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Mware[®]

VMTN6636U: GPU Enabled Linux VDI

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#NotSupported – VMworld 2012

- The first rule of Not Supported is you don't talk about Not Supported
- The second rule of Not Supported is...

Rules are made to be broken!





Agenda

- Overview
- Host Configuration
- Licensing
- Virtual Machine Configuration
- Testing

NVIDIA GRID "August 2017 Release" scheduled for August 32 Pascal GPUs are #NotSupported for Linunx Desktops in VMware Horizon





Assumptions

- Ability to manage a VMware Horizon Environment
- Ability to administer Linux Desktops
- You understand this configuration is <u>Not Supported</u> by VMware

Results WILL vary!

Not covered today:

- Integration of Linux Desktops with Directory Services
- VMware Horizon Installation
- Linux VM image optimization
- Basic Linux VM administration tasks





Overview

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Hardware Specs

- Testing on Cisco UCS C240 M3 host
 - Dual E5-2640 6 Core Procs
 - 64GB of RAM
 - NVIDIA P4 @ 384.37 (Version 5.0 beta)
- VMware vSphere 6.5 (Build 5310538)
- vCenter Server Appliance 6.5.0 (Build 5705665)
- VMware Horizon 7.1.0 (Build 5170113)
 - Basic Environment Only
 - Sub-optimal



- Management environment on separate host (Dell R610)
 - vCenter Appliance
 - AD/DNS (Windows 2k8 R2)
 - Jump Box (Windows 2k8 R2)
 - NVIDIA GRID License Server (CentOS7.1 & Windows 2k8 R2)
 - vSphere Connection Server (Windows 2k8 R2)
- Horizon View Client run on Jump box





VM Specs

- CentOS 7.1 (x64)
 - 4 vCPU
 - 8GB vRAM
 - VMware Blast Extreme protocol

GPU

- GRID_p4-4q Profile
- GRID_p4-8q Profile
- Previous Testing
 - GRID_m60-4q vGPU Profile
 - GRID_m60-8q vGPU Profile
 - Passthrough







Host Configuration



Installing the Virtual GPU Manager (VIB)

- 1. Enter maintenance mode on the ESXi host esxcli system maintenanceMode set --enable true
- 2. Stop xorg: /etc/init.d/xorg stop
- 3. Install the Virtual GPU Manager VIB
 esxcli software vib install -v [full-vib path]/[vib-name].vib





Change ECC Mode

- 1. Set ECC config for the GPU
 - 1. nvidia-smi --ecc-config=0
 - 2. Note for Maxwell based GPUs it is still necessary to use GPU Mode Switch
- 2. Start xorg: /etc/init.d/xorg start
- 3. Reboot ESXi host
- 4. Verify the VIB version loaded
 - 1. vmkload_mod -l | grep nvidia
 - 2. nvidia-smi
- 5. Exit Maintenance Mode

esxcli system maintenanceMode set --enable false





Set Default Graphics – Shared Direct

- 1. ESXi Host
- 2. Configure Tab
- 3. Graphics option
- 4. Edit Button
- 5. Shared Direct

🚦 esxi02.wondernerd.local 🛛 🔒 📮 🖿	🕞 🛞 Actions 🗸	≡▼
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Image: Authentication Services Certificate	aphics Graphics Devices aphics Settings t graphics type: Shared Direct	Edit
Power Management Advanced System Settings System Resource Reservation Security Profile System Swap Host Profile ▼ Hardware Processors Graphics 3 Power Management DCI Devices	 esxi02.wondernerd.local - Edit Host Graphics Settings Settings will take effect after restarting the host or "xorg" service. Shared VMware shared virtual graphics Shared Direct Vendor shared passthrough graphics Shared passthrough GPU assignment policy: Spread VMs across GPUs (best performance) Group VMs on GPU until full (GPU consolidation) 	
😨 Recent Tasks	OK Cancel	





Licensing





NVIDIA GRID Licensing

License Editions

Edition	Features
GRID Virtual Application	Virtual GPUs for virtual application computing
NVIDIA GRID vPC (GRID vPC)	Virtual GPUs for business desktop computing
NVIDIA [®] Quadro [®] Virtual Data Center Workstation (Quadro vDWS)	 Virtual GPUs for midrange and high-end workstation computing Workstation graphics on GPU passthrough

• Each edition offers multiple virtual GPU options

Licensing is now enforced across all Operating Systems





vGPU Licensed on Tesla P40

	Name	Max Instances	FB Memory	Display Heads	Max X Res	Max Y Res	License
	P40-1Q	24	1024MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-2Q	12	2048MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-3Q	8	3072MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-4Q	6	4096MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-6Q	4	6144MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-8Q	3	8192MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-12Q	2	12288MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-24Q	1	24576MiB	4	4096	2160	GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0
	P40-1A	8	1024MiB	1	1280	1024	GRID-Virtual-Apps,3.0
	P40-2A	4	2048MiB	1	1280	1024	GRID-Virtual-Apps,3.0
	P40-3A	2	3072MiB	1	1280	1024	GRID-Virtual-Apps,3.0
	P40-4A	1	4096MiB	1	1280	1024	GRID-Virtual-Apps, 3.0
	P40-6A	4	6144MiB	1	1280	1024	GRID-Virtual-Apps,3.0
	P40-8A	3	8192MiB	1	1280	1024	GRID-Virtual-Apps, 3.0
	P40-12A	2	12288MiB	1	1280	1024	GRID-Virtual-Apps,3.0
	P40-24A	1	24576MiB	1	1280	1024	GRID-Virtual-Apps,3.0
#VMν	P40-1B	24	1024MiB	4	2560	1600	GRID-Virtual-PC,2.0; GRID-Virtual-WS,2.0; GRID-Virtual-WS-Ext, 2.0





Install GRID License Server

- Windows or Linux
 - Windows 7 / 8 / 8.1 / 10 / Server 2008 R2
 - Red Hat Enterprise Linux 7.1 64-bit
 - CentOS 7.1 64-bit (141MB disk space)
- Static IP Address
- License File Bound to MAC Address
- Detailed in "GRID License Server Release Notes"
- Supports High Availability





License Server Installation - CentOS

1. Install JRE

```
java -version
sudo yum install java (if not installed or lower than V.1.7)
```

2. Install Apache Tomcat

sudo yum install tomcat tomcat-webapps
sudo systemctl enable tomcat.service
sudo systemctl start tomcat.service

3. Install License Server

tar xfz NVIDIA-linux-2015.09-0001.tgz
sudo ./setup.bin





GRID License Server Configuration

- 1. Respond to questions using "Next" to navigate
- 2. At the Firewall Options
 - License Server (Port 7070) Checked
 - Management Interface (Port 8080) Unchecked
- 3. Click Done to Finish Installation
- 4. Verify Install by going to
 http://localhost:8080/licserver





Generate License File

- 1. Login to NVIDIA Enterprise
- 2. Click Register License Server on left (1)
 - 1. Enter Mac Address (2)
 - 2. Alias (optional)
 - 3. Site Name (optional)
- 3. Click Map-Add-ons (3)
 - 1. Enter quantity of GRID Licenses (4)
 - 2. Click Map Add-Ons button (5)
- 4. Click Download License File (6)
- 5. Install license by using the "License Management" section (7)
 - 1. Click the **Choose File** (8) button browse for the bin file containing the licenses.
 - 2. Click the **Upload** button (9)





Check Point

- Physical Cards Installed
- GPU Manager (VIB) Installed
- GRID License Server Installed, Configured, and Licensed
- Linux VM Created for Template







Add vGPU to Template VM

- 1. With Linux VM Shutdown
- 2. In the vSphere Web Client Right
 - Select Edit Settings (1)
- 3. Click New device drop down (2
 - Select Shared PCI Device (3)
- 4. Click the Add button (4)

J New Hard Disk nory Existing Hard Disk MB Migrate d disk 1 GB Bloom Template Bloom Fault Tolerance VD drive 1 CD/DVD Drive Controller Floppy Drive Controller Floppy Drive Controller Parallel Port A controller 0 Host USB Device Perices USB Controller SCSI Device Rename PCI Device Add Permission Alarms Remove from Inventory Delete from Disk	ardware	VM O	ptions	SDRS Rules	vApp Option	ns			Guest OS
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SATA Controller Update Manager			SATA SA	TA Controller					Update Manager



Add vGPU to Template VM (Continued)

- 1. Select desired GPU profile (1)
- 2. Click Reserve all Memory button (2)
- 3. Click OK button (3)
- 4. Power on VM

Virtual Hardware		ules van Ontions	
Viitual Hardware VM C		Rules VApp Options	
F 🔲 CPU	6	• 0	
Memory	8192	▼ MB ▼	
🕨 🛄 Hard disk 1	16	GB V	
SCSI controller 0	LSI Logic Parall	ł	
Metwork adapter 1	VM Network	👻 🗹 Conn	ect
OD/DVD drive 1	Client Device	🚽 🗌 Conn	ect
USB controller	USB 2.0		
Video card	Specify custom	settings 🚽	:
WMCI device			
SATA controller 0			
Other Devices			
New PCI device	NVIDIA GRID v	PU 🔹	
GPU Profile	grid_m60-8q		
	Warning: m reservation	e vin will not power on until its mem equals its memory size.	ory
20	Reserve all me	mory	
	PCI/PCIe pa	virtual machine operations are unav ssthrough devices are present. You	vailable when cannot
New device:	🔄 🚺 Shai	ed PCI Device 🚽 Add	
Compatibility: ESXi 6.0 an	d later (VM versio	n 11) 3	OK Cancel



Configure Linux Template VM

- For <u>Ubuntu</u> disable Compiz for improved performance
 - http://kb.vmware.com/kb/2114809
- Configure networking to resolve the FQDN of the Connection Server
- For <u>RHEL</u> and <u>CentOS</u>
 - Map Host name to 127.0.0.1 in /etc/hosts
 - Verify virbr0 is disabled
 - virsh net-destroy default
 virsh net-undefined default
 service libvirtd restart

Important!





More

1drnrd.me/CfgHs7LD

Configure Linux Template VM

Install gcc

- sudo yum group install "Development Tools"
- Edit the /etc/nsswitch.conf
 - hosts: cache db files dns
- Configure runlevel for 5
- Disable Nouveau driver
 - Varies based on OS





Install Drivers in the VM

<u>GUEST OS Drivers Must Match VIB Version</u>

- 1. Copy the VMware Horizon Linux Agent to the VM
- 2. Copy the Linux GRID Driver Package to the VM
- 3. Before attempting to run the driver installer, exit the X server and terminate all OpenGL applications.
 - RHEL & CentOS:
 - 1. sudo init 3
 - 2. sudo service gdm stop
 - Ubuntu:
 - 1. Use **CTRL-ALT-F1** to switch to a console login prompt.
 - 2. Log in and shut down the display manager: sudo service lightdm stop
- 4. chmod **+x** NVIDIA-linux-x86_64-[version]-grid.run
- 5. Run the driver installer:

sudo sh ./NVIDIA-Linux_x86_64-[Version]-grid.run





Finish Driver Configuration

- Select Yes to update the X configuration
- Reboot the VM
- <u>Switch to Horizon, ssh, or VNC Console –</u> (Black Screen on terminal connection)
- Install Horizon Linux Agent
 - Unpack the Horizon Linux Agent
 - sudo sh ./[path]/install_viewagent.sh
- Run: nvidia-smi (to validate that the card is present)
- Reboot





Result of nvidia-smi

 Notice it shows the information about the vGPU added

NAID	IA-SMI 384	.37		Driver Ve	rsion: 384	.37	
GPU Fan	Name Temp Per	Persi f Pwr:U	stence-M sage/Cap	+ Bus-Id Memo	Disp.A Dry-Usage	+ Volatile GPU-Util	Uncorr. ECC Compute M.
===== 0 N/A	GRID P4-4 N/A P	Q 8 N/A	On / N/A	0000:02:02.(401MiB /) On 4095MiB	+======== 	N/A Default
							CDII Memoru
GPU	PID	Type	Process :	name			Usage
	======== 16970	 G	======== /usr/bin,	======================================	========	========	40MiB
. U							



#NOT SUPPORI



Configuring gridd.conf - vGPU

- 1. As root In Text Editor Open /etc/nvidia/gridd.conf
 - 1. sudo vi /etc/nvidia/gridd.conf
 - 2. Template can be found: /etc/nvidia/gridd.conf.template
- 2. Set the ServerAddress to the Address of your GRID License Server
- 3. Set the FeatureType to 1 for vGPU
- 4. Save Changes to the file (esc : wq for VI)
- 5. Restart the nvidia-gridd service
 - sudo service nvidia-gridd restart



Licensed

(localhost:8080/licserver/		C Q Search	☆自◆命	
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	Licensed Clier	nts		
License Server Licensed Clients	Licensed Clients with features cons	umed or reserved. Click a Client ID for further details.		
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		Copyright (c	2017 NVIDIA Corporation. All Rights Reserved. 2017	0501-0001
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* <u>Settings</u>				





Limitations

- Pascal GPUs not supported
- No VMware vMotion
- No VMware DRS
- No Instant Clone Support
- No Snapshotting of running VMs
- Must use VMware Blast Extreme protocol







Automated Pool in Horizon

- In desktop pools, right click Add 1.
- Select Automated Desktop Pool 2.
- 3. Select pool type
- 4. Select Clone type
- 5. Enter pool info
- Configure Desktop pool settings 6.
 - 1. Default Display protocol: VMware Blast
 - 2. Allow Users to Choose Protocol: No
 - 3. 3D Render: [Automatic | NVIDA GRID VGPU | Hardware]
- 7. Continue as normal





Type



SUS ANO SIV SUS ANO SIV SOURS SIVESDO

GGWZ



Testing

- OpenGFX
- Won't run without an OpenGL capable graphics card
- Can highlight other problems





#VMworld #VMTN6636U #NotSupported

34

GFXBench – It Works!

Single pass results in a non-optimized environment, individual results may vary significantly

Testing with P4-8Q

- Lowest FPS: Texturing @ 63.5544 FPS
- Highest FPS: Tessellation @ 713.276 FPS
- Off screen Lowest FPS: 1080p Texturing Offscreen @ 95.8384
 FPS
- Off screen Highest FPS: 1080p Tessellation Offscreen @ 1481.04 FPS

Testing with P4-4Q

- Lowest FPS: Texturing @ 64.4044 FPS
- Highest FPS: Tessellation @ 713.862 FPS
- Off screen Lowest FPS: 1080p Texturing Offscreen @ 95.9874 FPS

gfxbench.com

More

Off screen Highest FPS: 1080p Tessellation Offscreen
 @ 1473.5 FPS FPS



Thank you for attending this vBrownBag TechTalk – A VMTN Network Member

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Presentation available at www.wondernerd.net

