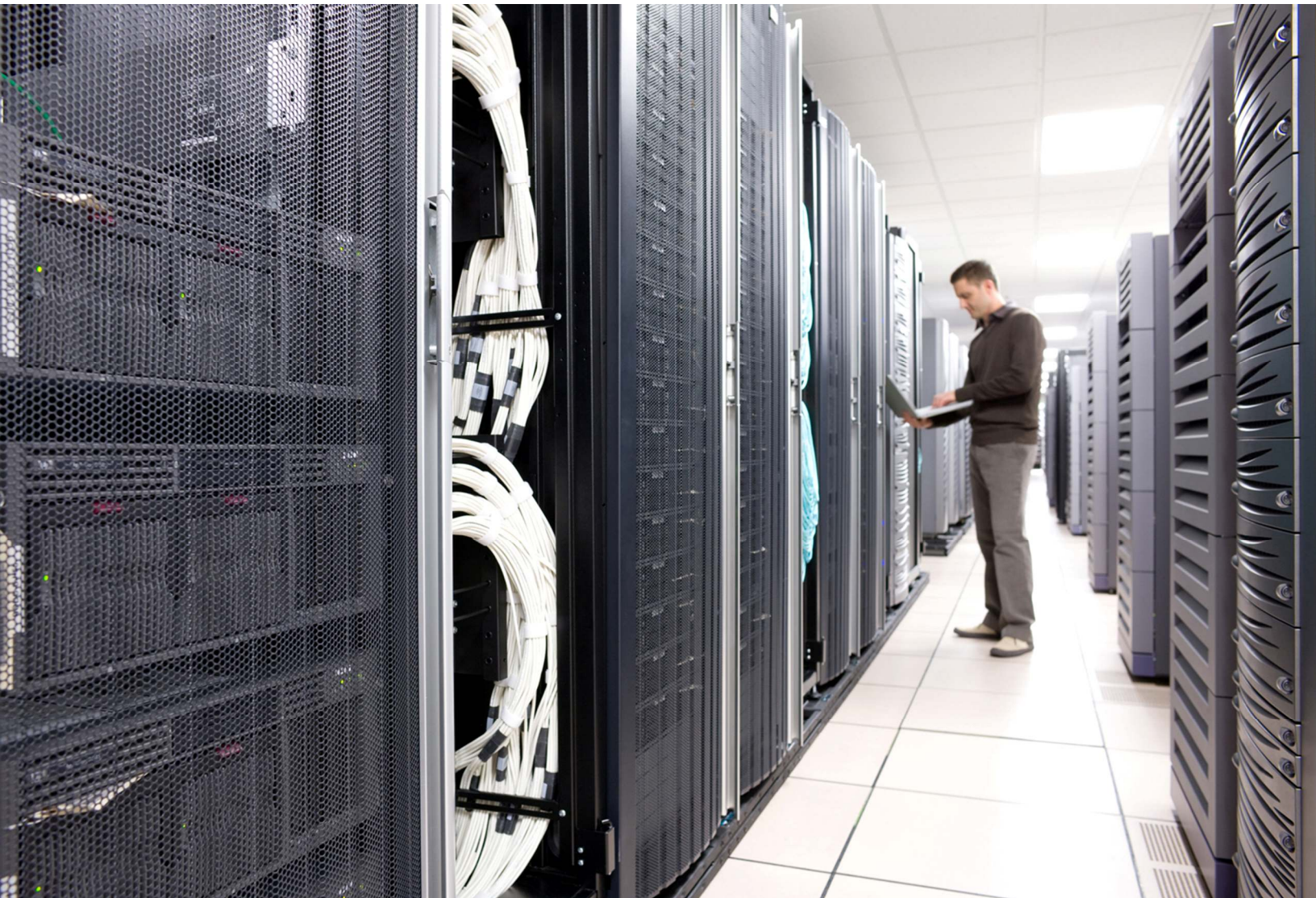
Best Practices for Monitoring Cisco Unified Border Element with Cisco Prime Collaboration

White Paper



Contents

Introduction

This document highlights suggested best practices for field personnel and customers. It will help enable you to effectively use Cisco Prime Collaboration to monitor Cisco Unified Border Element (Cisco UBE).

Other documents that address the monitoring of the other Cisco Unified Communications components are available. This document does not replace the Cisco Prime Collaboration user guide, which is available on Cisco.com at http://www.cisco.com/en/US/products/ps12363/products_user_guide_list.html.

In addition, you will find the best-practices document for deployment topics such as initial device setup, installation guidelines, server sizing, and so on, at http://www.cisco.com/en/US/products/ps12363/index.html.

About Cisco Prime Collaboration

Cisco Prime Collaboration provides a unified view of the entire IP communications infrastructure. It presents the current operational status of each element of the IP communications network. Cisco Prime Collaboration continuously monitors the current operational status of different IP communications elements, such as:

- Cisco Unified Communications Manager
- Cisco Unified Communications Manager Express
- Cisco Unity® software
- Cisco Unity Express
- Cisco Unified Contact Center
- Cisco Unified Contact Center Express
- Cisco Unified Presence Server
- Cisco Emergency Responder
- Cisco Unified MeetingPlace® Express
- Cisco gateways, routers, switches, and IP phones
- Cisco TelePresence® Video Communication Server
- Cisco TelePresence Management Suite

Cisco Prime Collaboration also provides diagnostic capabilities for faster trouble isolation and resolution. It monitors and evaluates the current status of both the IP communications infrastructure and the underlying transport infrastructure in the network. It uses open interfaces such as Simple Network Management Protocol (SNMP), Hypertext Transfer Protocol (HTTP), and Windows Management Instrumentation (WMI) to remotely poll data from different devices in your IP communications deployment. Because Cisco Prime Collaboration does not deploy any agent software on the devices being monitored, it is nondisruptive to your system operations.

Managing Cisco UBE

For Cisco Prime Collaboration to manage a Cisco Unified Voice Gateway, you must add the latter to Cisco Prime Collaboration using **Operate > Device Work Center**. When you want to add a Cisco UBE, keep the following information nearby:

- The IP address or hostname
- The SNMP read-only credentials

Once the Cisco UBE has been added and Cisco Prime Collaboration has collected the required inventory details from the device, Cisco Prime Collaboration marks the device as Managed. This signals that the Cisco UBE has been successfully added and is being managed by Cisco Prime Collaboration.

If your devices are not going into the Managed state, see the user guide at http://www.cisco.com/en/US/products/ps12363/products_user_guide_list.html.

Once the Cisco UBE is in the Managed state, you can open the UC Topology View from the Cisco Prime Collaboration dashboard. You can find the Cisco UBE that you have just added by navigating to **associated Cisco Unified Communications Manager Cluster**.

Figure 1 shows one of the main entry points for managing the devices. By right-clicking the device, you can see a list of context-sensitive tools that can be used on that device. Figure 2 shows the list of context-sensitive tools.

Figure 1. Entry Point for Managing a Cisco UBE

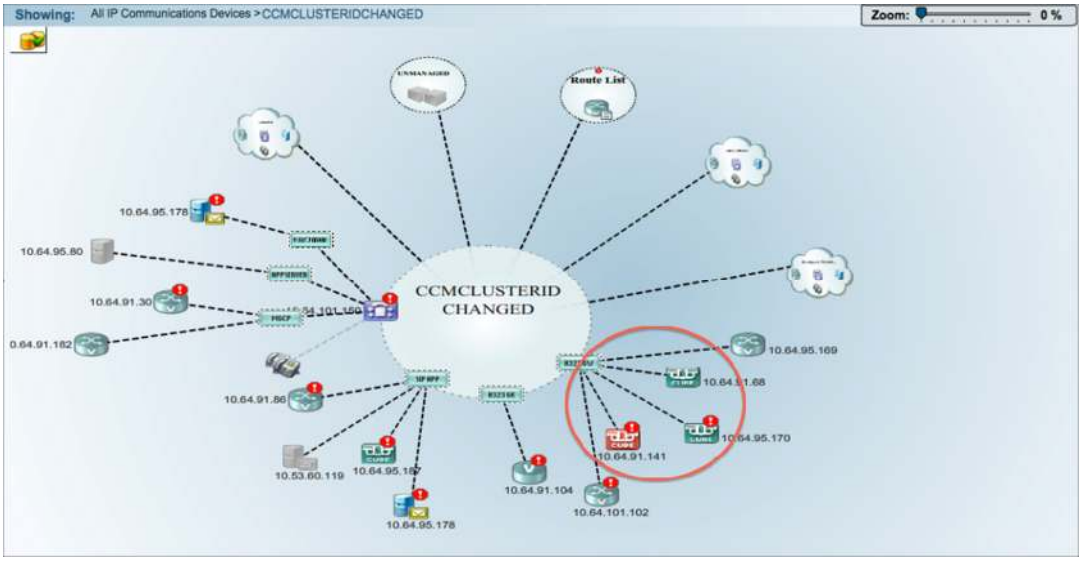


Figure 2. List of Context-Sensitive Tools

In the remainder of this document, we will go through all of these tools in detail.

Basic Health Monitoring

Cisco Prime Collaboration monitors system and environment parameters of a Cisco UBE device. See Table 1.

Table 1. Basic Health Monitoring

Monitored Parameters	Description
System Parameter	Usage of processor and device memory along with status of (voice and data) interfaces and card on the Cisco router hosting the Cisco UBE.
Environment Parameters	Status of system fan, system temperature sensor, voltage sensor, and system power supply of the router hosting the Cisco UBE.

You can see the details of these parameters by selecting the **Detailed Device View** right-click option on the device from the Service Level View.

Fault Monitoring

View the list of active events on a Cisco UBE by selecting the **Event Details** right-click option on the device from the UC Topology View (Figure 3).

Figure 3. Active Events

You can also view the event history on a Cisco UBE by selecting the **Event History** right-click option on the device from the UC Topology View.

Cisco Prime Collaboration performs monitoring and generates events on fault conditions detected on a Cisco UBE device. (See Table 2: Fault Monitoring.)

Table 2. Fault Monitoring

Fault Condition	Event Details
Processor or network adapter utilization	**HighUtilization** **Event Description:** This event indicates that current utilization exceeds the utilization threshold configured for this network adapter or processor. **Default Threshold:** 90% **Recommended Actions:** (Processor related) The most common reason is that one or more processes are using excessive CPU space. Once the process is identified, you may want to take action, which could include restarting the process.
Memory utilization	**InsufficientFreeMemory** **Event Description:** This event indicates that the system is running out of memory resources. Also reported if there has been a failure to allocate a buffer due to lack of memory. **Default Threshold:** 15% **Recommended Actions:** Use the Cisco IOS® Software **show** memory command to check memory utilization. Sometimes high memory utilization is indicative of a memory leak. It is important to identify which process is using excessive memory.
Temperature sensor is out of range	**TemperatureSensorDown** **Event Description:** Device temperature or voltage is outside the normal operating range. When an OutOfRange event is generated, you will normally also see fan, power supply, or temperature events. This event can also be received as an SNMP trap (caemTemperatureNotification, caemVoltageNotification, ciscoEnvMonRedundantSupplyNotification, or caemFanNotification). **Default Threshold:** • Relative Temperature Threshold • Relative Voltage Threshold **Recommended Actions:** Verify that environmental temperatures are set up correctly. Identify the reported temperature sensor location (ioborad/cpu) and verify status. Check fan status to verify that system fans are operating normally. Contact Cisco for hardware replacement, if needed.
Gateway port unavailable, or out-of-service issue	**HighAnalogPortUtilization** **Event Description:** Percentage utilization of an analog port has exceeded one of the following: • E&M Port Utilization Threshold • FXS Port Utilization Threshold • FXO Port Utilization Threshold **Note:** You must enable polling for Voice Utilization Settings to monitor this event. **Default Polling Interval:** 4 minutes **Default Threshold:** 90% **Recommended Actions:** Use this event to assess whether you should install additional resources. When the event is generated, check event details and identify which resource has exceeded the threshold. Use the performance graph to monitor resource utilization in real time over the past 72 hours, which will help you determine if you need to add resources.
High port utilization (T1 CAS/T1 PRI/E1 PRI/BRI/E1 CAS)	**HighDigitPortUtilization** **Event Description:** The percentage of utilization of a digital port has exceeded one of the following: • BRI Channel Utilization Threshold • T1 PRI Channel Utilization Threshold • E1 PRI Channel Utilization Threshold • T1 CAS Channel Utilization Threshold **Note:** You must enable polling for Voice Utilization Settings to monitor this event. **Default Polling Interval:** 4 minutes **Default Threshold:** 90% **Recommended Actions:** When this event is generated, check event details and identify which resource has exceeded the threshold. Use the performance graph to monitor the resource utilization in real time over the past 72 hours and determine if you need to add additional resources.

Fault Condition	Event Details
High resource utilization (DSP)	**HighResourceUtilization** **Event Description:** This event indicates that a certain specified type of resource has exceeded the DSP Utilization Threshold. **Note:** You must enable polling for Voice Utilization Settings to monitor this event. **Default Polling Interval:** 4 minutes **Default Threshold:** 90% **Recommended Actions:** When this event is generated, click the event ID to view event details and identify which resource has exceeded the threshold. Use the performance graph to monitor the resource utilization in real time over the past 72 hours to determine if you need to install additional resources.
D Channel out of service	**D Channel Out Of Service** **Event Description:** This event indicated that MGCP D Channel is out of service. This event is generated by monitoring the syslog messages received from Cisco Unified Communications Manager. **Default Polling Interval:** N/A **Default Threshold:** N/A **Recommended Actions:** Use the Cisco IOS Software **show log** command to determine if a circuit issue exists. This event can be generated as a result of gateway failovers or gateway reboots.
System interface or hardware is operationally down	**OperationallyDown** **Event Description:** • Interface - Card or network adapter's operational state is not normal. • System Hardware - Disk's operational state is not normal. **Default Polling Interval:** 4 minutes **Default Threshold:** N/A **Recommended Actions:** Check the status of the indicated interface and investigate the root cause. **Note:** For interfaces, Cisco Prime Collaboration generates an OperationallyDown clear event only if the card is reinserted into the same slot and the module index is the same before and after the card is reinserted.
Lost contact with a cluster	**LostContactwithCluster** **Event Description:** A voice gateway, voice gatekeeper, voice port, or voice interface lost registration with a Cisco Unified Communications Manager cluster. **Default Polling Interval:** 4 minutes. **Default Threshold:** N/A. **Recommended Action:** This indicates that a voice gateway lost registration with a Cisco Unified Communications Manager cluster. When this event is generated, you can go to Communications Manager to verify the registration status of a reported gateway. To find out why the gateway lost registration, verify that IP connectivity exists within the network. Also check and verify gateway configurations and use the recommended Cisco Unified Communications Manager trace to troubleshoot.
Adjacency detached from the SBC	**AdjacencyDetached** **Description:** This notification is generated when an adjacency is detached from the SBC. **Clear Interval:** This event is cleared when the adjacency is attached back to the SBC, and the corresponding clear trap is processed in Cisco Prime Collaboration. **Trigger:** Processed trap **Severity:** Critical **Device Type:** Voice Gateway - Border Element **Event Code:** 7037 **Recommended Action:** Mitigate the problem that caused the adjacency to become detached. **Note: Supported only for Cisco UBE-SP edition.**

Fault Condition	Event Details
Mean Opinion Score Conversational Quality is over the threshold	**MOSCQEReachedCriticalThreshold** **Description:** This event is raised when the QOS metric for the Mean Opinion Score Conversational Quality, Estimated (MOSCQE) value crosses the configured threshold and reaches Critical level, resulting in poor voice quality **Trigger:** Processed trap **Severity:** Critical **Device Type:** VoiceGateway - Border Element **Event Code:** 7040 **Clear Interval:** This event is cleared either if the MOS value returns to normal and a clear trap is received in Prime Collaboration, or if the MOS value moves to Major or Minor and a trap is received indicating this. At any point in time, only one of the following events will be active: • MOSCQEReachedCriticalThreshold • MOSCQEReachedMajorThreshold • MOSCQEReachedMinorThreshold **Recommended Action:** Check the connectivity and settings in the intermediate routers to rule out the occurrence of jitter, packet loss, or delay, which may affect the MOS. **Note: Supported only for Cisco UBE-SP edition.**
Mean Opinion Score Conversational Quality has reached a major threshold	**MOSCQEReachedMajorThreshold** **Description:** This event is raised when the QOS metric for the Mean Opinion Score Conversational Quality, Estimated (MOSCQE) value crosses the configured threshold and reaches Major level, resulting in poor voice quality. **Trigger:** Processed trap **Severity:** Warning **Device Type:** VoiceGateway - Border Element **Event Code:** 7038 **Clear Interval:** This event is cleared either if the MOS value returns to normal and a clear trap is received in Cisco Prime Collaboration, or if the MOS value moves to Critical or Minor and a trap is received indicating this. **Recommended Action:** Check the connectivity and settings in the intermediate routers to rule out the occurrence of jitter, packet loss, or delay, which may affect the MOS. **Note: Supported only for CUBE-SP edition.**
Mean Opinion Score Conversational Quality has reached a minor threshold	**MOSCQEReachedMinorThreshold** **Description:** This event is raised when the QOS metric for Mean Opinion Score Conversational Quality, Estimated (MOSCQE) value crosses the configured threshold and reaches Minor level, resulting in poor voice quality. **Trigger:** Processed trap **Severity:** Informational **Device Type:** VoiceGateway - Border Element **Event Code:** 7038 **Clear Interval:** This event is cleared either if the MOS value returns to normal and a clear trap is received in Cisco Prime Collaboration, or if the MOS value moves to Critical or Major and a trap is received indicating this. **Recommended Action:** Check the connectivity and settings in the intermediate routers to rule out the occurrence of jitter, packet loss, or delay, which may affect the MOS. **Note: Supported only for Cisco UBE-SP edition.**
DSP Failure	**DSPFailure** **Description:** Generated when the digital signaling processor (DSP) on the router experiences failure. Event attributes specify which DSP is affected as well as the operational state of the DSP (failed, shutdown, and so on). At any given hour, there is only one DSPFailure event on a DSP (even if DSP failed multiple times during that hour). **Trigger:** Trap **Severity:** Critical **Device Type:** Router or Voice Gateway **Clear Interval:** Time-based autoclear after 1 hour **Event Code:** 2142 **Recommended Action:** Contact Cisco TAC for assistance.

Polling and Thresholds

You can configure the interval at which Cisco Prime Collaboration polls specific information from the Cisco UBE device, as well as set the thresholds based on which events should be raised by Cisco Prime Collaboration.

Configure polling intervals by selecting the **Polling Parameters** right-click option on the device from the UC Topology View. For H323 and SIP Gateway, the polling parameters are defined in the Administration/System Setup/Polling and Threshold/UC Polling Settings/System Defined Groups/H323 Voice Gateway. Configure the polling setting related to basic health monitoring by selecting the Voice Health Settings parameter type. See Table 3.

Table 3. Polling Settings for H323 and SIP Gateways

Parameter	Polling Settings
System	• Processor and Memory Utilization
Environment	• Power Supply • Fan • Temperature Sensor
Interface	• Connector Port and Interface • Access Port • FXX (FXS, FXO) Interface • E1 Voice Port • DS1 Voice Port
Application	Application Polling

You can configure the thresholds by selecting the **Threshold Parameters** right-click option on the device from the UC Topology Level View. You can configure the threshold setting related to basic health monitoring by selecting Voice Health Settings as the parameter type. You can choose from two threshold categories, depending on the exact threshold that you need to configure. See Table 4.

Table 4. Threshold Settings

Parameter	Threshold Settings
System	Processor and Memory
Environment	Temperature Sensor

Performance Monitoring

Cisco Prime Collaboration performs trending of the following categories on a Cisco UBE:

- Resource usage (DSP and its channels)
- Call statistics (active calls)
- Trunk statistics (trunk usage at DS0 level, port usage, gateway statistics)
- MTP and Transcoder Sessions usage
- Total, Inbound, Outbound Call Volume both at interface and dial-peer level

You can view the performance report or graphs over the past 7 days by selecting the **Performance** right-click option on the device from the UC Topology View, and then selecting the performance parameter that you want to view. You can view multiple performance reports or graphs in a single screen (Figure 4).

Figure 4. Performance Graphs

You can also configure the thresholds for the performance parameters by opening the Threshold Parameters page and selecting **Voice Utilization Settings** as the parameter type.

Physical Connectivity

View the Layer 2 or Layer 3 connectivity of the network in which the Cisco UBE resides by selecting the **Connectivity Details** right-click option on the device from the Service Level View.

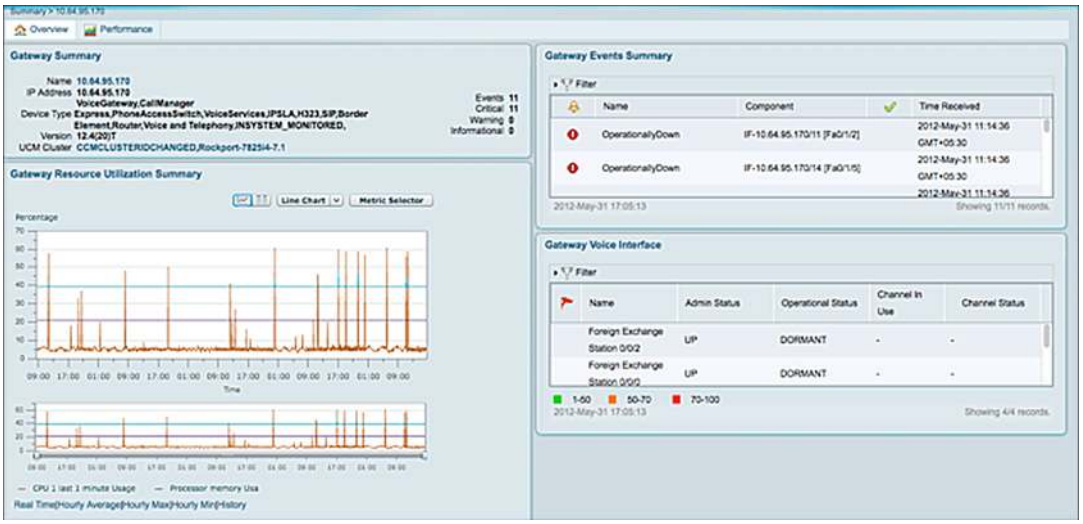
Logical View

Search the Cisco UBE Device in the Service Level View by providing the managed name of the device. Clicking the device opens the Map View in the right pane, showing the Logical Connectivity View.

Device Troubleshooting

You can troubleshoot Cisco UBE events highlighted in UC Topology View using the Diagnostics View that can be launched by selecting the **Gateway Diagnostics View** right-click option from the UC Topology View (Figure 5).

Figure 5. Gateway Diagnostics View



You can then address the issue isolated with diagnostics view by opening the Cisco UBE Administration page by selecting the **Voice Gateway Administration** right-click option on the device from the UC Topology View.

Device Administration

Suspend or resume monitoring of a Cisco UBE device by selecting the **Suspend Device** or **Resume Device** right-click option on the device from the UC Topology View. When the device is in the Suspended state, it no longer communicates with Cisco Prime Collaboration. You might want to do suspend the device to avoid false events when the Cisco UBE is in Maintenance mode. You can also delete the Cisco UBE from Cisco Prime Collaboration by selecting the **Delete Device** right-click option on the device from the UC Topology View.

Recommendations on Monitoring Important Cisco UBE Components with Cisco Prime Collaboration

Recommendations on Performance Monitoring

We recommend that you generate daily graphs and seven-day reports for trend analysis. A seven-day report establishes a baseline for the system.

To generate a daily graph, go to the UC Topology View and select the **Performance** right-click option on the device, then select the appropriate metric and time that you want to view. Cisco Prime Collaboration can give you a real-time graph over the past 72 hours.

CPU Usage

View the performance report or graphs for Total CPU Usage (Percentage) on a Cisco UBE by selecting the **Performance** right-click option on the device from the UC Topology View. The Maximum and Average data provides trending information.

You can also view each processor's CPU utilization in 1-minute and 5-minute increments by selecting the **Detailed Device View** right-click option on the device from the UC Topology View.

Memory Usage

View the performance report or graphs for Memory Usage (Percentage) on a Cisco UBE by selecting the **Performance** right-click option on the device from the UC Topology View. Minimum and average values are used for establishing system growth needs. Maximum free memory values are used to detect memory leaks.

High-Temperature Condition

View the current temperature and default threshold for each temperature sensor by opening the Detailed Device View.

Counter Values for the Cisco UBE

Cisco IOS Gateway Port Usage

Calls Active

This value represents the number of streaming connections that are currently active (in use); in other words, the number of calls that actually have a voice path connected.

Calls in setup mode or in teardown mode are not reported by this count.

View the performance report or graphs for Active Calls (Number) on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

The minimum and maximum of this value can also be collected over time for capacity planning purposes.

Real-time graphing of this parameter, compared with expected values based on historical data, is useful in detecting subtle system performance degradation (generally by detecting that the real-time number of calls active is below expected values compared to the same time-of-day/day-of-week baseline values).

PRI Channels Active

This value represents the total number of B channels that are holding active voice calls. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Baseline data can be used to detect real-time underutilization of circuits, an indication of possible system performance degradation (including otherwise hard-to-detect PSTN call routing or circuit-down conditions). Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for PRI channel utilization on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

To view related counters, go to **Detailed Device View > IOS Gateway Port Usage**.

CAS Channels Active

This value represents the total number of active B channels on a CAS trunk. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Baseline data can be used to detect real-time underutilization of circuits, an indication of possible system performance degradation (including otherwise hard-to-detect PSTN call routing or circuit-down conditions). Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for CAS channel utilization on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

To view related counters, go to **Detailed Device View > IOS Gateway Port Usage**.

Non-voice PRI Channels Active

This value represents the total number of B channels that are holding active nonvoice (data or fax) calls. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Baseline data can be used to detect real-time underutilization of circuits, an indication of possible system performance degradation (including otherwise hard-to-detect PSTN call routing or circuit-down conditions). Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for PRI channel utilization on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

To view related counters, go to **Detailed Device View > IOS Gateway Port Usage**.

Non-voice CAS Channels Active

This value represents the total number of B channels on a CAS trunk that are holding active nonvoice (data or fax) calls. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Baseline data can be used to detect real-time underutilization of circuits, an indication of possible system performance degradation (including otherwise hard-to-detect PSTN call routing or circuit-down conditions). Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for CAS channel utilization on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

To view related counters, go to **Detailed Device View > IOS Gateway Port Usage**.

BRI Channels Active

This value represents the total number of B channels that are holding active voice calls. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Baseline data can be used to detect real-time underutilization of circuits, an indication of possible system performance degradation (including otherwise hard-to-detect PSTN call routing or circuit-down conditions). Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for BRI channel utilization on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

To view related counters, go to **Detailed Device View > IOS Gateway Port Usage**.

E&M, FXO, FXS Ports Active

This value shows E&M, FXS, and FXO port status (In Service or Out of Service) and port utilization. Collection of this data over time is used to understand call patterns and busy-hour peak calls. Data trending allows for circuit growth and provisioning planning.

View the performance report or graphs for E&M/FXS/FXO Ports In Service on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

You can also view the percentage of active E&M, FXS, and FXO ports from Cisco IOS Gateway Port Usage in the Detailed Device View.

DSP Usage

DSP Channels Active

This value represents the total number of DSP channels that are being used for call processing. Data trending allows for resource growth and provisioning planning.

View the performance report or graphs for Percentage DSP Channels Active on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

DSP Channels in Use

This value represents the total number of DSP channels that are reserved for serving calls. Data trending allows for resource growth and provisioning planning.

View the performance report or graphs for Percentage DSP Channels In-Use on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

Percentage Used Transcode Sessions

This value represents the percentage of active transcoding sessions.

View the performance trend for Percentage Active Transcoding Sessions on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

Percentage Used MTP Sessions

This value represents the percentage of active MTP sessions.

View the performance trend for Percentage Active MTP Sessions on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

Call Traffic Statistics

Call Volume at Interface Level

This value represents the total, inbound, outbound calls placed on a particular interface.

View the performance trend for an interface call volume on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

Call Volume at Dial Peer Level

This value represents the total, inbound, outbound calls placed on a particular dial peer.

View the performance trend for an interface call volume on a Cisco UBE by selecting the **Performance** right-click option from the UC Topology View.

Recommendations on Events for Notification Services

The following are the most important Cisco UBE-related events, for which you can set up email, e-page, or SNMP trap notification. See Table 2 for the corresponding recommended actions.

Caution: The following recommendations for critical items to be monitored are deployment specific and should be customized for individual customers. Based on bandwidth availability, if you have especially slow-speed WAN links, you might need to adjust the polling intervals. Thresholds may need to be adjusted based on your baseline data.

Events Associated with CPU

HighUtilization

This event indicates that current utilization exceeds the utilization threshold configured for this network adapter or processor.

Events Associated with Memory

InsufficientFreeMemory

This event occurs when the percentage of available free memory resources is lower than the configured value. This event indicates that available free memory resources are running low.

Events Associated with Environment

OutOfRange

Device temperature or voltage is outside the normal operating range. When an OutOfRange event is generated, you will normally also see fan, power supply, or temperature events.

Events Associated with Resource Availability

HighResourceUtilization

This event indicates that a certain specified type of Cisco UBE resource has exceeded the DSP utilization threshold (the default threshold is 90 percent).

Note: You must enable polling for Voice Utilization Settings to monitor this event.

Events Associated with Analog Port Utilization

HighAnalogPortUtilization

This event indicates that a certain specified type of Cisco UBE resource has exceeded one of these thresholds (the default threshold is 90 percent):

- FXO Utilization Threshold
- FXS Utilization Threshold
- E&M Utilization Threshold

Note: You must enable polling for Voice Utilization Settings to monitor this event.

Events Associated with Digital Port Utilization

HighDigitPortUtilization

The percentage utilization of a Cisco UBE digital port has exceeded one of the following thresholds (the default threshold is 90 percent):

- BRI Channel Utilization Threshold
- T1 PRI Channel Utilization Threshold
- E1 PRI Channel Utilization Threshold
- T1 CAS Channel Utilization Threshold

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