GRID VIRTUAL GPU FOR CITRIX XENSERVER

Version 361.40 / 362.13

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Release Notes

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RELEASE NOTES

These Release Notes summarize current status, information on validated platforms, and known issues with NVIDIA GRID™ vGPU™ software and hardware on Citrix XenServer.

This release includes the following software:

- NVIDIA GRID Virtual GPU Manager version 361.40 for Citrix XenServer 6.5 SP1 and Citrix XenServer 6.2 SP1 with hotfixes XS62ESP1009 and XS62ESP1011
- NVIDIA Windows drivers for vGPU version 362.13
- NVIDIA Linux drivers for vGPU version 361.45

> **Note:** If you install the wrong package for the version of XenServer you are using, GRID vGPU Manager will fail to load.
>
> The GRID vGPU Manager and Windows guest VM drivers must be installed together. Older VM drivers will not function correctly with this release of GRID vGPU Manager. Similarly, older GRID vGPU Managers will not function correctly with this release of Windows guest drivers. See "VM running older NVIDIA vGPU drivers fails to initialize vGPU when booted," on page 4.

Updates in this release:

- Addition of GRID vGPU Application Edition
- Enhanced support for 4K displays
- DirectX 12 support
- Miscellaneous bug fixes

VALIDATED PLATFORMS

This release of virtual GPU provides support for NVIDIA GRID K1, K2, and Tesla M60, M6 GPUs on Citrix XenServer, running on validated server hardware platforms. For a list of validated server platforms, refer to http://www.nvidia.com/buygrid.

SOFTWARE VERSIONS

This release has been tested with the following software versions:

Software	Version tested
Citrix XenServer 6.2	Version 6.2 with XS62ESP1 and applicable hotfixes including XS62ESP1009 and XS62ESP1011. The GRID vGPU Manager included in this release will not install without these hotfixes: • XS62ESP1009 http://support.citrix.com/article/CTX141191 • XS62ESP1011 http://support.citrix.com/article/CTX141472
Citrix XenServer 6.5	Version 6.5 with XS65ESP1. The GRID vGPU Manager included in this release will not install without XenServer 6.5 SP1.
Citrix XenServer 7.0	Only version 7.0 Tech Preview build 123251 is supported.
Citrix XenDesktop	Version 7.6, 7.8 in HDX 3D Pro mode.

Note: GRID vGPU on Citrix XenServer 6.2 does not support operation with physical GPUs BARs mapped above the 4 Gigabyte boundary in the system address space.

For XenServer 6.2, ensure that GPUs are mapped below the 4G boundary by disabling your server's SBIOS option that controls 64-bit memory-mapped I/O support. This option may be labeled "Enable >4G Decode" or "Enable 64-bit MMIO". See "Virtual GPU fails to start when GPUs are mapped above 4G." on page 5.

Linux support

GRID vGPU with Red Hat Enterprise Linux 7 / CentOS 7 guest VMs is supported on Tesla M60 and M6, as a technical preview feature on Citrix XenServer 6.5.

Note: Linux vGPU is not supported on XenServer 6.2.

HARDWARE CONFIGURATION

Tesla M60 and M6 GPUs support compute and graphics modes, which can be configured using the `gpumodeswitch` tool provided with GRID software releases. GRID vGPU requires that M60 / M6 are configured in graphics mode.

KNOWN PRODUCT LIMITATIONS

Known product limitations for this release of NVIDIA GRID are described in the following sections:

- "VM running older NVIDIA vGPU drivers fails to initialize vGPU when booted" on page 4
- "Virtual GPU fails to start if ECC is enabled" on page 5
- "Single vGPU benchmark scores are lower than passthrough GPU" on page 6.
- "Virtual GPU fails to start when GPUs are mapped above 4G" on page 6
- "nvidia-smi fails to operate when all GPUs are assigned to GPU passthrough mode" on page 7.
- "Windows Aero is disabled on XenDesktop session using 3 or 4 monitors in 2560×1600 resolution" on page 8"
- "VMs configured with large memory fail to initialize vGPU when booted" on page 8
- "vGPU host driver RPM upgrade fails" on page 9

VM RUNNING OLDER NVIDIA VGPU DRIVERS FAILS TO INITIALIZE VGPU WHEN BOOTED

Description

A VM running older NVIDIA drivers, such as those from a previous vGPU release, will fail to initialize vGPU when booted on a XenServer platform running the current release of GRID Virtual GPU Manager.

In this scenario, the VM boots in standard VGA mode with reduced resolution and color depth. The NVIDIA GRID GPU is present in Windows Device Manager but displays a warning sign, and a device status of "Windows has stopped this device because it has reported problems. (Code 43)".

Depending on the versions of drivers in use, the XenServer `/var/log/messages` file may contain the following information about the error:

- An error message:
  ```
  vmiop_log: error: Unable to fetch Guest NVIDIA driver information
  ```
- A report of a version mismatch between guest and host drivers:
  ```
  vmiop_log: error: Guest VGX version(1.1) and Host VGX version(1.2)
  do not match
  ```
- A report of a signature mismatch:
  ```
  vmiop_log: error: VGPU message signature mismatch.
  ```

Resolution

Install the latest NVIDIA vGPU release drivers in the VM.

VIRTUAL GPU FAILS TO START IF ECC IS ENABLED

Description

GRID K2, Tesla M60, and Tesla M6 support ECC (error correcting code) for improved data integrity. If ECC is enabled, virtual GPU fails to start. The following error is logged in `/var/log/messages`:

```
vmiop_log: error: Initialization: VGX not supported with ECC Enabled.
```

Virtual GPU is not currently supported with ECC active. GRID K2 cards and Tesla M60, M6 cards in graphics mode ship with ECC disabled by default, but ECC may subsequently be enabled using `nvidia-smi`.

Resolution

Use `nvidia-smi` to list the status of all GPUs, and check for ECC noted as enabled on GPUs. Change the ECC status to off on a specific GPU by executing the following command:

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

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

SINGLE VGPU BENCHMARK SCORES ARE LOWER THAN PASSTHROUGH GPU

Description

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

Aside from performance differences that may be attributed to a vGPU's smaller framebuffer size, vGPU incorporates a performance balancing feature known as Frame Rate Limiter (FRL), which is enabled on all vGPUs. 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 passthrough GPU.

Resolution

FRL is controlled by an internal vGPU setting. NVIDIA does not validate vGPU with FRL disabled, but for validation of benchmark performance, FRL can be temporarily disabled by specifying `frame_rate_limiter=0` in the VM's `platform:vgpu_extra_args` parameter:

```
[root@xenserver ~]# xe vm-param-set uuid=e71afda4-53f4-3a1b-6c92-
a364a7f619c2 platform:vgpu_extra_args="frame_rate_limiter=0"
[root@xenserver ~]#
```

The setting takes effect the next time the VM is started or rebooted.

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 removing the `vgpu_extra_args` key from the platform parameter, or by removing `frame_rate_limiter=0` from the `vgpu_extra_args` key, or by `setting frame_rate_limiter=1`. For example:

```
[root@xenserver ~]# xe vm-param-set uuid=e71afda4-53f4-3a1b-6c92-
a364a7f619c2 platform:vgpu_extra_args="frame_rate_limiter=1"
[root@xenserver ~]#
```

VIRTUAL GPU FAILS TO START WHEN GPUS ARE MAPPED ABOVE 4G

Version

XenServer 6.2

Status

Fixed in XenServer 6.5

Description

GRID vGPU on Citrix XenServer 6.2 does not support operation with GPUs mapped above the 4 gigabyte (4G) boundary in the system's physical address space.

If GPUs are mapped above 4G, the GRID vGPU Manager rpm will warn at the time of installation:

```
Warning: vGPU does not support GPUs mapped in 64-bit address space.
Please disable 64-bit MMIO from the system's BIOS. Refer to vGPU
release notes for details."
```

Also, the NVIDIA kernel driver will fail to load in XenServer's `dom0`, so the `nvidia` module won't appear in the module listing produced by `lsmod`. Additionally, the following warning messages will be present in the output of `dmesg`:

```
NVRM: This PCI I/O region assigned to your NVIDIA device is invalid:
NVRM: BAR1 is 128M @ 0xf800000000000000 (PCI:03ff:00:07.0)
NVRM: This is a 64-bit BAR mapped above 4GB by the system
NVRM: BIOS or the Linux kernel. The NVIDIA Linux/x86
NVRM: graphics driver and other system software components
NVRM: do not support this configuration.
```

Resolution

Ensure that GPUs are mapped below the 4G boundary by disabling your server's SBIOS option that controls 64-bit memory-mapped I/O support. This option may be labeled **Enable →4G Decode** or **Enable 64-bit MMIO**.

NVIDIA-SMI FAILS TO OPERATE WHEN ALL GPUS ARE ASSIGNED TO GPU PASSTHROUGH MODE

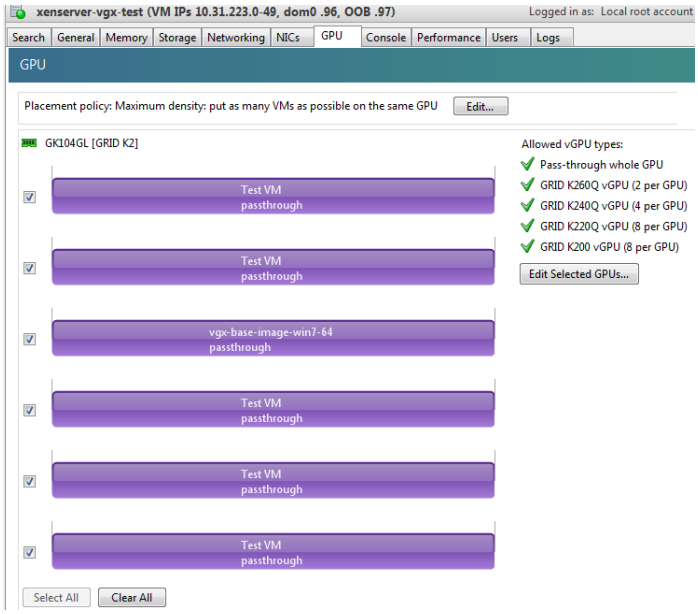
Description

If all GPUs in the platform are assigned to VMs in passthrough mode, `nvidia-smi` will return an error:

```
[root@xenserver-vgx-test ~]# nvidia-smi
Failed to initialize NVML: Unknown Error
```

This is because GPUs operating in passthrough mode are not visible to `nvidia-smi` and the NVIDIA kernel driver operating in XenServer's dom0.

To confirm that all GPUs are operating in passthrough, use XenCenter's GPU tab to review current GPU assignment:



Resolution

N/A

WINDOWS AERO IS DISABLED ON XENDESKTOP SESSION USING 3 OR 4 MONITORS IN 2560×1600 RESOLUTION

Description

Windows Aero may be disabled when XenDesktop is connected to a VM with a vGPU or passthrough GPU, with 3 or 4 monitors at 2560×1600 resolution.

This is a limitation of Windows 7, refer Microsoft's knowledge base article at https://support.microsoft.com/en-us/kb/2724530.

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 standard VGA mode with reduced resolution and color depth. The NVIDIA GRID GPU

is present in Windows Device Manager but displays a warning sign, and a device status of "Windows has stopped this device because it has reported problems. (Code 43)".

XenServer's `/var/log/messages` contains these error messages:

```
vmiop_log: error: NVOS status 0x29
vmiop_log: error: Assertion Failed at 0x7620fd4b:179
vmiop_log: error: 8 frames returned by backtrace
...
vmiop_log: error: VGPU message 12 failed, result code: 0x29
...
vmiop_log: error: NVOS status 0x8
vmiop_log: error: Assertion Failed at 0x7620c8df:280
vmiop_log: error: 8 frames returned by backtrace
...
vmiop_log: error: 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 specifying `enable_large_sys_mem=1` in the VM's platform:`vgpu_extra_args` parameter:

```
[root@xenserver ~]# xe vm-param-set uuid=e71afda4-53f4-3a1b-6c92-
a364a7f619c2 platform:vgpu_extra_args="enable_large_sys_mem=1"
```

The setting takes effect the next time the VM is started or rebooted. With this setting in place, less GPU FB is available to applications running in the VM. To accommodate system memory larger than 64GB, the reservation can be further increased by specifying `extra_fb_reservation` in the VM's `platform:vgpu_extra_args` parameter, and settings its value to the desired reservation size in megabytes. The default value of 64M is sufficient to support 64GB of RAM. We recommend adding 2M of reservation for each additional 1GB of system memory. For example, to support 96GB of RAM, set `extra_fb_reservation` to `128`:

```
platform:vgpu_extra_args="enable_large_sys_mem=1,
extra_fb_reservation=128"
```

The reservation can be reverted back to its default setting by removing the `vgpu_extra_args key` from the platform parameter, or by removing `enable_large_sys_mem` from the `vgpu_extra_args` key, or by setting `enable_large_sys_mem=0`.

VGPU HOST DRIVER RPM UPGRADE FAILS

Description

Upgrading vGPU host driver RPM fails with the following message on the console:

```
[root@xenserver ~]# rpm –U NVIDIA-vGPU-xenserver-6.5-352.46.x86_64.rpm
```

```
error: Failed dependencies:
       NVIDIA-vgx-xenserver conflicts with NVIDIA-vGPU-xenserver-6.5-
352.46.x86_64
[root@xenserver ~]#
```

Resolution

Uninstall the older vGPU RPM before installing the latest driver.

Use the following command to uninstall the older vGPU RPM:

```
[root@xenserver ~]# rpm –e NVIDIA-vgx-xenserver
```

RESOLVED ISSUES

Bug ID	Summary and Description
200172195	**PowerPoint intermittently crashes in slideshow mode on XenDesktop in a dual-monitor setup** Running the PowerPoint application in slideshow mode over a XenDesktop session in a dual-monitor setup sometimes causes the application to crash.
200155765	**CATIA intermittently crashes during quick object rotation** Using the mouse to quickly rotate large models in the CATIA application sometimes causes the application to crash
200010747	**Booting multiple VMs simultaneously causes an error** When multiple VMs are booted simultaneously, an error occurs and the log file on the host contains an error message similar to the following message: `NVRM: nv_vunmap: can't unmap 31 pages at 0xffffc90011f5f000, invalid context!`
1717876	**Loading large models in CATIA causes an OpenGL failure** Loading very large models in CATIA exhausts the frame buffer, causing Open GL to fail with the error OPENGL 8.
1720471	**Black screen on initial connection to a VM using XenDesktop from a client with multiple displays** The initial connection to a VM that uses XenDesktop from a client with multiple displays results in a black screen. Disconnecting and reconnecting to the VM resolves the issue.
1718648	**OpenGL applications hang on Linux VMs** OpenGL applications hang after some time when running on Linux VMs with vGPU.

KNOWN ISSUES

Driver upgrade from 352.83 to 361.40 fails on bare metal

Description	Driver upgrade fails on a bare metal setup with this error message: `An NVIDIA kernel module 'nvidia' appears to already be loaded in your kernel. This may be because it is in use .....` The upgrade fails because it does not stop the `nvidia-gridd` service.
Version	
Workaround	Stop the `nvidia-gridd` service before upgrading the driver.
Status	Open
Ref. #	200184005

4096x2160 resolution is not available in Windows Control Panel

Description	4096x2160 resolution cannot be applied through NVIDIA Control Panel and is not listed in Windows Control Panel.
Version	
Workaround	Clear the **Hide all unsupported modes** checkbox in Windows Control Panel.
Status	Open
Ref. #	200182826

GNOME Display Manager (GDM) fails to start on Red Hat Enterprise Linux 7.2

Description	GDM fails to start on Red Hat Enterprise Linux 7.2.
Version	
Workaround	Enable permissive mode for Security Enhanced Linux (SELinux).
Status	Not an NVIDIA bug
Ref. #	200167868

Video goes blank when run in loop in Windows Media Player

Description	When connected to a vGPU-enabled VM using Citrix XenDesktop, a video played back in looping mode on Windows Media Player goes blank or freezes after a few iterations.
Workaround	None
Status	Open
Ref. #	1306623

Local VGA console is momentarily unblanked when XenDesktop changes resolution of the VM desktop

Description	When XenDesktop establishes a remote connection to a VM using vGPU, the VM's local VGA console display in XenCenter is blanked (assuming the VM local console has not been disabled by setting `platform:vgpu_extra_args="disable_vnc=1"`). If the XenDesktop session changes resolution of the VM's desktop, the local VGA console momentarily unblanks, allowing a XenCenter user to briefly view the desktop.
Workaround	Disable the VM's local VGA console: `xe vm-param-set uuid=<vm-uuid> platform:vgpu_extra_args="disable_vnc=1"`
Status	Open
Ref. #	NVIDIA-145 / 1375164

VM bugchecks on shutdown/restart when XenDesktop is installed and NVIDIA driver is uninstalled or upgraded.	
Description	If the XenDesktop agent is installed in a VM before any NVIDIA GPU driver is installed, the VM will bugcheck (bluescreen) when the NVIDIA driver is subsequently upgraded or uninstalled. The bugcheck code is 0x7E, `SYSTEM_THREAD_EXCEPTION_NOT_HANDLED`.
Workaround	Do a force shutdown of the VM and restart it. Alternatively, install the NVIDIA driver in guest VMs before installing XenDesktop.
Status	Open
Ref. #	NVIDIA-295 / 200018125

Application frame rate may drop when running XenDesktop at 2560×1600 resolution.	
Description	An application's rendering frame rate may drop when running XenDesktop at 2560×1600 resolution, relative to the frame rate obtained at lower resolutions.
Fix	Using the Windows `regedit` utility within the VM, open the `HKLM\SOFTWARE\Citrix\Graphics` registry key and create a new DWORD value, `EncodeSpeed`, with a value of 2. Reboot the VM. This setting may improve the delivered frame rate at the expense of a reduction in image quality.
Status	Open
Ref. #	NVIDIA-190 / 1416336

Windows VM BSOD

Description	Windows VM bugchecks on XenServer when running a large number of vGPU based VMs.
	
	XenServer's `/var/log/messages` contains these error messages:
	
	`NVRM: Xid (PCI:0000:08:00): 31, Ch 0000001e, engmask 00000111, intr 10000000`
	`NVRM: Xid (PCI:0000:08:00): 31, Ch 00000016, engmask 00000111, intr 10000000`
	`...`
	`vmiop_log: error: Assertion Failed at 0xb5b898d8:4184`
	`vmiop_log: error: 8 frames returned by backtrace`
	`vmiop_log: error: /usr/lib/libnvidia-vgx.so(_nv000793vgx+0x69d) [0xb5b8064d]`
	`vmiop_log: error: /usr/lib/libnvidia-vgx.so(_nv000479vgx+0x118) [0xb5b898d8]`
	`vmiop_log: error: /usr/lib/libnvidia-vgx.so(_nv000782vgx+0x59) [0xb5b85f49]`
	`vmiop_log: error: /usr/lib/libnvidia-vgx.so(_nv000347vgx+0x3db) [0xb5b932db]`
	`vmiop_log: error: /usr/lib/libnvidia-vgx.so [0xb5b78e4a]`
	`vmiop_log: error: /usr/lib/xen/bin/vgpu [0x80554be]`
	`vmiop_log: error: /lib/libpthread.so.0 [0xb7612912]`
	`vmiop_log: error: /lib/libc.so.6(clone+0x5e) [0xb76fc5ee]`
	`vmiop_log: error: failed to initialize guest PTE entries`
	`vmiop_log: error: failed to fill up guest PTE entries 3`
	`vmiop_log: error: VGPU message 27 failed, result code: 0xff000003`
	`vmiop_log: error: 0xc1d00001, 0xff010000, 0x1a77ba000, 0x0, 0x1,`
	`vmiop_log: error: 0x1, 0x1000, 0x10202, 0xc1d00001, 0xff010000,`
	`vmiop_log: error: 0xcaf00004, 0x0`
	`vmiop_log: error: Timeout occurred, reset initiated.`

Version	XenServer 6.2
Fix	Please ensure that you are running the latest OEM firmware for your GRID boards.
Status	Closed
Ref. #	NVIDIA-327 / 1632120

MPlayer, or other video players, fail to start when using hardware acceleration on Linux VMs running vGPU

Description	VDPAU is currently not supported on Linux VMs running vGPU.
Version	
Workaround	Configure the video player to not use VDPAU or hardware acceleration.
Status	Open
Ref. #	200144667

Windows VM BSOD when upgrading NVIDIA drivers over a XenDesktop session

Description	Windows VM bugchecks when NVIDIA guest drivers are upgraded over a XenDesktop session. If the VM is restarted after the bugcheck, the upgraded driver loads correctly and full functionality is available.
Version	
Fix	Upgrade XenDesktop to 7.6 Feature Pack 3
Status	Closed
Ref. #	NVIDIA-370 / 200130780

XenCenter does not allow vGPUs to be selected as a GPU type for Linux VMs

Description	When creating a new Linux VM or editing the properties of an existing Linux VM, XenCenter does not allow vGPUs to be selected as a GPU type. vGPU on Linux VMs is supported as a technical preview on XenServer 6.5, and does include XenCenter integration.
Version	
Workaround	Please refer to `Chapter 5 – XenServer vGPU Management` in the `GRID vGPU User Guide` on how to configure vGPU using `xe CLI`.
Status	Closed
Ref. #	NVIDIA-360

If X server is killed on a RHEL7 VM running vGPU, XenCenter console may not automatically switch to text console

Description	If X server is killed on a RHEL7 VM running vGPU, XenCenter console may display a corrupted image and fail to switchover to text console. The failure to switchover to text console is due to a bug in RHEL7, which causes X server to not start correctly under certain configurations.
Version	
Workaround	Use `CTRL + ALT + F[1|2|3|…]` to switch between Linux terminals.
Status	Closed
Ref. #	NVIDIA-350 / 200123378

Multiple WebGL tabs in Microsoft Internet Explorer may trigger TDR on Windows VMs

Description	Running intensive WebGL applications in multiple IE tabs may trigger a TDR on Windows VMs.
Version	
Workaround	Disable hardware acceleration in IE. To enable software rendering in IE, refer Microsoft's knowledge base article at https://support.microsoft.com/en-us/kb/2528233.
Status	Open
Ref. #	200148377

XenDesktop shows only a black screen when connected to a vGPU VM

Description	XenDesktop sometimes displays only a black screen when it is connected to an NVIDIA vGPU VM. The probable cause is that the display that is connected to the NVIDIA vGPU is entering a lower power state.
Fix	Disable all display-related power management settings. For detailed instructions, visit the Microsoft power plans frequently asked questions at http://windows.microsoft.com/en-us/windows/power-plans-faq and from the list, select your OS version.
Status	Not an NVIDIA bug
Ref. #	1719877

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