Teradici PCoIP® Hardware Accelerator (APEX 2800) Administrator's Guide

teradici®

PCoIP

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Revision History

Version	Date	Description
11	Apr. 13, 2015	Updated document for Teradici PCoIP® Hardware Accelerator (APEX 2800) release 2.5. This release contains the following new features: • ESXi driver: Support for ESXi 6 and ESXi 5.1 U3 • VM driver: Support for VMware Horizon 6.1 Image caching has also been enhanced in this release for improved bandwidth utilization.
10	Oct. 15, 2014	• Updated System Requirements section for release 2.4.1. This release supports VMware Horizon View 6.0.1, 5,3, 5.2, 5.1, and 5.0.
9	Aug. 18, 2014	• Updated document and screen captures for Teradici PCoIP® Hardware Accelerator (APEX 2800) release 2.4. This release contains the following features: • Support for VMware Horizon 6. • ESXi VIB names now include the major, minor, and maintenance ESXI version to provide full details about the PCoIP Hardware Accelerator's ESXi driver.
8	Jan. 15, 2014	• Updated document for Teradici PCoIP® Hardware Accelerator (APEX 2800) driver release 2.3.3 to state that VMware Horizon View 5.3 is now supported.
7	Nov. 12, 2013	• Updated document for Teradici PCoIP® Hardware Accelerator (APEX 2800) driver release 2.3.2 to state that ESXi 5.5 is supported for VMware View 2.2.
6	Aug. 20, 2013	• Updated document for Teradici PCoIP® Hardware Accelerator (APEX 2800) driver release 2.3.0. • Added information about vGPU and image caching support in section 1.1.1, Benefits. • Revised descriptions for **bw_disable_threshold** and **bw_enable_threshold** in section 4.1.1, Specifying Property Settings for a VM. • Updated document to reflect the new name for this product.

Version	Date	Description
5	Jul. 2, 2013	• Updated document for Teradici APEX 2800 Server Offload Card driver release 2.2.1 to state that ESXi 5.1 Update 1 is supported.
4	Apr. 1, 2013	• Updated document and screen captures with information for Teradici APEX 2800 Server Offload Card driver release 2.2, ESXi 5.1, VMware View 5.2, and Teradici Arch™ published desktop. • Edited and restructured document.
3	Sept. 25, 2012	• Updated document and screen captures for Teradici APEX 2800 Server Offload Card driver release 2.1.
2	Feb. 24, 2012	• Updated the document for ESXi 5.0. • Added Lenovo RD240 to list of tested VDI Server platforms. • Added information about disabling ESXi interrupt remapping to the Troubleshooting section. • Removed the information about the PCoIP Imaging Caching Size.
1	Jan. 27, 2012	• Initial release.

Contents

1 Welcome

1.1 Introduction

The Teradici PCoIP® Hardware Accelerator (APEX 2800) provides hardware-accelerated PCoIP® image encoding for server-hosted VMware View™ virtual desktops (often referred to as Virtual Desktop Infrastructure, or VDI).

The PCoIP Hardware Accelerator monitors the graphical demands of displays and automatically offloads the PCoIP encoding tasks of the most demanding displays from the vCPUs to the PCoIP Hardware Accelerator. To support multiple server types, the PCoIP Hardware Accelerator is available in the form factors shown below. For all cards, the features and functionality are the same.

- **Low profile (LP)**: Half height, half length card that can fit into a PCIe x4 slot (supports PCIe Gen 2.0)
- **MXM**: An MXM card for HP Gen8 blade servers
- **DXM-A by Amulet HotKey**: A DXM-A card for Dell "M" series blade servers

As demands change, the card seamlessly and automatically shifts between hardware encoding on the PCoIP Hardware Accelerator and software encoding on the vCPU(s) of the virtual desktops. This lets the PCoIP Hardware Accelerator support a large number of desktops while providing optimal use of resources.

The Teradici PCoIP Hardware Accelerator offloads up to 100 displays, depending on the maximum display resolution configuration and the display topology (i.e., whether landscape or portrait mode is enabled). The maximum number of offloaded displays for various scenarios is shown in the table below.

Note: Each virtual machine display is monitored separately. The number of displays offloaded may vary based on screen resolution and display activity.

Table 1-1: Maximum Number of Offloaded Displays

Maximum Width	Maximum Height	Maximum No. Offloaded Displays
Portrait mode enabled:		
2560	1600	25
1920	1200	40
1680	1050	50

Maximum Width	Maximum Height	Maximum No. Offloaded Displays
1280	1024	100
Portrait mode disabled:		
2560	1600	40
1920	1200	64
1680	1050	85
1280	1024	100

Note: Please see www.teradici.com for more information about hardware accelerator solutions.

1.1.1   Benefits

The Teradici PCoIP Hardware Accelerator delivers the following benefits:

- **Consistent user experience**: The PCoIP Hardware Accelerator constantly monitors the graphic encoding demands of each display and dynamically offloads up to 100 of the most active displays. This reduces peaks in server CPU utilization, ensuring a consistently optimal experience across all users, regardless of task or activity level.

- **Enhanced application performance**: Increased virtual CPU headroom results in more dependable application performance, enabling intensive applications to run more smoothly.

- **Improved VDI consolidation ratio**: The increased virtual CPU headroom also improves VDI consolidation ratio (i.e., the number of virtual servers required on each physical host). These gains occur for typical office workloads as well as scenarios with high levels of pixel changes (e.g., a number of users watching videos at the same time).

- **Compatible with GPU implementations in VMware Horizon View**: The PCoIP Hardware Accelerator supports Virtual Shared Graphics Acceleration (vSGA), Virtual Dedicated Graphics Acceleration (vDGA), and Shared Virtual GPU (vGPU) rendering on the ESXi server to further improve user experience without affecting the VDI consolidation ratio.

  Note: A reduction in frame rate may be experienced when using vDGA rendering.

- **Improved bandwidth utilization**: Image caching capabilities on the PCoIP Hardware Accelerator allow for optimal session bandwidth utilization.

- **Client compatibility**: The PCoIP Hardware Accelerator is compatible with all existing PCoIP zero clients and VMware View software clients.

- **Simple installation and setup**: The Teradici PCoIP Hardware Accelerator plugs into industry standard servers and is managed via VMware View Administrator. Installation and configuration are simple, and do not require management tools.

1.2   System Requirements

The Teradici PCoIP Hardware Accelerator can be used in VMware View™ virtual desktop environments that meet the following system requirements.

1.2.1   Server Platform

The virtual server platform for the PCoIP Hardware Accelerator requires an available card slot for one of the following form factors:

- PCIe x4, half height, half length for the PCoIP Hardware Accelerator LP (supports PCIe Gen 2.0)
- PCoIP Hardware Accelerator MXM for HP blade servers
- Teradici PCoIP Hardware Accelerator by Amulet HotKey (DXM-A) for Dell "M" series blade servers

This release is compatible with all previous ESXi updates. It has been tested on the following platforms:

- ESXi 6.0
- ESXi 5.5 U2
- ESXi 5.1 U3
- ESXi 5.0

VMware Horizon View versions supported:

- VMware Horizon View 6.1
- VMware Horizon View 6.0
- VMware Horizon View 5.3
- VMware Horizon View 5.2
- VMware Horizon View 5.1
- VMware Horizon View 5.0

Virtual operating systems:

- Windows 8.1 64-bit (Note: Windows 8 is not supported.)
- Windows 7 32-bit/64-bit
- Windows Server 2008 R2

Maximum of two PCoIP Hardware Accelerators per server, with up to 200 displays offloaded.

To get the latest drivers, please register at the Teradici Support Center, and subscribe to KB 15134-715 in the Teradici Support Knowledge Base.

1.2.2 Client Platform

This release has been tested on the following client platforms:

- Tera2 PCoIP Zero Client (firmware 4.7, 4.8)
- Tera1 PCoIP Zero Client (firmware 4.7)
- VMware Horizon Clients 3.2
- Displays with a maximum resolution of 2560 x 1600

1.2.3 Network

The PCoIP protocol provides a real-time delivery of a rich user desktop experience. To ensure a responsive desktop, the PCoIP protocol must be deployed across a properly architected virtual desktop network infrastructure that meets bandwidth, QoS, latency and packet-loss requirements. For more details, see "PCoIP® Protocol Virtual Desktop Network Design Checklist" (TER1105004).

2   Installing the Hardware Accelerator Hardware and Drivers

Note: The driver build numbers displayed in the screen shots in this section may differ from the build numbers for your drivers.

2.1   Installation Overview

The following is an overview of the steps for installing and configuring the PCoIP Hardware Accelerator.

1. Download the latest drivers.
2. Install the PCoIP Hardware Accelerator in the server.
3. Install the ESXi driver package on the server.
4. Verify the PCoIP Hardware Accelerator installation.
5. Install the PCoIP Hardware Accelerator virtual driver on each VDI desktop.
6. Verify pool policy settings.
7. Verify that PCoIP Hardware Accelerator is offloading the display encoding.

You can also watch a video tutorial showing the installation process for the Teradici PCoIP Hardware Accelerator. Please see KB 15134-776 in the Teradici Support Knowledge Base.

2.2   Downloading the Installation Package

Before beginning the installation, download the latest drivers to a convenient PC as follows:

1. From the Teradici Support Center, navigate to the **Downloads** page.
2. From the **Downloads Center** navigation pane, select the **Teradici PCoIP Hardware Accelerator (APEX 2800) > Drivers** link to see the latest PCoIP Hardware Accelerator driver downloads.
3. Select the appropriate version of the drivers package depending on the ESXi version you are running.
4. Accept the license agreement and download the package to your PC.
5. Extract the PCoIP Hardware Accelerator drivers package contents.

2.2.1   Drivers Package Contents

The PCoIP Hardware Accelerator drivers package includes the following components:

- **ESXi drivers package**: apex2800-*<release number>*-rel-esxi-*<esxi version>*-*<APEX 2800 esxi build number>*.zip

- **Virtual machine driver installer**: apex2800-<*release number*>-rel-<*APEX 2800 VM driver build number*>.exe

2.3   Installing the PCoIP Hardware Accelerator in the Server

Warning! Before beginning the installation:

- **Power down and disconnect devices from AC power before handling them. Failure to do this can result in personal injury or equipment damage. Some circuitry on the server PC can continue to operate even though the front panel power switch is off.**

- **Ensure you observe correct anti-static handling to avoid potential ESD damage to the card.**

1. Make sure all virtual machines hosted by the ESXi server are powered down or migrated to another server.

2. From the VMware vSphere client, right-click on the ESXi server in the inventory, and then select **Enter Maintenance Mode**.
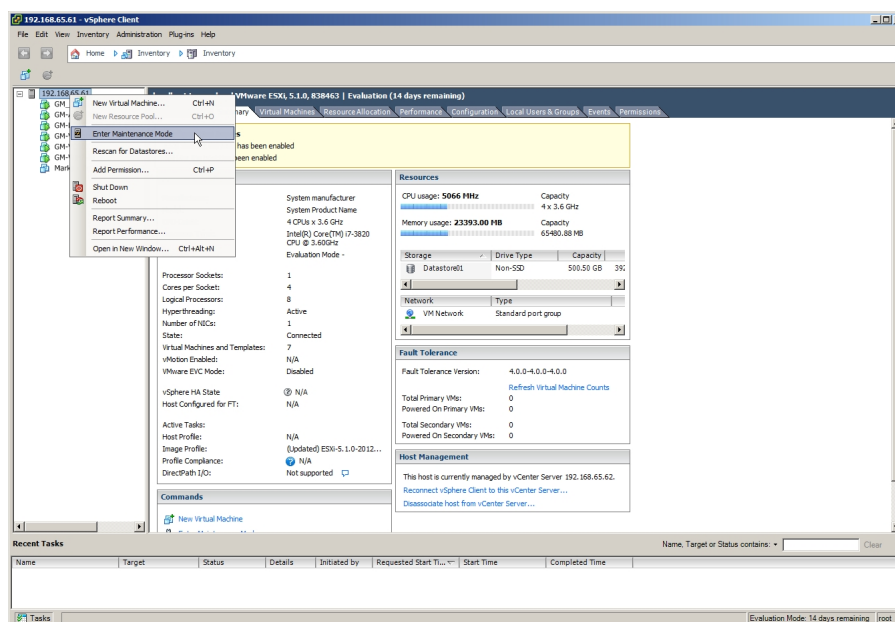
3. Before physically installing the PCoIP Hardware Accelerator, power down the server and disconnect it from the AC power. Also ensure you observe the correct anti-static handling to avoid potential ESD damage to the card.

4. Insert the PCoIP Hardware Accelerator into an available PCIe or mezzanine slot, and then secure the card.

5. Plug the server into a surge-protected AC outlet, and then power it on.

2.4 Installing the ESXi Driver

This procedure has the following steps:

- Enable remote login on the ESXi server
- Copy the ESXi installation package to the ESXi server using WinSCP
- Install the ESXi driver using an SSH client
- Exit maintenance mode from the vSphere client

2.4.1 Enable Remote Login on the ESXi Server

1. From the VMware vSphere client, select the ESXi server in the inventory.
2. From the **Configuration** tab, select **Software > Security Profile**.
3. In the **Services** section, click the **Properties** link.
4. In the **Remote Access** pane of the **Services Properties** dialog, select **ESXi Shell**.
5. At the **I/O Redirectory Options** dialog, select the desired startup policy, and then click **Start**.
6. Click **OK** to close the dialog.
7. After verifying that the selected startup policy shows as "Running" in the **Daemon** column of the **Service Properties** dialog, click **OK** to close the dialog.

2.4.2 Copy the ESXi Installation Package to the ESXi Server

This step requires WinSCP (Windows Secure Copy). If you do not have this program installed on your local PC, please download and install it before proceeding.

1. In the WinSCP **Login** screen, select **SCP** as the file protocol.
2. Enter the ESXi server's IP address along with the administrator username and password for the server, and then click **Login**.
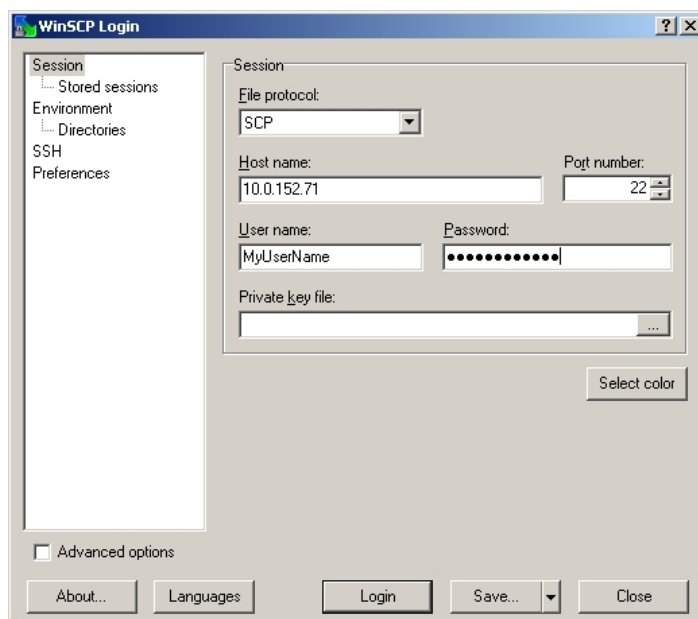
3. In the left pane of the WinSCP Login window, navigate to the directory on your local PC that contains the downloaded PCoIP Hardware Accelerator driver installation package. In the right pane, navigate to the **/tmp** directory on the ESXi server.

4. Copy the installation package from the PC to the ESXi server by dragging it over.
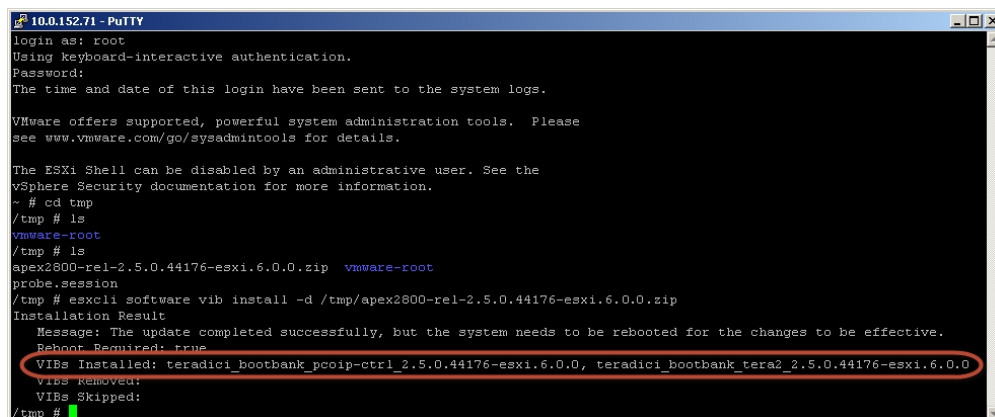
2.4.3   Install the ESXi Driver

Note: Ensure the ESXi server is in Maintenance Mode before proceeding. For details, see Installing the PCoIP Hardware Accelerator in the Server.

1. Using an SSH client from your local PC (e.g., PuTTY), connect to the ESXi server.

2. Navigate to the **/tmp** folder, and install the ESXi driver package using the following syntax:

   esxcli software vib install -d /tmp/*<ESXi driver package filename>*.zip

   After a few minutes, the installation result output displays. It should report that two VIBs (vSphere Installation Bundles) were installed, as shown below.

Note: If you do not put the ESXi server in Maintenance Mode, the installation output will indicate that two VIBs were skipped.

3. When you see the "completed successfully" message, type **reboot** at the prompt to restart the ESXi server.

2.4.4 Exit Maintenance Mode

1. From the VMware vSphere client, right-click on the ESXi server in the inventory.
2. Select **Exit Maintenance Mode** from the context menu.

2.5 Verifying the PCoIP Hardware Accelerator Installation

You can use a PCoIP control command to check that the card and ESXi driver were installed correctly.

1. From an SSH client (e.g., PuTTY), connect to the ESXi server.
2. Enter the following command:

/opt/teradici/pcoip-ctrl -I

3. Ensure that "APEX2800 device present" occurs in the APEX2800 driver information output. Also check the ESXi driver and firmware versions, as shown below.

For more information about the pcoip-ctrl -I command, see Viewing the PCoIP Hardware Accelerator Status.

2.6 Installing the Virtual Machine Driver

For VMware View VDI deployments, the PCoIP Hardware Accelerator virtual machine driver must be installed on each virtual machine. The installation program must be run from the VMware vSphere virtual machine console. It cannot be run from within a PCoIP session.

This procedure has the following steps:

- Run the virtual machine driver installer executable
- Verify the virtual machine driver installation

2.6.1 Run the Virtual Machine Driver Installer

1. Power up the virtual machine and copy the virtual machine driver installer to the virtual desktop.
2. From the VMware vSphere client, open a console window to the virtual machine.
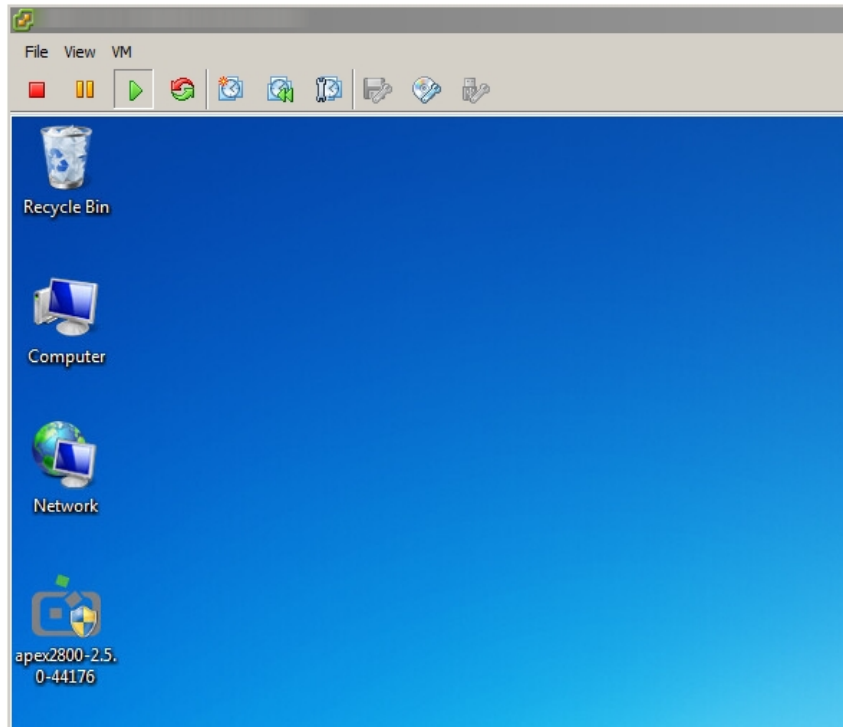
3. Run the virtual machine driver installer on the virtual machine and follow the steps in the installation wizard.

4. When the installation finishes, choose to manually reboot the machine later.

5. **Important**: Power the virtual machine off and then back on again to ensure that the ESXi server inspects the updated virtual machine image. A simple reboot does not cause the driver to take effect.

Performing a Silent Installation

You can also perform a silent installation of the virtual machine driver by typing the following at the virtual machine's command line:

> *<location>*\apex2800-2.5.0-rel-xxxxx.exe /S

where "*<location>*" is the full path to the folder containing the virtual machine installer, and "*xxxxx*" is the driver build number. Please note that the "/S" switch is case sensitive.

2.6.2   Verify the Virtual Machine Driver Installation

1. On the virtual machine, find the **tera2800_accel.dll** file.
   Note: For Windows 7, this file is in **C:\Program Files\Common Files\VMware\Teradici PCoIP Server.**

2. Right-click on the file, select **Properties**, and then the **Details** tab to display the file version number, as shown below.
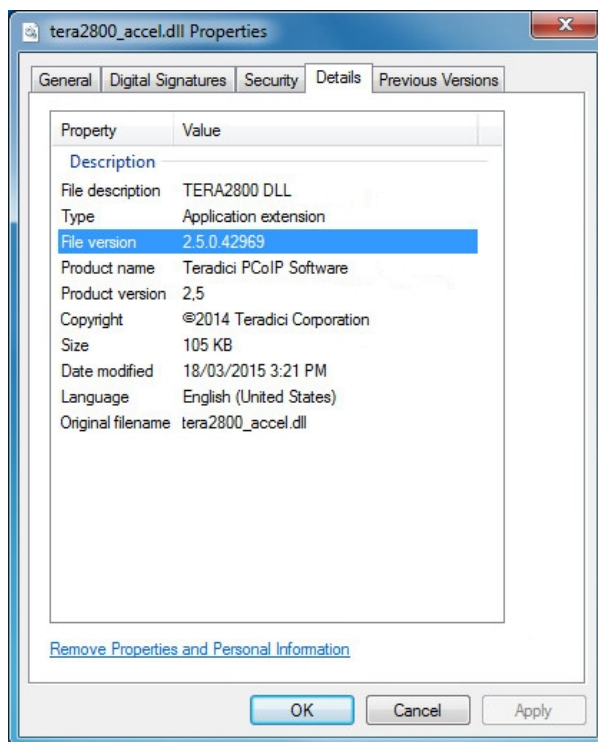
3. Verify your VMdriver by checking the compatibility matrix lists for ESXi, Horizon View, and PCoIP software versions in KB 15134-904 in the Teradici Support Knowledge Base.

2.7   Verifying the Policy Settings

The PCoIP Hardware Accelerator monitors the display activity for all virtual machines that have the virtual machine driver installed and that PCoIP hardware acceleration enabled. This maximizes the card benefit by allowing the PCoIP Hardware Accelerator to offload the most active displays.

To verify that hardware acceleration is enabled:

1. Log in to your VMware View Connection server.

2. From the **VMware View Administrator** main window, select **Policies > Global Policies**.

3. Make sure that the **PCoIP hardware acceleration** setting is enabled (i.e., set to **Allow**) for any policies that inherit from the global policy. (For details, see Assigning Priority to the Global Pool.)

4. In any custom policies, also make sure the option for enabling and disabling PCoIP hardware acceleration is set to **Allow**. (For details, see Assigning Priority to a User.)

2.8   Verifying Display Offloading

You can use a PCoIP control command to check that the PCoIP Hardware Accelerator is offloading the display encoding.

1. From an SSH client (e.g., PuTTY), connect to the ESXi server.
2. Enter the following command:

    /opt/teradici/pcoip-ctrl -V

3. Check the virtual machines that the PCoIP Hardware Accelerator is monitoring and the number of displays it is currently offloading.
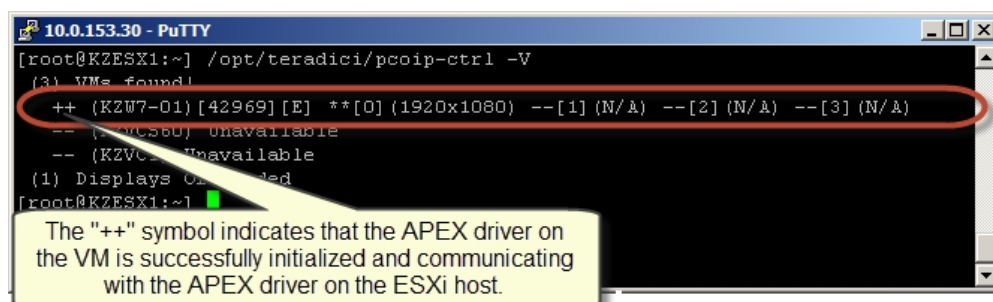
For more information about the pcoip-ctrl -V command, see Viewing the VM Usage and Monitoring Status.

2.9   Installing Additional PCoIP Hardware Accelerators

When additional Teradici PCoIP Hardware Accelerators are installed on the same server, they act as a single resource and can automatically offload additional displays.

To install an additional card and check its status, see Installing the PCoIP Hardware Accelerator in the Server and Viewing the PCoIP Hardware Accelerator Status, respectively.

2.10   Uninstalling the PCoIP Hardware Accelerator ESXi Driver
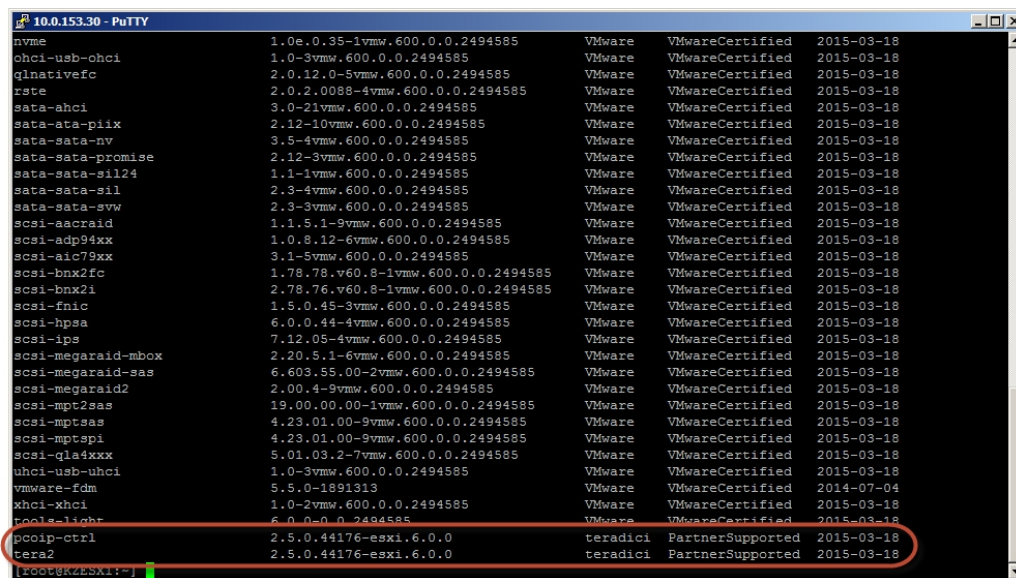
The steps to uninstall the PCoIP Hardware Accelerator ESXi driver vary slightly depending on the version of ESXi being used.

1. From VMware vSphere client, shut down all virtual machines hosted by the server.
2. Right-click on the ESXi server in the inventory, and then select **Enter Maintenance Mode**.
3. Using an SSH client (e.g., PuTTY) on your PC, connect to the ESXi server.
4. Identify the PCoIP Hardware Accelerator driver components to uninstall using the following command:

esxcli software vib list

This command lists two PCoIP Hardware Accelerator driver VIBs to remove: pcoip-ctrl and tera2.

Note: The VIB version number (e.g., **2.5.0.44176-esxi.6.0.0**) indicates the major, minor, and maintenance ESXI version to provide full details about the PCoIP Hardware Accelerator's ESXi driver.

Note: For PCoIP Hardware Accelerator ESXi driver versions prior to version 2.1, a third VIB, **tera-compat-esx**, also appears in this list and must be removed.

5. Uninstall the PCoIP Hardware Accelerator ESXi driver using the following command:

   esxcli software vib remove --vibname=pcoip-ctrl --vibname=tera2

   For PCoIP Hardware Accelerator ESXi driver versions prior to version 2.1, you also need to uninstall a third VIB by appending the following to this command:

   --vibname=tera-compat-esx

6. When you see the "update completed successfully" message, type **reboot** at the prompt to restart the ESXi server.

7. From the VMware vSphere client, right-click on the ESXi server in the inventory, and then select **Exit Maintenance Mode** from the context menu.

3   Managing the Hardware Accelerator

3.1   Using View Administrator to Assign Priorities

VMware View Administrator is used to manage the Teradici PCoIP Hardware Accelerator. No other management tool is required.

For example, you can use View Administrator to refine how the PCoIP Hardware Accelerator prioritizes display offloads when the card is operating at full capacity. By assigning one of five available priority levels to the global pool, a specific desktop pool, or an individual user, you can apply your knowledge about the known graphic demands of existing desktop pools to the card's prioritization of display offloads.

The default priority level for PCoIP hardware accelerating is "Medium." This ensures that displays belonging to higher priority desktop pools are encoded on the PCoIP Hardware Accelerator processor before lower priority displays, regardless of the amount of pixel activity being generated by the higher priority desktops. To change the priority to another level, follow the steps in the sections below.

Note: For full details about View Administrator settings, please see your VMware View documentation.

3.1.1   Assigning Priority to the Global Pool

To change the priority setting for your global pool:

1. From the View Connection Server's **VMware View Administrator** window, select **Policies > Global Policies**.
2. Click the **Edit Policies** button.
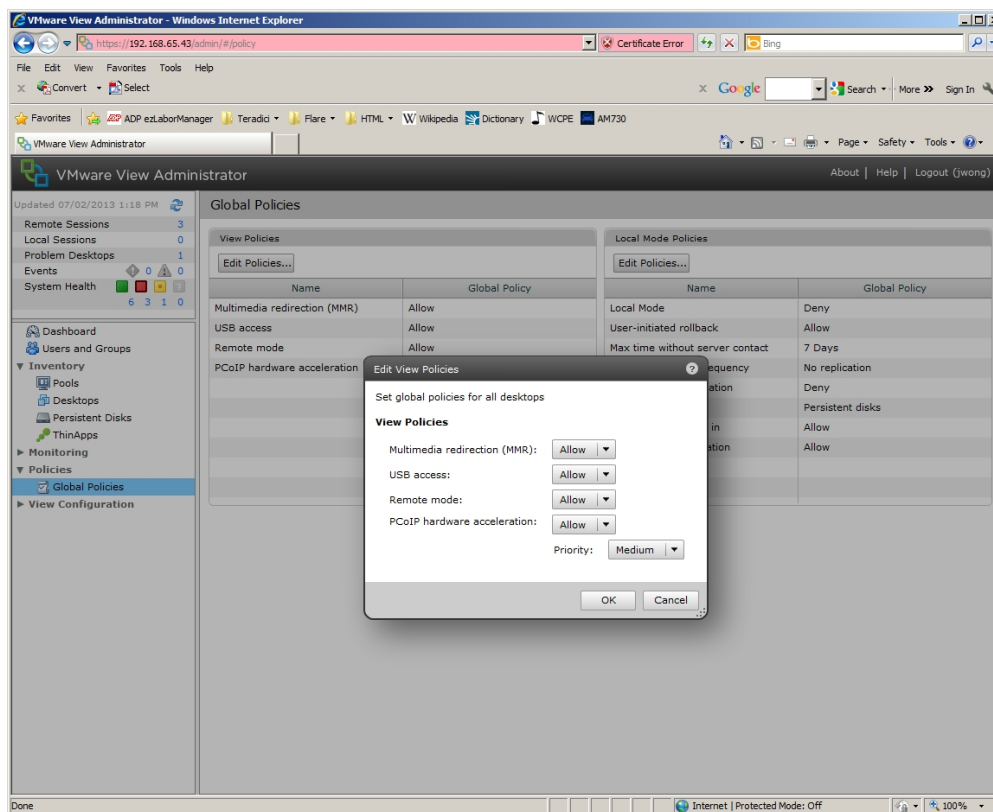
3. The **PCoIP hardware acceleration** drop-down box is set to **Allow** by default. You can change the **Priority** setting to any of the available options to apply the new priority to the desktop pools that inherit the global setting.

3.1.2 Assigning Priority to a Desktop Pool

To assign a priority level to a specific desktop pool:

1. From the View Connection Server's **VMware View Administrator** window, select **Inventory** > **Pools**.

2. Double-click the ID of the applicable desktop pool, and then click the **Policies** tab.

3. To configure general session policies, click **Edit Policies** from the **View Policies** pane.
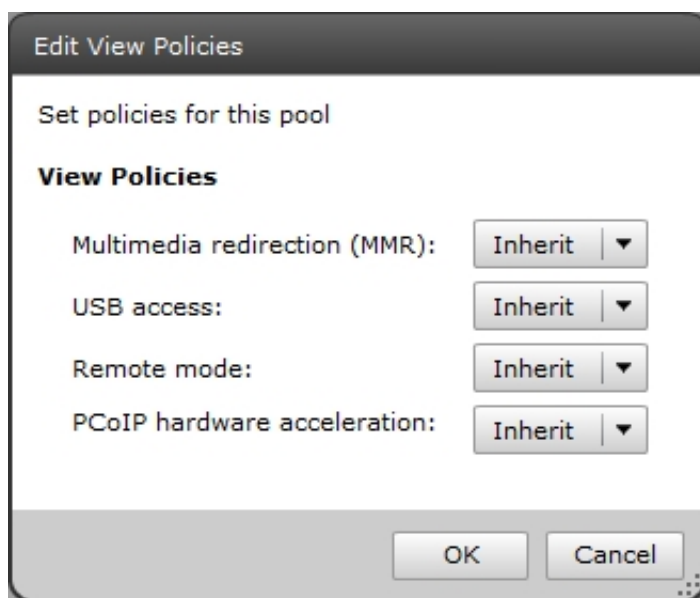
4. Change the **PCoIP hardware accleration** setting to **Allow** to enable the **Priority** box, and then select the desired priority.
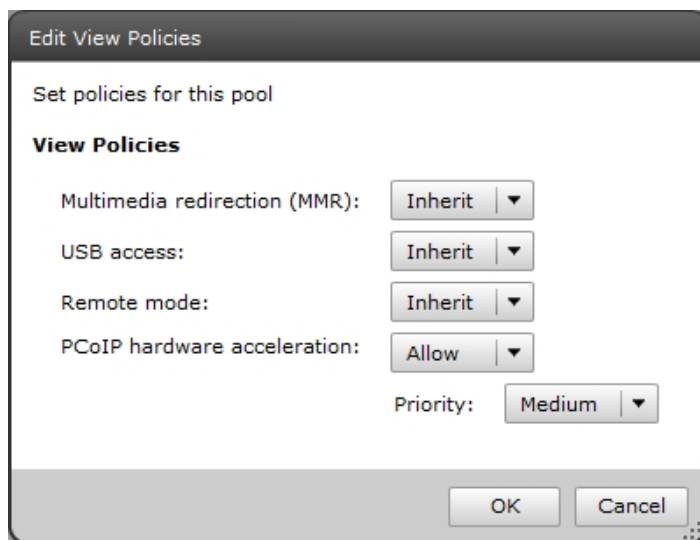
5. Click **OK** to save your changes. The new priority setting is applied to all users in the desktop pool except any users who have an individual priority setting applied to them.

3.1.3   Assigning Priority to a User

To assign a priority to a specific user within a desktop pool:

1. From the View Connection Server's **VMware View Administrator** window, select **Inventory > Pools**.

2. Double-click the ID of the applicable desktop pool, and then click the **Policies** tab.

3. Click **Edit Policies** from the **View Policies** pane to display the **Edit View Policies** window.

4. Click the **User Overrides** link.

5. Select the user to which you want to apply the priority setting, and then click **Next**.

6. Set **PCoIP hardware acceleration** to **Allow**, and then select the desired priority level.

7. Click **Finish** to save your settings.

3.2 PCoIP Session Variables

Most of the PCoIP session settings configured in VMware View are maintained by the PCoIP Hardware Accelerator. The following table shows some common session settings and whether or not they are supported by the Teradici PCoIP Hardware Accelerator.

Session Setting	Supported by PCoIP Hardware Accelerator
PCoIP Image Quality Levels: • Minimum Image Quality • Maximum Initial Image Quality • Maximum Frame Rate	 Yes. Yes. Yes.

Session Setting	Supported by PCoIP Hardware Accelerator
Maximum PCoIP Session Bandwidth	Supported dynamically. Receives the bandwidth limit values from the PCoIP software in VMware View.
PCoIP Session Bandwidth Floor	Supported dynamically. Receives the bandwidth floor from the PCoIP software in VMware View.
Turn Off Build-to-Lossless	Yes.

4 Using the Hardware Accelerator CLI

Note: The driver build numbers displayed in the screen shots in this section may differ from the build numbers for your drivers.

4.1 PCoIP Hardware Accelerator Command Line Interface

The Teradici PCoIP Hardware Accelerator supports a command line interface (CLI) on the ESXi server consisting of a **pcoip-ctrl** command with a series of command line options that you can use to configure and monitor your PCoIP Hardware Accelerators.

To use the PCoIP Hardware Accelerator CLI:

1. From an SSH client (e.g., PuTTY), connect to the ESXi server.
2. Enter the desired **pcoip-ctrl** command at the command prompt.

Note: All configured settings, with the exception of the offload indicator setting, appear in the PCoIP server logs.

4.1.1 Command Syntax

The structure for the **pcoip-ctrl** command is shown below.

Note: ESXi 5.x and later of the **pcoip-ctrl** command requires you to specify the command path (i.e., **/opt/teradici/pcoip-ctrl**…).

/opt/teradici/pcoip-ctrl [-d *<device number>*][-x][-e][-L *<log level>*][-I][-V][-O] [-P "*<property name> <property value>*"] [-X *name*]

Command Line Options	Description
-d	Specifies the device number (bus number) to control.
-x	Disables the PCoIP Hardware Accelerator device specified using the -d option.
-e	Enables the PCoIP Hardware Accelerator device specified using the -d option.
-I	Outputs the general driver and device information.
-V	Outputs virtual machine and display usage information.

-C	Outputs all software and firmware log event categories and current levels.	
-O	Outputs all virtual machine properties.	
-P *<property name> <property value>*	Sets the specified property value for a VM. Note: This command will take any property name. Please make sure the property name you enter is correct.	
	offload_indicator	Enables/disables the red dot offload indicator if the display is eligible. (Disabled by default.) For more information, see Specifying Property Settings for a VM.
	bw_enable_threshold bw_disable_threshold	For View 5.x clients, enables/disables network bandwidth thresholds for offload enabling and cancelling. For more information, see Specifying Property Settings for a VM.
-X *<property_name>*	Removes the specified property.	
-L *<log level>*	Sets the default log level in the APEX 2800 ESXi driver and firmware (e.g., **pcoip-ctrl -L0**):	
	0	CRITICAL log level
	1	ERROR log level
	2	INFO log level
--get-max-resolution	Retrieves a list of supported maximum resolutions and the current maximum resolution.	
--set-max-resolution *<selection>*	Selects a particular maximum resolution.	

--enable-portrait-mode	Enables portrait mode. (Because landscape orientation is the most common mode for a display, portrait mode is disabled by default.) Note: **enable-portrait-mode** only applies to software clients, not zero clients.
--disable-portrait-mode	Disables portrait mode.
--reset-properties	Resets all properties to the manufacturing default (i.e., deletes all properties set by the user).
--get-encoder-mode-switch-thresholds	Retrieves the client capability thresholds at which the encoder mode is switched.
--set-encoder-mode-switch-thresholds "*<enable_kbps> <disable_kbps>*"	Sets the client capability thresholds at which the encoder mode is switched.

Specifying Property Settings for a VM

This section describes the VM property names and values available for the **pcoip-ctrl -P** "*<property name> <property value>*" command.

PCoIP Hardware Accelerator Property	Description
offload_indicator	Sets the red dot display offload indicator option. **Operation:** Provides a way to see if a display is offloaded at the end user's display by a small dot overlay appearing at the top left corner of the screen. • Red dot: The display is offloaded using PCoIP hardware compression in the PCoIP Hardware Accelerator. • Blue dot: The display is using PCoIP software compression and is not offloaded. **Property value:** • 1: Enable the offload indicator. • 2: Disable the offload indicator. **Default:** Disabled.

bw_disable_threshold bw_enable_threshold	Sets the enable/disable network bandwidth threshold for offload cancelling. To view the enable or disable state for a VM, type **pcoip-ctrl -V**.
	Operation: When the network bandwidth for a session goes below the **bw_disable_threshold**, display offloading is cancelled. Once the network bandwidth is above the **bw_enable_threshold**, the display(s) are eligible for offloading again based on the VM priority and PCoIP Hardware Accelerator resource availability.
	Property value: 0 to any bandwidth number.
	Usage: At lower network bandwidths, there is a smaller load on the PCoIP Hardware Accelerator and as a result, less offload benefit. Automatically cancelling display offload below a network threshold helps maximize the benefit of the PCoIP Hardware Accelerator.
	Also, automatic display offload cancelling below a network threshold lets the session take advantage of WAN bandwidth optimization features in PCoIP software, such as client image caching (if available on the client).
	Defaults
	Session bandwidth threshold for offload cancelling (**bw_disable_threshold**): 5 Mbps.
	Session bandwidth threshold for offload enabling (**bw_enable_threshold**): 6 Mbps.

4.2   Example: Viewing the PCoIP Hardware Accelerator Status

When the installation and configuration of the PCoIP Hardware Accelerator is complete, you can verify the working status of the card and display general information about the ESXi driver, PCoIP Hardware Accelerator card, and virtual machines by typing the following command at the prompt:

    /opt/teradici/pcoip-ctrl -I

```
10.0.153.30 - PuTTY                                                    _ □ X
[root@KZESX1:~] /opt/teradici/pcoip-ctrl -I

APEX2800 Driver Information:
  - SVN revision (44176), Built Mar  9 2015 : 19:03:01
  - Display Manager is (ENABLED)
  - Display Portrait Mode is (ENABLED)
  - Maximum Resolution Supported: 1920 x 1200
  - Number of displays supported: 40

APEX2800 Device Summary:
  (1) APEX2800 device present
    -- APEX2800-LP PCIe (Bus 3) (IN_SERVICE)
        ++ Serial Number (L12110006231)
        ++ Firmware SVN revision (44176), Built Mar  9 2015 : 19:02:52
        ++ CPU Temperature (47c), Ambient/Board Temperature (43c)
        ++ Device Util (5), Image Pipeline (15060) Kpps

Virtual Machine Summary:
 -- (3) Virtual Machines Found
 -- (1) PCoIP Session Found
 -- (1) PCoIP Display Offloaded
[root@KZESX1:~]
```

APEX2800 Driver Information:	
SVN revision	Displays the ESXi driver version.
Display Manager	Communicates with the virtual machine driver to monitor displays and offload them based on their activity and priority levels. Enabled by default.
Display Portrait Mode	Indicates whether offloading is enabled for displays in portrait mode or landscope mode. This option is set by the **--enable-portrait-mode** and **--disable-portrait-mode** switches. When portrait mode is disabled, only displays configured in landscape mode are eligible for offloading. When portrait mode is enabled, displays configured in both portrait and landscape modes are eligible for offloading. Note: Portrait mode applies to software clients only. Displays connected to zero clients are always eligible for offloading. Note: This information only displays for PCoIP Hardware Accelerator driver version 2.0 and later.
Maximum Resolution Supported	Indicates the maximum resolution that is configured. This option is set by the **-set-max-resolution** switch.

Number of displays supported	Indicates the number of displays currently supported. This number depends on the maximum resolution and portrait mode settings that are configured. Note: This information only displays for PCoIP Hardware Accelerator driver version 2.0 and later.
APEX2800 Device Summary:	
APEX2800 device present	Indicates that the card is installed correctly.
APEX2800 PCIe	Displays the status of the card.
Serial Number	Displays the card's serial number. Note: This information only displays for PCoIP Hardware Accelerator driver version 2.1 and later.
Firmware SVN revision	Displays the card's firmware version.
CPU Temperature	Displays onboard temperatures for both the processor and board.
Device Util	Shows the current activity for the card. Values range from 0 to 99, with 0 indicating idle.
Virtual Machine Summary:	
Virtual Machines Found	Displays the number of virtual machines the card is currently supporting.
PCoIP Session Found	Displays the number of PCoIP sessions currently found.
PCoIP Display Offloaded	Displays the number of displays currently being offloaded.

4.3   Example: Viewing VM Usage and Monitoring Status

You can view information about each virtual machine the PCoIP Hardware Accelerator is currently monitoring by typing the following command at the prompt:

    /opt/teradici/pcoip-ctrl -V

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Virtual Machine Entries:	
(VM name) Unavailable	The virtual machine does not have the PCoIP Hardware Accelerator virtual machine driver installed and running.
(VM name) PCoIP Session Closed	The virtual machine is not in an active PCoIP session. If hardware acceleration is disabled for this user's virtual machine, this command also reports the PCoIP session as closed. For more information about hardware acceleration, see Using View Administrator to Assign Priorities.
(VM name) [VM driver build #] [E/D] ++[0] (display resolution) -- [1] (N/A) --[2] (N/A) --[3] (N/A)	The virtual machine is in a PCoIP session. The following information is also displayed: • **[E]**: Indicates the VM is eligible for offloading. • **[D]**: Indicates the VM is not eligible for offloading. • **++**: Indicates that the display is currently being offloaded. • **--**: Indicates that the display is currently not being offloaded (i.e., it is using PCoIP software encoding).

4.4 Example: Enabling/Disabling the PCoIP Hardware Accelerator

These examples show how to disable and enable the PCoIP Hardware Accelerator by typing the pcoip-ctrl -d <device number> command at the prompt.

Note: The device number (i.e, bus number) used by the card is displayed in the "APEX2800 PCIe" line of the "APEX2800 Device Summary" output of the pcoip-ctrl -I command. For details, see Example: Viewing the PCoIP Hardware Accelerator Status.

To disable the card in bus number 6:

/opt/teradici/pcoip-ctrl -d 6 -x

To enable the card in bus number 6:

/opt/teradici/pcoip-ctrl –d 6 –e

Note: The VM must be eligible for offloading for these settings to take effect.

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4.5   Example: Setting a Property

These examples show how to enable and disable the offload indicator (i.e., the small red square on the user's display) by typing the pcoip-ctrl -P "*<property name> <property value>*" command at the prompt:

To enable the offload indicator:

/opt/teradici/pcoip-ctrl -P "offload_indicator 1"

To disable the offload indicator:

/opt/teradici/pcoip-ctrl -P "offload_indicator 0"

To set the bandwidth threshold for offload enabling:

/opt/teradici/pcoip-ctrl -P "bw_enable_threshold 6000"

To set the bandwidth threshold for offload cancelling:
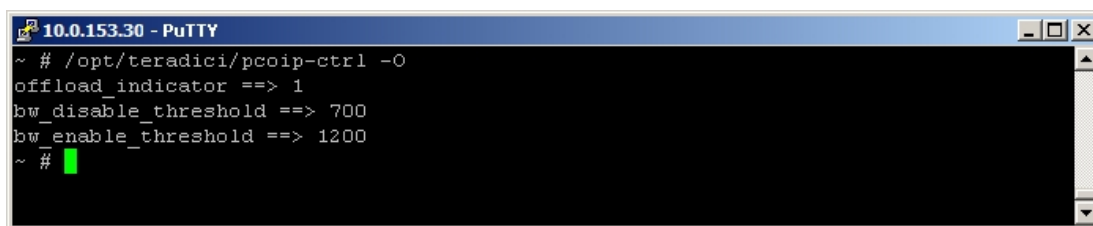
/opt/teradici/pcoip-ctrl -P "bw_disable_threshold 5000"

For more information about these commands, see Specifying Property Settings for a VM.

4.6   Displaying VM Property Values

To view the offload indicator and bandwidth threshold settings for a virtual machine, type the following command at the prompt:

/opt/teradici/pcoip-ctrl -O


```
10.0.153.30 - PuTTY
~ # /opt/teradici/pcoip-ctrl -O
offload_indicator ==> 1
bw_disable_threshold ==> 700
bw_enable_threshold ==> 1200
~ #
```
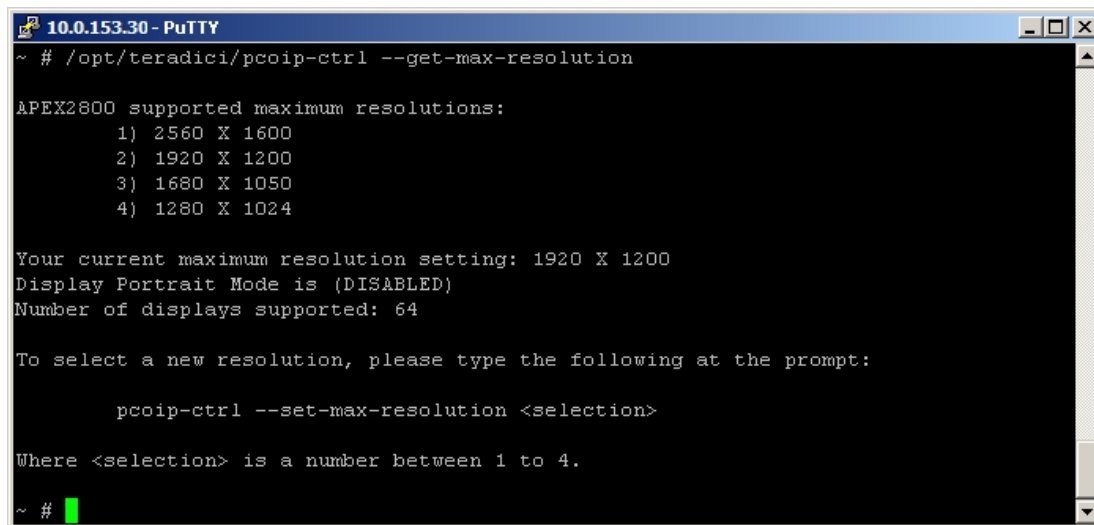
For more information about these settings, see Specifying Property Settings for a VM.

4.7 Example: Viewing and Setting the Maximum Display Resolution

To view the configured maximum display resolution, type the following command at the prompt:

/opt/teradici/pcoip-ctrl --get-max-resolution

To select a new resolution, type the following command at the prompt (where the number refers to the supported maximum resolutions that are listed in the pcoip-ctrl --get-max-resolution output):

/opt/teradici/pcoip-ctrl --set-max-resolution 2

4.8 Example: Setting the Log Level

The PCoIP Hardware Accelerator ESXi driver and firmware support multiple levels of logging to balance sufficient data, system performance, and log file size. The following log levels are available in both the PCoIP Hardware Accelerator ESXi and the PCoIP Hardware Accelerator firmware:

Log Level	Description
0-Critical	The system can no longer function correctly. This log level only shows the critical event messages in the log.
1-Error	This is the default log level. It includes critical and error event messages but does not include Information messages.

2-Info	This event log includes critical, error, and information event messages .
3-Debug	This event log provides detailed debug-level messages. Note: Please contact Teradici Support before setting this level.

To set a log level, type the pcoip-ctrl -L *<log level>* command at the prompt:
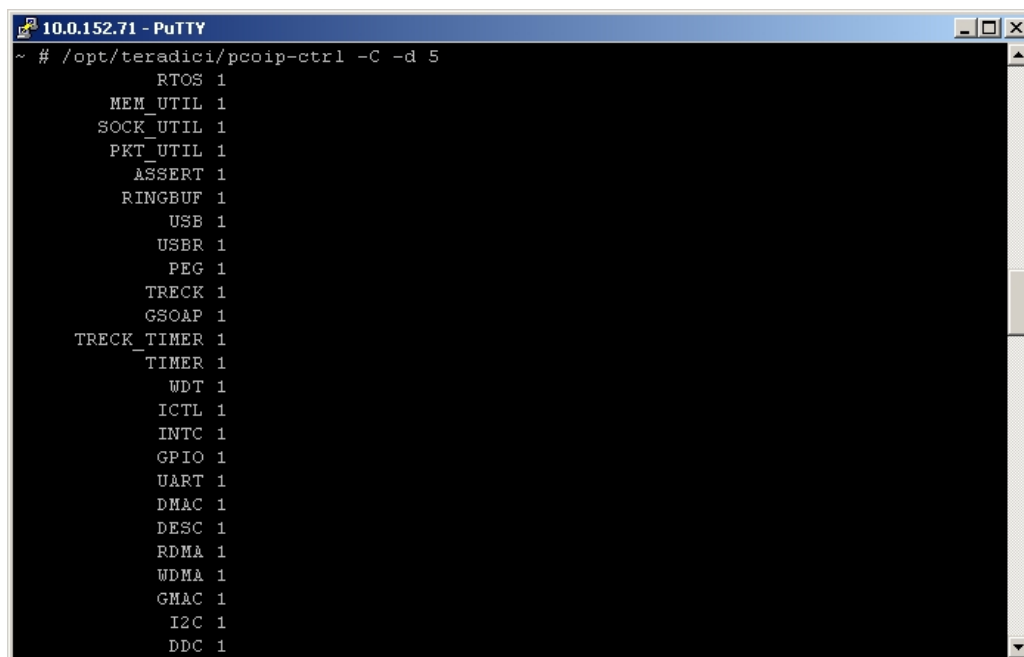
/opt/teradici/pcoip-ctrl -L 1

Note: Using a syslog server is recommended to ensure the necessary information is available in the event of an issue. See Enabling a Syslog Server for more details.

To view the current level of event messages that appear in your error log, type the pcoip-ctrl :-C -d *<device number>* command at the prompt:

/opt/teradici/pcoip-ctrl -C -d 4

Note: The device number (i.e, bus number) used by the card is displayed in the "APEX2800 PCIe" line of the "APEX2800 Device Summary" output of the pcoip-ctrl -I command. For details, see Example: Viewing the PCoIP Hardware Accelerator Status.

4.9   Example: Monitoring the ESXi Server Load

You can monitor the CPU loading for an ESXi server in two ways:

- Using the esxtop tool to gather CPU statistics
- Viewing CPU statistics from vSphere or vCenter performance charts

4.9.1 Using the esxtop Tool

You can use the VMware View esxtop command to monitor server load by viewing physical CPU statistics (PCPU USED(%) and PCPU UTIL(%)) for an ESXi server. The recommended method is to run the command in batch mode and save the values to a file.

1. From an SSH client (e.g., PuTTY), connect to the ESXi server.
2. Enter the esxtop command with the -b option to run the command in batch mode and save the performance statistics to a CSV file. E.g.,

   esxtop -b > myfile.csv

You can view the output file with Microsoft Excel or another applicable tool. The physical CPU (PCPU) values appear at the top part of the window, as shown below:

```
10.0.152.71 - PuTTY                                                      _ | □ | x
1:31:29am up  2:50, 384 worlds, 7 VMs, 14 vCPUs; CPU load average: 0.05, 0.04,
0.06
PCPU USED(%): 3.9 1.5 2.3 0.9 2.9 0.9 2.0 2.6 AVG: 2.1
PCPU UTIL(%): 6.2 3.4 4.5 2.2 5.9 1.9 4.4 3.7 AVG: 4.0
CORE UTIL(%): 9.2     6.6     7.4     7.9     AVG: 7.8

      ID     GID NAME              NWLD    %USED   %RUN     %SYS    %WAIT %VMWAI
       1       1 idle                 8   376.01  800.00    0.00     0.00
   14096   14096 TWSS_01              8     5.75    9.79    0.08   789.35    0.3
   11354   11354 TWVCS52              8     2.49    6.34    0.06   792.75    0.2
   15520   15520 esxtop.13346         1     2.00    1.95    0.00    97.99
   15338   15338 esxtop.13225         1     2.00    1.96    0.00    97.97
    3560    3560 TWVCENTER            8     1.40    2.42    0.02   797.00    0.0
   12890   12890 TWSS_02              8     0.70    1.27    0.01   798.16    0.0
    1485    1485 hostd.4902          26     0.41    0.58    0.00  2597.69
   11600   11600 TWGG_02              8     0.39    0.81    0.01   798.61    0.0
    3568    3568 TWMC1101_SS          8     0.31    0.57    0.02   799.75    0.7
    3576    3576 TWMC191_SS           8     0.30    0.59    0.02   799.75    0.0
      53      53 vmkapimod           16     0.26    0.58    0.00  1599.98
       8       8 helper              94     0.13    0.25    0.00  9400.00
    2401    2401 vpxa.5393           19     0.03    0.06    0.00  1900.00
    1407    1407 rhttpproxy.4861     12     0.02    0.06    0.00  1200.00
       2       2 system               9     0.02    0.04    0.00   899.90
    1337    1337 vmware-usbarbit      2     0.01    0.02    0.00   200.00
```

4.9.2 Viewing Performance Charts

You can view CPU statistics for an ESXi server from VMware View vSphere or vCenter by selecting it in the inventory, and then selecting the **Performance** tab.
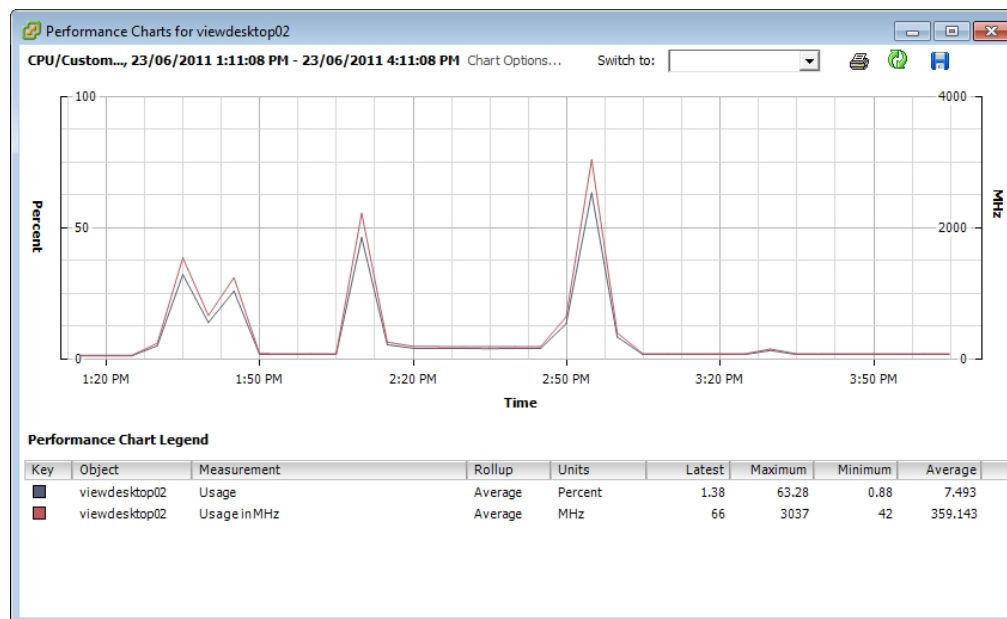
Note: Although you can monitor the server CPU resources through vSphere or vCenter, it is not recommended for benchmarking the PCoIP Hardware Accelerator because the usage is only updated every 20 seconds, and this timing misses spikes in server CPU loads.

4.9.3   Using the PCoIP Hardware Accelerator Dashboard

Teradici has also developed a PCoIP Hardware Accelerator dashboard interface to simplify demonstrations, evaluations, and proof-of-concept trials. The dashboard interface monitors CPU usage and performance, as shown in the figure below. For more information, see "APEX™ Dashboard Getting Started Guide" (TER1206002).
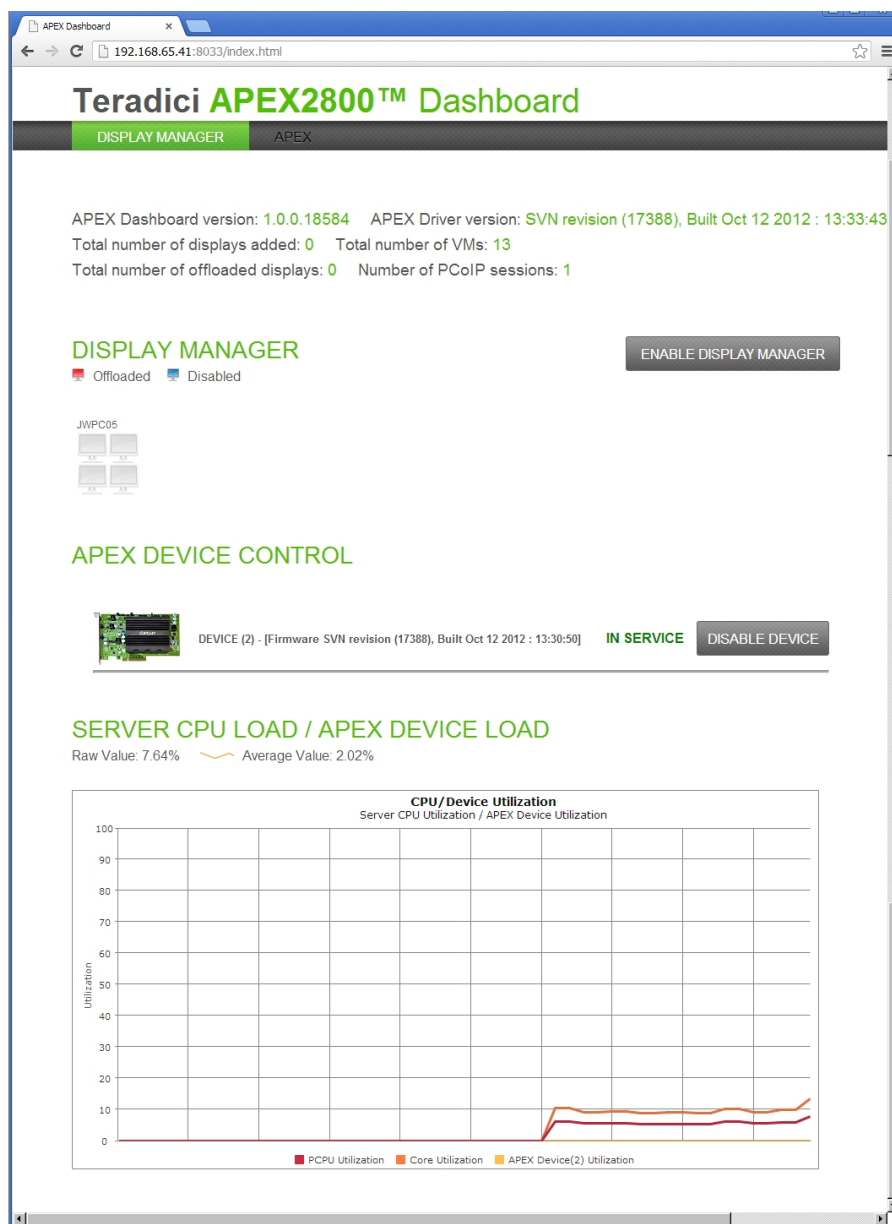
Figure 4-1: Teradici APEX 2800 Dashboard Interface

Note: The APEX 2800 dashboard interface is not suitable for production environments.

5 Troubleshooting

Note: The driver build numbers displayed in the screen shots in this section may differ from the build numbers for your drivers.

5.1 Overview

This section describes the following procedures for troubleshooting PCoIP Hardware Accelerator problems.

- Enabling a syslog server to capture log data
- Determining a card's status from the console and from a user's display
- Identifying a failed card
- Disabling ESXi Interrupt Remapping

Note: For further troubleshooting information, please visit the Teradici Support Center.

5.2 Enabling a Syslog Server

It is important to enable a syslog server to capture the log data in the event of an issue. Due to the volume of information, the event logs are overwritten quickly. Also, logs can be lost during a reboot. Enabling a syslog ensures the necessary data is available for troubleshooting.

To configure syslog on an ESXi server:

1. From the VMware vSphere client, select the ESXi server in the inventory, and then the **Configuration** tab.
2. In the **Software** panel, select **Advanced Settings > Syslog**.
3. To set up logging globally, select **global**, and then configure the required fields.
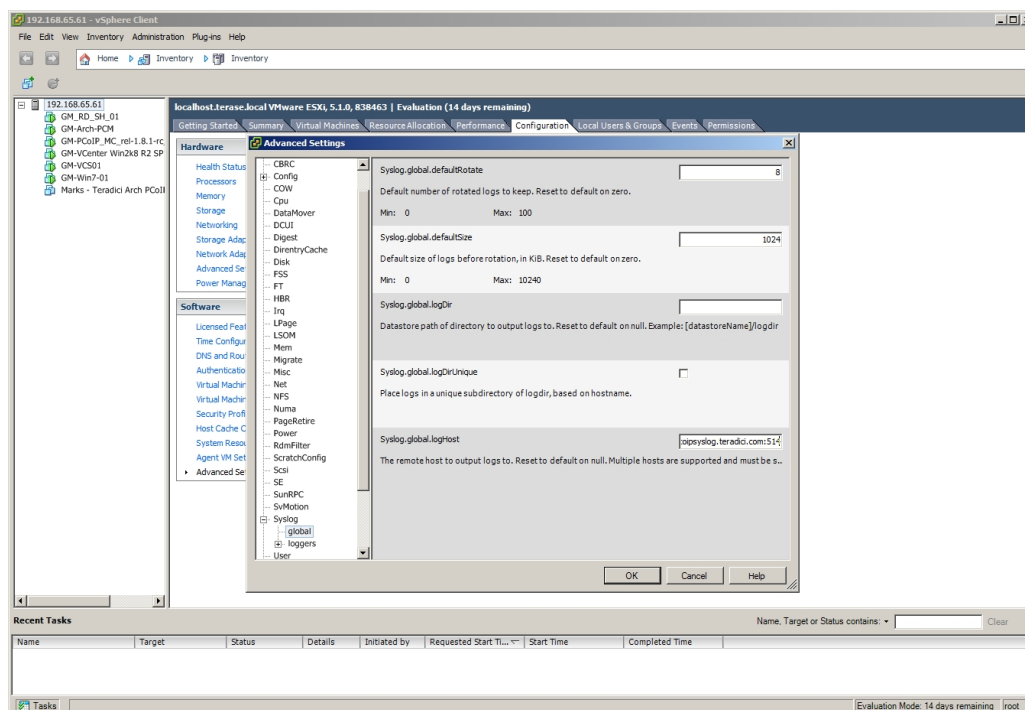
Note: If a syslog server is not available, you can move your logging to a non-scratch directory by following the steps outlined in the following VMware Knowledge Base articles:

- VMware KB 1016621
- VMware KB 1005030

5.3   Determining the PCoIP Hardware Accelerator Status

You can determine the status of a PCoIP Hardware Accelerator from the ESXi console or by viewing a user's display.

5.3.1   From the ESXi Console

To view the status of one or more PCoIP Hardware Accelerators from the ESXi console, open an SSH session with the ESXi server, and then enter the following command at the prompt:
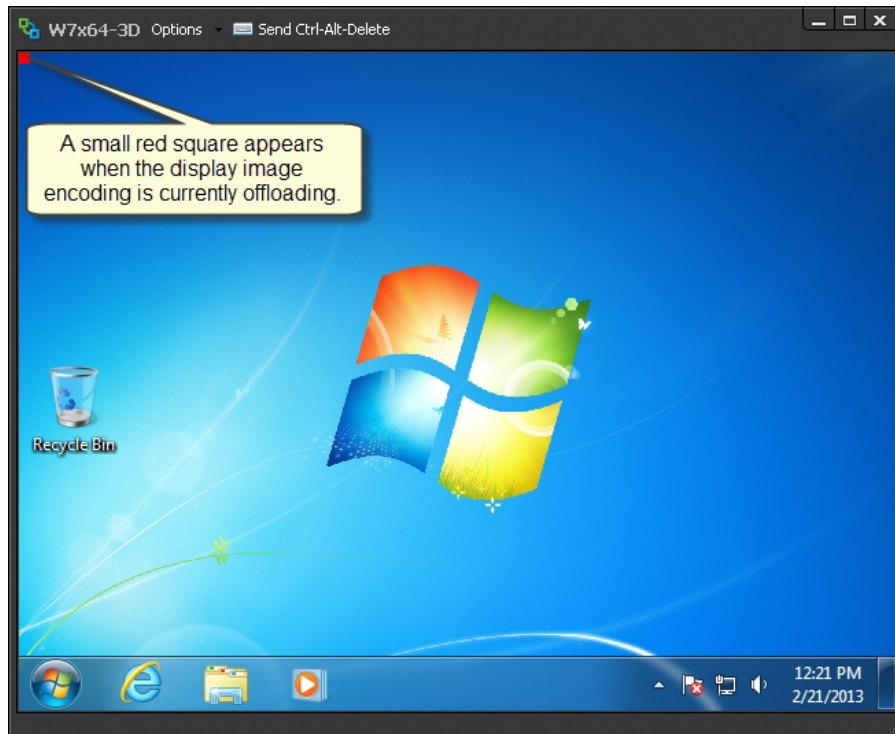
    /opt/teradici/pcoip-ctrl -I

For more information about this command, see Viewing the PCoIP Hardware Accelerator Status.

5.3.2   From a User's Display

If you have enabled the offload indicator, you can also determine from the user's screen if an individual display is offloaded:

- **Offloaded**: A small, red square appears in the top left-hand corner of the screen when the display is using PCoIP hardware compression in the PCoIP Hardware Accelerator.

- **Not offloaded**: A small blue square appears in the top left-hand corner of the screen when the display is using PCoIP software compression.
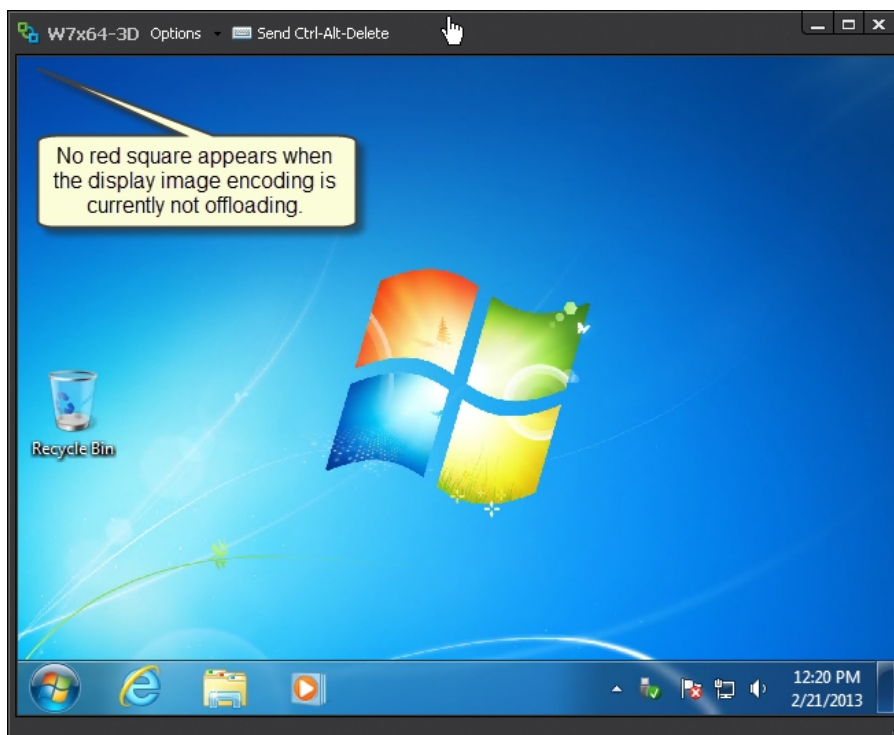
Note: By default the offload indicator is disabled.

5.4 Identifying a Failed Card

From the ESXi console, open an SSH session with the ESXi server, and then enter the following command at the prompt:

/opt/teradici/pcoip-ctrl -I
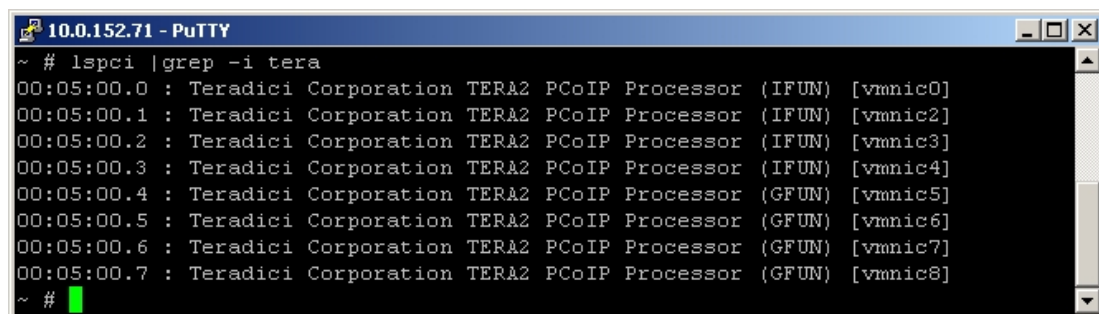
If the output does not show information for your card, or if the number of devices present does not match the number of installed cards (maximum of two), then one or more PCoIP Hardware Accelerators have failed.

For more information about this command, see Viewing the PCoIP Hardware AcceleratorStatus.

Note: You can also verify whether a card is detected by the ESXi host by typing the following command:

lspci |grep -i tera

Here is an example of the command output when a card is detected:

```
10.0.152.71 - PuTTY                                          _ □ ×
~ # lspci |grep -i tera
00:05:00.0 : Teradici Corporation TERA2 PCoIP Processor (IFUN) [vmnic0]
00:05:00.1 : Teradici Corporation TERA2 PCoIP Processor (IFUN) [vmnic2]
00:05:00.2 : Teradici Corporation TERA2 PCoIP Processor (IFUN) [vmnic3]
00:05:00.3 : Teradici Corporation TERA2 PCoIP Processor (IFUN) [vmnic4]
00:05:00.4 : Teradici Corporation TERA2 PCoIP Processor (GFUN) [vmnic5]
00:05:00.5 : Teradici Corporation TERA2 PCoIP Processor (GFUN) [vmnic6]
00:05:00.6 : Teradici Corporation TERA2 PCoIP Processor (GFUN) [vmnic7]
00:05:00.7 : Teradici Corporation TERA2 PCoIP Processor (GFUN) [vmnic8]
~ #
```

5.5   Disabling ESXi Interrupt Remapping

In some cases unrelated to the PCoIP Hardware Accelerator, enabling the interrupt remapping on the ESXi server can cause a loss of communication with PCIe devices. This problem can occur with any PCIe card, not just the PCoIP Hardware Accelerator. The interrupt remapping triggers the halt of any display offload onto the card.

If you experience this problem, disabling the ESXi interrupt remapping is the recommended solution. For more information, see VMware KB 1030265.

Glossary of Definitions

AWI

Administrative Web Interface

CLI

Command Line Interface

CPU

Central Processing Unit

ECC

Error Correction Code

ESX/ESXi

VMware hypervisor (virtual machine manager)

FPS

Frames per second

GPU

Graphics Processing Unit

GUI

Graphical User Interface presented by the zero client On Screen Display (OSD) when not operating in a PCoIP session

MC

Management Console

Mpps

Megapixels per second

MXM

Mobile PCI Express Module

OS

Operating System

OSD

On Screen Display

PCIe

Peripheral Component Interconnect Express

PCoIP host

Host side of PCoIP system

PCoIP software

Software implementation of the PCoIP protocol that is integrated into VMware View Agent/Client release 4.0 and later

PCoIP zero client

Desktop (client) side of PCoIP system; e.g., PCoIP zero client or PCoIP integrated display

PCoIP®

Personal Computer over Internet Protocol (PC-over-IP)

PC-over-IP®

Personal Computer over Internet Protocol

QoS

Quality of Service

vCPU

Virtual CPU within a virtual machine

VCS

View Connection Server

vDGA

Virtual Dedicated Graphics Acceleration

VDI

Virtual Desktop Infrastructure

vGPU

Shared Virtual GPU

VIB

VMware vSphere Installation Bundle

VM

Virtual Machine

VPN

Virtual Private Network

vSGA

Virtual Shared Graphics Acceleration

zero client

See PCoIP zero client