Using SNMP with a PCoIP® Endpoint

Simple Network Management Protocol (SNMP) is a communications protocol used to query and configure management information in network devices. SNMP is formally supported in Teradici firmware release 1.0 and all subsequent releases. SNMPv3 is available in PCoIP firmware 20.07, and is the only configurable option in firmware 20.10 or newer.

> ⚠ **SNMPv3 is the more secure choice**
>
> Teradici recommends you upgrade to firmware 20.07 or newer and use SNMPv3 which is a more secure version then SNMP versions 1 and 2.

PCoIP® Zero Clients and Remote Workstation Cards include an SNMP agent that supports reporting management information to a SNMP manager. The agent does not support modifying management information. The SNMP agent also supports generating traps and messages sent to an SNMP manager when specific asynchronous events occur.

Below are examples of what you can do if you, as an administrator, deployed an SNMP manager in a system with PCoIP® Zero Clients and Remote Workstation Cards.

- Monitor PCoIP® Zero Clients and Remote Workstation Cards and detect when they stop responding to SNMP queries.
- Measure the PCoIP® bandwidth usage over an extended period of time to help determine whether the network is adequately sized.
- Manage PCoIP® Zero Clients and Remote Workstation Cards by querying for attached display and USB devices

> ✏ **Networking Knowledge**
>
> A thorough knowledge of networking, SNMP and MIB are required to make use of SNMP with a PCoIP endpoint.

You can use any third party SNMP manager of your choice, however SNMP managers have a variety of capabilities, some do not support proprietary MIB additions or SNMPv3. Refer to your SNMP Manager documentation for available configuration and setup instructions.

PCoIP SNMP Agent Supported MIBs

A Management Information Base (MIB) is a list of variables that can be exchanged between an SNMP manager and agent. The MIB defines each variable and attributes about each variable.

The PCoIP SNMP agent supports the following standard MIBs as well as the TERADICI-PCOIP-MIB and TERADICI-PCOIPv2-MIB.

Supported MIBs

1.1.1 MIB-2 (RFC1213)

The MIB-2 MIB is the mandatory core SNMP MIB.

> ✏️ **Interfaces Group**
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> The Interfaces Group is one of the groups in the MIB-2 MIB. The *Interfaces Group* of a PCoIP device maintains statistics for two different interfaces (LOOPBACK and TERA_DSI). The LOOPBACK interface is self-explanatory. The TERA_DSI interface is the slow-path control interface. Care should be taken when using the *Interfaces Group* statistics. These statistics do not keep track of all packets processed by a PCoIP Zero Client or Remote Workstation Card. Statistics on the fast-path packets are not maintained in the interfaces group. Statistics on all packets processed by the PCoIP device, including the fast-path packets, are available in the EtherLike-MIB and RMON-MIB MIBs.

This MIB is supported in Teradici firmware revision 1.0 and all subsequent revisions.

1.1.2 EtherLike-MIB (RFC3635)

The EtherLike-MIB consists of extensions to MIB-2 dealing specifically with Ethernet and Ethernet-like interfaces. RFC3635 updates some definitions and deprecates others in response to management experience with RFC2665, it also incorporates support for 10 Gb/s interfaces.

This MIB is supported in Teradici firmware revision 1.0 and all subsequent revisions.

1.1.3 RMON-MIB (RFC2819)

The RMON-MIB consists of optional extensions to MIB-2 which are used for statistics gathering and remote network monitoring and management. The only MIB object within the RMON-MIB currently supported is the Ethernet Statistics Group.

This MIB is supported in Teradici firmware revision 1.0 and all subsequent revisions.

1.1.4 TERADICI-PCOIP-MIB

The PCoIP SNMP agent supports reporting the management information defined in a PCoIP defined MIB. The first generation TERADICI-PCOIP-MIB is described in this section and can be downloaded here.

The TERADICI-PCOIP-MIB maintains PCoIP and imaging statistics in two different groups or tables. Table 1-1 describes the PCoIP statistics and Table 1-2 describes the imaging statistics. PCoIP sessions capable of supporting multiple displays maintain and report imaging statistics for each display.

This MIB is supported in Teradici firmware revision 1.0 and all subsequent revisions.

Table 1-1: PCoIP Statistics

Parameter	Description
pcoipStatisticsSessionNumber	PCoIP session number used to link PCoIP statistics to imaging statistics
pcoipStatisticsPcoipPacketsTransmitted	PCoIP packets transmitted during the current or most recent session
pcoipStatisticsPcoipBytesTransmitted	PCoIP bytes transmitted during the current or most recent session
pcoipStatisticsPcoipPacketsReceived	PCoIP packets received during the current or most recent session
pcoipStatisticsPcoipBytesReceived	PCoIP bytes received during the current or most recent session
pcoipStatisticsPcoipLostPackets	PCoIP packets detected lost during the current or most recent session

Parameter	Description
pcoipStatisticsPcoipLatency	Approximate total round-trip PCoIP system (e.g. Remote Workstation Card to Zero Client and back to Remote Workstation Card) and network latency in milliseconds (± 1ms) during the current or most recent session.

Table 1-2: Imaging Statistics

Parameter	Description
imagingStatisticsSessionNumber	PCoIP session number used to link imaging statistics to PCoIP statistics
imagingStatisticsSessionActive	Indication of whether the imaging session is active or inactive
imagingStatisticsDisplayActive	Indication of whether the display is active or inactive
imagingStatisticsDisplayWidth	Width of display in pixels
imagingStatisticsDisplayHeight	Height of display in pixels
imagingStatisticsDisplayRefreshRate	Display refresh rate in Hz (opposed to the PCoIP frame update rate calculated using imagingStatisticsFrameCount)
imagingStatisticsFrameCount	Encoded frame count per display • This statistic is only maintained on Remote Workstation Card devices. Zero Clients set this statistic equal to zero. • This statistic can be used to calculate the frame rate of each display (frames per second). To do this, sample the counter twice and divide the difference between the two samples by the number of seconds that elapsed between gathering the two samples.

1.1.5 TERADICI-PCOIPv2-MIB

Superseding the TERADICI-PCOIP-MIB listed above, the PCoIP SNMP agent additionally supports a newer MIB version. TERADICI-PCOIPv2-MIB can be downloaded here). Although the previous MIB is still supported, Teradici recommends the use of the PCOIPv2-MIB exclusively for device information and statistics.

The TERADICI-PCOIPv2-MIB maintains a number of statistics in addition to device details. The general grouping of statistics are:

- PCoIP Session General Statistics
- PCoIP Session Network Statistics
- PCoIP Session Audio Statistics
- PCoIP Session Imaging Statistics
- PCoIP Session USB Statistics

Device information is grouped into the following categories:

- PCoIP General Device Information
- PCoIP Imaging Device Information (up to 4 attached devices)
- PCoIP USB Device Information (up to 10 attached devices) The following tables describe each group in detail.

This MIB is supported in Teradici firmware revision 4.0.0 and all subsequent revisions.

Table 1-3: PCoIP Session General Statistics

Parameter	Description
pcoipGenStatsSessionNumber	PCoIP session number used to link statistics to session. The session number is currently always set to the default value of 1.
pcoipGenStatsPacketsSent	Total number of packets that have been transmitted since the PCoIP session started.
pcoipGenStatsBytesSent	Total number of bytes that have been transmitted since the PCoIP session started.
pcoipGenStatsPacketsReceived	Total number of packets that have been received since the PCoIP session started.
pcoipGenStatsBytesReceived	Total number of bytes that have been received since the PCoIP session started.
pcoipGenStatsTxPacketsLost	Total number of transmit packets that have been lost since the PCoIP session started.

Parameter	Description
pcoipGenStatsSessionDuration	An incrementing number that represents the total number of seconds the PCoIP session has been open.

Table 1-4: PCoIP Session Network Statistics

Parameter	Description
pcoipNetStatsSessionNumber	PCoIP session number used to link statistics to session. The session number is currently always set to the default value of 1.
pcoipNetStatsRoundTripLatencyMs	Round trip latency in milliseconds between server and client.
pcoipNetStatsRXBWkbitPersec	Average number of kilobits per second that have been received since the PCoIP session started.
pcoipNetStatsRXBWPeakkbitPersec	Peak bandwidth for incoming PCoIP packets within a one second sampling period.
pcoipNetStatsRXPacketLossPercent	Percentage of received packets lost during a one second sampling period.
pcoipNetStatsTXBWkbitPersec	Average number of kilobits per second that have been transmitted since the PCoIP session started.
pcoipNetStatsTXBWActiveLimitkbitPersec	The current estimate of the available network bandwidth, updated every second.
pcoipNetStatsTXBWLimitkbitPersec	Transmit bandwidth limit for outgoing packets.
pcoipNetStatsTXPacketLossPercent	Percentage of transmitted packets lost during the one second sampling period.

Table 1-5: PCoIP Session Audio Statistics

Parameter	Description
pcoipAudioStatsSessionNumber	PCoIP session number used to link statistics to session. The session number is currently always set to the default value of 1.
pcoipAudioStatsBytesReceived	Total number of audio bytes that have been received since the PCoIP session started.
pcoipAudioStatsBytesSent	Total number of audio bytes that have been sent since the PCoIP session started.
pcoipAudioStatsRXBWkbitPersec	Per second average of audio data received. Reset after each read.
pcoipAudioStatsTXBWkbitPersec	Per second average of audio data sent. Reset after each read.
pcoipAudioStatsTXBWLimitkbitPersec	Transmit bandwidth limit for outgoing audio packets.

Table 1-6: PCoIP Session Imaging Statistics

Parameter	Description
pcoipImagingStatsSessionNumber	PCoIP session number used to link statistics to session. The session number is currently always set to the default value of 1.
pcoipImagingStatsBytesReceived	Total number of imaging bytes that have been received since the PCoIP session started.
pcoipImagingStatsBytesSent	Total number of imaging bytes that have been sent since the PCoIP session started.
pcoipImagingStatsRXBWkbitPersec	Per second average of kbits of imaging data received. Reset after each read.
pcoipImagingStatsTXBWkbitPersec	Per second average of kbits of imaging data sent. Reset after each read.
pcoipImagingStatsEncodedFramesPersec	The number of imaging frames which were encoded over a one second sampling period.

Parameter	Description
pcoipImagingStatsActiveMinimumQuality	The lowest encoded quality in the most recent 1 second period.
pcoipImagingStatsDecoderCapabilitykbitPersec	The current estimate of the decoder processing capability. This parameter should be expected to remain virtually constant on a zero client. Decoder capability will change on a View client depending on CPU loading.
pcoipImagingStatsPipelineProcRate	The current pipeline processing rate in megapixels per second.

Table 1-7: PCoIP Session USB Statistics

Parameter	Description
pcoipUSBStatsSessionNumber	PCoIP session number used to link statistics to session. The session number is currently always set to the default value of 1.
pcoipUSBStatsBytesReceived	Total number of USB bytes that have been received since the PCoIP session started.
pcoipUSBStatsBytesSent	Total number of USB bytes that have been sent since the PCoIP session started.
pcoipUSBStatsRXBWkbitPersec	Per second average of kbits of USB data received. Reset after each read.
pcoipUSBStatsTXBWkbitPersec	Per second average of kbits of USB data sent. Reset after each read

Table 1-8: PCoIP General Device Information

Parameter	Description
pcoipGenDeviceSessionNumber	PCoIP session number used to link attached displays to statistics. The session number is currently always set to the default value of 1.
pcoipGenDeviceName	String containing the PCoIP device name.

Parameter	Description
pcoipGenDeviceDescription	String describing the processor.
pcoipGenDeviceGenericTag	String describing device generic tag.
pcoipGenDevicePartNumber	String describing the part number of the device.
pcoipGenDeviceSerialNumber	String describing device serial number.
pcoipGenDeviceHardwareVersion	String describing the PCoIP processor version.
pcoipGenDeviceFirmwareVersion	String describing the currently running firmware revision.
pcoipGenDeviceUniqueID	String describing the device unique identifier.
pcoipGenDeviceMAC	String describing the device MAC address.
pcoipGenDeviceUptime	Integer containing the number of seconds since boot.

Table 1-9: PCoIP Imaging Device Information

Parameter	Description
pcoipImagingDevicesIndex	The auxiliary variable used for identifying instances of the columnar objects in the devices table.
pcoipImagingDevicesSessionNumber	PCoIP session number used to link imaging devices to statistics. The session number is currently always set to the default value of 1.
pcoipImagingDevicesDisplayWidth	Display width in pixels.
pcoipImagingDevicesDisplayHeight	Display height in lines.
pcoipImagingDevicesDisplayRefreshRate	Display refresh rate in Hz
pcoipImagingDevicesDisplayChangeRate	Display input change rate in Hz over a one second sample. Input rate refers to the frame rate at which a video source is changing.

Parameter	Description
pcoipImagingDevicesDisplayProcessRate	Display process frame rate in Hz over a one second sample. This parameter describes the frame rate that a PCoIP processor is actually processing and will always be equal to or less than the input change rate.
pcoipImagingDevicesLimitReason	String describing the reason for limiting the frame rate of this display, if applicable.
pcoipImagingDevicesModel	String describing the display model name.
pcoipImagingDevicesStatus	String describing the display device status.
pcoipImagingDevicesMode	String describing the display mode.
pcoipImagingDevicesSerial	String describing the display serial number.
pcoipImagingDevicesVID	String describing the display vendor ID.
pcoipImagingDevicesPID	String describing the display product ID.
pcoipImagingDevicesDate	String describing the display date of manufacture.

Table 1-10: PCoIP USB Device Information

Parameter	Description
pcoipUSBDevicesIndex	The auxiliary variable used for identifying instances of the columnar objects in the devices table.
pcoipUSBDevicesSessionNumber	PCoIP session number used to link USB devices to statistics. The session number is currently always set to the default value of 1.
pcoipUSBDevicesPort	USB device port: OHCI or EHCI.
pcoipUSBDevicesModel	String describing the model name of the connected device.

Parameter	Description
pcoipUSBDevicesStatus	String describing the USB device status. This status string contains the connection state of the device, and will also show if a device has been blocked due to authorization restrictions.
pcoipUSBDevicesDeviceClass	String describing the USB device class.
pcoipUSBDevicesSubClass	String describing the USB device sub class.
pcoipUSBDevicesProtocol	String describing the USB protocol used.
pcoipUSBDevicesSerial	String describing the USB device serial number.
pcoipUSBDevicesVID	String describing the USB device vendor ID.
pcoipUSBDevicesPID	String describing the USB device product ID.

1.2 SNMP Version Support

The PCoIP SNMP agent supports SNMPv1, SNMPv2c and SNMPv3. SNMPv1 and SNMPv2c was available in Teradici firmware release 1.0 and all subsequent releases up to an including firmware 20.07. SNMPv3 is available in PCoIP firmware 20.07, and is the only configurable option in firmware 20.10 or newer.

1.2.1 Using SNMPv1

Table 1-11 defines the parameter settings when using SNMPv1 to interact with the PCoIP SNMP agent.

Table 1-11: SNMPv1 Parameters

Parameter	Description
Device Address	End-point IP address (Remote Workstation Card or Zero Client)
Port	161

1.2.2 Using SNMPv2c

Table 1-12 defines the parameter settings when using SNMPv2c to interact with the PCoIP SNMP agent.

Table 1-12: SNMPv2c Parameters

Parameter	Description
Device Address	End-point IP address (Remote Workstation Card or Zero Client)
Port	161
Read Community Name	public

1.2.3 Using SNMPv3

Table 1-13 defines the parameter settings when using SNMPv3 to interact with the PCoIP SNMP agent.

Table 1-13: SNMPv3 Parameters

Parameter	Description
Device Address	End-point IP address (Remote Workstation Card or Zero Client)
Port	161
SNMPv3 Auth Password	enter strong password
SNMPv3 Priv Password	enter strong password

> ✏ **Zero Client specific details**
>
> For PCoIP endpoint specific values, see the PCoIP Zero Client or Remote Workstation Card administrators guide for complete details.

1.3 SNMP Traps

SNMP traps are asynchronous messages sent by an SNMP agent to an SNMP manager when certain conditions occur. The PCoIP SNMP agent supports generating the following SNMP trap.

- IF-MIB cold start

Other SNMP traps are enabled and disabled using a profile with the PCoIP Management Console and are disabled by default. For details about using a profile with PCoIP Management Console, please refer to Managing Profiles in the PCoIP Management Console Administrators Guide.

To enable traps, you must configure the following Network configuration parameters:

> ✏️ **PCoIP Firmware Version**
>
> SNMP version 3 traps are only available when using PCoIP firmware 20.07 or newer. SNMPv1 and SNMPv2c are available up to and including firmware 20.07.

- SNMP NMS Address: IP address of the SNMP management system the SNMP agent will send the trap to
- Enable SNMP Cold Start Trap: boolean variable that enables cold start traps
- Enable SNMP V1 Traps: boolean variable that enables v1 traps
- Enable SNMP V2c Traps: boolean variable that enables v2c traps
- Enable SNMP V3 Traps: boolean variable that enables SNMP version 3 traps

To enable or disable the generation of SNMP traps, the endpoints must be reset after modifying these parameters.

1.4 Known Issues

- Two counters in PCoIP Zero Clients and Remote Workstation Cards do not function properly. They report random values for the following MIB counters. These counters should be ignored when analyzing the data reported by a PCoIP Zero Client or Remote Workstation Cards.
  - etherStatsPkts128to255Octets.2
  - etherStatsPkts1024to1518Octets.2

- The statistic ifSpeed.2 should return an estimate of the interface's current bandwidth in bits per second. The PCoIP SNMP agent always returns the value 10Mbps.

- The PCoIP SNMP agent supports reading but does not support modifying variables with read-write access.