



# VIRTUAL GPU SOFTWARE R410 FOR VMWARE VSPHERE

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## Release Notes



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# Chapter 1.

## RELEASE NOTES

These *Release Notes* summarize current status, information on validated platforms, and known issues with NVIDIA vGPU software and associated hardware on VMware vSphere.



The most current version of the documentation for this release of NVIDIA vGPU software can be found online at [NVIDIA Virtual GPU Software Documentation](#).



Release 7.5 of NVIDIA vGPU software is the last release in the NVIDIA vGPU software 7 release branch.

The releases in this release family of NVIDIA vGPU software include the software listed in the following table:

Software	7.0	7.1	7.2	7.3	7.4	7.5
NVIDIA Virtual GPU Manager for the VMware vSphere releases listed in <a href="#">Hypervisor Software Releases</a>	410.68	410.91	410.107	410.122	410.137	410.137
NVIDIA Windows driver	411.81	412.16	412.31	412.38	412.45	412.47
NVIDIA Linux driver	410.71	410.92	410.107	410.122	410.137	410.141



### Caution

If you install the wrong NVIDIA vGPU software packages for the version of VMware vSphere you are using, NVIDIA Virtual GPU Manager will fail to load.

The releases of the vGPU Manager and guest VM drivers that you install must be compatible. Different versions of the vGPU Manager and guest VM driver from within the same main release branch can be used together. For example, you can use the vGPU Manager from release 7.1 with guest VM drivers from release 7.0. However,

versions of the vGPU Manager and guest VM driver from different main release branches cannot be used together. For example, you cannot use the vGPU Manager from release 7.1 with guest VM drivers from release 6.2.

See [VM running older NVIDIA vGPU drivers fails to initialize vGPU when booted](#).

This requirement does not apply to the NVIDIA vGPU software license sever. All releases of NVIDIA vGPU software are compatible with **all** releases of the license server.

## 1.1. Updates in Release 7.0

### New Features in Release 7.0

- ▶ vMotion support for VMs that are configured with vGPU
- ▶ vGPU support for NVIDIA frame buffer capture metrics
- ▶ vGPU support for render capture metrics from the hypervisor and guest VMs
- ▶ Support for NVIDIA GPU Cloud (NGC) containers with NVIDIA vGPU software
- ▶ Miscellaneous bug fixes

### Hardware and Software Support Introduced in Release 7.0

- ▶ Support for VMware vCenter Server 6.7
- ▶ Support for Ubuntu 18.04 LTS as a guest OS
- ▶ Support for Red Hat Enterprise Linux 7.6 as a guest OS
- ▶ Support for CentOS 7.6 as a guest OS
- ▶ Support for Windows 10 Spring Creators Update (1803) as a guest OS

### Feature Support Withdrawn in Release 7.0

- ▶ 32-bit Windows guest operating systems are no longer supported.
- ▶ VMware vSphere ESXi 5.5 is no longer supported.

## 1.2. Updates in Release 7.1

### New Features in Release 7.1

- ▶ Miscellaneous bug fixes

### Hardware and Software Support Introduced in Release 7.1

- ▶ Support for the Tesla T4 GPU
- ▶ Support for VMware Horizon 7.7

## 1.3. Updates in Release 7.2

### New Features in Release 7.2

- ▶ Miscellaneous bug fixes
- ▶ Security updates - see [Security Updates](#)

### Hardware and Software Support Introduced in Release 7.2

- ▶ Support for VMware Horizon 7.8

## 1.4. Updates in Release 7.3

### New Features in Release 7.3

- ▶ Security updates
- ▶ Miscellaneous bug fixes

### Hardware and Software Support Introduced in Release 7.3

- ▶ Support for VMware Horizon 7.9

## 1.5. Updates in Release 7.4

### New Features in Release 7.4

- ▶ Security updates
- ▶ Miscellaneous bug fixes

### Hardware and Software Support Introduced in Release 7.4

- ▶ Support for VMware Horizon 7.10

## 1.6. Updates in Release 7.5

### New Features in Release 7.5

- ▶ Fix for bug 2708778: In GPU pass-through mode, the NVIDIA graphics drivers fail to load with error code 43.

# Chapter 2.

## VALIDATED PLATFORMS

This release family of NVIDIA vGPU software provides support for several NVIDIA GPUs on validated server hardware platforms, VMware vSphere hypervisor software versions, and guest operating systems. It also supports the version of NVIDIA CUDA Toolkit that is compatible with R410 drivers.

### 2.1. Supported NVIDIA GPUs and Validated Server Platforms

This release of NVIDIA vGPU software provides support for the following NVIDIA GPUs on VMware vSphere, running on validated server hardware platforms:

- ▶ GPUs based on the NVIDIA Maxwell™ graphic architecture:
  - ▶ Tesla M6
  - ▶ Tesla M10
  - ▶ Tesla M60
- ▶ GPUs based on the NVIDIA Pascal™ architecture:
  - ▶ Tesla P4
  - ▶ Tesla P6
  - ▶ Tesla P40
  - ▶ Tesla P100 PCIe 16 GB (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
  - ▶ Tesla P100 SXM2 16 GB (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
  - ▶ Tesla P100 PCIe 12GB (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
- ▶ GPUs based on the NVIDIA Volta architecture:
  - ▶ Tesla V100 SXM2 (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)



- ▶ Tesla V100 SXM2 32GB (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
- ▶ Tesla V100 PCIe (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
- ▶ Tesla V100 PCIe 32GB (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
- ▶ Tesla V100 FHHL (vSGA, vMotion with vGPU, and suspend-resume with vGPU are **not** supported.)
- ▶ GPUs based on the NVIDIA Turing architecture:
  - ▶ **Since 7.1:** Tesla T4

For a list of validated server platforms, refer to [NVIDIA GRID Certified Servers](#).



Tesla M60 and M6 GPUs support compute mode and graphics mode. NVIDIA vGPU requires GPUs that support both modes to operate in graphics mode.

Recent Tesla M60 GPUs and M6 GPUs are supplied in graphics mode. However, your GPU might be in compute mode if it is an older Tesla M60 GPU or M6 GPU, or if its mode has previously been changed.

To configure the mode of Tesla M60 and M6 GPUs, use the `gpumodeswitch` tool provided with NVIDIA vGPU software releases.

### Requirements for Using vGPU on GPUs Requiring 64 GB of MMIO Space with Large-Memory VMs

Some GPUs require 64 GB of MMIO space. When a vGPU on a GPU that requires 64 GB of MMIO space is assigned to a VM with 32 GB or more of memory on ESXi 6.0 Update 3 and later, or ESXi 6.5 and later updates, the VM's MMIO space must be increased to 64 GB. For more information, see [VMware Knowledge Base Article: VMware vSphere VMDirectPath I/O: Requirements for Platforms and Devices \(2142307\)](#).

With ESXi 6.7, no extra configuration is needed.

The following GPUs require 64 GB of MMIO space:

- ▶ Tesla P6
- ▶ Tesla P40

### Requirements for Using GPUs Based on the Pascal and Volta Architectures in Pass-Through Mode

- ▶ The Tesla V100, Tesla P100, and Tesla P6 GPUs require 32 GB of MMIO space in pass-through mode.
- ▶ The Tesla P40 GPU requires 64 GB of MMIO space in pass-through mode.


- ▶ Pass through of GPUs with large BAR memory settings has some restrictions on VMware ESXi:
  - ▶ The guest OS must be a 64-bit OS.
  - ▶ 64-bit MMIO and EFI boot must be enabled for the VM.
  - ▶ The guest OS must be able to be installed in EFI boot mode.
  - ▶ The Tesla V100, Tesla P100, and Tesla P6 require ESXi 6.0 Update 1 and later, or ESXi 6.5 and later.
  - ▶ Because it requires 64 GB of MMIO space, the Tesla P40 requires ESXi 6.0 Update 3 and later, or ESXi 6.5 and later.

As a result, the VM's MMIO space must be increased to 64 GB as explained in [VMware Knowledge Base Article: VMware vSphere VMDirectPath I/O: Requirements for Platforms and Devices \(2142307\)](#).

## 2.2. Hypervisor Software Releases

### Supported VMware vSphere Hypervisor (ESXi) Releases

This release is supported on the VMware vSphere Hypervisor (ESXi) releases listed in the table.



Support for NVIDIA vGPU software requires the Enterprise Plus Edition of VMware vSphere Hypervisor (ESXi). For details, see [Compare VMware vSphere Editions \(PDF\)](#).


Updates to a base release of VMware vSphere Hypervisor (ESXi) are compatible with the base release and can also be used with this version of NVIDIA vGPU software unless expressly stated otherwise.

Software	Release Supported	Notes
VMware vSphere Hypervisor (ESXi) 6.7	6.7 and compatible updates	<p>All NVIDIA GPUs that support NVIDIA vGPU software are supported.</p> <p>Starting with release 6.7 U1, vMotion with vGPU and suspend and resume with vGPU are supported on suitable GPUs as listed in <a href="#">Supported NVIDIA GPUs and Validated Server Platforms</a>.</p> <p>Release 6.7 supports only suspend and resume with</p>

Software	Release Supported	Notes
		vGPU. vMotion with vGPU is <b>not</b> supported on release 6.7.
VMware vSphere Hypervisor (ESXi) 6.5	6.5 and compatible updates Requires VMware vSphere Hypervisor (ESXi) 6.5 patch EP3 (ESXi650-201811002, build 10884925) or later from VMware	All NVIDIA GPUs that support NVIDIA vGPU software are supported.  Suspend-resume with vGPU and vMotion with vGPU are <b>not</b> supported.
VMware vSphere Hypervisor (ESXi) 6.0	6.0 and compatible updates Pending release of a patch from VMware for VMware vSphere Hypervisor (ESXi) 6.0	GPUs based on the Pascal and Volta architectures in pass-through mode require 6.0 Update 3 or later.  For vGPU, all NVIDIA GPUs that support NVIDIA vGPU software are supported.  Suspend-resume with vGPU and vMotion with vGPU are <b>not</b> supported.

### Supported Management Software and Virtual Desktop Software Releases

This release supports the management software and virtual desktop software releases listed in the table.



Updates to a base release of VMware Horizon and VMware vCenter Server are compatible with the base release and can also be used with this version of NVIDIA vGPU software unless expressly stated otherwise.

Software	Releases Supported
VMware Horizon	<p>Since 7.4: 7.10 and compatible 7.10.x updates</p> <p>Since 7.3: 7.9 and compatible 7.9.x updates</p> <p>Since 7.2: 7.8 and compatible 7.8.x updates</p> <p>Since 7.1: 7.7 and compatible 7.7.x updates</p> <p>7.6 and compatible 7.6.x updates</p> <p>7.5 and compatible 7.5.x updates</p> <p>7.4 and compatible 7.4.x updates</p>

Software	Releases Supported
	7.3 and compatible 7.3.x updates 7.2 and compatible 7.2.x updates 7.1 and compatible 7.1.x updates 7.0 and compatible 7.0.x updates 6.2 and compatible 6.2.x updates
VMware vCenter Server	6.7 and compatible updates 6.5 and compatible updates 6.0 and compatible updates

## 2.3. Guest OS Support

NVIDIA vGPU software supports several Windows releases and Linux distributions as a guest OS. The supported guest operating systems depend on the hypervisor software version.



Use only a guest OS release that is listed as supported by NVIDIA vGPU software with your virtualization software. To be listed as supported, a guest OS release must be supported not only by NVIDIA vGPU software, but also by your virtualization software. NVIDIA cannot support guest OS releases that your virtualization software does not support.

NVIDIA vGPU software supports **only** 64-bit guest operating systems. No 32-bit guest operating systems are supported.

### 2.3.1. Windows Guest OS Support

NVIDIA vGPU software supports **only** the 64-bit Windows releases listed in the table as a guest OS on VMware vSphere. The releases of VMware vSphere for which a Windows release is supported depend on whether NVIDIA vGPU or pass-through GPU is used.



If a specific release, even an update release, is not listed, it's **not** supported.

VMware vMotion with vGPU and suspend-resume with vGPU are supported on supported Windows guest OS releases

Guest OS	NVIDIA vGPU - VMware vSphere Releases	Pass-Through GPU - VMware vSphere Releases
Windows Server 2016 1607, 1709	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Windows Server 2012 R2	6.7, 6.5, 6.0	6.7, 6.5, 6.0

Guest OS	NVIDIA vGPU - VMware vSphere Releases	Pass-Through GPU - VMware vSphere Releases
Windows Server 2008 R2	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Windows 10 RTM (1507), November Update (1511), Anniversary Update (1607), Creators Update (1703), Fall Creators Update (1709), Spring Creators Update (1803) (64-bit)	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Windows 8.1 Update (64-bit)	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Windows 8.1 (64-bit)	6.7, 6.5, 6.0	-
Windows 8 (64-bit)	6.7, 6.5, 6.0	-
Windows 7 (64-bit)	6.7, 6.5, 6.0	6.7, 6.5, 6.0

## 2.3.2. Linux Guest OS Support

NVIDIA vGPU software supports **only** the Linux distributions listed in the table as a guest OS on VMware vSphere. The releases of VMware vSphere for which a Linux release is supported depend on whether NVIDIA vGPU or pass-through GPU is used.



If a specific release, even an update release, is not listed, it's **not** supported.

VMware vMotion with vGPU and suspend-resume with vGPU are supported on supported Linux guest OS releases

Guest OS	NVIDIA vGPU - VMware vSphere Releases	Pass-Through GPU - VMware vSphere Releases
Red Hat Enterprise Linux 7.0-7.6 and later compatible 7.x versions	6.7, 6.5, 6.0	6.7, 6.5, 6.0
CentOS 7.0-7.6 and later compatible 7.x versions	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Red Hat Enterprise Linux 6.6 and later compatible 6.x versions	6.7, 6.5, 6.0	6.7, 6.5, 6.0
CentOS 6.6 and later compatible 6.x versions	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Ubuntu 18.04 LTS	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Ubuntu 16.04 LTS	6.7, 6.5, 6.0	6.7, 6.5, 6.0
Ubuntu 14.04 LTS	6.7, 6.5, 6.0	6.7, 6.5, 6.0
SUSE Linux Enterprise Server 12 SP3	6.7, 6.5, 6.0	6.7, 6.5, 6.0

## 2.4. NVIDIA CUDA Toolkit Version Support

The releases in this release family of NVIDIA vGPU software support NVIDIA CUDA Toolkit 10.0.

For more information about NVIDIA CUDA Toolkit, see [CUDA Toolkit 10.0 Documentation](#).

## 2.5. vGPU Migration Support

vGPU migration, which includes vMotion and suspend-resume, is supported only on a subset of supported GPUs, VMware vSphere Hypervisor (ESXi) releases, and guest operating systems.

Supported GPUs:

- ▶ Tesla M6
- ▶ Tesla M10
- ▶ Tesla M60
- ▶ Tesla P4
- ▶ Tesla P6
- ▶ Tesla P40
- ▶ **Since 7.1:** Tesla T4

Supported VMware vSphere Hypervisor (ESXi) releases:

- ▶ Release 6.7 U1 and compatible updates support vMotion with vGPU and suspend-resume with vGPU.
- ▶ Release 6.7 supports only suspend-resume with vGPU.
- ▶ Releases earlier than 6.7 do not support any form of vGPU migration.

Supported guest OS releases: Windows and Linux.

# Chapter 3.

## KNOWN PRODUCT LIMITATIONS

Known product limitations for this release of NVIDIA vGPU software are described in the following sections.

### 3.1. Issues may occur with graphics-intensive OpenCL applications on vGPU types with limited frame buffer

#### Description

Issues may occur when graphics-intensive OpenCL applications are used with vGPU types that have limited frame buffer. These issues occur when the applications demand more frame buffer than is allocated to the vGPU.

For example, these issues may occur with the Adobe Photoshop and LuxMark OpenCL Benchmark applications:

- ▶ When the image resolution and size are changed in Adobe Photoshop, a program error may occur or Photoshop may display a message about a problem with the graphics hardware and a suggestion to disable OpenCL.
- ▶ When the LuxMark OpenCL Benchmark application is run, XID error 31 may occur.

#### Workaround

For graphics-intensive OpenCL applications, use a vGPU type with more frame buffer.

## 3.2. vGPU profiles with 512 Mbytes or less of frame buffer support only 1 virtual display head on Windows 10

### Description

To reduce the possibility of memory exhaustion, vGPU profiles with 512 Mbytes or less of frame buffer support only 1 virtual display head on a Windows 10 guest OS.

The following vGPU profiles have 512 Mbytes or less of frame buffer:

- ▶ Tesla M6-0B, M6-0Q
- ▶ Tesla M10-0B, M10-0Q
- ▶ Tesla M60-0B, M60-0Q

### Workaround

Use a profile that supports more than 1 virtual display head and has at least 1 Gbyte of frame buffer.

## 3.3. NVENC requires at least 1 Gbyte of frame buffer

### Description

Using the frame buffer for the NVIDIA hardware-based H.264/HEVC video encoder (NVENC) may cause memory exhaustion with vGPU profiles that have 512 Mbytes or less of frame buffer. To reduce the possibility of memory exhaustion, NVENC is disabled on profiles that have 512 Mbytes or less of frame buffer. Application GPU acceleration remains fully supported and available for all profiles, including profiles with 512 Mbytes or less of frame buffer. NVENC support from both Citrix and VMware is a recent feature and, if you are using an older version, you should experience no change in functionality.

The following vGPU profiles have 512 Mbytes or less of frame buffer:

- ▶ Tesla M6-0B, M6-0Q
- ▶ Tesla M10-0B, M10-0Q
- ▶ Tesla M60-0B, M60-0Q



## Workaround

If you require NVENC to be enabled, use a profile that has at least 1 Gbyte of frame buffer.

## 3.4. VM failures or crashes on servers with 1 TB or more of system memory

### Description

Support for vGPU and vSGA is limited to servers with less than 1 TB of system memory. On servers with 1 TB or more of system memory, VM failures or crashes may occur. For example, when Citrix Virtual Apps and Desktops is used with a Windows 7 guest OS, a blue screen crash may occur. However, support for vDGA is not affected by this limitation.

This limitation applies only to systems with supported GPUs based on the Maxwell architecture: Tesla M6, Tesla M10, and Tesla M60.

### Resolution

1. Limit the amount of system memory on the server to 1 TB minus 16 GB by setting `memmapMaxRAMMB` to 1032192, which is equal to 1048576 minus 16384.
2. Reboot the server.

If the problem persists, contact your server vendor for the recommended system memory configuration with NVIDIA GPUs.

## 3.5. VM running older NVIDIA vGPU drivers fails to initialize vGPU when booted

### Description

A VM running a version of the NVIDIA guest VM drivers from a previous main release branch, for example release 4.4, will fail to initialize vGPU when booted on a VMware vSphere platform running the current release of Virtual GPU Manager.

In this scenario, the VM boots in standard VGA mode with reduced resolution and color depth. The NVIDIA virtual GPU is present in **Windows Device Manager** but displays a warning sign, and the following device status:

```
Windows has stopped this device because it has reported problems. (Code 43)
```

Depending on the versions of drivers in use, the VMware vSphere VM's log file reports one of the following errors:

- ▶ A version mismatch between guest and host drivers:

```
vthread-10| E105: vmiop_log: Guest VGX version(2.0) and Host VGX
version(2.1) do not match
```

- ▶ A signature mismatch:

```
vthread-10| E105: vmiop_log: VGPU message signature mismatch.
```

## Resolution

Install the current NVIDIA guest VM driver in the VM.

## 3.6. Virtual GPU fails to start if ECC is enabled

### Description

Tesla M60, Tesla M6, and GPUs based on the Pascal GPU architecture, for example Tesla P100 or Tesla P4, support error correcting code (ECC) memory for improved data integrity. Tesla M60 and M6 GPUs in graphics mode are supplied with ECC memory disabled by default, but it may subsequently be enabled using `nvidia-smi`. GPUs based on the Pascal GPU architecture are supplied with ECC memory enabled.

However, NVIDIA vGPU does not support ECC memory. If ECC memory is enabled, NVIDIA vGPU fails to start.

The following error is logged in the VMware vSphere host's log file:

```
vthread10|E105: Initialization: VGX not supported with ECC Enabled.
```

### Resolution

Ensure that ECC is disabled on all GPUs.

Before you begin, ensure that NVIDIA Virtual GPU Manager is installed on your hypervisor.

1. Use `nvidia-smi` to list the status of all GPUs, and check for ECC noted as enabled on GPUs.

```
# nvidia-smi -q
=====NVSMI LOG=====
Timestamp                : Tue Dec 19 18:36:45 2017
Driver Version           : 384.99
Attached GPUs            : 1
GPU 0000:02:00.0
[...]
  Ecc Mode
    Current                : Enabled
    Pending                : Enabled
```

```
[...]
```

2. Change the ECC status to off on each GPU for which ECC is enabled.
  - ▶ If you want to change the ECC status to off for all GPUs on your host machine, run this command:

```
# nvidia-smi -e 0
```

- ▶ If you want to change the ECC status to off for a specific GPU, run this command:

```
# nvidia-smi -i id -e 0
```

*id* is the index of the GPU as reported by `nvidia-smi`.

This example disables ECC for the GPU with index `0000:02:00.0`.

```
# nvidia-smi -i 0000:02:00.0 -e 0
```

3. Reboot the host.
4. Confirm that ECC is now disabled for the GPU.

```
# nvidia-smi -q
=====NVSMI LOG=====
Timestamp                : Tue Dec 19 18:37:53 2017
Driver Version           : 384.99
Attached GPUs            : 1
GPU 0000:02:00.0
[...]
Ecc Mode
  Current                : Disabled
  Pending                : Disabled
[...]
```

If you later need to enable ECC on your GPUs, run one of the following commands:

- ▶ If you want to change the ECC status to on for all GPUs on your host machine, run this command:

```
# nvidia-smi -e 1
```

- ▶ If you want to change the ECC status to on for a specific GPU, run this command:

```
# nvidia-smi -i id -e 1
```

*id* is the index of the GPU as reported by `nvidia-smi`.

This example enables ECC for the GPU with index `0000:02:00.0`.

```
# nvidia-smi -i 0000:02:00.0 -e 1
```

After changing the ECC status to on, reboot the host.

## 3.7. Single vGPU benchmark scores are lower than pass-through GPU

### Description

A single vGPU configured on a physical GPU produces lower benchmark scores than the physical GPU run in pass-through mode.

Aside from performance differences that may be attributed to a vGPU's smaller frame buffer size, vGPU incorporates a performance balancing feature known as Frame Rate Limiter (FRL). On vGPUs that use the best-effort scheduler, FRL is enabled. On vGPUs that use the fixed share or equal share scheduler, FRL is disabled.

FRL is used to ensure balanced performance across multiple vGPUs that are resident on the same physical GPU. The FRL setting is designed to give good interactive remote graphics experience but may reduce scores in benchmarks that depend on measuring frame rendering rates, as compared to the same benchmarks running on a pass-through GPU.

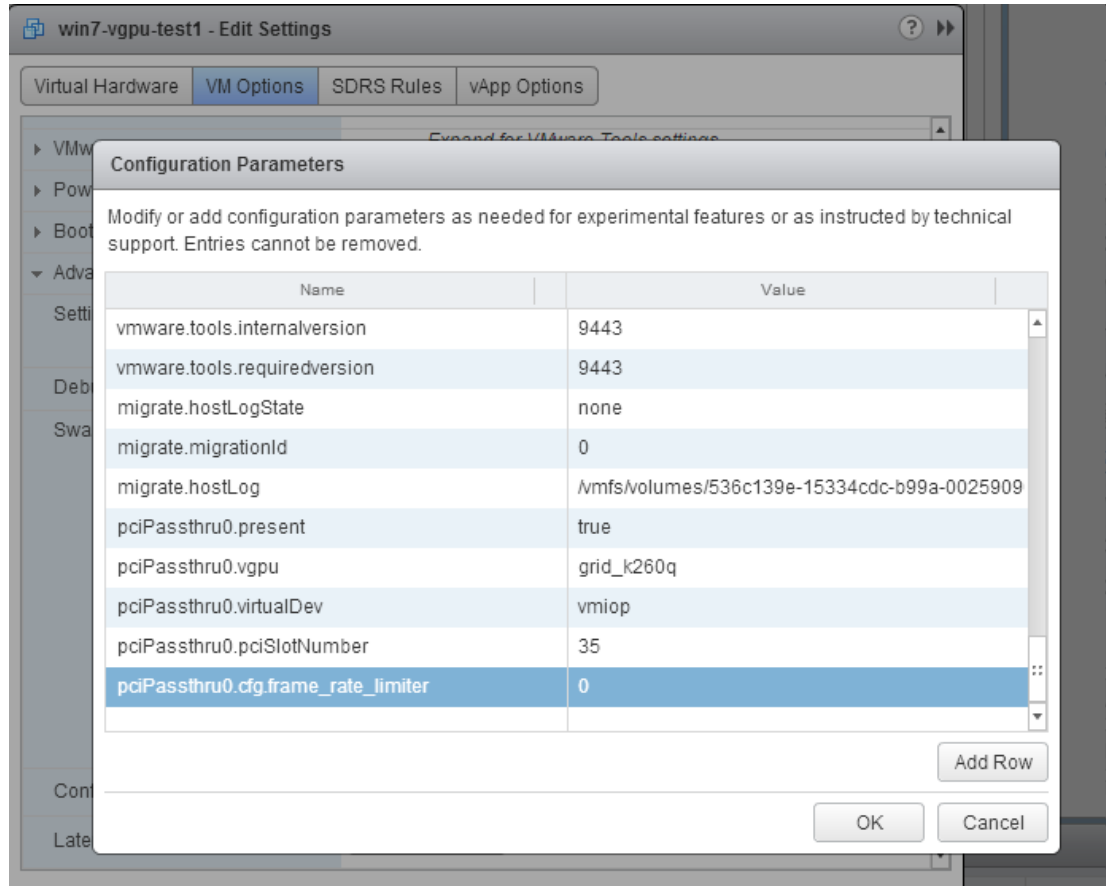
### Resolution

FRL is controlled by an internal vGPU setting. On vGPUs that use the best-effort scheduler, NVIDIA does not validate vGPU with FRL disabled, but for validation of benchmark performance, FRL can be temporarily disabled by adding the configuration parameter `pciPassthru0.cfg.frame_rate_limiter` in the VM's advanced configuration options.



This setting can only be changed when the VM is powered off.

1. Select **Edit Settings**.
2. In **Edit Settings** window, select the **VM Options** tab.
3. From the **Advanced** drop-down list, select **Edit Configuration**.
4. In the **Configuration Parameters** dialog box, click **Add Row**.
5. In the **Name** field, type the parameter name `pciPassthru0.cfg.frame_rate_limiter`, in the **Value** field type 0, and click **OK**.



With this setting in place, the VM's vGPU will run without any frame rate limit. The FRL can be reverted back to its default setting by setting `pciPassthru0.cfg.frame_rate_limiter` to 1 or by removing the parameter from the advanced settings.

## 3.8. VMs configured with large memory fail to initialize vGPU when booted

### Description

When starting multiple VMs configured with large amounts of RAM (typically more than 32GB per VM), a VM may fail to initialize vGPU. In this scenario, the VM boots in VMware SVGA mode and doesn't load the NVIDIA driver. The NVIDIA vGPU software GPU is present in **Windows Device Manager** but displays a warning sign, and the following device status:

```
Windows has stopped this device because it has reported problems. (Code 43)
```

The VMware vSphere VM's log file contains these error messages:

```

vthread10|E105: NVOS status 0x29
vthread10|E105: Assertion Failed at 0x7620fd4b:179
vthread10|E105: 8 frames returned by backtrace
...
vthread10|E105: VGPU message 12 failed, result code: 0x29
...
vthread10|E105: NVOS status 0x8
vthread10|E105: Assertion Failed at 0x7620c8df:280
vthread10|E105: 8 frames returned by backtrace
...
vthread10|E105: VGPU message 26 failed, result code: 0x8

```

## Resolution

vGPU reserves a portion of the VM's framebuffer for use in GPU mapping of VM system memory. The reservation is sufficient to support up to 32GB of system memory, and may be increased to accommodate up to 64GB by adding the configuration parameter `pciPassthru0.cfg.enable_large_sys_mem` in the VM's advanced configuration options



This setting can only be changed when the VM is powered off.

1. Select **Edit Settings**.
2. In **Edit Settings** window, select the **VM Options** tab.
3. From the **Advanced** drop-down list, select **Edit Configuration**.
4. In the **Configuration Parameters** dialog box, click **Add Row**.
5. In the **Name** field, type the parameter name `pciPassthru0.cfg.enable_large_sys_mem`, in the **Value** field type 1, and click **OK**.

With this setting in place, less GPU framebuffer is available to applications running in the VM. To accommodate system memory larger than 64GB, the reservation can be further increased by adding `pciPassthru0.cfg.extra_fb_reservation` in the VM's advanced configuration options, and setting its value to the desired reservation size in megabytes. The default value of 64M is sufficient to support 64 GB of RAM. We recommend adding 2 M of reservation for each additional 1 GB of system memory. For example, to support 96 GB of RAM, set `pciPassthru0.cfg.extra_fb_reservation` to 128.

The reservation can be reverted back to its default setting by setting `pciPassthru0.cfg.enable_large_sys_mem` to 0, or by removing the parameter from the advanced settings.

# Chapter 4.

## RESOLVED ISSUES

Only resolved issues that have been previously noted as known issues or had a noticeable user impact are listed. The summary and description for each resolved issue indicate the effect of the issue on NVIDIA vGPU software **before the issue was resolved**.

### Issues Resolved in Release 7.0

Bug ID	Summary and Description
200422318	<p><b>No data displayed on NVIDIA dashboards in VMware vRealize Operations</b></p> <p>Data is not collected for any ESXi host that is identified by its host name when it is added to VMware vCenter Server. The connection to CIM provider from NVIDIA Virtual GPU Management Pack fails for such hosts because their host names cannot be resolved.</p> <p>This issue is resolved in NVIDIA Virtual GPU Management Pack for VMware vRealize Operations 1.1.</p>
200439654	<p><b>View session freezes intermittently after a Linux VM acquires a license</b></p> <p>In a Linux VM, the view session can sometimes freeze after the VM acquires a license.</p>
2407960	<p><b>Intermittent purple screen crashes</b></p> <p>Intermittent purple screen crashes can occur with <code>nv_interrupt_handler</code>.</p>

### Issues Resolved in Release 7.1

Bug ID	Summary and Description
<ul style="list-style-type: none"> <li>▶ 2425350</li> <li>▶ 200492702</li> </ul>	<p><b>After a long stress test, a blue screen crash (BSOD) occurs</b></p> <p>After a long stress test, the GPU hangs, causing severe performance issues or a blue screen crash in the VM.</p>

Bug ID	Summary and Description
200461544	<p><b>Blue Screen crash during guest driver installation</b></p> <p>During installation of the NVIDIA vGPU software graphics driver in guest VMs running some Microsoft Windows 10 releases, a blue screen crash occurs with the error <code>VIDEO_TDR_FAILURE 116</code>.</p>
200426078	<p><b>Suspending and resuming a VM configured with vGPU can cause errors</b></p> <p>If the guest VM graphics driver comes from an older release of NVIDIA vGPU software than the Virtual GPU Manager, suspending and resuming a VM configured with vGPU causes one of the following sets of errors depending on the guest OS:</p> <ul style="list-style-type: none"> <li>▶ Windows: XID error 43, a TDR, and a VM crash</li> <li>▶ Linux: XID error 13 and XID error 69</li> </ul>

### Issues Resolved in Release 7.2

No resolved issues are reported in this release for VMware vSphere.

### Issues Resolved in Release 7.3

No resolved issues are reported in this release for VMware vSphere.

### Issues Resolved in Release 7.4

Bug ID	Summary and Description
2678149	<p><b>7.0-7.3 Only: Sessions freeze randomly with error XID 31</b></p> <p>Users' Citrix Virtual Apps and Desktops sessions can sometimes freeze randomly with error XID 31.</p>
200434909	<p><b>7.0-7.3 Only: Users' view sessions may become corrupted after migration</b></p> <p>When a VM configured with vGPU under heavy load is migrated to another host, users' view sessions may become corrupted after the migration.</p>

### Issues Resolved in Release 7.5

Bug ID	Summary and Description
2708778	<p><b>7.4 Only: In GPU pass-through mode, the NVIDIA graphics drivers fail to load</b></p> <p>In GPU pass-through mode with some hardware configurations, the NVIDIA graphics drivers fail to load with error code 43 and multiple assertion failures.</p>



# Chapter 5.

## SECURITY UPDATES

### 5.1. Since 7.2: Restricting Access to GPU Performance Counters

The NVIDIA graphics driver contains a vulnerability (CVE-2018-6260) that may allow access to application data processed on the GPU through a side channel exposed by the GPU performance counters. To address this vulnerability, update the driver and restrict access to GPU performance counters to allow access only by administrator users and users who need to use CUDA profiling tools.

The GPU performance counters that are affected by this vulnerability are the hardware performance monitors used by the CUDA profiling tools such as CUPTI, Nsight Graphics, and Nsight Compute. These performance counters are exposed on the hypervisor host and in guest VMs only as follows:

- ▶ On the hypervisor host, they are always exposed. However, the Virtual GPU Manager does not access these performance counters and, therefore, is not affected.
- ▶ In Windows and Linux guest VMs, they are exposed **only** in VMs configured for GPU pass through. They are not exposed in VMs configured for NVIDIA vGPU.

#### 5.1.1. Windows: Restricting Access to GPU Performance Counters for One User by Using NVIDIA Control Panel

Perform this task from the guest VM to which the GPU is passed through.

Ensure that you are running **NVIDIA Control Panel** version 8.1.950.

1. Open **NVIDIA Control Panel**:
  - ▶ Right-click on the Windows desktop and select **NVIDIA Control Panel** from the menu.
  - ▶ Open **Windows Control Panel** and double-click the **NVIDIA Control Panel** icon.

2. In **NVIDIA Control Panel**, select the **Manage GPU Performance Counters** task in the **Developer** section of the navigation pane.
3. Complete the task by following the instructions in the **Manage GPU Performance Counters > Developer** topic in the **NVIDIA Control Panel** help.

## 5.1.2. Windows: Restricting Access to GPU Performance Counters Across an Enterprise by Using a Registry Key

You can use a registry key to restrict access to GPU Performance Counters for all users who log in to a Windows guest VM. By incorporating the registry key information into a script, you can automate the setting of this registry for all Windows guest VMs across your enterprise.

Perform this task from the guest VM to which the GPU is passed through.



**Caution** Only enterprise administrators should perform this task. Changes to the Windows registry must be made with care and system instability can result if registry keys are incorrectly set.

1. Set the `RmProfilingAdminOnly` Windows registry key to 1.

```
[HKLM\SYSTEM\CurrentControlSet\Services\nvlddmkm\Global\NVTweak]
Value: "RmProfilingAdminOnly"
Type: DWORD
Data: 00000001
```

The data value 1 restricts access, and the data value 0 allows access, to application data processed on the GPU through a side channel exposed by the GPU performance counters.

2. Restart the VM.

## 5.1.3. Linux Guest VMs: Restricting Access to GPU Performance Counters

On systems where unprivileged users don't need to use GPU performance counters, restrict access to these counters to system administrators, namely users with the `CAP_SYS_ADMIN` capability set. By default, the GPU performance counters are not restricted to users with the `CAP_SYS_ADMIN` capability.

Perform this task from the guest VM to which the GPU is passed through.

This task requires `sudo` privileges.

1. Log in to the guest VM.
2. Set the kernel module parameter `NVreg_RestrictProfilingToAdminUsers` to 1 by adding this parameter to the `/etc/modprobe.d/nvidia.conf` file.
  - ▶ If you are setting only this parameter, add an entry for it to the `/etc/modprobe.d/nvidia.conf` file as follows:

```
options nvidia
NVreg_RegistryDwords="NVreg_RestrictProfilingToAdminUsers=1"
```

- ▶ If you are setting multiple parameters, set them in a single entry as in the following example:

```
options nvidia NVreg_RegistryDwords="RmPVMRL=0x0"
"NVreg_RestrictProfilingToAdminUsers=1"
```

If the `/etc/modprobe.d/nvidia.conf` file does not already exist, create it.

3. Restart the VM.

## 5.1.4. Hypervisor Host: Restricting Access to GPU Performance Counters

On systems where unprivileged users don't need to use GPU performance counters, restrict access to these counters to system administrators. By default, the GPU performance counters are not restricted to system administrators.

Perform this task from your hypervisor host machine.

1. Open a command shell as the root user on your hypervisor host machine.
2. Set the kernel module parameter `NVreg_RestrictProfilingToAdminUsers` to 1 by using the `esxcli set` command.

- ▶ If you are setting only this parameter, set it as follows:

```
# esxcli system module parameters set -m nvidia -p
"NVreg_RestrictProfilingToAdminUsers=1"
```

- ▶ If you are setting multiple parameters, set them in a single command as in the following example:

```
# esxcli system module parameters set -m nvidia -p
"NVreg_RegistryDwords=RmPVMRL=0x0 NVreg_RestrictProfilingToAdminUsers=1"
```

3. Reboot your hypervisor host machine.

# Chapter 6.

## KNOWN ISSUES

### 6.1. 7.4 Only: In GPU pass-through mode, the NVIDIA graphics drivers fail to load

#### Description

In GPU pass-through mode with some hardware configurations, the NVIDIA graphics drivers fail to load with error code 43 and multiple assertion failures.

#### Status

Resolved in NVIDIA vGPU software 7.5

#### Ref. #

2708778

### 6.2. 7.0-7.3 Only: Sessions freeze randomly with error XID 31

#### Description

Users' Citrix Virtual Apps and Desktops sessions can sometimes freeze randomly with error XID 31.

This issue is accompanied by error messages similar to the following examples (in which line breaks are added for readability):

```
Sep  4 22:55:22 localhost kernel: [14684.571644]
NVRM: Xid (PCI:0000:84:00): 31, Ch 000000f0, engmask 00000111, intr 10000000.
MMU Fault: ENGINE GRAPHICS HUBCLIENT_SKED faulted @ 0x2_1e4a0000.
```

```
Fault is of type FAULT_PDE_ACCESS_TYPE_WRITE
```

**Status**

Resolved in NVIDIA vGPU software 7.4

**Ref. #**

2678149

## 6.3. Tesla T4 is enumerated as 32 separate GPUs by VMware vSphere ESXi

**Description**

Some servers, for example, the Dell R740, do not configure SR-IOV capability if the SR-IOV SBIOS setting is disabled on the server. If the SR-IOV SBIOS setting is disabled on such a server that is being used with the Tesla T4 GPU, VMware vSphere ESXi enumerates the Tesla T4 as 32 separate GPUs. In this state, you cannot use the GPU to configure a VM with NVIDIA vGPU or for GPU pass through.

**Workaround**

Ensure that the SR-IOV SBIOS setting is enabled on the server.

**Status**

Open

**Ref. #**

2697051

## 6.4. VMware vCenter shows GPUs with no available GPU memory

**Description**

VMware vCenter shows some physical GPUs as having 0.0 B of available GPU memory. VMs that have been assigned vGPUs on the affected physical GPUs cannot be booted. The `nvidia-smi` command shows the same physical GPUs as having some GPU memory available.

## Workaround

Stop and restart the Xorg service and `nv-hostengine` on the ESXi host.

1. Stop all running VM instances on the host.
2. Stop the Xorg service.

```
[root@esxi:~] /etc/init.d/xorg stop
```

3. Stop `nv-hostengine`.

```
[root@esxi:~] nv-hostengine -t
```

4. Wait for 1 second to allow `nv-hostengine` to stop.
5. Start `nv-hostengine`.

```
[root@esxi:~] nv-hostengine -d
```

6. Start the Xorg service.

```
[root@esxi:~] /etc/init.d/xorg start
```

## Status

Not an NVIDIA bug

A fix is available from VMware in VMware vSphere ESXi 6.7 U3. For information about the availability of fixes for other releases of VMware vSphere ESXi, contact VMware.

## Ref. #

2644794

## 6.5. 7.0-7.3 Only: Users' view sessions may become corrupted after migration

### Description

When a VM configured with vGPU under heavy load is migrated to another host, users' view sessions may become corrupted after the migration.

### Workaround

Restart the VM.

### Status

Resolved in NVIDIA vGPU software 7.4

**Ref. #**

200434909

## 6.6. Users' sessions may freeze during vMotion migration of VMs configured with vGPU

**Description**

When vMotion is used to migrate a VM configured with vGPU to another host, users' sessions may freeze for up to several seconds during the migration.

These factors may increase the length of time for which a session freezes:

- ▶ Continuous use of the frame buffer by the workload, which typically occurs with workloads such as video streaming
- ▶ A large amount of vGPU frame buffer
- ▶ A large amount of system memory
- ▶ Limited network bandwidth

**Workaround**

Administrators can mitigate the effects on end users by avoiding migration of VMs configured with vGPU during business hours or warning end users that migration is about to start and that they may experience session freezes.

End users experiencing this issue must wait for their sessions to resume when the migration is complete.

**Status**

Open

**Ref. #**

2569578

## 6.7. 7.0 Only: After a long stress test, a blue screen crash (BSOD) occurs

**Description**

After a long stress test, the GPU hangs, causing severe performance issues or a blue screen crash in the VM.

This issue affects only supported GPUs based on the NVIDIA Pascal architecture or the NVIDIA Volta architecture.

The `nvidia-smi -q` command returns the following information, in which power readings and clocks data are shown as `Unknown Error`.

```
Power Readings
  Power Management      : Supported
  Power Draw            : Unknown Error
  Power Limit           : 250.00 W
  Default Power Limit   : 250.00 W
  Enforced Power Limit  : 250.00 W
  Min Power Limit       : 125.00 W
  Max Power Limit       : 250.00 W
Clocks
  Graphics              : Unknown Error
  SM                    : Unknown Error
  Memory                : 3615 MHz
  Video                 : Unknown Error
```

### Status

Resolved in release 7.1

### Ref. #

- ▶ 2425350
- ▶ 200492702

## 6.8. Vulkan applications crash in Windows 7 guest VMs configured with NVIDIA vGPU

### Description

In Windows 7 guest VMs configured with NVIDIA vGPU, applications developed with Vulkan APIs crash or throw errors when they are launched. Vulkan APIs require sparse texture support, but in Windows 7 guest VMs configured with NVIDIA vGPU, sparse textures are not enabled.

In Windows 10 guest VMs configured with NVIDIA vGPU, sparse textures are enabled and applications developed with Vulkan APIs run correctly in these VMs.

### Status

Open

### Ref. #

200381348



## 6.9. Host core CPU utilization is higher than expected for moderate workloads

### Description

When GPU performance is being monitored, host core CPU utilization is higher than expected for moderate workloads. For example, host CPU utilization when only a small number of VMs are running is as high as when several times as many VMs are running.

### Workaround

Disable monitoring of the following GPU performance statistics:

- ▶ vGPU engine usage by applications across multiple vGPUs
- ▶ Encoder session statistics
- ▶ Frame buffer capture (FBC) session statistics
- ▶ Statistics gathered by performance counters in guest VMs

### Status

Open

### Ref. #

2414897

## 6.10. H.264 encoder falls back to software encoding on 1Q vGPUs with a 4K display

### Description

On 1Q vGPUs with a 4K display, a shortage of frame buffer causes the H.264 encoder to fall back to software encoding.

### Workaround

Use a 2Q or larger virtual GPU type to provide more frame buffer for each vGPU.

### Status

Open

**Ref. #**

2422580

## 6.11. H.264 encoder falls back to software encoding on 2Q vGPUs with 3 or more 4K displays

**Description**

On 2Q vGPUs with three or more 4K displays, a shortage of frame buffer causes the H.264 encoder to fall back to software encoding.

This issue affects only vGPUs assigned to VMs that are running a Linux guest OS.

**Workaround**

Use a 4Q or larger virtual GPU type to provide more frame buffer for each vGPU.

**Status**

Open

**Ref. #**

200457177

## 6.12. Frame capture while the interactive logon message is displayed returns blank screen

**Description**

Because of a known limitation with NvFBC, a frame capture while the interactive logon message is displayed returns a blank screen.

An NvFBC session can capture screen updates that occur after the session is created. Before the logon message appears, there is no screen update after the message is shown and, therefore, a black screen is returned instead. If the NvFBC session is created after this update has occurred, NvFBC cannot get a frame to capture.

**Workaround**

Press **Enter** or wait for the screen to update for NvFBC to capture the frame.

**Status**

Not a bug

**Ref. #**

2115733

## 6.13. RDS sessions do not use the GPU with some Microsoft Windows Server releases

**Description**

When some releases of Windows Server are used as a guest OS, Remote Desktop Services (RDS) sessions do not use the GPU. With these releases, the RDS sessions by default use the Microsoft Basic Render Driver instead of the GPU. This default setting enables 2D DirectX applications such as Microsoft Office to use software rendering, which can be more efficient than using the GPU for rendering. However, as a result, 3D applications that use DirectX are prevented from using the GPU.

**Version**

- ▶ Windows Server 2016
- ▶ Windows Server 2012

**Solution**

Change the local computer policy to use the hardware graphics adapter for all RDS sessions.

1. Choose **Local Computer Policy > Computer Configuration > Administrative Templates > Windows Components > Remote Desktop Services > Remote Desktop Session Host > Remote Session Environment**.
2. Set the **Use the hardware default graphics adapter for all Remote Desktop Services sessions** option.

## 6.14. VMware vMotion fails gracefully under heavy load

**Description**

Migrating a VM configured with vGPU fails gracefully if the VM is running an intensive workload.

The error stack in the task details on the vSphere web client contains the following error message:

```
The migration has exceeded the maximum switchover time of 100 second(s).
ESX has preemptively failed the migration to allow the VM to continue running on
the source.
To avoid this failure, either increase the maximum allowable switchover time or
wait until
the VM is performing a less intensive workload.
```

### Workaround

Increase the maximum switchover time by increasing the `vmotion.maxSwitchoverSeconds` option from the default value of 100 seconds.

For more information, see [VMware Knowledge Base Article: vMotion or Storage vMotion of a VM fails with the error: The migration has exceeded the maximum switchover time of 100 second\(s\) \(2141355\)](#).

### Status

Not an NVIDIA bug

### Ref. #

200416700

## 6.15. Cloned VMs configured with a vGPU type different than the type in the master image fail to start

### Description

Cloned VMs configured with a vGPU type different than the type in the master image fail to start.

When a Windows 10 VM is booted, the VM becomes stuck in a loop and alternately displays `Getting devices ready: 50%` and `Preparation in progress`.

### Workaround

Create one master image for each vGPU type that you want to use. Do not attempt to configure a cloned VM with a vGPU type different than the type in the master image.

### Status

Not an NVIDIA bug

**Ref. #**

2285306

## 6.16. View session freezes intermittently after a Linux VM acquires a license

**Description**

In a Linux VM, the view session can sometimes freeze after the VM acquires a license.

**Workaround**

Resize the view session.

**Status**

Open

**Ref. #**

200426961

## 6.17. 7.0 Only: Blue Screen crash during guest driver installation

**Description**

During installation of the NVIDIA vGPU software graphics driver in guest VMs running some Microsoft Windows 10 releases, a blue screen crash occurs with the error VIDEO\_TDR\_FAILURE 116.

**Version**

This issue affects the following Microsoft Windows 10 releases:

- ▶ RTM (1507)
- ▶ November Update (1511)

**Workaround**

1. Identify the NVIDIA GPU for which the **Hardware Ids** property contains values that start with `PCI\VEN_10DE`.
  - a. Open **Device Manager** and expand **Display adapters**.

- b. For each NVIDIA GPU listed under **Display adapters**, double-click the GPU and in the **Properties** window that opens, click the **Details** tab and select **Hardware Ids** in the **Property** list.
2. For the device that you identified in the previous step, display the value of the **Class Guid** property.

The value of this property is a string, for example, 4d36e968-e325-11ce-bfc1-08002be10318.

3. Open the **Registry Editor** and navigate to **HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\Class\class-guid\**, where *class-guid* is the value of the **Class Guid** property that you displayed in the previous step.

Under *class-guid*, multiple adapters numbered as four-digit numbers starting from **0000** are listed, for example, **0000** and **0001**.

4. For each adapter listed, create the `EnableVGXFlipQueue` Windows registry key with type `REG_DWORD` and a value of **0**.
5. Install the NVIDIA vGPU software graphics driver.

### Status

Resolved in NVIDIA vGPU software release 7.1.

### Ref. #

200461544

## 6.18. 7.0 Only: Suspending and resuming a VM configured with vGPU can cause errors

### Description

If the guest VM graphics driver comes from an older release of NVIDIA vGPU software than the Virtual GPU Manager, suspending and resuming a VM configured with vGPU causes one of the following sets of errors depending on the guest OS:

- ▶ Windows: XID error 43, a TDR, and a VM crash
- ▶ Linux: XID error 13 and XID error 69

### Workaround

Ensure that the guest VM graphics driver and the Virtual GPU Manager come from the same release of NVIDIA vGPU software.

**Status**

Open

**Ref. #**

Resolved in NVIDIA vGPU software release 7.1.

## 6.19. Even when the scheduling policy is equal share, unequal GPU utilization is reported

**Description**

When the scheduling policy is equal share, unequal GPU engine utilization can be reported for the vGPUs on the same physical GPU.

For example, GPU engine usage for three P40-8Q vGPUs on a Tesla P40 GPU might be reported as follows:

```
[root@localhost:~] nvidia-smi vgpu
Wed Jun 27 10:33:18 2018
```

-----					
NVIDIA-SMI 390.59			Driver Version: 390.59		
GPU	Name		Bus-Id		GPU-Util
	vGPU ID	Name	VM ID	VM Name	vGPU-Util
=====					
0	Tesla P40		00000000:81:00.0		52%
	2122661	GRID P40-8Q	2122682	centos7.4-xmpl-211...	19%
	2122663	GRID P40-8Q	2122692	centos7.4-xmpl-211...	0%
	2122659	GRID P40-8Q	2122664	centos7.4-xmpl-211...	25%
-----					
1	Tesla P40		00000000:85:00.0		58%
	2122662	GRID P40-8Q	2122689	centos7.4-xmpl-211...	0%
	<b>2122658</b>	<b>GRID P40-8Q</b>	<b>2122667</b>	<b>centos7.4-xmpl-211...</b>	<b>59%</b>
	2122660	GRID P40-8Q	2122670	centos7.4-xmpl-211...	0%
-----					

The vGPU utilization of the vGPU 2122658 is reported as 59%. However, the expected vGPU utilization should not exceed 33%.

This behavior is a result of the mechanism that is used to measure GPU engine utilization.

**Status**

Open

**Ref. #**

2175888

## 6.20. When the scheduling policy is fixed share, GPU utilization is reported as higher than expected

### Description

When the scheduling policy is fixed share, GPU engine utilization can be reported as higher than expected for a vGPU.

For example, GPU engine usage for six P40-4Q vGPUs on a Tesla P40 GPU might be reported as follows:

```
[root@localhost:~] nvidia-smi vgpu
Mon Aug 20 10:33:18 2018
```

NVIDIA-SMI 390.42		Driver Version: 390.42	
GPU	Name	Bus-Id	GPU-Util
vGPU ID	Name	VM ID	vGPU-Util
0	Tesla P40	00000000:81:00.0	99%
	<b>85109</b> <b>GRID P40-4Q</b>	<b>85110</b> <b>win7-xmpl-146048-1</b>	<b>32%</b>
	<b>87195</b> <b>GRID P40-4Q</b>	<b>87196</b> <b>win7-xmpl-146048-2</b>	<b>39%</b>
	<b>88095</b> <b>GRID P40-4Q</b>	<b>88096</b> <b>win7-xmpl-146048-3</b>	<b>26%</b>
	89170 GRID P40-4Q	89171 win7-xmpl-146048-4	0%
	90475 GRID P40-4Q	90476 win7-xmpl-146048-5	0%
	93363 GRID P40-4Q	93364 win7-xmpl-146048-6	0%
1	Tesla P40	00000000:85:00.0	0%

The vGPU utilization of vGPU 85109 is reported as 32%. For vGPU 87195, vGPU utilization is reported as 39%. And for 88095, it is reported as 26%. However, the expected vGPU utilization of any vGPU should not exceed approximately 16.7%.

This behavior is a result of the mechanism that is used to measure GPU engine utilization.

### Status

Open

### Ref. #

2227591



## 6.21. No data displayed on NVIDIA dashboards in VMware vRealize Operations

### Description

No data is displayed on NVIDIA dashboards in VMware vRealize Operations with the NVIDIA Virtual GPU Management Pack.

Data is not collected for any ESXi host that is identified by its host name when it is added to VMware vCenter Server. The connection to CIM provider from NVIDIA Virtual GPU Management Pack fails for such hosts because their host names cannot be resolved.

### Workaround

When adding a host to VMware vCenter Server, specify its IP address instead of its host name.

### Status

Resolved in NVIDIA Virtual GPU Management Pack for VMware vRealize Operations 1.1.

### Ref. #

200422318

## 6.22. `nvidia-smi` reports that vGPU migration is supported on all hypervisors

### Description

The command `nvidia-smi vgpu -m` shows that vGPU migration is supported on all hypervisors, even hypervisors or hypervisor versions that do not support vGPU migration.

### Status

Closed

### Ref. #

200407230

## 6.23. GPU resources not available error during VMware instant clone provisioning

### Description

A GPU resources not available error might occur during VMware instant clone provisioning. On Windows VMs, a Video TDR failure - NVLDDMKM.sys error causes a blue screen crash.

This error occurs when options for VMware Virtual Shared Graphics Acceleration (vSGA) are set for a VM that is configured with NVIDIA vGPU. VMware vSGA is a feature of VMware vSphere that enables multiple virtual machines to share the physical GPUs on ESXi hosts and can be used as an alternative to NVIDIA vGPU.

Depending on the combination of options set, one of the following error messages is seen when the VM is powered on:

- ▶ Module 'MKS' power on failed.

This message is seen when the following options are set:

- ▶ **Enable 3D support** is selected.
- ▶ **3D Renderer** is set to **Hardware**
- ▶ The graphics type of all GPUs on the ESXi host is Shared Direct.
- ▶ Hardware GPU resources are not available. The virtual machine will use software rendering.

This message is seen when the following options are set:

- ▶ **Enable 3D support** is selected.
- ▶ **3D Renderer** is set to **Automatic**.
- ▶ The graphics type of all GPUs on the ESXi host is Shared Direct.

### Resolution

If you want to use NVIDIA vGPU, unset any options for VMware vSGA that are set for the VM.

1. Ensure that the VM is powered off.
2. Open the vCenter Web UI.
3. In the vCenter Web UI, right-click the VM and choose **Edit Settings**.
4. Click the **Virtual Hardware** tab.
5. In the device list, expand the **Video card** node and de-select the **Enable 3D support** option.
6. Start the VM.

**Status**

Not a bug

**Ref. #**

2369683

## 6.24. VMs with 32 GB or more of RAM fail to boot with GPUs requiring 64 GB of MMIO space

**Description**

VMs with 32 GB or more of RAM fail to boot with GPUs that require 64 GB of MMIO space. VMs boot successfully with RAM allocations of less than 32 GB.

The following GPUs require 64 GB of MMIO space:

- ▶ Tesla P6
- ▶ Tesla P40

**Version**

This issue affects the following versions of VMware vSphere ESXi:

- ▶ 6.0 Update 3 and later updates
- ▶ 6.5 and later updates

**Workaround**

If you want to use a VM with 32 GB or more of RAM with GPUs that require 64 GB of MMIO space, use this workaround:

1. Create a VM to which less than 32 GB of RAM is allocated.
2. Choose **VM Options > Advanced** and set `pciPassthru.use64bitMMIO="TRUE"`.
3. Allocate the required amount of RAM to the VM.

For more information, see [VMware Knowledge Base Article: VMware vSphere VMDirectPath I/O: Requirements for Platforms and Devices \(2142307\)](#).

**Status**

Not an NVIDIA bug

Resolved in VMware vSphere ESXi 6.7

**Ref. #**

2043171

## 6.25. Module load failed during VIB downgrade from R390 to R384

**Description**

Some registry keys are available only with the R390 Virtual GPU Manager, for example, `NVreg_IgnoreMMIOCheck`. If any keys that are available only with the R390 Virtual GPU Manager are set, the NVIDIA module fails to load after a downgrade from R390 to R384.

When `nvidia-smi` is run without any arguments to verify the installation, the following error message is displayed:

```
NVIDIA-SMI has failed because it couldn't communicate with the NVIDIA driver.  
Make sure that the latest NVIDIA driver is installed and running.
```

**Workaround**

Before uninstalling the R390 VIB, clear all parameters of the `nvidia` module to remove any registry keys that are available only for the R390 Virtual GPU Manager.

```
# esxcli system module parameters set -p "" -m nvidia
```

**Status**

Not an NVIDIA bug

**Ref. #**

200366884

## 6.26. Resolution is not updated after a VM acquires a license and is restarted

**Description**

In a Red Enterprise Linux 7.3 guest VM, an increase in resolution from 1024×768 to 2560×1600 is not applied after a license is acquired and the `gridd` service is restarted. This issue occurs if the `multimonitor` parameter is added to the `xorg.conf` file.

**Version**

Red Enterprise Linux 7.3

**Status**

Open

**Ref. #**

200275925

## 6.27. On Tesla P40, P6, and P4 GPUs, the default ECC setting prevents NVIDIA vGPU from starting

**Description**

On Tesla P40, Tesla P6, and Tesla P4 GPUs, the default error-correcting code (ECC) memory setting prevents NVIDIA vGPU from starting. By default, ECC memory is enabled on these GPUs, but NVIDIA vGPU does not support ECC memory.

**Workaround**

Before running NVIDIA vGPU, disable ECC memory as explained in *Virtual GPU Software User Guide*.

**Status**

Closed.

**Ref. #**

200269717

## 6.28. Tesla P40 cannot be used in pass-through mode

**Description**

Pass-through mode on Tesla P40 GPUs and other GPUs based on the Pascal architecture does not work as expected. In some situations, after the VM is powered on, the guest OS crashes or fails to boot.

### Workaround

Ensure that your GPUs are configured as described in [Requirements for Using GPUs Based on the Pascal and Volta Architectures in Pass-Through Mode](#)

### Status

Not a bug

### Ref. #

1944539

## 6.29. NVIDIA vGPU encoder and process utilization counters don't work with Windows Performance Counters

### Description

GPU encoder and process utilization counter groups are listed in Windows Performance Counters, but no instances of the counters are available. The counters are disabled by default and must be enabled.

### Workaround

Enable the counters by running the following sequence of commands from a command shell:

```
wmic /namespace:nv path System call enableProcessUtilizationPerfCounter
```

```
wmic /namespace:nv path System call enableEncoderSessionsPerfCounter
```

If you need to disable the counters, run the following sequence of commands from a command shell:

```
wmic /namespace:nv path System call disableProcessUtilizationPerfCounter
```

```
wmic /namespace:nv path System call disableEncoderSessionsPerfCounter
```

### Status

Open

### Ref. #

1971698

## 6.30. On Linux, 3D applications run slowly when windows are dragged

### Description

When windows for 3D applications on Linux are dragged, the frame rate drops substantially and the application runs slowly.

This issue does not affect 2D applications.

### Status

Open

### Ref. #

1949482

## 6.31. A segmentation fault in DBus code causes `nvidia-gridd` to exit on Red Hat Enterprise Linux and CentOS

### Description

On Red Hat Enterprise Linux 6.8 and 6.9, and CentOS 6.8 and 6.9, a segmentation fault in DBus code causes the `nvidia-gridd` service to exit.

The `nvidia-gridd` service uses DBus for communication with **NVIDIA X Server Settings** to display licensing information through the **Manage License** page. Disabling the GUI for licensing resolves this issue.

To prevent this issue, the GUI for licensing is disabled by default. You might encounter this issue if you have enabled the GUI for licensing and are using Red Hat Enterprise Linux 6.8 or 6.9, or CentOS 6.8 and 6.9.

### Version

Red Hat Enterprise Linux 6.8 and 6.9

CentOS 6.8 and 6.9

### Status

Open

**Ref. #**

- ▶ 200358191
- ▶ 200319854
- ▶ 1895945

## 6.32. No Manage License option available in NVIDIA X Server Settings by default

**Description**

By default, the **Manage License** option is not available in **NVIDIA X Server Settings**. This option is missing because the GUI for licensing on Linux is disabled by default to work around the issue that is described in [A segmentation fault in Dbus code causes nvidia-gridd to exit on Red Hat Enterprise Linux and CentOS](#).

**Workaround**

This workaround requires `sudo` privileges.



Do not use this workaround with Red Hat Enterprise Linux 6.8 and 6.9 or CentOS 6.8 and 6.9. To prevent a segmentation fault in Dbus code from causing the `nvidia-gridd` service from exiting, the GUI for licensing must be disabled with these OS versions.

1. If **NVIDIA X Server Settings** is running, shut it down.
2. If the `/etc/nvidia/gridd.conf` file does not already exist, create it by copying the supplied template file `/etc/nvidia/gridd.conf.template`.
3. As root, edit the `/etc/nvidia/gridd.conf` file to set the `EnableUI` option to `TRUE`.
4. Start the `nvidia-gridd` service.

```
# sudo service nvidia-gridd start
```

When **NVIDIA X Server Settings** is restarted, the **Manage License** option is now available.

**Status**

Open



## 6.33. Licenses remain checked out when VMs are forcibly powered off

### Description

NVIDIA vGPU software licenses remain checked out on the license server when non-persistent VMs are forcibly powered off.

The NVIDIA service running in a VM returns checked out licenses when the VM is shut down. In environments where non-persistent licensed VMs are not cleanly shut down, licenses on the license server can become exhausted. For example, this issue can occur in automated test environments where VMs are frequently changing and are not guaranteed to be cleanly shut down. The licenses from such VMs remain checked out against their MAC address for seven days before they time out and become available to other VMs.

### Resolution

If VMs are routinely being powered off without clean shutdown in your environment, you can avoid this issue by shortening the license borrow period. To shorten the license borrow period, set the `LicenseInterval` configuration setting in your VM image. For details, refer to *Virtual GPU Client Licensing User Guide*.

### Status

Closed

### Ref. #

1694975

## 6.34. Memory exhaustion can occur with vGPU profiles that have 512 Mbytes or less of frame buffer

### Description

Memory exhaustion can occur with vGPU profiles that have 512 Mbytes or less of frame buffer.

This issue typically occurs in the following situations:

- ▶ Full screen 1080p video content is playing in a browser. In this situation, the session hangs and session reconnection fails.
- ▶ Multiple display heads are used with Citrix Virtual Apps and Desktops or VMware Horizon on a Windows 10 guest VM.
- ▶ Higher resolution monitors are used.
- ▶ Applications that are frame-buffer intensive are used.
- ▶ NVENC is in use.

To reduce the possibility of memory exhaustion, NVENC is disabled on profiles that have 512 Mbytes or less of frame buffer.

When memory exhaustion occurs, the NVIDIA host driver reports Xid error 31 and Xid error 43 in the VMware vSphere log file `vmware.log` in the guest VM's storage directory.

The following vGPU profiles have 512 Mbytes or less of frame buffer:

- ▶ Tesla M6-0B, M6-0Q
- ▶ Tesla M10-0B, M10-0Q
- ▶ Tesla M60-0B, M60-0Q

The root cause is a known issue associated with changes to the way that recent Microsoft operating systems handle and allow access to overprovisioning messages and errors. If your systems are provisioned with enough frame buffer to support your use cases, you should not encounter these issues.

### Workaround

- ▶ Use an appropriately sized vGPU to ensure that the frame buffer supplied to a VM through the vGPU is adequate for your workloads.
- ▶ Monitor your frame buffer usage.
- ▶ If you are using Windows 10, consider these workarounds and solutions:
  - ▶ Use a profile that has 1 Gbyte of frame buffer.
  - ▶ Optimize your Windows 10 resource usage.

To obtain information about best practices for improved user experience using Windows 10 in virtual environments, complete the [NVIDIA GRID vGPU Profile Sizing Guide for Windows 10 download request form](#).

Additionally, you can use the [VMware OS Optimization Tool](#) to make and apply optimization recommendations for Windows 10 and other operating systems.

### Status

Open

**Ref. #**

- ▶ 200130864
- ▶ 1803861

## 6.35. vGPU VM fails to boot in ESXi 6.5 if the graphics type is Shared

**Description**

If vSGA is being used, this issue shouldn't be encountered and changing the default graphics type is not necessary.

On VMware vSphere Hypervisor (ESXi) 6.5, after vGPU is configured, VMs to which a vGPU is assigned may fail to start and the following error message may be displayed:

```
The amount of graphics resource available in the parent resource pool is insufficient for the operation.
```

The vGPU Manager VIB provides vSGA and vGPU functionality in a single VIB. After this VIB is installed, the default graphics type is Shared, which provides vSGA functionality. To enable vGPU support for VMs in VMware vSphere 6.5, you must change the default graphics type to Shared Direct. If you do not change the default graphics type you will encounter this issue.

**Version**

VMware vSphere Hypervisor (ESXi) 6.5

**Workaround**

Change the default graphics type to Shared Direct as explained in *Virtual GPU Software User Guide*.

**Status**

Open

**Ref. #**

200256224

## 6.36. ESXi 6.5 web client shows high memory usage even when VMs are idle

### Description

On VMware vSphere Hypervisor (ESXi) 6.5, the web client shows a memory usage alarm with critical severity for VMs to which a vGPU is attached even when the VMs are idle. When memory usage is monitored from inside the VM, no memory usage alarm is shown. The web client does not show a memory usage alarm for the same VMs without an attached vGPU.

### Version

VMware vSphere Hypervisor (ESXi) 6.5

### Workaround

Avoid using the VMware vSphere Hypervisor (ESXi) 6.5 web client to monitor memory usage for VMs to which a vGPU is attached.

### Status

Not an NVIDIA bug

### Ref. #

200191065

## 6.37. VMs configured with NVIDIA vGPU must not be on a host in a VMware DRS cluster

### Description

The ESXi host on which VMs configured with NVIDIA vGPU reside must not be a member of a VMware Distributed Resource Scheduler (DRS) cluster. The installer for the NVIDIA driver for NVIDIA vGPU software cannot locate the NVIDIA vGPU software GPU card on a host in a VMware DRS Cluster. Any attempt to install the driver on a VM on a host in a DRS cluster fails with the following error:

```
NVIDIA Installer cannot continue  
This graphics driver could not find compatible graphics hardware.
```

Furthermore, you **cannot** overcome this limitation by configuring a VM with NVIDIA vGPU and installing the driver on the VM on a host outside a DRS cluster and moving the host into the DRS cluster after configuring it.

### Workaround

Move each VM configured with NVIDIA vGPU to a host outside the DRS cluster.

1. Remove NVIDIA Virtual GPU Manager from the host in the DRS cluster.
2. Create a cluster of VMware ESXi hosts outside the DRS domain.
3. Install the NVIDIA Virtual GPU Manager on an ESXi host in the cluster that you created in the previous step.
4. Create a vSphere VM for use with NVIDIA vGPU.
5. Configure the vSphere VM with NVIDIA vGPU.
6. Boot the vSphere VM and install the NVIDIA driver for NVIDIA vGPU.

For instructions for performing these tasks, refer to *Virtual GPU Software User Guide*.

### Status

Open

### Ref. #

1933449

## 6.38. GNOME Display Manager (GDM) fails to start on Red Hat Enterprise Linux 7.2 and CentOS 7.0

### Description

GDM fails to start on Red Hat Enterprise Linux 7.2 and CentOS 7.0 with the following error:

```
Oh no! Something has gone wrong!
```

### Workaround

Permanently enable permissive mode for Security Enhanced Linux (SELinux).

1. As root, edit the `/etc/selinux/config` file to set SELINUX to permissive.
 

```
SELINUX=permissive
```
2. Reboot the system.

```
~]# reboot
```

For more information, see [Permissive Mode](#) in *Red Hat Enterprise Linux 7 SELinux User's and Administrator's Guide*.

**Status**

Not an NVIDIA bug

**Ref. #**

200167868

## 6.39. NVIDIA Control Panel fails to start and reports that “you are not currently using a display that is attached to an Nvidia GPU”

**Description**

When you launch NVIDIA Control Panel on a VM configured with vGPU, it fails to start and reports that you are not using a display attached to an NVIDIA GPU. This happens because Windows is using VMware's SVGA device instead of NVIDIA vGPU.

**Fix**

Make NVIDIA vGPU the primary display adapter.

Use Windows screen resolution control panel to make the second display, identified as “2” and corresponding to NVIDIA vGPU, to be the active display and select the Show desktop only on 2 option. Click Apply to accept the configuration.

You may need to click on the Detect button for Windows to recognize the display connected to NVIDIA vGPU.



If the VMware Horizon/View agent is installed in the VM, the NVIDIA GPU is automatically selected in preference to the SVGA device.

**Status**

Open

Ref. #

## 6.40. VM configured with more than one vGPU fails to initialize vGPU when booted

### Description

Using the current VMware vCenter user interface, it is possible to configure a VM with more than one vGPU device. When booted, the VM boots in VMware SVGA mode and doesn't load the NVIDIA driver. The additional vGPU devices are present in Windows Device Manager but display a warning sign, and the following device status:

```
Windows has stopped this device because it has reported problems. (Code 43)
```

### Workaround

NVIDIA vGPU currently supports a single virtual GPU device per VM. Remove any additional vGPUs from the VM configuration before booting the VM.

### Status

Open

Ref. #

## 6.41. A VM configured with both a vGPU and a passthrough GPU fails to start the passthrough GPU

### Description

Using the current VMware vCenter user interface, it is possible to configure a VM with a vGPU device and a passthrough (direct path) GPU device. This is not a currently supported configuration for vGPU. The passthrough GPU appears in Windows Device Manager with a warning sign, and the following device status:

```
Windows has stopped this device because it has reported problems. (Code 43)
```

### Workaround

Do not assign vGPU and passthrough GPUs to a VM simultaneously.

**Status**

Open

**Ref. #**

1735002

## 6.42. vGPU allocation policy fails when multiple VMs are started simultaneously

**Description**

If multiple VMs are started simultaneously, vSphere may not adhere to the placement policy currently in effect. For example, if the default placement policy (breadth-first) is in effect, and 4 physical GPUs are available with no resident vGPUs, then starting 4 VMs simultaneously should result in one vGPU on each GPU. In practice, more than one vGPU may end up resident on a GPU.

**Workaround**

Start VMs individually.

**Status**

Not an NVIDIA bug

**Ref. #**

200042690

## 6.43. Before Horizon agent is installed inside a VM, the Start menu's sleep option is available

**Description**

When a VM is configured with a vGPU, the **Sleep** option remains available in the **Windows Start** menu. Sleep is not supported on vGPU and attempts to use it will lead to undefined behavior.

**Workaround**

Do not use Sleep with vGPU.

Installing the VMware Horizon agent will disable the **Sleep** option.



**Status**

Closed

**Ref. #**

200043405

## 6.44. vGPU-enabled VMs fail to start, `nvidia-smi` fails when VMs are configured with too high a proportion of the server's memory.

**Description**

If vGPU-enabled VMs are assigned too high a proportion of the server's total memory, the following errors occur:

- ▶ One or more of the VMs may fail to start with the following error:

```
The available Memory resources in the parent resource pool are insufficient for the operation
```

- ▶ When run in the host shell, the `nvidia-smi` utility returns this error:

```
-sh: can't fork
```

For example, on a server configured with 256G of memory, these errors may occur if vGPU-enabled VMs are assigned more than 243G of memory.

**Workaround**

Reduce the total amount of system memory assigned to the VMs.

**Status**

Closed

**Ref. #**

200060499

## 6.45. On reset or restart VMs fail to start with the error VMIOP: no graphics device is available for vGPU...

### Description

On a system running a maximal configuration, that is, with the maximum number of vGPU VMs the server can support, some VMs might fail to start post a reset or restart operation.

### Fix

Upgrade to ESXi 6.0 Update 1.

### Status

Closed

### Ref. #

200097546

## 6.46. `nvidia-smi` shows high GPU utilization for vGPU VMs with active Horizon sessions

### Description

vGPU VMs with an active Horizon connection utilize a high percentage of the GPU on the ESXi host. The GPU utilization remains high for the duration of the Horizon session even if there are no active applications running on the VM.

### Workaround

None

### Status

Open

Partially resolved for Horizon 7.0.1:

- ▶ For Blast connections, GPU utilization is no longer high.
- ▶ For PCoIP connections, utilization remains high.

**Ref. #**

1735009

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