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**Chapter 1.**

**INTRODUCTION TO GPUMODESWITCH**

gpumodeswitch is a command-line tool that is used to switch supported NVIDIA GPUs between compute and graphics mode. This chapter describes these modes and when to use them. Using gpumodeswitch describes how to use gpumodeswitch.

### 1.1. Compute and graphics mode

NVIDIA Tesla GPUs are shipped in a configuration optimized for high-performance compute (HPC) applications:

#### Table 1  Compute mode settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classcode</td>
<td>3D Controller</td>
<td>This classcode indicates to operating systems (OS) that the GPU is not intended for use as a primary display device.</td>
</tr>
<tr>
<td>Memory BAR</td>
<td>8 gigabytes</td>
<td>Tesla GPUs expose a large memory base address register (BAR) for direct access to the framebuffer from the CPU, and other PCI Express devices.</td>
</tr>
<tr>
<td>I/O base BAR</td>
<td>Disabled</td>
<td>The GPU need not consume any legacy I/O resources when used as a non-display device.</td>
</tr>
<tr>
<td>ECC protection</td>
<td>Enabled</td>
<td>Error Correcting Code (ECC) is enabled on the GPU framebuffer to protect against single- and multi-bit memory errors.</td>
</tr>
</tbody>
</table>

Collectively this GPU configuration is referred to as compute mode. While compute mode is optimal for HPC usage, it can cause compatibility problems with OS and hypervisors when the GPU is used primarily as a graphics device:

- Some OS require that the GPU advertise a VGA display controller classcode in order for the GPU to be used as a primary graphics device.
- Some hypervisors cannot support passthrough of GPUs with large memory BARs to guest virtual machines.

To address these problems, certain NVIDIA Tesla GPUs support setting the GPU into **graphics** mode:
### Table 2  Graphics mode settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classcode</td>
<td>VGA Controller</td>
<td>This classcode indicates to OS that the GPU can function as a primary display device.</td>
</tr>
<tr>
<td>Memory BAR</td>
<td>256 megabytes</td>
<td>The GPUs a smaller memory BAR for direct access to the framebuffer.</td>
</tr>
<tr>
<td>I/O base BAR</td>
<td>Enabled</td>
<td>The GPU exposes an I/O BAR to claim the resources require to operate as a VGA controller.</td>
</tr>
<tr>
<td>ECC protection</td>
<td>Disabled</td>
<td>ECC protection is disabled by default, though it can still be enabled by use of the nvidia-smi management tool</td>
</tr>
</tbody>
</table>

The mode of the GPU is established directly at power-on, from settings stored in the GPU’s non-volatile memory. `gpumodeswitch` is used to program the mode of the GPU by updating the GPU’s non-volatile memory settings.

### 1.2. When to use graphics mode

We recommend that graphics mode be used whenever supported Tesla products are used in the following scenarios:

- GPU passthrough with hypervisors that do not support large BARs. At the time of publication, this includes Citrix XenServer 6.2, 6.5, VMware ESXi 5.1, 5.5, 6.0, Red Hat Enterprise Linux 7.0, 7.1.
- GPU passthrough to Windows VMs on Xen and KVM hypervisors.
- GRID Virtual GPU deployments.
- VMware vSGA deployments.

Consult individual NVIDIA product release notes for the latest information on compatibility with compute and graphics modes.

### 1.3. Supported products

At the time of writing, `gpumodeswitch` is supported on the following products:

- Tesla M60
- Tesla M6
Chapter 2.
USING GPUMODESWITCH

gpumodeswitch is a command line utility that runs on Windows, Linux, or VMware ESXi. This chapter describes how to use gpumodeswitch, and the optional Linux boot packages included with gpumodeswitch.

2.1. Supported environments

gpumodeswitch can be run in the following environments

- Windows 64-bit command prompt
- Linux 32/64-bit shell (including Citrix XenServer dom0)
- VMware ESXi hypervisor

If the server platform hosting the Tesla GPUs does not natively run any of the supported environments, we recommend temporarily booting Linux on the server; the gpumodeswitch release package includes bootable Linux images for this purpose. These images are described in Booting from a Linux bootable image.

2.2. What’s in the package

The gpumodeswitch package contains these files:

- gpumodeswitch.exe
  Windows executable
- nvflsh64.sys
  Windows 64-bit driver module
- gpumodeswitch
  Linux executable, also usable on XenServer dom0
- NVIDIA-GpuModeSwitch-1OEM.600.0.0.2494585.x86_64.vib
  vSphere Installation Bundle (VIB) for VMware ESXi
- gpumodeswitch.iso
  Bootable Linux ISO image
- gpumodeswitch.zip
  Bootable Linux image for use with USB storage (e.g. a flash key)
2.3. Installing the **gpumodeswitch** VIB

If you are using VMware ESXi as your hypervisor, you must install the **gpumodeswitch** VIB before attempting to run **gpumodeswitch**.

To install the VIB, you need to access the ESXi host through the ESXi Shell or secure shell (SSH). For information about how to enable ESXi Shell or SSH for an ESXi host, see the VMware documentation.

1. Put the ESXi host into maintenance mode.

   ```
   # vim-cmd hostsvc/maintenance_mode_enter
   ```

2. If an NVIDIA driver is already installed on the ESXi host, remove the driver.
   a) Get the name of the VIB package that contains the NVIDIA driver.

   ```
   # esxcli software vib list | grep -i nvidia
   ```

   b) Remove the VIB package that contains the NVIDIA driver.

   ```
   # esxcli software vib remove -n NVIDIA-driver-package
   
   NVIDIA-driver-package is the VIB package name that you got in the previous step.
   ```

3. Run the `esxcli` command to install the VIB.

   ```
   # esxcli software vib install --no-sig-check -v directory/NVIDIA-GpuModeSwitch-10EM.600.0.0.2494585.x86_64.vib
   
   directory is the path to the directory that contains the VIB file.
   ```

4. Take the host out of maintenance mode.

   ```
   # vim-cmd hostsvc/maintenance_mode_exit
   ```

5. Reboot the ESXi host.

   ```
   # reboot
   ```

You can now run **gpumodeswitch** to switch the modes of your GPUs.

After switching the modes of your GPUs, continue with your NVIDIA GRID vGPU set up by completing these tasks:

1. Uninstalling the **gpumodeswitch** VIB as explained in **Uninstalling the gpumodeswitch VIB**
2. Installing the NVIDIA virtual GPU manager for your hypervisor as explained in **GRID Virtual GPU User Guide**

2.4. Running **gpumodeswitch**

**gpumodeswitch** supports these operations:

- Listing the current mode of GPUs in the host
Changing the mode of individual or all GPUs

**gpumodeswitch** lists and changes the modes only of GPUs that are not marked for passthrough to the VMs.

For each operation, **gpumodeswitch** writes a log file that contains information about the operation. For details, see Log files created by **gpumodeswitch**.

### 2.4.1. Prerequisites for running **gpumodeswitch**

Before running **gpumodeswitch**, ensure that the prerequisites for your environment are met:

- For Linux and VMware ESXi, ensure that you can run **gpumodeswitch** as root.
- For XenServer dom0 and Linux KVM hosts, ensure that no VMs are active on passthrough.
- For Windows, ensure that the following prerequisites are met:
  - You have administrator permissions (see Figure 2).
  - The **nvflsh64.sys** driver is in the same directory as the **gpumodeswitch** executable.

### 2.4.2. Listing current GPU modes

To list the current mode of all GPUs in the system, use **--listgpumodes**:

```bash
# gpumodeswitch --listgpumodes
NVIDIA GPU Mode Switch Utility Version 1.02
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.

PLX (8747h)          (10B5,8747,10B5,8747) H:---:NRM S:00,B:81,PCI,D:00,F:00
Adapter: PLX (8747h)          (10B5,8747,10B5,8747) H:---:NRM
                 S:00,B:81,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (47,8747) : uChip 25AA320A 1.8-5.5V 4Kx8S, page
GPU Mode: N/A

Tesla M60            (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00
Adapter: Tesla M60            (10DE,13F2,10DE,113A) H:82:SP8
                      S:00,B:83,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
GPU Mode: Graphics

Tesla M60            (10DE,13F2,10DE,113A) H:82:SP16 S:00,B:84,PCI,D:00,F:00
Adapter: Tesla M60            (10DE,13F2,10DE,113A) H:82:SP16
                      S:00,B:84,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
GPU Mode: Compute
```
2.4.3. Switching GPU modes

To switch a GPU’s mode, use the --gpumode command:

- `--gpumode graphics` switches to graphics mode
- `--gpumode compute` switches to compute mode

After a GPU mode switch, the server platform should be rebooted to ensure that the modified resources of the GPU are correctly accounted for by any OS or hypervisor running on the platform.

2.4.3.1. Switching all GPUs interactively

By default, the command works on all supported GPUs in the host.

To switch all GPUs interactively, when prompted, type `y` to confirm the mode switch:

```
# gpumodeswitch --gpumode graphics
NVIDIA GPU Mode Switch Utility Version 1.02
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.

Update GPU Mode of all adapters to "graphics"?
Press 'y' to confirm or 'n' to choose adapters or any other key to abort:

y

Updating GPU Mode of all eligible adapters to "graphics"

PLX (8747h) (10B5,8747,10B5,8747) H:--:NRM S:00,B:81,PCI,D:00,F:00
Adapter: PLX (8747h) (10B5,8747,10B5,8747) H:--:NRM S:00,B:81,PCI,D:00,F:00
Identifying EEPROM...
EEPROM ID (47,8747) : uChip 25AA320A 1.8-5.5V 4Kx8S, page
Cannot set GPU mode for this adapter

Tesla M60 (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00
Adapter: Tesla M60 (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00
Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
Programming UPR setting for requested mode..
License image updated successfully.
Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more during the update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
...............
Verifying update...
Update successful.
```
Firmware image has been updated from version 84.04.7C.00.00 to 84.04.7C.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

Tesla M60 (10DE,13F2,10DE,113A) H:82:SP16 S:00,B:84,PCI,D:00,F:00
Adapter: Tesla M60 (10DE,13F2,10DE,113A) H:82:SP16
S:00,B:84,PCI,D:00,F:00

Identifying EEPROM...
EEProm ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.

Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more during the
update process depending on your display adapter and output device.

Identifying EEPROM...
EEProm ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
............
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.7C.00.00 to 84.04.7C.00.00.
A reboot is required for the update to take effect.

# 2.4.3.2. Switching all GPUs without interaction

To switch all supported GPUs in the host without confirming the mode switch, use the
--auto command.

# gpumodeswitch --gpumode graphics --auto

NVIDIA GPU Mode Switch Utility Version 1.23.0
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.

NOTE: Unconfigured display adapter found, device not accessible:
  PLX (8747h) (10B5,8747,10B5,8747) H:--:NRM
  S:00,B:03,PCI,D:00,F:00
NOTE: Unconfigured display adapter found, device not accessible:
  PLX (8747h) (10B5,8747,10B5,8747) H:82:SP8
  S:00,B:83,PCI,D:00,F:00

Tesla M60 (10DE,13F2,10DE,113A) H:04:SP8 S:00,B:05,PCI,D:00,F:00
Adapter: Tesla M60 (10DE,13F2,10DE,113A) H:04:SP8
S:00,B:05,PCI,D:00,F:00

Identifying EEPROM...
EEProm ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.
Programming ECC setting for requested mode.
The display may go "BLANK" on and off for up to 10 seconds or more during the update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
..................
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.85.00.00 to 84.04.85.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

Tesla M60            (10DE,13F2,10DE,113A) H:04:SP16 S:00,B:06,PCI,D:00,F:00
Adapter: Tesla M60            (10DE,13F2,10DE,113A) H:04:SP16
     S:00,B:06,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.

Programming ECC setting for requested mode.
The display may go "BLANK" on and off for up to 10 seconds or more during the update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
..................
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.85.00.00 to 84.04.85.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

PLX (8747h)          (10B5,8747,10B5,8747) H:--:NRM S:00,B:81,PCI,D:00,F:00
Adapter: PLX (8747h)          (10B5,8747,10B5,8747) H:--:NRM
     S:00,B:81,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (47,8747) : uChip 25AA320A 1.8-5.5V 4Kx8S, page
Cannot set GPU mode for this adapter

Tesla M60            (10DE,13F2,10DE,113A) H:84:SP8 S:00,B:85,PCI,D:00,F:00
Adapter: Tesla M60            (10DE,13F2,10DE,113A) H:84:SP8
     S:00,B:85,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.
Using gpumodeswitch

Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more during the
update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
...............                
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.85.00.00 to 84.04.85.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

Tesla M60            (10DE,13F2,10DE,113A) H:84:SP16 S:00,B:86,PCI,D:00,F:00
Adapter: Tesla M60            (10DE,13F2,10DE,113A) H:84:SP16
S:00,B:86,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.

Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more during the
update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
...............                
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.85.00.00 to 84.04.85.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

#

2.4.3.3. Switching individual GPUs

To switch the mode of an individual GPU, type n when prompted, then enter the index
of the GPU you want to switch:

# gpumodeswitch --gpumode graphics

NVIDIA GPU Mode Switch Utility Version 1.02
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.

Update GPU Mode of all adapters to "graphics"?
Press 'y' to confirm or 'n' to choose adapters or any other key to abort:
n
Select display adapter:

<0> PLX (8747h)  (10B5,8747,10B5,8747) H:---:NRM S:00,B:81,PCI,D:00,F:00
<1> Tesla M60  (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00
<2> Tesla M60  (10DE,13F2,10DE,113A) H:82:SP16 S:00,B:84,PCI,D:00,F:00
<3> PLX (8747h)  (10B5,8747,10B5,8747) H:---:NRM S:00,B:85,PCI,D:00,F:00
<4> PLX (8747h)  (10B5,8747,10B5,8747) H:86:SP8 S:00,B:87,PCI,D:00,F:00
<5> GRID K520  (10DE,118A,10DE,100D) H:88:SP8 S:00,B:89,PCI,D:00,F:00
<6> GRID K520  (10DE,118A,10DE,100D) H:88:SP16 S:00,B:8A,PCI,D:00,F:00

Select a number (ESC to quit): 1

Tesla M60  (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00

Adapter: Tesla M60  (10DE,13F2,10DE,113A) H:82:SP8
S:00,B:83,PCI,D:00,F:00

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page

Programming UPR setting for requested mode..
License image updated successfully.

Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more during the
update process depending on your display adapter and output device.

Identifying EEPROM...
EEPROM ID (EF,3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...

.................
Verifying update...
Update successful.

Firmware image has been updated from version 84.04.7C.00.00 to 84.04.7C.00.00.
A reboot is required for the update to take effect.

InfoROM image updated successfully.

2.4.4. Log files created by gpumodeswitch

For each operation that it performs, gpumodeswitch creates a log file that contains
information about the operation. The file name and content of the log file depend on the
operation.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Command</th>
<th>Log File Name</th>
<th>Log File Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>List GPU modes</td>
<td>--listgpumode</td>
<td>listgpumodes.txt</td>
<td>A summary of GPU modes</td>
</tr>
<tr>
<td>Switch GPU modes</td>
<td>--gpumode</td>
<td>setgpumodes.txt</td>
<td>A summary of the command executed</td>
</tr>
</tbody>
</table>

2.4.4.1. Log file for listing GPU modes

The --listgpumode command writes GPU mode information to a log file named
listgpumodes.txt.

The log file summarizes GPU modes:

```
# more /tmp/listgpumodes.txt
GPU ID:
PLX (8747h)  (10B5,8747,10B5,8747) H:---:NRM S:00,B:81,PCI,D:00,F:00
GPU Mode: N/A
```
2.4.4.2. Log file for switching GPU modes

The `--gpumode` command writes GPU mode update information to a log file named `setgpumode.txt`. The log file summarizes the command execution:

```
# more /tmp/setgpumode.txt
GPU ID: PLX (8747h) (10B5,8747,10B5,8747) H:---:NRM S:00,B:81,PCI,D:00,F:00
Cannot set GPU mode for this adapter
GPU ID: Tesla M60 (10DE,13F2,10DE,113A) H:82:SP8 S:00,B:83,PCI,D:00,F:00
Successfully updated GPU mode to graphics.
GPU ID: Tesla M60 (10DE,13F2,10DE,113A) H:82:SP16 S:00,B:84,PCI,D:00,F:00
Successfully updated GPU mode to graphics.
```

2.4.4.3. Changing the log file directory

By default, `gpumodeswitch` creates the log file in the current working directory if the current working directory is writable.

To change the directory in which the log file is created, use the `--outfilepath` option. The following example commands create the log file in the `/tmp` directory:

- Listing current GPU modes:

  ```
  # gpumodeswitch --listgpumodes --outfilepath /tmp/
  ```

- Switching GPUs to graphics mode:

  ```
  # gpumodeswitch --gpumode graphics --outfilepath /tmp
  ```

When using the bundled Linux bootable images (see Booting from a Linux bootable image), the system boots into a read-only file system. Log files can be generated by using the `outfilepath` option to write the log files into `/tmp`.

2.4.5. Next Steps

After switching the modes of your GPUs, continue with your NVIDIA GRID vGPU setup as follows:

1. If you are using VMware ESXi as your hypervisor, uninstall the `gpumodeswitch VIB` as explained in Uninstalling the gpumodeswitch VIB.
2. Install the NVIDIA virtual GPU manager for your hypervisor explained in *GRID Virtual GPU User Guide*.

### 2.5. Uninstalling the gpumodeswitch VIB

If you are using VMware ESXi as your hypervisor, you must uninstall the gpumodeswitch VIB after running `gpumodeswitch`.

To uninstall the VIB, you need to access the ESXi host through the ESXi Shell or secure shell (SSH). For information about how to enable ESXi Shell or SSH for an ESXi host, see the VMware documentation.

1. Put the ESXi host into maintenance mode.
   ```
   # vim-cmd hostsvc/maintenance_mode_enter
   ```
2. Run the `esxcli` command to uninstall the VIB.
   ```
   # esxcli software vib remove -n NVIDIA-VMware_ESXi_6.0_GpuModeSwitch_Driver
   ```
3. Take the host out of maintenance mode.
   ```
   # vim-cmd hostsvc/maintenance_mode_exit
   ```
4. Reboot the ESXi host.
   ```
   # reboot
   ```

After uninstalling the gpumodeswitch VIB, continue with your NVIDIA GRID vGPU set up by installing the NVIDIA virtual GPU manager for your hypervisor as explained in *GRID Virtual GPU User Guide*.

### 2.6. Booting from a Linux bootable image

If your server platform is not running one of the environments that supports gpumodeswitch, use one of the Linux bootable images included in the release to boot your server to a minimal Linux environment that includes gpumodeswitch.

#### 2.6.1. Booting directly from ISO

The `gpumodeswitch.iso` file in the release package is intended for direct boot on a server platform, using the server’s remote management capability.

1. Connect the ISO file as an emulated storage device on the server.
2. Reboot the server.
3. Use the BIOS boot menu to select the emulated device for boot.
The ISO image boots to a Linux shell prompt from which `gpumodeswitch` can be run directly. For instructions, see Running `gpumodeswitch`.

### 2.6.2. Booting from a USB flash key

The `gpumodeswitch.zip` file in the release package is intended to be unpacked onto a USB flash key, which can then be used to boot the server.

On a Windows system, follow these steps to create a bootable USB key:

1. Connect a USB flash key of at least 64 megabytes in size.
2. In Windows Explorer, right-click on the USB drive and select **Format** to format it.
3. Note the driver letter that is assigned to the USB drive (for example, E:).
4. Unzip `gpumodeswitch.zip` to the freshly formatted USB drive.
   a) Right-click the zip file and select **Extract All**.
   b) Browse to the USB drive’s letter, and then click **OK** to unzip the contents.
5. Open a Windows **Command Prompt** window with Administrator privileges.
   a) Search for `cmd`.
   b) Right-click on the `cmd` program icon and select **Run as administrator**.
6. In the **Command Prompt** window, change to the USB drive by typing its drive letter, (for example, `e:`) and then pressing **Return**.

7. Run the following command, replacing `e:` with your USB drive’s letter.

```
syslinux -m -a e:
```

8. Close the **Command Prompt** window, and eject and unplug the USB drive.

9. Boot the server from the USB drive.

The image boots to a Linux shell prompt from which `gpumodeswitch` can be run directly. For instructions, see **Running gpumodeswitch**.

### 2.7. Troubleshooting `gpumodeswitch`

Some common problems can cause the `gpumodeswitch` command to fail or to be unavailable.

#### 2.7.1. Unloading an existing NVIDIA driver

You cannot run `gpumodeswitch` in a non-Windows environment where an existing NVIDIA driver is already loaded on the GPU.

In a Linux environment or a XenServer environment, the `gpumodeswitch` command fails and an error is reported:

```
[root@xenserver ~]# ./gpumodeswitch --listgpumodes
NVIDIA GPU Mode Switch Utility Version 1.02
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.
...
ERROR: In order to avoid the irreparable damage to your graphics adapter it is necessary to unload the NVIDIA kernel driver first:
```

---

**Figure 2** Launching an administrator command prompt
Using `gpumodeswitch`

In a VMware ESXi environment, the `gpumodeswitch` command is not available.

### 2.7.1.1. Unloading an existing NVIDIA driver in a Linux environment

1. Halt any services that are using the GPU.
2. Unload the NVIDIA driver.

    ```
    [root@linux ~]# rmmod nvidia
    ```

### 2.7.1.2. Unloading an existing NVIDIA driver in a XenServer environment

1. Halt any VMs that are using the GPU.
2. Stop XenServer’s `gpumon` service.

    ```
    [root@xenserver ~]# service xcp-rrdd-gpumon stop
    Stopping XCP RRDD plugin xcp-rrdd-gpumon: [ OK ]
    ```
3. Unload the NVIDIA kernel driver.

    ```
    [root@xenserver ~]# rmmod nvidia
    ```

### 2.7.1.3. Unloading an existing NVIDIA driver in a VMware ESXi environment

Remove the driver and install the gpumodeswitch VIB as explained in Installing the gpumodeswitch VIB.
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