Virtual GPU Software R450 for VMware vSphere

Release Notes
Table of Contents

Chapter 1. Release Notes

1.1. NVIDIA vGPU Software Driver Versions

1.2. Compatibility Requirements for the NVIDIA vGPU Manager and Guest VM Driver

1.3. Updates in Release 11.0

1.4. Updates in Release 11.1

Chapter 2. Validated Platforms

2.1. Supported NVIDIA GPUs and Validated Server Platforms

2.2. Hypervisor Software Releases

2.3. Guest OS Support

2.3.1. Windows Guest OS Support

2.3.2. Linux Guest OS Support

2.4. NVIDIA CUDA Toolkit Version Support

2.5. vGPU Migration Support

2.6. Multiple vGPU Support

2.7. Peer-to-Peer CUDA Transfers over NVLink Support

Chapter 3. Known Product Limitations

3.1. Issues occur when the channels allocated to a vGPU are exhausted

3.2. Total frame buffer for vGPUs is less than the total frame buffer on the physical GPU

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

3.4. In pass through mode, all GPUs connected to each other through NVLink must be assigned to the same VM

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

3.6. NVENC requires at least 1 Gbyte of frame buffer

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

3.8. VM running an incompatible NVIDIA vGPU guest driver fails to initialize vGPU when booted

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

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

Chapter 4. Resolved Issues

Chapter 5. Known Issues

5.1. Since 11.1: Licensing event logs indicate license renewal from unavailable primary server
5.2. 11.0 Only: The NVIDIA license not present notification appears even for VMs for which the vGPU is licensed........................................................................................................................................28
5.3. Driver upgrade in a Linux guest VM with multiple vGPUs might fail.................................32
5.4. 11.0 Only: Failure to allocate resources causes VM failures or crashes............................33
5.5. NVIDIA Control Panel fails to start if launched too soon from a VM without licensing information........................................................................................................................................33
5.7. VMware Horizon clients that use PCoIP cannot connect to a Windows 10 2004 VM with multiple displays.....................................................................................................................................34
5.8. Suspend and resume between hosts running different versions of the vGPU manager fails........................................................................................................................................35
5.9. Remoting solution session freezes with VGPU message 21 failed and VGPU message 14 failed errors.........................................................................................................................................36
5.10. Displays are not driven by NVIDIA vGPU and only Manage License is available...............36
5.11. On Linux, a VMware Horizon 7.12 session freezes after a switch to full screen................37
5.12. On Linux, a VMware Horizon 7.12 session with two 4K displays freezes.............................37
5.13. On Linux, the frame rate might drop to 1 after several minutes........................................38
5.14. Frame buffer consumption grows with VMware Horizon over Blast Extreme...................39
5.15. 10.0 Only: Random purple screen crashes with nv_interrupt_handler can occur...............39
5.16. DWM crashes randomly occur in Windows VMs.................................................................40
5.17. Remote desktop session freezes with assertion failure and XID error 43 after migration........41
5.18. Citrix Virtual Apps and Desktops session freezes when the desktop is unlocked.................41
5.19. NVIDIA vGPU software graphics driver fails after Linux kernel upgrade with DKMS enabled........................................................................................................................................42
5.20. Red Hat Enterprise Linux and CentOS 6 VMs hang during driver installation..................43
5.21. Publisher not verified warning during Windows 7 driver installation.................................44
5.22. Tesla T4 is enumerated as 32 separate GPUs by VMware vSphere ESXi............................45
5.23. VMware vCenter shows GPUs with no available GPU memory........................................45
5.24. RAPIDS cuDF merge fails on NVIDIA vGPU......................................................................46
5.25. Users’ sessions may freeze during vMotion migration of VMs configured with vGPU.... 47
5.26. Migration of VMs configured with vGPU stops before the migration is complete..............48
5.27. ECC memory settings for a vGPU cannot be changed by using NVIDIA X Server Settings48
5.28. Changes to ECC memory settings for a Linux vGPU VM by nvidia-smi might be ignored49
5.29. Black screens observed when a VMware Horizon session is connected to four displays.50
5.30. Quadro RTX 8000 and Quadro RTX 6000 GPUs can’t be used with VMware vSphere ESXi 6.5..................................................................................................................................................50
5.31. Vulkan applications crash in Windows 7 guest VMs configured with NVIDIA vGPU.........51
5.32. Host core CPU utilization is higher than expected for moderate workloads....................52
5.33. H.264 encoder falls back to software encoding on 1Q vGPUs with a 4K display..............52
5.34. H.264 encoder falls back to software encoding on 2Q vGPUs with 3 or more 4K displays
5.35. Frame capture while the interactive logon message is displayed returns blank screen
5.36. RDS sessions do not use the GPU with some Microsoft Windows Server releases
5.37. VMware vMotion fails gracefully under heavy load
5.38. View session vMotion intermittently after a Linux VM acquires a license
5.39. Even when the scheduling policy is equal share, unequal GPU utilization is reported
5.40. When the scheduling policy is fixed share, GPU utilization is reported as higher than expected
5.41. nvidia-smi reports that vGPU migration is supported on all hypervisors
5.42. GPU resources not available error during VMware instant clone provisioning
5.43. VMs with 32 GB or more of RAM fail to boot with GPUs requiring 64 GB of MMIO space
5.44. Module load failed during VIB downgrade from R390 to R384
5.45. Tesla P40 cannot be used in pass-through mode
5.46. On Linux, 3D applications run slowly when windows are dragged
5.47. A segmentation fault in DBus code causes nvidia-gridd to exit on Red Hat Enterprise Linux and CentOS
5.48. No Manage License option available in NVIDIA X Server Settings by default
5.49. Licenses remain checked out when VMs are forcibly powered off
5.50. Memory exhaustion can occur with vGPU profiles that have 512 Mbytes or less of frame buffer
5.51. vGPU VM fails to boot in ESXi 6.5 if the graphics type is Shared
5.52. ESXi 6.5 web client shows high memory usage even when VMs are idle
5.53. NVIDIA driver installation may fail for VMs on a host in a VMware DRS cluster
5.54. GNOME Display Manager (GDM) fails to start on Red Hat Enterprise Linux 7.2 and CentOS 7.0
5.55. NVIDIA Control Panel fails to start and reports that “you are not currently using a display that is attached to an Nvidia GPU”
5.56. VM configured with more than one vGPU fails to initialize vGPU when booted
5.57. A VM configured with both a vGPU and a passthrough GPU fails to start the passthrough GPU
5.58. vGPU allocation policy fails when multiple VMs are started simultaneously
5.59. Before Horizon agent is installed inside a VM, the Start menu’s sleep option is available
5.60. vGPU-enabled VMs fail to start, nvidia-smi fails when VMs are configured with too high a proportion of the server’s memory
5.61. On reset or restart VMs fail to start with the error VMIOP: no graphics device is available for vGPU
5.62. nvidia-smi shows high GPU utilization for vGPU VMs with active Horizon sessions
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.

Note: The most current version of the documentation for this release of NVIDIA vGPU software can be found online at NVIDIA Virtual GPU Software Documentation.

1.1. NVIDIA vGPU Software Driver Versions

Each release in this release family of NVIDIA vGPU software includes a specific version of the NVIDIA Virtual GPU Manager, NVIDIA Windows driver, and NVIDIA Linux driver.

<table>
<thead>
<tr>
<th>Software</th>
<th>11.0</th>
<th>11.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVIDIA Virtual GPU Manager for the VMware vSphere releases</td>
<td>450.55</td>
<td>450.80</td>
</tr>
<tr>
<td>listed in Hypervisor Software Releases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NVIDIA Windows driver</td>
<td>451.48</td>
<td>452.39</td>
</tr>
<tr>
<td>NVIDIA Linux driver</td>
<td>450.51.05</td>
<td>450.80.02</td>
</tr>
</tbody>
</table>

1.2. Compatibility Requirements for the NVIDIA vGPU Manager and Guest VM Driver

The releases of the NVIDIA vGPU Manager and guest VM drivers that you install must be compatible. If you install the wrong guest VM driver release for the release of the vGPU Manager that you are using, the NVIDIA vGPU fails to load. See VM running an incompatible NVIDIA vGPU guest driver fails to initialize vGPU when booted.

Note: This requirement does not apply to the NVIDIA vGPU software license server. All releases in this release family of NVIDIA vGPU software are compatible with all releases of the license server.
Compatible NVIDIA vGPU Manager and Guest VM Driver Releases

The following combinations of NVIDIA vGPU Manager and guest VM driver releases are compatible with each other.

- NVIDIA vGPU Manager with guest VM drivers from the same release
- NVIDIA vGPU Manager with guest VM drivers from different releases within the same major release branch
  
  In this situation, the combination supports only the features, hardware, and software (including guest OSes) that are supported on both releases.

- NVIDIA vGPU Manager from a later major release branch with guest VM drivers from the previous branch
  
  In this situation, the combination supports only the features, hardware, and software (including guest OSes) that are supported on both releases.

The following table lists the specific software releases that are compatible with the components in the NVIDIA vGPU software 11 major release branch.

<table>
<thead>
<tr>
<th>NVIDIA vGPU Software Component</th>
<th>Releases</th>
<th>Compatible Software Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVIDIA vGPU Manager</td>
<td>11.0 through 11.1</td>
<td>◆ Guest VM driver releases 11.0 through 11.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◆ All guest VM driver 10.x releases</td>
</tr>
<tr>
<td>Guest VM drivers</td>
<td>11.0 through 11.1</td>
<td>NVIDIA vGPU Manager releases 11.0 through 11.1</td>
</tr>
</tbody>
</table>

Incompatible NVIDIA vGPU Manager and Guest VM Driver Releases

The following combinations of NVIDIA vGPU Manager and guest VM driver releases are incompatible with each other.

- NVIDIA vGPU Manager from a later major release branch with guest VM drivers from two or more major releases before the release of the vGPU Manager
- NVIDIA vGPU Manager from an earlier major release branch with guest VM drivers from a later branch

The following table lists the specific software releases that are incompatible with the components in the NVIDIA vGPU software 11 major release branch.

<table>
<thead>
<tr>
<th>NVIDIA vGPU Software Component</th>
<th>Releases</th>
<th>Incompatible Software Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVIDIA vGPU Manager</td>
<td>11.0 through 11.1</td>
<td>All guest VM driver releases 9.x and earlier</td>
</tr>
<tr>
<td>Guest VM drivers</td>
<td>11.0 through 11.1</td>
<td>All NVIDIA vGPU Manager releases 10.x and earlier</td>
</tr>
</tbody>
</table>
1.3. Updates in Release 11.0

New Features in Release 11.0

- Cross-branch driver support
  This change allows a release of the Virtual GPU Manager from a later major release branch to be used with the NVIDIA vGPU software graphics drivers for the guest VMs from the previous branch.
- Licensing grace period for unlicensed virtual GPUs and physical GPUs
  An unlicensed virtual GPU or physical GPU initially operates at full capability but its performance is degraded over time if a license is not obtained.
- Miscellaneous bug fixes

Hardware and Software Support Introduced in Release 11.0

- Support for Windows 10 May 2020 Update (2004) as a guest OS
- Support for Ubuntu 20.04 LTS as a guest OS
- Support for VMware Horizon 2006 (8.0)

Feature Support Withdrawn in Release 11.0

- The following guest OS releases are no longer supported:
  - Windows Server 2012
  - Windows Server 2008 R2
  - Windows 8.1
  - Windows 8
  - Windows 7

1.4. Updates in Release 11.1

New Features in Release 11.1

- Miscellaneous bug fixes

Hardware and Software Support Introduced in Release 11.1

- Support for the following GPUs:
  - NVIDIA A100 PCIe 40GB
- NVIDIA A100 HGX 40GB
- Support for the Red Hat Enterprise Linux 7.9 as a guest OS

**Feature Support Withdrawn in Release 11.1**

- Windows Server 2012 R2 is no longer supported as a guest OS with GPUs based on architectures after NVIDIA Turing™ architecture.
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 R450 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 (NVIDIA Virtual Compute Server (vCS) is not supported.)
  - Tesla M10 (vCS is not supported.)
  - Tesla M60 (vCS is not supported.)

- 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 is not supported.)
  - Tesla V100 SXM2 32GB (vSGA is not supported.)
  - Tesla V100 PCIe (vSGA is not supported.)
Validated Platforms

- Tesla V100 PCIe 32GB (vSGA is **not** supported.)
- Tesla V100S PCIe 32GB (vSGA is **not** supported.)
- Tesla V100 FHHL (vSGA is **not** supported.)
- GPUs based on the NVIDIA Turing™ architecture:
  - Tesla T4 (vSGA is **not** supported.)
  - Quadro RTX 6000 in displayless mode (vSGA is **not** supported.)
  - Quadro RTX 6000 passive in displayless mode (vSGA is **not** supported.)
  - Quadro RTX 8000 in displayless mode (vSGA is **not** supported.)
  - Quadro RTX 8000 passive in displayless mode (vSGA is **not** supported.)

  In displayless mode, local physical display connectors are disabled.

- GPUs based on the NVIDIA Ampere architecture:
  - **Since 11.1:** NVIDIA A100 PCIe 40GB (supports only GPU pass through)
  - **Since 11.1:** NVIDIA A100 HGX 40GB (supports only GPU pass through)

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

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**Note:**

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.

Even in compute mode, Tesla M60 and M6 GPUs do **not** support NVIDIA Virtual Compute Server vGPU types.

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**Requirements for Using C-Series vCS vGPUs**

Because C-Series vCS vGPUs have large BAR memory settings, using these vGPUs 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 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](https://kb.vmware.com/s/article/2142307).
Because the VM’s MMIO space must be increased to 64 GB, vCS requires ESXi 6.0 Update 3 and later, or ESXi 6.5 and later.

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]
- VMs with 32 GB or more of RAM fail to boot with GPUs requiring 64 GB of MMIO space

With ESXi 6.7 or later, no extra configuration is needed.

The following GPUs require 64 GB of MMIO space:

- Tesla P6
- Tesla P40
- Tesla P100 (all variants)
- Tesla V100 (all variants)

Requirements for Using GPUs Requiring Large MMIO Space in Pass-Through Mode

- The following GPUs require 32 GB of MMIO space in pass-through mode:
  - Tesla V100 (all 16GB variants)
  - Tesla P100 (all variants)
  - Tesla P6

- The following GPUs require 64 GB of MMIO space in pass-through mode.
  - Quadro RTX 8000 passive
  - Quadro RTX 6000 passive
  - Tesla V100 (all 32GB variants)
  - Tesla P40

- 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 must be enabled for the VM.
If the total BAR1 memory exceeds 256 Mbytes, EFI boot must be enabled for the VM.

Note: To determine the total BAR1 memory, run `nvidia-smi -q` on the host.

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).

**Linux Only: Error Messages for Misconfigured GPUs Requiring Large MMIO Space**

In a Linux VM, if the requirements for using C-Series vCS vGPUs or GPUs requiring large MMIO space in pass-through mode are not met, the following error messages are written to the VM’s `dmesg` log during installation of the NVIDIA vGPU software graphics driver:

```
NVRM: BAR1 is 0M @ 0x0 (PCI:0000:02:02.0)
[  90.823015] NVRM: The system BIOS may have misconfigured your GPU.
[  90.823019] nvidia: probe of 0000:02:02.0 failed with error -1
[  90.823031] NVRM: The NVIDIA probe routine failed for 1 device(s).
```

### 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.

*Note: 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.

<table>
<thead>
<tr>
<th>Software</th>
<th>Release Supported</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware vSphere Hypervisor</td>
<td>7.0 and compatible updates</td>
<td>All NVIDIA GPUs that support NVIDIA vGPU software are supported.</td>
</tr>
<tr>
<td>(ESXi) 7.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>Release Supported</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| VMware vSphere Hypervisor | 6.7 and compatible updates             | **Since 11.1:** The following GPUs are supported in GPU pass through mode **only** and are **not** supported in any mode on NVIDIA vGPU software 11.0:  
  - NVIDIA A100 PCIe 40GB  
  - NVIDIA A100 HGX 40GB  
  All NVIDIA GPUs that support NVIDIA vGPU software are supported.  
  **Since 11.1:** The following GPUs are supported in GPU pass through mode **only** and are **not** supported in any mode on NVIDIA vGPU software 11.0:  
  - NVIDIA A100 PCIe 40GB  
  - NVIDIA A100 HGX 40GB  
  Starting with release 6.7 U3, the assignment of multiple vGPUs to a single VM is supported.  
  Starting with release 6.7 U1, vMotion with vGPU and suspend and resume with vGPU are supported on suitable GPUs as listed in [Supported NVIDIA GPUs and Validated Server Platforms](#).  
  Release 6.7 supports only suspend and resume with vGPU. vMotion with vGPU is **not** supported on release 6.7. |
| VMware vSphere Hypervisor | 6.5 and compatible updates             | All NVIDIA GPUs that support NVIDIA vGPU software are supported.  
  **Since 11.1:** The following GPUs are supported in GPU pass through mode **only** and are **not** supported in any mode on NVIDIA vGPU software 11.0:  
  - NVIDIA A100 PCIe 40GB  
  - NVIDIA A100 HGX 40GB  
  Requires VMware vSphere Hypervisor [ESXi] 6.5 patch P03 (ESXi650-201811002, build 10884925) or later from VMware  
  All NVIDIA GPUs that support NVIDIA vGPU software are supported.  
  **Since 11.1:** The following GPUs are supported in GPU pass through mode **only** and are **not** supported in any mode on NVIDIA vGPU software 11.0:  
  - NVIDIA A100 PCIe 40GB  
  - NVIDIA A100 HGX 40GB  
  Requires VMware vSphere Hypervisor [ESXi] 6.5 patch P03 (ESXi650-201811002, build 10884925) or later from VMware |
Validated Platforms

<table>
<thead>
<tr>
<th>Software</th>
<th>Release Supported</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>not supported in any mode on NVIDIA vGPU software 11.0:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ NVIDIA A100 PCIe 40GB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ NVIDIA A100 HGX 40GB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The following features of NVIDIA vGPU software are not supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Assignment of multiple vGPUs to a single VM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Suspend-resume with vGPU</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ vMotion with vGPU</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Live VMware snapshots with vGPU</td>
</tr>
</tbody>
</table>

Supported Management Software and Virtual Desktop Software Releases

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

Note: 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.

<table>
<thead>
<tr>
<th>Software</th>
<th>Releases Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware Horizon</td>
<td>2006 [8.0] and compatible updates</td>
</tr>
<tr>
<td></td>
<td>7.12 and compatible 7.12.x updates</td>
</tr>
<tr>
<td></td>
<td>7.11 and compatible 7.11.x updates</td>
</tr>
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<td></td>
<td>7.10 and compatible 7.10.x updates</td>
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</tr>
<tr>
<td></td>
<td>7.4 and compatible 7.4.x updates</td>
</tr>
<tr>
<td></td>
<td>7.3 and compatible 7.3.x updates</td>
</tr>
</tbody>
</table>
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.

Note:
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.

Note:
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.

<table>
<thead>
<tr>
<th>Guest OS</th>
<th>NVIDIA vGPU - VMware vSphere Releases</th>
<th>Pass-Through GPU - VMware vSphere Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2019</td>
<td>7.0, 6.7, 6.5 update 2, 6.5 update 1</td>
<td>7.0, 6.7, 6.5 update 2, 6.5 update 1</td>
</tr>
<tr>
<td>Windows Server 2016 1709, 1607</td>
<td>7.0, 6.7, 6.5</td>
<td>7.0, 6.7, 6.5</td>
</tr>
</tbody>
</table>
### Validated Platforms

#### Virtual GPU Software R450 for VMware vSphere

**RN-07347-001 _v11.0 through 11.1**  

<table>
<thead>
<tr>
<th>Guest OS</th>
<th><strong>NVIDIA vGPU - VMware vSphere Releases</strong></th>
<th><strong>Pass-Through GPU - VMware vSphere Releases</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2012 R2 (not supported on GPUs based on architectures after the NVIDIA Turing™ architecture)</td>
<td>7.0, 6.7, 6.5</td>
<td>7.0, 6.7, 6.5</td>
</tr>
<tr>
<td>Windows 10:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‣ May 2020 Update (2004)</td>
<td>7.0, 6.7, 6.5</td>
<td>7.0, 6.7, 6.5</td>
</tr>
<tr>
<td>‣ November 2019 Update (1909)</td>
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<tr>
<td>‣ May 2019 Update (1903)</td>
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<tr>
<td>‣ October 2018 Update (1809)</td>
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<tr>
<td>‣ Spring Creators Update (1803)</td>
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<td>‣ Fall Creators Update (1709)</td>
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<tr>
<td>‣ Creators Update (1703)</td>
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<td>‣ Anniversary Update (1607)</td>
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<tr>
<td>‣ November Update (1511)</td>
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<tr>
<td>‣ RTM (1507)</td>
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</tr>
</tbody>
</table>

**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.

**Note:**

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.

<table>
<thead>
<tr>
<th>Guest OS</th>
<th><strong>NVIDIA vGPU - VMware vSphere Releases</strong></th>
<th><strong>Pass-Through GPU - VMware vSphere Releases</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat Enterprise Linux 8.2</td>
<td>7.0, 6.7, 6.5 update 3</td>
<td>7.0, 6.7, 6.5 update 3</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 8.1</td>
<td>7.0, 6.7, 6.5 update 3</td>
<td>7.0, 6.7, 6.5 update 3</td>
</tr>
<tr>
<td>CentOS Linux 8 (1911)</td>
<td>7.0, 6.7, 6.5 update 3</td>
<td>7.0, 6.7, 6.5 update 3</td>
</tr>
<tr>
<td>CentOS 8.0</td>
<td>7.0, 6.7, 6.5 update 3</td>
<td>7.0, 6.7, 6.5 update 3</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 7.6-7.9 and later compatible 7.x versions</td>
<td>7.0, 6.7, 6.5</td>
<td>7.0, 6.7, 6.5</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 7.6-7.8 and later compatible 7.x versions</td>
<td>7.0, 6.7, 6.5</td>
<td>7.0, 6.7, 6.5</td>
</tr>
</tbody>
</table>
2.4. NVIDIA CUDA Toolkit Version Support

The releases in this release family of NVIDIA vGPU software support NVIDIA CUDA Toolkit 11.0.

For more information about NVIDIA CUDA Toolkit, see CUDA Toolkit 11.0 Documentation.

Note:
- If you are using NVIDIA vGPU software with CUDA on Linux, avoid conflicting installation methods by installing CUDA from a distribution-independent runfile package. Do not install CUDA from distribution-specific RPM or Deb package.
- To ensure that the NVIDIA vGPU software graphics driver is not overwritten when CUDA is installed, deselect the CUDA driver when selecting the CUDA components to install.
- For more information, see NVIDIA CUDA Installation Guide for Linux.

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
Validated Platforms

- Tesla P6
- Tesla P40
- Tesla V100 SXM2
- Tesla V100 SXM2 32GB
- Tesla V100 PCIe
- Tesla V100 PCIe 32GB
- Tesla V100S PCIe 32GB
- Tesla V100 FHHL
- Tesla T4
- Quadro RTX 6000
- Quadro RTX 6000 passive
- Quadro RTX 8000
- Quadro RTX 8000 passive

Note: A VM configured with a C-series vGPU on a Quadro RTX 8000 passive or Quadro RTX 6000 passive GPU cannot be migrated between a host that is running a vGPU manager from an NVIDIA vGPU software 11 release and a host running a vGPU manager from an NVIDIA vGPU software 10 release.

Supported VMware vSphere Hypervisor (ESXi) releases:
- Release 7.0 and compatible updates support vMotion with vGPU and suspend-resume with vGPU.
- 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.

2.6. Multiple vGPU Support

To support applications and workloads that are compute or graphics intensive, multiple vGPUs can be added to a single VM. The assignment of more than one vGPU to a VM is supported only on a subset of vGPUs and VMware vSphere Hypervisor (ESXi) releases.

Supported vGPUs

Only Q-series and C-series vGPUs that are allocated all of the physical GPU’s frame buffer are supported.
<table>
<thead>
<tr>
<th>GPU Architecture</th>
<th>Board</th>
<th>vGPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turing</td>
<td>Tesla T4</td>
<td>T4-16Q</td>
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<td>T4-16C</td>
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<tr>
<td></td>
<td>Quadro RTX 6000</td>
<td>RTX6000-24Q</td>
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<td>RTX6000-24C</td>
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<td></td>
<td>Quadro RTX 6000 passive</td>
<td>RTX6000P-24Q</td>
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<td>Quadro RTX 8000</td>
<td>RTX8000-48Q</td>
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<td>RTX8000P-48C</td>
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<tr>
<td>Volta</td>
<td>Tesla V100 SXM2 32GB</td>
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<td>V100D-32C</td>
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<td>Tesla V100 PCIe 32GB</td>
<td>V100D-32Q</td>
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<td>V100D-32C</td>
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<td>Tesla V100S PCIe 32GB</td>
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<td>V100X-16Q</td>
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<td></td>
<td>Tesla V100 PCIe</td>
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<tr>
<td></td>
<td>Tesla V100 FHHL</td>
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<td>V100L-16C</td>
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<tr>
<td>Pascal</td>
<td>Tesla P100 SXM2</td>
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<td>P100-16Q</td>
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<tr>
<td></td>
<td>Tesla P100 PCIe 12GB</td>
<td>P100C-12Q</td>
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<td></td>
<td>P100C-12C</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Tesla P6</td>
<td>P6-16Q</td>
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<td>P6-16C</td>
</tr>
</tbody>
</table>
**Validated Platforms**

<table>
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</tr>
</thead>
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<td></td>
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<td>P4-8Q</td>
</tr>
<tr>
<td></td>
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<td>P4-8C</td>
</tr>
<tr>
<td>Maxwell</td>
<td>Tesla M60</td>
<td>M60-8Q</td>
</tr>
<tr>
<td></td>
<td>Tesla M10</td>
<td>M10-8Q</td>
</tr>
<tr>
<td></td>
<td>Tesla M6</td>
<td>M6-8Q</td>
</tr>
</tbody>
</table>

**Maximum vGPUs per VM**

NVIDIA vGPU software supports up to a maximum of four vGPUs per VM on VMware vSphere Hypervisor (ESXi).

**Supported Hypervisor Releases**

VMware vSphere Hypervisor (ESXi) 7.0 and 6.7 U3 and later compatible updates only.

If you upgraded to VMware vSphere 6.7 Update 3 from an earlier version and are using VMs that were created with that version, change the VM compatibility to [vSphere 6.7 Update 2 and later](#). For details, see [Virtual Machine Compatibility](#) in the VMware documentation.

### 2.7. Peer-to-Peer CUDA Transfers over NVLink Support

Peer-to-peer CUDA transfers enable device memory between vGPUs on different GPUs that are assigned to the same VM to be accessed from within the CUDA kernels. NVLink is a high-bandwidth interconnect that enables fast communication between such vGPUs. Peer-to-Peer CUDA Transfers over NVLink is supported only on a subset of vGPUs, VMware vSphere Hypervisor (ESXi) releases, and guest OS releases.

**Supported vGPUs**

Only Q-series and C-series vGPUs that are allocated all of the physical GPU’s frame buffer on physical GPUs that support NVLink are supported.

<table>
<thead>
<tr>
<th>GPU Architecture</th>
<th>Board</th>
<th>vGPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turing</td>
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<td>RTX8000-48Q</td>
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<td>RTX8000-48C</td>
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</tbody>
</table>
## GPU Architecture

<table>
<thead>
<tr>
<th>Board</th>
<th>vGPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadro RTX 8000 passive</td>
<td>RTX8000P-48Q</td>
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<td></td>
<td>RTX8000P-48C</td>
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<tr>
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<td>Tesla V100 SXM2 32GB</td>
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<td>Tesla V100 SXM2</td>
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<td>Tesla P100 SXM2</td>
<td>P100X-16Q</td>
</tr>
<tr>
<td></td>
<td>P100X-16C</td>
</tr>
</tbody>
</table>

### Supported Hypervisor Releases

Peer-to-Peer CUDA Transfers over NVLink are supported on all hypervisor releases that support the assignment of more than one vGPU to a VM. For details, see [Multiple vGPU Support](#).

### Supported Guest OS Releases

Linux only. Peer-to-Peer CUDA Transfers over NVLink are **not** supported on Windows.

### Limitations

- Only direct connections are supported. NVSwitch is not supported.
- PCIe is not supported.
- SLI is not supported.
Chapter 3. Known Product Limitations

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

3.1. Issues occur when the channels allocated to a vGPU are exhausted

Description

Issues occur when the channels allocated to a vGPU are exhausted and the guest VM to which the vGPU is assigned fails to allocate a channel to the vGPU. A physical GPU has a fixed number of channels and the number of channels allocated to each vGPU is inversely proportional to the maximum number of vGPUs allowed on the physical GPU.

When the channels allocated to a vGPU are exhausted and the guest VM fails to allocate a channel, the following errors are reported on the hypervisor host or in an NVIDIA bug report:

| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): Guest attempted to allocate channel above its max channel limit 0xfb |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): VGPU message 6 failed, result code: 0x1a |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): 0xc1d004a1, 0xff0e0000, 0xff0400fb, 0x3c36f, |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): 0xc1d004a1, 0xff0e0000, 0xff0400fb, 0x3c36f, |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): 0xc1d004a1, 0xff0e0000, 0xff0400fb, 0x3c36f, |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): 0xc1d004a1, 0xff0e0000, 0xff0400fb, 0x3c36f, |
| Jun 26 08:01:25 srvxen06f vgpu-3[14276]: error: vmiop_log: (0x0): 0xc1d004a1, 0xff0e0000, 0xff0400fb, 0x3c36f, |

Workaround

Use a vGPU type with more frame buffer, thereby reducing the maximum number of vGPUs allowed on the physical GPU. As a result, the number of channels allocated to each vGPU is increased.
3.2. Total frame buffer for vGPUs is less than the total frame buffer on the physical GPU

Some of the physical GPU’s frame buffer is used by the hypervisor on behalf of the VM for allocations that the guest OS would otherwise have made in its own frame buffer. The frame buffer used by the hypervisor is not available for vGPUs on the physical GPU. In NVIDIA vGPU deployments, frame buffer for the guest OS is reserved in advance, whereas in bare-metal deployments, frame buffer for the guest OS is reserved on the basis of the runtime needs of applications.

If error-correcting code (ECC) memory is enabled on a physical GPU that does not have HBM2 memory, the amount of frame buffer that is usable by vGPUs is further reduced. All types of vGPU are affected, not just vGPUs that support ECC memory.

On all GPUs that support ECC memory and, therefore, dynamic page retirement, additional frame buffer is allocated for dynamic page retirement. The amount that is allocated is inversely proportional to the maximum number of vGPUs per physical GPU. All GPUs that support ECC memory are affected, even GPUs that have HBM2 memory or for which ECC memory is disabled.

The approximate amount of frame buffer that NVIDIA vGPU software reserves can be calculated from the following formula:

\[
\text{max-reserved-fb} = \frac{\text{vgpu-profile-size-in-mb}}{16} + 16 + \text{ecc-adjustments} + \text{page-retirement-allocation}
\]

- **max-reserved-fb**: The maximum total amount of reserved frame buffer in Mbytes that is not available for vGPUs.
- **vgpu-profile-size-in-mb**: The amount of frame buffer in Mbytes allocated to a single vGPU. This amount depends on the vGPU type. For example, for the T4-16Q vGPU type, vgpu-profile-size-in-mb is 16384.
- **ecc-adjustments**: The amount of frame buffer in Mbytes that is not usable by vGPUs when ECC is enabled on a physical GPU that does not have HBM2 memory.
  - If ECC is enabled on a physical GPU that does not have HBM2 memory ecc-adjustments is fb-without-ecc/16, which is equivalent to 64 Mbytes for every Gbyte of frame buffer assigned to the vGPU. fb-without-ecc is total amount of frame buffer with ECC disabled.
  - If ECC is disabled or the GPU has HBM2 memory, ecc-adjustments is 0.
- **page-retirement-allocation**: The amount of frame buffer in Mbytes that is reserved for dynamic page retirement.
  - On GPUs based on the NVIDIA Maxwell GPU architecture, page-retirement-allocation = 4/\text{max-vgpus-per-gpu}.
On GPUs based on NVIDIA GPU architectures **after** the Maxwell architecture, \( \text{page-retirement-allocation} = 128 + \text{max-vgpus-per-gpu} \)

**max-vgpus-per-gpu**

The maximum number of vGPUs that can be created simultaneously on a physical GPU. This number varies according to the vGPU type. For example, for the T4-16Q vGPU type, \( \text{max-vgpus-per-gpu} \) is 1.

---

**Note:** In VMs running Windows Server 2012 R2, which supports Windows Display Driver Model (WDDM) 1.x, an additional 48 Mbytes of frame buffer are reserved and not available for vGPUs.

---

### 3.3. 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.
3.4. In pass through mode, all GPUs connected to each other through NVLink must be assigned to the same VM

Description
In pass through mode, all GPUs connected to each other through NVLink must be assigned to the same VM. If a subset of GPUs connected to each other through NVLink is passed through to a VM, unrecoverable error XID 74 occurs when the VM is booted. This error corrupts the NVLink state on the physical GPUs and, as a result, the NVLink bridge between the GPUs is unusable.

Workaround
Restore the NVLink state on the physical GPUs by resetting the GPUs or rebooting the hypervisor host.

3.5. 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.
3.6. **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.

3.7. **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.

Depending on the version of NVIDIA vGPU software that you are using, the log file on the VMware vSphere host might also report the following errors:

2016-10-27T04:36:21.128Z cpu74:70210)Failed to DMA map address 0x118d296c00 (0x4000): Can't meet address mask of the device..

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.

**3.8. VM running an incompatible NVIDIA vGPU guest driver fails to initialize vGPU when booted**

**Description**

A VM running a version of the NVIDIA guest VM driver that is incompatible with the current release of Virtual GPU Manager will fail to initialize vGPU when booted on a VMware vSphere platform running that release of Virtual GPU Manager.

A guest VM driver is incompatible with the current release of Virtual GPU Manager in either of the following situations:

- The guest driver is from a release in a branch two or more major releases before the current release, for example release 9.4.

  In this situation, the VMware vSphere VM’s log file reports the following error:

  ```
  vmiop_log: (0x0): Incompatible Guest/Host drivers: Guest VGX version is older than the minimum version supported by the Host. Disabling vGPU.
  ```

- The guest driver is from a later release than the Virtual GPU Manager.

  In this situation, the VMware vSphere VM’s log file reports the following error:

  ```
  vmiop_log: (0x0): Incompatible Guest/Host drivers: Guest VGX version is newer than the maximum version supported by the Host. Disabling vGPU.
  ```

In either situation, 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)
```  

**Resolution**

Install a release of the NVIDIA guest VM driver that is compatible with current release of Virtual GPU Manager.
3.9. 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.

Note: 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.

### 3.10. 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 \texttt{pciPassthru0.cfg.enable_large_sys_mem} in the VM’s advanced configuration options.

\begin{quote}
\textbf{Note:} This setting can only be changed when the VM is powered off.
\end{quote}

1. Select \textit{Edit Settings}.
2. In \textit{Edit Settings} window, select the \textbf{VM Options} tab.
3. From the \textbf{Advanced} drop-down list, select \textit{Edit Configuration}.
4. In the \textbf{Configuration Parameters} dialog box, click Add Row.
5. In the \textbf{Name} field, type the parameter name \texttt{pciPassthru0.cfg.enable_large_sys_mem}, in the \textbf{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 \texttt{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 \texttt{pciPassthru0.cfg.extra_fb_reservation} to 128.

The reservation can be reverted back to its default setting by setting \texttt{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 11.0

<table>
<thead>
<tr>
<th>Bug ID</th>
<th>Summary and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200275925</td>
<td><strong>Resolution is not updated after a VM acquires a license and is restarted</strong></td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

### Issues Resolved in Release 11.1

<table>
<thead>
<tr>
<th>Bug ID</th>
<th>Summary and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200626446</td>
<td><strong>11.0 Only: Failure to allocate resources causes VM failures or crashes</strong></td>
</tr>
<tr>
<td></td>
<td>Failure to allocate resources causes VM failures or crashes. When the error occurs, the error message NVOS status 0x19 is written to the log file on the hypervisor host. Depending on the resource and the underlying cause of the failure, VGPU message 52 failed, VGPU message 4 failed, VGPU message 21 failed, and VGPU message 10 failed might also be written to the log file on the hypervisor host.</td>
</tr>
<tr>
<td>3087984</td>
<td><strong>11.0 Only: The NVIDIA license not present notification appears even for VMs for which the vGPU is licensed</strong></td>
</tr>
<tr>
<td></td>
<td>After starting and logging on to a Windows VM that is configured with NVIDIA vGPU, users see the NVIDIA license not present notification even when the vGPU is already licensed. This notification is misleading and should be ignored. This issue occurs because the NVIDIA driver is not storing the correct NVIDIA vGPU software license state.</td>
</tr>
</tbody>
</table>
Chapter 5. Known Issues

5.1. Since 11.1: Licensing event logs indicate license renewal from unavailable primary server

Description
Licensing event logs for the guest VM indicate that a license is renewed from primary license server even when primary license server is unavailable and the license is renewed from the secondary server.

Workaround
None. However, these incorrect event log entries are benign and can be ignored.

Status
Open

Ref. #
200658253

5.2. 11.0 Only: The NVIDIA license not present notification appears even for VMs for which the vGPU is licensed

Description
After starting and logging on to a Windows VM that is configured with NVIDIA vGPU, users see the NVIDIA license not present notification even when the vGPU is already licensed. This
Known Issues

Virtual GPU Software R450 for VMware vSphere

RN-07347-001_v11.0 through 11.1

This issue affects Windows server and Windows desktop operating systems.

Version

Workaround

While the misleading notifications can be ignored, this workaround can be used to suppress the notifications if they cause confusion.

CAUTION: This workaround suppresses all notifications, even valid notifications, from NVIDIA Container. Therefore, use this workaround only if immediate resolution is needed.

1. When the notification appears, grab it by right-clicking in the notification window.

2. In Action Center, go to Windows notifications for NVIDIA Container, right-click the notification, and click Go to notification settings.
3. In the notification settings for NVIDIA Container, set Show notification banners to Off.
If necessary, you can reenable these notifications in one of the following ways:

- **Use System settings** as follows:

  1. In **Notifications & actions**, under **Get notifications from these senders**, select **NVIDIA Container** to see more settings.

     ![Get notifications from these senders](image)

     2. In the notification settings for **NVIDIA Container**, set the **Show notification banners** option to **On**.

     ![Settings](image)

- **Set the Windows registry key** `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Notifications\Settings\Microsoft.Explorer.Notification.{D38519CE-37BE-5DFF-CF14-CC1848376559}\ShowBanner` to **1**.
5.3. Driver upgrade in a Linux guest VM with multiple vGPUs might fail

Description
Upgrading the NVIDIA vGPU software graphics driver in a Linux guest VM with multiple vGPUs might fail. This issue occurs if the driver is upgraded by overinstalling the new release of the driver on the current release of the driver while the `nvidia-gridd` service is running in the VM.

Workaround
1. Stop the `nvidia-gridd` service.
2. Try again to upgrade the driver.

Status
Open

Ref. #
200633548
5.4. **11.0 Only: Failure to allocate resources causes VM failures or crashes**

**Description**
Failure to allocate resources causes VM failures or crashes. When the error occurs, the error message NVOS status 0x19 is written to the log file on the hypervisor host. Depending on the resource and the underlying cause of the failure, VGPU message 52 failed, VGPU message 4 failed, VGPU message 21 failed, and VGPU message 10 failed might also be written to the log file on the hypervisor host.

**Status**
Resolved in NVIDIA vGPU software 11.1

**Ref. #**
200626446

5.5. **NVIDIA Control Panel fails to start if launched too soon from a VM without licensing information**

**Description**
If NVIDIA licensing information is not configured on the system, any attempt to start NVIDIA Control Panel by right-clicking on the desktop within 30 seconds of the VM being started fails.

**Workaround**
Restart the VM and wait at least 30 seconds before trying to launch NVIDIA Control Panel.

**Status**
Open

**Ref. #**
200623179
5.6. Citrix Virtual Apps and Desktops session corruption occurs in the form of residual window borders

Description
When a window is dragged across the desktop in a Citrix Virtual Apps and Desktops session, corruption of the session in the form of residual window borders occurs.

Version
This issue affects only Citrix Virtual Apps and Desktops version 7.2003

Workaround
Use Citrix Virtual Apps and Desktops version 7.1912 or 2006.

Status
Not an NVIDIA bug

Ref. #
200608675

5.7. VMware Horizon clients that use PCoIP cannot connect to a Windows 10 2004 VM with multiple displays

Description
VMware Horizon clients that use PC over IP (PCoIP) cannot connect to a Windows 10 2004 VM with multiple displays. When this issue occurs, clients cannot connect to the VM even if only a single display is connected to it.

The desktop capture mechanism for VMware Horizon clients that use PCoIP is provided by NVIDIA® Frame Buffer Capture (NVFBC). NVFBC is deprecated on Windows 10 starting with Windows 10 October 2019 Update. For more information, see NVFBC Windows 10 Support Deprecation Technical Bulletin (PDF).
Version
This issue affects only Windows 10 May 2020 Update (2004) guest VMs.

Workaround
For a configuration with multiple displays, use the VMware Blast Extreme display protocol.

Status
Not an NVIDIA bug

Ref. #
200607827

5.8. Suspend and resume between hosts running different versions of the vGPU manager fails

Description
Suspending a VM configured with vGPU on a host running one version of the vGPU manager and resuming the VM on a host running a version from an older main release branch fails. For example, suspending a VM on a host that is running the vGPU manager from release 11.1 and resuming the VM on a host running the vGPU manager from release 10.4 fails. When this issue occurs, the error One or more devices (pciPassthru0) required by VM vm-name are not available on host host-name is reported on VMware vCenter Server.

Status
Not an NVIDIA bug

Ref. #
200602087
5.9. Remoting solution session freezes with VGPU message 21 failed and VGPU message 14 failed errors

Description
The remoting solution session sometimes freezes while a window is being resized. For a Windows guest VM, the error message VGPU message 21 failed is written to the log file on the hypervisor host. For a Linux guest VM, the error messages VGPU message 21 failed and VGPU message 14 failed are written to the log file on the hypervisor host.

Workaround
Try resizing the window again.

Status
Open

Ref. #
200627445

5.10. Displays are not driven by NVIDIA vGPU and only Manage License is available

Description
If VMware Horizon is used to connect to a VM after the VM is restarted or shut down and started again, displays are not driven by NVIDIA vGPU and only the Manage License page is available in NVIDIA Control Panel.

Workaround
Disconnect and reconnect or log off and log on again.

Status
Open
5.11. On Linux, a VMware Horizon 7.12 session freezes after a switch to full screen

Description
On a Linux VM configured with a -1Q vGPU, one 4K display, and VMware Horizon 7.12, the VMware Horizon session might become unresponsive after a switch from large screen (windowed) to full screen. When this issue occurs, the VMware vSphere VM’s log file contains the error message Unable to set requested topology.

Version
This issue affects deployments that use VMware Horizon 7.12.

Workaround
Use VMware Horizon 7.11.

Status
Open

Ref. #
200617112

5.12. On Linux, a VMware Horizon 7.12 session with two 4K displays freezes

Description
On a Linux VM configured with a -1Q vGPU, two 4K displays, and VMware Horizon 7.12, the VMware Horizon session might become unresponsive. When this issue occurs, the VMware vSphere VM’s log file contains the error message Failed to setup capture session (error 8). Unable to allocate video memory.
Version
This issue affects deployments that use VMware Horizon 7.12.

Workaround
Use VMware Horizon 7.11 or a vGPU with more frame buffer.

Status
Open

Ref. #
200617081

5.13. On Linux, the frame rate might drop to 1 after several minutes

Description
On Linux, the frame rate might drop to 1 frame per second (FPS) after NVIDIA vGPU software has been running for several minutes. Only some applications are affected, for example, glxgears. Other applications, such as Unigine Heaven, are not affected. This behavior occurs because Display Power Management Signaling (DPMS) for the Xorg server is enabled by default and the display is detected to be inactive even when the application is running. When DPMS is enabled, it enables power saving behavior of the display after several minutes of inactivity by setting the frame rate to 1 FPS.

Workaround
1. If necessary, stop the Xorg server.
   
   # /etc/init.d/xorg stop

2. In a plain text editor, edit the /etc/X11/xorg.conf file to set the options to disable DPMS and disable the screen saver.
   
   a). In the Monitor section, set the DPMS option to false.
      
      Option "DPMS" "false"
   
   b). At the end of the file, add a ServerFlags section that contains option to disable the screen saver.
      
      Section "ServerFlags"
      Option "BlankTime" "0"
      EndSection
   
   c). Save your changes to /etc/X11/xorg.conf file and quit the editor.

3. Start the Xorg server.
5.14. Frame buffer consumption grows with VMware Horizon over Blast Extreme

Description
When VMware Horizon is used with the Blast Extreme display protocol, frame buffer consumption increases over time after multiple disconnections from and reconnections to a VM. This issue occurs even if the VM is in an idle state and no graphics applications are running.

Workaround
Reboot the VM.

Status
Open

Ref. #
200605900

5.15. 10.0 Only: Random purple screen crashes with nv_interrupt_handler can occur

Description
Random purple screen crashes can occur, accompanied by a stack trace that contains nv_interrupt_handler.
When the purple screen crash occurs, the hypervisor host displays a stack trace that contains entries similar to the following examples:

- nv010143rm
- nv005916rm
- nv017782rm
- nv21250rm
- nv021218rm
- nv_interrupt_handler

**Version**

NVIDIA vGPU software 10.0 only

**Workaround**

Reboot the ESXi hypervisor host.

**Status**

Resolved in NVIDIA vGPU software 10.1

**Ref. #**

2740072

5.16. **DWM crashes randomly occur in Windows VMs**

**Description**

Desktop Windows Manager (DWM) crashes randomly occur in Windows VMs, causing a blue-screen crash and the bug check CRITICAL_PROCESS_DIED. Computer Management shows problems with the primary display device.

**Version**

This issue affects Windows 10 1809, 1903 and 1909 VMs.

**Status**

Not an NVIDIA bug

**Ref. #**

2730037
5.17. **Remote desktop session freezes with assertion failure and XID error 43 after migration**

**Description**

After multiple VMs configured with vGPU on a single hypervisor host are migrated simultaneously, the remote desktop session freezes with an assertion failure and XID error 43. This issue affects only GPUs that are based on the Volta GPU architecture. It does not occur if only a single VM is migrated.

When this error occurs, the following error messages are logged to the VMware vSphere Hypervisor [ESXi] log file:

```
Jan  3 14:35:48 ch81-m1 vgpu-12[8050]: error: vmiop_log: NVOS status 0x1f
Jan  3 14:35:48 ch81-m1 vgpu-12[8050]: error: vmiop_log: Assertion Failed at 0x4b8cacf6:286
...
Jan  3 14:35:59 ch81-m1 vgpu-12[8050]: error: vmiop_log: (0x0): XID 43 detected on physical_chid:0x174, guest_chid:0x14
```

**Status**

Open

**Ref. #**

200581703

5.18. **Citrix Virtual Apps and Desktops session freezes when the desktop is unlocked**

**Description**

When a Citrix Virtual Apps and Desktops session that is locked is unlocked by pressing **Ctrl+Alt+Del**, the session freezes. This issue affects only VMs that are running Microsoft Windows 10 1809 as a guest OS.

**Version**

Microsoft Windows 10 1809 guest OS
Known Issues

Virtual GPU Software R450 for VMware vSphere RN-07347-001_v11.0 through 11.1 | 42

Workaround
Restart the VM.

Status
Not an NVIDIA bug

Ref. #
2767012

5.19. NVIDIA vGPU software graphics driver fails after Linux kernel upgrade with DKMS enabled

Description
After the Linux kernel is upgraded (for example by running sudo apt full-upgrade) with Dynamic Kernel Module Support (DKMS) enabled, the nvidia-smi command fails to run. If DKMS is enabled, an upgrade to the Linux kernel triggers a rebuild of the NVIDIA vGPU software graphics driver. The rebuild of the driver fails because the compiler version is incorrect. Any attempt to reinstall the driver fails because the kernel fails to build.

When the failure occurs, the following messages are displayed:

```
-> Installing DKMS kernel module:
  ERROR: Failed to run `/usr/sbin/dkms build -m nvidia -v 450.51.05 -k 5.3.0-28-generic':
  Kernel preparation unnecessary for this kernel. Skipping...
  Building module:
  cleaning build area...
  'make' -j8 NV_EXCLUDE_BUILD_MODULES='' KERNEL_UNAME=5.3.0-28-generic
  IGNORE_CC_MISMATCH='' modules...(bad exit status: 2)
  ERROR (dkms apport): binary package for nvidia: 450.51.05 not found
  Error! Bad return status for module build on kernel: 5.3.0-28-generic
  (x86_64)
  Consult /var/lib/dkms/nvidia/ 450.51.05/build/make.log for more information.
  -> error.
  ERROR: Failed to install the kernel module through DKMS. No kernel module was installed;
  please try installing again without DKMS, or check the DKMS logs for more information.
  ERROR: Installation has failed. Please see the file '/var/log/nvidia-installer.log' for details.
  You may find suggestions on fixing installation problems in the README available on the Linux driver download page at www.nvidia.com.
```
Workaround

When installing the NVIDIA vGPU software graphics driver with DKMS enabled, specify the `--no-cc-version-check` option.

Status

Not a bug.

Ref. #

2836271

5.20. Red Hat Enterprise Linux and CentOS 6 VMs hang during driver installation

Description

During installation of the NVIDIA vGPU software graphics driver in a Red Hat Enterprise Linux or CentOS 6 guest VM, a kernel panic occurs, and the VM hangs and cannot be rebooted. This issue is observed on older Linux kernels when the NVIDIA device is using message-signaled interrupts (MSIs).

Version

This issue affects the following guest OS releases:

- Red Hat Enterprise Linux 6.6 and later compatible 6.x versions
- CentOS 6.6 and later compatible 6.x versions

Workaround

1. Disable MSI in the guest VM to fall back to INTx interrupts by adding the following line to the file `/etc/modprobe.d/nvidia.conf`:
   ```
   options nvidia NVreg_EnableMSI=0
   ```
   If the file `/etc/modprobe.d/nvidia.conf` does not exist, create it.
2. Install the NVIDIA vGPU Software graphics driver in the guest VM.

Status

Closed

Ref. #

200556896
5.21. Publisher not verified warning during Windows 7 driver installation

Description
During installation of the NVIDIA vGPU software graphics driver for Windows on Windows 7, Windows warns that it can’t verify the publisher of the driver software. If Device Manager is used to install the driver, Device Manager warns that the driver is not digitally signed. If you install the driver, error 52 (CM_PROB_UNSIGNED_DRIVER) occurs.

This issue occurs because Microsoft is no longer dual signing WHQL-tested software binary files by using the SHA-1 and SHA-2 hash algorithms. Instead, WHQL-tested software binary files are signed only by using the SHA-2 hash algorithm. All NVIDIA vGPU software graphics drivers for Windows are WHQL tested.

By default, Windows 7 systems cannot recognize signatures that were created by using the SHA-2 hash algorithm. As a result, software binary files that are signed only by using the SHA-2 hash algorithm are considered unsigned.

For more information, see 2019 SHA-2 Code Signing Support requirement for Windows and WSUS on the Microsoft Windows support website.

Version
Windows 7

Workaround
If you experience this issue, install the following updates and restart the VM or host before installing the driver:

- Servicing stack update (SSU) [KB4490628]
- SHA-2 update [KB4474419]

Status
Not a bug
5.22. 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

5.23. 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
   ```

```
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

### 5.24. RAPIDS cuDF `merge` fails on NVIDIA vGPU

**Description**

The `merge` function of the RAPIDS cuDF GPU data frame library fails on NVIDIA vGPU. This function fails because RAPIDS uses the Unified Memory feature of CUDA, which NVIDIA vGPU does not support.

**Status**

Open

**Ref. #**

2642134
5.25. 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
5.26. Migration of VMs configured with vGPU stops before the migration is complete

Description
When a VM configured with vGPU is migrated to another host, the migration stops before it is complete. After the migration stops, the VM is no longer accessible.

This issue occurs if the ECC memory configuration (enabled or disabled) on the source and destination hosts are different. The ECC memory configuration on both the source and destination hosts must be identical.

Workaround
Reboot the hypervisor host to recover the VM. Before attempting to migrate the VM again, ensure that the ECC memory configuration on both the source and destination hosts are identical.

Status
Not an NVIDIA bug

Ref. #
200520027

5.27. ECC memory settings for a vGPU cannot be changed by using NVIDIA X Server Settings

Description
The ECC memory settings for a vGPU cannot be changed from a Linux guest VM by using NVIDIA X Server Settings. After the ECC memory state has been changed on the ECC Settings page and the VM has been rebooted, the ECC memory state remains unchanged.

Workaround
Use the nvidia-smi command in the guest VM to enable or disable ECC memory for the vGPU as explained in Virtual GPU Software User Guide.
If the ECC memory state remains unchanged even after you use the `nvidia-smi` command to change it, use the workaround in Changes to ECC memory settings for a Linux vGPU VM by `nvidia-smi` might be ignored.

**Status**
Open

**Ref. #**
200523086

### 5.28. Changes to ECC memory settings for a Linux vGPU VM by `nvidia-smi` might be ignored

**Description**
After the ECC memory state for a Linux vGPU VM has been changed by using the `nvidia-smi` command and the VM has been rebooted, the ECC memory state might remain unchanged.

This issue occurs when multiple NVIDIA configuration files in the system cause the kernel module option for setting the ECC memory state `RMGuestECCState` in `/etc/modprobe.d/nvidia.conf` to be ignored.

When the `nvidia-smi` command is used to enable ECC memory, the file `/etc/modprobe.d/nvidia.conf` is created or updated to set the kernel module option `RMGuestECCState`. Another configuration file in `/etc/modprobe.d/` that contains the keyword `NVreg_RegistryDwordsPerDevice` might cause the kernel module option `RMGuestECCState` to be ignored.

**Workaround**
This workaround requires administrator privileges.

1. Move the entry containing the keyword `NVreg_RegistryDwordsPerDevice` from the other configuration file to `/etc/modprobe.d/nvidia.conf`.
2. Reboot the VM.

**Status**
Open
5.29. Black screens observed when a VMware Horizon session is connected to four displays

**Description**

When a VMware Horizon session with Windows 7 is connected to four displays, a black screen is observed on one or more displays.

This issue occurs because a VMware Horizon session does not support connections to four 4K displays with Windows 7.

**Status**

Not an NVIDIA bug

5.30. Quadro RTX 8000 and Quadro RTX 6000 GPUs can't be used with VMware vSphere ESXi 6.5

**Description**

Quadro RTX 8000 and Quadro RTX 6000 GPUs can’t be used with VMware vSphere ESXi 6.5. If you attempt to use the Quadro RTX 8000 or Quadro RTX 6000 GPU with VMware vSphere ESXi 6.5, a purple-screen crash occurs after you install the NVIDIA Virtual GPU Manager.

**Version**

VMware vSphere ESXi 6.5
**Workaround**

Upgrade VMware vSphere ESXi to patch level ESXi 6.5 P04 (ESXi650-201912002, build 15256549) or later.

VMware resolved this issue in this patch for VMware vSphere ESXi.

**Status**

Not an NVIDIA bug

**Ref. #**

200491080

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**5.31. 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
5.32. 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

5.33. 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.
5.34. 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.

5.35. 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,
Known Issues

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

5.36. 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 2019
- Windows Server 2016
- Windows Server 2012

Solution

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

2. Set the Use the hardware default graphics adapter for all Remote Desktop Services sessions option.
5.37. **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

---

5.38. **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.
5.39. 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:

```bash
[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%    |
| 2122658    GRID P40-8Q | 2122667  centos7.4-xmpl-211... |     59%    |
|      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.
5.40. 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    VM Name               | vGPU-Util  |
|===============================+================================+============|
|   0  Tesla P40                | 00000000:81:00.0               |  99%       |
| 85109      GRID P40-4Q   | 85110    win7-xmpl-146048-1    |     32%    |
| 87195      GRID P40-4Q   | 87196    win7-xmpl-146048-2    |     39%    |
| 88095      GRID P40-4Q   | 88096    win7-xmpl-146048-3    |     26%    |
| 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
5.41. **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

5.42. **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

5.43. 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
Known Issues

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

5.44. 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.

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

Status

Not an NVIDIA bug

Ref. #

200366884

5.45. 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 Requiring Large MMIO Space in Pass-Through Mode

Status

Not a bug

Ref. #

1944539

5.46. 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

### 5.47. 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
5.48. 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.

Note: 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.

If you are licensing a physical GPU for vCS, you must use the configuration file /etc/nvidia/gridd.conf.

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
5.49. 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

5.50. 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
5.51. vGPU VM fails to boot in ESXi 6.5 if the graphics type is Shared

Description

Note: 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
5.52. **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

5.53. **NVIDIA driver installation may fail for VMs on a host in a VMware DRS cluster**

**Description**
For VMware vSphere releases before 6.7 Update 1, the ESXi host on which VMs configured with NVIDIA vGPU reside must not be a member of an automated 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 an automated VMware DRS Cluster. Any attempt to install the driver on a VM on a host in an automated DRS cluster fails with the following error:
**Known Issues**

**Virtual GPU Software R450 for VMware vSphere R450 for VMware vSphere**

| RN-07347-001_v11.0 through 11.1 | 68 |

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

**Note:** This issue does not occur with VMs running VMware vSphere 6.7 Update 1 or later without load balancing support. For these releases, vSphere DRS supports automatic initial placement of VMs configured with NVIDIA vGPU.

**Version**

VMware vSphere Hypervisor [ESXi] releases **before 6.7 Update 1**.

**Workaround**

Ensure that the automation level of the DRS cluster is set to **Manual**.

For more information about this setting, see **Edit Cluster Settings** in the VMware documentation.

**Status**

Open

**Ref. #**

1933449

---

**5.54. 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*. 
Known Issues

Virtual GPU Software R450 for VMware vSphere

RN-07347-001_v11.0 through 11.1   |   69

Status
Not an NVIDIA bug

Ref. #
200167868

5.55. 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.

Note: 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. #

5.56. 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. #

5.57. 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.
5.58. 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

5.59. 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

5.60. 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
5.61. **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

5.62. **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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