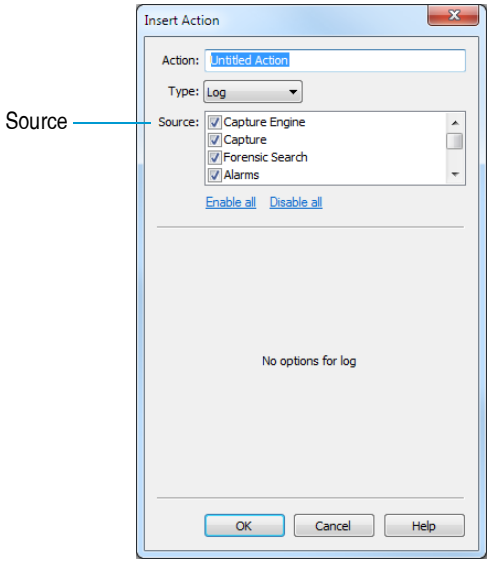
**Note** For Capture Engines, you must also click the yellow bar above the list of actions in order to send the changes to the Capture Engine.

7. For the new action, select the level of severity check box that will start the action whenever the level of severity is generated by the program. See *Configuring notifications* on page 272.
8. Click **OK**.

## Sources of Capture Engine notifications

In a Capture Engine, you must specify the source of notifications to which an action will respond. The **Edit Action** dialog lets you select the source for an action.

When a *Source* is selected, the action will be used to send (or respond to) notifications from that source, but only when the notification also has a level of severity that matches one of the levels of severity enabled for the Action in the **Notifications** view of the **Capture Engines** window. For example, you can create an Action that responds only to notifications that have *Alarms* as their source. If you then enable this Action only for notifications with a severity level of Severe (using the tools in the **Notifications** view), the Action will respond only to a notification generated by an Alarm that also has a severity level of Severe.




The sources of notifications for a Capture Engine are:

- *Capture Engine:* The Capture Engine is the source of notifications. It generates notifications on the occurrence of events directly related to Capture Engine functions such as the start and stop of a Capture Engine itself.
- *Capture:* Capture is any active capture window running on a Capture Engine. A capture window generates notifications of changes in its overall state, such as start and stop of capture, a tripped trigger, and so forth.
- *Forensic Search:* Forensic Search is any forensic search running on a Capture Engine.
- *Alarms:* Alarms are any alarms enabled in the Alarms view of any active capture window on the Capture Engine.
- *Expert:* Expert is the Expert view and Expert analysis functions in any active capture window on the Capture Engine.
- *FTP Analysis Module:* FTP Analysis Module is the analysis module running on the Capture Engine.
- *Web Analysis Module:* Web Analysis Module is the analysis module running on the Capture Engine.

# Using the Name Table

## In this chapter:

# About the name table

The Omnipeek Name Table is used for constructing and maintaining symbolic names for network devices and processes.

When you first start capturing packets, devices on your network will typically be identified by their logical or physical addresses. The Name Table lets you assign symbolic names to addresses, ports and protocols. When you are collecting statistics, Omnipeek scans all traffic for logical and symbolic names in the contents of passing packets. You can control how and whether these passively discovered names are added to the Name Table.

The Name Table interacts with open Capture Engine capture windows in order to perform name resolution functions. See *Omnipeek name resolution* on page 280.

You can also use the Name Table and the Capture Engine Trust Table to set a trust value for any physical address in the Name Table. See *Using the Capture Engine trust table* on page 283.

# Adding entries to the name table

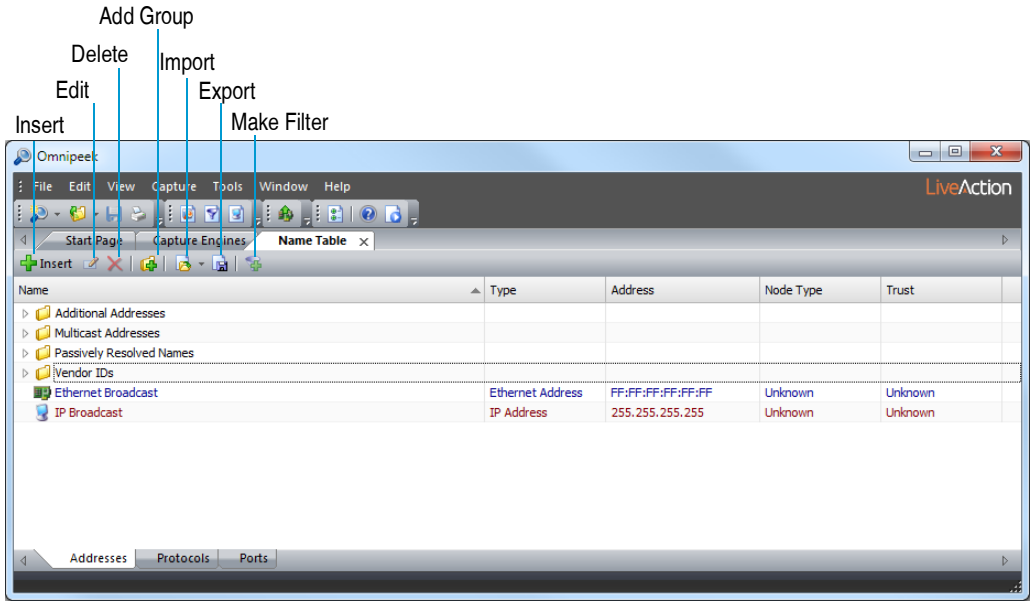
Omnipeek ships with a default Name Table. There are several ways to create new Name Table entries for your network devices. You can:

- Add names manually with the **Insert** dialog.
- Highlight items in other views and click **Insert Into Name Table**.
- Highlight one or more items in other views and click **Resolve Names**.
- Select *Enable passive name resolution* in the **Name Resolution** view of the **Options** dialog.
- Use **Import** in the **Name Table** window to load previously saved versions of the Name Table.

**Note** To display packets and statistics in the program, on the **View** menu, point to **Display Format**, and then click **Name Table Entry**.

## The name table window

To open the Name Table, on the **View** menu, click **Name Table**.




- *Name:* The symbolic name you assigned.

- *Type*: Type of address, port, or protocol.
- *Address, Protocol, Port:* The value that allows Omnipeek to identify the address, port, or protocol. For example, an address of the *Type* IP will show a dotted decimal number in the *Address* column and a protocol of the *Type* LSAP will show the one-byte hexadecimal discriminator in the *Protocol* column.

  The **Address** tab also has columns for *Node Type* and *Trust*, which are configured in the Edit Name dialog. See *Adding and editing name table entries manually* on page 279.

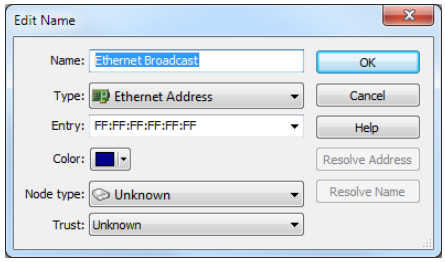
> **Tip** Click the column headings to sort entries in the table.

- *Insert:* Click to open the **Insert Name** dialog.
- *Edit:* Click to open the **Edit Name** dialog with the details of the selected entry filled in and ready to edit. When a Group is highlighted, it brings up the **Edit Group** dialog with the name of the highlighted Group ready to edit.
- *Delete:* Click to delete the selected entry.
- *Add Group:* Click to open the **Add Group** dialog in which you can create a new group folder. You can drag entries into and out of group folders.
- *Import:* Click to open a dialog in which you can specify the *Names* file to load into the Name Table.
- *Export:* Click to open a **Save** dialog to save the contents of the Name Table.
- *Make Filter:* Click to open the **Insert Filter** dialog with an untitled filter matching the information in the selected Name Table entry.

## Adding and editing name table entries manually

**To enter the name table entry manually:**

1. On the **View** menu, click **Name Table**.
2. Do one of the following:
   - Click **Insert**. The **Insert Name** dialog appears.
   - Select the entry you wish to edit and click **Edit**. The **Edit Name** dialog appears.




3. Complete the dialog. The *Node type* options let you choose an icon representing this entry, including *Workstation*, *Server*, *Router*, *Switch*, *Repeater*, *Printer*, or *Access Point*.

> **Note** Click **Help** on this dialog to learn more about available options and settings.

4. Choose a *Trust* value for this entry. See *Trusted, known, and unknown nodes* on page 280.
5. Click **OK** to add the entry to the Name Table.

> **Note** Symbolic names assigned to protocols in the Name Table will *not* override names provided by ProtoSpecs. See *ProtoSpecs™* on page 224.

## Adding names from other windows

You can add to the Name Table or change name assignments for addresses by choosing device and protocol entries from other displays in the program. Any window that can show individual devices can be used as a source of names for the Name Table. This includes the following windows and views:

- **Packets**, **Expert**, **Nodes**, **WLAN**, and **Peer Map** views in capture windows
- **Packet Decode** windows

**To add information from selected items to the Name Table:**

1. Select an item in one of the appropriate views to be entered into the Name Table.
2. Right-click and choose **Insert Into Name Table...**. This opens a dialog (titled to match the appropriate view) with edit fields already filled in to match your selection.
3. Follow the instructions for making manual entries and edits to the Name Table. See *Adding and editing name table entries manually* on page 279.

> **Note** You can only apply the **Insert Into Name Table** command to one entry at a time. If multiple entries are selected, each one will be brought up in a separate dialog.

## Trusted, known, and unknown nodes

You can use the Name Table to set *Trust* attributes for any physical address in the Name Table. This is particularly useful for monitoring security in 802.11 WLAN environments.

- *Unknown:* This is the default value, assigned to any node that is automatically added to the Name Table.
- *Known:* This is an intermediate value, letting you identify familiar sources that are beyond your own control, such as an access point in a neighboring office.
- *Trusted:* This is the value you can assign to the devices on your own network.

There are two ways to set Trust values:

- You can set these values in the same way as any other Name Table attributes. See *Adding and editing name table entries manually* on page 279.
- You can right-click any node in the **WLAN Statistics** window or the **WLAN** view of a capture window and choose a Trust value.

If the node is already in the Name Table, its *Trust* value will be updated. If the node is not yet in the Name Table, the program will silently add the node, using its physical address as the *Name* for the new entry. If the node is identified in the **WLAN** view as an access point, the *Node type* of the new Name Table entry will also be set to *Access Point*.

> **Tip** You can set alarms and send notifications based on Trust. The **Expert** view can also use Trust information. Setting the Trust attributes for your network makes intrusion detection fast, accurate, and easy.

# Omnipeek name resolution

Omnipeek can actively resolve IP device or host names on your network if DNS is reachable. Once names are resolved, they can be added automatically to your Name Table, where the names will be available to replace logical address entries for devices in any displays.

**To resolve names manually:**

1. Select the nodes or packets whose addresses you wish to resolve. You can do this directly in any window that shows the individual nodes.

2. Click **Resolve Names** in the header of the window in which you've selected the items, or right-click and click **Resolve Names...**.

Omnipeek will use your network to find the names of the IP addresses of the selected packets. You must have an adapter available for network services, and DNS must be reachable over the network. Once names have been resolved, you will see name entries substituted for logical addresses in all displays.

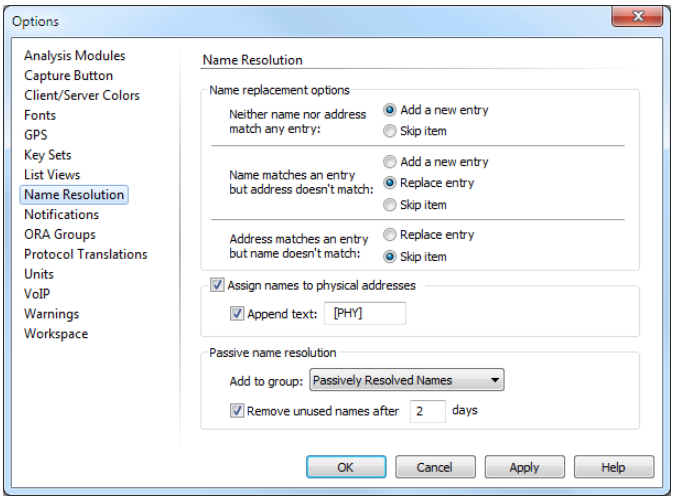
**Tip** You can also look up the address of an IP name by clicking **Resolve Name** in the **Edit Name** dialog.

**Important!** Name resolution requires an active network connection. 802.11 WLAN adapters cannot be used for network services when they are in use for monitoring or capture. The LiveAction Gigabit cards can never be used for network services. For more information, see *Supported adapters* on page 4.

## Configuring name resolution

Name and address resolution is controlled through the *Name Resolution* options of the **Options** dialog. To open the dialog, on the **Tools** menu, click **Options...**, and then click **Name Resolution**.

The *Name Resolution* options are identified below.




- *Name replacement options:* Use the radio buttons in this section to determine how the program will use new information about names and addresses to automatically update the Name Table.

**Note** Click **Help** to learn more about the available options and settings.

- *Assign names to physical addresses:* Select this check box to automatically add names for the physical addresses found in the same packet as the logical addresses being resolved. You may choose to add a short text string to the end of all names assigned by this function.

  Before resolving names and automatically assigning names to physical addresses, it is recommended that you manually add names for the physical address of intermediate link devices such as routers.
- *Append text:* Select this option and enter any text to append to the end of all names assigned by this function.
- *Enable passive name resolution:* When this check box is selected, the program examines all incoming packets found on the active adapter for symbolic names it can add to the Name Table. It adds these names according to the rules you set down in the *Name replacement options* section. You can:
  - Accept the default group *Passively Resolved Names*.

- Choose another Name Table group as the location in which to put all name and address pairs discovered by passive name resolution. This is particularly useful when much of the traffic from outside the local network uses symbolic names, as Web traffic does.

- *Remove unused names after...days:* Select this option to keep the Name Table from becoming overgrown with unnecessary data.

> **Tip** In some environments, large numbers of new names may be discovered each day through passive name resolution. If a name is encountered before its time is up, the clock for this item is restarted. In this way, you can ensure that all passively added names in the Name Table have been seen in network traffic at some time during, for example, the past two days.

# Loading and saving name table data

You can load and save the contents of the Name Table, allowing you to keep descriptions of different segments, or to simply store and retrieve different ways of looking at the same segment.

## Loading a previously saved name table

You can load the contents of previously built and saved Name Tables, including any Name Table files you may have created manually or exported using other LiveAction analyzers.

The program recognizes the following files as Name Tables: **.nam*, **.txt (tab delimited), and **.csv (comma delimited) files.

**To load the names from another Name Table into the current Name Table:**

1. On the **View** menu, click **Name Table**. The **Name Table** window appears.
2. Click **Import** or choose a previously used Name Table from the list beside **Import**.
3. Choose one of the following:
   - Click **Yes** in the dialog asking *Delete all entries before importing?* if you would like to replace the existing Name Table with the imported names.
   - Click **No** to add the imported names to the current Name Table.
4. Navigate to the location of the file you wish to load.
5. Choose this file and click **OK**.

> **Tip** You can also use drag and drop to add the contents of a saved Name Table file to the existing Name Table. Simply drag the Name Table file onto the open **Name Table** window.

## Saving the name table

You can save all or a selected subset of the Omnipeek Name Table to a new file. If you are managing several networks, it may be useful to build and store Name Tables for each of the networks you support.

**To save the entire contents of the current Name Table under a new name:**

1. On the **View** menu, click **Name Table**. The **Name Table** window appears.
2. Click **Export**.
3. Choose a location in which to save the file.
4. Click **OK**.

**Tip** You can also save selected names from the Name Table. Group folder information is preserved when exporting either individual entries or the entire Name Table.

**To save selected names from the current Name Table into a new Name Table file:**

1. On the **View** menu, click **Name Table**. The **Name Table** window appears.
2. Select the entries you wish to export.

**Tip** You can use **Ctrl + click** and **Shift + click** to highlight multiple entries.

3. Right-click and choose **Export Selected...**.
4. Choose a location in which to save the file.
5. Click **OK**.

# Using the Capture Engine trust table

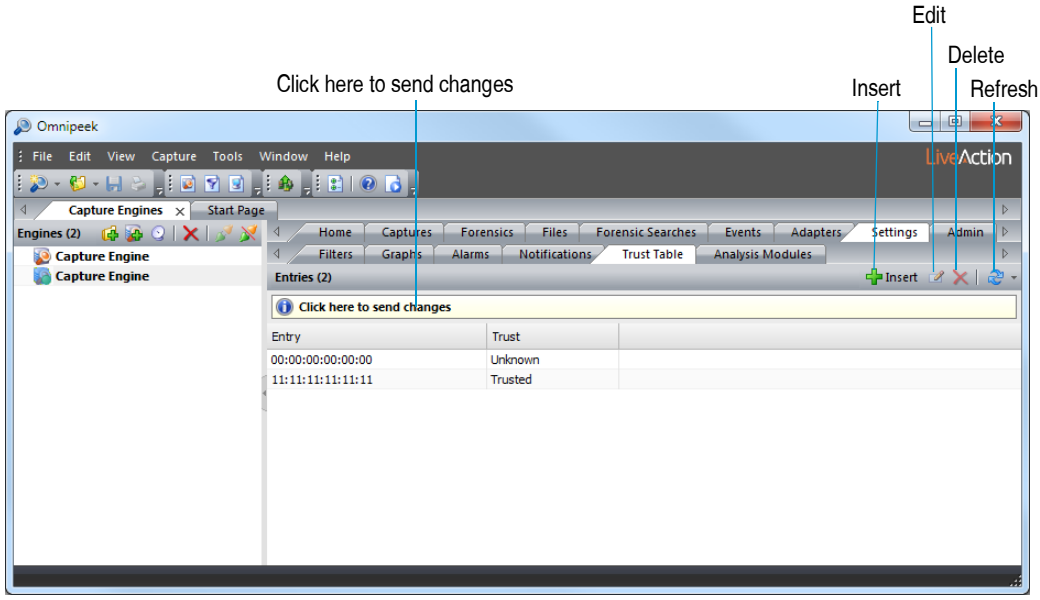
In the **Capture Engines** window, the **Trust Table** tab of a Capture Engine allows you to associate physical addresses with a trust value. See *Trusted, known, and unknown nodes* on page 280.

**Note** The **Trust Table** tab is not supported on Capture Engine for Omnipeek (Linux).

Capture Engine uses the *Trust* information from the Trust Table in the **Expert**, **WLAN**, and **Summary** statistics views. You can also set alarms and send notifications based on Trust.

## Capture Engine trust table tab

Select the *Trust Table* tab for a connected Capture Engine in the **Capture Engines** window.




The *Trust Table* tab allows you to associate 802.11 WLAN addresses with a trust value: *Trusted*, *Known*, or *Unknown*. These values are used by the **WLAN** and **Summary** views of a Capture Engine capture window.

The parts of the *Trust Table* tab are identified below.

- *Insert:* Click to open the **Insert** dialog, where you can enter the physical address (MAC address) of the entry and choose one of the three Trust values for this node.

  - *Trusted:* Can be assigned to the devices on your own network.
  - *Known:* Lets you identify familiar sources that are beyond your own control, such as an access point in a neighboring office.
  - *Unknown:* The default value, assumed for any node not listed in the Trust Table.
- *Edit:* Click to edit the selected entry.
- *Delete:* Click to delete the selected entry.
- Refresh: Click to update your view of the remote Trust Table with the most recent changes.
- *Click here to send changes:* Click to send your changes to the Capture Engine.

**Note** Making changes to the trust values of entries on a Capture Engine is a two step process: first make the changes in the **Insert** dialog, then send the changes to the Capture Engine.

## Capture Engine name resolution

When a Capture Engine capture window is open, entries in the Omnipeek Name Table can be applied to the display of information in that window. You can also use the name resolution features in Omnipeek for logical and physical addresses in Capture Engine. See*Omnipeek name resolution* on page 280.

**Important!** The **Expert**, **WLAN**, and **Summary** views of a Capture Engine capture window use the values found in the Trust Table of the Capture Engine on which they are running, not the trust values displayed in the Omnipeek Name Table.

CHAPTER 18

# Viewing Logs and Events

## In this chapter:

# About logs and events

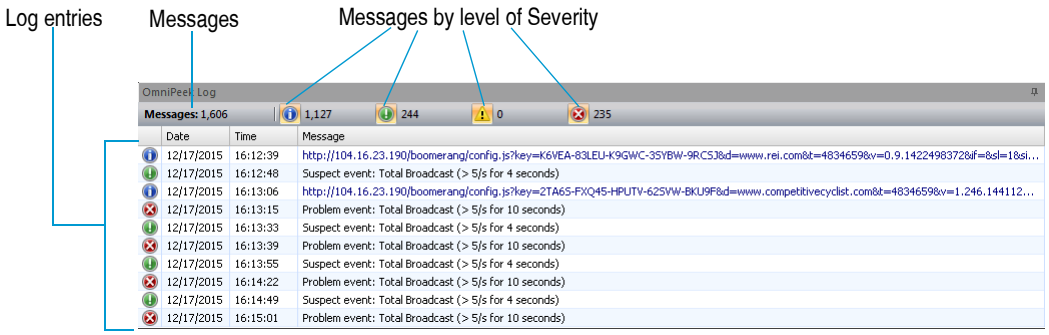
Logs typically record program processes and system level events, such as program start and stop, new captures started, etc. Events are specific to a capture window and typically record analytic results, such as Expert, notifications, and HTTP events.

Omnipeek has a global log for the program as a whole, as well as individual event views for each Omnipeek capture. See *Omnipeek global log* on page 286 and *Omnipeek capture events* on page 288.

Capture Engines have a global and audit log for each Capture Engine, as well as individual event views for each Capture Engine capture. See *Capture Engine global events* on page 287, *Capture Engine audit log* on page 291, and *Capture Engine capture events* on page 289.

# Omnipeek global log

To view the Omnipeek global log, on the **View** menu, click **Log Window**. The **Omnipeek Log** window appears at the bottom of the main window.




The parts of the **Omnipeek Log** window are identified below:

- *Events:* Displays the total number of events in the log.
- *Events by level of Severity*: Shows total number of events by each level of severity. You can toggle between hiding and showing the notifications of any level of severity by clicking the severity icon.
- *Event entries:* Each log entry displays a severity of notification icon and the *Date*, *Time*, and *Message*.
- Right-click the log for the following options:
  - *Save Log...:* Saves the log as a text file (tab-delimited or comma separated values).
  - *Print Log...:* Prints the log to a printer. To alter default print settings, choose **Print Setup...** from the **File** menu.
  - *Copy:* Copies selected lines from the log to the clipboard as tab-delimited text.
  - *Copy Hyperlink*: Copies selected hyperlinks from the log to the clipboard.
  - *Open Hyperlink*: Opens selected hyperlinks from the log into your browser.
  - *Clear Log*: Clears or empties the log.
  - *Maximum Log File Size...:* Opens a dialog in which you can change the maximum size for the Log file, in kilobytes (the default is 4MB). When the limit is reached, the log will delete older entries to make room for newer entries.
  - *Auto Scroll:* Toggles the Auto Scroll feature of the log.

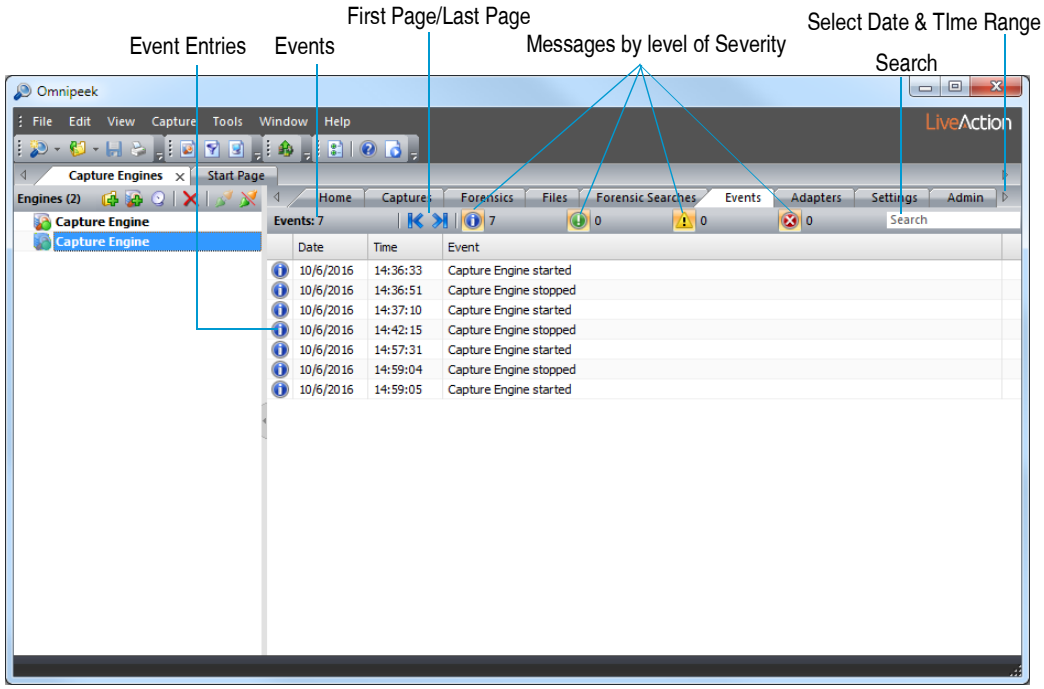
**Tip** The Web Analysis Module writes URLs it discovers in network traffic to the log. You can access that Internet resource by double-clicking on the URL directly in the **Log** window. This launches your default Internet browser and opens the selected URL.

You can float the Log window inside of the main window by dragging the *Omnipeek Log* title to

the main window. Double-click the *Omnipeek Log* title to dock the log back to the bottom of the main window.

# Capture Engine global events

To view the Capture Engine global events, select the **Events** tab in the **Capture Engines** window of a connected Capture Engine.




The parts of the Capture Engines **Events** tab are identified below:

- *Events*: Displays the total number of events.
- *First Page/Last Page*: Allows you to quickly go to the first or last page of the events.
- *Messages by level of Severity*: Displays the total number of events by each level of severity.

**Tip** You can toggle between hiding and showing the notifications of any level of severity by clicking the severity icon at the top of the window.

- *Search*: Allows you to search text displayed in the *Event* column. Separate multiple search terms with a white space, or the 'AND,' 'OR,' or 'NOT' (capitalized) operators. A white space is treated like the 'AND' operator.
- *Select Date & Time Range:* Allows you to search the events by date and time. You can specify both the start and end date and time. The clock icon is highlighted when a date and time range filter is in use. Click the clock icon again to remove the filter. When in use, mouse over the clock icon to display a tooltip of the date/time range filter.
- *Event entries:* Each entry displays a severity of notification icon and the *Date*, *Time*, and *Event*.
- Right-click the events for the following options:
  - *Select Related Packets:* Copies selected lines from the log to the clipboard as tab-delimited text.
  - *Copy:* Copies selected events to the clipboard as tab-delimited text.
  - *Copy Hyperlink*: Copies selected hyperlinks to the clipboard.
  - *Open Hyperlink*: Opens selected hyperlinks into tabs in your browser.

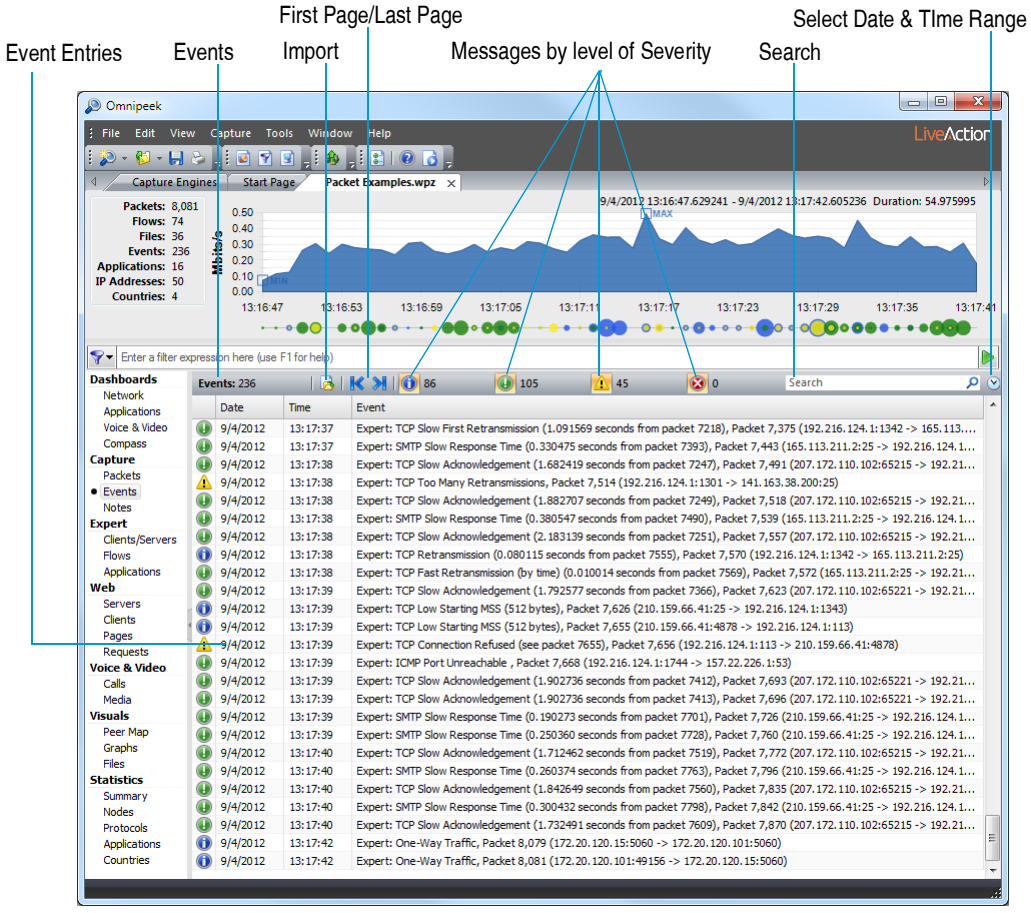
- *Clear Events*: Clears the contents of the **Events** tab.
- *Global Events Only*: Toggles between showing global events only or all events. The global events are those relating solely to a Capture Engine itself, such as start and stop events.
- *Highlight Search Terms*: Highlights the search terms found in the **Events** tab.

**Note** The Expert Event log for each Capture Engine capture window is a separate entity. All other log entries on a single Capture Engine are stored in a single database. When the database becomes full, old entries are deleted to make room for newer entries.

# Omnipeek capture events

To view the Omnipeek capture window events, select the **Events** view in the capture window.

**Note** The **Events** view of a capture window has a limit defined in terms of number of events allowed. You can select or enter the maximum (Max) number of log messages allowed in the log, and then select or enter the number (Adjust) of log messages to delete once the number of log messages reaches the maximum. The oldest messages are deleted first. To change the default log size in new capture windows, on the **Tools** menu, click **Options**.... The **Options** dialog appears. See *Configuring the Options dialog* on page 298.




The parts of the **Events** view of an Omnipeek capture window are identified below:

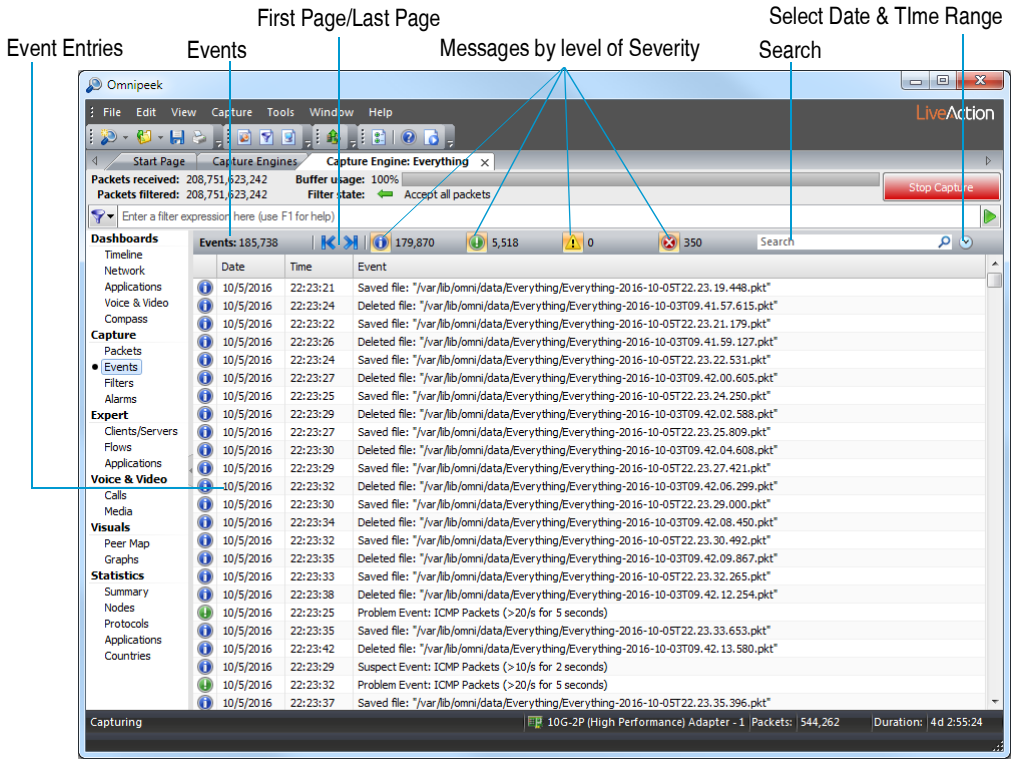
- *Events*: Displays the total number of events.
- *Import*: Allows you to import events from supported files. Typically, this is most often used for importing security events from a supported IDS/IPS, such as Snort® or Suricata.

**Note** To import an events file from Snort or Suricata, you must first save the events from Snort as a Snort Fast log file, and save the events from Suricata as an EVE JSON file. The events in the events file must correspond to packets contained within the capture file.

- *First Page/Last Page*: Allows you to quickly go to the first or last page of the events.
- *Messages by level of Severity*: Displays the total number of events by each level of severity.
- *Search*: Allows you to search text displayed in the *Event* column. Separate multiple search terms with a white space, or the 'AND,' 'OR,' or 'NOT' (capitalized) operators. A white space is treated like the 'AND' operator.
- *Select Date & Time Range:* Allows you to search the events by date and time. You can specify both the start and end date and time. The clock icon is highlighted when a date and time range filter is in use. Click the clock icon again to remove the filter. When in use, mouse over the clock icon to display a tooltip of the date/time range filter.
- *Event entries:* Each event entry displays a severity of notification icon and the *Date*, *Time*, and *Event*.
- Right-click the log for the following options:
  - *Select Related Packets:* Displays the **Selection Results** dialog. Click **Highlight selected packets**, **Hide selected packets**, **Hide unselected packets**, **Copy selected packets to new window**, or **Label selected packets**. For more information, see *Hiding and unhiding packets* on page 114 and *Selecting related packets* on page 115.
  - *Copy:* Copies selected events to the clipboard as tab-delimited text.
  - *Copy Hyperlink*: Copies selected hyperlinks to the clipboard.
  - *Open Hyperlink*: Opens selected hyperlinks into tabs in your browser.
  - *Clear Events*: Lets you clear the contents of the log.
  - *Auto Scroll:* Toggles the Auto Scroll feature of the log.
  - *Highlight Search Terms*: Lets you highlight search terms found in the log.

# Capture Engine capture events

To view the Capture Engine capture events, select the **Events** view in the Capture Engine capture window.




The parts of the **Events** view of a Capture Engine capture window are identified below:

- *Events*: Displays the total number of events.
- *First Page/Last Page*: Allows you to quickly go to the first or last page of events.
- *Messages by level of Severity*: Displays total number of events by each level of severity.

**Note** Entries to the **Event** view of a Capture Engine capture window are also written to the **Events** tab of a Capture Engine, unless *Global Events Only* is selected from the context menu. See *Capture Engine global events* on page 287.

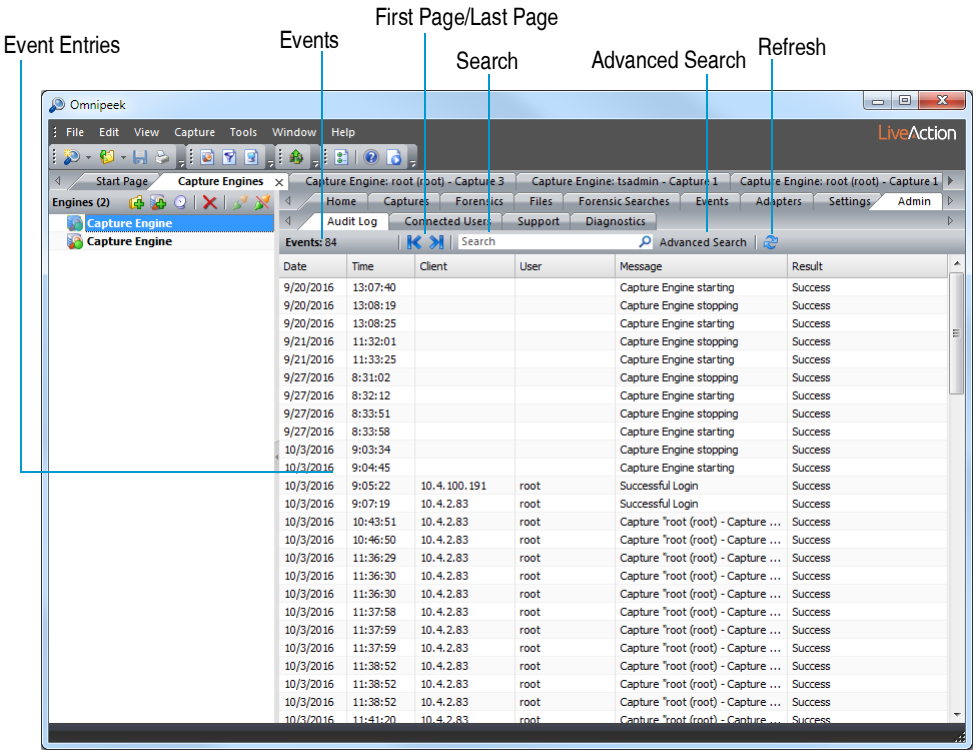
- *Search*: Allows you to search text displayed in the *Event* column. Separate multiple search terms with a white space, or the 'AND,' 'OR,' or 'NOT' (capitalized) operators. A white space is treated like the 'AND' operator.
- *Select Date & Time Range:* Allows you to search events by date and time. You can specify both the start and end date and time. The clock icon is highlighted when a date and time range filter is in use. Click the clock icon again to remove the filter. When in use, mouse over the clock icon to display a tooltip of the date/time range filter.
- *Event entries:* Each event entry displays a severity of notification icon and the *Date*, *Time*, and *Message*.
- Right-click the events for the following options:
  - *Select Related Packets:* Displays the **Selection Results** dialog. Click **Highlight selected packets**, **Hide selected packets**, **Hide unselected packets**, **Copy selected packets to new window**, or **Label selected packets**. For more information, see *Hiding and unhiding packets* on page 114 and *Selecting related packets* on page 115.
  - *Copy:* Copies selected lines from the log to the clipboard as tab-delimited text.
  - *Copy Hyperlink*: Copies selected hyperlinks from the log to the clipboard.
  - *Open Hyperlink*: Opens selected hyperlinks from the log into your browser.
  - *Clear Events*: Clears the contents of the **Events** view.

- *Global Messages Only*: Lets you toggle between showing global events only or all events. The global events are those relating solely to a capture window, such as start and stop events.
- *Highlight Search Terms*: Lets you highlight search terms found in the **Events** view.

# Capture Engine audit log

The Capture Engine audit log lists available information regarding events taking place on the Capture Engine. You can search the log, clear the log, and refresh the log.

To view the Capture Engine audit log, select the *Admin* tab for a connected Capture Engine in the **Capture Engines** window, and then select the *Audit Log* tab.




The parts of the *Audit Log* are identified below:

- *Events*: Displays the total number of events.
- *Event entries:* Each event entry displays the *Date*, *Time*, *Client*, *User*, *Message*, and *Result*.
- *First Page/Last Page*: Allows you to quickly go to the first or last page of events.
- *Search*: Allows you to search text displayed in the *Message* column of the log. Separate multiple search terms with a white space, or the 'AND,' 'OR,' or 'NOT' (capitalized) operators. A white space is treated like the 'AND' operator.
- *Advanced Search*: Click to display a dialog that allows you to perform an advanced search by *Message*, *Clients*, *Users*, and *Time Range*.
- *Refresh*: Click to update the audit log.
- Right-click the log for the following options:
  - *Save Audit Log...:* Saves the log as a text file (tab-delimited or comma separated values).
  - *Copy:* Copies selected rows to the clipboard as tab-delimited text.
  - *Clear Log*: Deletes the contents of the log.
  - *Highlight Search Terms*: Highlights search terms found in the log.
  - *Highlight Failures*: Highlights any 'failures' found in the log.

CHAPTER 19

# Applying Analysis Modules

## In this chapter:

# About analysis modules

Analysis Modules are external plug-ins that provide additional highly focused analysis features to the program. An Analysis Module tests network traffic and provides detailed summaries and counts of key parameters, posting its results to the **Summary Statistics** windows and to the Summary column of the **Packets** view of capture windows.

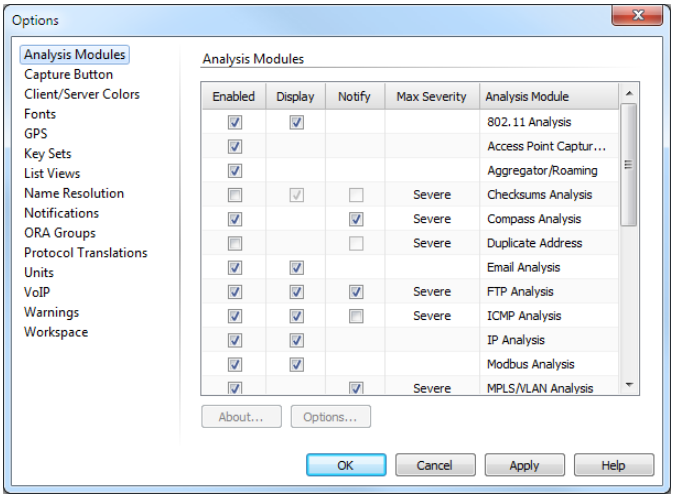
Enabled Analysis Modules are applied to traffic captured in real time and to packets in the buffer of a capture window. You can enable and disable Analysis Modules in Omnipeek individually. In addition, many Analysis Modules have user-configurable options, which can be used to further refine the data you collect about your network.

The Analysis Modules shipped with Omnipeek cover a wide range of the most common protocols and network applications. An SDK is available for users to write their own Analysis Modules to report on proprietary protocols or applications, or to present statistics of interest in a particular environment. Visit *https://www.liveaction.com/support/frequently-asked-questions/* for more information.

**Note** Capture Engines with Analysis Modules use a subset of the Analysis Modules available in Omnipeek. For a complete list, see *Capture Engine analysis modules* on page 295.

# Enabling and configuring analysis modules

To open the *Analysis Modules* options, on the **Tools** menu, click **Options...**.




Click *Analysis Modules* in the navigation pane to view a list of available Analysis Modules.

The parts of the *Analysis Modules* options are identified below.

- *Enabled:* Select or clear the check box beside its name to enable or disable the Analysis Module.
- *Display:* Select the check box beside its name to allow the Analysis Module to write details about the packet to the Summary column in the **Packets** view of any capture window.
- *Notify:* Select the check box beside its name to tell the Analysis Module to send notifications when it detects certain events. For more on associating notifications with actions, see Chapter 16, *Sending Notifications*.
- *Max severity:* This column allows you to set an upper limit for the severity of the notifications coming from each particular Analysis Module. Each Analysis Module assigns its own level of severity to each type of event it is able to detect. It tries to assign that pre-determined severity to any notification of that event. For example, if you enable notification for an Analysis Module and set the maximum severity to *Minor* and the Analysis Module then tries to send notifications of *Severe*, *Major*, or *Minor* severity; they will all be treated as *Minor*.

- *Options...:* Click to open an Options dialog for the selected Analysis Module. *Options* is unavailable if the selected Analysis Module does not have user-configurable options.

  Alternatively, double-click the Analysis Module to open its corresponding Options dialog.
- *About...:* Click to display an About Box for the selected Analysis Module.

## Apply analysis module command

Analysis Modules are usually applied to packets as they arrive in the buffer from the network, or as they are loaded from a file. Analysis Modules are also re-applied each time the contents of the buffer is changed by hiding or unhiding packets.

**To apply the IP Analysis Module to selected packets in a Packet List:**

1. Select the packet(s) to which you would like to apply the IP Analysis Module.
2. Right-click, choose the **Apply Analysis Module** command and select **IP Analysis** from the submenu.

   This applies the IP Analysis Module to the selected packet(s) and allows the Analysis Module to write to the Summary column.

   A message dialog appears showing the number of your selected packets which were processed by the Analysis Module you applied. If the dialog shows less than the total number (for example *2 of 3 packets applied*), it means that the Analysis Module you applied did not find the relevant information.
3. Click **OK** to close the message dialog.

## Using analysis modules

Analysis Modules process packets each time the packets are loaded into a buffer. This means the same Analysis Module may process the same packet several times, but with the results posted to different places in Omnipeek, depending on which buffer is involved.

Omnipeek maintains separate buffers for individual capture windows or files.

**Important!** Analysis Modules that are enabled in the **Analysis Modules** view of the **Options** dialog can be disabled in the **Analysis Options** view of the **Capture Options** dialog for optimizing performance in individual cases. However, an Analysis Module cannot be enabled in the **Analysis Options** view that has been disabled in the **Analysis Modules** view of the **Options** dialog.

# Installed analysis modules

For full descriptions and instructions for applying each Analysis Module, see Appendix D, *Analysis Modules*.

## Capture Engine analysis modules

Analysis Modules operating on Capture Engine captures are enabled and disabled in the **Analysis Options** view of the Capture Engine **Capture Options** dialog. The following Analysis Modules are available in Capture Engines:

- 802.11 Analysis
- Email Analysis
- FTP Analysis
- ICMP Analysis
- IP Analysis
- MPLS/VLAN Analysis
- NCP Analysis

- QoS Analysis
- RADIUS Analysis
- SCTP Analysis
- SMB Analysis
- SQL Analysis
- SUM Analysis
- Telnet Analysis
- VoIP Analysis
- Web Analysis

CHAPTER 20

# Configuring Options

## In this chapter:

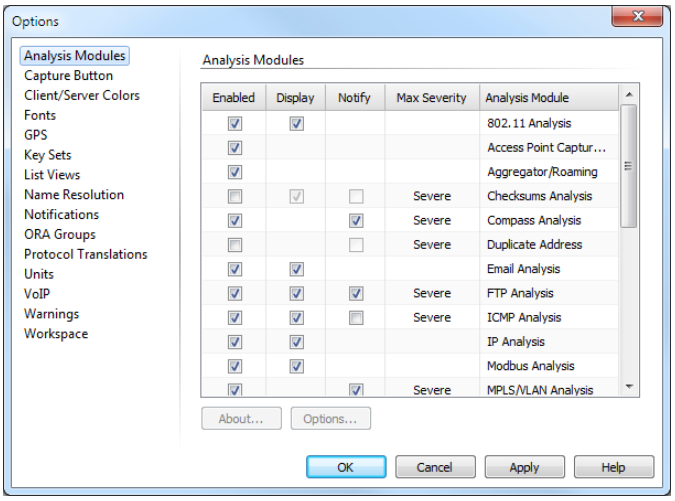
# Configuring the Options dialog

Many features in Omnipeek are configured in the **Options** dialog.

> **Note** Click **Help** in each of these views to learn more about specific options and settings.

**To open the Options dialog:**

- On the **Tools** menu, click **Options**....




You can configure the following from the Options dialog:

- *Analysis Modules:* These options let you configure the Analysis Modules. Analysis Modules process packets each time they are loaded into a buffer for capture windows. See *Enabling and configuring analysis modules* on page 294.
- *Capture Button:* These options let you configure color and flash settings for the **Start Capture**, **Stop Capture**, and **Start/Stop/Abort Trigger** buttons in a capture window.
- *Client/Server Colors:* These options let you control the color display of clients and servers in **Expert** and **Web** views. See *Setting client/server colors* on page 150.
- *Fonts:* These options let you set the font, style, and size of the text used throughout the application.
- *GPS:* These options let you enable and configure the GPS (Global Positioning System) feature. GPS allows you to analyze data provided by a separately purchased GPS receiver. See Chapter 24, *Global Positioning System*.
- *Key Sets:* These options let you create and edit Key Sets used for 802.11 security. See *Configuring wireless channels and encryption* on page 303.
- *List Views:* These options let you set the background color and how vertical and horizontal lines appear whenever a list view is displayed.
- *Matrix Switches:* These options let you control Datacom and/or Net Optics matrix switches that are installed and connected.
- *Name Resolution:* These options let you control how name and address substitutions are handled in the Name Table. See *Omnipeek name resolution* on page 280.
- *Notifications:* These options let you configure Notifications. Notifications are messages sent from triggers, alarms, Analysis Modules and other parts of the program to announce and describe the occurrence of specified events. See *Configuring notifications* on page 272.
- *ORA Groups:* These options let you manage Omnipeek Remote Assistant files between computers. See Chapter 23, *Omnipeek Remote Assistant*.

- *Protocol Translations*: These options lets you manage protocol translations defined locally on Omnipeek. You can create, edit, duplicate, and delete protocol translations. See *Protocol translations* on page 225.
- *Units:* These options let you set the units for time and throughput in the **Expert** and **Flow Visualizer** views. See *Setting units for time and throughput* on page 150.
- *VoIP:* These options let you specify a geographical region and VoIP emulation model to use when calculating VoIP quality scores. See *Setting VoIP options* on page 215.
- *Warnings:* These options let you control the behavior of automatic warning dialogs that appear in the application.
- *Workspace:* These options let you set the default behavior for scrolling, saving, and restoring windows.

# Configuring display format options

You can configure how certain information is displayed in various lists, such as the *Nodes* view, Packet List pane, and the **Node Statistics** window.

The **Display Format** submenu (on the **View** menu, click **Display Format**) has the following options:

- *Show Address Names:* Enable this option to display a node's name from the Name Table (if any) instead of its address whenever packets are encountered to or from the node.
- *Show Port Names:* Enable this option to display a port's name from the Name Table (if any) instead of its address whenever packets are encountered to or from the port.
- *Logical Address:* Enable this option to display logical addresses instead of physical addresses, wherever logical addresses are available.
- *Physical Address:* Enable this option to display physical addresses instead of logical addresses, wherever physical addresses are available.
- *Local Time:* Enable this option to show all timestamps adjusted for local time settings (such as time zone and Daylight Savings Time) on the local computer. When disabled, all timestamps are displayed in UTC (Coordinated Universal Time).

# Configuring color options

You can configure how colors already assigned in other dialogs will be used in displaying packets. There are four sources of color assignments for elements of network traffic:

- The **Flags** view of the **Packet List Options** dialog (available by left-clicking anywhere in the Packet List pane headers) determines the color associated with error or trigger packets. You can also assign a color to 802.11 WLAN management packets and control packets, as well as to encrypted packets and/or to packets with decryption errors.
- The **Edit Name** dialog in the **Name Table** can set the color for packets associated with a particular address (node), port, or protocol.
- ProtoSpecs assigns colors to all the protocols it can identify. ProtoSpecs color choices cannot be overridden.
- The **Insert Filter** or **Edit Filter** dialog can set the color for any filter you create or edit.

The **Color** submenu (on the **View** menu, click **Color**) has the following options:

- *Source:* Shows packets destined for a particular node in the color assigned to that node in the Name Table.
- *Destination:* Shows packets destined for a particular node in the color assigned to that node in the Name Table.

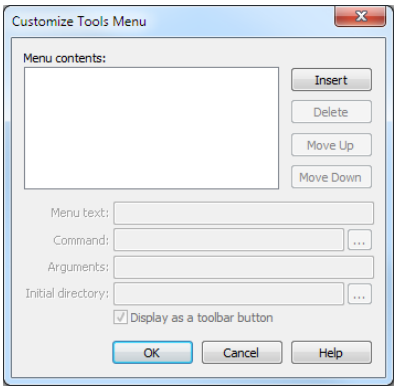
- *Protocol:* Shows packets in the color assigned to protocols by ProtoSpecs. If ProtoSpecs can identify the protocol *and* the protocol is listed in the Name Table and has a color assigned there, then the color assigned in the Name Table will be used.
- *Filter:* Shows packets that are captured through a filter in the color assigned to that filter in the **Edit Filter** dialog.
- *Flag:* Shows packets that have been flagged in the color assigned to trigger, error, and other flagged packet types in the **Packet List Options** dialog.
- *Independent:* Shows each of the above items in its own assigned color.
- *No Color:* Turns off all color coding.

# Customizing the tools menu

You can add other LiveAction programs to the **Tools** menu, allowing you to start these programs from within Omnipeek.

**To add a program to the Tools menu:**

1. On the **Tools** menu, click **Customize...**. The **Customize Tools Menu** dialog appears.




2. Click **Insert**.
3. Type the *Menu text* to set the name of the tool as it will appear in the **Tools** menu.
4. Type or browse to the location of the tool in the *Command* field.

> **Tip** You can also enter any *Arguments* for the program and set its initial directory by typing the path or clicking the **...** (ellipsis) to navigate to its location.

5. Click **OK** to accept your changes.

# Optimizing capture performance

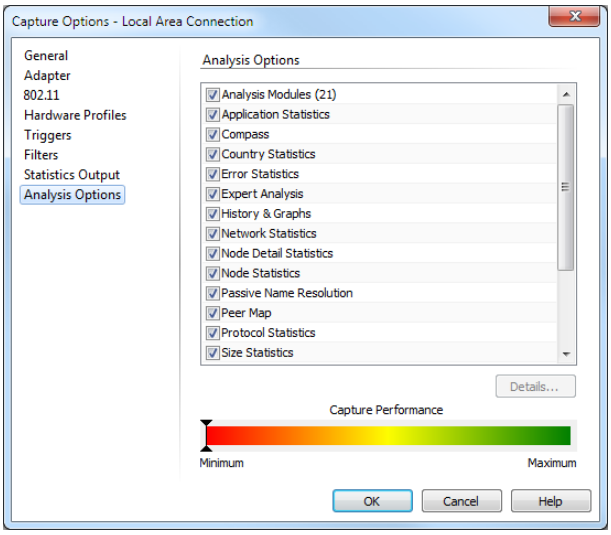
You can increase capture performance by selectively disabling certain analysis options and subsequently freeing up system resources. The **Analysis Options** of the **Capture Options** dialog lets you enable or disable various options for the currently selected capture.

**To enhance capture performance:**

1. Do any of the following to open the **Capture Options** dialog:
   - On the **Capture** menu, click **Start Capture**
   - On the Start page, click **New Capture**

**Note** For a Capture Engine, open the **Capture Engines** window, click the **Captures** tab, and then either create a new capture window or click **Capture Options** for an existing capture to open the **Capture Options** dialog.

2. Click the **Analysis Options** view.




3. Select the various options that you want enabled.

   The colored bar at the bottom displays the relative capture performance achieved as you enable or disable options. Disabling options will move the indicator to the right (maximum performance), while enabling functions will move the indicator to the left (minimum performance).

4. Click **OK**.

**Note** You can highlight the *Analysis Modules* (Omnipeek console only), *Node Statistics*, *Node/Protocol Detail Statistics*, *Protocol Statistics*, and *Voice & Video Analysis* options and then click **Details** to display additional options for controlling the use of resources by these options. Click **Help** on the dialogs that appear for information on the available options and settings.

CHAPTER 21

# Capturing Data for Wireless Analysis

## In this chapter:

# About 802.11

You can use Omnipeek and the Windows Capture Engine to capture and monitor 802.11 WLAN traffic on your network. A supported wireless adapter must be selected as the capture or monitor adapter, and the adapter must have the appropriate LiveAction wireless driver installed. Check the Readme in the driver folder (for example, *C:\Program Files\LiveAction\Omnipeek\Driver*) for installation instructions. You can also download the appropriate drivers from *https://www.liveaction.com/support/frequently-asked-questions/*. See also *System requirements* on page 4 and *Supported adapters* on page 4 for additional information on wireless adapters and driver requirements.

**Important!** Changes made to the settings of a particular adapter are applied whenever that adapter is selected as the capture or monitor adapter. Changes made to the channel value for an adapter being used in multiple captures are globally applied to all captures.

# Configuring wireless channels and encryption

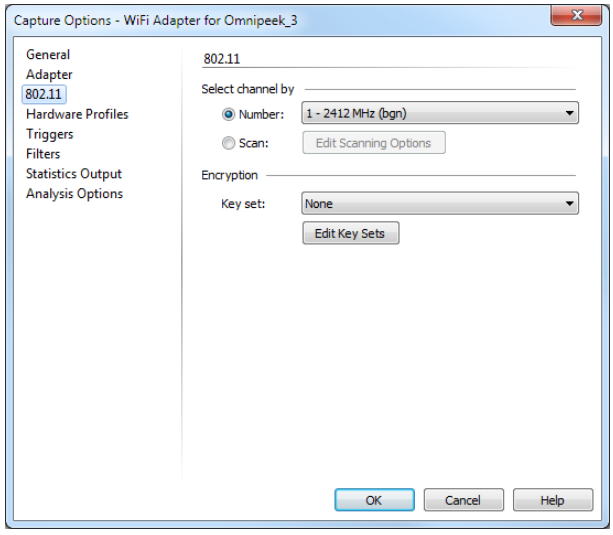
When a wireless adapter is selected as the capture or monitor adapter, you can specify the channel settings used by the adapter to listen for traffic on your 802.11 WLAN. You can choose to listen for traffic occurring on a specific channel, or scan a range of channels. Additionally, if WEP, WPA (using a pre-shared key), or WPA2 (using a pre-shared key) encryption is enabled on your network, you can define or select key sets used to decrypt the WEP, WPA, or WPA2 encryption.

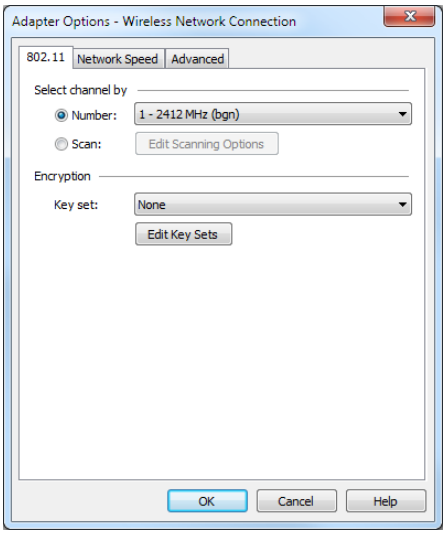
**To configure wireless channels and encryption:**

1. Open the **Capture Options** dialog.

**Note** For a Capture Engine, you will need to open the *802.11* tab of the **Adapter Options** dialog. To open the **Adapter Options** dialog, click the *Adapters* tab in the **Capture Engines** window and then click *Options* for the selected wireless adapter.

2. Select the *802.11* options (or *802.11* tab).






3. Select the option for selecting channels:
   - *Number:* Select this option to specify a specific channel, and then select the channel from the list.
   - *Scan:* Select this option to scan for traffic on multiple channels. You will need to click *Edit Scanning Options* to select the channels. See *Edit scanning options* below.
4. If WEP, WPA, or WPA2 encryption is enabled on your network, select the key set used to decrypt the WEP, WPA, or WPA2 encryption. See *Edit key sets* on page 305 to define or edit key sets.

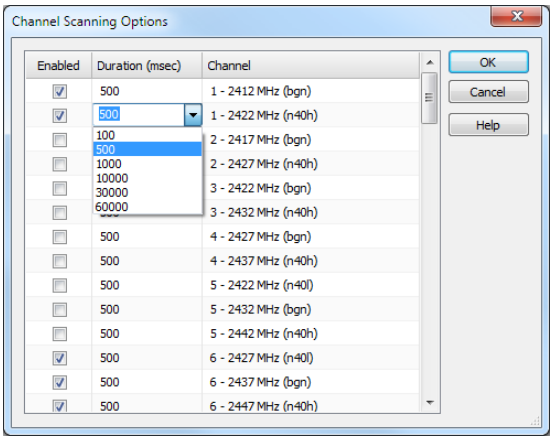
## Edit scanning options

From the *802.11* options in the **Capture Options** dialog, you can specify and configure channels to scan. Scanning multiple channels can be invaluable when troubleshooting interference or optimizing the location and channel choice for new access points. Channel scanning is often used in conjunction with the WLAN, Channel, and Signal statistics.

**Note** If WPA/WPA2 decryption using a pre-shared key is enabled on your network, we recommend not enabling the *Edit Scanning* option in order to make sure that all packets required for decryption are captured. A four-way (WPA2) or six-way (WPA) handshake authentication establishes the PTK (Pairwise Transient Key) and GTK (Group Transient Key) used for decryption. All of the EAPOL key exchanges must be captured to derive the PTK and GTK.

**To select channels to scan:**

1. Open the **Capture Options** dialog.
2. Select the *802.11* options.
3. Select the *Scan* option and then click **Edit Scanning Options**. The **Channel Scanning Options** dialog appears, listing the channels appropriate to the current adapter.




4. Select the check box of the channels you want to include in the scan. (Right-click inside the dialog to display options for enabling and disabling channels.)

> **Tip** Click a value in the *Duration* column to configure the amount of time you want Omnipeek to listen for traffic on the channel.

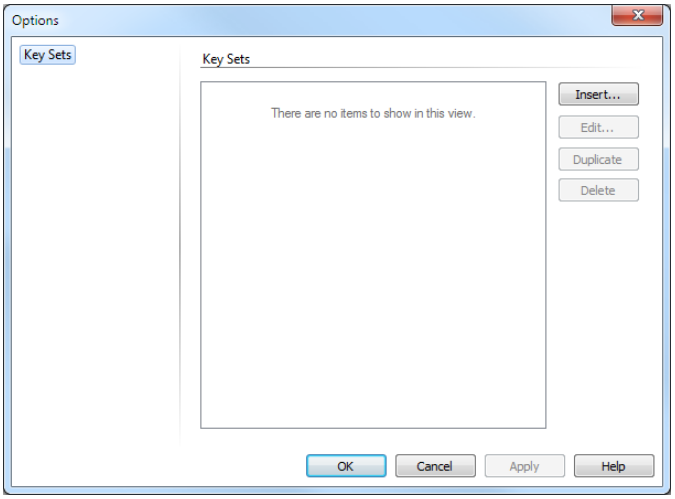
5. Click **OK**.

## Edit key sets

From the *802.11* options in the **Capture Options** dialog, you can define or edit key sets used to decrypt WEP, WPA, or WPA2 encryption. You must first display the **Key Sets** dialog in order to define or edit a key set.

**To display the Key Sets dialog:**

1. Open the **Capture Options** dialog.
2. Select the *802.11* options.
3. Click **Edit Key Sets**. The **Key Sets** dialog appears.

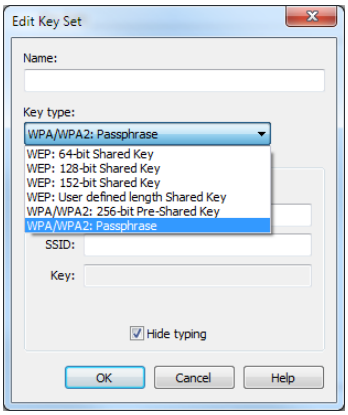



4. Click **Insert**, **Edit**, **Duplicate**, or **Delete** to insert, edit, duplicate, or delete a key set.

### *Defining a new key set*

**To define (insert) a new key set:**

1. From the **Key Sets** dialog, click **Insert**. The **Edit Key Set** dialog appears.




2. Enter the *Name* for the key set.
3. Select the key type from the list:
   - *WEP: 64-bit Shared Key:* The key that you enter must consist of 10 hexadecimal digits (0-9, A-F). You can define up to four keys.
   - *WEP: 128-bit Shared Key:* The key that you enter must consist of 26 hexadecimal digits (0-9, A-F). You can define up to four keys.
   - *WEP: 152-bit Shared Key:* The key that you enter must consist of 32 hexadecimal digits (0-9, A-F). You can define up to four keys.
   - *WEP: User defined length Shared Key:* The key that you enter can consist of an arbitrary length (0-9, A-F; up to 506 hex characters, or 253 bytes). You can define up to four keys.
   - *WPA/WPA2: 256-bit Pre-Shared Key:* The key that you enter must consist of 64 hexadecimal digits (0-9, A-F). Only one key can be defined.
   - *WPA/WPA2: Passphrase:* You must enter both the *Phrase* (the same passphrase used in configuring the access point for WPA/WPA2) and *SSID* (the name of the wireless network) to use in creating the pre-shared *Key* (which appears as the *Key*).

**Note** In all of these cases, the encryption algorithm adds an additional three bytes to the keys.

**Tip** You can clear the *Hide typing* check box to show the actual characters of the hex number used for the key set and passphrase contents. Selecting the *Hide typing* check box adds another level of security by replacing the actual characters on the screen with dots.

4. Enter the key set(s) or Passphrase for the key type you have selected.
5. Click **OK**.

For information on applying a key set to decrypt all or some of the WEP or WPA-encrypted packets directly from either the **Packets** view or packet decode window, see *Applying decryption in the Packets view* on page 80 or *Decoding packets* on page 84.

## *Editing a key set*

**To edit an existing key set:**

- From the **Key Sets** dialog, select a key set and click **Edit**. The **Edit Key Set** dialog appears. The steps to edit the key set are essentially the same as when you define the key set, as explained above.

### *Duplicating a key set*

**To duplicate an existing key set:**

1. From the **Key Sets** dialog, select a key set and click **Duplicate**. A copy of the key set is immediately added to the existing list.
2. You can edit the copy of the key set as explained above.

### *Deleting a key set*

**To delete an existing key set:**

1. From the **Key Sets** dialog, select a key set and click **Delete**.
2. Click **Yes** to delete the key set.

# Troubleshooting WLAN

To troubleshoot a WLAN, you must first capture the wireless data carrying the WLAN information. Capturing data for wireless analysis can be broken down into two main categories: portable and distributed. The type of data captured and retained varies depending on the intended use of the data.

## Portable analysis

Portable analysis requires that the analyst be present at the source of data collection with the appropriate hardware and software to perform the analysis. Portable analysis using Omnipeek is typically done with a laptop computer running Omnipeek, using one or more supported wireless adapters.

## Distributed analysis

Distributed analysis allows the analyst to collect data from remote locations and analyze the data locally. This eliminates costly visits to remote locations for portable analysis. Omnipeek supports two primary methods for distributed analysis.

### *Remote Adapters*

If you have an Aruba or Cisco access point, you can stream packets from one or more of those access points into a wireless capture window in Omnipeek. See *Capturing Packets from an Access Point Capture Adapter* on page 36.

### *Capture Engines*

Capture Engines provide data capture and analysis 24 hours a day without requiring ongoing monitoring by the analyst. Capture Engines are Windows software or Linux appliances (LiveCapture) that are designed for continuous, remote operation. For wireless analysis, supported wireless adapters need to be added to enable wireless capture. Capture Engines are controlled using Omnipeek as a console. See Chapter 2, *Using Capture Engines with Omnipeek*.

# Optimizing wireless analysis

Omnipeek is designed for a wide range of analysis tasks, but very often only a limited set of analysis options are pertinent to the task at hand. Here are some guidelines for configuring various analysis options to optimize performance for wireless analysis:

- **Analysis Options**: The analysis capabilities of Omnipeek are broken down into functional options. It is often the case that not all functional analysis options will be needed for the work being done. Turning off unnecessary analysis options will improve Omnipeek performance. To view and turn off unneeded analysis options when starting a new capture, see *Optimizing capture performance* on page 300.

**Note** If you later find that you need a certain analysis option that you disabled, and you saved the packet capture files, just enable the analysis option and open the packet file to see the newly enabled analysis results.

- **Expert Event Analysis**: In addition to functional analysis options, Omnipeek continually monitors the network for Expert events, network anomalies, and suboptimal performance at all layers of the network, from application to physical. It also shows network events associated with wireless-specific anomalies and VoIP calls. Each individual Expert event can be enabled or disabled separately. It is important to review the Expert events to ensure that events you want to analyze are enabled. Once a capture is started, choose any one of the Expert Views from the left-hand navigation of the main Capture Window, and then click **Expert EventFinder Settings**. The Expert EventFinder Settings dialog box appears, allowing each individual Expert event to be configured and enabled or disabled. Pay special attention to the VoIP and Wireless Expert Events, as these can be extremely useful in identifying VoWLAN issues before they become serious problems.
- **Multichannel Analysis**: Multichannel analysis allows multiple, simultaneous captures on unique wireless channels with all captured packets analyzed as if it is a single capture. This is extremely useful for analyzing situations where users are roaming from channel to channel, or when it is known where a problem is but not what channel the wireless client is using. See *Capturing Packets from an Aggregator/Roaming Adapter* on page 36.
- **Roaming**: Roaming latency analysis provides detailed information every time a wireless client moves from one AP to another. Roaming latency analysis requires multichannel analysis since roaming typically involves a change in channel. See *Roaming latency analysis* on page 308.

**Note** Roaming assumes wireless clients are moving from one channel to another channel. This can be on the same AP, or across different APs. If the capture is scanning, roaming will be detected and reported but the latency measurements may not be accurate. For best results, roaming should be used along with the Wireless Channel Aggregator, or aggregation using an AP remote adapter. See *Capturing Packets from an Aggregator/Roaming Adapter* on page 36.

- **The VoIP Dashboard**: The Voice & Video dashboard provides a visual summary of voice and video calls, including VoWLAN calls, as well as useful graphs and statistics to troubleshoot and analyze voice and video traffic. See *Voice & Video dashboard* on page 63.
- **Voice & Video Views**: The Voice & Video views in capture windows provide simultaneous analysis of voice and video traffic, including VoWLAN calls, with subjective and objective quality metrics. The Calls view displays one row for each call in a capture. and the Media view displays one row for each RTP media flow in a call. See *Voice & Video view window* on page 200.

# Roaming latency analysis

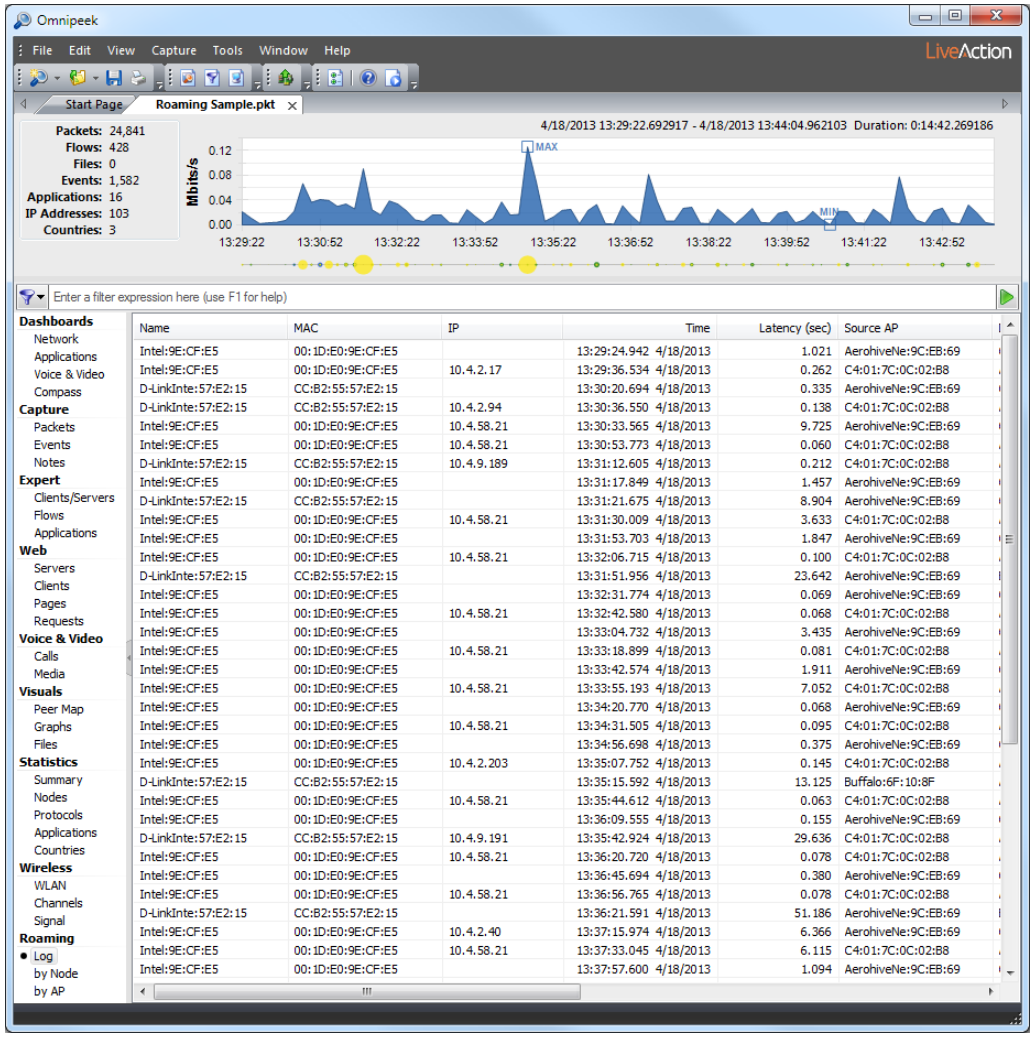
Roaming latency is the amount of time it takes for a wireless client to move from one access point to another. You can use Omnipeek to perform roaming latency analysis by measuring the amount of time between the last known data packet for a device on one access point, and the first data packet seen for that device on another access point. This is extremely useful in determining whether latency is caused by devices on the network, applications on the network, or the network itself.

Roaming latency analysis requires multichannel analysis since roaming typically involves a change in one or more channels. See *Capturing Packets from an Aggregator/Roaming Adapter* on page 36. Once you have started capturing from one or more of the wireless adapters, you can see the roaming latency data displayed in the three **Roaming** views: **Log**, **by Node**, and **by AP**.

**Tip** Double-click an entry inside each of the **Roaming** views to filter and view the packets associated with that entry.

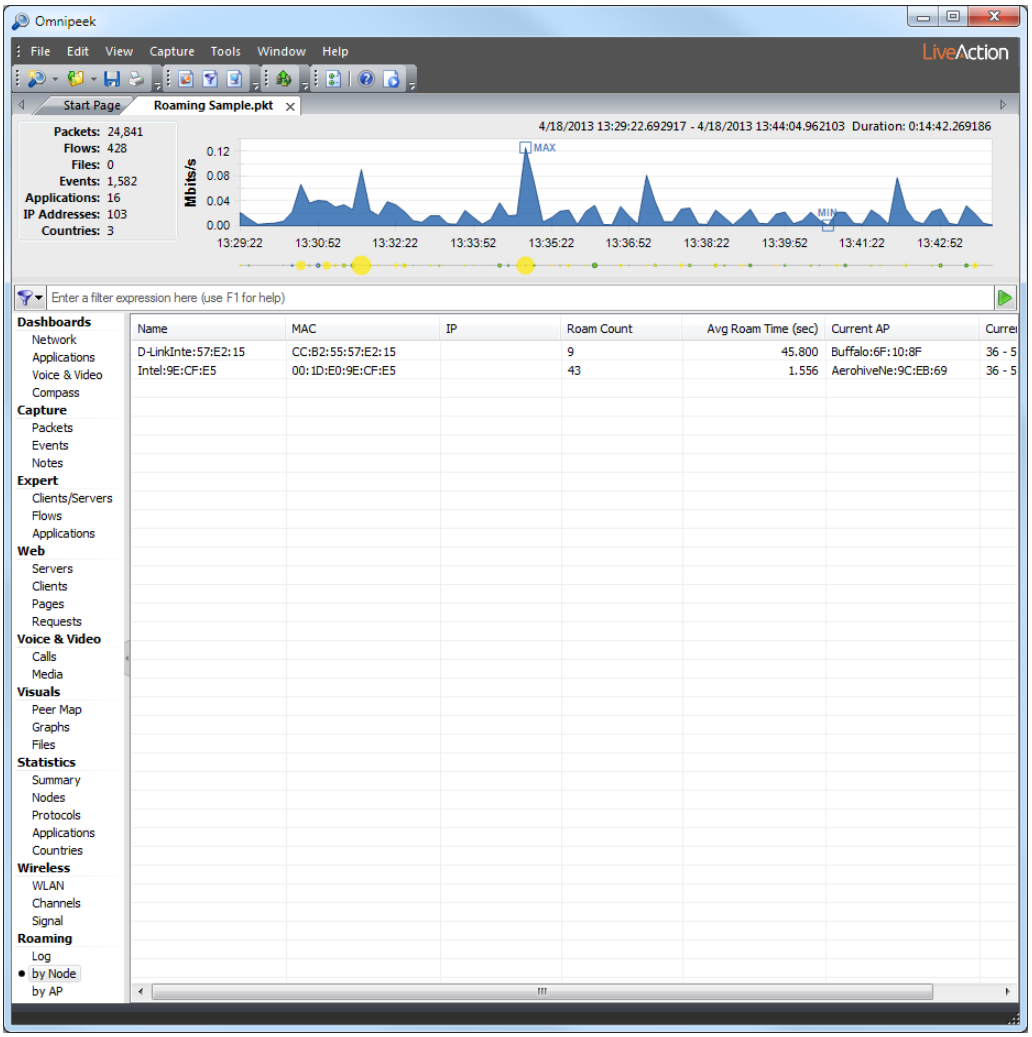
# Log

The **Log** view displays a log entry each time a roaming device is detected.



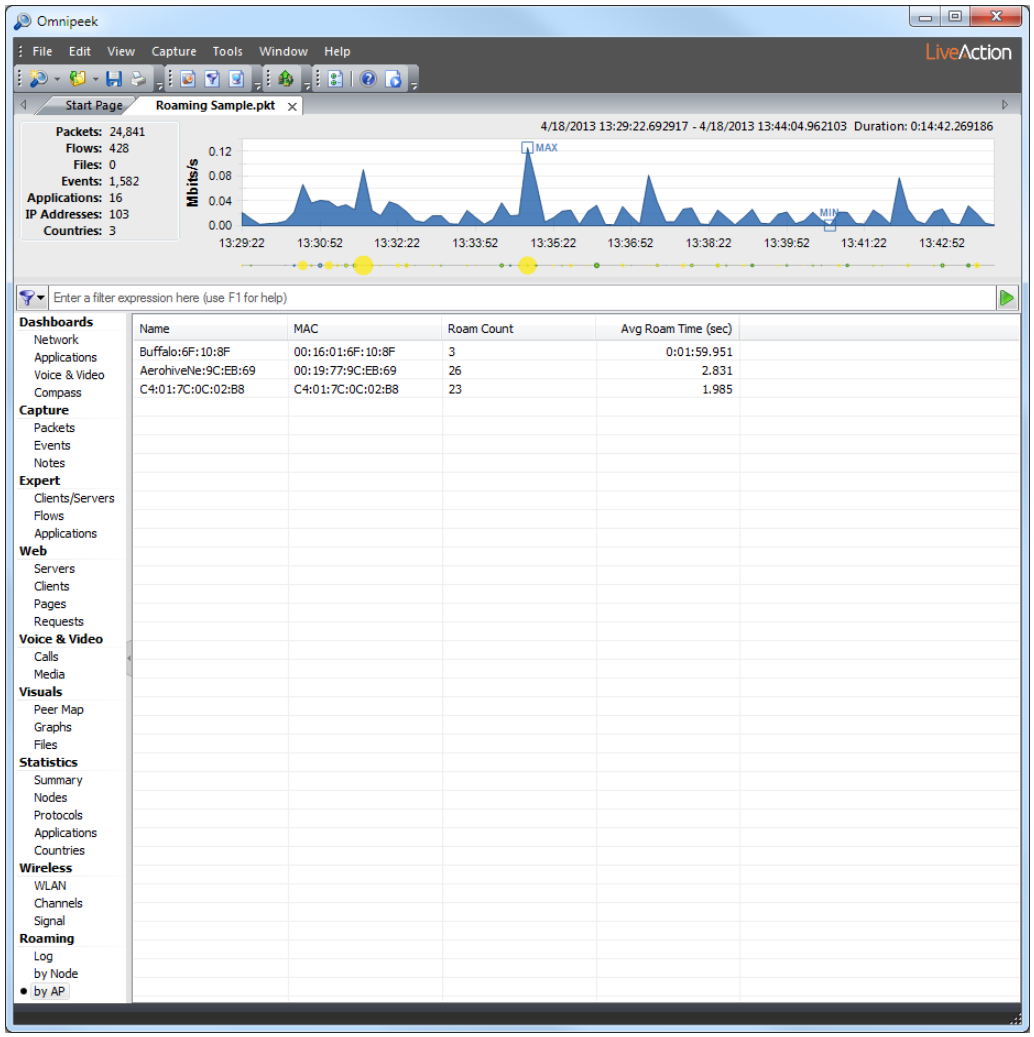

# by Node

The **by Node** view displays an entry for each device, and maintains an average latency value for that device.




# by AP

The **by AP** view displays an entry for each access point, and maintains an average latency value for that AP.


Omnipeek
File Edit View Capture Tools Window Help
LiveAction
Start Page
Roaming Sample.pkt
Packets: 24,841
Flows: 428
Files: 0
Events: 1,582
Applications: 16
IP Addresses: 103
Countries: 3
4/18/2013 13:29:22.692917 - 4/18/2013 13:44:04.962103 Duration: 0:14:42.269186
Mbits/s
0.12
0.08
0.04
0.00
MAX
MIN
13:29:22
13:30:52
13:32:22
13:33:52
13:35:22
13:36:52
13:38:22
13:39:52
13:41:22
13:42:52
Enter a filter expression here (use F1 for help)
Dashboards
Network
Applications
Voice & Video
Compass
Capture
Packets
Events
Notes
Expert
Clients/Servers
Flows
Applications
Web
Servers
Clients
Pages
Requests
Voice & Video
Calls
Media
Visuals
Peer Map
Graphs
Files
Statistics
Summary
Nodes
Protocols
Applications
Countries
Wireless
WLAN
Channels
Signal
Roaming
Log
by Node
by AP
Name
MAC
Roam Count
Avg Roam Time (sec)
Buffalo:6F:10:8F
00:16:01:6F:10:8F
3
0:01:59.951
AerohiveNe:9C:EB:69
00:19:77:9C:EB:69
26
2.831
C4:01:7C:0C:02:B8
C4:01:7C:0C:02:B8
23
1.985

CHAPTER 22

# Configuring capture adapters

## In this chapter:

# About capture adapters

The LiveAction Capture Adapters are used exclusively with LiveAction appliances. Capture Adapters are optimized for 10 Gigabit or 40 Gigabit Ethernet capture.

If you have a Capture Adapter already installed, you can define one hardware profile for a capture adapter or a capture from within Omnipeek. See *Configuring hardware profiles*.

**Important!** Changes made to the settings of a particular adapter are applied whenever that adapter is selected as the capture adapter.

# Configuring hardware profiles

A hardware profile can be applied to a capture adapter or a capture depending on the model of your capture adapter. Hardware profiles tell a capture adapter or a capture the type of traffic to capture and how to manage that traffic. Hardware profiles can slice the packets, discard error packets, and apply an address or a port filter. Different settings can be applied per capture adapter channel as well.

**Important!** All of the hardware profile settings are applied in hardware, and allow for better performance than performing these operations in software.

If a capture adapter that supports hardware profiles exists, the **Hardware Profiles** tab appears in the **Settings** tab.

If a capture adapter supports hardware profiles per capture and is selected as the adapter for a capture in the Capture Options, then the **Hardware Profiles** tab is accessible in the capture options and any hardware profile selected affects just that capture.

If a capture adapter supports hardware profiles per adapter, the **Hardware Profiles** tab appears in the Adapter Options dialog for that capture adapter and any hardware profile selected affects all captures using that capture adapter.

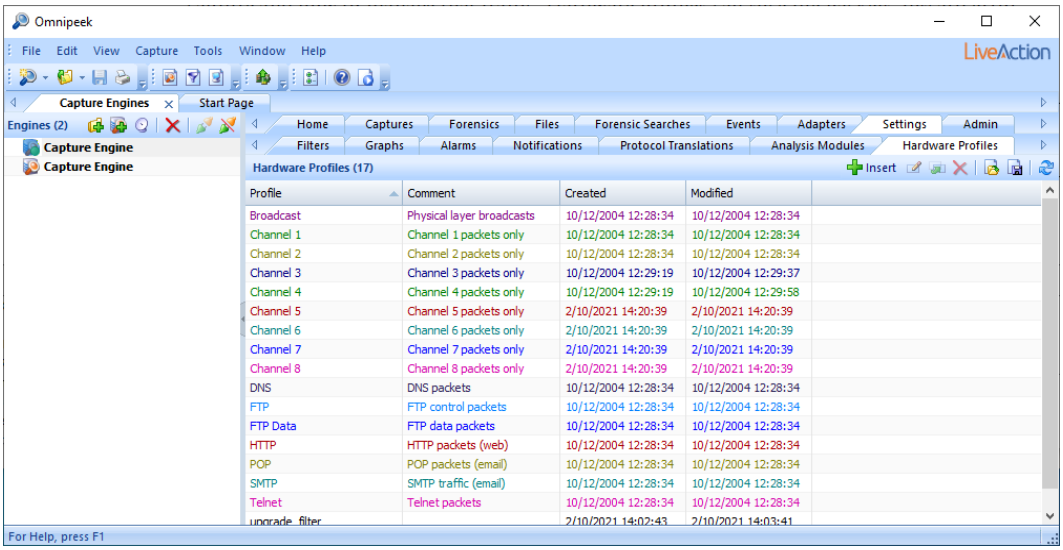
The hardware profile support for a capture adapter is dependent on the model of your capture adapter.

The **Hardware Profiles** tab allows you to define and manage your hardware profiles. In the Capture Options, the **Hardware Profiles** tab allows you to select one hardware profile that is used with the capture. In the Adapter Options dialog, the **Hardware Profiles** tab allows you to select one hardware profile that is used for all captures using that capture adapter. Packet slicing, error packet settings, and filters based on address or port are implemented on the adapter in hardware.

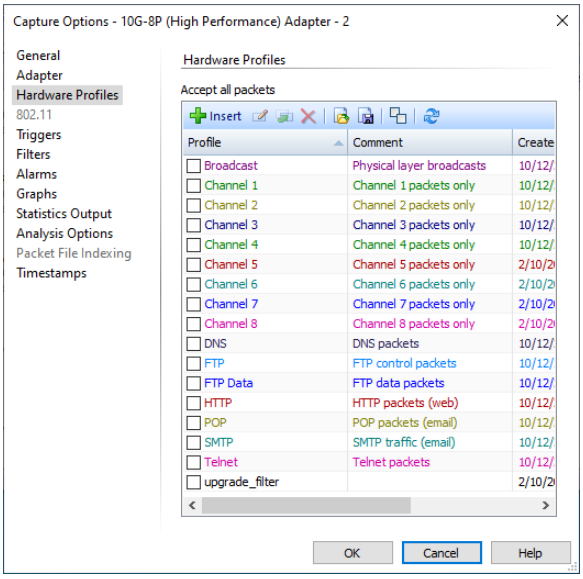
**Note** Only one hardware profile can be implemented on a capture or a capture adapter at a time.

**To create a new hardware profile:**

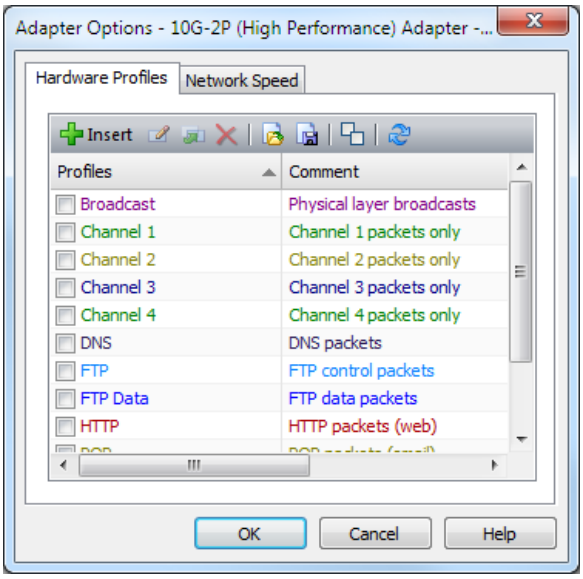
1. Do one of the following to display the **Hardware Profiles** tab:
   - Select the **Hardware Profiles** tab from the **Settings** tab of the **Capture Engines** window.



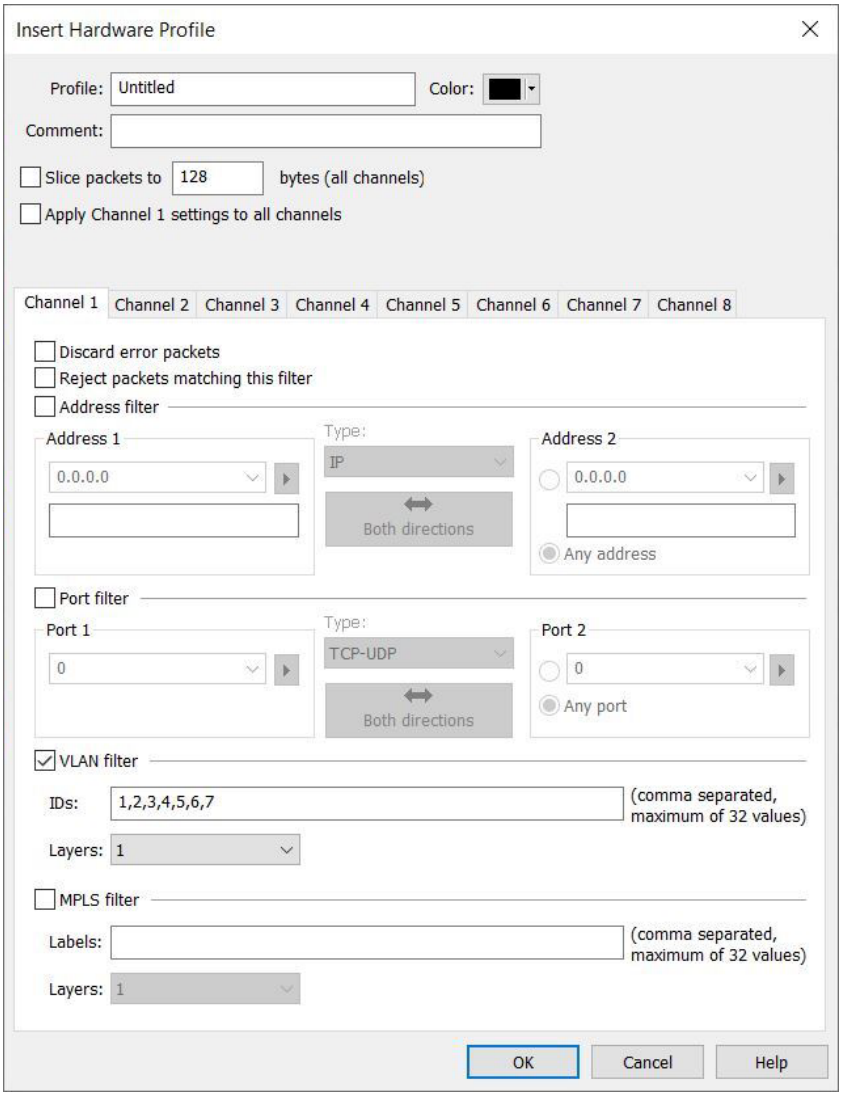

- Select a capture from the **Captures** tab of the **Capture Engines** window and click *Capture Options* for the capture. The **Capture Options** dialog appears.




- Select a capture adapter from the **Adapters** tab of the **Capture Engines** window and Click *Options* for the adapter. The **Adapter Options** dialog appears.




2. Click the **Hardware Profiles** tab.
3. Click **Insert**. The **Insert Hardware Profile** dialog appears.



4. Complete the dialog:

**Important!** Hardware profiles containing an overly complex configuration using the options specified below may result in an error dialog indicating that the hardware profile is too complex. When starting a capture, you may also get the error dialog when multiple captures use hardware profiles that are collectively too complex when used together. If you receive this error dialog, try reducing the complexity of the hardware profile. For example, try limiting the number of filters, reduce the number of channels, limit the number of VLAN IDs or MPLS labels, or limit the number of layers used in the hardware profile.

Additionally, when using multiple hardware profiles on the same capture adapter, these hardware profiles should be exclusive with each other (capturing a unique set of packets) or else you may find that some of the captures are missing packets since a packet can only be sent to one capture. When a packet matches more than one hardware profile in use, the most recent captures have precedence over less recent captures.

- *Profile:* Type a name for the profile.
- *Color:* Select a color for the profile.
- *Comment:* Type a comment to provide a more complete description of the hardware profile's properties.
- *Slice packets to ... bytes (all channels):* Select this option and enter a value in bytes to enable packet slicing on the card.

**Important!** The minimum entry is 16 bytes, and the length must be a multiple of 16 bytes. We recommend keeping the slice value at 128 bytes or greater.

Additionally, if you have two captures on the same capture adapter, and one has a hardware profile that has *Slice packets to ... bytes (all channels)* enabled, while the other has *Slice packets to ... bytes (all channels)* disabled, only the last capture started receives packets while the other capture stops receiving packets.

- *Apply Channel 1 filter settings to all channels:* Select this option to assign the same properties defined for Channel 1 to all channels. Clear the check box if you want to define properties separately for each channel.
- *Discard duplicate packets:* If your capture adapter supports this feature, this option is available and can be selected to discard duplicate packets.

**Important!** If you have two captures on the same capture adapter, and one has a hardware profile that has *Discard duplicate packets* enabled, while the other has *Discard duplicate packets* disabled, only the last capture started receives packets while the other capture stops receiving packets.

- *Discard error packets:* Select this option to discard error packets.
- *Reject packets matching this filter:* Select this option to pass packets to Omnipeek that do not match this filter.
- *Address filter:* Select this check box to specify a filter parameter based on address.

**Note** Wildcard addresses (or range of addresses) and CIDR range filtering are supported for *Address filter*.

- *Address 1:* Type or select the first address for the filter. Clicking the small arrow lets you select or resolve an address from the Name Table.

- *Type:* Select the type of addresses you want to enter. Both Address 1 and Address 2 must be of the same type and must be entered in the correct format.

  Click the button with the directional arrow to select the send/receive relationship between Address 1 and Address 2.
- *Address 2:* Type or select the second address for the filter. Clicking the small arrow lets you select or resolve an address from the Name Table.
- *Any address:* Select this option to specify any address for Address 2.
- *Port filter:* Select this check box to specify a filter parameter based on port.
- *Port 1:* Type or select the first port for the filter. Clicking the small arrow lets you select a port from the Name Table.
- *Type:* Select the type of port you want to enter. Both Port 1 and Port 2 must be of the same type and must be entered in the correct format.

  Click the button with the directional arrow to select the send/receive relationship between Port 1 and Port 2.
- *Port 2:* Type or select the second port for the filter. Clicking the small arrow lets you select a port from the Name Table.
- *Any port:* Select this option to specify any port for Port 2.
- *VLAN filter:* Select this option to enable VLAN filtering. This allows you to enter a comma separated list of VLAN IDs to match against.
- *IDs:* Type the list of VLAN IDs, separated by a comma. The list cannot exceed 32 entries and must be within the valid VLAN ID range of 0 to 0xFFF.
- *Layers:* Select how deep of a VLAN stack to match against, with 1 being the minimum and 2 being the maximum.
- *MPLS filter:* Select this option enable MPLS filtering. This allows you to enter a comma separated list of MPLS labels to match against.
- *Labels:* Type the list of MPLS labels, separated by a comma.The list cannot exceed 32 entries and must be within the valid MPLS Label range of 0 to 0xFFFFF.
- *Layers:* Select how deep of an MPLS stack to match against, with 1 being the minimum and 3 being the maximum.

5. Click **OK** to add the new hardware profile to the list of profiles.
6. Click the *Click here to send changes* message to send your changes to the Capture Engine.

**Important!** Because the hardware profile definitions reside on a Capture Engine, you must send all changes to a Capture Engine when you use the **Insert**, **Edit**, **Duplicate**, or **Delete** functions.

CHAPTER 23

# Omnipeek Remote Assistant

## In this chapter:

# About Omnipeek Remote Assistant

Omnipeek Remote Assistant (ORA) is an easy to use, fully secure tool for troubleshooting wired and wireless networks. ORA allows remote users to easily collect critical network data needed for troubleshooting network problems. The network data (also known as "captures") is fully encrypted and can only be accessed by the analyst requesting the data. Once the data has been collected and stored locally on the computer running ORA, the files can be transferred to the analyst for further investigation using Omnipeek.

There are three steps when using ORA:

- First, the network analyst generates an ORA session to be sent to the remote user. This session is packaged in an ORA management file (a ZIP file containing an executable file and supporting files). Each ORA session can be based on an existing ORA group (using the same security key) or a new ORA group with new encryption key. See *Generating an ORA management file* on page 319.
- The second step is for the remote user to extract the files from the ORA management file, and then run the ORA executable. See *Generating encrypted capture files* on page 320.
- The third step is for the network analyst to open and analyze the files generated from the remote user. See *Opening an encrypted capture file* on page 321.

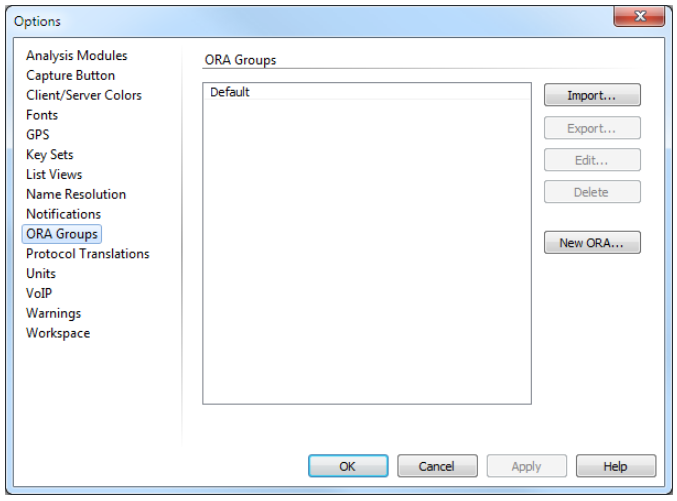
You can also import and export ORA management files. Importing ORA management files allows another Omnipeek–ORA user to analyze files that they did not generate themselves. See *Importing an ORA management file* on page 321. Exporting ORA management files allows a user to authorize another Omnipeek–ORA user to open and analyze files generated by the original user. See *Exporting ORA management file* on page 321.

# Generating an ORA management file

To begin using ORA, an ORA session must be created and packaged in an ORA management file. The ORA management file is then sent to the remote user.

**To generate an ORA management file:**

1. On the **Tools** menu, click **Options**. The **Options** dialog appears.
2. Click *ORA Groups*. The **ORA Groups** dialog appears.




3. Click **New ORA...**. The **New ORA** dialog appears.
   - *New ORA Group*: Select this option to generate a new set of ORA management files, and then enter a name for the ORA group. This allows you to create a new set of ORA management files with a new encryption key.
   - *New ORA based on selected ORA group*: Select this option to generate a new set of ORA management files based on an existing ORA group (using the same security key).

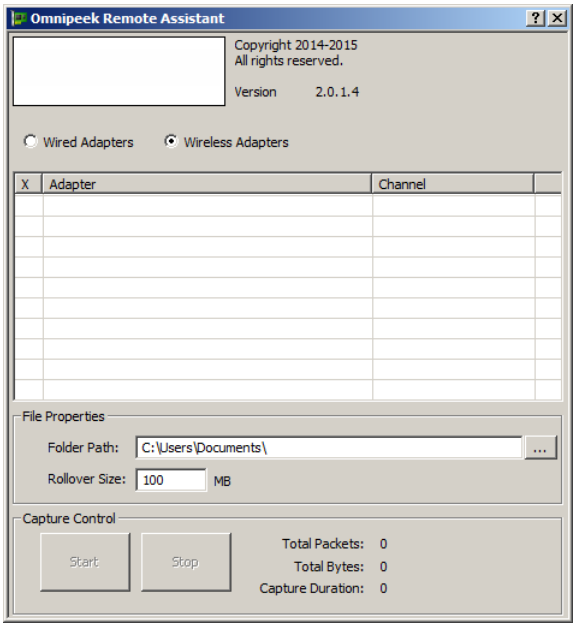
4. Enter a file name and choose a location for the new ORA group.
5. Click **Save**.
6. Deliver the ORA management file to the remote user.

# Generating encrypted capture files

All files created by ORA are encrypted. These files can only be decrypted and analyzed with computers having a unique security key.

**To generate encrypted capture files:**

1. Obtain the ORA management file generated in *Generating an ORA management file* on page 319.
2. Double-click the ZIP file to extract the contents of the file to a location on the target computer's hard disk.
3. Double-click the ORA application file (*OmnipeekRemoteAssistant.exe*). The main program window appears. The parts of the main program window are described below.




- **Wired Adapters**: Select this option to choose from a list of available wired network adapters installed on the ORA computer. You cannot select a combination of both wired and wireless adapters.
- **Wireless Adapters**: Select this option to choose from a list of available wireless network adapters installed on the ORA computer. You cannot select a combination of both wired and wireless adapters. The wireless adapter must be a supported adapter with the appropriate driver installed. Please visit *https://www.liveaction.com/support/frequently-asked-questions/* for information on obtaining and installing the driver for your wireless adapter.
- **Adapter List**: The adapter list displays and allows you to select from the available wired or wireless network adapters installed on the ORA computer. You cannot select a combination of both wired and wireless adapters.

  If a wireless network adapter is selected, the *Channel* drop down menu is enabled, allowing the selection of a wireless channel.

**Note** If you are using a supported wireless network adapter, check with your network analyst to ensure you have the appropriate LiveAction supported wireless driver installed. You must have a supported wireless adapter and driver to capture 802.11 traffic.

- **File Properties**: The *File Properties* let you choose a folder path and specify the maximum rollover file size of a file before a new file is created. The folder path can be entered directly into the folder path edit box, or selected by clicking **Browse**. All files created by ORA are saved as encrypted LiveAction capture files (**.pke*), and are appended with a timestamp so that each new file created with the same folder path and file name is unique.
- **Capture Control**: The *Capture Controls* let you start and stop captures. **Start** and **Stop** are enabled only when the configuration is correct. **Start** is disabled until a valid adapter has been selected. Once the capture has been started, the main program window, except for **Stop**, is disabled. While the capture is running, the *Total Packets*, *Total Bytes*, and *Capture Duration* are displayed in real-time. When **Stop** is clicked, the main program window is reenabled.

4. In the *Adapter List*, select one or more wired adapters, or one or more wireless adapters. You cannot select a combination of both wired and wireless adapters.
5. In the *File Properties*, enter or select a folder path for your encrypted capture files.

   Each file that is created includes a prefix (default prefix is 'Packet') and timestamp in its filename. The file is saved as a LiveAction encrypted capture file (**.pke*).
6. In the *File Properties*, specify a rollover file size (in MBs) for each capture file before a new capture file is created.
7. Click **Start** to begin generating capture files.
8. Click **Stop** when you want to stop generating capture files.
9. Deliver your encrypted capture files to your network analyst per their instructions.

# Opening an encrypted capture file

Encrypted ORA capture files (**.pke*) can be opened in Omnipeek in the following ways:

- Double-click the file from Windows Explorer
- On the **File** menu, click **Open**

# Importing an ORA management file

Importing an ORA management file allows another Omnipeek–ORA user to analyze files that they did not generate themselves. The user simply imports the ORA management file from the original computer that generated the ORA session. Once imported, any **.pke* files generated with that ORA/encryption key combination can be opened and analyzed.

**To import an ORA management file:**

1. On the **Tools** menu, click **Options**. The **Options** dialog appears.
2. Click *ORA Groups*. The **ORA Groups** dialog appears.
3. Click **Import**.
4. Select the ORA management file (**.zip*). The ORA management file must have been previously exported by the original user using the **ORA Groups** dialog in Omnipeek.
5. Click **Open**.

# Exporting ORA management file

Exporting an ORA management file allows a user to authorize another Omnipeek–ORA user to open and analyze files generated by the original user. The original user must export the ORA management file and make it available to the new user, who must then import the file.

**To export an ORA management file:**

1. On the **Tools** menu, click **Options**. The **Options** dialog appears.

2. Click *ORA Groups*.
3. Click **Export**.
4. Name the ORA management file (*.*zip*).
5. Click **Save**.

CHAPTER 24

# Global Positioning System

## In this chapter:

# About GPS

GPS (Global Positioning System) is a system of navigational satellites. Commercially available GPS receivers can calculate and report their geographical position and other navigational data (called a *fix*) based on signals transmitted by these satellites.

**Note** The GPS feature is not supported in the 64-bit version of Omnipeek.

Omnipeek can display data provided by a separately purchased GPS receiver. For each packet, optional columns in the **Packets** view can show the *GPS Time*, *Latitude*, *Longitude*, *Altitude*, and *Speed* currently reported by the connected GPS receiver. This is especially useful if you needed to identify where you were when you received a set of packets.

**Note** The GPS receiver requires clear access to the GPS satellites in order to display data in Omnipeek.

For example, if you worked on a large military base, you might need to identify the reach of your wireless network. Using Omnipeek and the GPS receiver, you could drive around the base capturing wireless packets with the GPS device providing you with coordinates. The resulting captures would provide a set of packets with their signal strengths from your network and a set of coordinates for your location.

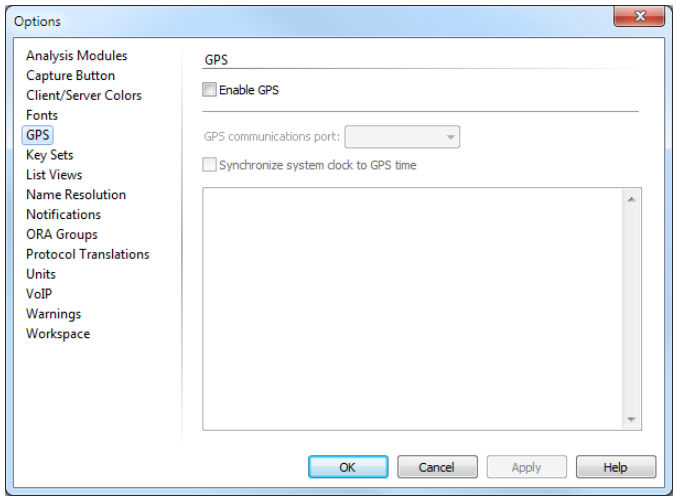
Omnipeek uses a separate utility, the LiveAction GPS Daemon, as the interface between itself and your GPS receiver. The daemon supports GPS receivers that follow the NMEA (National Marine Equipment Association) 0183 standard which provides data in recognized GPS *sentences* (comma-separated ASCII data strings) in the GPRMC and GPGGA formats.

Refer to the manufacturer's instructions for your particular GPS receiver for information on how to use features of your GPS receiver.

# Enabling GPS

**To enable GPS in Omnipeek:**

1. Connect a supported GPS receiver to the USB port on the computer running Omnipeek.
2. Turn on the GPS receiver.
3. In Omnipeek, on the **Tools** menu, click **Options**. The **Options** dialog appears.
4. Click the **GPS** view.




Configure the GPS options:

- Select the *Enable GPS* check box to start the LiveAction GPS Daemon whenever Omnipeek is started (or when you click **OK** or **Apply** of the dialog). See *Starting the LiveAction GPS daemon from the system tray* to learn more about using the LiveAction GPS Daemon.
- In the *GPS communication port* list, select the communications port (USB) to which the GPS receiver is connected.
- Select the *Synchronize system clock to GPS time* check box to update the system clock of the host computer to the time reported by the GPS receiver any time the system clock is more than 59 seconds out of sync with the GPS receiver time.

5. Click **OK**.

# Starting the LiveAction GPS daemon from the system tray

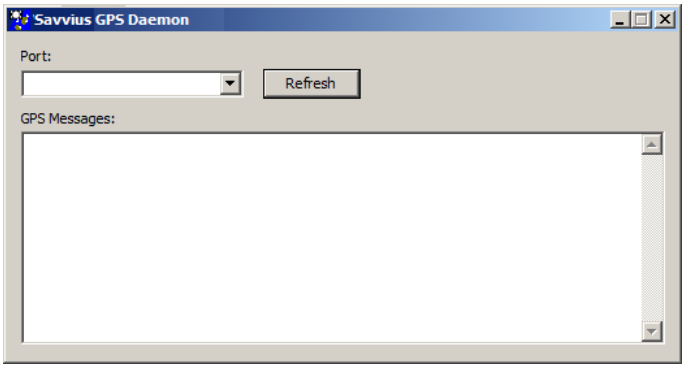
The LiveAction GPS daemon provides another way (in addition to the **Options** dialog) to select the USB port used for GPS communication. GPS messages formatted in the NMEA standard are also displayed when you start the LiveAction GPS daemon from the system tray.

**To start the GPS Daemon from the system tray:**

1. Double-click the LiveAction GPS Daemon icon in the Windows system tray.

   The **LiveAction GPS Daemon** window appears.




2. Click **Refresh** to update the window.

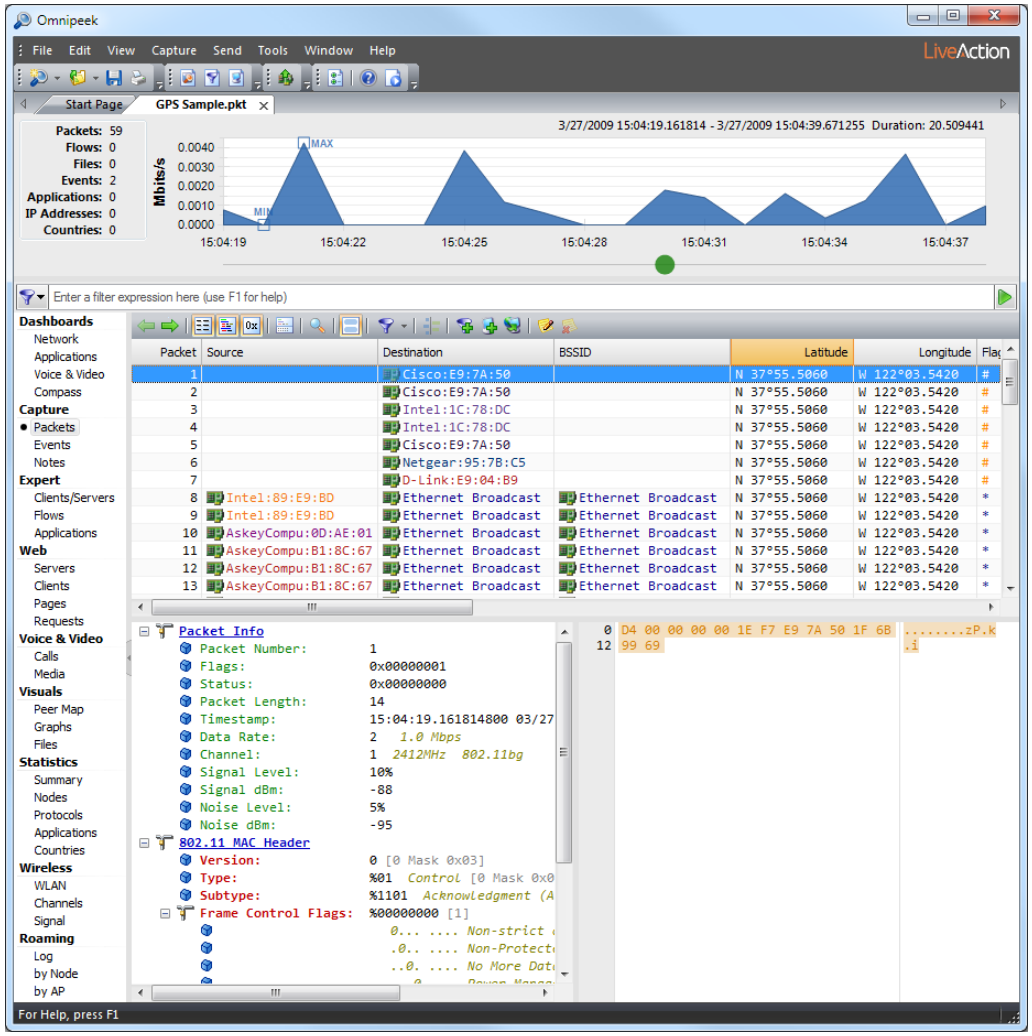
# GPS columns in the Packets view

In the **Packets** view of a capture window, you can show GPS data by displaying one or more columns related to GPS. Simply right-click an existing column head and select one of the GPS columns described in the table below.

| Column | Description |
|---|---|
| GPS Time | Displays the time reported by the GPS receiver for the fix associated with this packet. |
| Latitude | Displays the latitude portion of the GPS fix associated with this packet, reported (*N*, north or *S*, south) in degrees, minutes, and decimal fractions of a minute. |
| Longitude | Displays the longitude portion of the GPS fix associated with this packet, reported (*E*, east or *W*, west) in degrees, minutes, and decimal fractions of a minute. |

| Column | Description |
|---|---|
| Altitude | Displays the altitude portion of the GPS fix associated with this packet. Reported in the measurement system appropriate to the local settings associated with the user in the operating system. (US users in feet, all others in meters.) |
| Speed | Displays the speed portion of the GPS fix associated with this packet. Reported in the measurement system appropriate to the local settings associated with the user in the operating system. (US and UK users in miles per hour, all others in kilometers per hour.) |

The following figure shows an example of the latitude and longitude columns in a capture window:




The GPS columns remain blank until GPS data is available. Once GPS data becomes available, the columns will show either GPS data or *N/A*. During capture, data is posted to these columns as it is passed from the GPS receiver by the LiveAction GPS Daemon.

GPS receivers typically send a new fix every one or two seconds. The capture window will continue to use the last valid fix for a short interval. When the next fix is posted, the capture window will begin using this new fix for all captured packets. If the new fix is based on NMEA sentences flagged as invalid by the GPS receiver, the capture window will show N/A in the GPS columns.

If a new fix is not presented within the time-out (a few seconds), the capture window will also begin to show *N/A* for all GPS columns. This can happen for any number of reasons. One of the most common causes is that the GPS receiver has temporarily lost contact with the satellites.

**Tip** GPS receivers usually have their own integrated display. Each time they get a new fix, they typically send the data to the attached computer first, then update their display. If you are

moving fast enough, you may notice some slight lag between the updates of the GPS display and the computer screen.

The native format of GPS data for distance, speed, and altitude is expressed in metric or SI units (based on the meter). Omnipeek checks the operating system settings for the current user to determine which system of measurement is appropriate. If the local settings for the user indicate that the U.S. system of measurement should be used, then *Altitude* is displayed in feet and *Speed* is displayed in miles per hour. For a user in the UK, *Altitude* is in meters and *Speed* is in miles per hour. For all other users, *Altitude* is in meters and *Speed* is in kilometers per hour.

**Note** Conversion to another measurement system is performed before data is posted to the capture window. When you save packets to a capture file, GPS data is saved in whichever measurement system is in use by the capture window. Omnipeek does not convert between measurement systems when opening a capture file.

APPENDIX A

# Menus and Keyboard Shortcuts

## In this appendix:

# File menu

| Menu item | Shortcut | Description |
|---|---|---|
| New Capture… | Ctrl + N | Opens the **Capture Options** dialog to configure a new capture window. |
| New Capture From Template | | Creates a new capture window whose layout matches the template selected by one of the two methods below. |
| Choose… | | Opens a file **Open** dialog wherein you can navigate to the capture window template of your choice. |
| (recent templates) | | A list of the most recently used capture window templates. Choose one to create a new capture window using this template. |
| New Multi-Segment Analysis Project… | Ctrl + Shift + N | Starts the **New Multi-Segment Analysis Project** wizard. |
| New Compass Workspace… | Ctrl + Shift + C | Open a new Compass workspace which allows you to aggregate and display network utilization and statistic chart windows from any number of capture files. |
| Open… | Ctrl + O | Opens an Omnipeek capture file or other supported file type in a new capture file window. |
| Close | | Closes the active window or file. |
| Save All Packets… | Ctrl + S | Opens the **Save** dialog to save all packets in the active window. |
| Save Selected Packets… | | Opens the **Save** dialog to save selected packets in the **active window. This item is displayed as Save Filters…, Save Graph…, Save Names…**, or as **Save Log…**, **Save Node Statistics**, and so forth, when the relevant window is active. |
| Save Report… | | Opens the **Save Report** dialog to choose the file format and location in which to save a report on any of several collections of statistics for the current capture window or capture file. Formats include text (*.txt, *.csv), HTML, or XML. |
| Save Capture Template… | | Opens the **Save** dialog to save the Capture Options of the current capture window as a capture template (*.*ctf*), so it can be used to format subsequent new capture windows. |
| Print Setup… | | Opens the **Print Setup…** dialog for configuring printer functions. |
| Print… | Ctrl + P | Prints the active window in a format appropriate to its type. |
| Print Selected Packets… | | Opens the **Print** dialog to allow you to print the **Decode** view of the selected packets as a single document. |
| Properties | | Displays various properties for the capture window. |
| Recent File | | Following the **Properties** command is a numbered list of recently opened capture files. |
| Exit | Alt + F4 | Quit Omnipeek. |

# Edit menu

| Menu item | Shortcut | Description |
|---|---|---|
| Undo | Ctrl + Z | Undoes the last edit. |
| Redo | Ctrl + Shift + Z | Redoes the last edit. |
| Cut | Ctrl + X | Cuts the highlighted item(s) and copies to the clipboard. |
| Copy | Ctrl + C | Copies highlighted item(s) to the clipboard. |

| Menu item | Shortcut | Description |
|---|---|---|
| Paste | Ctrl + V | Pastes the current contents of the clipboard. |
| Insert | Ins | When the **Filters** window is active, opens the **Insert Filter** dialog; when the **Name Table** window is active, opens the **Insert** dialog. |
| Delete | Del | Deletes the highlighted item(s). |
| Clear All Packets | Ctrl + B | Deletes all packets from the active capture window. |
| Select All | Ctrl + A | Selects all packets, text, or items in a window. |
| Select None | Ctrl + D | Removes all highlighting and selection. |
| Invert Selection | | Unselects items that were selected and selects items that were unselected. |
| Select Packets… | Ctrl + E | Opens the **Select Packets** dialog, where you can use filters, ASCII or hex strings, packet length, and Analysis Modules to select captured packets. |
| Select Related Packets | | Searches for and selects packets that provide best matches to the highlighted item(s), based on the set of characteristics chosen from the list below. |
| By Source | | Chooses packets with matching source address. |
| By Destination | | Chooses packets with matching destination address. |
| By Source and Destination | | Chooses packets with matching source and destination addresses. |
| By VLAN | | Chooses packets in virtual LAN. |
| By Protocol | | Chooses packets with matching protocol. |
| By Port | | Chooses packets with matching port. |
| By Application | | Chooses packets by application. |
| By Flow | | Chooses packets sent between two nodes, using the matching protocol. |
| Hide Selected Packets | Ctrl + H | Removes selected packets from the display without deleting them. Hidden packets are not processed further. |
| Hide Unselected Packets | Ctrl + Shift + H | Removes unselected packets from the display without deleting them. Hidden packets are not processed further. |
| Unhide All Packets | Ctrl + U | Restores all previously hidden packets to normal status. |
| Copy Selected Packets to New Window | | Creates a temporary capture file window containing only the selected packets. |
| Reprocess All Packets | | Forces the same recalculation of all views without hiding or unhiding any packets. Changes to **Reprocess VoIP Info** when you hold down the **Ctrl** key before selecting the **Edit** menu. This reprocesses only the information in the **VoIP** tab. |
| Go To… | Ctrl + G | Opens the **Go To** dialog where you can choose a packet number to jump to. If packets are selected, the number of the first selected packet is shown. |
| Go To Next Selected | Ctrl + J | Jumps to the next selected packet. |
| Go To Previous Selected | Ctrl + Shift+J | Jumps to the previously selected packet. |
| Find Pattern | Ctrl + F | Opens the **Find Pattern** dialog to search for a user-defined string in specified parts of packets. |
| Find Next | F3 | Finds the next match in sequence to the previous **Find Pattern** search. |

# View menu

| Menu item | Shortcut | Description |
|---|---|---|
| Capture Engines | | Opens the **Capture Engines** window. |
| Filters | Ctrl + M | Opens the **Filters** window. |
| Name Table | | Opens the **Name Table** window. |
| Log Window | Ctrl + L | Opens the **Log** window. |
| Display Format | | The following options control display format for nodes: |
| Show Address Names | | Display using the names found in the Name Table when available. |
| Show Port Names | | Display using port names found in the Name Table |
| Show Country Names | | Controls whether full country names are displayed or the ISO 2-character country code. Using the country code can be useful for exporting (saving) the statistics data and importing them into other programs. |
| Logical Address | | Display using the logical address of the node where available. |
| Physical Address | | Display using the hardware (MAC) address only. |
| Local Time | | Operates as a toggle setting. When enabled, the program shows all timestamps adjusted for local time settings, such as time zone and Daylight Savings Time. When unchecked, the program shows all timestamps as UTC (Coordinated Universal TIme). |
| Color | | The following options control the use of color in **Packets** views and other displays: |
| Source | | Use the color assigned to the source node. |
| Destination | | Use the color assigned to the destination node. |
| Protocol | | Use the color assigned to the protocol. |
| Filter | | Use the color assigned to the filter that allowed the packet to be captured. |
| Flag | | Use the color assigned to flagged packets. |
| Independent | | Each item uses its own color. |
| No Color | | Use no color coding in **Packets** view and other displays. |
| Toolbars | | The following options control the buttons that are displayed in the main window toolbar. |
| File | | Show/hide **File** on the toolbar. |
| View | | Show/hide **View** on the toolbar. |
| Capture | | Show/hide **Capture** on the toolbar. |
| Options/Help | | Show/hide **Options/Help** on the toolbar. |
| Customize… | | Opens the Customize dialog for customizing *Commands, Toolbar, Keyboard, Menu*, and *Options*. |
| Overview | | Show/hide the Overview graph. |
| Filter Bar | | Show/hide the filter bar. |

| Menu item | Shortcut | Description |
|---|---|---|
| Status Bar | | Operates as a toggle setting. When enabled, displays status alerts and the current adapter in a bar at the bottom of the main program window. |
| Full Screen | F11 | Displays main window as full screen. Press Esc to return to main window. |
| Application Look | | Displays application user interface in the selected theme. |
| Blue | | Displays the user interface with a blue theme. |
| Black | | Displays the user interface with a black theme. |
| Silver | | Displays the user interface with a silver theme. |
| Custom | | Displays the user interface with a custom theme. |

# Capture menu

| Menu item | Shortcut | Description |
|---|---|---|
| Start Capture | Ctrl + Y | Opens the **Capture Options** dialog for a new capture. Toggles packet capture for an active capture window (Start Capture or Stop Capture). When the active window has a Start Trigger, displays as Start Trigger or Abort Trigger. |
| Capture Options… | | Opens the **Capture Options** dialog for an existing capture window. |

# Tools menu

| Menu item | Shortcut | Description |
|---|---|---|
| Download Engine Packet File… | | Opens the **Distributed Forensic Search Wizard Time Range & Filter** dialog where you choose the time range and filter for the search. |
| Split Packet File… | | Opens the **Split Packet File** dialog where you can split a large packet file into smaller packet files. |
| Merge Packet Files… | | Opens the **Merge Packet Files** dialog where you can merge smaller packet files into a large packet file. |
| Decrypt WLAN Packets… | | Opens the **Decrypt WLAN Packets** dialog, where you can choose a key set to apply to encrypted packets in the current capture window. |
| Decrypt SSL Packets… | | Opens the **SSL Server Keys** dialog, where you can choose a key set to apply to SSL encrypted packets in the current capture window. |
| Options… | | Opens the **Options** dialog, where you can specify default program behavior. From the **Workspace** view of this dialog you can also globally restore program defaults. |
| Customize… | | Opens the **Customize Tools Menu** dialog from which you can add items to the **Tools** menu, allowing you to launch other programs from within Omnipeek. |

# Window menu

| Menu item | Shortcut | Description |
|---|---|---|
| New Vertical Tab Group | | Adds the currently selected tab to a new vertical tab group in the main program window. |
| New Horizontal Tab Group | | Adds the currently selected tab to a new horizontal tab group in the main program window. |
| Cascade | | Arranges all open windows one behind the other, with only the tops of those behind showing above the others. This menu item is only available when the 'Multiple documents' Window layout is enabled from the Options Workspace dialog (**Tools > Options**). |
| Tile Vertically | | Fills the screen with open windows, arranged side-by-side. This menu item is only available when the 'Multiple documents' Window layout is enabled from the Options Workspace dialog (**Tools > Options**). |
| Tile Horizontally | | Fills the screen with open windows, arranged one above the other. This menu item is only available when the 'Multiple documents' Window layout is enabled from the Options Workspace dialog (**Tools > Options**). |
| Arrange Icons | | Lines up the icons of minimized open files. |
| Next | Ctrl + Tab | Makes the next window in sequence the active window. |
| Previous | Ctrl + Shift + Tab | Makes the previous window in sequence the active window. |
| Close All | | Closes all open windows. |

**Note** The *Cascade*, *Tile Vertically*, *Tile Horizontally*, and *Arrange Icons* menu commands are only available if the *Window layout* in the *Workspace* options (**Tool** > **Options**) is set to *Multiple documents*.

# Help menu

| Menu item | Shortcut | Description |
|---|---|---|
| Help Topics | F1 | Launches the Online Help. |
| Keyboard Map | | Opens the **Help Keyboard** dialog that displays the keyboard accelerator keys for Omnipeek. |
| Show Start Page | | Opens the Start Page. |
| Check for Updates | | Connects to the internet to determine if a newer version of Omnipeek is available. If a newer version is available, a dialog is then displayed that allows you to open a browser window for upgrade instructions. You can also configure version checking automatically whenever Omnipeek is launched from the Options Workspace dialog (**Tools** > **Options**). |
| Readme | | Opens the Readme file, containing information about the program which may have appeared since the publication of the current manual. |
| Getting Started Guide | | Opens the Omnipeek Getting Started Guide. |
| LiveAction on the Web | | The following indented items will launch the default Internet browser and load the appropriate page from the LiveAction web site. |
| Product News | | Loads the latest product news about Omnipeek and related LiveAction products. |
| Technical Support | | Loads the technical support pages. |

| Menu item | Shortcut | Description |
|---|---|---|
| LiveAction Home Page | | Loads the LiveAction home page. |
| About Omnipeek | | Displays the Omnipeek about box, including the last 10 characters of the serial number of your copy. |
| Support… | | Click **Support…** in the **About Omnipeek** dialog to display key system and program information. You can also save this information to a text file. |

# Reference

## In this appendix:

# Packet list columns

The available columns in the Packet List of the **Packets** view of a capture window are described below.

| Column | Description |
|---|---|
| Packet | Displays a packet number as determined by the time-sequential order in which the packets were captured. |
| Source | Displays the source address. Depending upon the choice under **Display Format** in the **View** menu, this address may be a physical address, a higher-level, logical address such as IP, or a symbolic name. Will appear italicized if *Calculate implied transmitter* is enabled in the **Format** tab of the **Packet List Options** dialog. |
| Source Logical | Shows the logical address of the packet's source. Unlike the default *Source* column, this column's display is unaffected by any choice you make in **Display Format** under the **View** menu. This allows you to show different formats for a packet's source on a single line. |
| Source Physical | Shows the physical address of the packet's source. Unlike the default *Source* column, this column's display is unaffected by any choice you make in **Display Format** under the **View** menu. This allows you to show different formats for a packet's source on a single line. Will appear italicized if *Calculate implied transmitter* is enabled in the **Format** tab of the **Packet List Options** dialog. |
| Source Port | Displays the source port or socket, if any, in the notation appropriate for that protocol. |
| Source Country | Displays the source country. If the source country is not available, then *Private Network*, *Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Source City | Displays the source city. If the source city is not available, then *Private Network*, *Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Source Latitude | Displays the latitude of the source city. |
| Source Longitude | Displays the longitude of the source city. |
| Destination | Displays the destination address. Depending upon the choice under **Display Format** in the **View** menu, this address may be a physical address, a higher-level, logical address such as IP, or a symbolic name. |
| Destination Logical | Shows the logical address of the packet's destination. Unlike the default *Destination* column, this column's display is unaffected by any choice you make in **Display Format** under the **View** menu. This allows you to show different formats for a packet's destination on a single line. |
| Destination Physical | Shows the physical address of the packet's destination. Unlike the default *Destination* column, this column's display is unaffected by any choice you make in **Display Format** under the **View** menu. This allows you to show different formats for a packet's destination on a single line. |
| Destination Port | Displays the destination port or socket, if any, in the notation appropriate for that protocol. |
| Destination Country | Displays the destination country. If the destination country is not available, then *Private Network*, *Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Destination City | Displays the destination city. If the destination city is not available, then *Private Network, Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Destination Latitude | Displays the latitude of the destination city. |
| Flow ID | Displays the ID of the flow. |
| Destination Longitude | Displays the longitude of the destination city. |
| BSSID | Displays the ID number of the access point or base station to whose traffic this packet belongs.This six byte hexadecimal number is typically formed from the station's MAC address. |
| Transmitter | Displays the physical address of the station identified in the packet header as the Transmitter, regardless of which address field may contain that information. A transmitter is typically the last hop on a relay through the DS (distribution system) and is distinguished from the original Source address. Will appear italicized if *Calculate implied transmitter* is enabled in the **Format** tab of the **Packet List Options** dialog. |

| Column | Description |
|---|---|
| Receiver | Displays the physical address of the station identified in the packet header as the Receiver, regardless of which address field may contain that information. A receiver is typically the first hop on a relay through the DS (distribution system) and is distinct from the ultimate Destination address. |
| Address 1 | Displays the physical address found in the first address field of the 802.11 WLAN MAC header, without reference to its type: destination, receiver, or BSSID. |
| Address 2 | Displays the physical address found in the second address field of the 802.11 WLAN MAC header, without reference to its type: source, BSSID or transmitter. |
| Address 3 | Displays the physical address found in the third address field of the 802.11 WLAN MAC header, without reference to its type: source, destination, or BSSID. |
| Address 4 | Displays the physical address found in the fourth address field of the 802.11 WLAN MAC header, without reference to its type. This address field is empty, except in packets relayed through the DS, in which it holds the source address. |
| GPS Time | Displays the time reported by the GPS receiver for the fix associated with this packet. |
| Latitude | Displays the latitude portion of the GPS fix associated with the packet, reported (*N*, north or *S*, south) in degrees, minutes, and decimal fractions of a minute. |
| Longitude | Displays the longitude portion of the GPS fix associated with the packet, reported (*E*, east or *W*, west) in degrees, minutes, and decimal fractions of a minute. |
| Altitude | Displays the altitude portion of the GPS fix associated with the packet. Reported in the measurement system appropriate to the local settings associated with the user in the operating system. (US users in feet, all others in meters.) |
| Speed | Displays the speed portion of the GPS fix associated with this packet. Reported in the measurement system appropriate to the local settings associated with the user in the operating system. (US and UK users in miles per hour, all others in kilometers per hour.) |
| VLAN | Displays the VLAN tags present in the packet. |
| Flags | Contains flag characters indicating that a packet matches some particular condition, such as an error condition or type of protocol data. The characters used for flags are assignable in the **Flags** tab of the **Packet List Options** dialog. |
| Adapter | Displays the IP address or name of the adapter, or the access point or access point controller, from which each packet originated. |
| Channel | When an 802.11 adapter is selected as the capture adapter, this column displays the wireless channel for 802.11 captures.<br><br>When a Capture Engine adapter is selected as the capture adapter, this column displays the channel on which the packet was captured. |
| Frequency | The center frequency of the 802.11 WLAN channel on which the packet was captured. |
| Band | The 802.11 WLAN standard(s) governing the use of the channel on which the packet was captured. |
| Signal | Displays the RSSI (Received Signal Strength Indicator) reported in the receipt of this packet, with RSSI normalized to a percentage value. |
| Signal dBm | Displays the received signal strength reported in the receipt of this packet, in dBm (decibel milliWatts). |
| Data Rate | Displays the data rate at which the body of this packet was transmitted. |
| Noise | Displays the noise detected on receipt of this packet, expressed as a percentage. |
| Noise dBm | Displays the noise detected on receipt of this packet, expressed in dBm (decibel milliWatts). |

| Column | Description |
|---|---|
| 802.11 Flags | Displays the 802.11 frame control flags. The flags and their codes are as follows:<br>- Order (O)<br>- Protected Frame (W)<br>- More Data (D)<br>- Power Management (P)<br>- Retransmission (R)<br>- More Fragments (M)<br>- From DS (F)<br>- To DS (T) |
| MCS | Displays the Modulation Coding Scheme (MCS) index for various 802.11 packets., |
| Spatial Streams | Displays the number of spatial streams for various 802.11 packets. |
| Size | Displays the length of the packet in bytes, including the packet header, FCS bytes, and any padding. |
| Size Bar | Contains a graphic representation of the relative size of each packet, color-coded to indicate the relative size of basic protocol elements within the packet. |
| IP Length | Displays the total length of the IP datagram, in bytes. It includes the length of the IP header and data. |
| IP ID | Displays the IP ID (Identifier) of the packet. The IP ID uniquely identifies each IP datagram sent by a host. It normally increments by one each time a datagram is sent. |
| IP TTL | Displays the IP TTL (Time To Live) for IP packets, or Hop Count for IPv6 packets. |
| Date | Shows the date the packet was received. |
| Absolute Time | Displays the timestamp assigned to each packet as the actual time of capture, according to the system clock of the computer on which the program is running. Use the **Format** tab of the **Packet List Options** dialog to set the display units for all timestamps to milliseconds, microseconds, or nanoseconds. |
| Delta Time | Shows the timestamp of each packet as the elapsed time since the capture of the previous visible packet. When packets are hidden, the time shown is relative only to the previous visible packet. Use the **Format** tab of the **Packet List Options** dialog to set the display units for all timestamps to milliseconds, microseconds, or nanoseconds. |
| Relative Time | Displays the timestamp of each packet as the elapsed time since the start of the current session. You can set a particular packet as the "zero" time for all items in the *Relative Time* column. Packets captured before will show negative values, those after, positive values, all relative to the new zero time. To set a packet as the zero time by setting it as the Relative Packet, right-click the packet's line and choose **Set Relative Packet**. Use the **Format** tab of the **Packet List Options** dialog to set the display units for all timestamps to milliseconds, microseconds, or nanoseconds. |
| Protocol | Displays the protocol type of the packet. This may be shown as an LSAP value, a SNAP value, or a ProtoSpec. If you have established a symbolic name for a protocol otherwise unknown to ProtoSpecs, that name may be taken from the Name Table and displayed here. |
| Application | Displays the application associated with the packet. |
| Filter | Displays the name of the filter that allowed the packet to be entered into the capture buffer. |
| Summary | Lists any information provided about the packet by enabled Analysis Modules. |
| Analysis Module Name | Displays the name of the Analysis Module that supplied the information on that packet that is displayed in the *Summary* column. |
| Note | Shows the full text of any user-entered note associated with the packet. |
| Expert | Presents data collected about the packet by the Expert Analysis tools. Typically, this is a short description of the type of problem found in the packet or a description of the event, and may include a measurement (such as response time since another named packet) which caused this packet to be identified as an event. |
| Dynamic Decode | Displays a portion of the information present in the **Decode** view of the packet, when that information matches the most recently highlighted part of any decode of any packet in the capture window. It shows the same part of the decode for every packet that contains the selected type of information. |

### Special address ranges

There are several special cases where country information will not be available for certain IP ranges:

- *Private Network*: IPv4 addresses in the ranges 10.0.0.0/8, 172.16.0.0/12, 192.168.0.0/16, and 169.254.0.0/16 are private networks, and their location cannot be determined. They classified as '*Private Network*.' This also applies to IPv6, with ranges fd00::/8 and fe80::/10.
- *Multicast*: IP multicast addresses shall be classified as '*Multicast*.' These are IPv4 range 224.0.0.0/4 and IPv6 range ff00://8.
- *Unknown*: Any addresses not in the ranges above, but not in the Geo IP database are classified as '*Unknown*.'

## Expert view columns

The following sections describe the column headings available in the **Expert** views.

**Note** For descriptions of columns available in the Expert **VoIP Media** view, see *Voice & Video view columns* on page 344.

### Expert clients/servers, flows, and application view columns

The following table describes the columns available in the Expert **Clients/Servers**, **Flows**, and **Applications** views.

| Column | Description |
|---|---|
| Flow ID | A sequence number assigned to each unique flow identified by the Expert. |
| Name | The name of the application for the current flow |
| Client Addr | The address of the Client for the current flow. |
| Client Port | The port on which the Client or Client Addr was communicating in the current flow. |
| Client Country | Displays the client country. If the client country is not available, then *Private Network, Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Client City | Displays the client city. If the client city is not available, then *Private Network, Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Client Latitude | Displays the latitude of the client city. |
| Client Longitude | Displays the longitude of the client city. |
| Server Addr | The address of the Server or Server Addr for the current flow. |
| Server Port | The port on which the Server or Server Addr was communicating in the current flow. |
| Server Country | Displays the server country. If the server country is not available, then *Private Network, Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Server City | Displays the server city. If the server city is not available, then *Private Network, Multicast*, or *Unknown* is displayed. See *Special address ranges* on page 339. |
| Server Latitude | Displays the latitude of the server city. |
| Server Longitude | Displays the longitude of the server city. |
| Flows | For a pair of nodes, shows the number of flows detected. (*Hierarchical* view only) |
| Events | Total number of events identified by the Expert EventFinder. |

| Column | Description |
|---|---|
| Protocol | The protocol under which the packets in this flow were exchanged. |
| Application | Displays the application associated with the flow. |
| Hops | Number of router hops between the server and the capture adapter. |
| Packets | The number of packets in the selected exchange. Note that packet totals are rolled up, such that higher levels of aggregations show totals for all sub-elements. |
| Client Pkts | The total number of packets sent from the Client or Client Addr in the current flow. |
| Server Pkts | The total number of packets sent from the Server or Server Addr in the current flow. |
| Bytes | The total bytes represented by the packets which were a part of the selected flow. |
| Client Bytes | The total bytes sent from the Client or Client Addr in the current flow. |
| Server Bytes | The total bytes sent from the Server or Server Addr in the current flow. |
| Start | The timestamp of the first packet in the current flow. |
| Finish | The timestamp of the final packet in the current flow. |
| Duration | The elapsed time, from the first to the last packet of the selected exchange, represented in the form Hours:Minutes:Seconds.decimal seconds. The precision is set in the *Expert view options dialog*. |
| 3-Way Handshake | The time required for the TCP 3-way handshake (i.e., the time between the initial SYN sent from client to server, and the ACK which acknowledges the initial SYN/ACK from server to client). |
| % Wireless Retries | The number of 802.11 retry packets, as a percentage of all packets for this row. |
| Network Latency Turn Count | The number of pairs of packets used to calculate the value for network latency. Network latency is the time difference between a request packet and the first response packet. |
| Best Network Latency | The lowest observed network latency in the current flow or stream. |
| Avg Network Latency | For exchanges in which this parameter is relevant, shows the arithmetic average of all client/server network latencies for the selected pair of nodes. |
| Worst Network Latency | The longest observed network latency in the current flow. |
| Application Latency Turn Count | The number of pairs of packets used to calculate the value for application latency. Application latency is the time difference between a request packet and the first response packet with data, minus the network latency. |
| Best Application Latency | The lowest observed application latency in the current flow or stream. |
| Avg Application Latency | For exchanges in which this parameter is relevant, shows the arithmetic average of all client/server application latencies for the selected pair of nodes. |
| Worst Application Latency | The longest observed application latency in the current flow. |
| Response Time Turn Count | The number of pairs of packets used to calculate the value for response time. Response time is the time difference between a request packet and the first response packet with data. |
| Best Response Time | The lowest observed response time in the current flow or stream. |
| Avg Response Time | For exchanges in which this parameter is relevant, shows the arithmetic average of all client/server response times or of latencies for the selected pair of nodes. |
| Worst Response Time | The longest observed response time in the current flow. |
| C->S bps Turn Count | The number of packets sent from Client Addr to Server Addr, forming the basis for the throughput calculations for the current flow or conversation in this direction. |

| Column | Description |
|---|---|
| C->S bps Best | The largest observed throughput from Client Addr to Server Addr in the current flow. |
| C->S bps | The calculated simple average throughput (total throughput divided by total packets) for the traffic from Client Addr to Server Addr observed in the current flow. |
| C->S bps Worst | The smallest observed throughput from Client Addr to Server Addr in the current flow. |
| S->C bps Turn Count | The number of packets sent from Server Addr to Client Addr, forming the basis for the throughput calculations for the current flow in this direction. |
| S->C bps Best | The largest observed throughput from Server Addr to Client Addr in the current flow. |
| S->C bps | The calculated simple average throughput (total throughput divided by total packets) for the traffic from Server Addr to Client Addr observed in the current flow. |
| S->C bps Worst | The smallest observed throughput from Server Addr to Client Addr in the current flow. |
| TCP Status | For exchanges that represent TCP transactions, notes whether the session is *Open* or *Closed*. |

## Expert event log columns

The following table describes the columns in the Event Log tab of the Expert.

| Column | Description |
|---|---|
| Severity Icon | The severity of the event, as set in the **Expert EventFinder Settings** window. |
| Date/Time | The date and time this event occurred. |
| Layer | The network layer to which events of this type belong. |
| Event | The EventFinder definition which identified this packet as an event. The description may be modified to show additional information. |
| Source Addr | The source address for this packet. The node is identified by its logical address or by the symbolic name for that address if one exists in the Name Table. |
| Dest Addr | The destination address for this packet. The node is identified by its logical address or by the symbolic name for that address if one exists in the Name Table. |
| Source Port | The source port for this packet. If the port is a well known port, the protocol or application name will be shown instead of the port number. |
| Dest Port | The destination port for this packet. If the port is a well known port, the protocol or application name will be shown instead of the port number. |
| Packet | The packet number, as assigned in the **Packets** view of the capture window or capture file. |
| Flow ID | The ID (or call number, or flow index) of the flow (or call) to which the event pertains. |
| Request ID | Unique ID assigned to this individual HTTP request. |
| Call Number | Internally generated call ID. First captured call is call 1, second is call 2, and so on. Note: Do not confuse this with the “phone number” string that often appears in the gateway-assigned “Call ID” column. |
| Flow Index | Internally generated index for a single flow within a call. The first flow is index 1, second is 2, and so on. Signaling and control flows also consume index numbers, so it is rare that a call's media flows will occupy indices 1 and 2. |

## Expert node details tab rows and columns

The following table describes the rows and columns in the *Details* tab of the Expert.

| Column | Description |
|---|---|
| Name | The name (or address) of each node. The node is identified by its logical address or by the symbolic name for that address if one exists in the Name table. |
| Network Address | The logical address, in a format appropriate to the protocol of the conversation. |
| Packets Sent | The total number of packets sent by this node as a part of this conversation. |
| Bytes Sent | The total number of bytes sent by this node as a part of this conversation. |
| Average Size (Bytes) | The average size of the packets sent by this node as a part of this conversation, in bytes. |
| First Packet Time | The date and time of capture (to the nearest second) of the first packet for this node in the current conversation. |
| Last Packet Time | The date and time of capture (to the nearest second) of the last packet for this node in the current conversation. |
| Routed Hops | The number of intervening router hops between the node and the capture adapter. |
| TCP Min Window | The minimum size of the TCP window during the course of this conversation. |
| TCP Max Window | The maximum size of the TCP window during the course of this conversation. |
| Best, Worst, Average, and Turn | Shows measures of response time and throughput. |
| Network Latency | The time difference between a request packet and its first response packet. |
| Application Latency | The time difference between a request packet and its first response packet with data minus the network latency. |
| Response Time | The time difference between a request packet and its first response packet with data. |
| C-> S (units) | Shows throughput for client to server. |
| S-> C (units) | Shows throughput for server to client. |
| Layer | OSI layer of detected Expert Event for the selected flow. |
| Event | Name of Expert Event (see *Expert EventFinder* on page 152). |
| Count | Number of instances of this event for the selected node pair. |

## Flow Visualizer Packets tab columns

The following table describes the columns available in the *Packets* tab of the **Flow Visualizer**.

| Column | Description |
|---|---|
| Packet | Packet number. |
| Cumulative Bytes (Client) | Running byte count of all bytes from the client. |
| Cumulative Bytes (Server) | Running byte count of all bytes from the server. |
| Cumulative Bytes (Both) | Running byte count of all bytes, total. |
| Absolute Time | Packet Time. |
| Relative Time | Packet Time, relative to first packet in this flow. |
| Delta Time | Packet Time, relative to previous packet. |
| Size | Packet's byte count. |

| Column | Description |
|---|---|
| Client <-> Server | Graphic display of size and direction of the packet. Client arrows point right; server arrows point left. This column can also display tick marks between packets. |
| Acked By | The packet number of the first packet that ACKs this packet. |
| Ack For | The packet number of the first packet that this packet ACKs. |
| Client SACK | The SACK value present in the client packet. |
| Server SACK | The SACK value present in the server packet. |
| Summary | A display of IP and TCP data for this packet. Similar to the *Summary* column in the **Packets** view, with unique spacing of client and server information. |
| Expert | If there is an expert event for this packet, this column displays that event's message. Right-click to open *Expert EventFinder* dialog. |

## Flow Visualizer TCP Trace graph flags

The following table describes each of the flags in the TCP Trace graph of the **Flow Visualizer**.

| Client | Server | Flag | Description |
|---|---|---|---|
| | yes | | TCP PUSH flag set (appear as a diamond, rather than an arrowhead, and do not have a text label) |
| yes | yes | FIN | TCP FIN flag set (shows a square, rather than an arrowhead) |
| yes | yes | SYN | TCP SYN flag set (shows a diamond, rather than an arrowhead) |
| yes | yes | U | TCP Urgent flag set |
| yes | | RST_IN | TCP RST flag set in ACK packet from client |
| | yes | RST_OUT | TCP RST flag set in packet from server |
| | yes | R | Retransmitted data (at least one byte of SEQ overlaps) |
| | yes | O | Out of sequence data |
| yes | | Z | ACK packet with a zero window |
| | yes | P | Zero window probe |
| yes | yes | ! | The **Expert** identified an event for this packet |
| yes | yes | HD | Hardware Duplicate (also called IP Local Routing) |
| yes | | S | Selective ACK (also shows a purple line, spanning the acknowledged sequence numbers) |

# Web view columns

The following table describes the columns common to all of the **Web** views of a capture window.

| Column | Description |
|---|---|
| Name | Name of the server, client, page, or individual HTTP request. |
| Timing | Graphical timeline of this individual HTTP request. |
| Request ID | Unique ID assigned to this individual HTTP request. |

| Column | Description |
|---|---|
| Page ID | Unique ID assigned to an HTML page. All the images, stylesheets, and other embedded files that make up a single HTML page will have this same Page ID. When Page ID == Request ID, that's the HTML page's request. |
| Flow ID | Flow ID assigned to this client/server TCP connection. Same as the Flow ID that appears throughout Expert views. |
| Client Addr | Who sent this HTTP request? |
| Client Port | TCP port from which this HTTP request came. |
| Server Addr | Who sent this HTTP response? |
| Server Port | TCP port from which this HTTP response came. Usually port 80. |
| URI | What file or page on the server the HTTP request wants. Can be outrageously long for some cgi, ad server, and database-driven requests. |
| Response Code | Numeric HTTP response code, such as 200 for success, or 404 for page not found. |
| Response Text | Textual explanation of HTTP response code, such as “OK” or “Page not found”. |
| Content-Type | Value of the Content-Type HTTP response header. text/html for HTML pages, image/jpeg for jpegs. |
| Referer | Value of the Referer HTTP request header. URL of page that linked to this individual HTTP request. For embedded images, stylesheets, and so on, this is usually the containing HTML page. For HTML pages, this is the page that linked to this page. |
| Host | Value of the Host HTTP request header. Can differ from actual Server IP address when accessing a web server farm. (Not shown in screenshot above.) |
| Packets | Total number of packets. |
| Client Pkts | Request packets from client |
| Server Pkts | Response packets from server |
| Bytes | Total number of bytes |
| Client Bytes | Request bytes from client |
| Server Bytes | Response bytes from server |
| Request Data Bytes | Payload bytes from client (typically 0 unless there is some POST data). “Client Bytes” minus all the HTTP request header bytes. |
| Response Data Bytes | Payload bytes from server, often the size of the actual file transferred (unless transfer-encoding adds to or compresses the payload). “Server Bytes” minus HTTP response header bytes. |
| Start | Time of first packet, either the SYN if this is the first request on a flow, or the first packet of the HTTP GET or other HTTP request. |
| Finish | Time of last packet, either the last FIN if this is the last request on a flow, or the last packet of the HTTP response. |
| Duration | The difference between Finish and Start times. |

# Voice & Video view columns

The following table describes the columns available in the Voice & Video **Calls** and **Media** views of a capture window. Some columns are specific to either the **Calls** or **Media** view.

For a list of additional columns available in the **Voice & Video Flow Visualizer**, see *Voice & Video Flow Visualizer columns* on page 347.

| Column | Description |
|---|---|
| Call Number | Internally generated call ID. First captured call is call 1, second is call 2, and so on.<br>Note: Do not confuse this with the "phone number" string that often appears in the gateway-assigned "Call ID" column. |
| Flow Index | Internally generated index for a single flow within a call. The first flow is index 1, second is 2, and so on. Signaling and control flows also consume index numbers, so it is rare that a call's media flows will occupy indices 1 and 2. |
| SSRC | Synchronization Source: a unique 32-bit hexadecimal value that identifies a single media flow within a node. |
| Name | Internally generated string identifying a call: "from--> to" or a media flow: "RTP src:port--> dest:port" |
| Flow ID | PeekFlow-assigned ID of this single signaling, media, or media control flow. Corresponds to Flow ID values in **Expert** and **Web** views. Most flows contain two media flows, one for each direction. |
| From | Caller-assigned "phone number" of the node initiating the call. |
| To | Callee-assigned "phone number" of the node receiving the call. |
| Call ID | Gateway-assigned call identifier string, usually some sort of globally-unique identifier. |
| Call Status | Status of call is either "Opened" or "Closed." |
| Asserted Identity | P-Asserted-Identity field from SIP headers. |
| End Cause | Most recent call termination signaling like BYE or 480 not available. |
| Signaling | Specific signaling protocol for this row. |
| Protocol | Protospec name of this row. See also Signaling and Codec columns. |
| Codec | Codec used for media. |
| Bit Rate | Voice and Audio: Average bitrate for the audio stream in bits per second.<br><br>Video: Average bandwidth of transmitted video content in bits per second, excluding IP overhead, FEC (Forward Error Correction), and retransmissions. |
| Codec Type | Type of media flow: voice, audio, or video. |
| DSCP | Differentiated Services Code Point (DSCP) is meant to categorize the packet into a specific class which can then be used to manage and classify network traffic. This provides Quality of Service (QoS) to modern IP networks. |
| Caller Address | IP address or name table entry of node initiating the call. |
| Caller Port | UDP port for the node initiating the call, usually applies only to individual flow rows such as media flow rows. |
| Callee Address | IP address or name table entry of node receiving the call. |
| Callee Port | UDP port for the node receiving the call, usually applies only to individual flow rows such as media flow rows. |
| Gatekeeper Address | IP address of the first gatekeeper or proxy contacted by the caller |
| Gatekeeper Port | UDP port of the first gatekeeper or proxy contacted by the caller |
| Source Addr | The source address for this media flow. |
| Source Port | UDP port of node sending this media flow. |
| Dest Addr | The destination address for this media flow. |
| Dest Port | The destination port for this media flow. |
| Media Flows | Number of separate media flows within this call. Often two per call. |

| Column | Description |
|---|---|
| Media Packets | Number of packets in media flow. |
| Control Flows | Number of media control flows. |
| Control Packets | Number of media control packets. |
| Signaling Flows | Number of signaling flows. |
| Signaling Packets | Number of signaling packets. |
| Packets | Total number of packets in the call, including all media, signaling, and control flows. |
| Setup Time | Time between first signaling packet and the last signaling packet before media packets start flowing. |
| PDD | Post Dial Delay: Time between last signaling packet and first media packet. |
| One-Way Delay | One half of the average round-trip delay for this call or flow. |
| Start | Time of first packet in this call or media flow. |
| Finish | Time of last or most recent packet in this call or media flow. |
| Duration | The difference between Finish and Start times. |
| MOS-LOW | Because MOS scores are based on media flows, not calls, each call's quality shall be considered to be the lowest MOS score (MOS-LOW) of any of it's associated media flows. Voice media shall be scored with MOS-CQ, video media with MOS-V, and audio media with MOS-A. |
| Jitter | Jitter in seconds. Packet-to-Packet Delay Variation (RFC 3550) |
| Packet Loss % | Expected but never received packets as a percentage of expected packets. |
| MOS-LQ | An estimated listening quality Mean Opinion Score, suitable for comparison with published MOS scores. |
| MOS-CQ | An estimated conversational quality Mean Opinion Score, incorporating factors (such as echo and delay) that affect conversational quality. |
| MOS-Nom | The nominal (generally accepted maximum obtainable) MOS score for the audio stream, given a typical transmission system and particular audio codec. |
| MOS-AV | Audiovisual MOS, a 1-5 score that considers the effect of picture and audio quality and audio-video synchronization on overall user experience. |
| MOS-V | Video Mean Opinion Score, a 1-5 score that measures the impact of the video codec, image size, frame rate, packet loss distribution, GoP structure, content, and frame loss concealment on viewing quality. |
| R Factor Listening | Provides an estimate of the effects that packet loss, jitter, and codec type had on listening quality for the call. |
| R Factor Conversational | Provides an estimate of the perceptual quality of the call, incorporating factors that affect conversational quality. |
| R Factor G.107 | The ITU-T G.107 R-factor calculated for the audio stream. |
| R Factor Nominal | The nominal (generally accepted maximum obtainable) R-factor for the audio stream, given a typical transmission system and selected audio codec. |
| VS-TQ | Video Service Transmission quality, a codec independent score measuring the ability of the IP network to reliably transmit video content. |
| Voice Loss Degradation | Severity of perceptual quality degradation caused by packet loss. |
| Voice Discard Degradation | Severity of perceptual quality degradation caused by packet discard (jitter). |
| Voice Codec Degradation | Severity of perceptual quality degradation caused by codec distortion. |
| Voice Delay Degradation | Severity of perceptual quality degradation caused by delay. |
| Voice Signal Level Degradation | Severity of perceptual quality degradation caused by signal level too high/too low. |

| Column | Description |
|---|---|
| Voice Noise Level Degradation | Severity of perceptual quality degradation caused by excessive noise. |
| Voice Echo Level Degradation | Severity of perceptual quality degradation caused by uncancelled echo. |
| Voice Recency Degradation | Severity of perceptual quality degradation caused by the recency of burst packet loss. |
| Video Loss Degradation | Severity of perceptual quality degradation caused by packet loss. |
| Video Discard Degradation | Severity of perceptual quality degradation caused by packet discard (jitter). |
| Video Codec Quantization Degradation | Severity of perceptual quality degradation caused by codec quantization. |
| Video Codec Bandwidth Restrictions Degradation | Severity of perceptual quality degradation caused by codec bandwidth restrictions. |
| Video Frame Resolution Degradation | Severity of perceptual quality degradation caused by frame resolution. |
| Video Frame Rate Degradation | Severity of perceptual quality degradation caused by frame rate. |
| Video GOP Length Degradation | Severity of perceptual quality degradation caused by GoP (Group of Pictures) length. |
| Video Available Network Bandwidth Degradation | Severity of perceptual quality degradation caused by available network bandwidth. |
| Video Delay Degradation | Severity of perceptual quality degradation caused by delay. |
| Video A/V Synchronization Degradation | Severity of perceptual quality degradation caused by audio/video synchronization. |
| Video Recency Degradation | Severity of perceptual quality degradation caused by the recency of burst packet loss. |

# Voice & Video Flow Visualizer columns

In addition to many of the columns available in the Voice & Video views, (see *Voice & Video view columns* on page 344), the following table describes columns also available in the **Voice & Video Flow Visualizer**.

| Column | Description |
|---|---|
| Packet | Packet number. For RTP/RTCP rows, this is the first packet in that row. |
| Message | There is one set of messages per signaling flow. If a call has multiple signaling flows (i.e. H.225/Q.931, and H.245), there will be multiple sets of messages. Each new message in the signaling flow increments the message index.<br><br>You can use the Message index and the Flow Index together to get an understanding of the sequence of events on multiple signaling channels for a single call. |
| Time | Packet time. |
| Relative Time | Time relative to the first row in the Voice & Video Flow Visualizer. |
| Finish | Time of last packet in the RTP/RTCP row. |
| Duration | Finish - Time |
| Bounce Diagram | The “visual” part of Voice & Video Flow Visualizer. |
| DSCP | Differentiated Services Code Point (DSCP) is meant to categorize the packet into a specific class which can then be used to manage and classify network traffic. This provides Quality of Service (QoS) to modern IP networks. |
| Response Code | Response code number, such as 100 or 200 for SIP responses *Trying* or *OK*. |
| Response Text | Response message, such as SIP responses *Trying* or *OK*. |

| Column | Description |
|---|---|
| Sequence | Signaling sequence number |
| Sequence Method | Signaling sequence method |
| Media Packets | Number of RTP packets in this RTP/RTCP row. |
| Control Packets | Number of RTCP packets in this RTP/RTCP row. |
| RTP/RTCP | Values for last RTP packet in this RTP/RTCP row:<br><br>Jitter<br>MOS-LQ<br>MOS-CQ<br>MOS-Nom<br>MOS-AV<br>MOS-V<br>R Factor Listening<br>R Factor Conversational<br>R Factor G.107<br>R Factor Nominal<br>VS-TQ |

# Files view columns

The following table describes the columns available in the list view of the **Files** view of a capture window.

| Column | Description |
|---|---|
| Name | The name of the file. |
| File ID | The unique ID assigned to the file. |
| Request ID | The unique ID assigned to the individual HTTP request. |
| Flow ID | The Flow ID assigned to this client/server TCP connection. Same as the Flow ID that appears throughout Expert views. |
| Client Addr | The address of the client that sent the HTTP request. |
| Client Port | The TCP port from where the HTTP request originated. |
| Client Country | The country from where the HTTP request originated. |
| Client City | The city from where the HTTP request originated. |
| Client Latitude | The latitude of the client city. |
| Client Longitude | The longitude of the client city. |
| Server Addr | The address of the server that sent the HTTP response. |
| Server Port | The TCP port from where the HTTP response came. Usually port 80. |
| Server Country | The country from where the HTTP response came. |
| Server City | The city from where the HTTP response came. |
| Server Latitude | The latitude of the server city. |
| Server Longitude | The longitude of the server city. |
| URI | The file or page on the server the HTTP request wants. Can be outrageously long for some cgi, ad server, and database-driven requests. |
| Content-Type | The value of the Content-Type HTTP response header. For example, text/html for HTML pages and image/jpeg for jpegs. |

| Column | Description |
|---|---|
| Referer | The value of the Referer HTTP request header. URL of page that linked to this individual HTTP request. For embedded images, stylesheets, and so on, this is usually the containing HTML page. For HTML pages, this is the page that linked to this page. |
| Host | The value of the host HTTP request header. Can differ from the actual Server IP address when accessing a web server farm. |
| Size | The size of the file. |
| First Packet | The first packet that contains an HTTP payload. |
| Last Packet | The last packet that contains an HTTP payload. |
| Start | The absolute time of the First Packet with an HTTP payload. |
| Finish | The absolute time of the Last Packet with an HTTP payload. |
| Duration | The difference between Start and Finish times. |

# Nodes statistics columns

The following table describes the columns common to all of the flat views in the **Nodes** view of a capture window.

| Column | Description |
|---|---|
| Node | The address or name of the node, in the format appropriate to the view type. |
| Country | The name and flag of the country where each node is physically located. |
| City | The name of the city where each node is physically located |
| Latitude | Displays the latitude of the city where each node is physically located. |
| Longitude | Displays the longitude of the city where each node is physically located. |
| Utilization % | The amount of bandwidth used by this node expressed as a percentage of the total possible bandwidth of the adapter from which you are capturing. It is an average over the duration of the capture. |
| Total Bytes % | Percentage of total bytes sent and received by this node. |
| Total Packets % | Percentage of total packets sent and received by this node. |
| Total Bytes | Total bytes sent and received by this node. |
| Total Packets | Total packets sent and received by this node. |
| Bytes Sent | Total bytes sent by this node. |
| Bytes Received | Total bytes received by (or addressed to) this node. |
| Packets Sent | Total packets sent by this node. |
| Packets Received | Total packets received by (or addressed to) this node. |
| Broadcast Packets | Total broadcast packets sent by this node. |
| Broadcast Bytes | Total broadcast bytes sent by this node. |
| Multicast Packets | Total multicast packets sent by this node. |
| Multicast Bytes | Total broadcast and multicast packets sent by this node. |
| Broadcast/Multicast Packets | Total broadcast and multicast packets sent by this node. |

| Column | Description |
|---|---|
| Broadcast/Multicast Bytes | Total broadcast and multicast packets sent by this node. |
| Min. Size Sent | The size of the smallest packet sent by this node. |
| Max. Size Sent | The size of the largest packet sent by this node. |
| Avg. Size Sent | The average size of the packets sent by this node. |
| Min. Size Received | The size of the smallest packet received by this node. |
| Max. Size Received | The size of the largest packet received by this node. |
| Avg. Size Received | The average size of the packets received by this node. |
| First Time Sent | Time stamp of the first packet sent by this node. |
| Last Time Sent | Time stamp of the most recent packet sent by this node. |
| First Time Received | Time stamp of the first packet received by this node. |
| Last Time Received | Time stamp of the most recent packet received by this node. |
| Duration | The difference between the time stamp of the earliest sent or received packet and that of the most recent sent or received packet. |
| Peers | The number of nodes that are communicating with this node. |
| Packets/Peers | The average number of packets for all of the nodes that are communicating with this node. |
| Bytes/Peers | The average number of Bytes for all of the nodes that are communicating with this node. |

# Applications statistics columns

The following table describes the available columns and options in the **Applications** statistics of a capture window.

| Column | Description |
|---|---|
| Application | The name of the application. |
| Category | The category for the application. |
| Productivity | Productivity is scored relative to a work environment, and follows this scheme:<br>1: Not suitable inside of a working environment<br>2: Unlikely to be used for work tasks<br>3: Broad-use traffic that could be used for either personal or work-related tasks<br>4: Likely work-oriented traffic<br>5: Traffic is solely for work or office purposes |
| Risk | Risk is determined on a scale of 1 to 5. We look at four weighted risk factors:<br>1 pt. Excessive bandwidth<br>1 pt. Potential data leakage<br>1 pt. Prone to misuse<br>2 pts. Contains or is used by malware |
| Utilization % | The amount of bandwidth used by this application expressed as a percentage of the total possible bandwidth of the adapter from which you are capturing. It is an average over the duration of the capture. |
| Bytes % | Percentage of total bytes sent and received by this application. |
| Packets % | Percentage of total packets sent and received by this application. |
| Bytes | Total bytes sent and received by this application. |

| Column | Description |
|---|---|
| Packets | Total packets sent and received by this application. |
| First Time | Time stamp of the first packet sent by this application. |
| Last Time | Time stamp of the most recent packet sent by this application. |
| Columns | Displays the Columns dialog that lets you select and reorder the columns to display in the Applications statistics. |
| Show Columns | Displays all columns available in the Applications statistics. |

# WLAN statistics columns

The following table describes all of the columns available in the **WLAN** view of a capture window.

Data rates are dependent on physical layer implementations, and different data rate columns are available, depending on the standards supported by the selected adapter.

In 802.11 WLANs, every packet begins with a preamble and PLCP header sent at the lowest common data rate. The body of the packet can then be sent at any of the supported data rates. It is the data rate at which the body of the packet is sent that is reported in data rate columns.

| Column | Description |
|---|---|
| Node | The *Node* column in the **WLAN** view displays detected nodes in a nested hierarchy of stations (*STA*) under *BSSIDs*, under *ESSIDs*. |
| ESSID | The ESSID for this node. When ESSIDs are in use, access points (or equivalents) will announce their ESSID in Beacon packets and/or Probe Response packets. |
| Type | The type of node. This is either the identifying string of an extended service set (*ESSID*), an access point (*AP*), an ordinary station temporarily acting as the base station for an ad hoc group (*Ad Hoc*), or a Station (*STA*). Broadcast and multicast destination addresses which cannot be identified as belonging to a particular node are identified by the *Admin* label. Unknown node types will show a blank in this field. |
| Channel | The channel on which Omnipeek was listening when the most recent packet for this node was captured. During a channel scan, this value may appear anomalous, as the same node may be detected on multiple channels but only the most recent will show in this column.<br><br>**Important:** The channel shown for Nodes identified as an access point (*AP*) will be the channel on which that AP is broadcasting, as identified in the AP's Beacon packets and Probe Responses. |
| Frequency | The frequency in MHz of the traffic captured on a specific channel. |
| Band | The identifying band of the traffic captured on a specific channel such as a/b/g/n. |
| Association Strength | The WLAN view ranges each STA under the AP (or equivalent) with which it most recently communicated. The *Association Strength* parameter allows you to distinguish between nodes that are simply probing (searching for an AP with which to associate) and those that are truly associated (those that have completed the association process with a particular AP). Nodes that are truly associated with their AP show an Association Strength of *Strong*. Those that are not associated, but have merely communicated (typically with a probe packet) show an Association Strength of *Weak*. |
| Authentication | Shows the most recently seen form of authentication used by this node to connect with its BSSID. Example values include *EAPTLS*, *LEAP*, and *PEAP*. Note that Omnipeek does not monitor the authentication state of all nodes, but only registers the most recent authentication. Also, some authentication methods are encrypted in a way that prevents identification of the authentication method. |
| Encryption | Shows the most recently seen form of encryption used by this node to communicate with its BSSID. Example values include *CKIP*, *TKIP*, *WEP* and *CCMP*. Note that Omnipeek does not monitor the encryption state of all connections, but only registers the most recent method seen from each node. |
| Trust | Shows the user-assigned trust setting from the Name Table for this BSSID or STA. Right-click any node to change this property. See *Trusted, known, and unknown nodes* on page 280. |

| Column | Description |
|---|---|
| Signal Strength columns | Columns showing statistics related to signal strength reported with each packet, expressed either as a percentage or in decibel milliWatts (dBm).<br><br>Cur. = Most recently reported signal strength on the channel.<br><br>Min. = Minimum signal strength reported on this channel from the time the statistics count was created until the most recent update.<br><br>Max. = Maximum signal strength reported on this channel from the time the statistics count was created until the most recent update. |
| Noise columns | Columns showing statistics related to noise reported with each packet, expressed either as a percentage or in decibel milliWatts (dBm).<br><br>Cur. = Most recently reported noise reading on the channel.<br><br>Min. = Minimum noise reading reported on this channel from the time the statistics count was created until the most recent update.<br><br>Max. = Maximum noise reading reported on this channel from the time the statistics count was created until the most recent update. |
| Bytes Sent | Bytes sent by this node. |
| Bytes Received | Bytes received by this node. |
| Total Bytes | Total bytes, both sent and received, for this node. |
| Packets Sent | Packets sent by this node. |
| Packets Received | Packets received by this node. |
| Total Packets | Total packets, both sent and received, for this node. |
| Retry Packets | Retry packets sent by this node. |
| Protected Packets | Number of encrypted packets sent by this node (Protected Frame bit set to 1). |
| WEP ICV Errors | Number of WEP ICV errors encountered in attempting to apply WEP keys to packets from this node. |
| WEP Key | Name of the user-defined WEP key currently in use to decrypt traffic from this node. |
| Beacon Packets | Number of beacon packets sent by this node. |
| Broadcast ESSID | Number of broadcast ESSID packets sent by this node. |
| Power Save | The power save state most recently reported by this node. Values are *awake* or *sleep*. |
| Roam Time | For STAs moving between APs, shows the time between last successful data transmission (for example, with previous AP) and successful association with new AP. For APs, shows average value for associated STAs entering the BSS during the capture session. |
| Data Rate columns | Columns show the number of *Packets* (or *Bytes*) sent at the data rate named in the column header. You can show columns for any and all data rates supported by the current adapter. |
| Broadcast Packets | Total broadcast packets sent by this node. |
| Broadcast Bytes | Total broadcast bytes sent by this node. |
| Multicast Packets | Total multicast packets sent by this node. |
| Multicast Bytes | Total multicast bytes sent by this node. |
| Min. Size Sent | The size of the smallest packet sent by this node. |

| Column | Description |
|---|---|
| Max. Size Sent | The size of the largest packet sent by this node. |
| Avg. Size Sent | The average size of the packets sent by this node. |
| Min. Size Received | The size of the smallest packet received by this node. |
| Max. Size Received | The size of the largest packet received by this node. |
| Avg. Size Received | The average size of the packets received by this node. |
| First Time Sent | Time stamp of the first packet sent by this node. |
| Last Time Sent | Time stamp of the most recent packet sent by this node. |
| First Time Received | Time stamp of the first packet received by this node. |
| Last Time Received | Time stamp of the most recent packet received by this node. |
| Duration | The difference between the time stamp of the earliest sent or received packet and that of the most recent sent or received packet. |
| Privacy | Shows *True* or *False*, and indicates whether the Privacy bit in the capabilities sections of Management packets (Beacon, Probe, and so forth) recently sent by this node was set to 1 (*True*) or 0 (*False*). This tells potential peers that the sending node will use encryption (***True***) or will not (*False*). |

# Channel statistics columns

The following table describes all of the columns available in the **Channels** view of a capture window.

| Column | Description |
|---|---|
| Channel | The number of the channel, indicating its center frequency. |
| Frequency | Shows frequency of channel in MHz (for example, 5180MHz for Channel 36). |
| Band | Shows wireless band of channel (for example, 802.11a, 802.11b, and 802.11n). |
| APs | Number of access points seen on the channel. |
| Total | Total of all traffic on the channel. |
| Data | Data packets. |
| Mgmt | Management packets. |
| Ctrl | Control packets. |
| Local | Local traffic, not associated with any Distribution System (DS). Includes Station to Station plus management and control packets. The TO DS and FROM DS bits are both set to 0. |
| From DS | The number of packets on that channel which were marked as “From DS,” meaning they were tagged as being directed toward a Distribution System. This generally means packets from an access point to a client. |
| To DS | The number of packets on that channel which were marked as “To DS,” meaning they were tagged as being directed toward a Distribution System. This generally means packets from a client to an access point. |
| DS-DS | The number of packets on that channel which were marked as both “To DS” and “From DS,” meaning they were tagged as being from one Distribution System to another. This generally means packets from one access point to another access point. |
| Retry | Packets in which the Retry bit is set to 1, indicating the packet is a retransmission. |

| Column | Description |
|---|---|
| Protected | Packets in which the Protected Frame bit is set to 1, indicating the packet payload is encrypted. |
| Order | Packets in which the Order bit is set to 1, requesting the contents be handled in strict order. |
| CRC Errors | Packets with CRC errors. The CRC is a checksum performed over the whole packet. CRC errors indicate the packet was truncated or garbled in transmission. This is common in cases of channel overlap and interference. |
| WEP ICV | Packets containing WEP ICV Errors. The ICV is a checksum performed over the data portion of a WEP-encrypted packet. On an otherwise properly formed packet, a WEP ICV failure often means the WEP keys used to decrypt the packet are not the right ones. Packets with CRC errors will commonly show as also having WEP ICV errors. |
| Signal Strength columns | Columns showing statistics related to signal strength reported with each packet, expressed either as a percentage or in decibel milliWatts (dBm).<br><br>Min. = Minimum signal strength reported on this channel from the time the statistics count was created until the most recent update.<br><br>Max. = Maximum signal strength reported on this channel from the time the statistics count was created until the most recent update.<br><br>Cur. = Most recently reported signal strength on the channel.<br><br>Avg. = Average signal strength over the period of statistics collection on this channel. Calculated as the simple average of all reported signal strengths seen, regardless of duration. |
| Noise columns | Columns showing statistics related to noise reported with each packet, expressed either as a percentage or in decibel milliWatts (dBm).<br><br>Min. = Minimum noise reading reported on this channel from the time the statistics count was created until the most recent update.<br><br>Max. = Maximum noise reading reported on this channel from the time the statistics count was created until the most recent update.<br><br>Cur. = Most recently reported noise reading on the channel.<br><br>Avg. = Average noise reading over the period of statistics collection on this channel. Calculated as the simple average of all reported noise readings seen, regardless of duration. |
| Created | Date and time at which this channel was first scanned for a signal, in the current session. |
| Updated | Date and time of the most recent scan of this channel, in the current session. |
| Data Rate columns | A variety of columns showing the number of packets/bytes in which the data portion of the packet was transmitted at the specified data rate. |

# Capture Engine capture tab columns

The following table lists the columns and their descriptions available from the *Captures* tab of a Capture Engine window.

| Column | Description |
|---|---|
| Capture | Name of the capture window. |
| Comment | Displays any comments added to the capture window when the capture was first created. |
| Status | For example, *Capturing* or *Idle*. |
| Adapter | Adapter used by Capture Engine. |

| Column | Description |
|---|---|
| Link Speed | Reported automatically by the adapter in Mbits per second |
| Media | For example, *Ethernet*. |
| Buffer size | Total size of capture buffer set for current capture. |
| Packets Received | Total packets presented on the adapter used by this capture window. |
| Packets Filtered | Total packets accepted into the buffer. |
| Packets Analyzed | Total packets analyzed when analysis is enabled on a given capture. |
| Analysis Dropped Packets | Total packets dropped between the adapter and user space. |
| Packets Dropped | Total packets dropped from the buffer. |
| Start Time | Time at which capture was begun. |
| Stop Time | Time at which capture was stopped. |
| Duration | Elapsed time since start of current capture. |
| Alarms | Shows a separate icon (indicating severity of notification) for each alarm enabled in the capture window that is indicating a Suspect Condition or Problem Condition. |
| Owner | Username of the person who created the capture window. |
| Modified by | Username from the login of the person that most recently made any change to the capture window. |
| Action | Most recent action (for example, *Start Capture*). |

# Capture Engine files tab columns

The following table lists the columns and their descriptions available from the *Files* tab of a Capture Engine window.

| Column | Description |
|---|---|
| Name | Name of the file saved to the Data Folder on the Capture Engine. See *Configuring and updating Capture Engine settings* on page 19. |
| Path | The location of the saved file. |
| Capture | Name entered in the General view of the remote capture Options dialog. |
| Size | Size of capture. |
| Media | Media type of capture. |
| Packets | When capture is stopped, displays number of capture packets. |
| Start Time | Time when remote capture began. |
| Stop Time | Time when remote capture was stopped. |
| Duration | Total length of remote capture. |
| Time Zone | Time Zone in which capture took place. |
| Adapter | Adapter selected for this capture. |
| Adapter Address | MAC address of computer on which selected adapter resides. |

| Column | Description |
|---|---|
| Link Speed | The speed as reported by the adapter in Mbits/second. |
| File Number | The number of the file in a capture-to-disk session |

# Capture Engine details tab columns

The following table lists the columns and their descriptions available from the nested *Details* tab of a Capture Engine window *Forensics* tab.

| Column | Description |
|---|---|
| Capture | Name entered in the General view of the Capture Options dialog. |
| Session Start Time | Start time of capture session. |
| Data Start Time | Start time of available data in the capture session. |
| Data End Time | End time of available data in the capture session. |
| Duration | Length of time of available data in the capture session. |
| Size | Size of available data in the capture session. |
| Packets | Number of captured packets in the capture session. |
| Packets Dropped | Number of dropped packets in the capture session. |
| Media | Media type of capture. |
| Adapter | Adapter for the capture session. |
| Adapter Address | MAC address of the adapter for the capture session. |
| Link Speed | The speed as reported by the adapter in Mbits/second. |
| Owner | Name of user that created the capture. |

APPENDIX C

# Omnipeek Installed Components

## In this appendix:

# Component descriptions

The default location for Omnipeek installed components is typically *C:\Program Files\LiveAction\Omnipeek*. The following table lists and describes each component:

| Component | Description |
|---|---|
| Alarms | The *1033/Alarms* directory contains two sets of predefined alarms (*default alarms.alm* and *additional alarms.alm*) which you can import into the Alarms window. You can also modify the alarms in these files. See Chapter 15, *Setting Alarms and Triggers*. |
| Copyrights | The *1033/Copyrights* directory contains text files of certain licenses used in Omnipeek. |
| Dashboard | The *1033/Dashboard* directory contains settings for the dashboards. |
| Documents | The *1033/Documents* directory contains PDF versions of the User Guide, Getting Started Guides for all Omni software. |
| Expert | The *1033/Expert* directory contains the html files used by the Expert EventFinder. See Chapter 8, *Expert Analysis* / |
| Filters | The *1033/Filters* directory contains the files *default.flt* and *default hardware filters.flt*, which are the default selection of filters for use with the program. You can create, modify, or delete individual filters, and save and reload various assortments of filters in named **.flt* files for use in different packet capture scenarios. |
| Graphs | The *1033/Graphs* directory contains the default set of graphs for the Graphs view of capture windows and capture file windows in files called default graphs.gph. and default *remotegraphview.xml*. |
| Html | The *1033/Html* directory contains the html version of the *Omnipeek Getting Start Guide*. |
| Names | The *1033/Names* directory contains configuration files for Name Table entries you might want to install. The *default.nam* file provides a starting configuration for the Name Table, and includes a current list of the Vendor ID portion of MAC addresses. This allows you to substitute the name of the card manufacturer for the first three bytes of any physical address. |
| Analysis modules | The *1033/PluginRes* directory contains files used by Analysis Modules that enhance the program's analyzing capabilities. For a complete description of the Analysis Modules available with the program, see Appendix D, *Analysis Modules*. |
| Reports | The *1033/Reports* directory contains XML, XSL, and HTML templates, along with related support files, for use with the Save Report functions and with options available in the Statistics Output views of the Capture Options dialog. See *Generating statistics output reports* on page 234 for more details. |
| Utilities | The *Bin* directory contains helpful utilities, such as the two command line utilities included with Omnipeek. PeekCat concatenates smaller capture files into a larger one. PeekSplit creates smaller capture files out of a larger one. |
| Compass | The *Compass* directory contains the **Compass** dashboard Flash UI and support files. |
| Packet decoders | The *Decodes* directory contains the modules used to decode packets. These modules provide Omnipeek with the instructions it needs to display packet contents, based on the types of protocols used. |
| Drivers | The *Drivers* directory contains the Omnipeek drivers for supported adapters and operating systems, along with their installation instructions. |
| MIBs | The *MIBs* directory contains the MIB file that supports the SNMP Trap action in notifications. For an overview of the notifications functions in Omnipeek, see Chapter 16, *Sending Notifications*. |
| Plugins | The *Plugins* directory contains the DLL files for the Analysis Modules. |
| Samples | The *Samples* directory contains a variety of sample capture files and an associated name table file. You can use these files for testing, training, and to familiarize yourself with program functions. See the *Readme* file in that directory for more details. |

| Component | Description |
|---|---|
| Application Data | Application data, such as names, filters, log files, and so forth, is cached in the Application Data folder. The default location of the Application Data folder is in a directory in the root drive where the operating system is installed (typically C:\) with the path name: Documents and Settings\(user name)\Application Data.<br><br>Omnipeek creates a subdirectory structure within these locations to cache application data. That subdirectory structure is: *LiveAction\Omnipeek*. For example, the application data for the Administrator of a Windows 7 64-bit system would be cached in: *C:\Users\tsadmin\AppData\Roaming\LiveAction\Omnipeek.* |
| GPS | The LiveAction GPS Daemon is the interface between itself and your GPS receiver and is typically installed by default at *C:\Program Files\Common Files\LiveAction\GPS\gpsdaemon.exe.* |

# Analysis Modules

## In this appendix:

# Analysis Module Descriptions

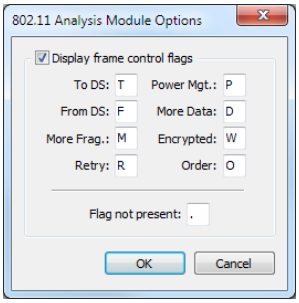
This appendix describes each of the *Analysis Modules* options found in the **Options** dialog. To view the **Options** dialog, on the **Tools** menu, click **Options** (or on the Start Page, click *List installed plug-ins*).

## 802.11 Analysis

The 802.11 analysis module displays and logs the values found in the one-bit frame control fields of the 802.11 WLAN MAC headers.

**To open the 802.11 Analysis Module Options dialog:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *802.11 Analysis Module* and click **Options**. The **802.11 Analysis Module Options** dialog appears.



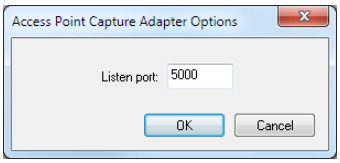

3. Select *Display frame control flags* to have flags displayed in the Summary column of the **Packets** view of capture windows.
4. Assign (or accept defaults for) the character Omnipeek will use for each of the frame control flags monitored by the analysis module.
   - To change the character, type a new value beside the flag.
   - Indicate null values for any of the frame control flags by entering the character in the *Flag not present* text box.
5. Click **OK** to accept your changes.

## Access Point Capture Adapter

The *Access Point Capture Adapter*, lets you stream packets from one or more access points into a running wireless capture window in Omnipeek. To begin streaming packets, you will need to create a new Access Point Capture Adapter entry, and then select the new adapter as the adapter for a capture window. See *Capturing Packets from an Access Point Capture Adapter* on page 36.

**To configure the port on Omnipeek should listen on for the access point data:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *Access Point Capture Adapter* and click **Options**. The **Access Point Capture Adapter Options** dialog appears.



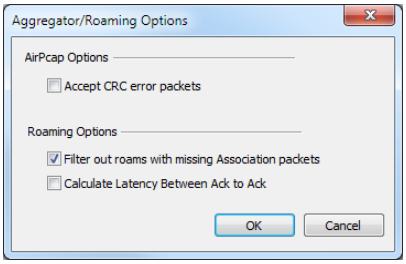

3. Enter a *Listen port* value. The default is 5000.
4. Click **OK** to accept your changes.

# Aggregator/Roaming Adapter

The *Aggregator/Roaming Adapter*, which appears in the **Analysis Modules** view of the **Options** dialog in Omnipeek, lets you capture and analyze traffic from multiple sources. For wired traffic, it aggregates packets from multiple wired adapters. For wireless traffic, it captures wireless packets from multiple channels simultaneously, measures vital statistics on each channel separately, and calculates the latency of devices roaming between access points. See *Configuring adapter options* on page 34. You can enable or disable the Aggregator/Roaming Adapter functionality in Omnipeek in the **Analysis Modules** view of the **Options** dialog.

**To change options in the Aggregator/Roaming Options dialog:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *Aggregator/Roaming* and click **Options**. The **Aggregator/Roaming Options** dialog appears.




3. Configure the dialog:
   - *Accept CRC packets*: Select this option to show CRC packets for AirPcap adapters in the **Packets** view.
   - *Filter out roams with missing Association packets*: Select this option to hide missing association packets in the **Roaming** views. This option is enabled by default.
   - *Calculate Latency Between Ack to Ack*: Select this option to calculate the latency between the last data packet with a corresponding ACK from the old access point, and the first data packet with a corresponding ACK from the new access point. Also by default, this option filters out all the roams with missing association.
4. Click **OK** to accept your changes.

# Checksums Analysis

Many network error detection and correction techniques are based on checksums. The sender performs a computation on the data to be sent and the result, the checksum, is included with the transmission. The receiver performs the same computation on the data it receives and compares its results to the sender's checksum. If a difference exists, the data is most likely corrupted and the sender is asked to retransmit the data.

The Checksums analysis module verifies checksums and keeps track of the total number of invalid checksums for IP headers and data (including ICMP, IGMP, TCP, and UDP). Invalid checksums can be displayed in capture windows. This analysis module can send notifications.

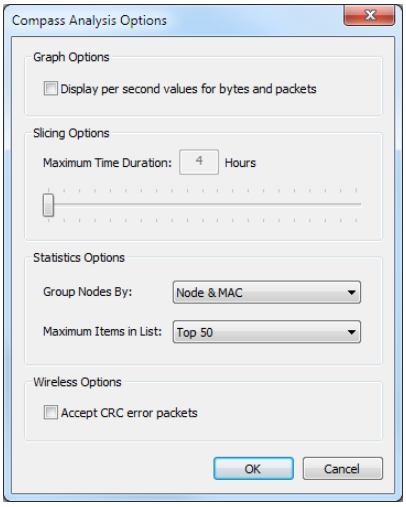
# Compass Analysis

The Compass Analysis module displays the **Compass** dashboard inside a capture window. The **Compass** dashboard is an easy-to-use network monitoring tool for both wired and wireless networks. It is an interactive forensics dashboard that displays network utilization over time, including top protocols, flows, nodes, channels, WLAN, VLAN, Data Rates, Applications, and Countries. See *Compass dashboard* on page 65.

**To change options in the Compass Options dialog:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.

2. Select *Compass Adapter* and click **Options**. The **Compass Options** dialog appears.




3. Configure the **Compass Options** dialog:
   - Select *Display per second values for bytes and packets* if you would like per second values to appear.
   - Use the *Maximum Time Duration* slider bar to set the 'Slicing' value. 'Slicing' refers to removing a portion of time from the beginning of the statistics database, thereby leaving the most recent data restricted to a maximum time duration. 'Slicing' only occurs during real-time captures.

   **Note** When the statistics database reaches a time duration equal to the maximum time duration + 10 minutes, Compass removes the first 10 minutes of statistics data from the database.

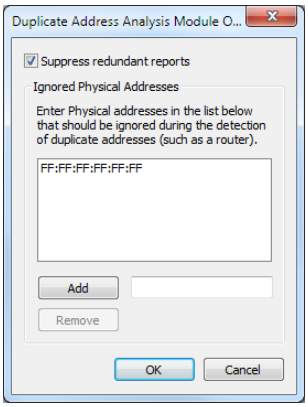
   - Select from *Group Nodes By:*, the preferred method for grouping statistics in the statistic chart windows (Node & MAC, Node, or Mac).
   - Select from *Maximum Items in List:*, the maximum number of list view items to display for statistic chart windows (Top 5, 10, 20, 50 or 100).
   - Select *Accept CRC error packets* if you would like to also capture CRC error packets when capturing wireless packets.
4. Click **OK** to accept your changes.

## Duplicate Address

The Duplicate Address analysis module displays and logs instances of two or more network devices using the same IP address. When two separate physical addresses are noted by the Duplicate Address analysis module to be using the same logical IP address, the analysis module produces a Notification. The Duplicate Address analysis module also adds a count of duplicate IP addresses detected to **Summary Statistics** and the Summary view of any capture window.

**To change options in the Duplicate Address analysis module Options dialog:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *Duplicate Address Analysis Module* and click **Options**. The **Duplicate Address Analysis Module Options** dialog appears.




3. Select *Suppress redundant reports* and enter the physical addresses of devices that should be ignored. (By default, duplicate reports for the physical hardware broadcast address are suppressed.)
4. Click **OK** to accept your changes.

> **Tip** For the most accurate results, you should use the Name Table to identify routers on the local segment before enabling the Duplicate Address analysis module.

Duplicate IP address notifications are usually caused by multiple routers. Because routers forward traffic from other networks at OSI Layer 3, the logical address (IP) is forwarded unchanged but the physical address (MAC) is changed to that of the router doing the forwarding. When there is more than one router on the local segment, multiple physical addresses may be associated with a single logical address and send a Duplicate Address notification.

## Email Analysis

The Email analysis module displays SMTP and POP3 commands that can be helpful in debugging Internet mail problems. The Email analysis module reports on client/server connections by counting the number of mail transfers initiated, the number of successful transfers, and the number of failed transfers. It then delivers this information to **Summary Statistics** and to the Summary column in the **Packets** view of any capture window,.

SMTP specifies the exact format of messages a client on one machine uses to transfer mail to a server on another. Communication between a client and a server consists of readable ASCII text.

First, the client establishes a reliable stream connection to the server and then waits for the server to send a 220 READY FOR MAIL message. If the server is overloaded, it may delay sending the 220 message temporarily. Once the 220 message is received by the client, the client sends a HELO command.

The server responds by identifying itself. Once communication has been established, the sender can transmit one or more mail messages, terminate the connection, or request the server to reverse the roles of sender and receiver so messages can flow in the opposite direction. The receiver must acknowledge each message. It can also suspend the entire connection or the current message transfer.

Mail transactions begin with the MAIL command which provides the sender identification as well as a FROM: field that contains the address to which errors should be reported. A recipient prepares its data structures to receive a new mail message and replies to a MAIL command by sending the response 250, which means all is well. The full response consists of the text 250 OK. As with other application protocols, programs read the abbreviated commands and 3-digit numbers at the beginning of lines. The remaining text is intended to help debug mail software.

After a successful MAIL command, the sender issues a series of RCPT commands that identify recipients of the mail message. The receiver must acknowledge each RCPT command by sending 250 OK or by sending the error message 550 No Such User Here.

After all RCPT commands have been acknowledged, the sender issues a DATA command. In essence, a DATA command informs the receiver that the sender is ready to transfer a complete mail message. The receiver responds with message 354 Start Mail Input and specifies the sequence of characters used to terminate the mail message. The termination sequence consists of 5 characters: carriage return, line feed, period, carriage return, and line feed.

Although clients can suspend the delivery completely if an error occurs, most clients do not. Instead, they continue delivery to all valid recipients and then report problems to the sender.

Usually, the client reports errors using email. The error message contains a summary of the error as well as the header of the mail message that caused the problem.

Once the client has finished sending all the mail messages to a particular destination, the client may issue the TURN command to turn the connection around. If it does, the server responds 250 OK and assumes control of the connection. With the roles reversed, the side that was originally the server sends back any waiting mail messages. Whichever side controls the interaction can choose to terminate the session by issuing a QUIT command. The other side responds with command 221, which means it agrees to terminate. Both sides then close the TCP connection.

## FTP Analysis

The FTP analysis module provides the ability to:

- Report the number of successful file transfer initiations, completions, and failures.
- Report and display the names of files that are being uploaded or downloaded.
- Report and display ftp commands (for example, ls, cd, and so forth).

The FTP analysis module also watches FTP control traffic for status messages that signal the successful start and end of a file transfer. A count is then added to **Summary Statistics** for these values. The FTP analysis module can also write these control messages to the Summary column of the **Packets** view of capture windows.

FTP can send an unsuccessful termination message. This condition is rare, but can be of interest to a network manager, especially if there is a high incidence of terminated sessions. Normally, failed FTP transactions are due to unexpected network delays or disruptions. Because a status packet does not usually accompany termination, the only way for a network manager to be aware of this condition is by monitoring the difference between the successful start and end of file transfers. A high discrepancy can signal not only potential network problems, but also additional loss of bandwidth due to unsuccessful transfers.

## ICMP Analysis

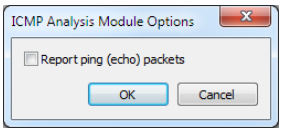
ICMP (Internet Control Message Protocol) is a maintenance protocol that handles error messages to be sent when packets are discarded or when systems experience congestion. For example, the classic TCP/IP test command is PING. It sends an ICMP Echo Request to a remote system. If the system responds, the link is operational. If it fails to respond to repeated pings, something is wrong.

Another important function of ICMP is to provide a dynamic means to ensure that your system has an up-to-date routing table. ICMP is part of any TCP/IP implementation and is enabled automatically. ICMP messages provide many functions, including route redirection. If your workstation forwards a packet to a router, for example, and that router is aware of a shorter path to your destination, the router sends your workstation a redirection message informing it of a shorter route.

The ICMP analysis module displays information about ICMP destination unreachables, ICMP redirects, ICMP address mask replies, ICMP source quenches, and more. The analysis module can display ICMP type and code in **Summary Statistics** and in the Summary column of the **Packets** view of capture windows. This analysis module can also send notifications.

**To change options in the ICMP analysis module Options dialog:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *ICMP Analysis Module* and click **Options**. The **ICMP Analysis Module Options** dialog appears.




3. Select *Report ping (echo) packets* to log or deselect to ignore ping (echo) packets. The default is to ignore these packets since they are quite common.
4. Click **OK** to accept your changes.

## IP Analysis

The IP analysis module keeps track of and displays information about requests and responses from ARP, RARP, DHCP, and DNS; and TCP sequence numbers, acknowledgement numbers, windows, and flags, as well as TCP and UDP port numbers.

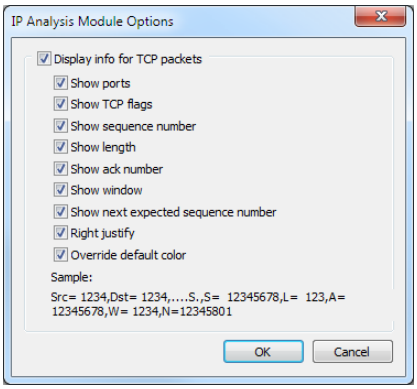
Address Resolution Protocol (ARP) dynamically discovers the physical address of a device, given its IP address. Reverse Address Resolution Protocol (RARP) enables a device to discover its IP address by broadcasting a request on the network. Dynamic Host Configuration Protocol (DHCP) provides clients with a dynamically assigned IP address and other network configuration setting parameters. Domain Name System (DNS) is a set of distributed databases providing information such as the IP addresses corresponding to network device names, and the location of mail servers.

A Sequence number is a 32-bit field of a TCP header. If the segment contains data, the Sequence number is associated with the first octet of the data. TCP requires that data is acknowledged (given an Acknowledgement number) before it is considered to have been transmitted safely. TCP maintains its connections within a series of TCP windows established by the protocol. TCP packets may contain flags to denote a variety of conditions or protocol functions.

Results of the IP analysis module are displayed in the Summary column in the **Packets** view of any capture window, and its counts are used as some of the key baseline traffic elements provided in **Summary Statistics**.

**To change the options for the IP analysis module:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *IP Analysis Module* and click **Options**. The **IP Analysis Module Options** dialog appears.




3. Options for this analysis module, all of which are enabled by default, are to show: ports, TCP flags, sequence number, length, ack number, window, and next expected sequence number. Also enabled by default are the display options of *Right justify*, which makes the numbers line up correctly when seen in the **Packets** view, and *Override default color*, which shows information from this analysis module in gray in the Summary column of the **Packets** view.

## Modbus Analysis

The Modbus analysis module collects information carried in the Modbus/TCP automation control protocol. The Modbus analysis module collects the type (query or response), transaction number, and function com-

mand found in Modbus over TCP packets, and posts this information to the Summary column of the **Packets** view of capture windows. Modbus is a standard for device control and reporting in industrial computing.

## MPLS/VLAN Analysis

The MPLS/VLAN analysis module provides statistics for MPLS and VLAN networks. The MPLS/VLAN analysis module is supported on both Omnipeek and Capture Engine. This combined plug-in provides basic statistics (i.e., total packets/bytes and packets/bytes per IP-Node) and is displayed in the **Summary** view.

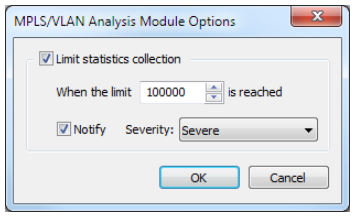
Unlike other plug-ins, MPLS and VLAN are dynamically created, and therefore each 802.1Q VLAN ID observed in the capture, a new VLAN group will be created in the **Summary** view, named *VLAN Network <id>*, where *<id>* is the VLAN ID as specified in the 802.1Q header. Within this group, there is one statistic for each IP addressed observed using that VLAN ID. In addition, there is a *Total* statistic representing the total number of packets and bytes observed using that VLAN ID.

For each MPLS label observed in the capture, a new group will be created in the Summary view, named *MPLS Network <label>*, where *<label>* is the MPLS label observed as specified in the MPLS header. Within this group, there is one statistic for each IP address observed using that MPLS label. In addition, there will be a *Total* statistic representing the total number of packets and bytes observed using that MPLS label.

These statistics can be used to make or Alarms, as with most other summary statistics, subject to the current limitations of graphs and alarms (e.g., there are no alarms on local captures).

**To change the options for the MPLS/VLAN analysis module:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *MPLS/VLAN Analysis* and click **Options**. The **MPLS/VLAN Analysis Module Options** dialog appears.




3. Select *Limit statistics collection* and specify an upper limit to limit statistics collection (if not selected, there is no limit). If the *Notify* check box is enabled, there will also be a notification sent when the limit is reached (and the severity of that notification is set with the *Severity* drop down).
4. Click **OK** to accept your changes.

## NCP Analysis

The NCP analysis module collects request commands and response completion codes found in NCP (Netware Core Protocol) headers and posts this information to the Summary column of the **Packets** view of capture windows. NCP defines a set of request and reply packets used in support of file and print services over IP.

## PPP Analysis

The PPP analysis module summarizes PPP traffic. The analysis module provides this information to **Summary Statistics** and the *Summary* column in the **Packets** view of any capture window.

## RADIUS Analysis

The RADIUS analysis module provides statistics and decode summaries for Remote Access Dial-up User Services (RADIUS) and RADIUS accounting packets, including summaries for Access Request, Accept, and Reject packets; Accounting Request and Response packets; Access Challenge; and RADIUS Start and Stop packets.

The analysis module provides this information to **Summary Statistics** and the *Summary* column in the **Packets** view of any capture window.

## SCTP Analysis

The SCTP analysis module collects information on the chunk type found in SCTP (Stream Control Transmission Protocol) headers and posts this information to the Summary column of the **Packets** view of capture windows.

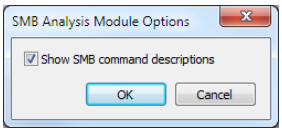
SCTP (rfc 2960) provides reliable simultaneous transmission of multiple data streams between two nodes on an IP network. Either or both of the end points may be multi-homed. The original purpose of SCTP was to make IP networks capable of establishing the types of connections required for telephone service. Telephone service relies on SS7 (Signalling System 7), which sends signalling information (that is, information about the connection) along with the voice or other data at the same time. Sometimes referred to as next generation TCP (TCPng), SCTP was designed for broad application, and is not limited to telephone service over IP.

## SMB Analysis

The SMB analysis module tracks many of the most common commands, status messages, and other responses for the Server Message Block protocol. It displays information about these SMB transactions in the Summary column of the **Packets** view of any capture window. SMB is essentially an extended and enhanced file management protocol. Conceptually, the protocol treats files, printers, and named pipes as file objects which can be opened, closed, and modified.

**To change the options for the SMB analysis module:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.
2. Select *SMB Analysis Module* and click **Options**. The **SMB Analysis Module Options** dialog appears.




3. Select *Show SMB command descriptions* to display SMB command descriptions in the Summary column in the **Packets** view of capture windows.

## SQL Analysis

The SQL analysis module provides decode summaries for TNS and TDS traffic. Structured Query Language (SQL) is a widely used standard for querying databases. When using SQL over a network, the queries and data are carried within special protocols, where the type of protocol used depends on the type of database environment. Oracle environments use Transparent Network Substrate (TNS). Sybase and Microsoft SQL Server environments use the Tabular Data Stream protocol (TDS).

The module provides TDS descriptions including Login, RPC, and SQL summary strings. For TNS, the module provides decode summaries for TNS Connect, Accept, Refuse, Redirect, Data, Abort, Resend, Marker, and Control packets. The analysis module provides this information to the Summary column in the **Packets** view of any capture window.

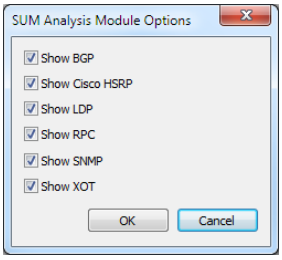
## SUM Analysis

The SUM analysis module provides decode summaries to the Summary column in the **Packets** view of a capture window for the following protocols: BGP, HSRP, LDP, RPC, SNMP, and XOT.

**To change the options for the SUM analysis module:**

1. On the **Tools** menu, click **Options**, and then click **Analysis Modules**.

Select *SUM Analysis Module* and click **Options**. The **SUM Analysis Module Options** dialog appears.




2. Select the protocols for which you would like to display decode summaries in the Summary column in the **Packets** view of capture windows.

## tcpdump Capture Adapter

The *tcpdump Capture Adapter*, lets you capture packets from remote computers that have the 'tcpdump' packet capture utility, into a running capture window in Omnipeek. To begin capturing packets, you will need to create a new tcpdump Capture Adapter entry, and then select the new adapter as the adapter for a capture window. See *Capturing Packets from a tcpdump Capture Adapter* on page 38.

## Telnet Analysis

The Telnet analysis module displays the contents of telnet sessions in the Summary column in the **Packets** view of any capture window.

Telnet is a TCP/IP protocol that enables a terminal attached to one host to log in to other hosts and interact with their resident applications.

## VoIP Analysis

The VoIP analysis module provides information on traffic related to Voice over IP (VoIP). Specifically, the module provides decode summaries for MGCP, SIP, RTCP, G.723, H.323, H.225, G.711 traffic, and follows H.245 connections based on H.323 port/IP connection data. The VoIP analysis module provides its decode summaries to the Summary column in the **Packets** view of any capture window.

## Web Analysis

The Web analysis module displays and logs access to World Wide Web resources. When a Web URL is accessed over the network, the URL is added to the log file, noting the date and time of the access. The information is also written to the Summary column in the **Packets** view of any capture window. The Web analysis module adds a count of URLs accessed in **Summary Statistics**.

**Tip** Double-click any URL posted to the Log file by the Web analysis module to open that resource in your default browser.

**Note** In environments with significant Web traffic, the Web analysis module can write substantial amounts of information to the global log. You may want to disable the Web analysis module in such cases to prevent the Log file from growing too large, too quickly.

# Expert Events

## In this appendix:

# About Expert events

This appendix lists all of the Expert Events found in the program. For a complete list of the descriptions, possible causes, and remedies of each Expert Event, please see the *Expert EventFinder* or the Omnipeek online help.

# VoIP

- *H.225 RAS Reject:* An H.225 Registration, Admission and Status (RAS) request has been rejected by a Gatekeeper.
- *H.225 Call Signaling (Q.931) - Call Dropped:* An H.225/Q.931 Signaling Protocol RELEASE COMPLETE message with a cause other than most "normal" causes is observed on a previously established call.
- *H.225 Call Signaling (Q.931) - Call Rejected:* An H.225/Q.931 Signaling Protocol RELEASE COMPLETE message with a cause other than most "normal" causes is observed on a previously established call.
- *H.245 Control Reject:* An H.245 Control Protocol Request has been rejected.
- *Low MOS-CQ:* The PMOS-CQ score for a VoIP flow has dropped below the threshold specified in the EventFinder settings.
- *Low R Factor Conversational:* The R-Conversational factor for a VoIP flow has dropped below the threshold specified in the EventFinder settings.
- *MGCP - Transient Error:* Resource not available error has occurred, causing the current operation to fail, but with the expectation that the same operation can be fulfilled in a future request.
- *MGCP - Permanent Error:* A permanent error has occurred that can not be fulfilled in future requests and will not disappear with time.
- *MGCP - Connection Deleted or Restart in Progress:* The gateway is deleting or restarting a connection to a Call Agent.
- *RTP Excessive Jitter Detected:* By checking the timestamps of arriving RTP packets, the Expert has detected excessive interarrival jitter (packets which are not arriving at constant intervals). Ideally, jitter should be near zero. To report events based on the jitter values contained within RTCP packets, see the *RTP Excessive Jitter Reported* event.
- *RTP Excessive Jitter Reported:* RTP interarrival jitter (packets which are not arriving at constant intervals) is reported by the recipient in its Real-time Transport Control Protocol (RTCP) report (usually sent at 5 second or shorter intervals). Ideally, jitter should be near zero. To report events based on the RTP packet timestamps, see the *RTP Excessive Jitter Detected* event.
- *RTP Excessive Packet Loss Detected:* Analysis of captured RTP packets shows a packet loss level above the threshold specified in the EventFinder settings.
- *RTP Excessive Packet Loss Reported:* An RTCP packet has reported that a receiver has seen a packet loss level above the threshold specified in the EventFinder settings.
- *RTP Not Marked for QoS:* IP QoS is not enabled on the device that forwarded the received packet.
- *RTP Late Packet Arrival:* An RTP packet arrived later than expected.
- *RTP Packet Out of Sequence*: An RTP packet has arrived ahead of a previously sent RTP packet.
- *SCCP Station Alarm - Advisory:* The Cisco Skinny Client Control Protocol (SCCP) defines eight levels of station alarms. The expert groups the lower four station alarms in this category. This includes Debug, Informational, Notice, and Warning. The upper four are grouped into the "SCCP Station Alarm – Critical" group.
- *SCCP Station Alarm - Critical Alert:* The Cisco Skinny Client Control Protocol (SCCP) defines eight levels of station alarms. The expert groups the top four most severe station alarms in this category. This includes Emergency, Alert, Critical, and Error. The lower four are grouped into the "SCCP Station Alarm – Advisory" group.
- *SCCP Station QoS Error:* A Cisco SkinnyEP (RSVP Agent) is reporting an error to Call Manager.

- *SCCP Station Register Reject:* The Call Manager is rejecting a station's attempt to register.
- *SIP Post-Dial Delay Exceeded:* The delay between a client's first Session Initialization Protocol (SIP) INVITE request and the resulting 180-Ringing response from a server exceeded the threshold.
- *SIP Redirection:* A client's Session Initialization Protocol (SIP) request resulted in a 3xx-Redirection response from a server.
- *SIP Client Authentication Required:* A client's Session Initialization Protocol (SIP) request resulted in a 401-Unauthorized or 407-Proxy Authentication Required response from a server.
- *SIP Client Error:* A client's Session Initialization Protocol (SIP) request resulted in a 4xx-Request Failure response from a server.
- *SIP Server Error:* A client's Session Initialization Protocol (SIP) request resulted in a 5xx-Server Failure response from a server.
- *SIP Global Error:* A client's Session Initialization Protocol (SIP) request resulted in a 6xx-Global Failure response from a server.

# Wireless

## *Performance*

- *Wireless - Too Many Physical Errors:* There are frames captured at this location containing a CRC error. The threshold is in number of CRC errors per second.
- *Wireless AP - QBSS Client Too Many:* A QoS Basic Service Set (QBSS) capable access point has more users than the specified default.
- *Wireless AP - Mixed Mode:* An 802.11 b/g access point is communicating with both b and g clients.
- *Wireless AP - 802.11n Capable:* An access point is capable of using 802.11n.
- *Wireless AP - 802.11n Dual Channel Capable:* An access point is advertising that it is capable of using dual channel mode for increased throughput.
- *Wireless AP - Physical Errors:* There are frames from a wireless client captured at this location containing a CRC error. The threshold is in number of CRC errors per second
- *Wireless AP - QoS Not Enabled:* An access point is not advertising that it is capable of QoS or WMM.
- *Wireless AP - Repeater Mode Detected:* Reported once per access point, this condition implies that an access point is functioning as a relaying device, cutting effective throughput in half.
- *Wireless AP - Too Many:* The number of access points observed on a given channel is at or greater than the threshold, decreasing the efficiency of utilization (contention) of that channel.
- *Wireless AP - Too Many Clients:* The number of active clients connected to an access point has exceeded the threshold.
- *Wireless AP - Too Many Retries:* The access point has previously attempted to send packets over the wireless medium without receiving an ACK from the receiver.
- *Wireless AP - Weak Signal:* The signal strength of a frame transmitted by an access point and captured at this location is at or below the threshold.
- *Wireless Channel Overlap:* The Expert has detected a management frame from a channel other than the capture channel, indicating channel overlap or "bleed."
- *Wireless Client - Excessive Roam Time:* A roaming client has been observed to take an unacceptably long time to rejoin another access point the wireless network. This can cause performance effects on time-sensitive applications such as VoIP over WLAN
- *Wireless Client - High Fragmentation Rate:* Based on the threshold, there are too many packets being fragmented into smaller packets. This impacts performance on your WLAN by increasing traffic and decreasing effective throughput.

- *Wireless Client - No Response to Probe Request:* The access point failed to send out a probe response frame for outstanding probe request from clients for its ESSID.
- *Wireless Client - Physical Errors:* There are frames from a wireless client captured at this location containing a CRC error. The threshold is in number of CRC errors per second.
- *Wireless Client - Power Save Interval Exceeded:* Association requests specify the number of beacon intervals a station will wait before waking up to receive buffered traffic from the access point. A wireless client has failed to "wake up" within this time to receive buffered traffic.
- *Wireless Client - Power Save Listen Interval Too Long:* The wireless client has been observed to have a power save interval longer than the specified value in the threshold.
- *Wireless Client - Power Save Missed Packet:* An access point has dropped buffered data that was being held for a client in the "sleep" state.
- *Wireless Client - Probe Response Not Accepted:* The reported wireless client has not continued the normal process of associating with the responding access point after receiving a matching probe response frame.
- *Wireless Client - Too Many Retries:* The client has previously attempted to send packets over the wireless medium without receiving an ACK from the receiver.
- *Wireless Client - Weak Signal:* The signal strength of a frame transmitted by a client and captured at this location is at or below the threshold. The minimum sample period is how often this event is reported.
- *Wireless Data Rate Change:* The data rate of this packet is lower than the previous packet.
- *Wireless Excessive Data Rate Change:* The data rate of this packet is changing at an excessive rate.
- *Wireless Excessive Probe Requests:* A client is sending excessive probe requests. If this problem persists, it could lead to lowered available bandwidth and a delay in the client getting on the network.
- *Wireless Excessive RTS:* A wireless network has seen more RTS (Request to Send) packets than specified by the threshold. This overhead can slow down the overall throughput of the network if used excessively.
- *Wireless Fragmentation Packet Size Too Small:* The wireless fragmentation size of a packet is lower than the threshold. This can cause a decrease in throughput, but increase the ability of the sender to deal with interference.
- *Wireless g Device Short Time Slot:* A wireless 802.11g device has re-transmitted a frame using the short time slot. This may be an indication of a collision problem in a mixed b/g network as 802.11b does not support short slots.
- *Wireless High Beacon Rate*: An access point or ad hoc station is sending beacon frames at a faster rate than the threshold.
- *Wireless Low Signal-to-Noise Ratio:* The analyzer is receiving packets with a low signal-to-noise ratio below the value specified in the settings.
- *Wireless RF Interference:* Unwanted RF signals disrupt normal operation, causing lower data rates and a high percentage of wireless retries. This event is triggered when noise is detected above the configured threshold in the EventFinder settings.
- *Wireless RTS/CTS Data Packets Too Small:* RTS/CTS mechanism is using packets size smaller than the threshold, potentially impacting throughput.
- *Wireless Transmission Retry:* The transmitter has previously attempted to send this packet over the wireless medium.

## Security

- *Wireless AP - Broadcasting ESSID:* The access point is sending its ESSID in beacon broadcasts, allowing all stations (including tools that snoop broadcast packets) to see the ESSID.
- *Wireless AP - Inconsistent Configuration:* Multiple access points (BSSIDs) in your WLAN, with the same ESSID, have conflicting configuration elements such as different data rates, compatibility configurations or more.
- *Wireless AP - Missing:* An access point, active in the past, has recently stopped transmitting packets. This event is only reported once per access point unless the device reappears and disappears again.
- *Wireless AP - Not Configured:* The access point is broadcasting an ESSID that is one of several known default ESSIDs. The ESSID table is contained in an XML file which can be updated.
- *Wireless AP - Possible Spoof:* Multiple access points are seen beaconing for a short period of time and then disappearing.
- *Wireless AP - Restarted:* An access point has been restarted within the past number of minutes as determined by the threshold.
- *Wireless AP - Rogue:* An unrecognized access point has been detected, since it does not exist in the name table and it is not designated as an access point.
- *Wireless AP - WEP Not Required:* The access point does not require WEP for stations to associate to it.
- *Wireless Ad Hoc Detected:* Two or more wireless nodes are communicating directly to each other without using an access point. If communicating on the same or nearby channel as a wireless infrastructure using access points, available bandwidth can be severely impacted.
- *Wireless Association Attack:* The number of association requests is at or has exceeded the threshold, measured in number of associations in so many seconds.
- *Wireless Association Denied:* An authenticated client's association request was denied by the access point resulting in any of the following status codes in the association response frame: 12,17,18,19,20,21,22,23,24,25,26.
- *Wireless Authentication Attack:* The number of authentication requests is at or has exceeded the threshold, measured in number of authentications in so many seconds.
- *Wireless Authentication Denied:* An access point is rejecting a client's authentication request. A "normal insertion" by a client into a wireless network is a probe request followed by authentication, then association.
- *Wireless Client - Associated with Rogue Access Point*: A client has associated with an unknown or untrusted access point. This event is monitored and reported for each recorded association.
- *Wireless Client - Acting as DHCP Server:* A wireless client is acting as a DHCP server indicating a potential rogue DHCP server and security risk.
- *Wireless Client - Rogue:* An unrecognized client has been detected, since it does not exist in the name table.
- *Wireless Client - Using Access Point Address:* A station is transmitting frames using the same source address as an access point.
- *Wireless Client - Using Access Point ESSID*: A wireless client in ad hoc mode has been detected using the same ESSID that is being used by valid access point(s) in the infrastructure network. This leads some clients to connect to an undesired network.
- *Wireless Data Sent But Not Associated:* A data frame has been received by the access point from a non-authenticated station. The access point will reject the frame and send a deauthenticate frame back to the station with the error status.

- *Wireless Deauthentication Attack:* There are a large number of deauthentication frames which may be from a client spoofing an access point. These frames are usually sent to the "all stations broadcast" address causing all stations associated with that access point to disassociate
- *Wireless Duration Attack:* The duration field in the client's data frame is set to a value higher than the above threshold. The duration field reserves the wireless medium by updating the Network Allocation Vector (NAV) for the time it will take to complete a WLAN transaction including acknowledgements.
- *Wireless PSPF Violation:* Public Secure Packet Forwarding (PSPF). Two clients are communicating to each other via an access point. In some hotspots this is undesirable as a possible security and/or performance risk.
- *Wireless Reassociation Denied:* An access point is rejecting a client's association request. A "normal insertion" by a client into a wireless network is a probe request followed by authentication, then association.
- *Wireless RF Jamming:* RF Jamming is a step above innocent interference. Jamming can be defined as malicious attacks on your RF domain in order to cause service disruptions. This event is triggered when noise is detected above the configured threshold in the EventFinder settings.
- *Wireless Same Send & Receive Address:* The source address and destination address are identical.
- *Wireless Security Error:* A wireless (802.11i or WPA2) security error has occurred during a wireless transaction.
- *Wireless Source Address is Broadcast:* A station has assigned an all stations broadcast address (all 1s or FF:FF:FF:FF:FF:FF in hex) as its source address.
- *Wireless Source Address is Multicast:* A station has assigned a multicast address (the lower bit of the first byte of an address is set to "1") as its source address.

## Network Policy

- *Network Policy Violation - Vendor ID:* A device with a prohibited MAC address is transmitting on the network.
- *Network Policy Violation - Channel:* A wireless device is transmitting on a prohibited channel.
- *Network Policy Violation - ESSID:* An access point is broadcasting a prohibited ESSID.
- *Network Policy Violation - WLAN Encryption:* A device is transmitting on the network with a prohibited form of WLAN encryption.
- *Network Policy Violation - WLAN Authentication:* A device is transmitting on the network with a prohibited form of WLAN authentication.

## Client/Server

- *Busy Network or Server:* There is a moderate to high fluctuation in response time. The higher the sensitivity, the higher the likelihood that this problem will be flagged.
- *Inefficient Client:* "Chatty" conversations in which data packets from a server have small average packet sizes. The higher the sensitivity, the higher the likelihood that this problem will be flagged.
- *Low Server-to-Client Throughput:* The throughput from the server to the client is at or lower than the threshold.
- *Low Client-to-Server Throughput:* The throughput from the client to the server is at or lower than the threshold.
- *Non-Responsive Client:* Often indicates that a client or peer (for which a connection has already been established) is not acknowledging data received from server or peer.
- *Non-Responsive Server:* Often indicates that a server or peer (for which a connection has already been established) is no longer responding to repeated packet retransmissions from a client or peer.

- *One-Way Traffic:* No packets have been seen in the reverse direction for a user-definable length of time. This diagnosis is flagged only once for a given "conversation."
- *Slow Server Response Time:* The average response time from the server is equal to or higher than the threshold.

# Application

## DHCP

- *DHCP Low Lease Time:* The client has been offered an IP address lease in which the lease time is at or below the threshold.
- *DHCP Multiple Server Response:* A client requesting an IP address has had multiple DHCP servers respond to its request.
- *DHCP Request Rejected:* A DHCP Request has been rejected by a DHCP server.
- *DHCP Request Storm:* A high count of DHCP addresses are being requested.

## DNS

- *DNS Slow Response Time:* The average response time from the DNS server is equal to or higher than the threshold.
- *DNS Error:* An error response from a DNS server that is usually more serious than an invalid name.
- *DNS Non-Existent Host or Domain:* The host or domain name requested in a DNS name query cannot be found or the name for a given IP address cannot be found (reverse lookup).

## HTTP

- *HTTP Request Not Found*: Also known as "Client Error 404," the HTTP server has nothing matching the client's request.
- *HTTP Client Error:* Returned from the server as a result of an invalid HTTP client request and usually more serious than an invalid URL (see "HTTP Request Not Found").
- *HTTP Server Error:* A client's request is usually valid, but the server has erred. Also known as "Server Error 5xx."
- *HTTP Slow Response Time:* The average response time from the server is equal to or higher than the threshold.

## Oracle

- *Oracle Logon Denied:* The Oracle client's logon data was rejected by the remote server.
- *Oracle Slow Response Time:* The average response time from the Oracle server is equal to or higher than the threshold.
- *Oracle TNS Connection Refused:* The client's connect request was denied by the remote server.

## POP3

- *POP3 Login Failed:* A POP3 server has rejected a client's attempt to authenticate.
- *POP3 Server Returned Error:* A POP3 connection or request has been rejected by a POP3 server after a TCP connection has already been established.
- *POP3 Slow Response Time:* The average response time from the server is equal to or higher than the threshold.

### SMB/CIFS

- *SMB Logon or Access Denied:* A Server Message Block (SMB) attempt to logon or share a remote resource has failed.
- *SMB Command Rejected:* A Server Message Block (SMB) command has been rejected.
- *SMB Invalid Network Resource:* A Server Message Block (SMB) command to connect to a network resource name has been rejected.
- *SMB Repeated or Looped Transaction:* A SMB application or OS redirector has sent the same transaction command back-to-back within the threshold time setting.
- *SMB Excessive Transaction Loops:* A SMB application or OS redirector has sent too many SMB Repeated or Looped Transaction commands within the threshold percentage of packets.

### SMTP

- *SMTP Server Returned Error:* A SMTP request has been rejected by an SMTP server.
- *SMTP Slow Response Time:* The average response time from the server is equal to or higher than the threshold.

### SQL

- *SQL Server Failed Login:* The SQL Server client's login was rejected by the remote server.
- *SQL Server Client Error:* The SQL Server has encountered errors that can be corrected by the client.
- *SQL Server Fatal Error:* The SQL Server has encountered a non-recoverable system problem in which the program code that carries out a particular SQL statement is no longer running.
- *SQL Server Resource Error:* The SQL Server has run out of resources.
- *SQL Server Slow Response Time:* The average response time from the SQL Server is equal to or higher than the threshold.

- *FTP Slow Response Time:* The average response time from the server is equal to or higher than the threshold.
- *Kerberos Request Rejected:* A Kerberos Request has been rejected by a Kerberos server.
- *LDAP Slow Response Time:* The average response time from the LDAP server is equal to or higher than the threshold.
- *NFS Retransmission:* One or more packets of an NFS transaction using UDP has not reached its destination.
- *Windows Master Browser Election:* A windows node has broadcast an election datagram to force a master browser election. The Browser protocol is used to maintain the Network Neighborhood.

## Session

- *NetBIOS (over IP) Session Refused:* The host is rejecting a clients NetBIOS connection attempt.

## Transport

### TCP

- *TCP Connection Refused:* The host is rejecting a clients initial TCP connection attempt.
- *TCP Connection Lost:* TCP data is repeatedly being sent with no acknowledgement until the sender gives up and resets the connection.
- *TCP Inactive Connection Reset:* The sender has set the RST flag in a TCP packet.

- *TCP Connection Reset:* One end of a TCP connection has set the RST flag in a TCP packet, which sometimes indicates an abrupt disconnect. The normal TCP disconnect is to FIN although some applications will terminate with a reset or a FIN followed by a reset.
- *TCP Too Many Retransmissions:* The source IP node is sending another TCP packet with a sequence number that matches a previously sent TCP packet to the same destination IP address and TCP port numbers. "Too many" is when the percentage threshold meets or exceeds that of total transmitted (non-ACK) packets.
- *TCP Fast Retransmission (by ACK):* The source IP node is resending a TCP packet because the receiver has indicated a missing packet with a triple duplicate ACK (four identical ACK packets in a row).
- *TCP Fast Retransmission (by time):* The source IP node is sending another TCP packet with a sequence number that matches a previously sent TCP packet to the same destination IP address and TCP port numbers. Retransmits are flagged as "fast" if they occur before the TCP Fast Retransmission threshold.
- *TCP Slow First Retransmission:* The first retransmission is taking longer than the threshold which may indicate slow recovery time and throughput.
- *TCP Retransmission:* The source IP node is sending another TCP packet with a sequence number that matches a previously sent TCP packet to the same destination IP address and TCP port numbers.
- *TCP Idle Too Long:* The TCP connection hasn't been used since the threshold was set.
- *TCP Invalid Checksum:* The TCP header and/or data is in error. One or more bits has erroneously changed since the TCP segment was transmitted by the source IP host
- *TCP Low Starting MSS:* The TCP Maximum Segment Size (MSS) is at or below the threshold setting.
- *TCP Repeated Connect Attempt:* A client is attempting multiple times to establish a TCP connection.
- *TCP Slow Acknowledgement:* The recipient appears to be slow in acknowledging TCP data segments based on the threshold added to the average ACK time.
- *TCP Slow Segment Recovery:* A TCP segment is taking longer than the threshold to complete, which may indicate slow recovery time and throughput.
- *TCP Triple Duplicate ACK:* A receiving TCP node has noticed one or more missing packets and is requesting that the sender retransmit them by sending 4 identical ACK packets.
- *TCP Low Window:* The application is not keeping up with the incoming TCP segments. The threshold is based on the percentage of the maximum observed window for this conversation.
- *TCP Stuck Window:* The TCP window size has not changed for three or more consecutive packets and has dropped below a percentage of the maximum window. The application may be one or more packets behind in processing incoming TCP segments.
- *TCP Zero Window:* The recipients TCP receive buffer is filling up (low window) or full (zero window).
- *TCP Segment Out of Sequence:* A TCP data packet's TCP sequence number is less than the previous data packet's ending TCP sequence number.
- *TCP Segment Outside Window:* The flagged TCP packet carries data before or after the available TCP window most recently advertised in an acknowledgement packet from the destination.
- *TCP Segment Acked but Missing:* A TCP ACK packet that acknowledges data has not yet appeared within the capture.
- *TCP Keep-Alive:* A TCP Keep-Alive packet can be used to verify that the computer at the remote end of the connection is still available. This packet is sent with the sequence number set to one less than the current sequence number for the connection. A host receiving a Keep-Alive packet responds with an ACK for the current sequence number.

- *TCP Keep-Alive ACK:* A TCP Keep-Alive ACK packet is sent in response to a TCP Keep-Alive packet.
- *TCP Header Incomplete:* Packet does not contain a full TCP header.
- *TCP Duplicate ACK:* The source IP node is sending a TCP packet with an acknowledgment number that matches a previously sent TCP packet to the same destination IP address and TCP port number.
- *TCP Selective ACK:* SACK is the abbreviation for *Selective Acknowledgment*. The node that sends the SACK tells the receiver that it has not received some data.

- *RSVP Error:* RSVP error occurred in an RSVP path message or RSVP reservation message.
- *UDP Invalid Checksum:* The UDP header and/or data is in error. One or more bits has erroneously changed since the UDP datagram was transmitted by the source IP host.
- *UDP Length Exceeds Packet Length:* The UDP Length field contains a value which exceeds the actual amount of UDP data in the packet.

# Network

## IP

- *IP Invalid Header Checksum:* The header portion of the IP datagram is in error. One or more bits has erroneously changed (with the exception of the TTL) since the IP datagram was transmitted by the source IP host.
- *IP Local Routing:* Two identical IP packets except for the TTL have been detected.
- *IP Network Duplicated Packet:* A single packet has appeared multiple times on your network. This could be a waste of network resources.
- *IP Low Time-To-Live:* The IP Time-To-Live (TTL) has fallen to or below a pre-determined threshold indicating that the packet can only traverse that many more routers before it is discarded
- *IP Missing Fragment:* An IP datagram has been fragmented by the host application or a router, and one of the fragments is missing.
- *IP Packet with CRC Frame Error*. The CRC re-computed by the analyzer when the frame was received did not match the CRC at the end of the frame, indicating one or more corrupted bits in the frame. If the IP Header Checksum is okay, then the problem is most likely elsewhere in the frame.
- *IP Zero Address in Broadcast:* An IP UDP packet is being broadcast using the old IP broadcast address of 0.0.0.0.
- *IP Length Exceeds Packet Length:* The value in the IPv4 Total Length field is larger than the actual amount of IP data in the packet.

## ICMP

- *ICMP Network Unreachable:* A router is reporting back to the source host that it cannot forward a packet on to a network along the path to the destination host.
- *ICMP Host Unreachable:* A router is reporting back to the source host that it cannot forward the packet to the destination host.
- *ICMP Protocol Unreachable:* The destination host is reporting back to the source host that the indicated next layer protocol (usually TCP or UDP) is not available.ICMP Port Unreachable
- *ICMP Port Unreachable:* The destination host is reporting back to the source that the application layer protocol as specified by the UDP port is not supported.
- *ICMP Fragmentation Needed:* A router is reporting back to the destination host that fragmentation is required to forward the packet, but the Don't Fragment bit was set in the IP header.

- *ICMP Source Route Failed:* A router is reporting back to the source host that the path specified by the source cannot be followed.
- *ICMP Host Unknown:* A router is reporting back to the source host that the destination host does not exist.
- *ICMP Net Unreachable TOS:* A router is reporting back to the source host that a network is unavailable for the Type of Service (TOS) specified in the original IP datagram's header.
- *ICMP Host Unreachable TOS:* A router is reporting back to the source host that the destination host is unavailable for the Type of Service (TOS) specified in the original IP datagram's header.
- *ICMP Comm Admin Prohibited:* A router is reporting back to the source host that it cannot forward the original datagram due to administrative filtering settings.
- *ICMP Host Precedence Violation:* The first hop router is reporting back to the source host that a requested precedence is not permitted.
- *ICMP Precedence Cutoff:* A router is reporting back to the source host that a network has a minimum precedence level that is not satisfied by the original datagram.
- *ICMP Host Redirect:* A router is reporting back to the source host that it should use an alternate route for the destination host.
- *ICMP Host TOS Redirect:* A router is reporting back to the source host that it should use an alternate route for the destination network and Type of Service (TOS).
- *ICMP TTL Exceeded:* A router is reporting back to the source host that a datagram has expired before being delivered to the destination host.
- *ICMP Fragmentation Time Exceeded:* The destination host is reporting back to the source host that not all fragments of a datagram have been received.
- *ICMP Parameter Problem:* The reporting host is reporting back to the source host that it found a problem with the header parameters in the original data gram such that it could not complete processing of the datagram and must discard it.
- *ICMP Obsolete Message:* The reporting host is using an ICMP message type that has been obsoleted or deprecated. Recipient hosts may not understand the error message as a result.

### *IPsec*

- *ESP Out of Sequence:* An ESP packet has been captured out if its intended sequential order.

## Data Link

- *802.1X Dictionary Attack:* A node is generating multiple login attempts by using common words found in a dictionary.
- *ARP Request Storm:* A high count of ARP requests are flooding the network.
- *Broadcast Storm:* A sustained level of all stations broadcast packets (the destination physical address consists of all 1s) has met or exceeded the threshold.
- *Multicast Storm:* A sustained level of multicast (the broadcast bit in the destination physical address is set to 1) packets has met or exceeded the threshold.
- *Severe Broadcast Storm:* A sustained level of all stations broadcast packets (the destination physical address consists of all 1s) has met or exceeded the threshold. Severe Multicast Storm
- *Severe Multicast Storm:* A sustained level of multicast packets has met or exceeded the threshold (the broadcast bit in the destination physical address is set to 1).
- *Spanning Tree Topology Change:* The actively forwarding bridge (or switch) port for this segment has changed.

- *EAP Authentication Failure:* Using the 802.1x framework to carry EAP requests and responses (such as Cisco LEAP), an authenticator cannot authenticate the client.
- *Gratuitous ARP:* A gratuitous ARP packet is either an ARP reply which is not a response to an ARP request or to which no reply is expected.

# Physical

## LAN

- *Too Many Physical Errors:* The CRC re-computed by the analyzer when the frame was received did not match the CRC at the end of the frame, indicating one or more corrupted bits in the frame. The threshold applies to a window of consecutive CRC frames from any source.
- *MAC Flooding:* There is a high rate of new MAC Addresses flooding the network. This is often done to fill up switch node tables to cause a Denial of Service attack.

# Real-World Security Investigations

## In this appendix:

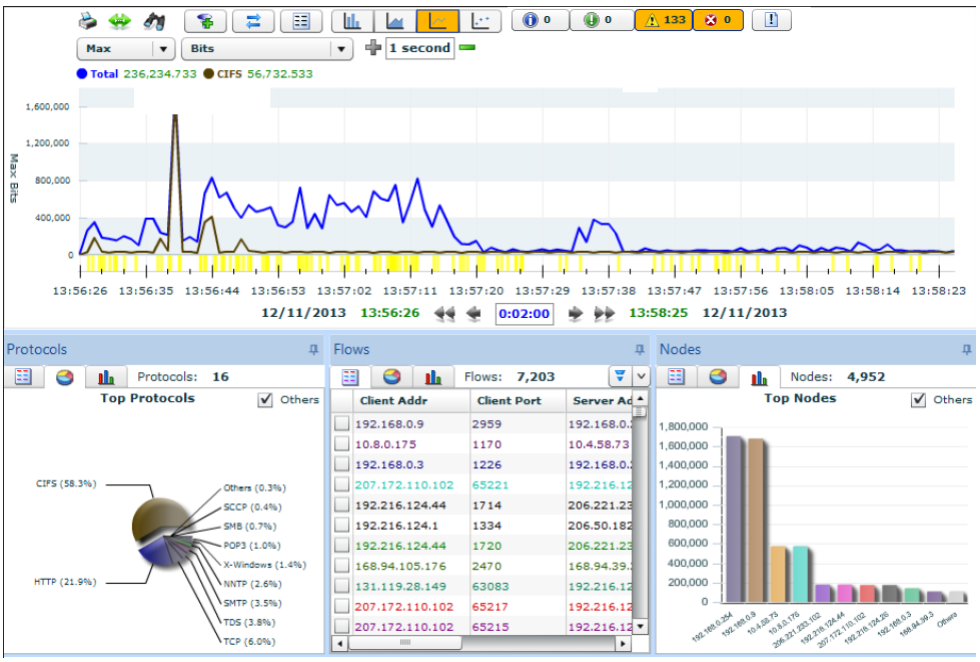
# About real-world security investigations

This appendix describes several different security investigations that are based on real events, and how Omnipeek was used in each of the investigations. In all of the investigations, the names and IP addresses have been changed to protect the privacy of the organizations involved. Several best practices used by many Enterprise customers are described at the end of the appendix.

# Investigation #1: Tracing the course of a server attack

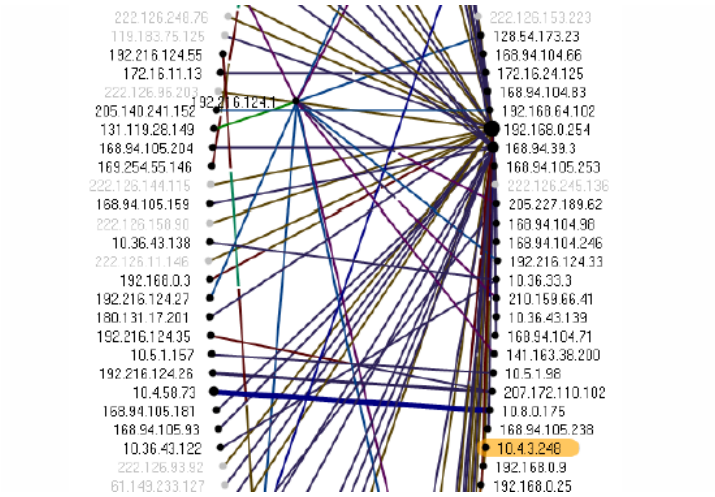
A security tool on an enterprise network raised an alert about unusual activity on a server. (In the screen-shots below, identified by the address 10.4.3.248.) When the IT team investigated, they discovered that the server had been compromised by a security attack. Unfortunately, the security tool provided no further information about the attack, such as who the culprit was and which other systems, if any, had also been compromised.

To answer these questions, the team turned to Omnipeek. Using the Compass dashboard, they were able to see that the compromised system had initiated a spike in Common Internet File System (CIFS) traffic shortly after the attack had begun. The Compass dashboard below shows an example of such a CIFS spike.



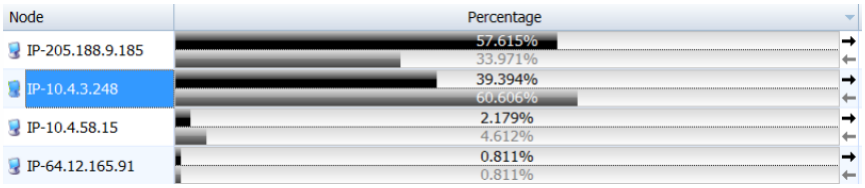

Because their LiveCapture had recorded all network traffic around the time of the spike, the team was able to examine network activity in detail to explore this burst of traffic and its consequences.

To learn more about the systems involved in the CIFS spike, the team opened a Peer Map, showing all IP communications during the period in question. The Peer Map confirmed that the compromised server had communicated with several other systems.




Next, the team filtered traffic to show communications only from the compromised server. This made it easy to identify the three other systems that the compromised server had communicated with after the attack.


The forensics system's Nodes view provided another look at the communication among these systems during the critical time of the attack.




Now the IT team knew which servers to focus their attention on in their efforts to contain the attack and reverse its effects. In addition to quarantining and repairing 10.4.3.248, the IT team would also focus on 10.4.58.15, 64.12.165.91, and 205.188.9.185.

## Summary

Working from a vague security alert, the team was able to use network forensics to identify specific systems to quarantine and where to focus attention on cleaning up the attack. Network forensics enabled the team to find proof of the attack and trace its effects.

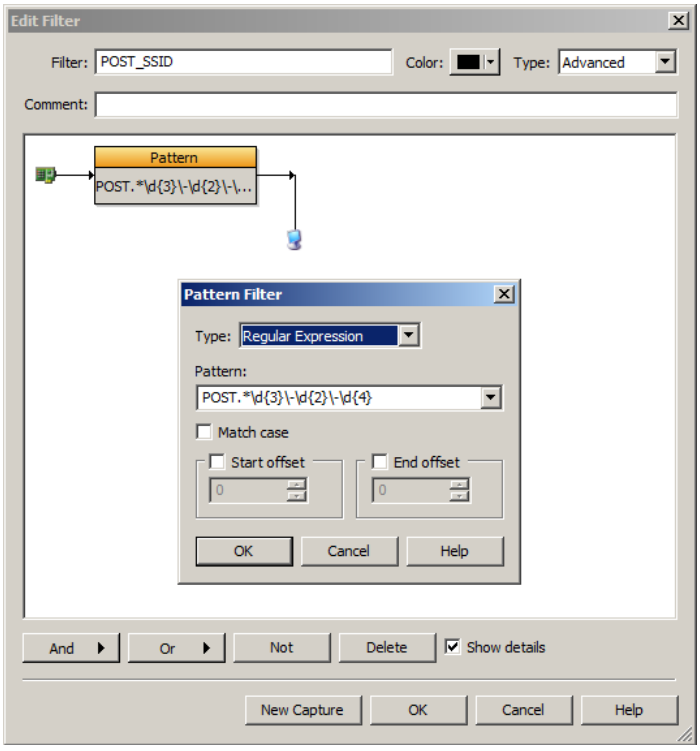
# Investigation #2: Ensuring compliance with security regulations and catching leaked data

In an audit, examiners look for evidence of compliance with security regulations. Many enterprise IT teams now use network forensics to ensure that traffic complies with regulations and to demonstrate that compliance to auditors.

Using tools like the Peer Map shown in the previous section, IT engineers can monitor and record traffic patterns, demonstrating to auditors which users have access to which resources, and which devices are talking to which other devices.

They can also configure filters based on regular expressions (Regex expressions) to look for traffic that may include personal information. The filters they use look for any packet that appears to include any number that seems like an SSID, a phone number, credit card numbers (strings of 16 digits), etc., that are sent in clear

text. Since these filters only look for the specific packets with the personal data, they expect to never capture a packet. If the filters do find matches, the network forensics solution alerts the IT team through syslog and SNMP traps, so IT engineers can review the data immediately to prevent additional loss of data. An example of an advanced pattern filter in Omnipeek that filters the POST operation for specific traffic is shown below.




Packet-level capture enables IT engineers and security experts to examine decoded traffic and discover exactly how a security breach is occurring. The screenshot below shows packet decodes from traffic that includes an HTTP POST command containing data that seems to include hacked Social Security IDs.

```
    TCP Offset:          5  (20 bytes) [46 Mask 0xF0]
    Reserved:            %0000 [46 Mask 0x0F]
  - TCP Flags:           %00010000  ...A.... [47]
      0... .... (No Congestion Window Reduction)
      .0.. .... (No ECN-Echo)
      ..0. .... (No Urgent pointer)
      ...1 .... Ack
      .... 0... (No Push)
      .... .0.. (No Reset)
      .... ..0. (No SYN)
      .... ...0 (No FIN)
    Window:              64273 [48-49]
    TCP Checksum:        0x2C4A [50-51]
    Urgent Pointer:      0 [52-53]
    No TCP Options
- HTTP - Hyper Text Transfer Protocol
    HTTP Command:        POST [54-57]
    URI:                 /save/Hold/Hacked_nfo/SSIDs/123-45-6789 [58-97]
```

The hex decode below shows another view of this problematic traffic, including the suspicious POST operation.

```
0000: 00 21 7C 17 D4 C9 00 B0 D0 7B EC A0 08 00 45 00 .!|......{....E.
0016: 05 DC 1E 1D 40 00 80 06 D2 8C 0A 64 01 69 D0 55 ....@......d.i.U
0032: 28 50 05 26 00 50 D1 45 49 E6 C0 D0 FC E5 50 10 (P.&.P.EI.....P.
0048: FB 11 2C 4A 00 00 50 4F 53 54 20 2F 73 61 76 65 ..,J..POST /save
0064: 2F 48 6F 6C 64 2F 48 61 63 6B 65 64 5F 6E 66 6F /Hold/Hacked_nfo
0080: 2F 53 53 49 44 73 2F 31 32 33 2D 34 35 2D 36 37 /SSIDs/123-45-67
0096: 38 39 20 26 34 35 26 61 72 67 34 3D 26 61 72 67 89 &45&arg4=&arg
0112: 35 3D 61 61 63 70 6C 75 73 26 61 72 67 36 3D 36 5=aacplus&arg6=6
```

## Summary

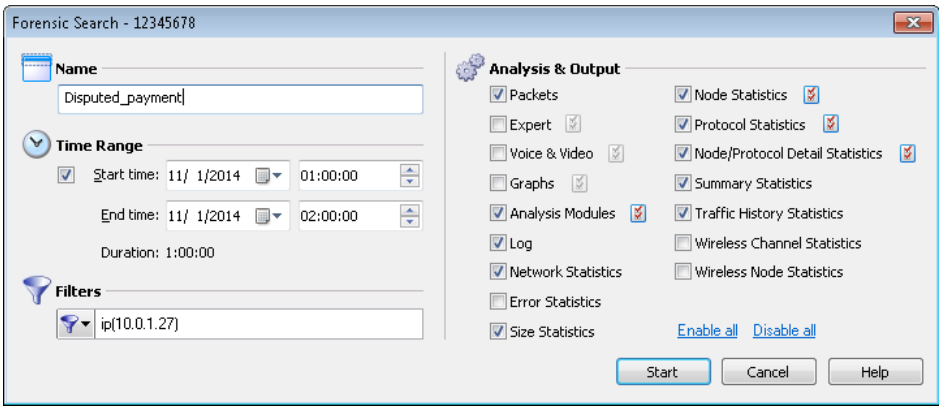
Network forensics provides IT teams and security experts with evidence of data breaches and details that are invaluable for tracking down the particulars of specific security attacks.

# Investigation #3: Transaction verification for an online gaming company

One of the world's leading online gambling companies with over ten million customers in 200 different countries uses LiveAction Omnipeek network forensics solution when it needs to verify business transactions, such as bets, that have been called into question. Because network forensics captures all aspects of network traffic, including the IP addresses of senders and receivers and all data transmitted between them, it provides a comprehensive record of orders, payments, and other financial transactions. In the case of the online gaming company, these transactions include online bets.

A customer who had lost quite a bit of money after a late night of gambling called the online gaming company and complained that he was not the person who had placed the losing bets. He claimed that someone else must have used his account from another location and run up the losses.

Using network forensics, the IT team at the gaming company was able to verify that the IP address and other characteristics of the traffic on the night in question matched his other activity with the gaming company, including previous sessions in which he had gambled and never complained. By verifying that the same address had been used for all his transactions, they were able to refute his claim that the losses were someone else's responsibility. An example of a forensic search in Omnipeek that is set up to search for a specific IP address over a specific time range is shown below.




## Summary

Network forensics enables e-commerce and service organizations to verify transactions, including source, recipients, and data transmitted. This analysis can be used not only for troubleshooting, but also for customer service.

# Investigation #4: Transaction verification for a merchant services company

Here's another example of using network forensics to verify online transactions.

The merchant services division of a major bank is using a LiveAction LiveCapture network analysis and recorder to capture and store traffic containing credit card authorizations. When a bank customer, such as an online retailer, contacts the bank with questions about a specific transaction, the bank's data center team can use the LiveAction network recorder to find and analyze the relevant transaction. The bank can then easily determine whether the authorization or denial was transmitted correctly.

For example, a consumer ordered a product from a major online retailer, charging the purchase to her credit card. To the consumer's surprise, the charge was declined. The consumer called the retailer to complain. As part of investigating the decision to decline the charge, the bank reviewed the network traffic that contained the authorization request and the bank's subsequent decline of that request. Having verified that the transaction complied with the bank's credit guidelines and that its servers had handled the request and response correctly, the bank was able to close the service ticket with the retailer.

### Summary

Network forensics enables financial services organizations to verify transactions, including source, recipients, and data transmitted. Because it captures all the packets that constitute a transaction, network forensics provides comprehensive evidence of what has been transacted between two or more parties.

## Security best practices

### Best practice #1: Capture traffic at every location

As a best practice for network security, IT organizations should capture traffic at every location, not just at the network core.

Consider the case of a large enterprise that suffered a security attack at a branch office. The breach spread from the branch office to headquarters. Without a detailed analysis of the traffic in the branch, the IT organization would have been unable to identify the source of the attack and apply the appropriate controls to prevent its spread.

### Best practice #2: Capture traffic 24/7

In addition to capturing traffic at every location, IT organizations should ensure that they capture traffic around the clock, so that even anomalies that occur outside of business hours can be investigated.

### Best practice #3: Set filters to detect anomalous behavior

In addition to maintaining a continuous, week-long capture of all network traffic, it's often helpful to define a secondary capture consisting only of network anomalies that may signal a security violation. If no anomalies occur, then no secondary capture is initiated and no alerts are raised. But if anomalies occur, IT engineers and security experts can take advantage of the evidence in a small capture file containing just the relevant data.

To configure a capture like this, IT engineers simply capture a file that starts recording data when any of the following conditions occur:

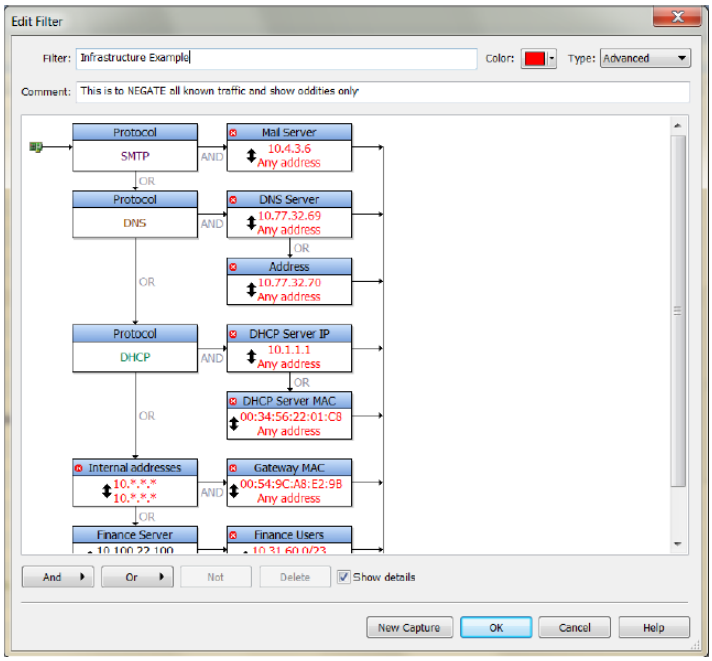
- Mail traffic (SMTP traffic) is not going to mail servers, possibly indicating the presence of a worm on the network.
- DHCP offers are coming from a source other than the DHCP servers, possibly indicating the presence of a rogue DHCP server.
- Offnet traffic is not destined for the MAC address of a router, possibly indicating the presence of a Man-in-the-Middle attack.
- Any user other than a member of the Finance team tries to connect to the Finance department's servers, possibly indicating a hacker and a probably Sarbanes-Oxley violation, as well.

- Any server in the DMZ tries to initiate an outbound connect other than to known backend servers, possibly indicating that a server has been compromised.

Each organization can identify its own list of anomalies relevant for the infrastructure and services being maintained.

If a secondary capture begins, IT engineers can open the capture files (which will be small) and know immediately where to begin their investigation.

The graphic below shows a series of NOT conditions that define a filter to capture anomalies on the network, such as SMTP traffic that does not involve the organization's mail server and DNS traffic that does not include the organization's DNS server.




## Summary

IT teams can accelerate troubleshooting by configuring network forensics solutions to automatically capture evidence of anomalous behavior. Then, instead of poring through terabytes of live traffic, they can simply examine small data recordings that include suspicious traffic associated with a specific anomaly.

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