

SolarWinds Orion

VoIP Monitor Administrator Guide

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About SolarWinds

SolarWinds, Inc develops and markets an array of network management, monitoring, and discovery tools to meet the diverse requirements of today's network management and consulting professionals. SolarWinds products continue to set benchmarks for quality and performance and have positioned the company as the leader in network management and discovery technology. The SolarWinds customer base includes over 45 percent of the Fortune 500 and customers from over 90 countries. Our global business partner distributor network exceeds 100 distributors and resellers.

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You can contact SolarWinds in a number of ways, including the following:

Team	Contact Information
Sales	1.866.530.8100 www.solarwinds.com
Technical Support	www.solarwinds.com/support
User Forums	www.thwack.com

Conventions

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

Convention	Specifying
Bold	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 Orion VoIP Monitor Documentation Library

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

Document	Purpose
Orion VoIP Monitor Administrator Guide	Provides detailed setup, configuration, and conceptual information.
Page Help	Provides help for every window in the Orion VoIP Monitor user interface
Release Notes	Provides late-breaking information, known issues, and updates. The latest Release Notes can be found at www.solarwinds.com .

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

Document	Purpose
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
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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 Orion 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 to quickly test the fitness of your current network for a future VoIP deployment and then determine and track quality of service on your deployed VoIP 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 both realtime and historical performance statistics for your VoIP network. 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.

Custom Charts and Gauges

VoIP Monitor provides a number of easy-to-read charts and gauges that you can customize to suit your monitoring requirements. Using custom VoIP Monitor gauges of key VoIP metrics such as jitter, latency, packet loss, and mean opinion score (MOS), you can quickly determine the current status and performance of your VoIP network. With custom VoIP Monitor charts, you are able to easily track the historical performance of all the devices on your VoIP network, including VoIP routers, call managers, gateways, and phones.

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 28.

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 29.

Call Manager Monitoring

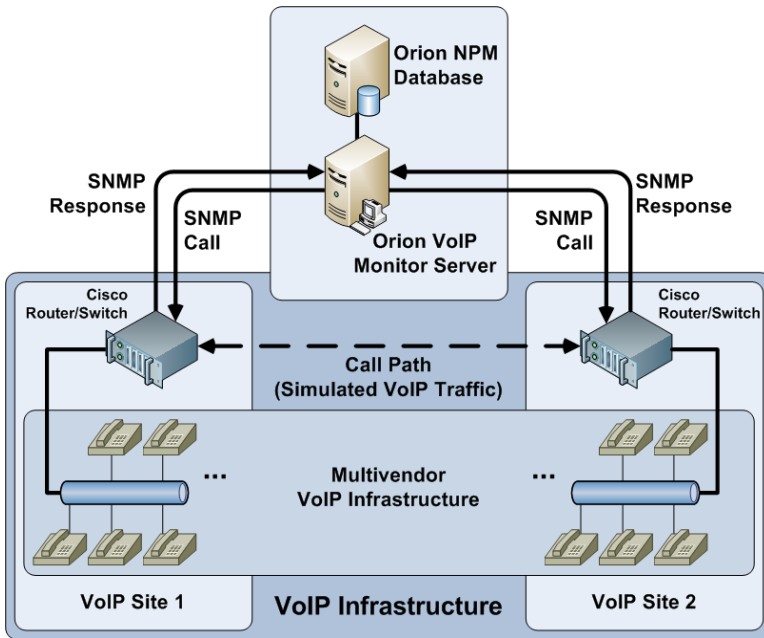
Call manager devices are scalable call-processing solutions for managing IP-based telecommunications networks. These devices provide VoIP networks with the same features and functionality of more traditional telephony. VoIP Monitor uses the SNMP and ICMP monitoring technology at the core of Orion Network 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. For more information about monitoring Cisco CallManager devices with VoIP Monitor, see “Adding or Deleting Cisco CallManager Devices” on page 24. For more information about monitoring other call manager devices with VoIP Monitor, see “Adding Call Manager Devices from Other Manufacturers” on page 26.

How Orion 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 using the jitter codec you specify. Cisco IP SLAs provide realtime and historical performance statistics that VoIP Monitor presents in the readily customizable Orion Web Console. A simplified schematic of a possible VoIP Monitor installation for two sites and a CallManager follows.

Note: VoIP Monitor uses simulated traffic, instead of real VoIP traffic, to ensure the continuous collection of performance statistics 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, SolarWinds recommends that you maintain your SQL Server installation on its own server, separate from the server 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. For more information about IP SLA-capable routers and switches, see www.cisco.com/go/fn and select "IP SLAs – UDP Based VoIP Operation".
CPU	Dual processor, 3GHz
RAM	3 GB
Hard Drive Space	20 GB
Operating System	Windows 2003 Server (32-bit or 64-bit) including R2, with IIS installed, running in 32 bit mode Windows 2008 Server (32-bit or 64-bit) with IIS installed, running in 32 bit mode
.Net Framework	Version 3.5 or later
Orion Network Performance Monitor	Version 9.1 SP3 or later
Database	SQL Server 2005 SP1 Express, Standard, or Enterprise SQL Server 2008 Express, Standard, or Enterprise
Web Browser	Internet Explorer version 6 or later Mozilla Firefox 3.0

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 licensing level of your underlying Orion NPM installation. VoIP Monitor licenses are currently available at each level for which Orion NPM is presently licensed. For example, if you are installing VoIP Monitor for use with an Orion Network Performance Monitor licensed at the SL100 level, you are allowed to monitor up to 100 VoIP resources. Likewise, if you are installing VoIP Monitor for use with an Orion Network Performance Monitor provisioned with an SLX license, you can monitor an unlimited number of VoIP resources. In addition, VoIP Monitor also offers licenses both for additional VoIP pollers and for use with website-only Orion Network Performance Monitor installations. 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:

- SolarWinds generally recommends that you back up your database before performing any upgrade.
- 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, contact SolarWinds support at www.solarwinds.com for licensing instructions specific to your installation.
- If you are installing an additional VoIP Monitor poller, contact SolarWinds support at www.solarwinds.com for licensing instructions specific to your installation.

To install Orion VoIP Monitor:

1. Log on to the Orion Network Performance Monitor server you will use to monitor your VoIP network.

Note: Orion VoIP Monitor requires 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 SolarWinds welcome message, and then click **Next** to continue.
5. Select **I accept the terms of the license agreement**, and then click **Next**.
6. Click **Install**.
7. After the wizard completes installation, click **Finish**.
8. **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 33.
9. Click **Continue** when the license is successfully installed.
10. **If the Configuration Wizard does not start automatically**, click **Start > All Programs > SolarWinds Orion > Configuration Wizard**.
11. Review the configuration summary.
12. **If the configuration settings are correct**, click **Finish**.

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 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 of the variation in network latency that results in a loss of synchronization over time. Users experience jitter 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 you to select a jitter codec to properly configure IP SLAs for your VoIP network. Codecs compute jitter 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 Network test interval	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

For more information about configurable settings within VoIP Monitor, see “Configuring VoIP Monitor with the VoIP Site Wizard” on page 13.

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 about MOS calculations, see ITU-T Recommendation G.107. For more information about codec algorithms, see “Jitter” on page 8. For more information about VoIP Monitor Settings, see “Configuring VoIP Monitor Settings” on page 16.

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 or Deleting Cisco CallManager Devices” on page 24. For more information about adding non-Cisco call management devices, see “Adding Call Manager Devices from Other Manufacturers” on page 26.

Using VoIP Monitor in the Orion Web Console

VoIP Monitor is a fully integrated module of the Orion Network Performance Monitor 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 27.

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 adding VoIP devices to the Orion database, you can then submit them to VoIP Monitor for monitoring.

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 specified on the VoIP Monitor Settings page. For more information, see “VoIP Monitor Settings” on page 13. 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		PHB	Drop Probability
IP Precedence													
ToS Value (decimal)	DSCP Value (decimal)	b7	b6	b5	b4	b3	b2	b1	b0				
Best Effort	0	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	0	CS1	
	64	16	0	1	1	0	0	0	0	0	0	CS2	
	96	24	0	1	0	0	0	0	0	0	0	CS3	
	128	32	1	0	1	0	0	0	0	0	0	CS4	
	160	40	1	0	0	0	0	0	0	0	0	CS5	
	192	48	1	1	1	0	0	0	0	0	0	CS6	
	224	56	1	1	0	0	0	0	0	0	0	CS7	
Assured Forwarding	40	10	0	0	1	0	1	0	0	0	0	AF11	Low
	48	12	0	0	1	1	0	0	0	0	0	AF12	Medium
	56	14	0	0	1	1	1	0	0	0	0	AF13	High
	72	18	0	1	0	0	1	0	0	0	0	AF21	Low
	80	20	0	1	0	1	0	0	0	0	0	AF22	Medium
	88	22	0	1	0	1	1	0	0	0	0	AF23	High
	104	26	0	1	1	0	1	0	0	0	0	AF31	Low
	112	28	0	1	1	1	0	0	0	0	0	AF32	Medium
	120	30	0	1	1	1	1	0	0	0	0	AF33	High
	136	34	1	0	0	0	1	0	0	0	0	AF41	Low
	144	36	1	0	0	1	0	0	0	0	0	AF42	Medium
152	38	1	0	0	1	1	0	0	0	0	AF43	High	
Expedited Forwarding	184	46	1	0	1	1	1	0	0	0	0	EF	

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 can automatically discover the IP SLA configuration of added VoIP devices. This auto-discovery option is available on the VoIP Monitor Call Path Configuration Discovery page of the VoIP Site Wizard. For more information about IP SLA operations, see “Understanding Quality of Service and IP SLAs” on page 7. For more information about the VoIP Site Wizard, see “Configuring VoIP Monitor with the VoIP Site Wizard” on page 13.

Configuring VoIP Monitor with the VoIP Site Wizard

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. Modifications include the addition of VoIP devices, the designation of call paths, and the configuration of polling options. VoIP Monitor provides the VoIP Site Wizard to guide you through the process of configuring VoIP Monitor for your specific VoIP network.

Starting the VoIP Site Wizard

The VoIP Site Wizard is a comprehensive configuration utility provided within VoIP Monitor to ensure that VoIP Monitor delivers a complete picture of the performance of your VoIP network. The following procedure shows how to access and start the VoIP Site Wizard.

Note: Although it is possible to directly access individual configuration pages without stepping through the VoIP Site Wizard, SolarWinds recommends that you start with the VoIP Monitor Settings page and then complete all steps of the wizard whenever you modify any aspect of your VoIP Monitor configuration.

To access and start the VoIP Site Wizard:

1. Click **VoIP Settings** at the top right of any VoIP Monitor view.
2. On the Configuration Settings for VoIP Monitor 2.0 page, click **Settings**.

Note: For more information about the configuration settings available on this page, see “VoIP Monitor Settings” on page 13.

The following sections provide detailed instructions for configuring the various aspects of VoIP Monitor for your VoIP network.

VoIP Monitor Settings

The Configuration Settings for VoIP Monitor 2.0 page gives an overview of the configuration pages within the VoIP Site Wizard. SolarWinds recommends that you follow the steps in the VoIP Site Wizard, starting with the VoIP Monitor Settings page. Access the VoIP Site Wizard from the Configuration Settings for VoIP Monitor page by clicking **Settings**, and then navigate through the following VoIP Site Wizard pages. The following aspects of VoIP Monitor may be configured from this page.

Settings

This page 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 collects test data about your network
- The length of time that collected data is retained in the Orion database
- The MOS advantage factor that appropriately characterizes 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
- If you have multiple VoIP pollers installed, you can configure the interval on which VoIP Monitor checks the status of these additional VoIP pollers

For more information about configuring VoIP Monitor settings, see “Configuring VoIP Monitor Settings” on page 16.

Thresholds

The VoIP Monitor Thresholds page allows you to establish error and warning levels for MOS, jitter, latency, and packet loss on your VoIP network. Using either default values provided by VoIP Monitor or the values that you provide to define error and warning conditions, VoIP Monitor can inform you of the status of your VoIP network status either through the web console view, in reports that you generate with Orion Report Writer, or with alerts and actions you define using the Advanced Alert Manager. For more information, see “Setting VoIP Monitor Thresholds” on page 17.

Sites

This page provides an intuitive interface for adding and removing 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 or delete existing locations from the VoIP Monitor Sites page. You must first add IP SLA-capable nodes to your Orion database with System Manager before they are available for monitoring by VoIP Monitor. For more information about adding, editing, or deleting VoIP Monitor sites, see “Adding, Editing, or Deleting VoIP Monitor Sites” on page 18.

Note: VoIP Monitor sites are limited to locations where there is an existing, Cisco IP SLA-compatible router or switch to serve as a simulation node. For more information about Cisco IP SLA-capable routers and switches, see www.cisco.com/go/fn and select “IP SLAs – UDP Based VoIP Operation”.

Call Paths

VoIP Monitor allows you to define possible call routes between the 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. With the VoIP Monitor call path configuration interface, you can either automatically define call paths using fully meshed and hub-and-spoke topologies or configure your own custom topology to suit the conditions of your VoIP network.

CallManager Nodes

The VoIP Monitor CallManager Nodes page allows you to specify the devices on your VoIP network that are Cisco CallManager and CallManager Express devices. The VoIP Monitor CallManagers resource that is available on VoIP Monitor views 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 Cisco CallManager devices, see “Adding or Deleting Cisco CallManager Devices” on page 24.

Infrastructure

The VoIP Monitor Infrastructure page allows you to select VoIP-related nodes and interfaces from your Orion database and then conveniently display them in the VoIP Infrastructure resource.

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. VoIP Monitor provides a number of default alerts, reports, and resources that allow you to constantly monitor all of your VoIP devices. For more information about adding devices and interfaces, see “Adding, Editing, or Deleting VoIP Monitor Sites” on page 18. For more information about alerts and reports in VoIP Monitor, see “Using VoIP Monitor” on page 27.

Database Details

The VoIP Monitor Database Details page provides installation and memory sizing information for your Orion database. From this view you can read statistics concerning individual tables within your database. Select a table from the list to see a count of rows and the amount of memory used by data and indexes, respectively.

Configuring VoIP Monitor Settings

The following steps guide you through the process of configuring VoIP Monitor on the VoIP Monitor Settings page.

Note: VoIP Monitor maintains default values for these settings. If, at any time, you want to use the default settings, click **Restore Defaults**, and then click **Next** to continue to the VoIP Monitor Thresholds page.

To configure VoIP Monitor settings:

1. **If you want to use a port other than the default for simulated VoIP traffic**, type your preferred port in the **VoIP UDP Port** field.
2. Select the **VoIP Jitter Codec** you are using for your VoIP network. For more information about jitter codecs, see “Jitter” on page 8.
3. Type a **Polling Interval**, in minutes.

Note: VoIP Monitor measures the performance of your network by periodically sending test packets over defined call paths. VoIP Monitor measures the performance of your VoIP network in transmitting these test packets. The period between measurements is referred to as the Polling Interval. For more information about this interval, see “Jitter” on page 8. 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.

4. Type the period of time, in days, to retain VoIP data in the **Call Path Data Retention** field.

Note: VoIP Monitor stores statistics regarding the performance of your VoIP network in your Orion database. The length of time 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 different retention periods to achieve the desired balance between database memory allocation and data retention.

5. 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 network, as compared to call quality over a wired phone network, 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 “Mean Opinion Score (MOS)” on page 10.

6. Provide a value for the **Type of Service (ToS)** octet to set the precedence of VoIP traffic on your network.

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 about the ToS octet, see “Setting VoIP Traffic Precedence” on page 11.

7. In the **Multiple Poller Check Interval** field, provide an interval, in minutes, to establish the frequency with which VoIP Monitor checks for other configured VoIP pollers.

Note: Set this number relatively high to optimize resource allocation unless you intend to add or remove additional VoIP pollers soon.

8. Click **Next** to continue to the VoIP Monitor Thresholds page after you have completed your VoIP Monitor settings configuration.

Setting VoIP Monitor Thresholds

VoIP Monitor indicates when metrics of your VoIP network are at warning or error levels by presenting relevant status icons and meters either in yellow to indicate warning conditions or in red to indicate error conditions. The VoIP Monitor Thresholds page allows you to set the status levels by which VoIP Monitor determines warning and error conditions. The following steps guide you through the process of configuring VoIP Monitor thresholds.

Note: VoIP Monitor maintains default values for these settings. If, at any time, you want to use the default settings, click **Restore Defaults**, and then click **Next** to continue to the VoIP Monitor Sites page.

To set VoIP Monitor thresholds:

1. Provide **Warning** and **Error** levels for **MOS** on your VoIP network.

Note: The value of the MOS Warning threshold should be higher than the value of the MOS Error threshold for your network. For more information about MOS, see “Mean Opinion Score (MOS)” on page 10.

2. Provide **Warning** and **Error** levels, in milliseconds, for **Jitter** on your VoIP network.

Note: The time period of the Jitter Warning threshold should be shorter than the time period of the Jitter Error threshold for your network. For more information about jitter, see “Jitter” on page 8.

3. Provide **Warning** and **Error** levels, in milliseconds, for **Latency** on your VoIP network.

Note: The time period of the Latency Warning threshold should be shorter than the time period of the Latency Error threshold for your network. For more information about latency, see “Latency” on page 7.

4. Provide **Warning** and **Error** levels, as percentages, for **Packet Loss** on your VoIP network.

Note: The percentage of the Packet Loss Warning threshold should be lower than the percentage of the Packet Loss Error threshold for your network. For more information about packet loss, see “Packet Loss” on page 9.

5. Click **Next** to continue to the VoIP Monitor Sites page after you have completed setting your VoIP Monitor thresholds.

Adding, Editing, or Deleting VoIP Monitor Sites

VoIP Monitor provides performance statistics for your VoIP network by sending simulated traffic over call paths between sites that you define. After you include VoIP devices in your Orion database you must designate appropriate VoIP routers as simulation nodes on the VoIP Monitor Sites page. Each of the sites on either end of a VoIP call path must be associated with a simulation node, and these simulation nodes must be IP SLA-compatible Cisco routers. The following procedure details the process of adding, editing, and deleting the sites over which VoIP Monitor monitors simulated traffic.

If you want VoIP Monitor to automatically enable IP SLA operations on an added router, you must grant Orion NPM write access to the router by providing an SNMP read/write credential when you add the router to the Orion database. For more information about adding devices to the Orion database, see “Using Orion System Manager” in the *SolarWinds Orion NPM Administrator Guide*.

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 if 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, and the selection operation does not complete.

To add, edit, or delete sites on your VoIP network:

1. **If you are deleting an existing site**, select the site you want to delete, click **Delete**, confirm the deletion by clicking **OK**, and then click **Next** to continue to the VoIP Monitor Call Paths page.

Note: If you delete a site, all related call paths that have the deleted site as an endpoint are also deleted.

2. **If you are adding a simulation node as a new site**, click **Add**.
3. **If you are editing the properties of an existing VoIP Monitor site**, select the site you are editing, and then click **Edit**.

4. Select the **VoIP Simulation Node** at the site you are creating or editing.
5. ***If you want to change the auto-populated name of the selected device,*** type an appropriate friendly name for identification in 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 allows you to identify the simulation node, for example, in terms of its geographic or physical location.
6. ***If you want to override the device IP address to specify a specific interface to use for testing,*** type the alternate IP address in the **IP Address** field.
7. ***If you want VoIP Monitor to attempt to automatically configure IP SLA operations on the selected site using the read/write community string you provided in Orion System Manager,*** select **Automatic** as the **IP SLA Configuration Mode**.
8. ***If you want to manually configure IP SLA operations for the selected site,*** select **Manual** as the **IP SLA Configuration Mode**.
Note: If you choose to manually configure IP SLA operations for the selected site, VoIP Monitor is unable to maintain IP SLA operations on the device. If a manually configured device is rebooted, you must enable IP SLA operations again to continue monitoring the device and its associated call paths. For this reason, SolarWinds recommends that you enable automatic configuration if your security policy allows. For more information, see "MIBs Maintained by VoIP Monitor for IP SLAs" on page 35.
9. ***If you have finished configuring the selected site,*** click **Submit**.
10. ***If you want to add, edit, or delete other sites,*** repeat the preceding steps, as required.
11. Click **Next** to continue to the VoIP Monitor Call Paths page after you have finished selecting VoIP Monitor sites.

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 can quickly become complicated, VoIP Monitor provides an easy-to-use interface for selecting call paths for monitoring. The VoIP Monitor Call Paths page offers the following three options for establishing monitoring:

Fully Meshed

A Fully Meshed call path configuration connects every VoIP site you define over distinct call paths to every other VoIP site in your network.

Hub and Spoke

A Hub and Spoke call path configuration allows you to designate specific VoIP sites as hubs. Each hub is then connected to all other VoIP sites, with call paths representing spokes.

Custom

The Custom call path configuration option allows you to define your own call paths. All defined VoIP sites are listed under this option, and expanding each site displays a list of all other VoIP sites. Checkboxes allow you to define call paths to best suit your monitoring requirements.

The following procedure provides the steps required to designate call paths in VoIP Monitor.

To designate call paths on your VoIP network:

1. ***If you want to monitor all possible call paths on your VoIP network***, select **Fully Meshed**, and then click **Next** to continue the VoIP Site Wizard.
2. ***If you want to employ a hub and spoke configuration for monitoring 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**.
 - e. Click **Next** to continue to the VoIP Monitor Call Path Configuration Discovery page.
3. ***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.
 - d. Click **Next** to continue to the VoIP Monitor Call Path Configuration Discovery page.

Discovering Call Path Configurations

If either of the following conditions applies to your installation, VoIP Monitor can attempt to automatically discover the call path configuration data required to enable IP SLA operations for your VoIP sites:

- You decided to manually configure IP SLA operations for a VoIP site.
- You opted not to provide a read/write community string when you added a VoIP device to Orion System Manager.

The following procedure is a guide to selecting a method for discovering required configuration information for call paths on your network.

To select a call path configuration discovery method:

1. ***If you only want VoIP Monitor to discover information for newly configured call paths***, select **Auto-discover new call path data**, and then click **Next** to start call path configuration discovery.

Note: Call paths already configured in VoIP Monitor are not affected by the selection of this option.

2. ***If you want VoIP Monitor to discover information for all currently configured call paths***, select **Auto-discover all call path data**, and then click **Next** to start call path configuration discovery.

Warning: Selecting this option will clear all current configuration data for any call paths you have already manually configured in VoIP Monitor.

3. ***If you do not want VoIP Monitor to automatically discover call path configuration information***, select **Skip auto-discovery**, and then click **Next** to continue to VoIP Monitor Call Path Manual Configuration page.

Note: To enable monitoring of designated call paths, you must provide valid IP SLA operation numbers on the VoIP Monitor Call Path Manual Configuration page. For more information about manual call path configuration, see “Configuring Call Paths Manually” on page 22.

If you selected either of the auto-discovery options, VoIP Monitor attempts to discover valid IP SLA operation numbers for each call path you have designated in VoIP Monitor. If VoIP Monitor is unable to discover a valid IP SLA operation number for any designated call path or if you decided to skip auto-discovery, the VoIP Monitor Call Path Manual Configuration page displays. For more information about updating IP SLA operation numbers and manual configuring call paths, see “Configuring Call Paths Manually” on page 22.

Configuring Call Paths Manually

In the event that VoIP Monitor is either unable or disallowed to automatically configure designated call paths, you must manually enable and configure IP SLA commands for each manually configured site. The VoIP Monitor Call Path Manual Configuration page lists all currently defined call paths for manually configured sites. Each call path is listed with its source and destination sites, current status, and IP SLA operation number.

Note: The VoIP Monitor Call Path Manual Configuration page is skipped if you select Auto-discovery on the VoIP Monitor Call Path Configuration Discovery page and VoIP Monitor is able to automatically configure all defined call paths.

Warning: If either device on a manually configured call path is rebooted at any time, the affected call path is removed from VoIP Monitor, and it will not be listed on VoIP Monitor Call Path Manual Configuration page. To show the affected call path again, you must enable the appropriate IP SLA operations on the rebooted device and either instruct VoIP Monitor to discover the operation again or instruct VoIP Monitor to skip discovery and then manually populate the IP SLA operations for the rebooted device.

The following procedure presents the steps required to manually configure call paths in VoIP Monitor.

To manually configure call paths:

1. ***If any of the VoIP devices on listed call paths are not already configured for UDP Jitter operations***, click **Config Instructions** next to the VoIP Monitor Call Path Manual Configuration page title, and then follow the instructions to configure these devices for UDP Jitter operations.

Notes:

- When configuring a device for IP SLA operations, required variables given in the Config Instructions should be set as follows:
 - *OperationNumber* should be a number that uniquely defines a destination for a given source site. If you do not have any IP SLA operations configured on the device, start with 1, and then increment the operation number for each new IP SLA operation added to the same device.

- *Codec* should be either *g711ulaw*, *g711alaw*, or *g729a*, depending on the codec you have configured for your network. For more information about codecs, see “Jitter” on page 8.
 - *DestinationIPAddress* should be the IP Address of the desired IP SLA Responder or site.
- If you are configuring IP SLA operations on multiple devices at the same time, SolarWinds Orion Network Configuration Manager can simplify the process by automating configuration. For more information, see “Using Orion Network Configuration Manager to Configure IP SLA Operations” on page 37.
2. Ensure that valid IP SLA operation numbers are provided for all call paths with status listed as expired, inactive, misconfigured, or unconfirmed.
Note: You can update IP SLA operations later by clicking the call path in the Misconfigured Call Paths resource or by clicking **Here** within the “Click Here to Update” note next to affected call paths in the VoIP Call Paths resource on the VoIP Summary View.
 3. ***If you have finished providing IP SLA operation numbers***, click **Next** to continue to the VoIP Monitor CallManager Nodes page.

Assigning Auto-Configured Call Paths

After creating call paths, you can specify the codec and the Virtual Routing and Forwarding table (VRF) name for a given call path. VRFs only exist on provider edge routers (PE). A VRF is a routing table instance, and you can have more than one VRF per PE. The VRF includes routes that are available to a certain set of sites. A VRF is named based on the VPNs it services and on the role of the CE in the topology.

Note: To use VRF names, your Cisco device must be running IOS 12.4t with enterprise services.

To assign auto-configured call paths:

1. ***If you want to filter the list of call paths***, complete the following procedure.
 - a. Click **Select Filter**.
 - b. Select a **Field**, **Comparison**, and **Value** from the lists provided, and then click **Add**.
 - c. ***If you want to add a new condition set***, click **Add New Condition Set**.
 - d. Continue adding any additional conditions or condition sets you need, and then click **Submit**.

2. Click the **Codec** list and then select the desired codec you want to use for the specified call path.
3. Type the VRF name in the Virtual Routing and Forwarding Name text box.
Note: After typing the VRF name in the first row, you can click **Apply First Row** to copy the name to additional call paths.
4. Click **Next** to continue to the VoIP Monitor Call Manager page.

Adding or Deleting Cisco CallManager Devices

Cisco CallManager and CallManager Express devices are added and deleted on the VoIP Monitor CallManager Nodes page of the VoIP Site Wizard. The following sections give procedures for adding or deleting CallManager devices.

Note: 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. For more information, see “Adding Call Manager Devices from Other Manufacturers” on page 26.

Adding CallManager Devices to VoIP Monitor

The following procedure adds a Cisco CallManager device to VoIP Monitor.

To add a CallManager device to VoIP Monitor:

1. **If you have not already added your CallManager devices to the Orion database**, use Orion System Manager to add your CallManager devices before continuing. For more information on adding devices, see “Using Orion System Manager” in the *SolarWinds Orion NPM Administrator Guide*.
2. Click **Add**, and then select the appropriate device type: **Cisco CallManager** or **CallManager Express**.
3. Expand the device lists to review available CallManager-hosting devices.
Note: If you do not see an expected CallManager device, use Orion System Manager to add it. For more information on adding devices, see “Using Orion System Manager” in the *SolarWinds Orion NPM Administrator Guide*.
4. Check the devices hosting CallManagers you want to monitor, and then click **Add**.
5. **If you have finished adding CallManager nodes**, click **Next** to continue to the VoIP Monitor Infrastructure page.

Deleting Cisco CallManager Devices from VoIP Monitor

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

To delete a CallManager device from VoIP Monitor:

1. Select the CallManager-hosting devices you want to delete, and then click **Delete**.
2. **If you are sure that you want to stop monitoring the selected node for CallManager data**, click **OK** in the dialog.
3. **If you have finished deleting CallManager nodes**, click **Next** to continue to the VoIP Monitor Infrastructure page.

Adding VoIP Infrastructure

The VoIP Monitor Infrastructure page provides an intuitive interface that allows you to select the Orion-managed devices that are part of your VoIP network. The following procedure shows how to add VoIP devices to VoIP Monitor.

Note: If a VoIP device that you want to monitor with VoIP Monitor is not listed on this page, you must add the device to the Orion database using Orion System manager. For more information, see “Using Orion System Manager” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

To add a VoIP device to VoIP Monitor:

1. **If you have not added your VoIP device 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 NPM Administrator Guide*.
2. Navigate the available devices and interfaces, and then check the appropriate objects for your VoIP network.
3. **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 and you want VoIP Monitor to automatically discover its IP SLA operation configuration, you must provide an SNMP read/write community string when you add the device in System Manager. For more information about IP SLA operations, see “Understanding Quality of Service and IP SLAs” on page 7.

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 in the same way as any other VoIP device, so non-Cisco call managers are added to VoIP Monitor in the same that any other VoIP device is added. 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 Infrastructure” on page 25.

Note: VoIP Monitor presents a non-Cisco call manager in the same way that it presents any other VoIP network node. Non-Cisco call managers are not displayed with Cisco devices in the CallManagers resource.

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 > All Programs > 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. 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. Resources on this view display registered, unregistered, and rejected phones and gateways, phone status details, 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.
Rejected Gateways	Triggered whenever the number of rejected gateways on a Cisco CallManager device exceeds a defined percentage of the total number of gateways on the same CallManager device.
Rejected Phones	Triggered whenever the number of rejected phones on a Cisco CallManager device exceeds a defined percentage of the total number of phones on the same CallManager device.
Unregistered Gateways	Triggered whenever the number of unregistered gateways on a Cisco CallManager device exceeds a defined percentage of the total number of gateways on the same CallManager device.
Unregistered Phones	Triggered whenever the number of unregistered phones on a Cisco CallManager device exceeds a defined percentage of the total number of phones on the same CallManager device.

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

SolarWinds provides Report Writer as a quick and easy way for you to extract data from your Orion database. 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.

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. For more information about predefined VoIP Reports, see “Using Predefined VoIP Reports” on page 29. For more information about using Report Writer, see “Creating Reports” in the *SolarWinds Orion Network Performance Monitor Administrator Guide*.

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 and download the Report Scheduler from the Additional Components for Orion area.

Report Writer capabilities are further enhanced when they are used with the Custom Property Editor. Custom properties are available for report sorting and filtering. For more information, see “Creating Custom Properties for VoIP Monitor” on page 30.

Using Predefined VoIP Reports

The following historical VoIP reports are provided with VoIP Monitor installation. Access these reports either by clicking **Reports** in the Views toolbar or by opening Orion Report Writer, where they may be modified, as necessary, to suit your VoIP network performance reporting requirements. For more information, see “Creating Reports” in the *SolarWinds Orion NPM Administrator Guide*.

Historical VoIP Reports

The following reports are predefined for reporting on the VoIP-enabled devices on your network.

Jitter – Last 30 Days

Displays the average jitter for call paths defined on your network between listed source and destination sites over the last 30 days.

Latency – Last 30 Days

Displays the average latency for call paths defined on your network between listed source and destination sites over the last 30 days.

MOS Score – Last 30 Days

Displays the average mean opinion score (MOS) for call paths defined on your network between listed source and destination sites over the last 30 days.

Packet Loss – Last 30 Days

Displays the average packet loss for call paths between listed source and destination sites, as defined on your network, over the last 30 days.

VoIP Nodes Availability – Last 30 Days

Displays the average availability for all VoIP-enabled nodes designated on your network over the last 30 days.

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 Orion 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, you can use the Custom Property Editor to populate your custom property with appropriate values or you can use the Import Wizard 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

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 more easily 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 from selected charts in the Display Data from Chart area. Data may be exported 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**, 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** and the data for your chart displays in a new browser window.

X-Axis Labels Orientation

The x-axis labels of selected charts may be configured as follows:

- To display an x-axis label horizontally, as read on a page, select **Horizontal** in the X-Axis Labels Orientation area of the Customize Chart page.
- To display an x-axis label vertically, facing left, corresponding to a 90° counterclockwise rotation of the label, select **VerticalLeftFacing** in the X-Axis Labels Orientation area of the Customize Chart page.
- To display an x-axis label vertically, facing right, corresponding to a 90° clockwise rotation of the label, select **VerticalRightFacing** in the X-Axis Labels Orientation area of the Customize Chart page.

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***, 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 connected to the Internet, log in to the Customer Portal of the SolarWinds website at 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.

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

Appendix C

Using Orion Network Configuration Manager to Configure IP SLA Operations

SolarWinds Orion Network Configuration Manager can simplify the process of manually configuring IP SLA operations on multiple devices. If you have already added your VoIP devices to your installation of Orion Network Configuration Manager, you can use the the Config Snippets feature of Orion Network Configuration Manager to easily automate the process of manually configuring IP SLA operations on multiple IP SLA-capable Cisco routers and switches without having to administratively log in to each individual device. For more information about adding devices to Orion Network Configuration Manager, see “Managing Nodes” in the *SolarWinds Orion Network Configuration Manager Administrator Guide*. The following procedure provides the required steps for using a Config Snippet to configure IP SLA operations on multiple VoIP devices.

Note: Config Snippets in Orion Network Configuration Manager can leverage Custom Properties defined in Orion Network Performance monitor for your devices.

To use a Config Snippet for manually configuring IP SLA operations:

1. Click **Start > All Programs > SolarWinds Configuration Management > Orion Network Configuration Manager**.
2. Log in to Orion Network Configuration Manager.
3. Click **Configs > Config Snippets**.
4. Click **New Snippet**.
5. Type a name for the new snippet in the **Snippet** field.
6. Type the following into the main text field:

```
ip sla monitor OperationNumber
type jitter dest-ipaddr DestinationIPAddress dest-port 17000
codec <Codec> advantage-factor 0
tos 184
exit
ip sla monitor schedule OperationNumber life forever start-time
now
```

7. Set variables in the Config Snippet as follows:

- *OperationNumber* should be a number that uniquely defines a destination for a given source site. If you do not have any IP SLA operations configured on the target device, start with 1, and then increment the operation number for each new IP SLA operation added to the same device.
- *Codec* should be either *g711ulaw*, *g711alaw*, or *g729a*, depending on the codec you have configured for your network. For more information about codecs, see “Jitter” on page 8.
- *DestinationIPAddress* should be the IP Address of the desired IP SLA Responder or Site.

After you have completed your Config Snippet, use the following procedure to upload it to your devices.

To upload a Config Snippet:

1. Click **Configs > Config Snippets**.
2. Right-click the snippet in the Config Snippets window, and then click **Upload to Devices**.

Note: Additional nodes can be added or removed from the list by using the associated buttons below the list of nodes.

3. ***If you want to write the configuration to memory***, check **Write Config to NVRAM**.
4. ***If you need to reboot your device following the upload***, check **Reboot Device**.

Warning: Rebooting a device may cause momentary connectivity outages.

5. Click **Create Upload Script**.
6. Click **Execute Command Script**.
7. ***If you want to save the results of the script when the upload finishes***, click **Save Results**.

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