

# SolarWinds Orion

## VoIP Monitor Administrator Guide

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## **Conventions**

The documentation uses consistent conventions to help you identify items throughout the printed and online library.

Convention	Specifying
<b>Bold</b>	Window items, including buttons and fields.
<i>Italics</i>	Book and CD titles, variable names, new terms
Fixed font	File and directory names, commands and code examples, text typed by you
Straight brackets, as in [value]	Optional command parameters
Curly braces, as in {value}	Required command parameters
Logical OR, as in value1 value2	Exclusive command parameters where only one of the options can be specified

## **SolarWinds VoIP Monitor Documentation Library**

The following documents are included in the VoIP Monitor documentation library:

<b>Document</b>	<b>Purpose</b>
VoIP Monitor Administrator Guide	Provides detailed setup, configuration, and conceptual information.
Page Help	Provides help for every window in the VoIP Monitor user interface
Release Notes	Provides late-breaking information, known issues, and updates. The latest Release Notes can be found at <a href="http://www.solarwinds.com">www.solarwinds.com</a> .

The following documents supplement the VoIP Monitor documentation library with information about Orion Network Performance Monitor:

<b>Document</b>	<b>Purpose</b>
Orion Network Performance Monitor Administrator Guide	Provides detailed setup, configuration, and conceptual information.
Page Help	Provides help for every window in the Orion Network Performance Monitor user interface
Release Notes	Provides late-breaking information, known issues, and updates. The latest Release Notes can be found at <a href="http://www.solarwinds.com">www.solarwinds.com</a> .

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## Chapter 1

# Introduction

SolarWinds Orion Voice over IP Monitor (VoIP Monitor) offers an easy-to-use, scalable VoIP network monitoring solution that integrates seamlessly into the Orion Network Performance Monitor Web Console.

## ***Why Install VoIP Monitor***

Voice over IP (VoIP) technology offers a cost-effective and efficient response to the telephony needs of enterprises of all sizes. As a VoIP network manager, you face more than the simple question of whether your network is up or down. You need to know specific quality of service measures for your network, and you need to know them both historically and in realtime. VoIP Monitor gives you the tools you require to quickly determine and track quality of service on your network over time.

Orion VoIP Monitor leverages the proven functionality of Orion Network Performance Monitor (Orion NPM), adding a number of VoIP-specific data collection and presentation tools that enable VoIP-specific network monitoring and realtime status reporting. Because it is a module of Orion NPM, VoIP Monitor maintains the function of Orion NPM while allowing you to narrow your network management and monitoring focus to the VoIP-specific devices of your wider network.

## ***What VoIP Monitor Does***

VoIP Monitor provides a full-featured solution that gives you the ability to monitor and report the status of your VoIP network over time with performance statistics available in realtime. VoIP Monitor offers the following features to help you manage your entire VoIP network.

### **Quality of Service (QoS) Monitoring with Cisco IP SLA Operations**

VoIP Monitor uses Cisco IP Service Level Agreements (IP SLAs) to measure VoIP network performance. Specifically, IP SLA operations provide immediate insight into VoIP network Quality of Service (QoS), including packet loss, latency, jitter, and mean opinion score (MOS) metrics. VoIP Monitor collects IP SLA data and then presents it in the easy-to-use Orion Web Console environment. With VoIP Monitor and IP SLA operations you know at a glance exactly how well your VoIP network is and has been performing. For more information about Cisco IP SLA operations, see [www.cisco.com/go/ipsla](http://www.cisco.com/go/ipsla).

## Custom Alerts and Actions

Leveraging the Orion Advanced Alert Manager, VoIP Monitor allows you to create custom alerts for your VoIP network in the same way you create custom alerts and actions in Orion Network Performance Monitor. Specifically, VoIP Monitor allows you to configure VoIP-related alerts with a variety of corresponding actions to notify you of VoIP events on your Orion-managed network. These VoIP alerts are filtered from existing Orion alerts and presented separately, within VoIP Monitor. For more information about using Advanced Alerts in VoIP Monitor, see “Using Advanced Alerts and Actions” on page 24.

## Custom Reporting

With Orion Report Writer, VoIP Monitor provides realtime and historical statistics reporting for the VoIP-specific devices in your network. When you install VoIP Monitor, several predefined reports become available within Orion Report Writer. In addition, with the use of custom properties, you can also generate custom reports to specifically communicate the historical condition of your VoIP network. For more information about data reporting in VoIP Monitor, see “Creating VoIP Monitor Reports” on page 24.

## Call Manager Monitoring

Call manager devices are scalable call-processing solutions for managing IP-based telecommunications networks. These devices provide VoIP networks with the same features and functionality of more traditional telephony. VoIP Monitor uses the SNMP and ICMP monitoring technology at the core of Orion Network Performance Monitor to interact with call managers. As a result, you are able to persistently track call manager performance. With the addition of VoIP Monitor, you immediately know the status of your VoIP network and all of its components at any time. Upon installation, VoIP Monitor allows you to monitor Cisco CallManager and CallManager Express devices. You can also define custom MIB pollers to monitor call managers from other manufacturers. For more information about custom MIB pollers, see “Creating Custom MIB Pollers” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*. For more information about Cisco CallManager and CallManager Express devices, search for “CallManager” at [www.cisco.com](http://www.cisco.com). For more information about monitoring Cisco CallManager devices with VoIP Monitor, see “Adding Cisco CallManager Devices to VoIP Monitor” on page 14. For more information about monitoring other call manager devices with VoIP Monitor, see “Adding Call Manager Devices from Other Manufacturers” on page 15.

## How VoIP Monitor Works

Orion VoIP Monitor builds upon the proven technology of Orion Network Performance Monitor (Orion NPM) to give you monitoring, alerting, and reporting

abilities for your VoIP network. After installation and initial configuration, VoIP Monitor deploys Cisco IP Service Level Agreements (IP SLAs) to generate simulated VoIP traffic between devices on your network, in accordance with the jitter codec that you specify. Cisco IP SLAs provide realtime and historical performance statistics that VoIP Monitor presents in the readily customizable Orion Web Console.

**Note:** VoIP Monitor uses simulated traffic, instead of real VoIP traffic, to ensure that performance data is continuously received so you can know the state of your network at any time, regardless of whether the network is actually being used to complete a call.



## Chapter 2

# Getting Started with Orion VoIP Monitor

Orion VoIP Monitor uses the same intuitive installer and configuration wizard interfaces that Orion Network Performance Monitor employs. Though it is an enterprise-class monitoring solution, VoIP Monitor does not require any additional resources beyond those required for the underlying implementation of Orion Network Performance Monitor.

## ***Installation Requirements***

The server that you use to host VoIP Monitor must also support an installation of Orion Network Performance Monitor. The following requirements are based on a minimum installation of VoIP Monitor with SQL Server on a separate database server.

**Note:** To optimize database scalability, your SQL Server installation should be maintained on a server other than the one on which you are hosting Orion Network Performance Monitor and VoIP Monitor.

Hardware/Software	Requirements (for Orion server unless stated otherwise)
Environment	VoIP Monitor sites are limited to locations where there is an existing, Cisco IP SLA compatible router to serve as a simulation node. Cisco IP SLA compatible routers include 2600, 3700, and 7200 Series. For more information, see <a href="http://www.cisco.com/go/fn">www.cisco.com/go/fn</a> and select "IP SLAs – UDP Based VoIP Operation".
CPU	3GHz or faster
RAM	2GB or more
Hard Drive Space	5GB or more
Operating System	Windows 2003 Server SP1 and higher, including R2 (32-bit & 64-bit) with IIS installed
.NET Framework	Version 3.0 or later
Orion Network Performance Monitor	Version 8.5 or later
SQL Server	SQL Server 2000 SP4 and SQL Server 2005 (Express, Standard, or Enterprise) on a separate database server with 4-8GB of memory and at least 20GB of available hard drive space.
Web Browser	Internet Explorer version 6 and later Mozilla Firefox 2.0

For more information about system requirements for Orion Network Performance Monitor, see "Requirements" in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

## VoIP Monitor Licensing

Orion VoIP Monitor is licensed in accordance with the underlying Orion NPM licensing. VoIP Monitor licenses are currently available at each level for which Orion NPM is presently licensed. For example, VoIP Monitor license VL100 mirrors Orion NPM license SL100 to give you the ability to monitor up to 100 VoIP resources, and VoIP Monitor license VLX (Enterprise) mirrors Orion Network Performance Monitor license SLX, giving you the ability to monitor an unlimited number of VoIP resources. For more information about Orion Network Performance Monitor licensing, see “Licensing Orion Network Performance Monitor” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

## Installing VoIP Monitor

Orion VoIP Monitor employs an intuitive wizard to guide your installation. The following procedure will complete your installation of Orion VoIP Monitor.

### Notes:

- For most Orion VoIP Monitor installations, the Configuration Wizard automatically maintains the configuration settings that you entered for your initial Orion Network Performance Monitor installation.
- If you are installing a web-only version of Orion VoIP Monitor on a remote Orion Network Performance Monitor server, please contact SolarWinds support at [www.solarwinds.com](http://www.solarwinds.com) for licensing instructions specific to your installation.

### To install Orion VoIP Monitor:

1. Log on to the Orion NPM server you will use to monitor your VoIP network.  
**Note:** Orion VoIP Monitor requires an installation of Orion NPM version 8.5 or later.
2. **If you downloaded the product from the SolarWinds website**, navigate to your download location and launch the executable.
3. **If you received physical media**, browse to the executable file, and then launch the executable.
4. Read the welcome message, and then click **Next** to continue.
5. Select **I accept the terms of the license agreement**, and then click **Next**.
6. **If you are ready to install Orion VoIP Monitor**, click **Install**.
7. When the wizard has completed installation, click **Finish**.

8. **If you are installing Orion VoIP Monitor on an additional poller that is not your primary Orion Network Performance Monitor poller**, click **Cancel** on the Install Software License Key window.
  9. **If this is a new installation of Orion VoIP Monitor**, provide the appropriate information on the Install Software License Key window, and then click **Continue**.
- Note:** You need your customer ID and password to install the key. For more information about Software License Keys, see “Software License Key” on page 29.
10. Click **Continue** when the license is successfully installed.
  11. **If the Configuration Wizard does not start automatically**, click **Start > SolarWinds Orion > Configuration Wizard**.
  12. **If this is a new installation of Orion VoIP Monitor**, check **Database**, **Website**, and **Services**, and then click **Next**.
  13. **If you are only updating or modifying specific components of your VoIP Monitor installation**, check **Database**, **Website**, or **Services**, as appropriate, and then click **Next**.

14. **If you have chosen to modify Database Settings**, complete the following steps:
  - a. Specify the **SQL Server** that hosts the database in which you want to store VoIP data and the appropriate credentials, if necessary, to log on to this server, and then click **Next**.
  - b. **If you are creating a new database**, select **Create a new database**, type a name in the **New Database** field, and then click **Next**.
  - c. **If you are using an existing database**, select **Use an existing database**, select or type a name in the **Existing Database** field, and then click **Next**.
  - d. **If you are prompted to stop polling engines**, click **OK** to stop the polling engines.

**Note:** You must stop all polling engines to prevent the corruption of your collected data.

- e. **If you want to create a new SQL account**, select **Create a new account**, enter a **New Account** and **Password**, confirm the password, and then click **Next**.
- f. **If you already have a SQL account**, select **Use an existing account**, enter or select an **Existing Account**, enter the **Password**, and then click **Next**.

**15. If you have chosen to modify Website Settings**, complete the following steps:

- a. Specify the **IP Address** of the web server that you are using for your Orion NPM Web Console installation.
- b. Specify the **TCP Port** through which you access the Orion Web Console.

**Notes:**

- If you specify any port other than 80, you must specify that port in the URL that is used to access the web console. For example, if you specify an IP address of 192.168.0.3 and a port of 8080, your URL is `http://192.168.0.3:8080`.
- Web browsers may report an error or security warning if the port that is designated for access to the web console is already assigned to another application.

- c. Click **Browse** to select the **Website Root Directory** in which you want to install the web console files or enter the appropriate path, and then click **Next**.
- d. *If you are prompted to use an existing website*, click **Yes**.

**16. If you have chosen to modify Services Settings**, confirm that all services that you want to install are checked in the Service Settings window, and then click **Next**.

**Note:** If you are installing Orion VoIP Monitor on an additional poller that is not your primary Orion Network Performance Monitor poller, confirm that **SolarWinds VoIP Monitor Service** is cleared.

17. Review the configuration summary.

**18. If the configuration settings are correct**, click **Next**.

**19. If you need to change any of the configuration settings**, click **Back** and make the appropriate corrections.

**20.** When the Configuration Wizard completes, click **OK** in the dialog, and then click **Close** in the Configuration Wizard.

## ***Understanding Quality of Service and IP SLAs***

IP Service Level Agreements (IP SLAs) are a diagnostic method developed by Cisco that generates and analyzes traffic between Cisco IOS devices on a VoIP network. By using VoIP Monitor to implement IP SLA operations between VoIP network devices, you can acquire realtime and historical statistics that give you accurate Quality of Service (QoS) measures for your network. VoIP Monitor builds on the proven monitoring capabilities of Orion Network Performance

Monitor and presents performance metrics generated with Cisco IP SLA operations over designated call paths on your VoIP network.

## Latency

Latency, also known as delay or lag, is a measure of the time, in milliseconds, it takes to complete a transfer of information, either roundtrip or one-way, between two network devices. With respect to VoIP, latency is a measure of the difference in time between when one caller speaks and when the other caller hears what the first has said. Excessive network latency can cause both noticeable gaps and a loss of synchronization in transmitted conversations, particularly when VoIP is used with other types of data, as in a videoconference. If these gaps become large enough, callers may find that they will inadvertently interrupt each other while conversing.

IP SLA operations measure latency by sequentially applying four different timestamps to a single test packet, as follows.

1. Timestamp **T1** is applied to a test packet as it leaves the source router.
2. Timestamp **T2** is applied as the test packet arrives at the target router.
3. Timestamp **T3** is applied as the test packet leaves the target router to return to the source.
4. Timestamp **T4** is applied when the test packet returns to the source.

IP SLA operations then provide four separate measures of latency by computing differences among the four timestamps, as follows.

Latency Measure	Calculation
Round Trip Time	$T4 - T1$
Source-to-Target Latency	$T2 - T1$
Target Processing Latency	$T3 - T2$
Target-to-Source Latency	$T4 - T3$

**Note:** Latency is computed for both Source-to-Target and Target-to-Source directions to account for asynchronous network behavior, providing a more detailed picture of overall network latency.

## Jitter

Jitter is a measure, in milliseconds, of the variability of network latency that results in a loss of synchronization over time. Jitter is experienced as distracting noise, clicks, and pops. To ensure acceptable quality of service, network jitter should be located, isolated, and addressed. VoIP Monitor allows you to identify areas of your network that may be experiencing synchronization difficulties,

enabling you to take the necessary action to ensure maximum QoS on your VoIP network.

VoIP Monitor requires that you select a jitter codec to properly configure IP SLAs for your VoIP network. Each codec dictates how jitter is computed by specifying that IP SLA operations send a number of packets ( $n$ ), each with a specific size ( $s$ ), at a set interval ( $i$ ) between packets, at a determined frequency ( $f$ ), as shown in the following table.

Codec	IP SLA Operation Frequency ( $f$ )	Default Number of Packets ( $n$ )	Default Packet Size ( $s$ )	Default Interval between Packets ( $i$ )
G.711a	Set on the VoIP Settings page as the <b>Network test interval</b>	1000	160 + 12 RTP bytes	20 ms
G.711u		1000	160 + 12 RTP bytes	20 ms
G.729a		1000	20 + 12 RTP bytes	20 ms

The **IP SLA Operation Frequency ( $f$ )** for all codecs may be changed directly from the VoIP Monitor Settings page. On the VoIP Monitor Settings page, the **Network test interval** field corresponds to the IP SLA Operation Frequency value in the previous table. For more information about VoIP Monitor Settings, see “VoIP Monitor Settings Configuration” on page 18.

**Note:** Based on the Cisco IP SLA operations used by VoIP Monitor, jitter codecs G.711a and G.711u can achieve peak MOS of 4.34. On the same basis, jitter codec G.729a can achieve a peak MOS of 4.06.

## Packet Loss

Packet Loss is a quantitative measure of information loss over a given network connection. Though packet loss is inevitable in any network environment, the goal is always to identify where packets are lost in transmission so you can act to minimize information loss and maintain high QoS for your VoIP services.

## Mean Opinion Score (MOS)

MOS is an industry standard measure of call quality expressed on a scale of increasing perceived quality, from 1 to 5. VoIP Monitor reports MOS as computed by a standard International Telecommunications Union (ITU) algorithm involving the codec for your VoIP network and values of latency, jitter, packet loss, and MOS advantage factor. Jitter, latency, and packet loss are variable quantities that are measured by VoIP Monitor in realtime. Generally, MOS reflects call quality as shown in the following table.

Call Quality	MOS
Very Satisfied	4.3-5.0
Satisfied	4.0-4.3
Some Users Satisfied	3.6-4.0
Many Users Dissatisfied	3.1-3.6
Nearly All Users Dissatisfied	2.6-3.1
Not Recommended	1.0-2.6

Both the MOS advantage factor and the codec algorithm are selected for your specific network on the VoIP Monitor Settings page. The following table provides some guidance as to how the advantage factor is determined for your application.

Communication System Type Examples	Maximum Advantage Factor Value
Conventional wired network	0
Wireless network within a building	5
Outdoor wireless network (cellular phones)	10
Remote communications by satellite	20

For more information MOS calculations, see ITU-T Recommendation G.107. For more information about codec algorithms, see “Jitter” on page 9. For more information about VoIP Monitor Settings, see “VoIP Monitor Settings Configuration” on page 18.

## Setting VoIP Traffic Precedence

VoIP Monitor allows you to set the precedence, or packet priority, of VoIP traffic. Setting precedence levels for VoIP traffic enables you to better ensure high quality of service on your VoIP Network. VoIP Monitor employs a decimal Type of Service value that is specified on the VoIP Monitor Settings page. For more information about VoIP Monitor settings, see “VoIP Monitor Settings” on page 16. The Type of Service value used by VoIP Monitor corresponds to per hop

behavior (PHB) and Differentiated Service Code Point (DSCP) values as shown in the following table.

		TOS Byte (IPv4) / Traffic Class (IPv6)											
		DSCP								Flow Control			
				IP Precedence									
	ToS Value (decimal)	DSCP Value (decimal)	b7	b6	b5	b4	b3	b2	b1	b0	PHB	Drop Probability	
Best Effort	0	0	0	0	0	0	0	0	0	0	Default		
Class Selector (Backward Compatibility with IP Precedence)	32	8	0	0	0	0	0	0	0	0	CS1		
	64	16	0	1	1	0	0	0	0	0	CS2		
	96	24	0	1	0	0	0	0	0	0	CS3		
	128	32	1	0	1	0	0	0	0	0	CS4		
	160	40	1	0	0	0	0	0	0	0	CS5		
	192	48	1	1	1	0	0	0	0	0	CS6		
	224	56	1	1	0	0	0	0	0	0	CS7		
Assured Forwarding	40	10	0	0	1	0	1	0	0	0	AF11	Low	
	48	12	0	0	1	1	0	0	0	0	AF12	Medium	
	56	14	0	0	1	1	1	0	0	0	AF13	High	
	72	18	0	1	0	0	1	0	0	0	AF21	Low	
	80	20	0	1	0	1	0	0	0	0	AF22	Medium	
	88	22	0	1	0	1	1	0	0	0	AF23	High	
	104	26	0	1	1	0	1	0	0	0	AF31	Low	
	112	28	0	1	1	1	0	0	0	0	AF32	Medium	
	120	30	0	1	1	1	1	0	0	0	AF33	High	
	136	34	1	0	0	0	1	0	0	0	AF41	Low	
	144	36	1	0	0	1	0	0	0	0	AF42	Medium	
152	38	1	0	0	1	1	0	0	0	AF43	High		
Expedited Forwarding	184	46	1	0	1	1	1	0	0	0	EF		

## Monitoring Cisco CallManager Health

VoIP Monitor references the Cisco Management Information Base (MIB) CISCO-CCM-MIB to provide out-of-the-box monitoring capability for Cisco CallManager and CallManager Express devices. With the use of custom MIB pollers, VoIP Monitor can also track the performance of call managers from other manufacturers. For more information about custom MIB pollers, see “Creating Custom MIB Pollers” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*. Once a call manager device has been added to the Orion database for management by Orion Network Performance Monitor, you can use the intuitive interface of VoIP Monitor to track and report call-processing performance statistics for your VoIP network.

Only Cisco CallManager and CallManager Express devices may be added to VoIP Monitor as CallManager nodes. Call management devices from other manufacturers may be added, and monitored, as VoIP devices on the VoIP Infrastructure page in the VoIP Monitor Admin menu. For more information, see “Adding Cisco CallManager Devices to VoIP Monitor” on page 14. For more information about adding non-Cisco call management devices, see “Adding Call Manager Devices from Other Manufacturers” on page 15.

## Using VoIP Monitor in the Orion Web Console

VoIP Monitor is a fully integrated module of the Orion NPM Web Console. Once VoIP Monitor is installed, click **VoIP Monitor** in the Orion Web Console Modules toolbar to open the VoIP Summary View. For more information about installing VoIP Monitor, see “Installing VoIP Monitor” on page 6. For more information about the VoIP Summary View, see “VoIP Monitor Views” on page 23.

All VoIP network devices and relevant interfaces that you want to monitor with VoIP Monitor must first be managed by Orion Network Performance Monitor. For more information, see “Using Orion System Manager” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*. After you add your VoIP devices and interfaces to the Orion database, you can then submit them to VoIP Monitor for monitoring.

## Adding VoIP Devices and Interfaces to VoIP Monitor

VoIP-capable devices and interfaces that have been included in the Orion Network Performance Monitor database may be designated for monitoring by VoIP Monitor. The following procedure provides the steps that are required to add a VoIP device or interface to VoIP Monitor.

### To add a VoIP device or interface to VoIP Monitor:

1. Log on to your Orion VoIP Monitor server.
2. **If you have not added your VoIP devices to the Orion database**, use Orion System Manager to add your VoIP devices before you continue. For more information, see “Using Orion System Manager” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

**Note:** If the node that you are adding is intended to be a VoIP Simulation node, provide an SNMP read/write community string when adding the node.

3. Click **Start > SolarWinds Orion > VoIP Monitor > VoIP Web Console**.
4. Log in to VoIP Monitor using a **User ID** with administrative privileges.

**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.

5. Click **Admin** on the toolbar.

6. Click **VoIP Monitor Settings** in the left navigation pane.
7. Click **Infrastructure**.
8. Navigate the available devices and interfaces and check the appropriate objects for your VoIP network.
9. ***If you do not see an expected VoIP-related device or interface in the list,*** use System Manager to add the device to the Orion database. For more information, see “Using Orion System Manager” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

**Note:** If you are adding a VoIP Simulation node, you must provide an SNMP read/write community string when you add the device in System Manager.

## Adding Cisco CallManager Devices to VoIP Monitor

The following procedure provides the steps to add a Cisco CallManager device to VoIP Monitor.

### To add a CallManager device to VoIP Monitor:

1. Log on to your Orion VoIP Monitor server.
2. ***If you have not added your CallManager devices to the Orion database,*** use System Manager to add your CallManager devices before continuing. For more information on adding CallManager devices, see “Adding VoIP Devices and Interfaces to VoIP Monitor” on page 13.
3. Click **Start > SolarWinds Orion > VoIP Monitor >VoIP Web Console**.
4. Log in to VoIP Monitor using a **User ID** with administrative privileges.  
**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.
5. Click **Admin** on the toolbar.
6. Click **VoIP Monitor Settings** in the left navigation pane.
7. Click **CallManager Nodes**.
8. Click **Add**.
9. Select the appropriate device type: **Cisco CallManager** or **CallManager Express**.
10. Expand the device lists and review available CallManager-hosting devices.

11. Check the devices hosting the CallManagers you want to monitor, and then click **Add**.

**Note:** If you do not see an expected CallManager device in the list, you need to use System Manager to add the device to your Orion database. For more information on adding CallManager devices, see “Adding VoIP Devices and Interfaces to VoIP Monitor” on page 13.

12. Check the CallManager devices you want to monitor, and then click **Add**.

## Deleting Cisco CallManager Devices from VoIP Monitor

The following procedure provides the steps to delete a Cisco CallManager device from VoIP Monitor.

1. Log on to your Orion VoIP Monitor server.
2. Click **Start > SolarWinds Orion > VoIP Monitor > VoIP Web Console**.
3. Log in to VoIP Monitor using a **User ID** with administrative privileges.

**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.

4. Click **Admin** on the toolbar.
5. Click **VoIP Monitor Settings** in the left navigation pane.
6. Click **CallManager Nodes**.
7. Select the CallManager-hosting devices you want to delete, and then click **Delete**.

## Adding Call Manager Devices from Other Manufacturers

Call managers from manufacturers other than Cisco can be monitored with VoIP Monitor if you use a custom management information base (MIB) poller specifically configured for your non-Cisco call manager. VoIP Monitor treats non-Cisco call managers as nodes, so the procedure for adding them is the same as for any other VoIP device. For more information about creating custom MIB pollers, see “Creating Custom MIB Pollers” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*. For more information about adding devices to VoIP Monitor, see “Adding VoIP Devices and Interfaces to VoIP Monitor” on page 13.

**Note:** VoIP Monitor presents a non-Cisco call manager as another VoIP network node. Non-Cisco call managers are not displayed with Cisco devices in the CallManagers resource.

## Configuring VoIP Monitor

After establishing your basic VoIP Monitor configuration with the Configuration Wizard, you can change your settings at any time to further customize VoIP Monitor for your network. The following sections present configuration options and procedures for VoIP Monitor.

### VoIP Monitor Settings

VoIP Monitor Settings are configured on the VoIP Monitor Settings page, available on the Orion Web Console Admin page. VoIP Monitor settings are also viewable from any page in VoIP Monitor by clicking **VoIP Settings** at the top right. The following aspects VoIP Monitor may be configured from this page:

#### Settings

Presents general options regarding your configuration of VoIP Monitor. From the VoIP Monitor Settings page you can configure the following aspects of your VoIP Monitor installation:

- The port through which VoIP Monitor sends simulated traffic
- The jitter codec that VoIP Monitor simulates on your network
- The interval on which VoIP Monitor tests your network
- The length of time that collected data is retained in the Orion database
- The MOS advantage factor to characterize your VoIP network for the purpose of determining the Mean Opinion Score (MOS).
- The Type of Service (ToS) octet allows you to set precedence levels for VoIP traffic and IP SLA operations.

#### Thresholds

Establishes error and warning levels for MOS, jitter, latency, and packet loss over your VoIP Network. Based on the values that you provide to define error and warning conditions, VoIP Monitor can inform you of your VoIP network status in the following ways:

- Through the web console view
- In reports that you generate with Report Writer
- With alerts and actions that you can define using Advanced Alert Manager

## Sites

Provides an intuitive interface for defining independent locations, or sites, on your VoIP network. Each site on your VoIP network is associated with a designated simulation node. You can easily create new sites and edit existing locations from the VoIP Monitor Sites page.

**Note:** VoIP Monitor sites are limited to locations where there is an existing, Cisco IP SLA-compatible router to serve as a simulation node. Cisco IP SLA-compatible routers include 2600, 3700, and 7200 Series. For more information, see [www.cisco.com/go/fn](http://www.cisco.com/go/fn) and select “IP SLAs – UDP Based VoIP Operation”.

## Call Paths

Allows you to define possible call routes between simulation nodes that you have entered on the VoIP Monitor Sites page. These are the call paths over which VoIP Monitor sends simulated traffic for determining the status and performance of your VoIP network. VoIP Monitor provides an easy-to-use interface that gives you the ability to quickly define these flexible call paths.

## Infrastructure

Gives you the ability to designate nodes that are currently monitored by Orion Network Performance Monitor as specifically VoIP-related. VoIP Monitor can monitor any node that is relevant to your VoIP network, provided you have first added the node with System Manager. By expanding the given node trees, you can choose to monitor VoIP traffic down to the interface level. For more information about adding devices and interfaces, see “Adding VoIP Devices and Interfaces to VoIP Monitor” on page 13.

## CallManager Nodes

Allows you to specify the devices on your VoIP network that are Cisco CallManager and CallManager Express devices. The VoIP Monitor CallManagers resource is specifically tailored for Cisco CallManager devices. You must first add CallManager nodes to your Orion database with System Manager before they are available for monitoring by VoIP Monitor. For more information about adding devices and interfaces, see “Adding VoIP Devices and Interfaces to VoIP Monitor” on page 13.

## Database Details

Provides installation and memory sizing information about the database VoIP Monitor uses to store VoIP network data. Additionally, you can view statistics about individual tables within your database. Select a table from the list to see a count of rows and memory usage by data and indexes, respectively.

## VoIP Monitor Settings Configuration

The following steps guide you through the process of configuring VoIP Monitor settings for your VoIP network.

### To configure VoIP Monitor settings:

1. Log on to your Orion VoIP Monitor server.
2. Click **Start > SolarWinds Orion > VoIP Monitor >VoIP Web Console**.
3. Log in to VoIP Monitor using a **User ID** with administrative privileges.  
**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.
4. Click **Admin** on the toolbar.
5. Click **VoIP Monitor Settings** in the left navigation pane.
6. Click **Settings**.
7. **If you want to use a port other than the default Port number for simulated VoIP traffic**, type your preferred port in the appropriate field.
8. Select the **Jitter codec to simulate** for your VoIP network. For more information about jitter codecs, see “Jitter” on page 9.
9. Type a **Network test interval**, in minutes.

#### Notes:

- VoIP Monitor measures the performance of your network by periodically sending test packets over the call paths that you have defined. The period between these packet transmissions is referred to as the Network Test Interval. For more information, see “Jitter” on page 9.
  - As network sizes and VoIP server performance vary, you may have to try a number of different intervals to achieve the desired balance between server processing load and data resolution.
10. Type the period of time, in days, to retain VoIP data in the **Call path test data retention** field.

#### Notes:

- VoIP Monitor stores statistics regarding the performance of your VoIP network in your Orion database. The length of time that this data is retained is configurable, allowing you to balance database maintenance with IP SLA requirements.
- As network sizes and VoIP server performance vary, you may have to try a number of different retention periods to achieve the desired balance between database memory allocation and data retention.

**11. Type a value for the MOS advantage factor.**

**Note:** The advantage factor is a measure, on a scale of 0 to 20, of the willingness of your VoIP network users to trade call quality for convenience. For example, a cellular telephone is more convenient than a wired telephone, so some loss of call quality due to compression over a cellular phone, as compared to call quality over a wired phone, is acceptable to most users. This distinction is reflected in a higher advantage factor for a cellular phone network than for a wired phone network. For more information, see “Packet Loss” on page 10.

**12. Provide a value for the Type of Service (ToS) octet that sets the precedence for VoIP traffic.**

**Note:** The ToS octet is a decimal value (0-255) that sets the precedence for VoIP traffic monitored with Cisco IP SLA operations. The default ToS value used by VoIP Monitor is 184, corresponding to Expedited Forwarding (EF) per hop behavior (PHB) and a Differentiated Service Code Point (DSCP) value of 46. For more information, see “Setting VoIP Traffic Precedence” on page . 11

**13. Click **Submit**, when you have completed your configuration.**

## Configuring VoIP Devices for IP SLA Operations

Cisco IP Service Level Agreements (IP SLAs) are the primary means by which VoIP Monitor acquires information about the performance of your VoIP network. The process of configuring a device for IP SLA can be quite intricate, as it can involve numerous command line operations on each router. To ease the process of device configuration for IP SLA, VoIP Monitor uses the Round Trip Time Monitor (RTTMON) MIB from Cisco to configure VoIP simulation nodes. When you add your VoIP routers, VoIP Monitor enables them for IP SLA operations automatically, allowing you to start monitoring your VoIP network immediately.

**Note:** VoIP Monitor automatically checks for IP SLA-compatibility when adding simulation nodes. It confirms that rttMonApplResponder of CISCO-RTTMON-MIB is “on”. To ensure that VoIP Monitor is able to configure and maintain devices for IP SLA operations, you must provide read-write credentials for each router you want to serve as a simulation node. You provide these credentials when adding devices with Orion System Manager. For more information about the MIBs that VoIP Monitor continually updates, see “MIBs Maintained by VoIP Monitor for IP SLAs” on page 31.

## Selecting VoIP Sites

After you include VoIP devices in your Orion database and VoIP Monitor configures them for IP SLA operations, the next step is to designate appropriate VoIP devices as simulation nodes. Both endpoints, or sites, on a VoIP call path must be associated with a simulation node. VoIP Monitor determines potential simulation nodes as you select them on the VoIP Infrastructure page. Simulation nodes must be IP SLA-compatible Cisco routers. Additionally, when you add a potential simulation node to Orion System Manager, you must grant Orion NPM write access to the router, so that VoIP Monitor can enable IP SLA operations on the added router. The following section details the process of both defining sites and designating simulation nodes.

**Note:** With the exception of Catalyst 4500 series switches, all Cisco IOS hardware supports IP SLA operations. If a potential simulation node does not support Cisco IP SLA operations or Orion NPM does not have write access to the selected simulation node, an error message displays when you try to add the device as a simulation node. The selection operation will not complete.

## Designating Sites

VoIP Monitor provides performance statistics for your VoIP network by sending simulated traffic over call paths between sites that you define. The following procedure designates sites over which VoIP Monitor monitors simulated traffic.

### To designate simulation nodes on your VoIP network:

1. Log on to your Orion VoIP Monitor server.
2. Click **Start > SolarWinds Orion > VoIP Monitor > VoIP Web Console**.
3. Log in to VoIP Monitor using a **User ID** with administrative privileges.

**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.

4. Click **Admin** on the toolbar.
5. Click **VoIP Monitor Settings** in the left navigation pane.
6. Click **Sites**.
7. Click **Create a new site**.
8. Complete the **Name** field.

**Note:** The Name of a VoIP site is not necessarily the same as its network name or IP address. The optional site name option helps you identify the simulation node, for example, in terms of its geographic or physical location.

9. Select the **VoIP Simulation Node** at the site you are creating, and then click **Create**.

Once you have established the VoIP sites in your network, you must designate the call paths over which you want to monitor traffic and record performance statistics, as shown in the following section.

## Designating Call Paths

VoIP Monitor provides performance statistics for your VoIP network by sending simulated traffic over call paths between sites that you define. Because large VoIP networks quickly become complicated, VoIP Monitor provides an easy-to-use interface for establishing call paths. The VoIP Call Paths page offers the following three options for establishing monitoring:

### Fully Meshed

Connects every VoIP site you define over distinct call paths to every other VoIP site in your network.

### Hub and Spoke

Establishes designated VoIP sites as hubs. Each hub is then connected to all other VoIP sites, with call paths representing spokes.

### Custom

Allows you to define your own call paths. All defined VoIP sites are listed. Expanding each site displays a list of all other VoIP sites. Checkboxes allow you to define call paths in whatever way best suits your requirements.

The following procedure provides the steps that you need to designate call paths in VoIP Monitor.

### To designate call paths on your VoIP network:

1. Log on to your Orion VoIP Monitor server.
2. Click **Start > SolarWinds Orion > VoIP Monitor > VoIP Web Console**.
3. Log in to VoIP Monitor using a **User ID** with administrative privileges.  
**Note:** Initially, `Admin` is the default administrator **User ID** with a blank **Password**.
4. Click **Admin** on the toolbar.
5. Click **VoIP Monitor Settings** in the left navigation pane.
6. Click **Call Paths**.
7. *If you want to monitor all possible call paths on your VoIP network, select **Fully Meshed**.*

8. ***If you want to employ a hub and spoke configuration for your call paths***, complete the following steps:
  - a. Select **Hub and Spoke**.
  - b. Click **Add**, select a site to serve as a hub, and then click **Submit**.
  - c. Repeat until you have added all the hubs you want.
  - d. ***If you want to delete a hub***, select the hub and then click **Delete**.
9. ***If you want to configure custom call paths***, select endpoints as follows:
  - a. Select **Custom**.
  - b. ***If you want to select all call paths originating from a specific site***, check that site at the top level. Checking the top-level site selects all other endpoints on call paths from the selected site.
  - c. Select additional call paths by expanding the available call path tree and then choosing call paths according to the following rules:
    - Top-level sites are “From” endpoints.
    - Secondary sites are “To” endpoints.

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## Chapter 3

# Using VoIP Monitor

Orion VoIP Monitor employs the same proven Web Console architecture used by Orion NPM, but VoIP Monitor focuses on the VoIP-related devices of your Orion-managed network. VoIP Summary View provides a customizable default page for VoIP Monitor. This default page gives you a complete overview of your entire VoIP network at a glance. After you have installed VoIP Monitor, you can start monitoring your VoIP network from the VoIP Summary View.

### To start VoIP Monitor:

1. Log on to your Orion VoIP Monitor server.
2. Click **Start > SolarWinds Orion > VoIP Monitor > VoIP Web Console**.

**Note:** You can also open VoIP Monitor at any time from within the Orion Web Console by clicking **VoIP Monitor** in the toolbar.

## VoIP Monitor Views

VoIP Monitor presents current metrics of VoIP network performance in easily reviewed tables, graphs, and charts. The following sections detail the statistics that are available in views of each aspect of your VoIP network. For more information about customizing VoIP Monitor views, see “Customizing Views” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*. The following views are provided with VoIP Monitor:

### VoIP Summary View

Provides an overview of your entire VoIP network, including resources that present information about VoIP devices, VoIP-related events and alerts, call paths, and overall performance metrics.

### VoIP CallManager View

Provides in-depth information about individual Cisco CallManager devices, including registered and unregistered phone statistics and device properties.

### VoIP Call Path View

Provides performance statistics, gauges, and charts for individual call paths.

### VoIP Site View

Provides performance statistics, gauges, and charts for individual VoIP sites.

## Using Advanced Alerts and Actions

VoIP Monitor provides a number of VoIP-specific alerts you can use with Orion Advanced Alert Manager to actively monitor and respond to detected issues. The Orion Advanced Alerts Manager also allows you to designate actions for VoIP Monitor alerts.

**Note:** Only advanced alerts may be used for VoIP-specific purposes. Basic alerts can not be configured to trigger on VoIP conditions or events.

## VoIP Monitor Alerts

Your installation of VoIP Monitor supplements the alerting abilities of Orion Network Performance Monitor with a number of VoIP-specific alerts.

Alert	Condition
Jitter	Triggered whenever a threshold value for latency variability is either met or sustained for a designated period of time.
Latency	Triggered whenever the measured delay on a designated call path reaches a threshold value, or it can be triggered if a defined delay is sustained for a designated period of time.
Mean Opinion Score (MOS)	Triggered whenever a connection either experiences a MOS below a specified level or maintains a specified MOS over a set period of time.
Packet Loss	Triggered whenever perceived packet loss either exceeds a threshold value or is sustained at a designated level for a specified period of time.
VoIP Infrastructure Node Status	Triggered whenever a designated node changes status, Up or Down.

Other alerts can be configured following the procedures in the *SolarWinds Orion Network Performance Monitor Administrator Guide* and using variables available in Orion NPM and the Advanced Alert Manager. For more information about using Advanced Alerts within Orion Network Performance Monitor, see “Creating and Configuring Advanced Alerts” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

## Creating VoIP Monitor Reports

Because VoIP Monitor is an integrated module of Orion Network Performance Monitor, information that you collect about your VoIP network is easily presented in a variety of formats using Orion Report Writer. SolarWinds provides Report Writer as a quick and easy way for you to extract data from your database, including VoIP network statistics, for presentation in a useful form. A number of predefined VoIP-specific reports are available with your installation of VoIP Monitor. Report Writer also enables custom VoIP report creation, as necessary, using criteria and conditions you choose. When you have finished editing your

reports, you can view them through the VoIP Monitor web interface and print them with the click of a button.

A report scheduling application is available to all customers with a current maintenance agreement. This tool schedules automatic email reports that can be sent to individual users or groups of users. Simply log in to the customer portal of [www.solarwinds.com](http://www.solarwinds.com) and download the Report Scheduler.

Report Writer capabilities are further enhanced when they are used in conjunction with the Custom Property Editor. Custom properties are available for report sorting and filtering. For more information about using custom properties, see “Creating Custom Properties for VoIP Monitor” on page 25.

## Using Predefined VoIP Reports

A number of VoIP-specific reports have been provided with your installation of VoIP Monitor. The following reports are provided through Orion Report Writer:

- Calls from a Site over the Last XX Days
- Calls to a Site over the Last XX Days
- Delay over the Last XX Days
- Jitter over the Last XX Days
- MOS over the Last XX Days
- Packet Loss % over the Last XX Days
- VoIP Infrastructure Availability

Other reports may be generated using variables available in Orion Report Writer. For more information about using Report Writer within Orion Network Performance Monitor, see “Creating Reports” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

## Creating Custom Properties for VoIP Monitor

Orion Custom Property Editor is available to simplify the task of monitoring your VoIP network. The Custom Property Editor allows you to define custom properties, such as country, building, asset tag, and serial number. These properties may apply to any VoIP device or interface that you have stored in the VoIP Monitor database. Once properties are added, they are available for display and filtering within any Orion application. A few examples of how custom properties may be used are as follows:

- Add a custom property and display it as an annotation on a chart.
- Add a custom property to interfaces to display a custom description.

- Add a custom property that is used as an account limitation on sites.
- Add additional information to sites, such as contact, owner, or support contract number.
- Add a notification property to sites that can configure the alerts feature to send an email to a computer named within the custom property.
- Add a custom property to routers and interfaces for grouping them on the web or in a report.
- Add a custom property of billing codes or customer IDs.

Custom Property Editor allows you to choose from a collection of commonly used properties, or you can easily and efficiently build your own custom properties. Once your custom property is defined, the Import Wizard allows you to populate your new property from either a text- or comma-delimited file. For more information about creating custom properties for VoIP Monitor, see “Creating Custom Properties” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

## **Customizing Charts in VoIP Monitor**

You can easily customize charts produced within the Orion Network Performance Monitor Web Console are easily customizable. The following sections describe options that are available on the Customize Chart page to modify the presentation of a selected chart.

**Note:** Click **Refresh** at any time while customizing a chart to review changes you have made.

### **Chart Titles**

**Chart Titles** are displayed at the top center of a generated chart. The Chart Titles area allows you to modify the title and subtitles of your generated chart.

**Note:** Orion Network Performance Monitor may provide default chart titles and subtitles. If you edit any of the **Chart Titles** fields on the Custom Chart page, you can restore the default titles and subtitles by clearing the respective fields, and then clicking **Submit**.

## Time Periods

You can designate a predefined or custom time period for your chart using either of the following methods:

- Select a predefined time period from the Adjust Time Period for Chart menu.
- Provide custom Beginning and Ending Dates/Times in the appropriate fields in the Enter Date / Time Period area.

## Adjust Sample Interval

The sample interval dictates the precision of your generated chart. A single point or bar is plotted for each sample interval. If a sample interval spans multiple polls, polled data is automatically summarized and plotted as a single point or bar on the chart.

**Note:** Due to limits of memory allocation, some combinations of time periods and sample intervals may require too many system resources to display, due to the large number of polled data points. As a result, charts may not display if the time period is too long or if the sample interval is too small.

## Chart Size

Chart size options configure the width and height, in pixels, of the chart. You can maintain the same width/height aspect ratio, or scale the chart in size, by entering a width in the Width field and then entering 0 for the Height.

## Data Tables

The Data Table Below Chart option displays a table of the charted data points below the chart.

**Note:** You may not be able to read individual data points if you select a small sample interval. Select a larger sample interval to make it easier to read data points.

## Font Size

Font sizes for generated charts are variable. The Font Size option allows you to select a Small, Medium, or Large size font for your chart labels and text.

**Note:** Font size selections are maintained in the printable version of your chart.

## Printing Options

To print your customized chart, click **Printable Version**. A printable version of your customized chart displays in the browser.

## Data Export Options

Exportable chart data is also available in the Display Data from Chart area as Microsoft Excel-compatible Raw Data or as HTML-formatted Chart Data, as shown in the following steps.

### To export chart data:

1. ***If you want to view your chart data as Microsoft Excel-compatible Raw Data***, click **Raw Data** in the Display Data from Chart area, and then follow the prompts, if provided, to open or save the resulting raw data file.
2. ***If you want to view your chart as HTML-formatted data***, click **Chart Data** in the Display Data from Chart area and the data for your chart displays in a new browser window.

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## Appendix A

# Software License Key

During installation, you may be prompted with the Install Software License Key window requesting that you supply your name, e-mail address, phone number, customer ID, and password. If this is the case, follow the instructions below to enable a software license key.

### To enable a software license key:

1. ***If the computer on which you are installing Orion VoIP Monitor is connected to the Internet and not behind a proxy server***, enter the requested information on the Install Software License Key window, and then click **Continue**.

**Note:** The SolarWinds license registration server will immediately issue a license key that will allow VoIP Monitor to operate.

2. ***If the computer on which you are installing Orion VoIP Monitor is not connected to the Internet***, your server cannot authenticate to the SolarWinds license registration server, so you must complete the following procedure.
  - a. Click **Skip This and Enter Software License Key Now** on the Install Software License Key window.
  - b. Using another computer that is connected to the Internet, log in to the customer area of the SolarWinds website at [www.solarwinds.com/keys](http://www.solarwinds.com/keys).
  - c. Click **Software Keys** from the Customer Area menu.
  - d. Select the product for which you need a key, and follow the instructions on the page to obtain a key.
  - e. Enter the key in the **Enter Software License Key** text box.
3. Click **Continue** to complete your Software License Key installation.



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## Appendix B

# MIBs Maintained by VoIP Monitor for IP SLAs

VoIP Monitor continually updates CISCO-RTTMON-MIB in order to maintain IP SLA operations between VoIP devices. The following MIB names are maintained by VoIP Monitor, according to the settings of your VoIP Monitor implementation, as it conducts IP SLA operations:

- rttMonCtrlAdminRttType.
- rttMonEchoAdminProtocol
- rttMonEchoAdminTargetAddress.
- rttMonEchoAdminSourceAddress
- rttMonEchoAdminTargetPort
- rttMonCtrlAdminFrequency
- rttMonEchoAdminCodecType
- rttMonEchoAdminCodecPayload
- rttMonEchoAdminCodecNumPackets
- rttMonEchoAdminCodecInterval
- rttMonEchoAdminICPIFAdvFactor
- rttMonCtrlAdminStatus
- rttMonScheduleAdminRttLife
- rttMonEchoAdminTOS
- rttMonScheduleAdminRttStartTime



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## Appendix C

# Bandwidth Gauges

Bandwidth Gauges provides realtime traffic monitoring. A bandwidth gauge can be configured to monitor the transmit and receive utilization of any remote network device, using SNMP to communicate and gather traffic statistics. Gauges display transmit and receive traffic in bits per second or transmit and receive percent utilization for each interface or port.

## ***Bandwidth Gauges Menus***

The following menus present options that are available for configuring bandwidth gauges.

### **File Menu**

The following options for bandwidth gauges are available from the File menu.

#### **Load Gauges**

Loads a set of gauges from a previously save file. This file has the extension `.BandwidthGauges`, and it is created by clicking **File > Save** or **File > Save As**.

#### **Save**

Saves the current set of gauges as a `*.BandwidthGauges` file. This file can be reloaded later by selecting **File > Load Gauges**.

#### **Save As**

Saves the current set of gauges as a `*.BandwidthGauges` file with a new filename. This file can be reloaded later by selecting **File > Load Gauges**.

#### **Close**

Closes all gauges currently displayed.

#### **Publish to Web**

Saves the gauges as an HTML file and saves gauge images to the specified location. This location could be part of a web site.

#### **New Window**

Opens another instance of the Bandwidth Gauges in a new window.

## Settings

Opens the Settings dialog window.

## Exit

Exits the program. You should save your gauges before exiting if you want to reload them without having to add them one at a time.

## Gauges Menu

The following options for bandwidth gauges are available from the Gauges menu.

### New Gauge

Adds a new gauge to the list.

### Refresh

Polls all devices and the updates the associated gauges. Some devices, including Windows servers, update the traffic statistics in their SNMP Agent every 15 to 20 seconds. If the device is polled more frequently than the remote SNMP Agent is updated, the gauges may show 0 bps, and then show the correct values a few seconds later. If you notice the gauges changing from 0 bps to a higher value, you may need to increase the poll interval. Double-click on a gauge to adjust its poll interval.

## ***Modifying Settings and the Publishing of Gauges***

The following sections detail options for publishing bandwidth gauges. These settings tabs are available by clicking **File > Settings**.

## Layout Tab

The following options for bandwidth gauges are available on the Layout tab.

### Number of Columns

Sets the maximum number of gauges to be displayed in each row. When a new gauge is added, a new row will be created if the current row is already displaying the maximum number of gauges.

### Reposition Gauges

Use the up and down arrows to arrange the display order of the gauges.

## Transparency Tab

The following options for bandwidth gauges are available on the Transparency tab.

### Switch to transparent mode after a few seconds

When this option is enabled, moving the mouse cursor away from the Bandwidth Gauges window will activate the transparent mode. When the gauges are transparent, mouse clicks will be passed to the workspace (applications running behind the gauges) instead of to the gauges. To exit transparent mode, place the mouse cursor over the Bandwidth Gauges title bar.

### Transparent Slider

Adjust the slider to change the transparency opacity. To make the gauges more prominent, increase the percentage, decrease it to make the gauges more transparent.

### Keep Bandwidth Gauges on top of other windows

Check this option to show Bandwidth Gauges on top of all windows even when working in another application.

**Note:** When Switch to transparent mode after a few seconds is enabled, the Bandwidth Gauges will always be placed on top of other windows.

## Gauge Styles Tab

The Gauge Styles tab provides a number of design options for viewing your bandwidth gauges.

### Style of Gauge

There are over thirty different gauge styles to choose from. Changing the Style in the Bandwidth Gauges Settings dialog only changes the default style. Click **Apply to All** to change the current gauges to the selected style.

Double-click on a gauge to modify the settings for a single set of gauges.

## Data Table Tab

The Data Table tab provides the option of displaying a data table below your bandwidth gauges.

### Show a data table below Gauges

Check this to set the default data table for all gauges. When a new gauge is added, it will contain a data table with the Selected Statistics shown here. Click **Apply to All** to add a data table to the gauges currently displayed.

Double-click on a gauge to modify the settings for a single set of gauges.

## Network Tab

The sliders on the Network tab are used to adjust polling frequency, timeout, and the frequency with which gauges are displayed. Clicking **Apply to All** applies the Update Gauges every XX seconds value to all gauges currently displayed.

**Note:** Some devices, including Windows servers, only update the traffic statistics in their SNMP Agent every 15 or 20 seconds. If the device is polled more frequently than the remote SNMP Agent is updated, the gauges may show 0 bps, and then show the correct values a few seconds later. If you notice the gauges changing from 0 bps to a higher value, you may need to increase the poll interval. Double-click on a gauge to adjust its poll interval.

## Auto-Publish

Bandwidth gauges may be formatted to publish directly to the web, by selecting the following option on the Auto-Publish tab.

### Auto-Publish these Gauges to a Web

When this is selected, an HTML file will be created every few seconds. The Web Page Title will be displayed on the title bar of the web browser and as the title of the web page. Adjust the slider at the bottom of the window to change how often the HTML file is updated.

## Context Menus

Right-click on any gauge to display a context menu of further options for the selected gauge.

### Copy

Right-clicking on a gauge and selecting Copy will copy an image of that gauge to the clipboard. Alternately, when right-clicking on the data table and selecting Copy will copy the data table text to the clipboard.

## Delete Selected Gauge

Deletes the gauge from the current display.

## New Gauge

Opens the New Traffic Gauges dialog to add a new gauge to the current display.

## Reset

Clears the historical statistics and starts a new baseline for the selected gauge.

## Refresh

Polls the selected device and the updates the gauges. Some devices, including Windows servers, only update their MIBs every 15 or 20 seconds. If the device is polled more frequently than the MIB is updated, zero values will be reported.

## Data Table

Displays the data table if not currently shown. If a data table is already displayed, it will be removed.

## Historical Chart

Displays a brief history of the selected gauge in a chart format.

## Historical Statistics

Displays a brief history of the selected gauge in a table format.

## Properties

Opens the Gauge Properties dialog for the selected gauge.

**Note:** Any value adjusted in this dialog will only apply to the selected gauge. To change values for all gauges, use the Bandwidth Gauges Settings dialog.

## *Saving and Loading a Set of Gauges*

Once you have a set of gauges defined, you can save their configuration as a file that can be loaded at anytime.

### To save a set of gauges:

1. Click **File > Save Gauges**.
2. Specify a name for the configuration file, and then click **Save**.

**To reload a set of gauges:**

1. Click **File > Load Gauges**.
2. Navigate to the configuration file, and then click **Open**.

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