NVIDIA vGPU Software for VMware vSphere Hypervisor

Deployment Guide

Document History

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Chapter 1. Getting Started

NVIDIA vGPU software enables multiple virtual machines (VMs) to have simultaneous, direct access to a single physical GPU, using the same NVIDIA graphics drivers that are deployed on non-virtualized operating systems. This gives VMs unparalleled graphics performance and application compatibility, together with cost-effectiveness and scalability brought about by sharing a GPU among multiple workloads.

This chapter covers how NVIDIA vGPU solutions fundamentally alter the landscape of desktop virtualization and enable users to use these solutions with applications of all levels of complexity and graphics requirements. This chapter also describes the NVIDIA vGPU architecture, the NVIDIA GPUs recommended for virtualization, the three NVIDIA vGPU software licensed products for desktop virtualization, and key standards supported by NVIDIA virtual GPU technology.

1.1 Why NVIDIA vGPU?

The promise of desktop virtualization, realized for server workloads years ago, is flexibility and manageability. Initially, desktop virtualization was used where flexibility and security were the primary drivers due to cost considerations. The democratization of technology over the years has reduced the total cost of ownership of desktop virtualization. This, along with advances in storage and multi-core processors make for a reasonable and/or advantageous cost to ownership.

The big remaining challenge for desktop virtualization is providing a cost effective yet rich user experience. There have been attempts to solve this problem with shared GPU technologies like vSGA that are cost effective, but those technologies do not provide the rich application support needed to be successful and ensure end user adoption. Dedicated GPU pass-through with vDGA provides 100% application compatibility, but is cost-effective only for the highest end use cases due to high cost and limited density of virtual machines per host server.

Due to the lack of scalable, sharable, and cost effective per user GPUs that provide 100% application compatibility, providing a cost-effective rich user experience was challenging for broad use cases in desktop virtualization. Meanwhile, high-end 3D applications simply did not work in a virtualized environment or were so expensive to implement with vDGA that it was reserved for only the most limited of circumstances.

Today this is no longer true, to thanks to NVIDIA vGPU technology combined with VMware Horizon. NVIDIA vGPU technology allows the flexibility where multiple virtual desktops share a single physical GPU. This provides the 100% application compatibility of vDGA pass-through graphics, but with the

lower cost of multiple desktops sharing a single graphics card to provide a rich, yet more costeffective user experience. With VMware Horizon, you can centralize, pool, and more easily manage traditionally complex and expensive distributed workstations and desktops. Now all your user groups can take advantage of the promise of virtualization.

1.2 NVIDIA vGPU Architecture

The high-level architecture of an NVIDIA virtual GPU enabled VDI environment is illustrated in Figure 1-1. Here, we have GPUs in the server, and the NVIDIA vGPU manager software (VIB) is installed on the host server. This software enables multiple VMs to share a single GPU, or if there are multiple GPUs in the server, they can be aggregated so that a single VM can access multiple GPUs. This GPU enabled environment provides not only unprecedented performance; it also enables support for more users on a server because work that was typically done by the CPU can be offloaded to the GPU. Physical NVIDIA GPUs can support multiple virtual GPUs (vGPUs) and be assigned directly to guest VMs under the control of NVIDIA's Virtual GPU Manager running in a hypervisor.

Guest VMs use the NVIDIA vGPUs in the same manner as a physical GPU that has been passed through by the hypervisor. In the VM itself, vGPU drivers are installed which support the different license levels that are available.



Figure 1-1 NVIDIA vGPU Platform Solution Architecture

NVIDIA vGPUs are comparable to conventional GPUs in that they have a fixed amount of GPU memory and one or more virtual display outputs or *head*. Managed by the NVIDIA vGPU Manager installed in the hypervisor, the vGPU memory is allocated out of the physical GPU frame buffer at the time the vGPU is created. The vGPU retains exclusive use of that GPU Memory until it is destroyed. Note: These are virtual heads, meaning on GPUs there is no physical connection point for external physical displays.

All vGPUs that reside on a physical GPU share access to the GPU's engines, including the graphics (3D) and video decode and encode engines. Figure 1-1 shows the vGPU internal architecture. The VM's guest OS leverages direct access to the GPU for performance and critical fast paths. Noncritical performance management operations use a paravirtualized interface to the NVIDIA Virtual GPU Manager.



Figure 1-2 NVIDIA vGPU Internal Architecture

1.3 Supported NVIDIA GPUs

Table 1-1 lists the hardware specifications for NVIDIA GPUs that support NVIDIA vGPU software.

Table 1-1 NVIDIA GPU Hardware Specifications

V100S	RTX 8000	RX 6000	M10	T4	P6
	Passive	Passive			

GPUs / Board	1	1	1	4	1	1
(Architecture)	(Volta)	(Turing)	(Turing)	(Maxwell)	(Turing)	(Pascal)
CUDA Cores	5,120	4,608	4,608	2,562	2,560	2,048
				(640 per GPU)		
Memory Size	32 GB HBM2	48 GB GDDR6	24 GB GDDR5	32 GB GDDR5	16 GB GDDR6	16 GB GDDR5
				(8GB per GPU)		
vGPU Profiles	1 GB, 2 GB, 4 GB, 8 GB, 16 GB, 32 GB	1 GB, 2 GB, 3 GB, 4 GB, 6 GB, 8 GB, 12 GB, 24 GB, 48 GB	1 GB, 2 GB, 3 GB, 4 GB, 6 GB, 8 GB, 12 GB, 24 GB	0.5 GB, 1 GB, 2 GB, 4GB, 8 GB	0.5 GB, 1 GB, 2 GB, 4GB, 8 GB, 16 GB	0.5 GB, 1 GB, 2 GB, 4GB, 8 GB, 16 GB
Form Factor	PCle 3.0 Dual Slot (Rack servers)	PCle 3.0 Dual Slot (Rack servers)	PCle 3.0 Dual Slot (Rack servers)	PCle 3.0 Dual Slot (Rack servers)	PCle 3.0 Single Slot (Rack servers)	MXM (Blade servers)
Power	250W	295W	295W	225W	75W	90W
Thermal	Passive	Active	Active	Passive	Passive	Bare Board

NVIDIA virtual GPU software is supported with NVIDIA GRID[®] GPUs. Determine the GRID GPU best suited for your environment, depending on whether you are optimizing for performance or density, and whether the GPUs will be installed in rack servers or blade servers. You can download datasheets from the links below.

- Highest performance The following NVIDIA GPUs are targeted at users with demanding workflows, compressed design cycles, and complex simulations:
 - NVIDIA V100S
 - <u>NVIDIA RTX™ 8000</u>
 - <u>NVIDIA RTX 6000</u>
- Highest density:
 - NVIDIA T4
 - NVIDIA M10
- Blade server optimized:
 - NVIDIA P6

1.4 NVIDIA vGPU Software Licensed Products

NVIDIA virtual GPU software divides GRID GPU resources so the GPU can be shared across multiple virtual machines running any application.

The portfolio of NVIDIA virtual GPU software products for desktop virtualization is as follows:

- NVIDIA[®] Quadro[®] Virtual Data Center Workstation (Quadro vDWS)
- NVIDIA GRID Virtual PC (GRID vPC)
- NVIDIA GRID Virtual Applications (GRID vApps)

To run these software products, you need an NVIDIA GPU and software license that addresses your specific use case.

Table 1-2 lists the virtual GPU software products and recommended NVIDIA GPUs for each product.

NVIDIA VIRTUAL GPU SC	OFTWARE FEATURES	Quadro vDWS	GRID vPC	GRID vApps
	Desktop Virtualization	Y	Y	
	RDSH App Housing	Y ⁴	Y	Y
	RDSH Desktop Hosting	Y ⁴	Y	Y
	Windows OS Support	Y	Y	Y
Configuration &	Linux OS Support		Y ⁵	
Deployment	GPU Pass-Through Support6	γ		Y
	Bare Metal Support7	Υ		Υ
	NVIDIA Graphics Driver	Y ⁴	Υ	Υ
	NVIDIA Quadro Driver	Υ		
	Guaranteed Quality of Service Scheduling8	Y	Y	Y
Display	Maximum Active Displays	Four 4K	Four QHD / Two 4K ¹⁸	One ⁹
υισμιαγ	Maximum Display Resolution	4096×2160	4096×2160	1280×1024
Data Center Management	Host, Guest, and Application Level Monitoring ¹⁰	Y	Y	Y
	Live Migration ⁵	Υ	Υ	Υ
	NVIDIA Direct Enterprise- Level Technical Support	γ	Y	Y
Support	Maintenance Releases, Defect Resolutions, and Security Patches for up to 3 years ¹¹	Y	Y	Y
Advanced Professional	Independent Software Vendor (ISV) Certifications	γ		
Features	CUDA / OpenCL	Y12		γ13
	NVENC	Y	Υ	

Table 1-2 Virtual GPU Software Products

	OpenGL Extensions, Including WebGL	Y	Y	Y
Graphics Features &	DirectX	Y	Y	Y
APIs	Vulkan Support	Y		
	Quadro Performance Features and Optimizations	Y		
	Max Frame Buffer Supported	32 GB	2 GB⁵	24 GB
Profiles	Available Profiles ¹⁴	0Q, 1Q, 2Q, 3Q, 4Q, 6Q, 8Q, 12Q, 16Q, 24Q, 32Q ¹⁹	OB, 1B, 2B⁵	24A, 16A, 12A, 8A, 6A, 4A, 3A, 2A, 1A
	High-end professional graphics users include uses for double precision compute workloads (i.e. Running 3D models and design workflows, intensive CAE simulations)	V100S ¹⁵		
	Mid to high-end professional graphics users, includes use for single precision compute workloads (i.e. Rendering & creating complex designs)	NVIDIA RTX 8000 Passive NVIDIA RTX 6000 Passive		
Recommended GPUs for Different Use Cases and Workflows	Entry to mid-level professional graphics users, including deep learning inference workloads and Pascal specific GPU architecture features	T4		
	Best density and performance for the knowledge worker		M10	
	Software developers using 2D Electronic Design Automation (EDA) tools and Linux apps; healthcare providers and financial traders needing increased productivity with multiple high-res monitor support		M10	
	Best for blade form factor	P6	P6	P6

¹ Assumes cost of subscription, NVIDIA GRID software, and hardware, with 3-year amortization of hardware of two M10 cards supporting 87 vApps users 64 vPC users

² Lakeside Software, Inc. "Elevating User Experience Through GPU Acceleration: A Windows 10 versus Windows 7 Analysis." Lakeside Software White Paper. 2017

³ Data from Lakeside Software Community Program 2017

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<sup>4</sup> With packaged GRID vApps license
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⁵ Supported starting with NVIDIA virtual GPU software Spring 2018 release (version 6.0)

⁷ Only NVIDIA M6 Hardware supported as primary display device

⁸ Scheduling options include fixed share, equal share, and best effort/time slicing

⁹ GRID vApps supports one 1280×1024 display from the GPU card. However, XenApp renders to an offscreen buffer, so it can support multiple software rendered displays at higher resolutions

¹⁰ Application level monitoring only available starting with the NVIDIA virtual GPU August 2017 release (version 5.0)

¹¹ Available with active Support, Updates, and Maintenance and Subscriptions (SUMs) contract

¹² Supported on 8GB 1:1 profile on Maxwell and all profiles on Pascal

¹³ Only supported for Maxwell 8A profile on GRID 4.x and earlier releases

¹⁴ Profiles supported have dependency on GPU selected. For vGPU profiles, "Q" stands for Quadro, "B" stands for Business, and "A" stands for Apps. For more information, read the Virtual GPU Software User Guide at docs.nvidia.com/grid/latest/grid-vgpu-user-guide/index ¹⁵ V100 support only available with NVIDIA virtual GPU software Spring 2018 release (version 6.0)

¹⁶ Gartner. April 25, 2017. "Gartner Survey Shows 85 Percent of Enterprises Will Have Started Windows 10 Deployments by End of 2017." [Press Release]. Retrieved from www.gartner.com/newsroom/id/3690917

¹⁷ John Peddie Research. October 16, 2017. Jon Peddie Research: Multiple Displays Can Increase Productivity By 42%. Retrieved from www.jonpeddie.com/press-releases/jon-peddie-research-multiple-displays-can-increase-productivity-by-42 Supports up to two 4K displays or four 2560×1600 displays on 2B profile.

¹⁸ Supports up to four 2560×1600 displays on 1B profile. Support for two 4K displays starts with NVIDIA virtual GPU software release 6.0, and support for four 2560×1600 displays on 2GB profile starts with NVIDIA virtual GPU software release 6.2

¹⁹ 32Q profile available with V100

The maximum number of vGPUs that can be created simultaneously on a physical GPU is defined by the amount of frame buffer per virtual desktop, and thus how many virtual desktops can share that physical GPU. For example, an NVIDIA M10 physical GPU can support up to 64 GRID vPC 0B profiles (32 GB total with 512MB per user) or 32 GRID vPC 1B profiles (32 GB total with 1GB per user). You cannot oversubscribe frame buffers, and they must be shared equally for each physical GPU; however, you may select different profiles for each GPU.

NVIDIA V100S, RTX 8000, RTX 6000 (passive and active cooling), and M10 are full height, full length, double width PCI-e cards, and are passively cooled (no onboard fan), requiring certified servers designed to power and cool them properly. NVIDIA T4 is a single slot 75W GPU, meaning you can accommodate two NVIDIA T4s in the same physical space you could fit a single double width card. NVIDIA P6 and T4 are designed to fit into blade server form factors. Refer to the web page <u>How to Buy NVIDIA Virtual GPU Solutions</u> for a list of certified server platforms for NVIDIA GPUs. Cross-reference the NVIDIA certified server list with the VMware vSphere HCL to find servers best suited for your NVIDIA vGPU and VMware vSphere environment. Each card must have auxiliary power cables connected to it (except NVIDIA T4); see the chart below for specific pin counts. Most industry standard servers require an enablement kit for properly mounting NVIDIA GPU cards. Check with your server OEM of choice for more specific requirements.

1.5 Supported Graphics APIs

This version of NVIDIA vGPU software includes support for:

- Full DirectX 12, Direct2D, and DirectX Video Acceleration (DXVA)
- OpenGL 4.6
- NVIDIA vGPU SDK (remote graphics acceleration)

⁶ Only supported on 1:1 profiles

Vulkan 1.1

For information about the virtual GPUs that support OpenCL and NVIDIA[®] CUDA[®] applications, see <u>NVIDIA CUDA Toolkit and OpenCL Support on NVIDIA vGPU Software</u> in *NVIDIA Virtual GPU Software* User Guide.

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Note: Only OpenCL and CUDA applications *without* Unified Memory are supported on NVIDIA virtual GPUs. Unified Memory and CUDA tools are *not* supported on NVIDIA virtual GPUs.

1.6 Before You Begin

This section describes the general prerequisites and some general preparatory steps that must be addressed before proceeding with the deployment.

1.6.1 Building an Evaluation Plan

To be successful, we highly recommend you start with an evaluation plan consisting of the following:

- A list of your business drivers and goals
- A list of all of the user groups, their workloads, and applications, with current, and future projections in consideration
- Current end-user experience measurements and analysis
- ROI / Density goals

1.6.2 Sizing Your Environment

Based on your evaluation plan, we recommend sizing an appropriate environment for each user group you are trying to reach with your evaluation.

For example, here are three examples of Dassault Systèmes SOLIDWORKS use cases and their computing needs:

- Entry-Level Engineer / Design Reviewer
 (Small Objects / Assemblies / Approximately 10% of Users)
 - 4 GB RAM
 - 2 vCPUs (2.6 GHz)
 - 2-4 GB video RAM
 - Two 2560×1600 displays
- Mid-Level Engineer (Avg to Large Objects / All App Features / Approximately 80% of Users)
 - 8 GB RAM
 - 4 vCPUs (2.6 GHz)
 - 4-8 GB video RAM
 - Four 2560×1600 displays and/or One 3840×2160
- Advanced Engineer (Extremely Large objects / All App Features / Approximately 10% of Users)

- 16 GB RAM
- 8 vCPUs (3.2 GHz)
- 8-16 GB video RAM
- Four 2560×1600 displays and/or two 3840×2160

Be sure to include enough RAM, CPUs, and GPUs to meet your sizing requirements.

1.6.3 Choosing Your Hardware

The following elements are required to install and configure vGPU software on VMware vSphere:

- NVIDIA certified servers with NVIDIA cards (see the web page <u>NVIDIA vGPU Partners</u> for a list of certified NVIDIA servers. It is helpful to cross check this list with the <u>VMware HCL</u> to ensure compatibility for your deployment. The following specifications are recommended:
 - 2.4 GHz CPU or faster (Intel Xeon Gold 6200 Family Product)
 - High-speed RAM
 - Fast networking

If you are using local storage, input/output operations per second (IOPS) plays a major role in performance. If you are using VMware for a Virtual SAN, see the <u>VMware Virtual SAN</u> requirements website for more details.

- High performance storage with Virtual SAN or high IOPS storage system
- High performance end points for testing access

1.6.4 General Prerequisites

The following elements are required to install and configure vGPU software on VMware vSphere 6.7:

Review the <u>Getting Started page</u> of the VMware Horizon documentation. It provides a roadmap for implementing Horizon as a server with Citrix clients and has a link to a lists of VMware education courses and other resources.

One or more NVIDIA certified servers with NVIDIA cards. For a list of certified servers, see the NVIDIA vGPU Partners page <u>Find a Virtualization Partner to Get Started</u>. Cross-check this list against the <u>VMware Compatibility Guide</u> to ensure compatibility with your environment.

Choose servers that meet the following requirements:

- 2.4 GHz CPU or faster (Intel Xeon Gold 6200 Family Product)
- High-speed RAM
- Fast networking
- If using local storage IOPS plays a major role in performance. If using VMware for Virtual SAN, see the VMware Virtual SAN requirements website for more details.
- Free 60-day evaluation for VMware vSphere and vSphere with Operations Management can be downloaded from <u>Product Evaluation Center for VMware vSphere 7.0</u>.

The appropriate NVIDIA GPU for your use case. See Table 1-1 for a better understanding of which GPU suits your deployment requirements. For additional guidance, contact your NVIDIA and VMware reps.

- VMware vSphere 6.7 build
 - vSphere and vCenter Server are available only from the VMware website. See the link above.
 - You may deploy vCenter Server 6 on a Microsoft Windows server or as an OVA Appliance.
- VMware Horizon 7 software. If needed, you may register for a trial to obtain the license keys required for various elements to deploy and manage Horizon at the web page <u>Welcome to My</u> <u>VMware</u>.
- NVIDIA vGPU software:
 - NVIDIA vGPU manager vSphere Installation Bundle (VIB)
 - NVIDIA WDDM guest driver (64-bit versions)

Note: The vGPU Manager VIB is loaded similarly to a driver in the vSphere hypervisor, and is then managed by the vCenter Server.

As of this document's publication date (see <u>Document History</u>), the <u>current NVIDIA vGPU software</u> <u>builds</u> are as follows:

- NVIDIA-VMware-450.55-10EM.670.0.0.8169922.x86_64.vib
- NVD.NVIDIA_bootbank_NVIDIA-VMware_450.55-10EM.670.0.0.8169922offline_bundle.zip
- 451.48_grid_server2012R2_64bit_international.exe
- 451.48_grid_win10_server2016_server2019_64bit_international.exe
- NVIDIA-Linux-x86_64-450.51.05-grid.run
- Microsoft software:
 - Windows Server 2016 (recommended) or Server 2012R2 (minimum)
 - Windows 10 Professional or Enterprise VL (for use as the guest operating system)
- Your choice of one of the following CLI/SSH/SCP tools installed on your Windows-based toolbox PC:
 - MobaXterm (SSH and SPC) is available from www.mobaxterm.mobatek.net. This is the recommended tool.
 - Putty (SSH) and WinSPC (SPC), available from www.putty.org and www.winscp.net, respectively.
- Licenses:
 - From the VMware Horizon website:
 - > VMware vSphere 6.7
 - > VMware Horizon 7
 - Microsoft (volume licenses recommended)
- Testing and Benchmarking tools:
 - NVIDIA System Management interface (NSMI)
 - OPTIONAL: VMware vRealize Operations for Horizon (V4H)
 - OPTIONAL: Lakeside Systrack 7 with GPU monitoring
 - User satisfaction survey
- A server system on which to install View Connection Server 6:
 - Runs Microsoft Windows Server 2016

- Must be joined to a domain
- Must be assigned a static IP address

1.6.5 Preparation for Pre-Installation

Before you install NVIDIA vGPU software:

- 1. Determine how vSphere will run on the physical hosts. Consider booting from a thumb drive, as this is an Early Access build.
- 2. Download and install any of the following for SSH and SCP:
 - An SSH tool (such as PuTTY) and an SCP tool (such as WinSCP)
 - MobaXterm, which handles both SSH and SCP functions
- 3. Set the BIOS on the physical hosts as appropriate. See 1.6.6, *Server BIOS* Settings on page 16.
- 4. Install Virtual Clone Drive or a similar tool to mount and unmount ISO images easily within the virtual machines.

1.6.6 Server BIOS Settings

Configure the BIOS for your physical hosts, as described below:

- Hyperthreading Enabled
- Power Setting or System Profile High Performance
- CPU Performance (if applicable) Enterprise or High Throughput
- Memory Mapped I/O above 4-GB Enabled (if applicable)

If NVIDIA card detection does not support all of the installed GPUs, set this option to Enabled

Chapter 2. Installing VMware ESXi

This chapter covers the following ESXi installation topics:

- Choosing an install method
- Preparing the USB boot media
- Installing ESXi from the USB media
- Initial host configuration
- Assigning a host license

This deployment guide assumes you are building an environment as a proof of concept, not as a production deployment. Consequently, it recommends settings and other choices that make the process faster and easier. Before you build your production environment, consult the corresponding guides for each technology and make choices appropriate for your needs.

2.1 Choosing an Install Method

With the ability to install from and onto an SD card or a USB flash drive, ESXi offers more flexibility than a local hard drive install. See the vSphere documentation regarding best practices for logs when booting from a USB flash drive or similar device. This lab uses Supermicro's IPMI and virtual media to boot from an ISO file and install on local storage.

2.2 Preparing USB Boot Media

Reference VMware KB: "Installing ESXi on a supported USB flash drive or SD flash card (2004784)"

Booting vSphere 6.7 from a USB flash drive is useful if your host has an existing vSphere Version 5.5 or earlier installation that you want to retain.

Use the following procedure to prepare a USB flash drive for booting:

5. Download UNetbootin from the GitHub UNetbootin page.

The Windows version of the application does not include an installer; however, the OSX version is packaged in a .DMG file that you must mount. You must also copy the application to the Applications folder before launching.

Alternatively, you can use YUMI, which allows booting from multiple installation images on one USB device, and lets you load the entire installation into RAM. You can download YUMI from <u>Pendrivelinux.com</u>.

6. Start the application, select Diskimage, and click the ... button to browse for the installation . ISO file:

			00	2 23
Distribution	== Select Distribution ==	*	== Select Version ==	*
Welcome to UNetboo	otin, the Universal Netboot Installer. U	Isage:		
1, Select a dist load below. 2. Select an ins	ribution and version to download from	n the list installin	t above, or manually specify file Ig.	es to
Diskimage	ISO V			
Diskimage Space used to preser	ISO 👻	: 0		: ME

- 7. Browse to the location that contains the installation . ISO file, then select Open.
- 8. Select the mounted USB flash drive on which to perform the installation, then click OK. The copying process begins, and YUMI displays a series of progress bars.



- 9. When the copying process is complete, click Exit, then remove the USB flash drive.
- 10. To install from this USB flash drive, insert it into the host using either an internal USB port or on an external USB port, then set that as the primary boot source or select from the boot menu on power up.

2.3 Installing ESXi

Use the following procedure to install ESXi regardless of boot source. Select the boot medium that holds the vSphere ISO from your host's boot menu.

1. Apply power to start the host. It displays the following menu when it starts up:

ESXi-6.7.0-20190402001-standard Boot Menu
ESXi-6.7.0-20190402001-standard Installer
Boot from local disk

- 2. Select the installer with the arrow keys, then press Enter to begin booting the ESXi 6.7 installer.
- 3. The installer displays a compatibility warning:



4. Press Enter to continue. The installer displays the End User License Agreement (EULA):



5. Read the EULA, then press F11 to accept it and continue the installation. The installer scans the host to locate a suitable installation drive:



When the installer is done scanning the host it displays all drives available for install:

Select a Disk to Install or Upgrade	
* Contains a VMFS partition # Claimed by VMware Virtual SAN (VSAN)	
Storage Device Local: * Intel RCS25ZB040LX # Intel RCS25ZB040LX # Intel RCS25ZB040LX * ATA INTEL SSDSC2BP24 * ATA INTEL SSDSC2BP24 # ATA INTEL SSDSC2BP24 Remote: (none)	Capacity 222.59 618 930.39 618 223.57 618 223.57 618
(Esc) Cancel (F1) Details (F5) Refresh (Enter) (Continue

6. Use the arrow keys to select the drive on which you want to install ESXi, then press Enter to continue.

You can install ESXi to a USB flash drive and then boot and run the system from that USB flash drive. This sample installation shows vSphere being installed on a local hard drive.

7. The installer scans the drive you selected to determine its suitability for install:

Sele * Contains a VMFS part # Claimed by VMware Vi	ect a Disk to Install or Upgrade ition rtual SAN (VSAN)				
St itt Scanning Lo * Gathering additional information from the selected device. Gi # This will take a few moments. Gi					
# ATA INTEL SSDS Remote: (none)	C2BP24 (t10.ATAINTEL_SSDSC2B) 223.57	GiB			
(Esc) Cancel (F1	.) Details (F5) Refresh (Enter) Continue	e			

8. The installer displays the Confirm Disk Selection window:

	ESXi and VMFS Found	
* Cont # Clai Storag	The selected storage device contains an installation of ESXi and a VMFS datastore. Choose whether to upgrade or install and overwrite the existing ESXi installation. Also choose whether to preserve or overwrite the existing VMFS datastore.	apacity
* Int # Int * ATA # ATA Remote (no	 () Upgrade ESXi, preserve VMFS datastore () Install ESXi, preserve VMFS datastore (<u>х</u>) Install ESXi, overwrite VMFS datastore Use the arrow keys and spacebar to select an option. (Esc) Cancel (Enter) OK 	.59 GiB .39 GiB .57 GiB .57 GiB
(Esc	:) Cancel (F1) Details (F5) Refresh (Enter) Cont	inue

9. Press Enter to accept your selection and continue.

For this EA2 release, Upgrade ESXi is not a supported selection.

10. The installer displays the Please select a keyboard layout window:

Please select a keyboard layout
Swiss French Swiss German Turkish US Default US Dvorak Ukrainian United Kingdon
Use the arrow keys to scroll.
(Esc) Cancel (F9) Back (Enter) Continue

11. Select a keyboard layout with the arrow keys, then press Enter. The installer displays the Enter a root password window:



12. Enter a root password in the Root password field.



CAUTION: To give you host maximum protection from unauthorized access, use a root password that contains at least eight (8) characters, including a mix of lower case and capital letters, digits, and special characters.

13. Confirm the password in the Confirm password field, then press Enter to continue. The installer rescans the system:



14. When the installer finishes rescanning, it displays the Confirm Install window:



Press F11 to proceed with the installation.



15. The ESXi 6.7 installation proceeds:

Installing ESXi 6.7.0
45 %

16. The installer displays the Installation Complete window when the installation process is completed:



17. Make sure that your installation medium has been ejected and your system is set to the boot disk. Then press Enter to reboot the system.



The installation is now complete.

2.4 Initial Host Configuration

ESXi 6.7 displays a countdown timer when you first boot it. You can wait for the countdown to expire or press Enter to proceed with booting. ESXi 6.7 displays a series of notifications during the boot process.

 Where ESXI 6.7.8 (Wikernel Release Build 8169922)

 Supervices SYS-20208-1R1

 2 x Intel (R) Kenn(R) CPU ES-2667 v4 # 3.200Hz

 225.9 GiB Henory

 To manage this host go to:

 http://SXIG*

 http://SXIG*

 thtp://SXIG*

 <t

When the boot process completes, VMware ESXi 6.7 displays this screen:

1. Press F2. ESXi displays the Authentication Required window:



2. Enter the root account credentials that you created during the installation process, then press Enter.

ESXi displays the System Customization screen:

System Customization	Configure Password
Configure Password Configure Lockdown Mode Configure Lockdown Mode Configure Management Network Restart Management Network Test Management Network Network Restore Options Configure Keyboard Troubleshooting Options View System Logs View System Logs View Support Information Reset System Configuration	Set To prevent unauthorized access to this system, set the password for the user.

3. Select Configure Management Network with the down-arrow key, then press Enter. ESXi displays the Network Adapters window:

4. Select the adapter to use as the default management network with the arrow keys, then press Enter. ESXi displays the IPv4 Configuration window:

- 5. Select Set static IPv4 address and network configuration with the up and down arrow keys, then enter the IPv4 address, subnet mask, and default gateway in their respective fields. Then press Enter to apply the new management network settings.
- 6. ESXi displays the Confirm Management Network dialog. Press the Y key to confirm your selection.
- 7. ESXi displays the DNS Configuration window. Add the primary and (if available) secondary DNS server address(es) in their respective fields.
- 8. Enter this vSphere host's host name in the Hostname field, then press Enter.

- 9. Select Test Management Network on the main ESXi 6.7 screen to open the Test Management Network window.
- 10. Perform the following tests:
 - Ping the default gateway.
 - Ping the DNS server.
 - Resolve a known address.
- 11. Return to the main ESXi 6.7 screen when you have completed testing, and then select Troubleshooting Options. ESXi displays the Troubleshooting Mode Options window:

Troubleshooting Mode Options	ESXi Shell
Enable ESXi Shell Enable SSH Modify ESXi Shell and SSH timeouts Modify DCUI idle timeout Restart Management Agents	ESXi Shell is Disabled Change current state of the ESXi Shell

12. Enable the ESXi Shell by selecting Enable ESXi Shell and pressing Enter. (Successive keypresses toggle vSphere Shell between enabled and disabled.) The window on the right displays the shell's status.

Troubleshooting Mode Options	ESXi Shell
Enable ESXi Shell Enable SSH Modify ESXi Shell and SSH timeouts Modify DCUI idle timeout Restart Management Agents	ESXi Shell is Disabled Change current state of the ESXi Shell

13. Enable SSH by selecting Enable SSH and pressing Enter. (Successive keypresses toggle SSH between enabled and disabled.) The window on the right displays the SSH status.

This completes the ESXi 6.7 installation. The ESXi 6.7 host is accessible by the IP that was set in the Management Network in this section.

Chapter 3. Installing VMware vCenter Server

This chapter covers installing VMware vCenter Server, including:

- Installing VCenter Server Appliance
- Adding Licenses to Your vCenter Server
- Adding a Host
- Setting the NTP Service on a Host
- Setting a vCenter Appliance to Auto-Start
- Mounting an NFS ISO Data Store

Review the prerequisites in General Prerequisites in section 1.6.4 before proceeding with these installations.

Note: This deployment guide assumes you are building an environment for a proof of concept. Refer to VMware best practice guides before building your production environment.

3.1 Installing vCenter Server Appliance

3.1.1 About VCSA

The VCSA is a preconfigured virtual appliance built on Project Photon OS that allows you to manage multiple ESXI 6.7 host and perform configuration changes from a single pane of glass. Since the OS was developed by VMware, it offers better performance and boot times than the previous Linux-based appliance. Furthermore, it uses an embedded vPostgres database, giving VMware full control of the software stack, and resulting in significant optimization for vSphere environments, and quicker release of security patches and bug fixes.

The VCSA scales up to 2000 hosts and 35,000 virtual machines. A couple of releases ago the VCSA reached feature parity with its Microsoft Windows counterpart, and is now the preferred deployment method for vCenter Server. Features such as Update Manager are bundled into the VCSA, as are file-based backup and restore and vCenter High Availability. The appliance also saves operating system license costs and is quicker and easier to deploy and patch.

- Software Considerations:
 - VCSA must be deployed to an ESXi host running version 5.5 or above. However, all hosts you intend to connect to VCSA should be running ESXi 6.0 or above. Hosts running v5.5 and earlier cannot be managed by the VCSA and do not have a direct upgrade path.
 - You must check compatibility of any third-party products and plugins that may be used for backup, virus protection, monitoring, etc., as they may need upgrading for ESXi compatibility.
 - To check version compatibility with other VMware products, see the <u>Product Interoperability</u> <u>Matrix</u>.
- Architectural Considerations:
 - When you implement a new vSphere environment, you must plan its topology in accordance with the VMware vCenter Server and Platform Services Controller Deployment Types.
 - Most deployments include vCenter Server and Platform Service Controller in one appliance, following the embedded deployment model, which is used in this guide.
- Other Considerations:
 - The VCSA with embedded PSC requires the following hardware resources (disk can be thin provisioned):
 - Tiny (up to 10 hosts, 100 VMs): 2 CPUs, 10 GB RAM.
 - Small (up to 100 hosts, 1000 VMs): 4 CPUs, 16 GB RAM.
 - Medium (up to 400 hosts, 4000 VMs): 8 CPUs, 24 GB RAM.
 - o Large (up to 1000 hosts, 10,000 VMs): 16 CPUs, 32 GB RAM.
 - X-Large (up to 2000 hosts, 35,000 VMs): 24 CPUs, 48 GB RAM; new in v6.5.
 - Storage requirements for the smallest environments start at 250 GB and increase depending on your specific database requirements. See the document <u>Storage Requirements</u> for further details.
 - If the PSC is deployed as a separate appliance it requires two CPUs, 4 GB of RAM, and 60 GB of disk storage.
 - Environments with ESXi host(s) that have more than 512 LUNs and 2048 paths should be sized large or x-large.
 - The ESXi host on which you deploy the VCSA must not be in lockdown or Maintenance Mode.
 - All vSphere components must be configured to use an NTP server. The installation may fail or the vCenter Server Appliance vpxd service may be unable to start if the clocks are not synchronized.
 - FQDN resolution must be enabled when you deploy vCenter Server.
 - <u>Required Ports for vCenter Server and Platform Services Controller</u>.
 - vSphere <u>VMware Configuration Maximums</u>.

3.1.2 vCenter Server Appliance (VCSA) Installation

Download the VMware vCenter Server Appliance ISO from VMware downloads: v6.7.0.

- 1. Mount the ISO on your computer. The VCSA installer is compatible with Mac, Linux, and Windows.
- 2. Browse to the corresponding directory for your operating system, e.g. \vcsa-uiinstaller\win32. Right click Installer and select Run as administrator.

		Application Tools win32					-	o x
File Home	Share	View Manage						~ 0
ተ 📕	> Thi	s PC > DVD Drive (F:) VMware VCSA > vcsa+ui	-installer > win32			~0	Search win32	p
		Namé	Date modified	Туре	Sizé			
Quick access		legaler.	A/48/10/10/10 A.20 AAA	Edu folder				
Desktop	1	incores and incores	4/10/2019 4:25 AM	File folder				
- Downloads	1	blok mane erennen 20 onrent och	2/10/2010 4/22 AM	BAY Ele	25.00			
Documents		C contract executes 200 exercise ask	2/10/2010 4:32 AM	DAK Tile	1 KD			
- Pictures		Content shell ask	2/10/2019 4.32 AM	PAK File	41.882 KB			
	1.6	addreamailer 47.dll	2/10/2018 4:22 AM	Annication press	11 386 KB			
	1	(a) timore di	2/10/2018 4/32 AM	Application extens	1 840 68			
		D iouttl dat	2/10/2010 #32 AM	DAT File	0.004.40			
		installer	2/10/2018 4/32 AM	Application	35.547 KB			
		(i) INEGLAU	2/10/2018-632 AM	Application extent	OF KB			
		Indexes and	2/10/2018 4/32 AM	Application extens	1.893 KB			
CheeDeine		DUCENSE	2/10/2018 4/32 AM	File	2 KB			
CHICONYE.		C LICENSES chromium	2/10/2018 4:32 AM	Chipme HTML Do	1.702 KB			
This PC		natives blob.bin	2/10/2018-4:32 AM	SIN File	335 KB			
A Metwork		node.dll	2/10/2018 4/32 AM	Application extens	14.693.KB			
Contraction of the second seco		snapshot blob.bin	2/10/2018 4/32 AM	BIN File	795 KB			
		ui resources 200 percent.pak	2/10/2018 4:32 AM	PAK File	85.KB			
		version	2/10/2018-4:32 AM	File	1 KB			
		views resources 200 percent.pak	2/10/2018 4:32 AM	PAK File	59 KB			
		input1_3.dll	2/10/2018 4/32 AM	Application extens.	SÓ KB			
								I THE OWNER
Wittems 1 item se	sected	24.2 MB						Dist wet

3. As you are installing a new instance, click Install.

4. In Stage 1 of the install process, the installer deploys the appliance. Click Next to begin:

This installer allows you to install a vCenter Server 6.7.	Appliance 6.7 or a Platform Services Controlle
Stage 1	imp 2
-	
e P	
Deploy appliance	
installing the appliance is a two stage process. The to the target vCenter Server or ESXI hast. The seco appliance. Click Next, to proceed with stage 1.	first stage involves deploying a new applianc and stage completes the setup of the deploye
	Stage 1

5. Read the EULA, then click Next to continue:

Introduction	End user license agreement	
2 End user license agreement	Read and accept the following license agreement:	
Select deployment type	VMWARE END USER LICENSE AGREEMENT	
Appliance deployment target	PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLESS OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF THE SOFTWARE.	
Set up appliance VM	IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU ITHE INDIVIDUAL OR LEGAL ENTITYL AGREE TO BE BOUND BY THE TERMS	
Select deployment size	DE THIS END USER LICENSE AGREEMENT ("DULA") IF YOU DO NOT AGREE TO THE TERMS DE THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL OR USE THE SOFTWARE, AND YOU	
Select datastore	MUST DELETE OR RETURN THE UNUSED SCH WARE TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT YOU PAID FOR THE SOFTWARE.	
Configure network settings	EVALUATION LICENSE. If You are idensing the Software for evaluation purposes, Your use of the Software is only permitted in a poneuroduction environment and for the permitted in a	
Ready to complete stage 1	: accept the terms of the license agreement	
	CANCEL BACK NEX	(

6. Select a deployment type. This example uses an embedded deployment combining the vCenter Server and Platform Services Controller in one appliance. Select Embedded Platform Services Controller, then click Next:

7. Select the ESXi host on which to install the VCSA as a guest. This must be a host that runs ESXi 5.5 or later. NVIDIA recommends that the vCenter server (Windows or appliance-based) run on a separate management cluster from the one designated for VDI workloads. Enter the IP address or fully qualified domain name (FQDN) of the chosen host, then its root username and password., and click Next:

introduction	Appliance deploym	ent target	
End user license agreement	Specify the appliance deployr instance on which the applian	nent larget settings. The larget is the ESXi host i ce will be deployed.	or vCenter.Serve
Select deployment type			
Appliance deployment target	ESX host or vCenter Server name	PODM unim Adarees	
Set up appliance VM	HTTPS port	443	
Select deployment size	User name	rost in Interfahier, Driman Vene	Ø
Select datastore	Password		
Configure network settings			
Ready to complete stage I			

8. If your computer running the installer can access the host, the installer may display a certificate warning as it connects. This happens if the host is using a self-signed cert. If the host uses a signed certificate, this warning does not appear. If you get the warning, click Yes to continue:

If an untrusted SSL certificate is installed on 192.168.1. communication cannot be guaranteed. Depending or issue might not represent a security concern.	100, secure n your security policy, this
The SHA1 thumbprint of the certificate is:	
86 FE 07 BC 37 79 E5 BC FB F5 EB B9 9D 6F 3C E7 44	4:BB:51:3B
To accept and continue, click Yes	

9. The installer validates the credentials you provided:

10. If the installer connects to the host successfully it prompts you to name the appliance, enter a root password for the appliance (twice, to check for typing errors), and click Next:

froduction	Set up appliance \	/M	
ind user license agreement	Specify the VM settings for t	he appliance to be deployed	
select deployment type	VM name	VMware vCenter Server Appliance	0
Appliance deployment target	Set root password		©.
ielect folder	Confirm root password		
Select compute resource			
Set up appliance VM			
select deployment size			
elect datastore			
Configure network settings			
Ready to complete stage 1			

11. Select a deployment size appropriate to the number of hosts and virtual machines that that vCenter Server will manage, then click Next:

Introduction	Select deplo	ymen	it size				
End user license agreement.	Select the deploym	ent size	for this vCent	ter Server with	an Embedde	d Platform Se	willes Cor
Select deployment type	Film more information	andep	oyment Sizes, i	reler to the vSp	mere 6.7 diocu	neritation	
Appliance deployment target	Deployment size		Tiny				
Select folder	Storage size		Defau	π		-	1
Select compute resource	Resources required	i for diff	erent deploys	ment sizes			
Set up appliance VM	Deployment Size	VCPUS	Memory (GB)	Storage (GB)	Hests (up to)	VMs (up to)	
Select deployment size	Tiny	2	10	300	10	100	
	Small	4	16	340	100	1000	
Select datastore	Medium	8	24	-525	400	4000	
Configure network setting)	Large	16	32	740	1000	10000	
Ready to complete stage 1	X-Large	24	48	1180	2000	35000	

12. Select the datastore where the VCSA is to be deployed'; select thin provisioning if required, then click Next. Configure the network settings for the appliance and click Next.

Introduction	Selectio	atasto	re				
End user license agreement	Select the s	orage loc	ation for	this appliance			
Select deployment type	o Install on	an existin	g datast	ore accessible	from the targe	et host	
Appliance deployment target	Name	т Тур	e v	Capacity +	Free v	Provisioned 🕈	Thin Provisioning v
Set up appliance VM	datasto	e1 VM	FS-6	458.25 GB	258.15 GB	200.1 GB	Supported
Select deployment size	datasto	e2 VM	FS-6	465.5 GB	123.96 GB	341.54 GB	Supported
Select datastore		-		-			
Configure network settings	() Install on	a new vS	Mode (er containing th	ne target host	(j)	
Ready to complete stage 1							

13. The installer displays a page for configuring network settings. This is a long page which you must scroll to display all of the settings.

Introduction	Configure network	settings	
End user weense agreement	Configure network settings for	this appliance	
Select deployment type	Network		<u> </u>
Appliance deployment target	IP version	IPv4	-
Select folder	IP assignment	stabe	
Select compute resource	FODN	FOD I I SHOW	Ø
Set up appliance VM	IP address		
Select deployment size	Subnet mask or prefix length		œ
Seleci datastore	Default gateway		
Configure network settings	DNS servers	Comma Bepärilled Elsopress	
Ready to complete stage 1	Common Ports		
	HTTP	80	
	HTTPS	443	

Before you configure these settings, choose an appropriate static IP address and enter it into local DNS (e.g. on the Domain Controller). Once you can resolve the address, enter the IP address its host name on the network setting page, then scroll down and enter remaining items. When the settings are complete, click Next.

14. The installer displays a summary page. Click Finish. The installer deploys the appliance.

15. The VCSA is now deployed. Click Continue to proceed to the install process's Stage 2, setting up the VCSA.

Install - Sta Controller	ge 1: Deploy v	Center Serve	r with an Embe	dded Platform	Services
You have Controller.	successfully dep	loyed the vCente	er Server with an E	mbedded Platforr	n Services
To proceed with	stage 2 of the deploy	ment process, applia	nce setup: click Cuntin		
f you exit, you ci interface	in continue with the a	appliance setup at an	y time by logging in to	the vCenter Server App	liance Management
				Carrier -	CLOSE CONTINUE

16. Click Next to begin the VCSA setup.

1	Introduction	Introduction	
2	Appliance configuration	Center Server Appliance installation overview	
3	SSO configuration		Stepe 2
4	Configure CEIP	0	
		E	Set up VCenter Server Appliance.
		Installing the vCenter Server Appliance is a two st completed. Click Next, to proceed with Stage 2, s	lage process. The first stage has been latting up the vCenter Server Appliance

17. Configure the NTP servers and enable SSH access if required, then click Next.

in a search and a	Appliance configuratio	n
Appliance configuration	A Contraction of the	
SSO configuration	Time synchronization mode	Synchronize time with NTP server: ~
Configure-CEIP	NTP servers (comma-separated list)	IPV4 on IPV6 of FODN
Ready to complete	SSH access	Disabled ~
	-	

18. Enter a unique SSO domain name. The default name is vSphere.local. Configure a password for the SSO administrator, then click Next.

Do not make the SSO domain name the same as your Active Directory Domain.
In	troduction	SSO configuration		
А	ppliance configuration	Create a new SSO domain		
55	SO configuration	Single Sign-On domain name	vsphere.local	Í
C	onfigure CEIP	Single Sign-On user name	administrator	
Re	eady to complete	Single Sign-On password		1
		Confirm password		
		Join an existing SSO domain		
		- And		

19. Check or clear the checkbox that opts in to the VMware Customer Experience Improvement Program, then click Next:

Introduction	Configure CEIP
Appliance configuration	Join the VMware Customer Experience Improvement Program
SSO configuration	
Configure CEIP	VMware's Customer Experience Improvement Program ("CEIP") provides VMware with information that enables VMware to improve its products and
Ready to complete	products. As part of the CEIP. VIAware collects technical information about your organization's use of VMware products and services on a regular basis in association with your organization's VMware license key(s). This information does not personally identify any individual.
	Additional information regarding the data collected through CEIP and the purposes for which it is used by VMware is set forth in the Trust & Assurance Center at http://www.ymware.com/trustymware/ceip.html.
	If you prefer not to participate in VMware's CEIP for this product, you should uncheck the box below. You may join or leave VMware's CEIP for this product at any time
	Join the VMware's Customer Experience Improvement Program (CEIP)

20. The installer displays a summary page. Review the details on this page, then click Finish.

	Ready to complete			
Introduction	Review your settings before fir	nishing the wizard.		
2 Appliance configuration	Network Details			
SSO configuration	Network configuration	Assign static IP add	ress	
	IP version	IPv4		
Configure CEIP	Host name	photon-machine		
Ready to complete	IP Address			
Contrast in contrast	Subnet mask	dama dia		
	Gateway	-		
	DNS servers	10000		
	Appliance Details			
	Time synchronization mode			
	SSH access	Disabled		
	SSO Details			
	Domain name	vsphere.local		
	User name	administrator		
	Customer Experience Improver	ment Program		
	CEIP setting	Opted out		

21. The installer displays a warning that you cannot pause or stop the install once you start it. Click OK to acknowledge the warning a start the install.

Wa	rning
4	You will not be able to pause or stop the install from completing once its started. Click OK to continue, or Cancel to stop the install.
	CANCEL

22. When the install process is complete, click Close to close the installer:

Install - Stage 2: Co	nplete	
0	You have successfully setup this Appliance	
	Complete	
vCeni starte	r Server Appliance setup has been completed successfully. Click on the link below to get I. Press close to exit.	
Appli Page	nce Getting Started https://photon-machine:443	
		CLOSE

3.2 Post Installation

This section describes post install configuration of VCSA.

3.2.1 Adding Licenses to Your vCenter Server

Logging into vCenter:

1. Connect to the vCenter post install using the IP or FQDN of the vCenter. Access vSphere by clicking either Launch vSphere Client (HTML5) or Launch vSphere Web Client (FLEX).

N	m ware [.]
Getti	ing Started
	LAUNCH VSPHERE CLIENT (HTML5)
	LAUNCH VSPHERE WEB CLIENT (FLEX)
Docu	umentation
V	Mware vSphere Documentation Center
E	unctionality Updates for the vSphere Client (HTML5)



NVIDIA recommends selecting the HTML5 client. The web client will be depreciated in a future version, and the HTML5 client is at nearly full feature parity.

2. vCenter Server displays the VMware Single Sign-On page:

vmware		
Uno saine. Passaure	Pâm inser Brophen loui Net meter second automaten 	VMware vCenter Single Sign-On

3. Enter the username and password that you specified during installation, then click the Login button. vCenter Server displays the VMware vSphere Web Client page:

		A There	are vCenter Server	systems with exp	ared or expiring lice	enses in your inventor	TY. MANAGE YOUR LICENSES	DETAILS			ò
vm vSphere Client										Administration@VSPHERE.LOCAL ~	
쉽 Home ♦ Shortcuts	Shortcuts Inventories										
Hosts and Clusters VMs and Templates VMs and Templates Networking Content Libraries Global Inventory Lists	Hosts and Chisters	VMs and Templates	Storage	Networking.	Global Inventory Lists	Linked Domains					
Policies and Profiles VRealize Operations Administration Undate Manager	Monitoring	Event Console	VM Customization Specifications	VM Storage Policies	Host Profiles	Update Manager					
🛐 Tasks	Administratio	'n									
A Taos & Custom Attr	- 0										
Recent Tasks Alarms											*
Task Name v	Target	~ Statur		v Initiator		Queued For	v Start Time 4	÷	Completion Time	r v Server	*
All Y											More Tasks

4. You must apply a new vCenter license key within 60 days. If you have purchased vCenter Server, log in to your <u>licensing portal</u>. Select your license and log in to the vSphere Web Client using the SSO administrator login. (If the license key does not appear then check with your VMware account manager.) Click the Menu drop-down, then click Administration.

			A There are vCenter S	erver systems with	expired or expiring	licenses in your invent	ory MANA	GE YOUR LICENSES	DETA	ILS
vm vSphere Client	Menu 🗸	Q 50								C
Administration + Access Control Roles Global Permissions	Licenses Pr	5 roducts	Assets							
* Licensing	+ Add New Lic	enses Ø	Synchronize Licenses							
Solutions Client Plug-Ins	License	۲	License Key	Ŧ	Product	Ŧ	Usage	Cepacity	State	τ Ex
Deployment Customer Experiency Im_ Single Sign On Users and Groups Conferenciation	4						4			
Certificates Certificate Management						No items	selected			

5. Select Licenses from the left-hand menu, then select the Licenses tab. Click Add New Licenses to open the New Licenses dialog:

Enter license keys	
License keys (one per line):	
ŕ	
	_
	Litense keys (one per line):

6. Enter the vCenter Server Standard license key provided at the vSphere beta program website:



7. Enter a unique name for the license in the License Name field, then click Next.

lew Licenses	Edit licens	se names		
1 Enter license keys	License name:	License 1		
	License key:	JM4D6-PCH13-78793-0H2R0-8HV5H	Expires: 0	08/03/2018
2 Edit license names	Product:	VMware vCenter Server 6 Standard (Instances)	Capacity 1	Instances
3 Ready to complete				

8. Review your selections, then click Finish to close the Enter New License dialog and return to the VMware vSphere Web Client page:

New Licenses	Ready to complete		8
1 Enter license keys	Number of licenses: 1		
2 Edit license names.	License name: License 1 License key: JM406-PCH13-78793-0H2R0-8HV5H		
3 Ready to complete			
			-
		CANCEL BACK	INISH

3.2.2 Adding a Host

To add a host in vCenter:

- 1. Select the Home icon (an outline of a house) on the VMware vSphere Web Client page.
- 2. Select Hosts and Clusters.
- 3. Click the ACTIONS dropdown and select New Datacenter.

vm vSphere Client Me	nu 🗸 🛛 🔍 Search		
	Summary Monitor Virtual Mach Hosts:	CTIONS → Actions - New Datacenter New Folder Distributed Switch Assign License Tags & Custom Attributes	nters Hosts & Clusters
	Custom Attributes	Value	

4. vCenter displays the New Datacenter dialog:

New Datace	nter	×
Name	Datacenter	_
Location:	Ø	
	CANCEL	ок

5. Enter a name for the datacenter in the Datacenter name field, then click OK. vCenter displays the new datacenter in the left panel of the page.

vm	vSphere Clie	nt	Menu 🗸	Q Search	
Ū	2 9	Ø	🗈 Datad	center	ACTIONS -
~ 🗗	-		Summary	Monitor	Configure
	Datacenter		****	Hosts:	0
				Virtual Mac	hines: 0
				Clusters:	0
				Networks:	0
			THE R. LEWIS CO.	Datastores:	0

6. Click the ACTIONS dropdown and select Add a Host. vCenter opens the Name and location dialog:

1 Name and location	Name and location			
2 Connection settings	Enter the name or IP address of the	host to add to vCenter Server.		
3 Host summary				
4 Assign license	Host name or IP address:			
5 Lockdown mode	Location:	Datacenter		
7 Deadu te semplete				
A seady to complete				

7. Enter the host name or IP address of the vSphere host and click Next. vCenter displays the Connection settings dialog:

2 Connection sottings	Connection settings		
2 Connection settings 3 Host summary	Enter the host connection details		
4 Assign license	User name:	root	
5 Lockdown mode	Dassword'		
6 VM location	Password.		
7 Ready to complete			

8. Enter the administrator account credentials in the Username and Password fields, then click Next. vCenter displays the Security Alert dialog"

~~	
	The certificate store of vCenter Server cannot verify the certificate.
	The SHA1 thumbprint of the certificate is:
	25:6F:B4:A8:F2:FE:68:5F:7C:FF:E7:58:30:BB:99:1C:08:AE:6C:E5
4	Click Yes to replace the host's certificate with a new certificate signed by the VMware Certificate Server and proceed with the workflow.
	Click No to cancel connecting to the host.

- 9. Click Yes to replace the host certificate. vCenter displays the Host summary dialog.
- 10. Review the settings.

If any settings are incorrect, click the Back button to return to an earlier screen and correct them.

If all of the settings are correct, click Next to continue. vCenter displays the Assign license dialog.

- 11. Confirm the license selection and click Next. vCenter displays the Lockdown mode dialog.
- 12. Accept the default setting (Disabled) and click Next. vCenter displays the VM location dialog.
- 13. Select a cluster or accept the default option and click Next to continue. vCenter displays the Ready to complete dialog.
- 14. Click Finish to add the new host. vCenter now displays the new host in the left-hand panel when you click the datacenter name.

vm	vSpher	e Clien	t	Menu 🗸	Q Search	i.				
			9	Summary	Monitor	ACTION	is v re	Permissions	VMs	Resource Pools
					Hypervi: Model: Process Logical I NICs: Virtual N State: Uptime:	sor: or Type: Processors: Aachines:	VMv Intel 24 1 7 Con 0 se	vare ESXI, 6.7.0, 8 (R) Xeon(R) Gold nected .cond	1169922 6126 CPU	@ 2.60GHz
				Hardware						

3.2.3 Setting the NTP Service on All Hosts

To ensure that time is accurate for all guests:

1. Click the first host object in the menu on the left:

Actions Actions Action Actions Actions Actions Actions Actions A	vm vSphere Client	Menu 🗸 🛛 Q. Search	
Default VM Compati	vm vSphere Client	Menu v Q. Starch Summary Monitor Storage Adapters Storage Adapters Storage Devices Host Cache Configure Protocol Endpoints Vortual switches Virtual Machines VM Startun/Smutodo- Agent VM Startungs Date Attract VM Startun/Smutodo- Agent VM Compad.	Datastores Networks Updates 07/28/2018, 1010.01 AM Disabled Stopped ntp.1e128.com
Default VM Compati_ Swap Fie Location		Default VM Compan. Swap File Location \$ system Licensing Host Profile Time Configuration Authentication Servi.	

- 2. Click Configure > System > Time Configuration > Edit
- 3. Enter a valid time server and click OK:

pecity now the date	and time on this host should be	e set.	
Manually configur	e the date and time on this hos	t	
2018-07-28	10:12:04		
date and time are in	ISO 8601 format)		
Use Network Tim	e Protocol (Enable NTP client)		
NTP Servers		ntp.je/28.com	
		Separate servers with commas, e.g. 10.31.21.2, fe00:2800	
NTP Service Sta	tue	Stopped	
		Start NTE Service	
NTP Service Sta	rtup Policy:	Start and stop manually	

4. Click the next host object in the menu on the left, then repeat steps 2 and 3. Repeat until you have set the time for each host object defined on the server.

3.2.4 Setting a vCenter Appliance to Auto-Start

To set a vCenter Appliance to start automatically:

 Select the host for the appliance on the vSphere Web Client, then select Configure > Virtual Machines > VM Startup/Shutdown.

Summary Monitor	ACTIONS - Configure Permissions	VMs Resource Pools Datastore	es Networks Updates	
✓ Storage Storage Adapters	Virtual Machine St	artup and Shutdown HA cluster, the automatic startup and shutc	down of virtual machines is disabled.	
Host Cache Configur.	Startup Order	VM Name	Startup	Startup Delay (s
Protocol Endpoints	Automatic Ordered			
I/O Filters	1	AD	Enabled	120
 Networking 	2	VMware vCenter Server Appliance	Enabled	120
Virtual switches VMkernel adapters	3	CS	Enabled	120
Physical adapters	Manual Startup			
TCP/IP configuration		V arr 1	Disabled	120
Virtual Machines		W	Disabled	120
VM Startup/Shutdo		D	Disabled	120
Default VM Compati		W	Disabled	120
Swap File Location				

2. Click the Edit button. vCenter displays the Edit VM Startup and Shutdown dialog:

efault VM Setti	ngs					
System influence	Auto	imatically start a	nd stop the virtual m	achines with the s	ystem	
Startup delay	120		Continue if VMware T	ools is started		
Shutdown delay	120					
Shutdown action	Power	off T				
Startup Order	Mole Down 🥜 E VM Name	Startup	Startup Delay (s)	VMware Tools	Shutdown Behav	Shutdown Delay
Startup Order	Vole Coler 🥜 E VM Name	Startup	Startup Delay (s)	VMware Tools	Shutdown Behav	Shutdown Delay
Startup Order Automatic Or 1	VM Name	Startup Enabled	Startup Delay (s) 120	VMware Tools Walt for startu	Shutdown Behav Power off	Shutdown Delay
Startup Order Automatic Or 1 2	AD VMware vCe_	Startup Enabled Enabled	Startup Delay (s) 120 120	VMware Tools Walt for startu Walt for startu	Shutdown Behav Power off Power off	Shutdown Delay 120 120
Startup Order Automatic Or 1 2 3	AD VM Name AD VMware vCe_ CS	Startup Enabled Enabled Enabled	Startup Delay (s) 120 120 120	VMware Tools Wait for startu Wait for startu	Shutdown Behav Power off Power off Power off	Shutdown Delay 120 120 120
Startup Order Automatic Or. 1 2 3 Manual Start.	AD VM Name AD VMware vCe CS	Startup Enabled Enabled Enabled	Startup Delay (s) 120 120 120	VMware Tools Walt for startu Walt for startu Walt for startu	Shutdown Behav Power off Power off Power off	Shutdown Delay 120 120 120
Startup Order Automatic Or 1 2 3 Manual Start	VM Name AD VM ware vCe CS	Startup Enabled Enabled Enabled	Startup Delay (s) 120 120 120 120 120	VMware Tools Wait for startu Wait for startu Wait for startu	Shutdown Behav Power off Power off Power off Power off	Shutdown Delay 120 120 120 120 120
Startup Order Automatic Or 1 2 3 Manual Start	VM Name AD VM ware vCe_ CS	Startup Enabled Enabled Enabled	Startup Delay (s) 120 120 120 120 120 120	VMware Tools Welt for startu. Welt for startu. Welt for startu. Welt for startu. Welt for startu.	Shutdown Behav Power off Power off Power off Power off Power off	Shutdown Delay 120 120 120 120 120 120

- 3. Select vCenter Appliance, then press the Up Arrow key to move that virtual machine up to the Automatic Startup section of the appliance table. Then click the Edit button.
- 4. Select or set the following options:
 - Select Use specified settings.
 - Set Startup delay to 0 seconds.
 - Check the checkbox for Use specified settings > Continue immediately if VMware Tools starts.
 - Select Use specified settings.
 - Set Shutdown delay to 0 seconds.
 - Set Perform shutdown action to Guest shutdown.

Virtual Machine	VMware vCenter S X
Startup/Shutdown settings	
Startup Settings	
After starting this virtual machine, continue starting according to the following settings:	other virtual machines
Use défault	
Use specified settings	
Startup delay O second(s)	
Continue immediately if VMware Tools starts	
Shutdown Settings	
After stopping this virtual machine, continue stoppin according to the following settings	ng other Virtual machines
🗇 Use default	
Use specified settings	
Shutdown delay: 0 second(s)	
Perform shutdown action: Guest shutdown 🔻	
	CANCEL OK

5. Click OK to apply the configuration settings.

The vCenter Web Client may not reflect these configuration changes immediately. Either click the Refresh icon or different configuration group and return to the current setting.

3.2.5 Mounting an NFS ISO Datastore

To mount an NFS ISO datastore:

- 1. In the main vSphere Web Client window, select Hosts and Clusters, then select the host.
- 2. Open the Actions dropdown, the select Storage > New datastore. vCenter Server displays the New Datastore window displays with the Type tab selected.

1 Type	Туре
2 Select NFS version	Specify datastore type.
3 Name and configuration 4 Ready to complete	 VMFS Create a VMFS datastore on a disk/LUN. NFS Create an NFS datastore on an NFS share over the network. VVol Create a Virtual Volumes datastore on a storage container connected to a storage provider.

- 3. Select NFS, then click Next to continue. vCenter Server displays the Select NFS version tab.
- 4. Select the correct NFS version, then click Next to continue. vCenter Server displays the Name and configuration tab.
- 5. Enter the NFS exported folder path in the Folder field, and the NFS server address in the Address field.

Because this an ISO datastore, consider making it read-only by checking the Mount NFS as read-only checkbox.

- 6. Click Next to continue. vCenter Server displays the Host accessibility tab.
- 7. Select the host that is to use the new datastore,
- 8. Click Next to continue. vCenter Server displays the Ready to complete tab.

 1 Type 2 Select NFS version 3 Name and configuration 	Name and configuration Specify name and configuration.					
4 Ready to complete	If you plan to con it is recommende datastore instead	nfigure an existing datastore on new hosts in the datacenter; d to use the "Mount to additional hosts" action from the d.	×			
	NFS Share Details					
	Datastore name:	Datastore				
	Folder:					
		E.g: /vols/vol0/datastore-001				
	Server:					
		E.g: nas, nas.it.com or 192.168.0.1				
	in the second					
	Access Mode	anh.				
	Mount NFS as read-	oniy				

9. Review the settings.

If any settings are incorrect, click Back to return to an earlier page and fix them.

If all of the settings are correct, click Next.

10. Click Finish to complete the procedure for adding the NFS ISO datastore.

The new datastore is now accessible as an installation source for virtual machine CD drives.

Chapter 4. Building Horizon Composer Server

This chapter covers installing VMware Horizon 7 Composer Server, including:

- Installing Horizon 7
- Registering the license
- Registering a vCenter Server
- Installing Horizon Composer Server
- Registering Horizon Composer Server

4.1 Installing Horizon

The server on which you install Horizon View must meet the requirements listed in General Prerequisites. As of this deployment guide's publication date, the current version of the Horizon Connection Server is version 7.5.1, and is installed by VMware-viewconnectionserver-x86_64-7.5.1-9122465.exe.

To install View 7.5.1:

1. Launch the installer. It displays the Welcome to the Installation Wizard screen.

占 VMv	vare Horizon 7 Connection Server
Q1	Welcome to the Installation Wizard for VMware Horizon 7 Connection Server
	The installation wizard will install VMware Horizon 7 Connection Server on your computer. To continue, click Next.
VMware Horizon*7 Connection Server	Copyright (c) 1998-2018 VMware, Inc. All rights reserved. This product is protected by U.S. and international copyright and intellectual property laws. VMware products are covered by one or more patents listed at http://www.vmware.com/go/patents.
Product version: 7.5.1-91224	65 x64 < Bade Next > Cancel

2. Click Next to display the End User License Agreement screen.

VMware Horizon 7 Connection Server	×
License Agreement Please read the following license agreement carefully.	÷
VMWARE END USER LICENSE AGREEMENT	^
PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLESS OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF THE SOFTWARE.	~
 I accept the terms in the license agreement I do not accept the terms in the license agreement 	
< Back Next > C	ancel

3. Click the I accept the terms of the license agreement radio button to accept the agreement, then click Next to continue.

閿	VMware Horizon 7 Connection Server
Destin Click	ation Folder Next to install to this folder, or click Change to install to a different folder.
0	Install VMware Horizon 7 Connection Server to: C:\Program Files\VMware\VMware View\Server\
	Change
	< Back Next > Cancel

- 4. The Horizon installer displays the Destination Folder window. Choose an install location, then click Next.
- 5. The Horizon installer displays the Installation Options screen:

岁 VMware H	orizon 7 Connection Server
Installation Options Select the type of Horizon 7 Conne	ction Server instance you want to install.
Select the type of Horizon 7 Conne	ction Server instance you want to install.
Horizon 7 Standard Server Horizon 7 Replica Server Horizon 7 Security Server Horizon 7 Enrollment Server	☑ Install HTML Access
Perform a standard full install. This	is used to install a standalone instance of Horizon 7
Connection Server or the first insta	nce of a group of servers.
Specify what IP protocol version sh instance:	all be used to configure this Horizon 7 Connection Server
IPv4	This server will be configured to choose the IPv4
IPv6	protocol for establishing all connections.
	< Back Next > Cancel

- Set the type of Horizon 7 Connection Server instance to Horizon 7 Standard Server.
- Check the Install HTML Access checkbox,
- Select IP protocol version IPv4.

- Click Next to continue.
- 6. The Horizon installer displays the Data Recovery screen.

y.	VMware Horiz	on 7 Connection Server	
Data Recovery	erv password details.		
This password prote will require entry of	ects data backups of yo this password.	ur Horizon 7 Connection Server, R	ecovering a backu
Enter data reco	very password:	•••••	
Re-enter passw	ord:	•••••	
Enter password	reminder (optional):	Î.	
		1	
		< <u>Back</u> <u>N</u> ext >	Cancel

7. Enter a password in the Enter data recovery password screen and re-enter it in the Re-enter password screen; then click Next to continue. The Horizon installer displays the Firewall Configuration screen:

岁 VMware Horizon 7 Connection Server
Firewall Configuration Automatically configure the Windows Firewall to allow incoming TCP protocol connections.
In order for Horizon 7 Connection Server to operate on a network, specific incoming TCP ports must be allowed through the local Windows Firewall service. The incoming TCP ports for the Standard Server are 8009 (AJP13), 80 (HTTP), 443 (HTTPS), 4001 (JMS), 4002 (JMS-SSL), 4100 (JMSIR), 4101 (JMSIR-SSL), 4172 (PCoIP), 8472 (Inter-pod API), and 8443 (HTML Access). UDP packets on port 4172 (PCoIP) are allowed through as well.
Configure Windows Firewall automatically
O Do not configure Windows Firewall
< Back Next > Cancel

CAUTION: To prevent unauthorized access, choose a root password that contains at least eight (8) characters and contains a mix of lower case and capital letters, digits, and special characters.

- 8. Check the Configure Windows Firewall automatically checkbox.
- 9. Click Next to continue. The Horizon installer displays the initial Horizon Administrators screen.

VMware Horizon 7 Connection Server
Initial Horizon 7 Administrators Image: Specify the domain user or group for initial Horizon 7 administration.
To login to Horizon 7 Administrator, you will need to be authorized. Select the local Administrators group option or enter the name of a domain user or group that will be initially allowed to login and will be granted full admistrative rights.
The list of authorized administrator users and groups can be changed later in Horizon 7 Administrator.
O Authorize the local Administrators group
 Authorize a specific domain user or domain group
GRID \Administrator
(domainname\username, domainname\groupname or UPN format)
< Back Next > Cancel

- 10. Select either the local Administrators group or a specific domain user or group, as appropriate, then click Next to continue.
- 11. The Horizon install displays the User Experience Improvement Program screen:

WMware Horizon 7 Co	onnection Server
User Experience Improvement Program Basic Customer Demographics	<u></u>
VMware's Customer Experience Improvement Progr. that enables VMware to improve its products and se how best to deploy and use our products.	am ("CEIP") provides VMware with information ervices, to fix problems, and to advise you on
Learn M	lore
☑ Join the VMware Customer Experience Improv	rement Program
Select your organization industry type:	High Tech 🗸
Select location of your organization's headquarter:	Asia and Pacific Islands
Select approximate number of employees:	~
< <u>B</u>	ack <u>N</u> ext > Cancel

12. Check the Join the VMware Customer Experience Improvement Program checkbox if you want to join; clear the checkbox if you do not.

Select appropriate values in the remaining fields, then click Next to continue. The Horizon install displays the Ready to Install the Program screen:

劇	VMware Horizon 7 Connection Server	*
Ready to I	install the Program	A
The wizar	d is ready to begin installation.	Ŧ
VMware H	lorizon 7 Connection Server will be installed in:	
C:\Progra	am Files\VMware\VMware View\Server\	
Click Insta	Il to begin the installation or Cancel to exit the wizard.	
		-
	< Back Install	Cancel

Click Install to complete the installation.





Click Finish to exit the installer.

14. Open the browser page at:

https://<host>/admin

Where <host> is the IP address or hostname of the server on which you installed Horizon:



4.1.1 Registering the Horizon License

To register the Horizon license:

1. Connect to the Horizon web console to open the Horizon Administrator:

Upicial t/ CONTRACTION	Libensing and Diage								
Sessions 0 Problem vCenter VMs 0	Likebung						_		
vents 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Edit License								
1 2 1 0	License Key:	Y1036-XXXXX-XXXX	K-XXXXX-1932N						
ientory	License expiration:	Friday, August 3, 20	18 12:00:00 AM PDT						
reactory	Designon licenses Enabled								
Dashboard	Application Demotion Deepers	Cashlad							
Users and Groups	when compare land	Enobled							
sources	view composer license:	Enabled							
Fermis	Instant Clone license:	Enabled							
Machines	Help Desk license:	Enabled							
Persistent Disks	Session Collaboration license:	Enabled							
licies	Usage Model: Concurrent User								
ew Configuration									
Serviers	Listage								
Instant Clone Domain Admins									
Global Settings	Reset Highest Count Reset Named Users Count								
Registered Machines	Session	Mode		Current		Highest			
Administrators	Total Concurrent Connections		Ú.		τ.				
ThinApp Configuration	Total Named Users		2		N/A				
Frent Configuration	Detailed Connection Breakdown								
	156Al Hermole		D		X				
	Active - full virtual machines		Ū.		1				
	Attive - Inked clone		0.1		1.91				
	Athive 1 oblige medime sources		0		0				
	Active - applications		0		10				
	Attrie - colliboration sessions		D: 1		0				

- 2. Select Horizon Configuration > Product Licensing and Usage in the left-hand pane. Horizon displays the Licensing and Usage window.
- 3. Select Edit License. Horizon Administrator displays the Edit License dialog:

Edit License		
License serial number: *		
	OK	Cancel .:

- 4. Enter your license key in the License serial number field.
- 5. Click OK to decode and apply the license.

You must obtain the license from the VMware Beta site from which you downloaded the software.

6. Verify that the license is enabled by looking for the "Enabled" messages in the "Licensing" part of the Licensing and Usage window.

4.2 Registering vCenter Server

To register vCenter server:

 In the left-hand pane of the Horizon Administrator window, Select Horizon Configuration > Servers. Horizon Administrator displays the Servers window:

Updated 8/15/14, 12:48 PM 🤤	Servers				
Sessions 0 Problem vCenter VMs 0	vCenter Servers	Security Servers Connection Serv	ers		
Problem RDS Hosts 0 Events 0 A 0	Add	Remove Disable Frovisioning	Enadle Provisioning		Ge d
System Health		vCenter Server	VM Disk Space Recla	View Storage Accelera	Provisioning
Inventory					
Dashboard Dashboard					

2. Click Add... to register a new vCenter server. Horizon Administrator displays the Add vCenter Server screen with the VC Information tab selected.

dd vCenter Server	vCenter Server Information		
VC Information	vCenter Server Settings		vCenter Server Settings
View Dompson Simups Down V in Frenchme	Server address:	vc.grid.com administrator@vsphere.local ************************************	Before you add vCenter Server to View, install a valid SSL certificate signed by a mixed CA, In a test environment, you can use the default, self-signed certificate that is installed with vCenter Server, but you must accept the certificate thumbprint. Provide the vCenter Server FQDN or IP address, user name, and password Concurrent Operations Limits Max concurrent VCenter provisioning operations: the maximum number of concurrent VM clenter provisioning operations on this vCenter server (full clones).
	Max concurrent power operations: Max concurrent View Compo maintenance operations: Max concurrent View Compo provisioning operations: Max concurrent Instant Clor	50 bser 12 bser 8 1e 20	Max concurrent power operations: the maximum number of concurrent VM power-on, power-off, reset, and configuration operations (full clones and linked clones). Max concurrent View Composer maintenance operations: the maximum number of concurrent View

- 3. Enter the vCenter server address and user credentials (not the local desktop user credentials) in the appropriate fields.
- 4. Click Next to display the Horizon Composer Settings tab.
- 5. Click Do not use Horizon Composer, then click Next to display the Storage tab.

Alternatively, if you want to use Horizon Composer and have already configured your environment to support Horizon Composer, then select Horizon Composer co-installed with vCenter Server and click Next. Then continue the Horizon Composer setup.

- 6. Accept the default storage settings.
- 7. Click Next to display the Ready to Complete window.
- 8. Click Finish.

The vCenter server is now added, and displays in the Horizon configuration:

VMware Horizon 7 Adm	ninistrator	Horizon Console	About Help L	ogout (administrato	
Updated 8/2/2018 12:08 AM 💝	Servers				
Sessions 0 Problem vCenter VMs 0	vCenter Servers Security Servers Connection Servers				
Problem RDS Hosts 0 Events 0 A 0	Add Edron Remove Disable Proy	isioning. Enable Froviers	minger).	B	
System Health I 1 1 0	vCenter Server	VM Disk Space Reclam	View Storage Accelerator	Provisioning	
	🕝 vc.grid.com(administrator@vsphere.local)	4	*	1	
Inventory					
ເAlpha Dashboard Image: Catalog Catalog					

4.3 Installing Horizon Composer Server

The server on which you are installing Horizon must meet the requirements listed in <u>General</u> <u>Prerequisites</u>. You also need access to a SQL server. For the installation that was used as a basis for these instructions, NVIDIA installed SQL Express 2012 on a separate Microsoft Windows Server 2012R2 guest on the management cluster. As of this deployment guide's publication date, the current version of the Horizon Composer Server is version 7.5.1, and the filename of the installer is VMwareviewcomposer-7.5.1-8971623.exe.

The purpose of the Composer Server is to create linked clones. The requirements are:

- A Microsoft Windows Server 2012R2 for Horizon Horizon Composer
- A Microsoft Windows Server 2012R2 for SQL 2012

Before install Horizon Composer 7.5 please make sure to install .NET 4.6 framework.

谩		VM	ware Hor	izon 7	Com	ooser		-		x
P	4		Welcome 7 Compo	e to th ser	e insta	aller for	VMwa	ire H	loriz	on
	设 VMw	vare Hori VMware I install thi	izon 7 Co Horizon 7 Co s prerequisit	imposer mposer te befori	er Inst requires running	NET 4.6.	Or Please er.	x	stall ss.	er
VMware Comp		-		<u>O</u> K						
				< Bac	k][Next >			Cance	1

1. The message box notifies you that Horizon 7 Composer requires .NET 4.6 to run. Click OK to close the message box and continue. The Horizon Composer installer displays the .NET Framework Setup screen.

J	Microsoft .	NET 2015 – 🗆 🗙			
	NET Framework 4.6.2 Setup Please accept the license terms to continue.	.NET			
	MICROSOFT SOFTWARE SUPPLEM	ENTAL LICENSE TERMS			
	.NET FRAMEWORK AND ASSOCIA MICROSOFT WINDOWS OPERATIN	TED LANGUAGE PACKS FOR IG SYSTEM			
	Microsoft Corporation (or based on v affiliates) licenses this supplement to Microsoft Windows operating system may use this supplement. You may r	where you live, one of its o you. If you are licensed to use n software (the "software"), you not use it if you do not have a			
	✓ I have read and accept the license terms Download size estimate:	📻 💾			
	Download time estimates:	Dial-Up: 161 minutes Broadband: 11 minutes			
	For data collection information, read the Microsoft Privacy Statement.				
		Install Cancel			

2. Check the "I have read..." checkbox, then click Install. The VMware Horizon Composer installer starts its installation wizard:

圆	VMware Horizon 7 Composer
₽ <u></u> ⊾	Welcome to the Installation Wizard for VMware Horizon 7 Composer
	The installation wizard will install VMware Horizon 7 Composer on your computer. To continue, click Next.
VMware Horizon™7 Composer ⊡PC@₽	Copyright © 1998-2018 VMware, Inc. All rights reserved. This product is protected by U.S. and international copyright and intellectual property laws. VMware products are covered by one or more patents listed at http://www.vmware.com/go/patents.
	<back next=""> Cancel</back>

3. Click Next. The wizard displays the License Agreement screen.

影 VMware Horizon 7 Composer	x			
License Agreement Please read the following license agreement carefully.	6			
VMWARE END USER LICENSE AGREEMENT	<u>^</u>			
PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLESS OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF THE SOFTWARE.				
 I accept the terms in the license agreement I do not accept the terms in the license agreement 				
InstallShield	Cancel			

4. Select the "I accept..." radio button, then click Next to continue. The wizard displays the Destination Folder screen.

₿	VMware Horizon 7 Composer
Destina Click N	tion Folder ext to install to this folder, or click Change to install to a different folder.
	Install VMware Horizon 7 Composer to: C:\Program Files (x86)\VMware\VMware View Composer\ Change
InstallShield	< <u>B</u> ack <u>Next</u> Cancel

5. Choose an install location, then click Next. The wizard displays the Database Information screen:

副	VMwa	re Horizon 7 Compo	oser 🗶
Database Enter ad	e Information Iditional database configur	ation information.	6
Enter the the DSN	e Data Source Name (DSN click the ODBC Setup butt) for the VMware Horizon 7 (on.	Composer database. To set up
			ODBC DSN Setup
Enter th	e username that you ente	red in the ODBC Data Sourc	e Administrator.
	e password for this datab	ase connection.	
InstallShield -			
-		< <u>B</u> ack	Next > Cancel

6. To set up a connection to a SQL server, click the ODBC DSN Setup... button. The VMware Horizon Composer wizard opens the ODBC Data Source Administrator installation wizard in a new window:

ODBC Data Source Administrator (64-	bit)		
User DSN System DSN File DSN Drivers Tracing Connection Pooling Ab	out		
System Data Sources:			
Name Platform Driver	A <u>d</u> d		
	Remove		
	<u>C</u> onfigure		
An ODBC System data source stores information about how to connect to the indicated data provider. A System data source is visible to all users on this machine, including NT services.			
OK Cancel	Apply Help		

7. Click the Add... button. You may need to download and install the SQL Server Native Client.

http://msdn.microsoft.com/en-us/lib/	ran, Q = C M msn	Installing SQL Server Native ×
Developer's Guide (Database Engine) SQL Server Native Client Programming	▲ See Also	
 Building Applications with SQL Server Native Client 	Concepts	
Installing SQL Server Native Client	Other Resources Installation How-to Topics	Client
Components of SQL Server Native Client		
Using Connection String Keywords with SQL Server Native Client	Community Additions	ADD
Using the SQL Server Native Client Header and Library Files		
Updating an Application to SQL Server Native Client from MDAC	SQL Server Native Client	for SQL Server 2014
Updating an Application from SOL Server 2005 Native Client	There is no SQL Server Native Clie SP1: http://www.microsoft.com/er	nt for SQL Server 2014: http://msdn.microsoft.com/en-us/library/cc280510.aspx. Use 5 1-us/download/details.aspx?id=35580
Using ADO with SQL Server Native Client	Carl Rabeler-Getty 8/6/2014	
Support Policies for SQL Server Native Client	SQLNCLI11 download lin	k
Connecting to a Azure SQL Database Using SQL Server Native Client	http://ga.microsoft.com/fwlink/?L	inRID=2396488clcid=0;409

8. Accept any security warnings after you download and begin the install.

Open File - Security Warning		
Do you want to run this file?		
-	Name:	<u>C:\Users\vadmin\Downloads\sqlncli.msi</u>
189°	Publisher:	Microsoft Corporation
	Туре:	Windows Installer Package
	From:	C:\Users\vadmin\Downloads\sqlncli.msi
		Run Cancel
✓ Always ask before opening this file		
While files from the Internet can be useful, this file type can potentially harm your computer. Only run software from publishers you trust. What's the risk?		

9. The ODBC Data Source Administrator wizard starts the SQL Server Native Client installation wizard.



- 10. Follow the wizard's guidance to continue the installation. Accept the defaults for all options.
- 11. When you are done selecting features the wizard displays the License Agreement screen.

岗 Microsoft SQL Server 2012 Native Client Setup	x	
License Agreement Please read the following license agreement carefully.		
MICROSOFT SOFTWARE LICENSE TERMS	-	
MICROSOFT SQL SERVER 2012 NATIVE CLIENT		
These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft		
updates,	~	
$\textcircled{\mbox{0}}$ I accept the terms in the license agreement \bigcirc I do not accept the terms in the license agreement		
< Back Next > Cancel		

12. Click the "I accept..." radio button, then click Next. The wizard displays the Feature Selection screen.

.	Microsoft SQL Server 2012 N	Vative Client Setup
Featur Selec	re Selection It the program features you would like to install	
Click	an icon in the following list to change how a fea	ture is installed. Feature description Microsoft SQL Server Native Client
Installa	tion path	Browse
		Disk Cost
	< Back	Next > Cancel

13. Click Next, accepting the defaults. The wizard displays the Ready to Install the Program screen.



14. Click Install. The wizard displays the Completing the SQL Server 2012 Native Client Installation screen.

岁 Micr	osoft SQL Server 2012 Native Client Setup
	Completing the SQL Server 2012 Native Client installation
	Setup has installed SQL Server 2012 Native Client successfully. Click Finish to exit.
	<back cancel<="" finish="" td=""></back>

15. When the install is complete, the wizard enables the screen's Finish button. Click Finish to close the SQL Server Native Client wizard and return to the ODBC Data Source Administrator installation wizard. That wizard now displays the Create New Data Source screen.

	Name COL Server	Version	Com
15532 P	SQL Server Native Client 11.0	2011 110 2100 60	Micro
	< 101		>

16. Select the SQL server you want to connect. Click Next to continue. The wizard displays a screen that prompts you to name and describe a new data source:

	This wizard will help you SQL Server.	u create an ODBC data source that you can use to conr	nect to
SOL Server 2012	What name do you war Na <u>m</u> e:	nt to use to refer to the data source?	
	How do you want to de <u>D</u> escription:	scribe the data source?	
	Which SQL Server do y	you want to connect to?	
	gara. E		
			-

17. Enter a name and description for the new data source and select the appropriate server, then click Next. The wizard prompts you for logon credentials:

SOL Server 2012	With Integrated Windows authentication.
	SEN (Optional)
	With SQL Server authentication using a login ID and password entered by the user.
	Login ID: sa
	Password:

18. Enter the credentials for the SQL account (not the Windows user account). For a remote SQL database, only a SQL accounts will work. The SQL account must be the database's db_owner. Then click Next. The wizard prompts you to specify properties for the database:

	vcdb	_
SQL Server 2012	<u>M</u> irror server:	
	S <u>P</u> N for mirror server (Optional):	
	Attach database filename:	
	✓ Use ANSI quoted identifiers.	
	Use ANSI nulls, paddings and warnings.	
	Application intent:	
	READWRITE	
	Multi-subnet failover.	

19. Check the Change the default name checkbox and name your database for the Horizon Composer. Click Next to continue. The wizard displays another screen that prompts you to specify database properties.

Mugat	English	
SQL Server 2012	Use strong encryption for data	
		ates and times.
	Save long running queries to the log file:	
	C:\Users\ADMINI~1.GRI\AppData\Local\Temp\QL	Browse,
	Long query time (milliseconds): 300	000
	Log ODBC driver statistics to the log file:	
	C:\Users\ADMINI~1.GRI\AppData\Local\Temp\ST	Bro <u>w</u> se

20. Click Finish to continue. The wizard displays a summary of properties you have specified for the new ODBC data source.

ODBC Microsoft SQL Server Setup
A new ODBC data source will be created with the following configuration:
Microsoft SQL Server Native Client Version 11.00.5058 Data Source Name: sql Data Source Description: Server: composer Use Integrated Security: No Database: vcdb Language: (Default) Data Encryption: No Trust Server Certificate: No Multiple Active Result Sets(MARS): No Mirror Server: Translate Character Data: Yes Log Long Running Queries: No Log Driver Statistics: No Use Regional Settings: No Use ANSI Quoted Identifiers: Yes Use ANSI Null, Paddings and Warnings: Yes
Test Data Source OK Cancel

- 21. Review your configuration, then click Test Data Source... . If the test is successful, the wizard displays a "successful configuration" message. If not, go back and correct your settings.
- 22. Return to the VMware Horizon Composer wizard:

VMware Horizon 7 Composer
Database Information
Enter additional database configuration information.
Enter the Data Source Name (DSN) for the VMware Horizon 7 Composer database. To set up the DSN dick the ODBC Setup button.
sql ODBC DSN Setup
Enter the username that you entered in the ODBC Data Source Administrator.
sa
Enter the password for this database connection.
<pre>cinstalismeid</pre>

23. Enter the database name, SQL administrator account name, and password to complete installation. Click Next to continue. The wizard displays the Composer Port Settings screen:

ë	VMware Horizon 7 Composer		
VMware Horizon 7 Composer Port Settings Enter the connection information for the VMware Horizon 7 Composer.			
Specify the web <u>S</u> OAP Port:	access port and security settings for VMware Horizon 7 Composer.		
SSL Certificate:	 Create default SSL certificate Use an existing SSL certificate 		
InstallShield ———	< <u>B</u> ack <u>N</u> ext > Cancel		

24. Select a web access port number. (Use the default if possible.) Click Next to continue. The wizard displays the Ready to Install the Program screen.

ø	VMware Ho	orizon 7 Co	mposer	x
Ready to The wiz	o Install the Program ard is ready to begin installation.			6
VMware	e Horizon 7 Composer will be install	led in:		
C:\Pro	gram Files (x86)\VMware\VMware	View Compose	er (
If you v begin ti	vant to review or change any of y ne installation or Cancel to exit the	our installation : wizard.	ı settings, dick Back. Clic	ck Install to
InstallShield		< <u>B</u> ack	Install	Cancel

25. Click Install to continue. The wizard displays the Installer Completed screen.

副	VMware Horizon 7 Composer	×
R	Installer Completed The installer has successfully installed VMware Horizon 7 Composer. Click Finish to exit the wizard.	
vMware Horizon™7 Composer ©pc⊚⊪		
5	< Back Einish Cance	

- 26. When the installation is complete, the wizard enables the Finish button. Click Finish to close the wizard.
- 27. You must reboot the system to make the installed software and data source available. The wizard displays a "You must restart your system..." message box. Click Yes to and reboot the server.


28. When the server reboot is complete, proceed to register Composer to Horizon. (It may take a few minutes for all of the services to start up, so be patient.)

4.4 Registering Horizon Composer Server

To register Horizon Composer Server:

1. Log in to Horizon Server. Horizon Server displays the VMware Horizon Administrator window:

VMware Horizon 7 Adn	iinistrator	Horizon Console Abnet Help Logout (administrato
Sessions Code 199	Serves VCenter Servers Security Servers Connection Servers	
Problem RDS Hosts 0 Events 0 d 0 d 0 System Health 0 0 0 0	Add Edit Remove Disable Provisioning	👔 🥏
Inventory	Interest administrator@vsphere.local)	× × ×
Catalog C		

 In the left-hand pane, under Horizon Configuration, select Servers. In the right-hand pane, select Edit to add a Horizon Composer to an existing vCenter Server, or Add to add a new vCenter Server with a Horizon Composer. Horizon Server opens the first window of the Register Horizon Composer wizard.

Add vCenter Server	vCenter Server Inform	nation	
VC Information	vCenter Server Set	tings	vCenter Server Settings
Mew Campose Shoraja Romy McConstran	Server address: User name: Password: Description: Port: Advanced Settings Specify the concurrent Max concurrent View provisioning operation Max concurrent View maintenance operation Max concurrent View provisioning operation Max concurrent View	vc.grid.com administrator@vsphere.local vCenter 6.7 443 443 to operation limits. ter ns: 20 r 50 Composer 12 composer 12 composer 8 nt Clone 20	Before you add vCenter Server to View, install a valid SSL certificate signed by a trusted CA. In a test environment, you can use the default, self-signed certificate that is installed with vCenter Server, but you must accept the certificate thumbprint. Provide the vCenter Server FQDN or IP address, user name, and password, Concurrent Operations Limits Max concurrent vCenter provisioning operations: the maximum number of concurrent VM clohing and deletion operations on this vCenter server (full clones). Max concurrent power operations; the maximum number of concurrent VM power-on, power-off, reset, and configuration operations (full clones and linked clones). Max concurrent View Composer maintenance operations: the maximum number of concurrent View

3. Enter the vCenter Server address, the administrator account username, and its password. Customize the configuration with the advanced settings if necessary; then click Next. The wizard opens the Invalid Certificate Detected dialog:

InVa	ilid Certificate Detect	ied
	- 0.0	8/2/2018 12:27 AM
The verif	identity of the specif fied for the following	fied vCenter Server cannot be reasons:
۵	Server's certificate i	s not trusted.
	Server's certificate o	cannot be checked.
VMw trus	vare recommends the ted Certification Auth	e use of certificates signed by a lority.
		View Certificate Cancel

4. Click Horizon Certification to display the invalid certificate.

Transfer Fr	vicipiid-april
metanil Um	ç1
Valled import	4/27/1e alloy and to 4/25/28 kill? Int
t bleat	C-us CN=vs.grid.com
	OU-Offware AngleAning One-particism Sh-california C-HS DC-Hoal DC-Hoal DC-Hoal DC-Hoal
Loris Survive	00 04 73 54 54 04 23 71 25
VIE BATT	1
Lagran + Rose (View)	SINA256WIRTESA
manufactory apportition-	ida.
Au-	10 to 20 12 23 00 40 e0 e0 are 44 mis fr to 20 10 10 45 e0 00 32 02 00 40 e0 are 51 mis fr to 20 10 10 10 45 e0 00 32 02 01 40 00 31 mis fr to 20 10 10 are 51 mis fr to 20 10 30 mis from 50 mis from 50 mis for 20 mis for 40 mis fo
Thermony Mennio	SHA-1
Thermoster of the local sector of the local se	3h 7a 42 23 ea 3e c4 0f c9 7a 1b b2 9c c1 a3 4f aa 03 93 0f
KOR Manager	dagit#Signature, KeyEncipherment, keyAgreement
E The Athronton Israel	INSteamervic.and.com

5. Click Accept to continue. The wizard displays the Horizon Composer Settings screen.

Add vCenter Server	View Composer	
Add vCenter Server VC Information View Composer View Composer Domains -Yinnans Disady to Committe	View Composer View Composer Settings Do not use View Composer View Composer co-installed with vCer Choose this if View Composer is instal Por: 18442 Standalone View Composer Server Choose this if View Composer is instal	ed on a separate server from vCenter ed on a separate server from vCenter
	Server address: composer.grid.com User name: administrator@grid.com Password:	thumbprint.

6. If you are using a standalone Horizon Composer Server, enter the server address, user account name and password.

If you are co-installing Horizon Composer Server with vCenter Server, select the Horizon Composer co-installed option.

Click Next to continue. The wizard opens the Invalid Certificate Detected dialog:



7. Click View Certificate. The wizard displays the invalid certificate.

Certificate Information	
Hisand for:	COMPOSER.
Issued by:	COMPOSER
Valual Drozest	8/1/18 11:43 PM to 6/1/20 11:43 PM
sandjeert:	C=US ST=CA L=CA O=VMware Inc OU=VMware Inc CN=CONFDSER ENALADDRESS=support @vmWare.com
Inare	C+US ST-CA L+CA O+VMware Inc. OU+VMware Inc. CN+CONPOSER EMAILDORSES-support@vmware.com
Settle Contrer-	2c ae 2f d1 d6 6d 62 9a 47 06 19 96 7a ca d0 24
Vorsion	j i
Signature Algorithm:	SHA25GWITHPSA
Public Kay Algerithms	RSA
Puttici Woy.	30 82 D1 72 30 04 06 09 24 86 48 86 17 04 01 01 01 05 06 03 82 01 0 82 01 04 02 82 01 01 00 b1 32 08 c e 85 4c 78 cl of 91 b7 d7 as 00 14 10 20 06 25 01 60 00 12 01 46 80 31 62 cd 47 62 23 96 e0 01 95 38 21 66 8c 86 31 69 42 31 61 76 70 61 16 79 94 25 01 46 51 66 51 66 69 31 46 66 31 64 94 82 31 b1 7 67 70 61 16 79 94 25 01 46 51 66 51 66 69 31 46 66 31 64 94 82 31 b1 7 67 70 61 16 79 94 25 01 46 51 66 51 66 51 66 69 51 46 65 51 14 47 34 45 65 66 32 66 53 06 60 55 06 66 51 66 51 66 51 66 69 51 56 50 56 56 51 56 56 56 56 56 50 50 50 50 50 66 50 56 56 56 56 56 56 56 56 56 56 56 56 56
-	- Po RE TO UN ON TO UT AR TO UR AR ON RE NO AR ON SO ON AF AN AN AN OF BE

8. Click Accept to accept the certificate. The wizard displays the Horizon Composer Domains screen.

Add vCenter Server	View Composer Doma	ins			P
VC Information	View Composer Don	nains		View Composer Domains	ľ
View Composer View Composer Domains	Add Fran	liemo.e.		View Composer adds computer accounts for linked-clone machines	
Stringen Deservers Consultant	Domains	User	Desktop Pool	In the AD domains configured here. The View Composer user accounts	l
	grid.com	Administrator		for the domains must have Create Computer Objects, Delete Computer Objects, and Write All Properties permissions in the domains. When you create a linked-clone desktop pool, you select a domain from this list to store the computer accounts.	
				< Back Next > Cancel	1

- 9. View the domains you have created, then click Next to continue.
- 10. Select View Storage Settings. The wizard displays the Storage Settings screen.

Add vCenter Server	Storage	
VC Information	Storage Settings	Storage Settings
View Composer Storage Dealty to Consolvid		ESXI hosts can be configured to cache virtual machine disk data, which Improves performance during I/O stomes such as when many machines power on and run anti-virus scans at once. Hosts read common data blocks from cache instead of reading the OS from disk. By reducing IOPS during boot storms, View Storage Accelerator lowers the demand on the storage array and uses less storage I/O bandwidth.
		Disk Space Reclamation With vSphere 5.x, virtual machines can be configured to use a space efficient disk format that supports reclamation of unused disk space (such as deleted files). This option reclaims unused disk space on each virtual machine. The operation is initiated when an estimate of used disk space exceeds the specified threshold.

11. Check the Reclaim VM disk space and Enable Horizon Storage Accelerator checkboxes and set the Default host cache size.

You can customize the cache sizes of each ESXi host at this point if necessary, by selecting Edit cache size.

When you are done, click Next to continue. The wizard displays the Ready to Complete screen, which summarizes the configuration you have defined.

Add vCenter Server	Ready to Complete	
VC Information	vCenter Server	192.168.1,103
View Composer	User name	administrator@vsphere.local
View Composer Domains	Password	****
Storage	Description	
Ready to Complete	Server Port	443
	Max Provision	20
	Max Power	50
	Max View Composer Operations	12
	Max View Composer Provision	8
	Max Instant Clone Engine Provision	20
	View Composer State	Standalone View Composer Server
	View Composer Address	composer.grid.com
	View Composer Password	******
	View Composer User Name	grid\administrator
	View Composer Port	18443
	Enable View Storage Accelerator	Yes
	Default host cache size:	1024
	VM Disk Space Reclamation	Yes

12. Review your configuration, then click Finish. This closes Horizon Composer registration wizard. The focus returns to the VMware Horizon Administrator window:

Mware Horizon 7 Adm	inistrator	Horizon Console	About Help Lo	igout (administrati
Undated 8/4/2018 7/27 PM 💐	Servers			
Sessions 0 Droblem uCenter Vite 0	vCenter Servers Security Servers Connection Servers			
Problem RDS Hosts 0 Events 0 0 0 0	Add) Edit Remove Disable Provisioning Intole Provisioning			B @
System Health	vCenter Server	VM Disk Space Reclam	View Storage Accelerator	Provisioning
	2 192.168.1.103(administrator@vsphere.local)	*	¥	*
nventory				
Costaboord Subsord Users and Groups Costalog Resources Grans Machines Machines Machines Montioning Policies View Configuration				
Servers				
Instant Clone Domain Admins				

13. Verify that your vCenter Server with Horizon Composer is ready to go.

4.4.1 "Error while checking the administrator" message

Horizon Composer Server versions 7.5.0 and 7.5.1 have a bug which may cause this error to be reported while you are using the wizard to register a co-installed vCenter Server and Horizon Composer Server.

Full don	nain name:	grid.com		
User na	me;	grid\administrator		
Passwo	Server Em	on		
		Saturday, Augu	st 4, 2018 7:32:0	5 P
-	Error while o information.	Saturday, Augu checking the administrator. Ple	st 4, 2018 7:32:0 ase re-check your	5 P
	Error while o information.	Saturday, Augu checking the administrator. Ple	st 4, 2018 7:32:0 ase re-check your	5 P

As of this deployment guide's publication date, this bug is not documented in the VMware release notes or knowledge base.

To work around the bug:

1. Register vCenter Server first, then click OK to finish:

Edit VCenter Serve	F b		2
vCenter Server	Storage		
vCenter Server S	ettings		
Edit			
Server address:	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
User name:	administr;	'~~a)	
Password:	*******		
Description:			
SSL:	Dn		
Port:	443		
View Composer S	erver Settings		
Edit			
Type:	None		
		DR	Candida
		ÚK.	Calicei

2. Register Horizon Composer Server only, then click OK to finish:

liow Composor So	ttings	
view composer se	tungs	
) Do not use View (Composer	
) View Composer c	o-installed with vCenter Server	
Choose this if Vie	v Composer is installed on the s	ame server as vCenter
Port: 19443		
Standalone View	Composer Server	
Choose this if Vie	w Composer is installed on a sep	arate server from vCenter
Server address:	composer.grid.com	
User name:	grid\administrator	
Password:	********	
Port:	18443	
Domains		
Verify Server Infor	mation	
Verify Server Lind	TISUUT .	

3. Edit the Horizon Composer settings again to add Horizon Composer domains separately:

Edit vCenter Server				
View Composer Se	attings			
O Do not use View	Composer			
O View Composer o	o-installed with vCenter Server			
Choose this if Vie	w Composer is installed on the s	ame server as vCenter		
Port: 19445				
 Standalone View 	Composer Server			
Choose this if Vie	w Composer is installed on a set	parate server from VCenter		
Server address:	composer.grid.com			
User name:	grid\administrator			
Password:	******			
Port:	18443			
Domains				
Add EUII	Tem,			
Domains	User	Desktop Pool		
grid.com	Administrator			
		ОК С		

Chapter 5. NVIDIA vGPU Manager VIB Installation

This chapter illustrates how the install the NVIDIA vGPU Manager VIB. It provides a step-by-step guide which includes downloading and preparing the VIB file for installation on the host.

For demonstration purposes, these steps use the VMWare vSphere web interface to upload the VIB to the server host.

The following paragraphs describe how to:

- Install the VIB
- Update the VIB
- Uninstall the VIB

5.1 Preparing the .vib File for Install

Before you perform the installation procedures, download the archive containing the VIB file and extract its contents to a folder. The file with that ends with .vib is the file that you must copy to the host datastore for installation.

5.1.1 Uploading the .vib File in vSphere Web Client

To upload the .vib file to the datastore using vSphere Web Client:

- 1. Click the Related Objects tab for the desired server.
- 2. Select Datastores. vSphere displays the names of the available datastores.
- 3. Either right click the appropriate datastore and select Browse Files or click the icon in the toolbar. vSphere displays the Datastore Browser window:

		_
Virtual Machines Data	astores Networks	
1 🔐 🛱 C	🖭 🎯 Actions 🗸	
Name	1 A Status	Туре
datastorn1	- datastore1	VMFS5
P Regis	ter VM	

4. Click the New Folder icon. vSphere displays the Create a new folder dialog:

Create a new folder				
Enter a name	e for the new folder:			
vib				
Create	Cancel			

- 5. Enter vib as the new folder's name, then click Create. vSphere creates the folder and closes the window.
- 6. Select the vib folder in the Datastore Browser window.
- 7. Click the Upload icon, indicated by the red arrow in this figure.

Q Search					C 🖆 🕽
- 🗐 datastore1	Name	Size	Modified	Туре	Path
▶ 🚞 .sdd.sf			This list is em	pty.	
>VDGA-001					
▶ 🚞 Win7-001					
Image: State of the state of					
> W7vGPU-001					
> W7vGPU-002					
▶ <mark>==</mark> vib					

vSphere displays the Client Integration Access Control window.

8. Select Allow. vSphere uploads the .vib file to the datastore on the host.



5.2 Installing vGPU Manager with the .vib File

The NVIDIA Virtual GPU Manager runs on the ESXi host. It is provided in the following formats:

- As a .vib file, which must be copied to the ESXi host and then installed
- As an offline bundle that you can import manually as explained in <u>Import Patches Manually</u> in the VMware vSphere documentation

CAUTION: Prior to vGPU release 11, NVIDIA Virtual GPU Manager and Guest VM drivers must be matched from the same main driver branch. If you update vGPU Manager to a release from another driver branch, guest VMs will boot with vGPU disabled until their guest vGPU driver is updated to match the vGPU Manager version. See <u>Virtual GPU Software for VMware</u> <u>vSphere Release Notes</u> for further details.

To install the vGPU Manager .vib file you must access the ESXi host via the ESXi Shell or SSH. See the VMware documentation for instructions to enable ESXi Shell or SSH for an ESXi host.



Before proceeding with the vGPU Manager installation make sure that all VMs are powered off and the ESXi host is placed in Maintenance Mode. See the VMware documentation on how to place an ESXi host in Maintenance Mode.

1. To place the host in Maintenance Mode, right click the Host entry in the ESXi window's left-hand panel, then select Enter Maintenance Mode.

vmware ESXi						
Navigator						
🗕 🖥 Host						
Manage	Manage Host		rver 🛛 🎦 Create/Register VM 🛛 🛅 Shut down 💽 Reboot 🛛 🤁 Refresh 🛛 🧔 Actions			
Monitor	1 Create/Register VM					
Virtual Machines	Shut down	rsion: ate: stime:	6.7.0 (Build 3169922) Normal (not connected to any vCenter Server) 0 days			
Metworking	Services	res naintenance mode				
	Enter maintenance mode					
	Lockdown mode	Putithjs	heat internance mode, je. This license will expire in 59 days.			
	Generate support bundle			* Configuration		
	Get SSH for Chrome		Supermicro	Image profile		
	Model		SYS-2028GR-TRT	vSphere HA sta		
	+ 🖬 CPU		16 CPUs x Intel(R) Xeon(R) CPU E5-2667 v4 @ 3.20GHz	▶ vMotion		
	Memo	ory	255.89 GB	- Svetom Inform		

Alternatively, you can place the host into Maintenance mode using the command prompt by entering

\$ esxcli system maintenanceMode set -- enable=true

This command will not return a response. Making this change using the command prompt will not refresh the vSphere Web Client UI. Click the Refresh icon in the upper right corner of the vSphere Web Client window.

Ę

CAUTION: Placing the host in Maintenance Mode disables any vCenter appliance running on this host until you exit Maintenance Mode, then restart that vCenter appliance.

- 2. Click OK to confirm your selection. This will place the ESXi host in Maintenance Mode.
- 3. Connect to the ESXi host over SSH.
- 4. Enter the esxcli command to install the vGPU Manager package:

```
$ esxcli software vib install -v <directory>/NVIDIA-
VMware_ESXi_6.7_Host_Driver-418.130-10EM.670.0.0.8169922.vib
Installation Result Message: Operation finished successfully.
Reboot Required: false
VIBs Installed: NVIDIA-VMware_ESXi_6.7_Host_Driver-418.130-
10EM.670.0.0.8169922.vib
VIBs Removed:
VIBs Removed:
VIBs Skipped:
```

Where <directory> is the absolute pathname of the directory that contains the .vib file. You must specify the absolute path even if the .vib file is in the current working directory.

5. Reboot the ESXi host and remove it from Maintenance Mode.



Although the display states "Reboot Required: false", a reboot is necessary for the vib to load and xorg to start.

6. Exit Maintenance Mode from the vSphere Web Client by right clicking the host and selecting Exit Maintenance Mode.

You also can exit from Maintenance Mode from the command prompt by entering this command:

\$ esxcli system maintenanceMode set -- enable=false

This command does not return a response and does not refresh the vSphere Web Client UI. Click the Refresh icon in the upper right corner of the vSphere Web Client window to refresh the UI.

- 7. To reboot the host from the vSphere Web Client, right click the host and select Reboot.
- 8. The host displays a dialog which prompts you to describe a reason for the reboot. Make an appropriate entry in the Log a reason for this reboot operation field, then click OK to continue.
 - As an alternative to steps 6 and 7, you can reboot the host from the command prompt by entering this command:

\$ reboot

This command does not return a response. It does not prompt you to log a reason for the reboot operation.

5.3 Updating vGPU Manager with the .vib File

Update the vGPU Manager VIB package if you want to install a new version of NVIDIA Virtual GPU Manager on a system where another version is already installed.

To update the vGPU Manager VIB you must access the ESXi host with the ESXi Shell or SSH. See the VMware documentation for how to enable ESXi Shell or SSH for an ESXi host.

Before proceeding with the vGPU Manager update, make sure that all VMs are powered off and the ESXi host is placed in Maintenance Mode. See the VMware documentation for how to place an ESXi host in Maintenance Mode.

1. Enter the esxcli command to update the vGPU Manager package:

```
$ esxcli software vib update -v <directory>/NVIDIA-
VMware_ESXi_6.7_Host_Driver-418.130-10EM.670.0.0.8169922.vib
Installation Result Message: Operation finished successfully.
Reboot Required: false
VIBs Installed: NVIDIA-VMware_ESXi_6.7_Host_Driver-418.130-
10EM.670.0.0.8169922.vib
VIBs Removed: NVIDIA-vGPU-
VMware_ESXi_6.0_Host_Driver_390.57-10EM.600.0.0.2159203
VIBs Skipped:
```

WxxxxxxWhereWhere <directory> is the pathname of the directory that contains the .vib file.

2. Reboot the ESXi host and remove it from Maintenance Mode.

5.4 Verifying the Installation of vGPU Manager

After the ESXi host has rebooted, verify the installation of the NVIDIA vGPU software package.

1. Verify that the NVIDIA vGPU Manager was installed and loaded correctly by checking the list of kernels-loaded modules for the NVIDIA kernel driver.

```
$ vmkload_mod -1 | grep nvidia
5 8420
```

If the NVIDIA driver is not listed in the output, check $\tt dmesg$ for load-time errors reported by the driver.

2. Verify that the NVIDIA kernel driver can successfully communicate with the NVIDIA physical GPUs in your system by running the nvidia-smi command:

\$ nvidia-smi

If the kernel driver an communicate with the physical GPUs, nvidia-smi displays a listing of the GPUs in your platform. The listing is similar to this:

```
Fri Jul 20 17:56:22 2018
+_____
NVIDIA-SMI 418.130 Driver Version: 418.130
                     _____+
| GPU Name Persistence-M| Bus-Id Disp.A | Volatile Uncorr. ECC |
| Fan Temp Perf Pwr:Usage/Cap | Memory-Usage | GPU-Util Compute M. |
0 M60 On | 0000:85:00.0 Off |
                              Off |
| N/A 23C P8 23W / 150W | 13MiB / 8191MiB | 0% Default |
Off
1 M60 On 0000:86:00.0 Off
N/A 29C P8 23W / 150W | 13MiB / 8191MiB | 0% Default |
+----+
 2 P40
       On 0000:87:00.0
                    Off |
                              Off |
| N/A 21C P8 18W / 250W | 53MiB / 24575MiB | 0% Default |
+-----+---+
------
Processes:
                           GPU Memory
GPU PID Type Process name
                           Usage
No running processes found
 -----+
```

If nvidia-smi fails to report the expected output for all the NVIDIA GPUs in your system, see <u>Troubleshooting</u> for troubleshooting instructions.

nvidia-smi also lets you monitor GPUs by entering this command:

```
$ nvidia-smi -1
```

The -I switch makes nvidia-smi run in a loop, refreshing the display at a fixed interval.

5.5 Uninstalling vGPU Manager

To uninstall vGPU Manager:

1. Run esxcli to determine the name of the vGPU driver bundle.

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

NVIDIA-VMware_ESXi_6.7_Host_Driver-418.130-10EM.670.0.0.8169922

2. Run this command to uninstall the driver package:

\$ esxcli software vib remove -n NVIDIA-VMware_ESXi_6.7_Host_Driver -maintenance-mode

The command displays this message if the uninstall process is successful:

```
Removal Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed:
VIBs Removed: NVIDIA-VMware_ESXi_6.7_Host_Driver-418.130-
10EM.670.0.0.8169922
VIBs Skipped:
```

3. Reboot the host to complete the uninstall process.

5.6 Changing the Default Graphics Type in VMware vSphere 6.5 and Later

The vGPU Manager VIBs for VMware vSphere 6.5 and later provide vSGA and vGPU functionality in a single VIB.

After this VIB is installed, the default graphics type is Shared, which only 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, VMs to which a vGPU is assigned fail to start, and vSphere displays the error message: "The amount of graphics resource available in the parent resource pool is insufficient for the operation."



If you are using a supported version of VMware vSphere earlier than 6.5, or are configuring a VM to use vSGA, omit this task.

Change the default graphics type before you continue configuration.

To change the default graphics type:

- 1. Ensure that the ESXi host is running and that all VMs on the host are powered off.
- 2. Log in to vCenter Server using the vSphere Web Client.
- 3. In the window's left-hand pane, select your ESXi host and click the Configure tab.
- 4. Select Graphics from the menu (the middle pane), then click the Host Graphics tab. On the Host Graphics tab, click Edit.



vSphere opens the Edit Host Graphics Settings dialog box.

5. Select Shared Direct in the dialog box, then click OK.



This dialog box also lets you change the allocation scheme for vGPU-enabled VMs. For more information, see <u>Modifying GPU Allocation Policy on VMware vSphere</u>.

- 6. vSphere changes the default graphics type to Shared Direct.
- 7. Restart the ESXi host or stop and restart X Server and nv-hostengine on the ESXi host.

To stop and restart X Server and nv-hostengine:

a. Stop the Xorg service:

\$ /etc/init.d/xorg stop

b. Stop nv-hostengine:

\$ nv-hostengine -t

- c. Wait one second to allow nv-hostengine to stop.
- d. Restart nv-hostengine:
 - \$ nv-hostengine -d
- e. Start the Xorg service.
 - \$ /etc/init.d/xorg start
- 8. Configure vGPU as explained in <u>Configuring a vSphere VM with Virtual GPU</u>.

For more information, see the following topics in the VMware vSphere documentation:

- Log in to vCenter Server by Using the vSphere Web Client
- Configuring Host Graphics

5.7 Changing the vGPU Scheduling Policy

GPUs, starting with the NVIDIA Maxwell[™] graphic architecture, implement a **best-effort vGPU** scheduler that aims to balance performance across vGPUs. The best effort-scheduler allows one vGPU to use GPU processing cycles that are not being used by other vGPUs. Under some circumstances, a VM running a graphics-intensive application may adversely affect the performance of graphics-light applications running in other VMs.

GPUs, starting with the NVIDIA Pascal[™] architecture, also support **equal-share** and **fixed-share vGPU schedulers**. These schedulers impose a limit on GPU processing cycles used by a single vGPU, which prevents graphics-intensive applications running in one VM from affecting the performance of graphics-light applications running in other VMs. The best-effort scheduler is the default scheduler for all supported GPU architectures.

The GPUs that are based on the Pascal architecture are the NVIDIA P4, NVIDIA P6, NVIDIA P40, and NVIDIA P100.

The GPUs that are based on the NVIDIA Volta[™] architecture are the NVIDIA V100 SXM2, NVIDIA V100 PCIe, and NVIDIA V100 FHHL.

The GPUs that are based on the NVIDIA Turing[™] architecture are the NVIDIA T4, RTX6000 and RTX8000.The GPU that is based on the NVIDIA Ampere[™] architecture is the NVIDIA A100.

5.7.1 vGPU Scheduling Policies

In addition to the default best effort scheduler, GPUs based on the Pascal and Volta architectures support equal share and fixed share vGPU schedulers.

Equal Share Scheduler

The physical GPU is shared equally amongst the running vGPUs that reside on it. As vGPUs are added to or removed from a GPU, the share of the GPU's processing cycles allocated to each vGPU changes accordingly. As a result, the performance of a vGPU may increase as other vGPUs on the same GPU are stopped or decrease as other vGPUs are started on the same GPU.

Fixed Share Scheduler

Each vGPU is given a fixed share of the physical GPU's processing cycles, the amount of which depends on the vGPU type. As vGPUs are added to or removed from a GPU, the share of the GPU's processing cycles allocated to each vGPU remains constant. As a result, the performance of a vGPU remains unchanged as other vGPUs are stopped or started on the same GPU.

5.7.2 RmPVMRL Registry Key

The RmPVMRL registry key sets the scheduling policy for NVIDIA vGPUs.

Туре

Dword

Contents

Value	Meaning
0x00 (default)	Best effort scheduler
0x01	Equal share scheduler with the default time slice length
0x00TT0001	Equal share scheduler with a user-defined time slice length TT
0x11	Fixed share scheduler with the default time slice length
0x00TT0011	Fixed share scheduler with a user-defined time slice length TT

Examples

The default time slice length depends on the maximum number of vGPUs per physical GPU allowed for the vGPU type.

Maximum Number of vGPUs	Default Time Slice Length
Less than or equal to 8	2 ms
Greater than 8	1 ms

ΤT

Two hexadecimal digits in the range 01 to 1E that set the length of the time slice in milliseconds (ms) for the equal share and fixed share schedulers. The minimum length is 1 ms and the maximum length is 30 ms.

If TT is 00, the length is set to the default length for the vGPU type.

If TT is greater than 1E, the length is set to 30 ms.

Examples

This example sets the vGPU scheduler to equal share scheduler with the default time slice length. RmPVMRL=0x01

This example sets the vGPU scheduler to equal share scheduler with a time slice that is 3 ms long. RmPVMRL=0x00030001

This example sets the vGPU scheduler to fixed share scheduler with the default time slice length. RmPVMRL=0x11

This example sets the vGPU scheduler to fixed share scheduler with a time slice that is 24 (0x18) ms long.

RmPVMRL=0x00180011

5.7.3 Changing the vGPU Scheduling Policy for All GPUs



You can change the vGPU scheduling policy only on GPUs based on the NVIDIA Pascal, NVIDIA Volta, NVIDIA Turing, and NVIDIA Ampere architectures.

Perform this task in your hypervisor command shell.

1. Open a command shell as the root user on your hypervisor host machine. On all supported hypervisors, you can use secure shell (SSH) for this purpose. Set the RmPVMRL registry key to the value that sets the GPU scheduling policy that you want.

```
# esxcli system module parameters set -m nvidia -p
"NVreg_RegistryDwords=RmPVMRL=value"
```

Value - The value that sets the vGPU scheduling policy that you want, for example:

- **0x01** Sets the vGPU scheduling policy to Equal Share Scheduler.
- **0x11** Sets the vGPU scheduling policy to Fixed Share Scheduler.
- For all supported values, see RmPVMRL Registry Key.
- 2. Reboot your hypervisor host machine.

5.7.4 Changing the vGPU Scheduling Policy for Specific GPUs

You can change the vGPU scheduling policy only on GPUs based on the NVIDIA Pascal, NVIDIA Volta, NVIDIA Turing, and NVIDIA Ampere architectures.

To change the vGPU scheduling policy for specific GPUs:

- 1. Open a command shell as the root user on your hypervisor host machine. You can use secure shell (SSH) for this purpose on all supported hypervisors.
- 2. Enter the lspci command and pipe its output to grep to display information only for NVIDIA GPUs:

lspci | grep NVIDIA

The output of grep shows the PCI domain and bus/device/function (BDF) of each NVIDIA GPU. Note this information for each GPU whose scheduling behavior you want to change.

For example, the GPUs listed here have the PCI domain 0000 and BDFs 85:00.0 and 86:00.0:

- 0000:85:00.0 VGA compatible controller: NVIDIA Corporation GM204GL [M60] (rev a1)
- 0000:86:00.0 VGA compatible controller: NVIDIA Corporation GM204GL [M60] (rev a1)

```
3. Enter an esseli set command with the module parameter
NVreg_RegistryDwordsPerDevice to set the PCI and RmPVMRL registry keys for each GPU:
```

```
\# esxcli system module parameters set -m nvidia \setminus
```

- > -p "NVreg_RegistryDwordsPerDevice=pci=<domain>:<bdf>;RmPVMRL=<value>\
- > [;pci=pci-domain:pci-bdf;RmPVMRL=value...]"

Where:

- <domain> is the PCI domain of the GPU.
- <bdf> is the PCI device BDF of the GPU.
- <value> is the value that sets the vGPU scheduling policy you want, from list in section 5.7.2 above.

For example, add this entry to the file /etc/modprobe.d/nvidia.conf to change the scheduling behavior of two GPUs:

```
options nvidia NVreg_RegistryDwordsPerDevice=
"pci=0000:85:00.0;RmPVMRL=0x01;pci=0000:86:00.0;RmPVMRL=0x11"
```

The changes are:

- For the GPU at PCI domain 0000 with BDF 85:00.0, use the equal-share scheduler.
- For the GPU at PCI domain 0000 with BDF 86:00.0, use the fixed-share scheduler.
- 4. Reboot your hypervisor host machine.

5.7.5 Restoring Default vGPU Scheduling Policies

To restore default vGPU scheduling policies:

- 1. Open a command shell as the root user on your hypervisor host machine. You can use secure shell (SSH) for this purpose on all supported hypervisors.
- 2. Unset the RmPVMRL registry key.
- 3. Set the module parameter to the empty string:

esxcli system module parameters set -m nvidia -p "<module>="

Where <module> is the module parameter to set, which depends on whether the scheduling behavior was changed for all GPUs or specified GPUs:

- For all GPUs, set the module parameter NVreg_RegistryDwords.
- For specified GPUs, set the module parameter NVreg_RegistryDwordsPerDevice.

For example, to restore default vGPU scheduler settings after they were changed for all GPUs, enter this command:

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

4. Reboot your hypervisor host machine.

5.8 Disabling and Enabling ECC Memory

Some GPUs that support NVIDIA vGPU software support error correcting code (ECC) memory with NVIDIA vGPU. ECC memory improves data integrity by detecting and handling double-bit errors. However, not all GPUs, vGPU types, and hypervisor software versions support ECC memory with NVIDIA vGPU.

On GPUs that support ECC memory with NVIDIA vGPU, ECC memory is supported with C-series and Qseries vGPUs, but not with A-series and B-series vGPUs. Although A-series and B-series vGPUs start on physical GPUs on which ECC memory is enabled, enabling ECC with vGPUs that do not support it might incur some costs.

On physical GPUs that do not have HBM2 memory, the amount of frame buffer that is usable by vGPUs is reduced. All types of vGPU are affected, not just vGPUs that support ECC memory.

The effects of enabling ECC memory on a physical GPU are as follows:

- ECC memory is exposed as a feature on all supported vGPUs on the physical GPU.
- In VMs that support ECC memory, ECC memory is enabled, with the option to disable ECC in the VM.
- ECC memory can be enabled or disabled for individual VMs. Enabling or disabling ECC memory in a VM does not affect the amount of frame buffer that is usable by vGPUs.

GPUs based on the Pascal GPU architecture and later GPU architectures support ECC memory with NVIDIA vGPU. These GPUs are supplied with ECC memory enabled.

Tesla M60 and M6 GPUs support ECC memory when used without GPU virtualization, but NVIDIA vGPU does not support ECC memory with these GPUs. In graphics mode, these GPUs are supplied with ECC memory disabled by default.

Some hypervisor software versions do not support ECC memory with NVIDIA vGPU.

If you are using a hypervisor software version or GPU that does not support ECC memory with NVIDIA vGPU and ECC memory is enabled, NVIDIA vGPU fails to start. In this situation, you must ensure that ECC memory is disabled on all GPUs if you are using NVIDIA vGPU.

5.8.1 Disabling ECC Memory

If ECC memory is unsuitable for your workloads but is enabled on your GPUs, disable it. You must also ensure that ECC memory is disabled on all GPUs if you are using NVIDIA vGPU with a hypervisor software version or a GPU that does not support ECC memory with NVIDIA vGPU. If your hypervisor software version or GPU does not support ECC memory and ECC memory is enabled, NVIDIA vGPU fails to start.

Where to perform this task from depends on whether you are changing ECC memory settings for a physical GPU or a vGPU.

- For a physical GPU, perform this task from the hypervisor host.
- For a vGPU, perform this task from the VM to which the vGPU is assigned.

Note: ECC memory must be enabled on the physical GPU on which the vGPUs reside.

Before you begin, ensure that NVIDIA Virtual GPU Manager is installed on your hypervisor. If you are changing ECC memory settings for a vGPU, also ensure that the NVIDIA vGPU software graphics driver is installed in the VM to which the vGPU is assigned.

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

```
# nvidia-smi -q
=========NVSMI LOG===========
                                    : Mon Jul 13 18:36:45 2020
Timestamp
Driver Version
                                   : 450.55
Attached GPUs
                                    : 1
GPU 0000:02:00.0
[...]
    Ecc Mode
       Current
                                    : Enabled
       Pending
                                    : Enabled
[...]
```

2. Change the ECC status to off for each GPU for which ECC is enabled.

• If you want to change the ECC status to off for all GPUs on your host machine or vGPUs assigned to the VM, run this command:

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

```
    If you want to change the ECC status to off for a specific GPU or vGPU, run this command:
    # nvidia-smi -i id -e 0
```

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

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

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

- 3. Reboot the host or restart the VM.
- 4. Confirm that ECC is now disabled for the GPU or vGPU.

```
# nvidia-smi -q
========NVSMI LOG==========
Timestamp
                                   : Mon Jul 13 18:37:53 2020
Driver Version
                                    : 450.55
Attached GPUs
                                    : 1
GPU 0000:02:00.0
[...]
    Ecc Mode
        Current
                                    : Disabled
        Pending
                                    : Disabled
[...]
```

5.8.2 Enabling ECC Memory

If ECC memory is suitable for your workloads and is supported by your hypervisor software and GPUs, but is disabled on your GPUs or vGPUs, enable it.

Where to perform this task from depends on whether you are changing ECC memory settings for a physical GPU or a vGPU.

- For a physical GPU, perform this task from the hypervisor host.
- For a vGPU, perform this task from the VM to which the vGPU is assigned.

Note: ECC memory must be enabled on the physical GPU on which the vGPUs reside.

Before you begin, ensure that NVIDIA Virtual GPU Manager is installed on your hypervisor. If you are changing ECC memory settings for a vGPU, also ensure that the NVIDIA vGPU software graphics driver is installed in the VM to which the vGPU is assigned.

1. Use nvidia-smi to list the status of all physical GPUs or vGPUs, and check for ECC noted as disabled.

```
[...]
```

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

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

• If you want to change the ECC status to on for a specific GPU or vGPU, run this command:

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

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

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

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

- 3. Reboot the host or restart the VM.
- 4. Confirm that ECC is now enabled for the GPU or vGPU

Current	: Enabled
Pending	: Enabled

[...]

Chapter 6. Deploying the NVIDIA vGPU Software License Server

This chapter covers deployment of the NVIDIA vGPU software license server, including:

- Platform Requirements
- Installing the Java Runtime Environment on Windows
- Installing the License Server Software on Windows

6.1 Platform Requirements

Before proceeding, ensure that you have a platform suitable for hosting the license server

6.1.1 Hardware and Software Requirements

- The hosting platform may be a physical machine, an on-premises virtual machine (VM), or a VM on a supported cloud service. NVIDIA recommends using a host that is dedicated solely to running the license server.
- The recommended minimum configuration is 2 CPU cores and 4 GB of RAM. A high-end configuration of 4 or more CPU cores with 16 GB of RAM is suitable for handling up to 150,000 licensed clients.
- At least 1 GB of hard drive space is required.
- > The hosting platform must run a supported operating system.
- On Window platforms, .NET Framework 4.5 or later is required.

6.1.2 Platform Configuration Requirements

- The platform must have a fixed (unchanging) IP address. The IP address may be assigned dynamically by DHCP or statically configured but must be constant.
- The platform must have at least one unchanging Ethernet MAC address, to be used as a unique identifier when registering the server and generating licenses in the NVIDIA Licensing Portal.
- > The platform's date and time must be set accurately. NTP is recommended.

6.1.3 Network Ports and Management Interface

The license server requires TCP port 7070 to be open in the platform's firewall, to serve licenses to clients. By default, the installer will automatically open this port. The license server's management interface is web-based and uses TCP port 8080. The management interface itself does not implement access control; instead, the installer does not open port 8080 by default, so that the management interface is only available to web browsers running locally on the license server host. Access to the management interface is therefore controlled by limiting remote access (via VNC, RDP, etc.) to the license server platform.

Note: If you choose to open port 8080 during license server installation, or at any time afterwards, the license server's management interface is unprotected.

6.2 Installing the NVIDIA vGPU Software License Server on Windows

The license server requires a Java runtime environment, which must be installed separately before you install the license server.

6.2.1 Installing the Java Runtime Environment on Windows

If a suitable Java runtime environment (JRE) version is not already installed on your system install a supported JRE before running the NVIDIA license server installer.

- 1. Download a supported 64-bit Oracle Java SE JRE or OpenJDK JRE.
 - Download Oracle Java SE JRE from the Java Downloads for All Operating Systems page.
 - Download Oracle Java SE JRE from the java.com: Java + You page
 - Download OpenJDK JRE from <u>the Community builds using source code from OpenJDK project</u> on GitHub.
- 1. Install the JRE that you downloaded.
 - Oracle Java SE JRE installation:



• OpenJDK JRE installation:

	Welcome to the 1.8.0_201-1-ojc	OpenJDK Ikbuild Setup	Wizard	
5	The Setup Wizard allows 1.8.0_201-1-ojdkbuild fi computer or to remove i continue or Cancel to ex	s you to change the eatures are installed from your comput dt the Setup Wizard	e way OpenJI d on your ver. Click Nex d.	ж t to

- 2. Set the JAVA_HOME system variable to the full path to the jre folder of your JRE installation.
 - For 64-bit Oracle Java SE JRE: C:\Program Files\Java\jre1.8.0_191
 - For 64-bit OpenJDK JRE: C:\Program Files\ojdkbuild\java-1.8.0-openjdk-1.8.0.201-1\jre

Ensure that the path does not include any trailing characters, such as a slash or a space.

If you are upgrading to a new version of the JRE, update the value of the JAVA_HOME system variable to the full path to the jre folder of your new JRE version.

- 3. Ensure that the Path system variable contains the path to the java.exe executable file.
 - For 64-bit Oracle Java SE JRE: C:\Program Files\Java\jre1.8.0_191\bin

• For 64-bit OpenJDK JRE: C:\Program Files\ojdkbuild\java-1.8.0-openjdk-1.8.0.201-1\bin

6.2.2 Installing the License Server Software on Windows

- 1. Unzip the license server installer and run setup.exe.
- 2. Accept the EULA for the license server software and the Apache Tomcat software used to support the license server's management interface.



3. Choose the destination folder where you want the license server software to be installed.

NVIDIA License Server	- 🗆 X
	Choose Install Folde
 Introduction License Agreement Apache License Choose Install Folder Choose Firewall Options Pre-Installation Summary Repair Installation Installing 	Please choose a destination folder for this installation. Destination folder: C:\Program Files (x86)\WVIDIA\License Server
Install Complete	Restore Default Folder Choose
<mark> NVIDIA</mark> .	
InstallAnywhere Cancel	Previous Next

4. In the Choose Firewall Options dialog box, select the ports to be opened in the firewall.

To enable remote clients to access licenses from the server and prevent remote access to the management interface, use the default setting, which sets ports as follows:

- Port 7070 is open to enable remote clients to access licenses from the server.
- Port 8080 is closed to ensure that the management interface is available only through a web browser running locally on the license server host.



5. After installation has completed successfully, click Done to exit the installer.



6.2.3 Obtaining the License Server's MAC Address

The license server's Ethernet MAC address uniquely identifies your server to the NVIDIA Licensing Portal. You will need this address to register your license server with the NVIDIA Licensing Portal to generate license files.

- 1. Open a web browser on the license server host and connect to the URL http://localhost:8080/licserver.
- 2. In the license server management interface, select Configuration.
- 3. On the License Server Configuration page that opens, in the Server host ID drop-down list, select the platform's ETHERNET address.

Attp://localhost:8080/licse	erver/serverProperties_view.ac	tion ♀ → 🚳 NVIDIA License C	lient Mana ×	
	DIA.			
	License S	Server Configuratio	on	
Licensed Clients <u>Reservations</u>	Properties	Value		Description
Licensed Feature Usage License Management Configuration	Server host ID	06407E06282C (ETHERNET)	~	Server's host ID used to uniquely identify the server to the NVIDIA licensing portal. If multiple ETHERNET IDs are available, select one and use consistently with licensing portal.
	General properties			
Locense Client Manager	Server Version	2017.11		Server's executable version
About Settings	Server Status	Alive		Indicates server state
Non-second data	License Generation			

6.2.4 Managing your License Server and Getting your License Files

To be able to download NVIDIA vGPU software licenses, you must create at least one license server on the NVIDIA Licensing Portal and allocate licenses to the server. After creating a license server and allocating licenses to it, you can download your license file.

6.2.4.1 Creating a Licenser Server on the NVIDIA Licensing Portal

To be able to download NVIDIA vGPU software licenses, you must create at least one license server on the NVIDIA Licensing Portal. Creating a license server on the NVIDIA Licensing Portal registers your license server host with the NVIDIA Licensing Portal through the MAC address of the host.

1. In the NVIDIA Licensing Portal, navigate to the organization or virtual group for which you want to create the license server.

- a. If you are not already logged in, log in to the <u>NVIDIA Enterprise Application Hub</u> and click **NVIDIA LICENSING PORTAL** to go to the NVIDIA Licensing Portal.
- b. **Optional:** If your assigned roles give you access to multiple virtual groups, select the virtual group for which you are creating the license server from the list of virtual groups at the top right of the page.

If no license servers have been created for your organization or virtual group, the NVIDIA Licensing Portal dashboard displays a message asking if you want to create a license server.

			Organization Example Corporation	C
LICENSE SERVERS	Entitlements		License Servers	
SOFTWARE DOWNLOADS				
) VIRTUAL GROUPS		ALLOCATED/TOTAL	PS EICENSE SERVER/ FEATURE	IN USE / ALLOCATED
) HISTORY			You do not have any license servers.	Would you like to create one?
R, USER MANAGEMENT	 Community in community 		CREATE LICENSE SERVER	
C ENTERPRISE SUPPORT	 operational and the second seco			

2. On the NVIDIA Licensing Portal dashboard, click **CREATE LICENSE SERVER**.

The Create License Server pop-up window opens.

Server Name	Product	Licenses	
Name this license server	Select a product	✓ 1	
Description	Added Products		
Provide a short description	Product		Count
	No produ	icts have been added yet	
MAC Address MAC Address 00000000000000000000000000000000000			
Pailover server configuration is optional. If configuring, you must provide a name AND MAC address			
Failover License Server			
Failover MAC Address			

- 3. Provide the details of your license server.
 - a. In the Server Name field, enter the host name of the license server.
 - b. In the **Description** field, enter a text description of the license server. This description is required and will be displayed on the details page for the license server that you are creating.
 - c. In the MAC Address field, enter the MAC address of your license server.
- 4. Add the licenses for the products that you want to allocate to this license server. For each product, add the licenses as follows:
 - a. From the **Product** drop-down list, select the product for which you want to add licenses.
 - b. In the **Licenses** field, enter the number of licenses for the product that you want to add.
 - c. Click ADD.
- 5. Leave the Failover License Server and Failover MAC Address fields unset.
- 6. Click CREATE LICENSE SERVER.

6.2.4.2 Downloading a License File

Each license server that you create has license file associated with it. The license file contains all the licenses that you allocated to the license server. After downloading the license file, you can install it on the license server host associated with the license server on the NVIDIA Licensing Portal.

1. In the NVIDIA Licensing Portal, navigate to the organization or virtual group for which you want to download the license file.

- a. If you are not already logged in, log in to the <u>NVIDIA Enterprise Application Hub</u> and click **NVIDIA LICENSING PORTAL** to go to the NVIDIA Licensing Portal.
- b. **Optional:** If your assigned roles give you access to multiple virtual groups, select the virtual group for which you are downloading the license file from the list of virtual groups at the top right of the page.
- 2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server whose associated license file you want to download.
- 3. In the License Server Details page that opens, review the licenses allocated to the license server.

C DASHBOARD		
ENTITLEMENTS Organization Example Corporation	2	
圖 LICENSE SERVERS < excorpls1		
🛞 SOFTWARE DOWNLOADS 🛃 DOWNLOAD LICENSE FILE 🖌 MANAGE LICENSES 🕞 REMOVE FEATURES 😨 ADD FEATURES		
C VIRTUAL GROUPS		
*9 HISTORY		
As User Management		
Server Type MAC Address Failover Server Failover MAC Address FLEXERA 000000550055 n/a n/a		
Created Last Modified 03/07/2020 10:26 pm (UTC) 03/07/2020 10:26 pm (UTC)		
Description Example Corporation license server		
Product Licenses		
GRID-Virtual-Apps 3.0 Product Key ID Expiration Date		
10 / 10 never expires	never expires	
Quadro-Virtual-DWS 5.0 Product Key ID Expiration Date		
5 / 5 never expires		
« COLLAPSE		

4. Click **DOWNLOAD LICENSE FILE** and save the .bin license file to your license server for installation.

6.2.5 Installing a License

NVIDIA vGPU software licenses are distributed as .bin files for download from the NVIDIA Licensing Portal.

Before installing a license, ensure that you have downloaded the license file from the NVIDIA Licensing Portal.

- 1. In the license server management interface, select **License Management**.
- 2. On the License Management page that opens, click **Choose File**.

🖉 🥂 NVIDIA License Client Mar 🗴			8	
← → C 🗋 localhost:8080/I	cserver/request_view.action			\$ =
	DIA.			
	License Managemen	L		
Licensed Clients Eeservations Licensed Feature Usage Licensed Feature Usage	Browse for the license file you received from the NVIDIA • Upload license file (.bin file):	licensing portal, and then click Upload to p	process the license file.	
 <u>Configuration</u> 	👩 Open			X
-	G v licenses	▼ 49	Search licenses	Q
Linese Clinit Managar	Organize 👻 New folder		8≡ • [1 0
> About	🖈 Favorites	Name	Date modified	Туре
> <u>settings</u>	Desktop Downloads	test-FAD578DE4D77-license.bin	9/6/2015 11:21 AM	BIN File
	Carlies Comments Comments Music Comments Pictures Videos			a,
	Computer -	< III		
	File na	me: test-FAD578DE4D77-license.bin 🔹	All Files Open Can	ncel
	0		- 👍 🙄 😽	2:08 PM

- 3. In the file browser that opens, select the .bin file and click **Open**.
- 4. Back on the License Management page, click **Upload** to install the license file on the license server. The license server should confirm successful installation of the license file.
| 🗲 🕘 國 http://localhost:8080/lic | server/response_upload.action 🛛 🔎 🛪 🖒 🌌 NVIDIA License Client Man 🗙 📑 |
|--|--|
| | DIA. |
| | License Management |
| Licensed Clients Licensed Clients Reservations Licensed Feature Usage License Management Configuration | Successfully applied license file to license server. Browse for the license file you received from the NVIDIA licensing portal, and then click Upload to process the license file. Upload license file (.bin file): Cancel Upload Upload |
| About Settings | Copyright (c) 2018 (NVIDIA Corporation, All Rights Reserved, 2018.06.0.24304595 |

Note: For additional configuration options including Linux server deployment, securing your license server, and license provisioning, refer to the <u>Virtual GPU Software License Server User Guide</u>.

Chapter 7. Selecting the Correct vGPU Profiles

A **vGPU profile** defines the properties of a vGPU. Profiles are grouped into series that are compatible with various physical GPU architectures.

Because NVIDIA vGPUs are a licensed feature, they require software licenses to be used on a virtual machine. The type of license required for a vGPU depends on the series of the profile used. Table 7-1 summarizes the vGPU profile series, their licenses, and their characteristics. A complete list of vGPU profiles may be found in <u>Virtual GPU Software User Guide</u>.

vGPU Profile Series	Designed for	Required License
Q-series	Creative & technical professionals who need Quadro performance & features	Quadro Virtual Data Center Workstation (vDWS)
C-series	Intensive server workloads: artificial intelligence (AI), deep learning, or high- performance computing (HPC)	Virtual Compute Server license or Quadro vDWS
B-series	Virtual desktops for business professionals & knowledge workers	NVIDIA GRID [®] Virtual PC license or Quadro vDWS
A-series	Streaming or session-based services for virtual applications	GRID Virtual Applications

Table 7-1

It is critical to choose the right profiles to give your users the best virtual GPU service.

7.1 The Role of the vGPU Manager

You use NVIDIA vGPU Manager to customize several properties of vGPU profiles to suit your users' needs, and to assign an appropriate vGPU profile to each vGPU.

Each virtual machine (VM) has specified amount of dedicated graphics memory. You must set the amount of dedicated graphics memory assigned to each vGPU profile to ensure that a VM which use it has the resources it needs to handle the expected graphics load.

7.2 Bringing Quadro to Virtualization

The Q-series vGPU profiles undergo the same rigorous application certification process as the NVIDIA[®] Quadro[®] line of adapters for professional graphics applications. As a result, you can expect 100% compatibility and performance. with your applications. ISVs requiring Quadro GPUs can certify against the NVIDIA vGPU profiles as well.

7.3 Matching Profiles to User Needs

As stated earlier in this deployment guide, you must define your user needs and match them to available NVIDIA vGPU profiles.

Continuing the example SOLIDWORKS use cases described in the section <u>Size Your Environment</u>, the VMs' video RAM and display needs can be matched to appropriate vGPU profiles:

- Entry level engineer or design reviewer
 - 8 GB RAM
 - 4 vCPUs (2.4 GHz)
 - 2-4 GB video RAM
 - One 1920×1080 display
- Mid-level engineer
 - 16 GB RAM
 - 4-8 vCPUs (2.6 GHz)
 - 4-8 GB video RAM
 - Two 1920×1080 displays and/or One 2560×1600
- Advanced engineer
 - 32-64 GB RAM
 - 8-12 vCPUs (3.2 GHz)
 - 8-16 GB video RAM
 - Two 2560×1600 displays and/or one 3840×2160

7.4 Creative and Technical Professionals

Creative and technical professionals with very demanding tasks previously required a physical computing device like a mobile or desktop workstation. This meant that the benefits of virtualization, such as security, ease of management, mobility, and collaboration could not be achieved. NVIDIA data center GPUs with NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS) software extends the benefits of virtualization to these users.

The keys to picking the proper profile for creative and technical professionals are compatibility and performance. Quadro vDWS software supports Quadro drivers, allowing users to benefit from the acceleration and stability that Quadro brings to professional applications used by the most demanding customers today.

It is critical to understand what applications your users require on their virtual machines. You must balance frame buffer and resource needs to manage the density and performance for your deployment. Professional applications have a range of workflows from design, to rendering, to video editing all with varying degrees of resource demands that you must estimate properly to ensure the best user experience.

Begin profile selection by considering the requirements of your users' primary applications. Professional application software vendors certify their products to run with NVIDIA Quadro to ensure the performance is tuned for maximum efficiency. Most vendors' web sites have a dedicated page about the proper GPU hardware to use; use those recommendations to select the appropriate vGPU profile to meet your end users' needs. To understand more about the graphics requirements of your users' applications, consult the application vendors.

7.5 Knowledge Worker Profiles

Today's digital workplace is changing due to the increased graphics requirements of productivity applications. The new digital worker expects a graphics-rich experience with immersive visual quality and processing speed. To satisfy these expectations, software developers are creating rich, graphically intensive user experiences for physical desktops in the enterprise. In a virtual desktop (VDI) environment without a GPU to offload these additional processing requirements, the end user sees slower performance, reduced feature sets, and applications that simply do not launch.

According to a study by Lakeside SysTrack Community data, the number of applications that are accelerated by graphics have doubled over the past five years. Below are some examples and their percentages of GPU demands based on the transition from a Microsoft Windows 7 environment to a Microsoft Windows 10 environment.

- Google Chrome: 36% increase
- Mozilla Firefox: 59% increase
- Microsoft Outlook: 85% increase
- Microsoft PowerPoint: 64% increase
- Microsoft Excel: 53% increase
- Skype: 409% increase

While professional applications like Dassault Systèmes SOLIDWORKS and CATIA and others require a GPU for graphics acceleration, it is also clear that common business applications now need GPU resources to run efficiently.

Chapter 8. Application Based VDI Hosting Sizing

8.1 How Many Users Can I Support on a Host?

Using one application, Siemens NX, as an example, a typical dialogue with a customer often sounds like this...

Customer: How many users can I support on a host?

NVIDIA: What is their primary application?

Customer: Siemens NX.

NVIDIA: Are they primarily 3D or 2D data users?

Customer: 3D mostly.

NVIDIA: Would you describe them as light, medium, or heavy users?

Customer: Medium to heavy.

NVIDIA: Power users to designers then.

Customer: I need performance and scalability numbers that I can use to justify the project...

8.2 An Example Application: Siemens NX

Siemens NX[™] is a popular industrywide solution for integrated 3D computer-aided design, manufacturing, and engineering analysis (CAD/CAM/CAE) that helps companies realize the value of digital twins. It is now available in a cost-effective private cloud environment. Siemens worked closely with NVIDIA Corporation to certify the deployment of NX in the private cloud using a virtual desktop infrastructure (VDI) with NVIDIA virtual GPU (vGPU) technology.

Siemens NX users fall into the following categories, which are appropriate for different groups of NVIDIA vGPU profiles:

	Light User	Medium User	Heavy User
Siemens NX usage	Light 2D to medium	Heavy 2D to light 3D	Medium 3D to heavy
classification	2D		3D

	Light User	Medium User	Heavy User
Guaranteed performance	12 users per server P4-4Q 4 vCPU 8GB RAM	6 users per server P4-8Q 8v CPU 8GB RAM	3 users per server P40-24Q 12 vCPU 8GB RAM2
Typical deployment	16-24 users per server P4-2Q 4 vCPU 8-16GB RAM	12-18 users per server P4-2Q / P4-4Q 8 vCPU 16-32GB RAM	6-9 users per server P40-8Q / P40-12Q 12 vCPU >96GB RAM

Notice the two rows of configurations. It is *critical* to ensure that the customer understands and deploys against the appropriate level of performance

- Guaranteed performance describes resources and constrains that guarantee the user will experience full performance of the vGPU at all times.
- Typical deployment describes resources and constraints that guarantee the user a typical level of performance that may be reduced at certain times. Do not use these figures if a guaranteed level of performance is critical.

8.3 Application-Based Sizing

This section contains an overview of the testing, methodology, and results that support the findings in this deployment guide. It also describes the lab environment used to test those findings.

The first step is to consider the specifications of a physical workstation build.

8.3.1 Recommended System Requirements

8-1 lists recommended minimum, recommended, and optimal hardware resources for a workstation supported by vSphere Hypervisor.

Resource	Requirement
CPU speed	Minimum: Hyperthreaded dual core * Recommended: Quad core * Optimal: 2x hyperthreaded six-core *
Platform	x64 with SSE2 extensions
Memory/RAM	Minimum: 4 GB Recommended: 16 GB Optimal: 32 GB

Table	8-1	Hardware	Resources	for a	а '	Workstation
Table	O_{-T}	naruware	nesources	101.0		vvorkstation

Resource	Requirement
Display properties	24-bit color depth
GPU	Good: NVIDIA [®] Quadro [®] P1000 Better: NVIDIA Quadro P2000 Best: NVIDIA Quadro P5000
Disk space	Recommended: 1 TB solid state drive (SSD)

The test keys on the "recommended" specifications when feasible. The goal is to test both performance and scalability, to maintain the flexibility and manageability advantages of virtualization without sacrificing the performance end users expect from NVIDIA powered graphics.

8.4 Testing Methodology

The Professional Visualization Performance Engineering Team at NVIDIA uses a custom designed benchmark engine to conduct vGPU testing at scale. This engine automates the testing process from provisioning virtual machines and establishing remote connections to executing the industry standard graphics performance benchmark SPECviewperf and analyzing the results across all virtual machines. Dedicated performance scores mentioned in this deployment guide are based on SPECviewperf 12.1.1, which was run in parallel on all virtual machines. Scores were averaged across three runs. Table 8-2 describes the VM Configuration used:



Table 8-2 VM Configuration for vCPU Performance Testing

vGPU Software Edition	Quadro vDWS
CVAIC	Defeult
VSYNC	Detault
Frame Rate Limiter	Default (Off)
VDA Version	7 2
VDA VEISION	1.2
Direct Connect Version	7.2
Number of Screens	1
Screen Resolution	1920×1080
HYPERVISOR CONFIGURATION	
Hypervisor	VMware vSphere 6.7.0
Remote Stack	VMware Horizon 7 with PCoIP
Remote Stack Version	7.2
VM Version	Vmx-13
VM Tools	10279
GPU Allocation Policy	Depth-First
vGPU Manager Version	NVIDIA Virtual GPU 10.X Software

A Proof of Concept (POC) is more likely to be successful when end users are classified as outlined above, as this allows standardization for optimal performance while minimizing management overhead. Customers often segment their end users into three user groups for each application and run similar user types on the same host. The below table outlines the most common definitions of user groups for Siemens NX, along with recommended configurations.



Table 8-3 Common User Group Definitions for Siemens NX

NVIDIA recommends configuring your dual socket server of choice using the Intel Xeon Gold 6154 CPU. This CPU's 18 cores and high frequency of 3.0 GHz are well suited to getting optimal performance for each end user while supporting the largest user scale on the server, making it also a cost-effective solution for Siemens NX.

Based on SPECviewperf 12.1.1, the below section outlines what typical customers usually configure based on various needs.

P4 with Quadro vDWS for Light and Medium Users

Quadro vDWS in combination with NVIDIA P4 is NVIDIA's recommended virtualization solution for Siemens NX.

The form factor of the NVIDIA P4 (single width, half height and powered through the PCIe bus) allows the use of up to six NVIDIA P4s in a server with two Intel Xeon Gold 6154 CPUs. SPECviewperf 12.1.1 tests show that six NVIDIA P4 GPUs with two Intel Xeon Gold 6154 CPUs is a well-balanced configuration for Siemens NX.

The below bar graph demonstrates that there are enough CPU resources available to host six NVIDIA P4s in one server running SPECviewperf 12.1.1 Siemens NX on 24 virtual machines. No performance decrease running 24 virtual machines (4 per GPU) in comparison to 4 (4 per GPU) demonstrates a great balance between CPU and GPU resources.



NVIDIA P40 with Quadro vDWS for Heavy Users

NVIDIA recommends the NVIDIA P40 with Quadro vDWS for heavy users that require the additional performance of an NVIDIA P40 over an NVIDIA P4. The NVIDIA P40 is the optimal choice for heavy users due to its greater performance and larger frame buffer, while the NVIDIA P4 is recommended for light and medium users due to the possibility of hosting up to six NVIDIA P4s in a two-socket, 2U server.



Up to 1.7x Performance with Tesla P40

Sufficient System Memory for each Individual User

While SPECviewperf 12.1.1 performs optimally with 8 GB of system memory per virtual machine, Siemens NX customers typically assign 16–32 GB of system memory to medium users for optimal performance. System memory requirements do not change with the transition to Quadro vDWS; therefore the same amount of system memory should be assigned to the Quadro vDWS accelerated virtual machine as is used in a physical workstation.

Flash Based Storage for Best Performance

NVIDIA recommends the use of flash-based storage (SSDs, etc.) for optimal performance. Flash based storage is the most common choice for physical workstations, and Siemens NX users expect similar performance in virtual environments.

A typical configuration for non-persistent virtual machines uses direct attached storage (DAS) on the server in a RAID 5 or RAID 10 configuration. For persistent virtual machines, a high performing all-flash storage solution is the preferred option.

Typical Networking Configuration for Quadro vDWS

There is no typical network configuration for Quadro vDWS because its requirements vary based on multiple factors such as choice of hypervisor, persistent/non-persistent virtual machines, choice of storage solution and many more. Most customers are using 10 Gbit networking for optimal performance..

Chapter 9. Creating Your First vGPU Virtual Desktop

This chapter describes how to:

- Create and configure a virtual machine in vSphere
- Install Microsoft Windows and VMware Tools on the VM
- Customize Windows settings
- Install Horizon Agent and Horizon Direct Connection on the VM
- Adjust additional VM settings and enable VM console access
- Enable the NVIDIA vGPU and finalize the installation

9.1 Creating a Virtual Machine

These instructions assist in making a VM from scratch to support NVIDIA vGPUs. Such a VM may be used as a gold master image to create additional VMs. Use the following procedure to configure a vGPU for a single guest desktop:

1. Open the vSphere Web Client:

vm vSphere Client	Menu 🗸 🔍 Search			C ③ ~ Administrat	or@VSPHERELOCAL ~	٢
 A Home ♦ Shortcuts 	Home					Í
Hosts and Clusters VMs and Templates Storage Networking Content Libraries Global Inventory Lists	CPU 50.47 GHz free	Memory 225.37 (30.52 GB used)	GB free 255.89 GB total	Storage 748.6 0	GB free	
Policies and Profiles VRealize Operations	₿ VMs	8	Hosts			1
Administration	6 2	0	1	0	0	
 Tasks Events 	Powered On Powered Off	Suspended	Connected	Disconnected	Maintenance	_
Tags & Custom Attribu.,	Objects with most alerts	0	송 Installed Plugins			4
G New Search	tisem () Alerts	2 Wernings	 VMware vRops Client Pl VMware Update Manag VMware Update Manag 	ugin er		-
Recent Tasks Alarms						*
Task Neme v Ta	nget v Suntus v kolistav	Y Queued For	Start Time ↓	 Completion Time 	 Server 	*

2. Browse to the host or cluster for which the VM is to be created. Right click the host or cluster and select New Virtual Machine:



vSphere opens the New Virtual Machine window:

1 Select a creation type 2 Select a name and folder	Select a creation type How would you like to create a virtual m	nachine?
3 Select a compute resource 4 Select storage 5 Select compatibility 6 Select a guest OS 7 Customize hardware 8 Ready to complete	Create a new virtual machine Deploy from template Clone an existing virtual machine Clone virtual machine to template Clone template to template Convert template to virtual machine	This option guides you through creating new virtual machine. You will be able to customize processors, memory, network connections, and storage. You will need install a guest operating system after creation.

Click Next. vSphere prompts you to specify the new virtual machine's name and location:

1 Select a creation type	Select a name and folder	
2 Select a name and folder	Specify a unique name and target location	_
4 Select storage	Virtual machine name:	
5 Select compatibility	Select a location for the virtual machine	
7 Customize hardware	₩ 10.19.203.106	
8 Ready to complete	> Datacenter	

3. Enter a name for the virtual machine. Choose the location to host the virtual machine using the collapsible tree under the label "Select a location for the virtual machine," then click Next to continue. vSphere prompts you to select a compute resource:

 2 Select a creation type 2 Select a name and folder 3 Select a compute resource 	Select a compute resource Select the destination compute resource for this operation
4 Select storage	↓ Datacenter
5 Select compatibility	V 🕅 SAE Lab
6 Select a guest OS	10.19.203.76
7 Customize hardware	
8 Ready to complete	
	Compatibility
	✓ Compatibility checks succeeded.

4. Select a compute resource to run the VM.

The compute resource you select must include an installed, correctly configured NVIDIA adapter that supports vGPU operations.

 1 Select a creation type 2 Select a name and folder 	Select storage Select the datastore in whi	ich to store the conf	liguration and disk fi	les	
3 Select a compute resource 4 Select storage 5 Select compatibility	VM Storage Policy:	Data:	store Default 🗠		
7 Customize hardware	Name	Capacity	Provisioned	Free	Тур
8 Ready to complete	detestore1	924 GB	1.16 TB	752.32 GB	VN.
	-				÷
	a Compatibility				¥ -

Click Next to continue. vSphere prompts you to select a storage resource:

5. Select the datastore to host the virtual machine, then click Next to continue. vSphere prompts you to select compatibility for the vGPU:

2 Select a name and folder	Select compatibility Select compatibility for this virtual machine depending on the hosts in your environment
 3 Select a compute resource 4 Select storage 5 Select compatibility 6 Select a guest OS 7 Customize hardware 8 Ready to complete 	The host or cluster supports more than one VMware virtual machine version. Select a compatibility for the virtual machine. Compatible with: ESXI 6.7 and later This virtual machine uses hardware version 14, which provides the best performance and latest features available in ESXI 6.7.

1

6. Compatibility settings allow the VM to run on different versions of vSphere. To run vGPUs, select ESXi 6.0 and later, then click Next to continue. vSphere prompts you to select a guest OS:

1 Select a creation type	Select a guest OS	
2 Select a name and folder	Choose the guest	OS that will be installed on the virtual machine
 3 Select a compute resource 4 Select storage 5 Select compatibility 	Identifying the gue defaults for the op	est operating system here allows the wizard to provide the appropria perating system installation.
6 Select a guest OS	Guest OS Family:	Windows •
7 Customize hardware B Ready to complète	Guest OS Version:	Microsoft Windows 10 (64-bit)
		Enable Windows Virtualization Based Security 0
		Compatibility: ESXI 6.7 and later (VM version

7. Select the appropriate Windows OS from the Guest OS Family and Guest OS Version dropdowns, then click Next to continue. vSphere prompts you to customize the vGPU's virtual hardware:

1 Select a creation type 2 Select a name and folder	Customize hardware Configure the virtual machine hardware			
4 Select storage	Virtual Hardware VM Opti	ons		
5 Select compatibility				ADD NEW DEVICE
7 Customize hardware	S CPU *	8 ~		0
a ready to complete	> Memory *	32	- G8	-
	New Hard disk *	120	GB 🕤	
	New SCSI controller *	LSI Logic SAS		
	New Network *	VM Network >		Connect
	> New CD/DVD Drive *	Client Device	~	D Domesti
	> New USB Controller	USB 3.0 -		
	> Video card *	Specify custom :	ettings v	
	VMCI device			
	Device on the virtual machine	PCI bus that provides	support for	the virtual
		Compatibility	ESXI 6.7	and later (VM version 1-

8. Set the virtual hardware based on your desktop workload requirements, then click Next to continue. vSphere displays a summary of the settings you have selected:

 1 Select a creation type 2 Select a name and folder 	Ready to complete Click Finish to start creation.		
 3 Select a compute resource 4 Select storage 	Transmission and		
 5 Select compatibility 6 Select a guest OS 	Virtual machine name	Win10-1709	
8 Ready to complete	Folder	AL-Datacenter	
	Host	10.110.17.30	
	Datastore	datastore1 (4)	
	Guest OS name	Microsoft Windows 10 (64-bit)	
	Virtualization Based Security	Disabled	
	CPUs	8	
	Memory	32 GB	
	NICs	1	
	NIC 1 network	VM Network	
	NIC 1 type	ETODOE	
	SCSI controller 1	LSI Logic SAS	
	Create hard disk 1	New virtual disk	

9. Review the new virtual machine's configuration. If any of the settings are wrong, click Back and correct them. When all of the settings are right, click Finish.

9.2 Installing Microsoft Windows

To install Microsoft Windows on the virtual machine:

1. Select the virtual machine, right click it, and select Edit Settings:



CPU	8	0
Memory	16. GB ~	
Hard disk 1		
SCSI controller 0	LSI Lógic SA5	
Network adapter 1	VM Network ~	Connect
CD/DVD drive 1	Client Device	8
USB xHCl controller	Client Device Datastore ISO File Content Library ISO File	
Video card	Specify custom settings ~	
VMCI device	Device on the Virtual machine PCI bus that prov Virtual machine communication interface	ides support for the
SATA controller 0	AHCI	
Other	Additional Hardware	

vSphere displays the Edit Settings dialog:

2. Click the dropdown list opposite the label "CD/DVD drive 1" and select an appropriate data source for CD/DVD media. (This example uses a Datastore ISO file.) Check the Connect checkbox to the right of the CD/DVD drive 1 dropdown to connect the ISO file to the VM's virtual CD/DVD drive:

		ADD NEW DEVICE
CPU	8 ~	6
Memory	16 GB ~	
Hard disk 1	120 GB -	
SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network -	Connect
> CD/DVD drive 1	Client Device	8
 USB xHCl controller 	Client Device Datastore ISO File Content Library ISO File	
Video card	Specify custom settings <	
VMCI device	Device on the Virtual machine PCI bus the Virtual machine communication interface	hat provides support for the
SATA controller 0	AHCI	
> Other	Additional Hardware	
> Other	Additional Hardware	

3. Click the caret next to "CD/DVD drive 1." vSphere expands the tree entry to reveal the details of the virtual device.

	ADD NEW DEV	ICE
CPU	8 *	0
Memory	16 GB	
Hard disk 1	120 GB ~	
SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network ~	
CD/DVD drive 1 *	Datastore ISO File	\otimes
Status	Connect At Power On	
CD/DVD Media	[datastore1]Share/en_wir BROWSE	
Device Mode	Dessimilation Classifier &	
Virtual Device Node	SATA controller 0 >> SATA(0:0) CD/DVD drive 1 >>	
USB xHCl controller	USB 3.0	
Video card	Specify custom settings ~	
VMCI device	Device on the virtual machine PCI bus that provides support for the virtual machine communication interface	2
CATA controllor 0	Δμ <i>r</i> i	

4. Check the Connect At Power On checkbox to connect the ISO file to the VM's virtual CD/DVD drive at boot time, then click the Browse button to the right of "CD/DVD Media." vSphere opens a Select File dialog:

Datastores	Contents	Information
datastores datastore1 i.sddsf i.sddsf i.tl0.ATASamsung_SSD_850_E AD i.coM i.coS i.replica-7bc7254c-70cd-4da7-b4b1-2 i.share i.soL i.vM-01 i.winkdump VMware vCenter Server Appliance i.wint0 i.wint0 wint0-1709 winsrv2012	Contents Contents Image: Con	Name: en_windows_10_multi- edition_vi_version_1709_updated_sept_3 Size4.25 GB Modified.08/03/2018_10:09:46 PM Encrypted: No

- 5. Navigate to and select the OS ISO file to be used for installation. Click OK to select the file.
- 6. Right click the virtual machine, then select Power>Power On to start the virtual machine, boot the ISO file, and install the operating system from it.

The virtual machine boots from the selected ISO file.

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If you are creating a new virtual machine and using vSphere Web Client's VM console functionality, the mouse may not be usable in the virtual machine until after both the operating system and the VM ware tools have been installed.

7. Perform a Custom (fresh) installation of Microsoft Windows 10 on the virtual machine.

During installation, Windows reboots the VM several times.

- 8. When Windows is done installing, disconnect the ISO from the VM.
- 9. Go through the initial Windows setup wizard to name the computer, create a local account, set the time zone, choose the update installation policy, etc.

Windows 10 is now installed on the virtual machine.

9.3 Installing VMware Tools

After you install Microsoft Windows on the virtual machine (VM), the next step is to install VMware Tools.

- 1. Select the Summary tab from the VM console.
- 2. Click the Install VMware Tools link in the yellow bar. The VM displays the Install VMware Tools window:



3. Click Install VMware Tools. The VM displays the Install VMware Tools window:



4. Click Mount. The VM displays an Open dialog:



5. Back on the VM console, Windows 10 detects the mounted CD image and opens the AutoPlay dialog. If the AutoPlay dialog does not open, browse to the virtual CD-ROM in the VM and start the installer (setup.exe or setup64.exe) manually.

Windows asks whether you want to allow the installer to make changes:



- 6. Click Yes to continue. If Windows displays the User Account Control (UAC) dialog, click Yes.
- 7. The installer displays the "Welcome..." screen:

🚽 VMware Tools Setup	– 🗆 X
	Welcome to the installation wizard for VMware Tools
	The installation wizard will install VMware Tools on your computer. To continue, click Next.
	Copyright 1998-2017 (c) VMware, Inc. All rights reserved. This product is protected by copyright and intellectual property laws in the United States and other countries as well as by international treaties. WMware products are covered by one or more patents listed at http://www.vmware.com/go/patents.
vm ware [.]	
	< Back Next > Cancel

- 8. To begin the installation, click Next.
- 9. When the installer prompts you to select a setup type, select Complete, then click Next:



- 10. In the next screen, accept all defaults, then click Next.
- 11. When the installer displays the Ready to install screen, click Install to begin installation:



12. When the installation is complete, the installer displays the Completed screen:

VMware Tools Setup	×			
	Completed the VMware Tools Setup Wizard			
	Click the Finish button to exit the Setup Wizard.			
vm ware [.]				
	< Bad: Einish Cancel			

13. Click Finish to close the VMware Tools installer. Reboot the virtual machine when prompted. This reboot is critical to ensure the tools are will load properly.

VMware Tools is now installed on the virtual machine.

9.4 Adding the Golden Master to the Domain

If you join a VM to a Windows Active Directory domain, you can manage it as you would any physical desktop in the domain.

Customize Windows on the virtual machine as follows:

- Join the domain
- Add appropriate Domain groups to Local Administrators

Adding a VM to the domain:

1. On the VM's Microsoft Windows, select Control Panel > System. Windows displays this dialog:

	System			-		×
÷	- 🖃 👻 🛧 👱 > Control Pane	l > System and Security > Sy	stem v Ö S	earch Control Panel		P
	Control Panel Home	View basic information	about your computer			?
•	Device Manager	Windows edition				
•	Remote settings	Windows 10 Pro N				_
•	System protection	© 2017 Microsoft Corpora	tion. All	ndow	'c 1	\cap
•	Advanced system settings	rights reserved.		IIGOV	51	U
		System				
		Processor:	Intel(R) Xeon(R) CPU E5-2667 v4 @ 3	.20GHz 3.20 GHz (2	processo	ors)
		Installed memory (RAM):	8.00 GB			
		System type:	64-bit Operating System, x64-based	processor		
		Pen and Touch:	No Pen or Touch Input is available fo	or this Display		
		Computer name, domain, and	workgroup settings		_	_
		Computer name:	DESKTOP-NCHEFLP	Cha	nge setti	ings
		Full computer name:	DESKTOP-NCHEFLP			/
		Computer description:				
		Workgroup:	WORKGROUP			
		Windows activation				
		Windows is not activated.	Read the Microsoft Software License	Terms		
	See also	Product ID: 00331-60000-0	0000-AA737	Activ	ate Wind	lows
	Security and Maintenance					

2. In the left-hand panel, click Advanced system settings. Windows displays the System Properties dialog:

System Propertie	5					×
Computer Name	Hardware	Advanced	System Protect	tion	Remote	
Wind on the	ows uses the e network.	e following inf	ormation to iden	tify yo	our compu	ter
Computer <u>d</u> escri	iption:					
	Fo	or example: " omputer".	Kitchen Compute	er" or	"Mary's	
Full computer na	ame: D	ESKTOP-NC	HEFLP			
Workgroup:	W	ORKGROU	0			
To use a wizard Network ID.	to join a dor	main or work <u>o</u>	jroup, click	<u>N</u> e	twork ID.	
To rename this o workgroup, click	computer or Change.	change its do	omain or	C	Change	
		OK	Can	cel	A	pply

3. Select the Computer Name tab, then click Change. Windows displays the Computer Name/Domain Changes dialog:

System Properties		×
Computer Name/Domain Changes	\times	mote
You can change the name and the membership of this computer. Changes might affect access to network resource	s.	computer
Computer name: Win10		ary's
Full computer name: Win 10		
More		ırk ID
Member of		
Domain:	,	nge
grid.com		
O Workgroup:		
WORKGROUP		
OK Cancel		
OK Cancel		<u>A</u> pply

4. Enter an appropriate name in the Computer name field. Select Domain and enter an appropriate name in the Domain name field. (The names in the illustration above are examples, and are not necessarily appropriate for your VM.)

Click OK. Windows opens a Windows Security dialog:

Windows Security ×					
Computer Name/Doma	ain Changes				
Enter the name and password of an account with permission to join the domain.					
administrator					
•••••	ି				
ОК	Cancel				

5. Enter your domain administrator credentials, then click OK. If the credentials are valid, Windows sets the domain name as you have specified it and opens a "Welcome..." dialog:



6. Click OK to close the dialog. Windows displays a "You must restart your computer..." dialog:



7. Click OK. The VM reboots.

9.5 Installing Horizon Agent

You must install the correct version of the Horizon Agent for your virtual machine.

To install Horizon Agent on your VM:

- 1. Several versions of the installer are provided with the Horizon 6.1 Early Access code. Find the correct version for your VM:
 - For 64-bit virtual machines, install VMware-viewagent-x86_64-7.5.1-9182637.exe.
- 2. Launch the installer. It displays a "Welcome..." screen:



3. Click Next to continue. The installer displays the License Agreement screen:



4. Select the "I accept the terms..." radio button, then click Next to continue. The installer displays the Network protocol configuration screen.

🛃 VMware Horizon Agent	×
Network protocol configuration	
Select the communication protocol	Ŧ
Specify the protocol to be used to configure this Horizon Agent instance:	
IPv4 This agent will be configured to choose the IPv4 protocol fo IPv6 all connections.	r establishing
< Back Next >	Cancel

5. Choose the appropriate network protocol (typically IPv4), then click Next to continue. The installer displays the Custom Setup screen:

🛃 VMware Horizon Agent	×
Custom Setup Select the program features you want installed.	<u>A</u>
Click on an icon in the list below to change how a feature is installed.	
Feature Descrip	ption
X USB Redirection VMware Horizon YMware Virtualization Pack for : VMware Horizon YMware Horizon View Compose VMware Horizon View Compose YMware Horizon Niew Compose VMware Horizon Niew Compose YMware Horizon View Compose VMware Horizon Niew Compose YMware Horizon Niew Compose VMware Horizon Niew Compose YMWare Hor	n Agent core functionality quires 252MB on your hard
drive.	· · ·
Install to: C:\Program Files\VMware\VMware View\Agent\	<u>C</u> hange
Help Space < Back Net	xt > Cancel

- 6. Accept all default values; click Next.
- 7. If the installer displays the Remote Desktop Protocol Configuration screen, select "Enable the Remote Desktop...," then click Next:



8. The installer displays the Ready to install the program screen:



9. Click Install to continue. The installer installs Horizon Agent on the VM. When it is done, it displays the Installer Completed screen:

🛃 VMware Horizon Agent	×
vmware	Installer Completed
vMware Horizon Agent	The installer has successfully installed VMware Horizon Agent. Click Finish to exit the wizard.
	<badi candel<="" finish="" td=""></badi>

10. Click Finish to close the installer. The installer prompts you to reboot:

👷 VMwa	re Horizon Agent Installer	Information	\times
1	You must restart your syst changes made to VMware i effect. Click Yes to restart restart later.	em for the configuration Iorizon Agent to take now or No if you plan to	
	Yes	No	

11. Click Yes to reboot the VM.

VMware Horizon Agent is now installed on the virtual machine.

9.6 Installing Horizon Direct Connection

The Horizon Direct Connection agent is a helpful tool for debugging when you configure virtual machines with vGPU. Install the correct version for your VM.

To install Horizon Direct Connection agent on your VM:

- 1. Several versions of the installer are provided with the Horizon 6.1 Early Access code. Find the correct version for your VM:
 - For 64-bit virtual machines, install VMware-viewagent-direct-connection-x86_64-7.5.1-9122465.exe.
- 2. Launch the installer. It displays a "Welcome..." screen.



3. Click Next to continue. The installer displays the End-User License Agreement screen:



4. Check the I accept the terms in the license agreement checkbox, then click Next to continue. The installer displays the Configuration Information screen:

🛃 VMware Horizon Agent Direct-Connection Plugin Setup	×
Configuration Information Please specify port information	æ
VMware Horizon Agent Direct-Connection Plugin requires that a firewall exception is a order to accept remote connections on the specified TCP port number. If Windows Fir enabled, the installer can automatically add this for you.	dded in rewall is
Listen for HTTPS connections on the following TCP port:	
Configure Windows Firewall automatically	
Back Next Ca	ancel

5. Enter an appropriate port number in the Listen for HTTPS connections field. The default HTTPS port number is 443; however, you may use a different port if you want.

Check the Configure Windows Firewall automatically checkbox. Then click Next to continue. The installer displays the Ready to install the program screen:

VMware Horizon Agent Direct-Connection Plugin Setup —	×
Ready to install VMware Horizon Agent Direct-Connection Plugin	흪
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.	
Back Install	Cancel

6. Click Install to continue. The installer begins performing the installation. When it is done, it displays the "Completed..." screen:

2	Completed the VMware Horizon Agent Direct-Connection Plugin Setup Wizard
	Click the Finish button to exit the Setup Wizard.
VMware Horlzon™ View Agent Direct- Connection Plugin	
	Bade Finish Cancel

7. Click Finish. The installer prompts you to reboot:

👷 VMwa	re Horizon Agent Install	er Information	\times
0	You must restart your sy changes made to VMwar effect. Click Yes to resta restart later.	stem for the configuration e Horizon Agent to take rt now or No if you plan to	
	Yes	No	

- 8. Click Yes to reboot the VM.
- 9. When Windows is fully booted, test Direct Connection using the installed VMware Horizon client by adding a server, entering the IP address of the VM, and logging in to the VM with the appropriate credentials when you are prompted to do so.

Horizon Direct Connection is now installed on the virtual machine.

9.7 Optimizing Windows

The <u>VMware OS Optimization Tool</u> helps optimize Microsoft Windows 7/8/2008/2012/10 systems for use with VMware Horizon View. The optimization tool includes customizable templates to enable or disable Windows system services and features across multiple systems, per VMware recommendations and best practices. Since most Windows system services are enabled by default, the optimization tool can easily be used to disable unnecessary services and enable features to improve performance.

You can perform the following actions using the VMware OS Optimization Tool:

- Local analysis and optimization
- Remote analysis
- Optimization history recording and rollback
- Template management

Review the <u>VMware Horizon Optimization Guide for Windows</u> for OS-specific tweaks.



Do not run the batch files recommended in this document without understanding the changes they make, as they may disable more functionality than anticipated.

To install the optimizer:

1. Download and browse to the folder containing the VMware OS Optimizer Tool, double click VMwareOSOptimizerTool.exe to run it.

1 2 Home	Share	View					~
· ↑	This	PC > Downloads > VMwareOSOptimization	nTool_b1100_9320643		~	ō,	Search VMwareOSOptimizatio ,0
		Name	Date modified	Туре	Size		
Quick access	1.2	MwareOSOptimizationTool	7/27/2018 2:22 AM	Application	12,550 KB		
Desktop		VMwareOSOptimizationTool.exe.config	7/27/2018 2:22 AM	CONFIG File	1 KB.		
- Downloads	*						
Documents							

2. The tool opens and displays the Analyze tab with System Information:

toning Hickory Remote Arabaia	ates De	and the second	Plates References			b1100
tem Information			HIGHLIGHT -		Analysis Summary	
5 Microsoft Windows 10 Pro N	System Nar	ie .	WIN10			
rsion	User Name		Administrator		600	
ocessor Intel(R) Xeon(R) CPU E5-2667 v4 @ 3.20GHz	Windows D	rectory	C/Windows		400-	
stem Type 64-bit	System Dire	ctory	C:\Windows\system32		429	342
sical Memory 8.00 GB	Windows Lo	çale	United States		2007	20 3
olay Controller VMware SVGA 3D	Display Ada	pter RAN	A 0.00 KB		0 Total	
vork Adapter – vmxnet3 Ethernet Adapter					- Optimization Not Applied	Optimization Applied
	I.					
ste VMware/Windows 10.			Optimizations	Description	Expected Result	Actual Result
Modifications to Standard Image	0	Apply	HICU Settings to Registry (86 items)			
Change Explorer Default View		à	Change Explorer Default View	Change explorer default view to Thic PC, Don't optimize the item when you use VMware Use	1	NA
Cursor Blink Cursor Blink Rate	2	۵	Cursor Blink	Disable cursor bl/nk.	1	NA
- Default Printer	2	4	Cursor Blink Rate	Not set cursor blink rate.	-1	530
4 Disable Hardware Acceleration (GPU Rendering) for	V	11	Default Printer	Set default printer to Print&Share.	т	4294967295
2% Disable Hardware Acceleration (GPU Rendering) for Group policy - Do not add shares of recently opene	R.	4	Disable Hardware Acceleration (GPU Rendering) for Mi	Disable Hardware Acceleration (GPU Rendering) for Microsoft Internet Explorer if there's no.	1	NA
Group policy - Maximum size of Active Directory set Group policy - Clear the recent programs list for ne	1	A	Disable Hardware Acceleration (GPU Rendering) for Mi	Disable Hardware Acceleration (GPU Rendering) for Microsoft Office 2010 if there's no hardw	1	NA
Group policy - Do not display or track terms in Jump		à	Disable Hardware Acceleration (GPU Rendering) for Mi	Disable Hardware Acceleration (GPU Rendering) for Microsoft Office 2016/2013 if there's no	1	NA
- Group policy - Turn off user tracking		4	Group policy - Do not add shares of recently opened o	Enable this policy, shared folders are not added to Network Locations automatically when yo	4	NA
Group policy - Turn off toest notifications Group policy - Turn off all Windows spotlight featur		4	Group policy - Maximum size of Active Directory searc	Enable this policy, set Number of objects returned to 5000.	5000	NA
Group policy - Turn off caching of thumbnail picture		â	Group policy - Clear the recent programs list for new u	Enable this policy, the recent programs list in the start menu will be blank for each new user.	i	NA
Group policy - Turn off the caching of thumbnails in	V	4	Group policy - Do not display or track items in Jump Li	Enable this policy, the Start Menu and Taskbar only track the files that the user opens locally	1	NA
On Screen Keyboard - Key Stroke Delay	12	4	Group policy - Turn off all balloon notifications	Enable this policy, no notification balloons are shown to the user.	1	NA
Cin Screen Keyboard - First Repeat Delay			Group policy - Turn off user tracking	Enable this policy, the system does not track the programs that the user runs, and does not r	1	NA
Packet Outlook Object Module(PCOM) - Work Result Pocket Outlook Object Module(PCOM) - Run Cranki	P		Group policy - Turn off toast notifications	Enable this policy, applications will not be able to raise toast notifications.	1	NA
	V	-	Group policy - Turn off all Windows spotlight features	Enable this policy Windows soutlight on lock screen Windows tips. Microsoft consumer feat	1	NA
Preview Desktop			Group policy - Turn off caching of thumbnal pictures	Enable this policy, thumbnal views are not cached.	1	NA
Freview Desktop Reduce Menu Show Delay RSS Feeds - Disable		-	Group policy - Turn off display of recent search entries	Enable this policy. File Explorer will not show suggestion poo-ups as users type into the Sean	T	Anavale Windows
Preview Desktop Fleduce Menu Show Delay RSS Feeds - Disable See Chi Engine - Disable Set Deshuk Walpaper						
Preview Desktop Reduce New Show Delay Reduce New Show Delay Set Creds - Disable Search Engine Joisele Set Default Weilpaper trentformate						

- 3. Click the Analyze button at the bottom left to begin.
- 4. Choose the template you want to use. These instructions use Win10 LoginVSI as an example. You can also create your own template.
- 5. When the tool finishes analyzing the OS the main window shows the results, and displays an Optimize button at the bottom left:

August Workson 13 Augu	🧾 🥗 📘 💆	-				b1100
A Model Worker Start Marken	Information	and Poten	and an and a second		Analysis Summary	
Market Witz Michael State Operation Decay for Decay for <thdecay for<<="" th=""><th>Microsoft Windows 10 Pro N S n u u sca (net)[R] Xeon(R) (CHU ES-3667 v4 @ 3.2001:b % S n u (net)[R] Xeon(R) (CHU ES-3667 v4 @ 3.2001:b % S n there S S n t</th><th>ystem Name Iser Name Vindows Directs lystem Directs Vindows Loca Xisplay Adaptr</th><th>Win10 Administrator ColWindows VCIWindows (system32) V Citik States RIMM 0.00 KB</th><th></th><th>400 200 0 Total Detimization Not Applied</th><th>10 neomeositi opinal madatory Delenceur Aprile</th></thdecay>	Microsoft Windows 10 Pro N S n u u sca (net)[R] Xeon(R) (CHU ES-3667 v4 @ 3.2001:b % S n u (net)[R] Xeon(R) (CHU ES-3667 v4 @ 3.2001:b % S n there S S n t	ystem Name Iser Name Vindows Directs lystem Directs Vindows Loca Xisplay Adaptr	Win10 Administrator ColWindows VCIWindows (system32) V Citik States RIMM 0.00 KB		400 200 0 Total Detimization Not Applied	10 neomeositi opinal madatory Delenceur Aprile
Visite database Visite dat	VMware/Windows 10 - LoginVSI.com - VDIUKEAPRO - +		Optimizations	Dekrytor	Expected Result	Actual Result
A for care in a constraint of the second	fodifications to Standard Image	00	Apply HIKCU Settings to Registry (23 items)			
Proceedings Proc	Action Center		Action Center	Disable action center completely.	1	N.A.
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Operation Operation <t< td=""><td>Feedback Most used apos</td><td>2</td><td>Devices Autoplay</td><td>Disable autoplay for all media and devices.</td><td>1</td><td>۵</td></t<>	Feedback Most used apos	2	Devices Autoplay	Disable autoplay for all media and devices.	1	۵
Bit Search Se	Recent Items	E.	Feedback	Disable Feedback.	0	NA
By Comparison of By Com	RSS Feeds - Disable	V	Most used apps	Disable show most used apps at start menu.	0	N.A
United States Bio Only Easter Bio Dial Dial Dial Dial Dial Dial Dial Dial <	Search Engine - Disable Set Default Wallpaper	Z	Recent Items	Disable show recent items at start menu.	<u>a</u>	NA
Operation Proceedings	Taskbar Search Box	R	And Reduce Menu Show Delay	Delay Show the Reduce Menu	120	NA
Wind Hets: Analysis Image: Second Segment Second	Transparency Effects	R	RSS Feeds - Disable	Peform this task to disable RSS feed capability and potentially improve performance and red	0	N.A.
Wind Rest- Annubusis the fusible Image: Section of the sectin of the section of the section of the section of the se	Visual Effects - Adjust for best performance Visual Effects - Animate windows when minimizing :	V	Search Engine - Disable	Disable Bing Search.	0	NA
Water Heys structures in which my control is not which deal Image: Any structures in which my control is not which deal Image: Any structure	Visual Effects - Animations in the taskbar Visual Effects - Enable Peek	B	Set Default Wallpaper	Set wallpaper to a "non existing" file to disable the end users ability to set a wallpaper.	0	N.A.
Wash Bits - Size transmission for extracts Wash Bits - Size transmission for extracts Bits Size transmission for extracts Wash Bits - Size transmission for extracts Wash Bits - Size transmission for extracts Bits Size transmission for extracts Wash Bits - Size transmission for extracts Bits Size transmission for extracts Bits Size transmission Bits Size transmission for extracts Bits Size transmission Bits Size transmit Bits Size transmission Bits Size transmission Bi	Visual Effects - Play animations in windows	D	Taskbar Search Box	Hiden taskbar search box.	0	NA
Image: The State St	Visual Effects - Show translucent selection rectangle	R	Temporary Internet Files to Non Persistent	Purge cache for IE on every close of IE. Non persistence	0	1
Wask There - Use day befores for con-bales or prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask The bask performance 2 NAA Becomposited prior (Life and prior) If wask the bask performance 2 NAA Becomposited prior (Life and prior) If wask the bask performance 2 NAA Becomposited prior (Life and prior) If wask the bask performance 3 NAA Becomposited pris (Life and pris) If wask the bask performance </td <td> Visual Lifects - Show window contents while dragging Visual Effects - Smooth edges of screen fonts </td> <td>D</td> <td>Transparency Effects</td> <td>Remove transparency effects.</td> <td>0</td> <td>1</td>	 Visual Lifects - Show window contents while dragging Visual Effects - Smooth edges of screen fonts 	D	Transparency Effects	Remove transparency effects.	0	1
Discipant Import Display Interview Display Interview <thdisplay interview<="" th=""> Display Interview</thdisplay>	Visual Effects - Use drop shadows for icon labels on Apoly HKLM Settings	R	Visual Effects - Adjust for best performance	Set Windows Visual Effects to Optimized for best performance	2	NA
Margen of general visions visions and the second se	Background Image	V	Visual Effects - Animate winclows when minimi	zing and Disable Animate windows when minimping and maxmiping Visual Effect	0	NA
Content experience improvement program - Disk	CIPS Change Notifications	R	Visual Effects - Animations in the taskbar	Disable Animations in the taskbar Visual Effect	9	NA
	Customer experience improvement program - Disat Cortana	V	Visual Effects - Enable Peek	Disable Enable Peek Visual Effect	0	Avatavate Windows

6. Scroll through the list of optimizations and select or deselect items depending on your needs. These instructions use the defaults.

Click Optimize.	The too	runs the se	elected sc	cripts to	optimize t	he OS:
-----------------	---------	-------------	------------	-----------	------------	--------

e 🖝 👦 👂		sta 📢			b1100
aliyze History Remote Analysis My Templ	ates Pub	c Templates References			
m Information				Analysis Summary	
Microsoft Windows 10 Pro N 5	iystem Nam	. WINTO		400	
	Iser Name	Administrator			
en Time SLift	orten Dire	tory CoWindows/sustem32		200-245	
ical Memory 8.60 GB V	Windows Lo	ale United States			135
lay Controller VMware SVGA 3D E	Sisplay Adap	ter RAM 0.00 KB		50	
rork Adapter vriwnet3 Ethernet Adapter				Total	recommended optional mandatory
				- Optimization Not Applied	Optimization Applied
VMware/Windows 10 - LogreVSI.com - VDILIKEAPR0 ~		Optimizations	Description	Expected Result	Actual Result
Modifications to Standard Image	00	Apply HKCU Settings to Registry (23 (terns)	Optimizing WIN10 for C\PregramData\VMware\OSOT\VMwa_ X		
Apply HKCU Settings to Registry	•	Action Center	Current Step: Hard disk timeouts on ac power	1	NA
Change Explorer Default View	Ø	A Change Explorer Default View		1	NA
Feedback	Ø	Devices Autoplay	24.5	1	0.
Recent Items	1	I feedback	Disable Feedback.	o	NA
Reduce Menu Show Delay RSS Feeds - Disable	•	Most used apps	Disable show most used apps at start menu.	0	NA
Search Engine - Disable	1	A Recent Items	Disable show recent items at start menu.	0	NA
- Taskbar Search Box	1	A Reduce Menu Show Delay	Delay Show the Reduce Menu	120	NA
Transparency Effects	•	RSS Feeds - Disable	Peform this task to disable RSS feed capability and potentially improve performance and red	D	NA
 Visual Effects - Adjust for best performance Visual Effects - Animate windows when minimizing - 	1	Search Engine - Disable	Disable Bing Search.	0	NA
Visual Effects - Animations in the taskbar	D	Set Default Wallpaper	Set malipaper to a "non existing" file to disable the end users ability to set a walipaper.	ò.	NA
Visual Effects - Play animations in windows		Taskbar Search Box	Hiden taskbar search box.	D	NA
Visual Effects - Show translucent selection rectangle	1	Temporary Internet Files to Non Persistent	Purge cache for IE on every close of IE. Non persistence	D	1
Visual Effects - Show window contents while draggi Visual Effects - Smooth edges of screen fonts		Transparency Effects	Remove transparency effects.	0	1
The second s		Visual Effects - Adjust for best performance	Set Windows Visual Effects to Optimized for best performance.	2	NA
Apply HKLM Settings	1	Visual Effects - Animate windows when minimiz	ing anc. Disable Animate windows when minimizing and maxmizing Visual Effect	D	NA
Visual Effects - Use drop shadows for icon labels on Apply HKLM Settings Background Image Background Image	and the second	Visual Effects - Animations in the taskbar	Disable Animetions in the taskbar Visual Effect	0	Turn on Windows Firmed
Visual leftects - Use drop shadows for icon labels on Apply HKIM Settings Background lange Beckground Layout Setvice - Disable Clifs Change Notifications	1				Turn on windows Pirewall
App VHLM Setting: Add Setting: App VHLM Setting: Add Setting Setting: Add Setting: Add Setti	1	Visual Efferts - Enable Reek	Disable Foable Peek Visual Effect	D.	A Windbivs/Vinewall/Instanced off. Tap :

7. When optimization is complete the tool displays its results:

~					
Analyze Opt	tenize	History Remote Analysis My Templates	Public Templates Raforences		
Optimization Result		Steps	Description	Expected Result	Actual Result
Apply HKCU Setting	ps to Regis	dry (19 items)			
SUCCESS	4	Action Center	Disable action center completely.	1	NA
SUCCESS	â	Change Explorer Default View	Change explorer default view to Thic PC.	1	NA
SUCCESS		Devices Autoplay	Disable autoplay for all media and devices.	1	C.
SUCCESS		Feedback	Disable Feedback	U.	NA
SUCCESS	as.	Most used apps	Disable show most used apps at start menu.	0	NA
SUCCESS	2	Recent Items	Disable show recent items at start menu.	0	NA
SUCCESS	æ	Reduce Menu Show Delay	Delay Show the Reduce Menu	120	NA
SUCCESS	0	RSS Feeds - Disable	Reform this task to disable RSS feed capability and potentially improve performance and reduce requirements for disk space growth related	0	NA
SUCCESS	<u>A</u>	Search Engine - Disable	Disable Bing Search.	a	NA
SUCCESS	۵	Temporary Internet Files to Non Persistent	Purge cache for IE on every close of IE. Non persistence	0	1
SUCCESS		Visual Effects - Adjust for best performance	Set Windows Visual Effects to Optimized for best performance.	2	NA
SUCCESS	12	Visual Effects - Animate windows when minimizing and	Disable Animate windows when minimizing and maxmizing Visual Effect	0	NA
SUCCESS		Visual Effects - Animations in the taskbar	Disable Animations in the taskbar Visual Effect	0	NA
SUCCESS	1	Visual Effects - Enable Peek	Disable Enable Peek Visual Effect	٥	NA
SUCCESS		Visual Effects - Play animations in windows	Turn off Play animations in windows.	9012038010000000	NA
SUCCESS		Visual Effects - Save taskbar thumbnail previews	Disable Save taskbar thumbnail previews Visual Effect	a	NA
SUCCESS	10	Visual Effects - Show translucent selection rectangle	Disable Show translucent selection rectangle Visual Effect	0	NA
SUCCESS	1	Visual Effects - Show window contents while dragging	Disable Show window contents while dragging Visual Effect	o	1)
SUCCESS		Visual Effects - Use drop shaclows for icon labels on th	Disable Use drop shadows for icon labels on the desktop Visual Effect	a	NA
Apply HKLM Setting	gs (27 ite	ms)			
SUCCESS		Background Image	Disable Logen BackgroundImage	1	NA
SUCCESS	a	Background Layout Service - Disable	Disable Background Layout Service	0	NA
SUCCESS	4	CIFS Change Notifications	Disable CIFS Change Notifications	1	NA
SUCCESS		Cortana	Disable Contana	0	NA
SUCCESS	à	Crash Control - Sending alert - Disable	Disable sending alert for the Crish Control	0	NA
SUCCESS	4	Crash Control - Writing event to the system log - Disa	Disable writing event to the system log for the Crash Control	Ó.	1
SUCCESS	1	Creation of Crash Dump - Disable	Removes the creation of a Crash Dump file	0	 Activate Windows
SUCCESS	100	IPs6 - Disable	Disable Pv6	255	NA GD to Sections to echyste Wrapowyc.

9.8 Additional Virtual Machine Settings

Perform the following additional tasks on the virtual machine as required in preparation for configuring its vGPU:

1. Turn Off Windows Firewall for all network types.



9.9 Enabling the NVIDIA vGPU

To enable vGPU support for your virtual machine, you must edit the virtual machine settings.

To enable vGPU support for your VM:

- 1. Power down the VM.
- 2. Click the VM in the inventory window. Right click the VM and select Edit Settings:
| vm vSphere Clie | ent Menu 🗸 C | | | | Cœ |) V Administrator@VSPHERE.LOCAL V (|
|---|--|---|---|---|-------------------|--|
| 🖸 🖸 🗐 | | 1709 ACTIONS
Monitor Configure | • Permissions | Datastores | Networks | |
| ✓ ☐ Datacenter ✓ ☐ SAE Lab ☐ 10.19.203.70 1 0.19.203.71 1 0.19.203.71 | 6 Powered I | Guest OS.
Compatibil
VMware Tr
DNS Name
IP Address
Host: | Microsoft Winde
ty: ESXI 6.7 and latv
iols: Not running, ver
More info
:
es:
10.19.203.76 | ws 10 (64-bit)
er (VM version 1
sion:10304 (Cur | 4)
rent) | CPU VISAGE
O HZ
MEMORY VISAGE
O B
STORAGE USAGE
8.57 GB |
| | Guest OS | | | ~ | Notes | ~ |
| (1) Winte-70 | Popen Remote Console | | | ^ | Edit Notes | |
| | Clone | . 🖸 sa | E Lab | | Custom Attributes | ^ |
| | Fault Tolerance | . 0 | 19.203.76 | | Attribute | Value |
| | VM Policies
Template | . ¥ Vi | I Network
tastore1 | | | |
| | Compatibility | | | | 4.0 | |
| Provide Alle | Move to folder | | | ^ | | No items to display |
| Recent Lasks Ala
Task Name v | Rename
Edit Notes
Tags & Custom Attributes
Add Permission | ~ Initia | or ~ C | Dueued For | ✓ Start Time ↓ | ✓ Completion Time ✓ Server |
| * | Remove from Inventory | _ | | _ | | - 10-0-1 |

The Edit Settings dialog appears:

		ADD NEW DEVICE
CPU	8 ~	0
Memory	8 GB -	
Hard disk T	120 GB ×	
SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network ~	Connect
CD/DVD drive 1	Client;Device.	
USB xHCl controller	USB 3.0	
Video card	Specify custom settings ~	
VMCI device	Device on the virtual machine PCI be virtual machine communication inter	us that provides support for the face
SATA controller 0	AHCI	
Other	Additional Hardware	

3. Click the Add New Device button. Navigation displays a dropdown menu of device types. Select Shared PCI device:

		ADD NEW DEVIC
CPU	<u>8 ~</u>	CD/DVD Drive
Memory	8 <u>GB</u> -	Hard Disk
Hard disk T	06. 08	RDM Disk. Existing Hard Disk
SCSI controller 0	LSI Logic SAS	Network Adapter
Network adapter 1	VM Network ~	USB Controller
CD/DVD drive 1	Client Device 🛛 🗠	NVDIMM NVMe Controller
USB xHCl controller	USB 3.0	Shared PCI Device
Video card	Specify custom settings 🗠	Pici Device
VMCI device	Device on the virtual machine PCI bus Virtual machine communication Interfa	s that provides support for the ace
SATA controller 0	AHCI	
Other	Additional Hardware	

4. Select Shared PCI Device to continue. The new PCI device shows that an NVIDIA GRID[®] vGPU device has been added.

				ADD NEW DEVI
< CPU	8 ~			
Memory	B	GB	~	
Hard disk 1	120		-	
SCSI controller 0	LSI Logic SAS			
Network adapter 1	VM Network ~			Connect
> CD/DVD drive 1	Client Device		~	
USB xHCl controller	USB 3.0			
New PCI device 🛕	NVIDIA GRID VGI	U -	>	
Video card	Specify custom s	etting	15 -	
VMCI device	Device on the virt virtual machine co	ual mi mimui	achine PCI bus tha hication interface	t provides support for the
SATA controller 0	AHCI			
Other	Additional Hardwa	are		

5. Expand the New PCI device, click the GPU Profile dropdown, and select the appropriate configuration. Then click the Reserve all memory button:

		ADD NEW DEVIC
CPU	<u>8</u> ~	0
Memory	32 • GB •	
Hard disk 1	120 GB ~	
SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network ~	🕅 Connect
CD/DVD drive 1	Client Device	
USB xHCl controller	USE 3.0	
New PCI device 🛕	NVIDIA GRID VGPU	
GPU Profile	grid_rtx6000p-12q 🖂	
Reserve all memory	rations are unavailable when PCI/PCIe passthrough ake or restore snapshots of such virtual machines.	devices are present. You cannot
> Video card	Specify custom settings 🐱	
VMCI device		
Device on the virtual machine PCI b	us that provides support for the virtual machine con	nmunication interface
SATA controller 0	AHCI	

6. Click OK to complete the configuration.

9.10 Installing the NVIDIA vGPU Driver: Microsoft Windows

After you create a Microsoft Windows virtual machine on the hypervisor and boot the VM, you must install the NVIDIA vGPU software display driver to fully enable GPU operation.

To install the NVIDIA driver in Microsoft Windows:

1. Start the virtual machine, then connect to it using either VMware Remote Console through the vSphere Web Client or VMware Horizon Client (via Direct Connection).

The first time you boot the VM after you enable a GRID vGPU, it displays a dialog warning requesting that you restart the computer to apply changes. Click Restart Later to continue booting the VM.

CAUTION: Do not reboot the VM if older NVIDIA drivers are installed. Doing so would produce a blue screen.

2. Log in to Windows and open Device Manager. Device Manager opens its window:



The window's "Display adapters" section shows a "Microsoft Basic Display Adapter" with an exclamation point on its icon to indicate a driver problem. This is normal.

3. Locate the NVIDIA driver and double click its Setup icon to launch it.

NVIDIA recommends that the installer be on a share volume that the VM can mount, for quick access.



4. The installer prompts you to specify a directory to hold the driver files:

🤕 NVIE	0IA Graphics Driver (391.81) Package	\times
	Please enter the folder where you want to save the NVIDIA driver files. If the folder does not exist, it will be created for you.	
Extrac	tion path:	
C:\NV	/IDIA\391.81	
	OK Cancel	

5. Click OK to accept the default and continue the install. The installer displays the NVIDIA software license agreement:



6. Click AGREE AND CONTINUE to continue. The installer displays the Installation Options screen:



7. Click the Custom (Advanced) radio button, then click Next. The installer displays the Custom installation options screen:

 System Check License Agreement 	Custom instal Select driver components:	lation optic	ons	
Options	Component	New Version	Current Version	
Install	Graphics Driver	391.81	None	
Finish	VIDIA WMI	2.31.0 149.27	None	
	Perform a clean install	ation		

8. Check the Perform a clean installation checkbox, then click Next. The installer begins installing the driver. When it is done, it displays the "Installer has finished" screen:

System Check	NVIDIA Install	ler has finis	hed	
Options	Component	Version	Status	
🔊 Install	nView	2.31.0 149.27	Installed	
Finish	Graphics Driver	391.81	Installed	
	(i) To complete the instal	llation, restart the com	iputer.	-

9. Click Restart Now to restart the VM and complete the install.

After you restart the VM, the mouse cursor may not track properly using VNC or vSphere console. In that case, use View Client to Direct Connect.

9.11 Installing the NVIDIA vGPU Driver: Linux

After you create a Linux virtual machine on the hypervisor and boot the VM, you must install the NVIDIA vGPU software display driver to fully enable GPU operation.

9.11.1 Installing on Bare Metal

When the physical host is booted before the NVIDIA vGPU software display driver is installed, the VESA Xorg driver starts the X server. If a primary display device is connected to the host, use it to access the desktop. Otherwise, use SSH to log in to the host remotely. If the Nouveau driver for NVIDIA graphics cards is installed, disable it before you install the NVIDIA vGPU driver.

Prerequisites

Installing the NVIDIA vGPU software display driver for Linux requires:

- Compiler toolchain
- Kernel headers

To install the NVIDIA vGPU driver for Linux

1. Copy the NVIDIA vGPU software Linux driver package to the guest VM or physical host where you are installing the driver.

The package has this name or a similar one: NVIDIA-Linux_x86_64-390.75-grid.run.

- 2. Exit the X server and terminate all OpenGL applications.
 - On Red Hat Enterprise Linux and CentOS systems, exit the X server by transitioning to runlevel
 3:

\$ sudo init 3

- On Ubuntu platforms:
 - i. Enter Ctrl+Alt+F1 to switch to a console log-in prompt.
 - ii. Log in and shut down the display manager:

\$ sudo service lightdm stop

3. From a console shell, run the driver installer as the root user:

sudo sh ./ NVIDIA-Linux_x86_64-352.47-grid.run

In some instances, the installer may fail to detect the installed kernel headers and sources. In that case rerun the installer, specifying the kernel source path with the --kernel-source-path option:

sudo sh ./ NVIDIA-Linux_x86_64-352.47-grid.run \backslash

- > -kernel-source-path=/usr/src/kernels/3.10.0-229.11.1.el7.x86_64
- 4. When the installer prompts you, accept the option to update the X configuration file xorg.conf:

NVIDIA Accelerated Graphics Driver for Linux	-x86_64 (352.47)
Would you like to run the nvidia-xconfig utility to a your X configuration file so that the NVIDIA X driven restart X? Any pre-existing X configuration file wi	automatically update r will be used when you ll be backed up.
Yes Mo	
NVIDIA Software Installer for Unix/Linux	www.nvidia.com

- 5. When the install is finished, select OK to close the installer.
- 6. Verify that the NVIDIA vGPU driver is operational.
 - a. Reboot the system and log in.
 - b. Run nvidia-settings:
 - \$ nvidia-settings

The NVIDIA X Server Settings dialog opens, showing that the NVIDIA driver is operational.

	NVIDIA X Server Settings	. в ж
X Server Information		
X Server Display Configuration X Screen 0 X Server XVideo Settings		
OpenGL Settings OpenGL/GLX Information Antialiasing Settings VDPAU Information	System Information Operating System: NVIDIA Driver Version: X Server Information	Linux-x86_64 384,66
PowerMizer DVI-D-0 - (NVIDIA VGX)	Display Name: Server Version Number: Server Vendor String:	localhost.localdomain:0 11.0 The X.Org Foundation
Manage License nvidia-settings Configuration	Server Vendor Version: NV-CONTROL Version: Screens:	1.17.2 (11702000) 1.29 1
1-	- A - Source	Help Quit

9.12 Licensing NVIDIA vGPU Software

NVIDIA vGPU software is a licensed product. It runs with reduced capability until you acquire a license.

The performance of an unlicensed vGPU is restricted as follows:

- Frame rate is capped at 3 frames per second.
- ▶ GPU resource allocations are limited, preventing some applications from running correctly.
- CUDA is disabled on vGPUs that support it.
- For vGPU software releases 6.0 and 6.1 only: Screen resolution is limited to 1280×1024 or less.

Acquiring a license removes these restrictions. A VM that is set up to use a licensed copy of NVIDIA vGPU software can run all versions of DirectX up to and including DirectX12 (and DirectX12 Raytracing on Turing architecture cards), OpenGL, and Vulkan graphics applications.

If licensing is configured, the VM obtains a license from the license server when a vGPU is booted. The VM retains the license until it is shut down. It then releases the license back to the license server. Licensing settings persist across reboots, and need be modified only if the license server address changes or the VM is reconfigured to use GPU passthrough.

For complete information about configuring and using NVIDIA vGPU software licensed features, including vGPU software, see <u>Virtual GPU Client Licensing User Guide</u>.

9.12.1 Licensing NVIDIA vGPU Software on Windows

1. Right click the Windows desktop and select NVIDIA Control Panel from the menu. This opens NVIDIA Control Panel.

Alternatively, open Windows Control Panel and double click the NVIDIA Control Panel icon.

2. In NVIDIA Control Panel, select the Manage License task in the Licensing section of the navigation pane.

NVIDIA Control Panel		
Eile Edit Desktop Help		
00		
Select a Task	Manage License You can enable additional features by applying a loonse. Loonse Editori: Image: State additional features a valid GRID VGPU loonse. Tracess GRID VGPU features, enter loonse server details and apply. Primary Loonse Server:	
	Port Number: Secondary License Server: Port Number:	
	Description: Triskal usage scenarios:	
Contem Information	*	

In this example the Manage License task pane shows that NVIDIA vGPU is currently unlicensed.

If the Licensing section and the Manage License task are not visible in NVIDIA Control Panel, the system has been configured to hide licensing controls. You must modify Windows Registry settings to change this. For information about Registry settings, see <u>Virtual GPU</u> <u>Client Licensing User Guide</u>.

- 3. In the Primary License Server field, enter the address of your primary NVIDIA vGPU software License Server. The address can be a fully qualified domain name such as gridlicensel.example.com, or an IP address such as 10.31.20.45. If you have only one license server, enter its address in this field.
- 4. Leave the Port Number field under Primary License Server unset. The port number defaults to 7070, which is the default port number used by NVIDIA vGPU software License Server.
- 5. In the Secondary License Server field, enter the address of your secondary NVIDIA vGPU software License Server. If you have only one license server, leave this field unset.
- 6. Leave the Port Number field under Secondary License Server unset. Like the primary license server port number, the port defaults to 7070.
- 7. Click Apply to apply the settings. NVIDIA Control Panel requests an appropriate license for the VM's vGPU from the configured license server.
- 8. If the VM successfully obtained a vGPU software license, it now supports full frame rate, resolution, and display output capabilities. The VM is now capable of running the full range of DirectX and OpenGL graphics applications.

If the VM fails to obtain a license, see <u>Virtual GPU Client Licensing User Guide</u> for troubleshooting guidance.

9.12.2 Licensing NVIDIA vGPU Software on Linux

- Start NVIDIA X Server Settings, using the method for launching applications in your Linux distribution. For example, on Ubuntu Desktop, open the Dash, search for NVIDIA X Server Settings, and click the NVIDIA X Server Settings icon. Linux launches NVIDIA X Server Settings.
- 10. Click Manage GRID License. The License Edition section of the NVIDIA X Server Settings window shows that NVIDIA vGPU software is currently unlicensed.
- 11. In the Primary Server field, enter the address of your primary NVIDIA vGPU software License Server. The address can be a fully qualified domain name such as gridlicensel.example.com, or an IP address such as 10.31.20.45. If you have only one license server, enter its address in this field.
- 12. Leave the Port Number field under Primary Server unset. The port number defaults to 7070, which is the default port number used by NVIDIA vGPU software License Server.
- 13. In the Secondary Server field, enter the address of your secondary NVIDIA vGPU software License Server. If you have only one license server, leave this field unset.
- 14. Leave the Port Number field under Secondary Server unset. Like the primary license server port number, the port defaults to 7070.
- 15. Click Apply to apply the settings. NVIDIA X Server Settings requests the appropriate license for the VM's vGPU from the configured license server.
- 16. If the VM successfully obtained a vGPU software license, it now supports full frame rate, resolution, and display output capabilities. The VM is now capable of running the full range of DirectX and OpenGL graphics applications.
- 17. If the VM fails to obtain a license, see <u>Virtual GPU Client Licensing User Guide</u> for troubleshooting guidance.

9.13 Finalizing the Installation

The final phase of NVIDIA vGPU configuration is to connect to the virtual machine and verify settings.

To finalize the installation:

18. Select the virtual machine in the vSphere Web Client window, then select the Summary tab:



19. Note the VM's IP address (circled in the illustration above).

The IP address information is displayed only if the virtual machine has VMware Tools running and has successfully negotiated an IP address from a DHCP server or is using a static address.

20. Start the VMware Horizon Client from the physical desktop to connect. Click New Server to register a new virtual machine connection.

🗐 VMware Horizon Cl	ient
+ New Server	

21. Enter the IP address of the VDI desktop to connect to in the Connection Server field, then click Continue. (You are connecting directly to a desktop, so don't enter the Horizon Connection Broker address at this time.)

VMware Horizon Client	X
vmware Horizon	
Enter the name of the Connectio	n Server
10, 19, 203, 108	

22. Click Connect. VMware Horizon Client displays the Login dialog:

vmware Hori	zon	
Server:	https://10.19.203.108	
User name:	administrator	
Password:	•••••	

- 23. Enter the local username and password (or the domain user and password if the virtual machine is a domain member), then click Login. This will launch the VDI.
- 24. Log in to the virtual machine.
- 25. Open Device Manager on the virtual machine and expand the Display Adapters entry:

-	l.	×

- 26. Confirm that the display adapter is now a vGPU display.
- 27. Right click the desktop and select NVIDIA Control Panel:

MVIDIA Control Panel		- 1 .	n x
File Edit Desktop Help			
G Back - O			
Select a Task	100 C 100		
Bostings Adjust range settings with preview Adjust range settings Adjust range settings Daplay Contage resolution Set of multile displays Learning Learning Adjust video roler settings Adjust video mage settings	NVIDIA CONTROL PANEL (mstain, 301, 301 GRID P40-24Q		NVIDIA.
System Information			

28. Click the System Information link in the bottom left corner of the window. NVIDIA Control Panel opens a System Information dialog:

Detailed information about yo	ur NVIDIA hardware and the syste	m it's running on.	
isplay Components			
System information			
Operating system: Wind	ows 10 Pro N, 64-bit		
DirectX runtime version: 12.0			
Director and the version in the			
Graphics card information			
Items	Details		
GRID P40-24Q	Driver version:	391.81	
	Direct3D API version:	12	
	Direct3D feature level:	12_1	
	CUDA Cores:	3840	
	Graphics clock:	1303 MHz	
	Memory data rate:	7230 MHz	
	Memory interface:	384-bit	
	Memory bandwidth:	347.04 GB/s	
	Total available graphics	28671 MB	¥.
	<		>
		1	About
		1	
			-

- 29. Confirm that the DirectX and graphics card driver versions are correct, then click Close.
- 30. If you plan to use this VM as a gold master image, release the DHCP address before logging out and shutting down. Open a command prompt and enter:

C...> ipconfig /release

31. At this point you lose connectivity to the VM. Use vSphere Web Client to shut down the guest OS:

vm vSpher	re Client I	Menu 🗸 🛛 🔾			С	? Administrato	
	9	🔒 Win10-					
 Ø 10.19.202.100 ✓ Datacente ✓ Ø Datacente ✓ Ø SAE Lai Ø 10.19 Ø 10.19	Actions Wello Power	Summary 1	Monitor Configure Guest OS Compatibility VMware Tools: DNS Name: IP Addresses: Host: IP Nome On	Permissions Datastores Microsoft Windows 10 (64-bit) ESXI 6.7 and later (VM version 14) Rumming, version:10304 (Current) More info wint0,grid.com 10.19.203.76	Networks		CPU USACE 32 MHZ 8 GB STORAGE USAGE 8.68 GB
C. Martin	Guest OS Snapshots Open Remote	Console	Power Off USuspend Reset		Notes Edit Notes		^
Rigrate Cloné - Paut Tolerance - VM Policies -	Shut Down Guest OS	>	Custom Attribut	es	^		
	오 VM Ne	twork	Ainpute	Value			
	Template Compatibility	:	datasto	prel			
	🔗 Edit Settings.		1.000	~	4		 No ltems to display

32. A vGPU enabled virtual machine is now confirmed. The next step is to build and deploy a Horizon vGPU Desktop Pool.

Chapter 10. Creating a Horizon vGPU Pool

A **pool** is a collection of virtual machines that can be controlled, authorized to users, etc. as a group. This chapter describes the following:

- Creating a template from an existing virtual machine
- Creating a Customization Specification
- Provisioning a single vGPU-enabled virtual machine from a template
- Creating Full and Linked Clones Horizon pools
- Enabling User Access to pools

To create a pool, you must first convert an existing virtual machine into a template, which you then can use either to create a single virtual machine or to create virtual machines on demand.

A complete demonstration of these features is beyond the scope of this document; however, converting a virtual machine to a template and then deploying virtual machines from that template is a fundamental operation that can reduce evaluation time.

10.1 Creating a Template

To create a template from an existing virtual machine:

1. In vSphere Web Client, right click a virtual machine and select Clone - > Clone to Template...

vSphere displays the Clone Virtual Machine To Template dialog with the Select a name and folder tab selected:

1 Select a name and folder	Select a name and folder	
2 Select a compute resource	Specify a unique name and target location	
3 Select storage 4 Ready to complete	VM template name: Win10-1709-Temp	
	Select a location for the template.	
	v 🗗 10.19.203.106	
	> 🔝 Datacenter	

- 2. In the VM template name field, enter a name for the template.
- 3. Select either a datacenter or virtual machine folder in which to create the template.

- 4. Click Next to display the Select a compute resource tab.
- 5. Select the host or cluster in which to store the template.
- 6. Click Next to display the Select storage tab.
- 7. Select the storage type and target datastore.
- 8. Click Next to display the Ready to complete tab.

 1 Select a name and folder 2 Select a compute resource 3 Select storage 	Ready to complete Click Finish to start creation.					
4 Ready to complete	Provisioning type	Clone virtual machine to template				
	Source virtual machine	Win10-1709				
	Template name	Win10-1709-Temp				
	Folder	Datacenter				
	Host	10.19.203.76				
	Datastore	datastore1				
	Disk storage	Same format as source				

9. Review the settings, then click Finish to start cloning the virtual machine to a template.

The vSphere Web Client Recent Tasks view displays the progress of the cloning operation.

Recent Tasks	Alat	rms													*
Task Nome	÷	Target	÷	Status	×	Initiator	~	Queued For	×	Start Time 🗸	×	Completion Time ~	<	Server	×
Clone virtual machine		(h Win10-1709		4	0% @	VSPHERE LOCAL\Ad	d	undefined		08/13/2018, 7.52:	37 PM			10.19.203.106	
Initiate guest OS shutdown		🛱 Win10-1709		✓ Completed		VSPHERE LOCALVA	1	2 ms		08/13/2018, 7:51:4	IÓ PM	08/13/2018, 7:51:40 PM		10.19.203.106	

10. When the cloning process is finished, vSphere opens a window that displays the template:

Datacenter Datacenter Datacenter Datacenter Powered Off Compatibility: ESXI 6.7 and later (VM version 14) VMware Tools: Not running, version:10304 (Current) More info DNS Name: IP Addresses: Host: 10.19.203.76 Launch Remote Console Powered 1700	10.19.203.106	Win10-1709 Summary Monitor	ACTIONS ~ Configure	Permissions	Datastores	Networks
E Launch Web Console Host: 10.19.203.76 Launch Remote Console @	Datacenter in reViewCompos F	Powered Off	Guest OS: Compatibility: VMware Tools: DNS Name: IP Addresses.	Microsoft Wind ESXI 6.7 and lat Not running, ve More info	ows 10 (64-bit) ter (VM version 14 rsion:10304 (Curr) ent)
D www-waa	ビー ビー 上 合 Win10-1709	Launch Web Console Launch Rémote Console (Host: B 🚑	10.19.203.76		

10.2 Creating a Customization Specification

Before you can provision a virtual machine from a template you must create a **VM Customization Specification.** This will handle actions such as joining the domain, renaming the machine. To create a VM Customization Specification:

1. From the left-hand pane of the vSphere Client home view, click Policies and Profiles:

Home	Home					
Shortcuts	🗗 10.19.203.106 ×					
📋 Hosts and Clusters						
VMs and Templates	CPU FO 72 C	1 - 6	Memory 210 OF		Storage 700 70	CD for a
Networking	50.73 G	Hz free	218.95	3B free	/33./2	GB free
Content Libraries	468 MHz used	51.2 GHz total	36.95 GB used I	255.89 GB total	190.28 GB used	1 924 GB total
Global Inventory Lists						
Policies and Profiles	>					
vRealize Operations	🗄 VMs		6	Hosts		
Administration						
🔷 Update Manager	5	1	0	1	0	0

vSphere displays the VM Customization Specifications tab:

vm vSphere Client	Manu 🖌 🔍 Search		C	0~	Administrator@VSPHERELOCAL V	٢
Policies and Profiles	VM Customization S	Specifications				
I VM Storage Policies	+ New_) import_ _3 ear.					
Storage Policy Components	Name_County a mean totel dication	 Goest OS 			→ VC	*
						-

2. Click New. vSphere displays the New VM Guest Customization Spec screen:

Name and target OS	Name and target OS	
Registration information	Specify a unique name for the VM	d customization specification and select the OS of the
Computer name	target VM.	
Windows license	VM Customination Coop	
Administrator password	VM customization spec	
Time zone	Name	Winto
Commands to run once		
Network	Description	
Workgroup or domain		
Ready to complete		
	vCenter Server	10.19.203.106 -
	Guest OS	
		device and the
	Target guest OS	O Windows O Linux
		Use custom SysPrep answer file
		Generate a new security identity (SID)

3. For Target guest OS, select Windows.

Check the Generate New Security ID (SID) checkbox.

If your organization currently utilizes an answer file, you can load that file by checking the Use custom SysPrep answer file checkbox.

If your organization does not use this functionality, leave the Use custom SysPrep answer file checkbox cleared. Enter a name for the new specification in the Customization Spec Name field.

Click Next. vSphere displays the Set Registration Information tab:

1 Name and target OS	Registration information	
2 Registration information	Specify registration information for this copy of the guest operating system.	
3 Computer name		
4 Windows license	Owner name	lack Liu
5 Administrator password	of the fight	5500 00
6 Time zone	Owner organization	Technical Marketing
7 Commands to run once	Granter of gamzagon	i connear marketing
B Network		
9 Workgroup or domain		
10 Ready to complete		

4. Enter the VM owner's name in the Name field and the owner's organization's name in the Organization field, then click Next to display the Computer Name tab:

Name and target OS	Computer name Specify a computer name that will identify this virtual machine on a network
3 Computer name	spearly a compared name and miniachery and mitabilities in a network.
4 Windows license	and a second
5 Administrator password	💽 Use the Virtual machine name 🔞
6 Time zone	O Enter a name in the Clone/Deploy wizard.
7 Commands to run once	O Entre a pama
8 Network	O Enter a halfie
9 Workgroup or domain	
10 Ready to complete	
	I Generalé a namé-using the custom application configured Withmen Celler Server

5. Enter a computer name for the VM, then click Next to display the Windows License tab:

1 Name and target OS	Windows license
2 Registration information	Specify the Windows licensing information for this copy of the guest operating system. If
3 Computer name	the virtual machine does not require licensing information, leave these fields blank.
4 Windows license	
5 Administrator password	
6 Time zone	Product key
7 Commands to run once	Disclude server license information (required for customizing a server quest OS)
8 Network	Include server incense intol/instant (redailed for equipment) a server gasse only
9 Workgroup or domain	Server license mode
10 Desmute complete	

6. Enter your Windows product key information or leave this field blank. Then click Next to display the Administrator Password tab:



7. Enter and confirm the administrator password (it is case sensitive) in the Password and Confirm Password fields, then click Next to display the Time Zone tab:



8. Select your time zone from the Time Zone pulldown menu, then click Next to display the Commands to Run Once tab.

1 Name and target OS	Commands to run once	
2 Registration information	Enter the commands to run the first time a user logs on.	
3 Computer name		
4 Windows license	Entel a new commanul	ADD
5 Administrator password		
6 Time zone	MOVENE MOVE BOWHI DELETE	
7 Commands to run once		
8 Network		
9 Workgroup or domain		
10 Ready to complete		

9. Enter any required one-time commands in this tab, then click Next to display the Network tab:

1 Name and target OS 2 Registration information	Network Specify the network settings for the virtual machine.					
4 Windows license 5 Administrator password 6 Time zone 7 Commands to run once 8 Network	Use standard netwo on all network interf Manually select cus	ork setting faces tom settin	is for the guest oper gs	rating syst	em, including enabl	ing DHCP
9 Workgroup or domain 10 Ready to complete	Description	τ	IPv4 Address	τ.	IPv6 Address	Ť
	Edit Delete		Use DHCP		Not used	

- 10. Click the appropriate radio button to either:
 - Use standard network settings: Automatically selects network settings.
 - Use manual network settings: Enter the network description, IPv4 address, and/or IPv6 address in the respective fields.

Click Next to display the Workgroup or Domain tab:

 1 Name and target OS 2 Registration information 	Workgroup or domain How will this virtual machine par	icipate in a network?	
 3 Computer name 4 Windows license 5 Administrator password 	🔿 Wörkgroup	Workiaszue	
 6 Time zone 7 Commands to run once 	💿 Windows Server domain	grid.com	
8 Network	Specify a user account that i	as permission to add a computer to the d	omain
9 Workgroup or domain 10 Ready to complete	Username	administrator	
	Password		
	Confirm password		

11. Select the appropriate radio button to make the VM a member of either a workgroup or a domain. Enter the VM's workgroup or domain information in the appropriate fields Then click Next to display the Ready to complete tab.

 1 Name and target OS 2 Registration information 	Ready to complete Review your settings selections before finishing the wizard.		
3 Computer name			
 5 Administrator password 	Name	Win10	
✔ 6 Time zone	OS type	Windows	
 7 Commands to run once 8 Network 	OS options	Generate new security ID	
9 Workgroup or domain	Registration info	Owner name: Jack Liu Organization: Technical Marketing	
10 Ready to complete	Computer name	Use Virtual Machine name	
	Product key	No product key specified	
	Administrator log in	Log in automatically as Administrator	
	Automatic logons	1	
	Time zone	(GMT+08:00) Beijing, Chongqing, Hong Kong, Urumqi	
	Network type	Standard	
	Windows Server domain	grid.com	
	Username	administrator	

12. Review your settings. If any are incorrect, click Back to correct them. When all of the settings are correct, click Finish to view the new customization specification from the template.



10.3 Provisioning a Single Virtual Machine

To provision a single vGPU-enabled virtual machine from a template:

1. From vSphere Client, right click the template and select New VM from this Template,,, vSphere displays the Deploy From Template window with the Select a name and folder tab selected.

Select a name and folder	Select a name and folde	er	
Select a compute resource	Specify a unique name a	and target location	
Select storage	and a state of the		
Select clone options	Virtual machine name:	Win10-1709-Single	_
5 Ready to complete			
	Select a location for the	virtual machine.	
	∨ 🗗 10.19.203.106		_
	> Datacenter		

2. In the Virtual machine name field, enter a name for the new VM. Then click Next to display the Select a compute resource tab.

- 3. Under Select a location for the virtual machine, select the cluster or host that is to host the VM. Then click Next to display the Select storage tab.
- 4. Select the target storage type and datastore. Then click Next to display the Select clone options tab:

1 Select a name and folder	Select clone options
2 Select a compute resource	Select further clone options
3 Select storage	
4 Select clone options	 Customize the operating system
5 Customize guest OS	Customize this virtual machine's hardware (Experimental)
6 Ready to complete	

Check the Customize the operating system checkbox, then click Next to display the Customize guest OS tab:

 1 Select a name and folder 2 Select a compute resource 	Customize guest OS	you deploy the virtual machine		
 3 Select storage 4 Select clone options 	Operating System: Microsoft Windows 10 (64-bit)			
5 Customize guest OS	Name 🛧	Guest OS	Last Modified	
6 Ready to complete	Win10	Windows	08/13/2018, 8:59:11 PM	
	WinSrv2012	Windows	08/13/2018, 8:40:43 PM	

 Select the template to be used to create the VM. vSphere displays the Ready to complete tab of the Deploy From Template window, which displays the properties of the customization specification used:

Provisioning type	Deploy from tomplate
Provisioning type	Deploy from template
	Deproy from template
Source template	Win10-1709-Temp
Virtual machine name	Win10-1709-Single
Folder	Datacenter
Host	10.19.203.76
Datastore	datastore1
Disk storage	Same format as source
Guest OS customization specification	Win10
	Virtual machine name Folder Host Datastore Disk storage Guest OS customization specification

6. Review the settings. If any of them are incorrect, click the Back button to fix them. If all of them are correct, click Finish to begin creating the virtual machine from the template.

When vSphere finishes creating the VM, the VM becomes visible in the datacenter and on the host that it was cloned to.

7. Add the new VM to a Horizon Desktop Pool, then authorize users and/or groups to use it. These steps are described later in section 10.6.

Horizon can leverage templates to create virtual machines automatically, on demand, to save time and resources. See the *Horizon* documentation for instructions on using this functionality.

The next sections describe how to install a desktop pool and then how to grant entitlements to users and groups to use that pool. You can create desktop pools from a gold master image with either Full Clones or Linked Clones with the help of Horizon Composer. Both use cases are explained in the following sections.

10.4 Creating Full Clone Desktop Pools

1. To create full clone desktop pools, you must have a template of the gold master image. Find the reference VM in the Navigator and right click it. Select Clone > Clone to Template.

vm vSphere Client	Menu 🗸 🔍 Se		C	⑦	ELOCAL V 🙄
C C	Brown Summary Monito Summary Monito Summary Monito Summary Monito Summary Monito Summary Summary	ACTIONS - Configure Permissions Datastori Guest OS Microsoft Windows 10 (64-b Compatibility: ESX 6, 7, and 14er (VM version VM vare Tools Not running, version 10304 (More into DNS Name IP Addresses Host 10.19 203.76	is Networks t) n 14) Current)		CPU USAGE O Hz MEMORY USAGE O B STORAGE USAGE 18.21 GB
Winto-1709 Winto-1709 Winto-1709-Tem	Snapshots Open Remote Console Migrate	*	Notes.		•
	Clone Fault Tolerance	See Clone to Virtual Machine See Clone to Template	Custom Attribute	5	^
	VM Policies Template	B ^D Clone to Template in Library	Attribute	Value	-

Alternatively, you can create a template by using the Template option to convert a VM to a template.

The Clone Virtual Machine To Template wizard walks you through the steps, described in Section 9.1. At the end of the process, click Finish to create the template:

1 Select a name and folder 2 Select a compute resource 3 Select storage	Ready to complete Click Finish to start creation.				
4 Ready to complete	Provisioning type	Clone virtual machine to template			
	Source virtual machine	Win10-1709			
	Template name	Win10-1709-Temp			
	Folder	Datacenter			
	Host	10.19.203.76			
	Datastore	datastore1			
	Disk storage	Same format as source			
	Folder Host Datastore Disk storage	Datacenter 10.19.203.76 datastore1 Same format as source			

2. Create a Customization Specification file to deploy a full clone pool. The New VM Guest Customization Spec wizard walks you through the steps, described in Section 9.1, Creating a Virtual Machine:

vm vSphere Client	Menu 🗸 🔍 Sea	rch		C (⑦∽ Administrator@VSPI	HERE LOCAL ~ 🤅
🗇 Home	Home					
Shortcuts	🗗 10.19.203.106 v					
Hosts and Clusters						
VMs and Templates	CPU		Memory		Storage 700 70	
Vetworking	50.73 0	Hz free	218.95	3B free	/33./2 (B free
Content Libraries	468 MHz used	51.2 GHz total	36.95 GB used I	255.89 GB total	190 28 GB used	924 GB total
Global Inventory Lists						
Policies and Profiles	>					
vRealize Operations	🗗 VMs		6	Hosts		1
C Administration						
🔷 Update Manager	5	1	0	1	0	0

3. Log in to Horizon Administrator:



4. Select Desktop Pools in the Inventory pane, then click Add. Horizon Administrator displays the Type (type of desktop pool) screen:



5. Select Automated Pool, then click Next. Horizon Administrator displays the User Assignment screen:



6. Select Floating, then click Next. Horizon Administrator displays a warning message:



7. Ignore the warning and click OK. Horizon Administrator displays the vCenter Server screen:

Add Desktop Pool			(?
Desktop Pool Definition Type User Assignment VCenter Server Setting	VCenter Server Instant dones View Composer linked dones Full virtual machines		Full Virtual Machine Machines sources will be full virtual machines that are created from a vCenter Server template.
Desktop Vol tetrines Desktop Vol Settings Environment Record Settings Record Storage Dotons Volante Editions Volante Editions Volante Editions Record Storage Dotons Record Stor	vCenter Server 10.19.203.106(administrator@vs phere.local)	View Composer 10.19.203.110	 Supported Features ✓ VMware Blast ✓ PCoIP Storage savings Recompose and refresh Push Image QuidpPrep guest customization ✓ SvPrep guest customization
	Description: None		ClonePrep guest customization

8. Select Full Virtual Machines, then click Next. Horizon Administrator displays the Desktop Pool Identification screen:



Enter a unique ID and a display name for the desktop pool, then click Next. Horizon Administrator displays the Remote Settings and Remote Display Protocol screen:

Desktop Pool Definition	Remote Settings		ĺ
User Assignment	Remote Machine Power	Take no power action V	
vCenter Server	Automatically logoff after	Never	
Setting	disconnect:	Never	
Desktop Pool Identification	Allow users to	No 🔻	
Desktop Pool Settings	reset/restart their		
Storage Optimization	machines:		
vCenter Settings	Allow user to initiate	No • 3	
Advanced Storage Options	different client devices:		
Guest Customization Ready to Complete	Delete machine after	No • 3	
ready to complete	Remote Display Protocol		-
	Default display protocol:	VMware Blast 🗸	
	Allow users to choose protocol:	Yes •	
	3D Renderer:	NVIDIA GRID VGPU Configure	
	Max number of monitors:	2 🔻 ?	
		May require power-cycle of related virtual machines ③	
	Max resolution of any one	1920x1200 🔻 🔇	
	monitor:	May require power-cycle of related virtual machines 💿	
	HTML Access:	Enabled ③	
		Requires installation of HTML Access.	
			ų

9. Set Default display protocol to Blast.

Set Allow users to choose protocol to Yes.

Set 3D Renderer to NVIDIA GRID VGPU. (HTML access is supported in this version if it is desired.)

Desktop Pool Definition	Provisioning Settings	
Туре	Basic	Naming Pattern
User Assignment vCenter Server Setting	 Enable provisioning Stop provisioning on error 	Virtual machines will be named according to the specified naming pattern.
Desktop Pool Identification Desktop Pool Settings Provisioning Settings	Virtual Machine Naming O Specify names manually O second s	By default, View Manager appends a unique number to the specified pattern to provide a unique name for
Storage Optimization vCenter Settings Advanced Storage Options Guest Customization Ready to Complete	Start machines in maintenance mode Unassigned machines kept powered on: Use a naming pattern	each virtual machine. To place this unique number elsewhere in the pattern, use '{n}'. (For example: vm-{n}-sales.).
	Naming Pattern: VGPU-{n}-Full Desktop Pool Sizing 6 Max number of machines: 6 Number of spare (powered on) machines: 1	The unique number can also be made a fixed length. (For example: vm- {n:fixed=3}-sales). See the help for more
	Provisioning Timing	options.
	 Provision machines on demand 	
	Min number of machines: 1	
	Provision all machines up-front	
	Virtual Device	
	 Add a Trusted Platform Module (vTPM) device to the VMs 	

Click Next. Horizon Administrator displays the Provisioning Settings screen:

10. In the Select a naming pattern field, enter a naming pattern to help differentiate the VMs in this pool from those in other pools.

Set Desktop Pools Sizing and Provisioning Timing to values that make sense for your infrastructure.

Click Next. Horizon Administrator displays the Storage Policy Management screen:

Deciden Real Definition	Storage Optimization	
Desktop Pool Definition Type User Assignment VCenter Server Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings Storage Optimization VCenter Settings Advanced Strrage Optimis Clust Clustomeanini	Storage Optimization Storage Policy Management Use VMware Virtual SAM Do not use VMware Virtual SAN Virtual SAN is not available because no Virtual SAN datastores are configured.	Storage Optimization Storage can be optimized by storing different kinds of dat separately.
Joney Joney Kone		

11. If a virtual SAN is configured, select the appropriate storage policy. If no virtual SAN is configured, both options are disabled so the screen allows no action.

Desktop Pool Definition	vCenter Settings		
Type User Assignment	Virtual Machine Template	a Click Browson	Prowee
Setting	Templater.	CORCK BIDWSEN.2	Browse
Desktop Pool Identification	Virtual Machine Location		
Desktop Pool Settings	VM folder location:	<click browse=""></click>	Влачеве
Provisioning Settings			
vCenter Settings	Resource Settings		
Advanceri Storage Options	Host or duster:	<click browse=""></click>	Bravies
Guest Clistomization Ready to Complete	Resource pool:	<click browse=""></click>	Browsen
	Datastores:	Click Browse to select	REAWAR
			· · · · · · · · · · · · · · · · · · ·

Click Next. Horizon Administrator displays the vCenter Settings screen:

12. Click the Virtual Machine Template > Browse button to display the Select Template dialog:

esktop	Pool Definition	vCenter Settings			
Jser As	Select template	filletion Blacklass T			
Centei etting Desktor	Select a template supported OS car	from which to deploy be selected.	virtual machines for this desk	top pool. Only templates with a	
esktor rovisio	Show all temp	ates 🧃			
torage Centei	Filter 👻		Find Clear	ā	8
invenci		Template		Path	

13. Select the template created earlier for the gold master image, then click OK to close the dialog:

14. Click the Virtual Machine Location > Browse button to display the VM Folder Location dialog:

	· ··· VCenter Settings	
Type User Assignmer	VM Folder Location	
vCenter Server Setting	Select the folder to store the VM	E
Desktop Pool Id Desktop Pool Se Provisioning So	Show all folders	æ)
Storage Optimiz	V 🛅 Datacenter	
vCenter Setting	FC	
Industry to Lower		
		OK Cancel
		< Back The Cancel

- 15. Select a folder to store the VMs, then click OK to close the dialog:
- 16. Click the Host or Cluster > Browse button to display the Host or Cluster dialog:

Desktop Pool Definition	vCenter Settings	
Туре	Minkund Mankline Tennelake	
User Assignment	Host or Cluster	
vCenter Server Setting Desktop Pool Identification	Select a host or a cluster on which to run the virtual machines created for this desktop pool.	Browse
Desktop Pool Settings Provisioning Settings	2	Browse
vCenter Settings	T Datacenter	
Inchainces Store on Onthese	TM Lab	Browse
and fillstarrigstore		
man to Complete		BMD-SE_
		Brown St.
	OK Consel	
	OK Cancel	

17. Select a Host or Cluster, then click OK to close the dialog:

18. Click the Resource pool > Browse button to display the Resource Pool dialog:

Desktop Pool Definition	vCen	iter Settings		
Туре	Virty	-1 Marchiter - Translade	1	
User Assignment		Resource Pool	-	Browse
Setting		Select a resource pool to use for this desktop pool.	ente 10	Diomocili
Desktop Pool Identification	Virtu			
Desktop Pool Settings	18	100 A		Browse
Storage Optimization	Bare	TM Lab		
vCenter Settings	RESC			100000
advanced Rollage Orinens				Browse
month the College			sources	Browse
	- 27			Browse
	1			
		OK Cancel		
	1		5	

- 19. Select a Resource Pool, then click OK to close the dialog:
- 20. Click the Datastores > Browse button to display the Select Datastores dialog:

sktop Po	ol Definition	vCent	Center Settings										
ype V Iser Assignment Center Server		Virtua	Machine Templat Template:	te /Datacen	ter/vm/Wia10+170	si7emp	Browse						
ti Sele	ct Datastores												
es Sele o Sele ce clust	ct the Datastore ct the datastores er can be selecte	type: In to use for d.	dividual Datastore this desktop pool.	• Only datasto	pres that can be u	sed by the	selected ho	ost or					
	Data	rtoro	Datasta	ro Chustor	Canacity (GB)	Eroo (GP)	ES Tuno	Drive Turn					
	datastore1	1			924.00	733.58	VMFS6	SSD					
Free	e space selected:		733.58 (A mini	mum of 768.0	0 GB is recommer	ided for net	v virtual ma	achines)					
						-	ОК	Cancel					

21. Select a datastore from the Desktop Pool, then click OK to close the dialog. Horizon Administrator displays the vCenter Settings screen:

Desktop Pool Definition	vCenter Settings									
Type User Assignment VCenter Server Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings	Virtual Machine Template Template: //Datacenter/vni/Win10-1709-Temp Browse Virtual Machine Location VM folder location: //Datacenter/vm/FC Browse									
Storage Optimization	Resource Settings									
vCenter Settings wrivanced Storage Options	3 Host or cluster:	/Datacenter/host/TM Lab	Browse							
Suest Catronization Really to Stimplette	_ Resource pool:	/Datacenter/host/TM Lab/Flesources	Browse							
	5 Datastores:	1 selected	Browse							

22. Review the settings you have chosen. If any are incorrect, click Back to correct them. When all of the settings are correct, click Next to continue. Horizon Administrator displays Advanced Storage Options screen:

Deskton Pool Definition	Advanced Storage Options		
Type User Assignment vCenter Server Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings Storage Octimization	Based on your resource selection, recommended. Options that are n- hardware are disabled. ✓ Use View Storage Accelerator Regenerate storage accelerato after:	the following features are ot supported by the selected rr 7 Days	View Storage Accelerator vSphere 5.x hosts can be configured to improve performance by caching certain desktop pool data. Enable this option to use View Storage Accelerator fo this pool. View Storage Accelerator is most useful fit
vCenter Settings Advanced Storage Options Guest Customization Ready to Complete	Blackout Times Storage accelerator regeneration do not occur during blackout times applies to both operations. Add Edit Remove	shared disks that are read frequently, such as View Composer OS disks.	
	Day 1	Virtual Machine ¥	
		_	

23. Check the Use Horizon Storage Accelerator checkbox if it is available.

Enter blackout times for non-refresh of Horizon Storage Accelerator cache to minimize impact on production users, then click Next to continue. Horizon Administrator displays the Guest Customization screen:

Desktop Pool Definition	Guest Customiz	ation							
Type User Assignment VCenter Server Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings Storage Optimization VCenter Settings	 None - Customization will be done manually Do not power on virtual machines after delation Use this customization specification: Allow reuse of pre-existing computer accounts (2) 								
Advanced Storage Options	Name	Guest OS	Description						
Guest Customization	Win10	Windows							
			e Bode - Next	Cancel					

24. To simplify deployment, click Use this customization specification, then click Next to display the Ready to Complete dialog:

Desktop Pool Definition	Ready to Complete		
Type User Assignment		Entitle users after this wizard finishes	
vCenter Server	Type:	Automated	L
Setting	User assignment:	Floating assignment	
Desktop Pool Identification	vCenter Server:	10.19.203.106(administrator@vsphere.local)	
Desktop Pool Settings	Use View Composer:	No	
Provisioning Settings	Unique ID:	FullClonevGPU	
Storage Optimization	Description:		
vCenter Settings	Display name:	FullClonevGPU	
Advanced Storage Options	Access Group:	1	
Guest Customization	Desktop pool state:	Enabled	
Ready to Complete	Remote Machine Power Policy:	Take no power action	
	Automatic logoff after disconnect:	Never	
	Connection Server restrictions:	None	
	Category Folder:	None	
	Allow users to reset/restart their machine:	No	
	Allow user to initiate separate sessions from different client devices:	No	
	Delete machine after logoff:	No	
	Default display protocol:	VMware Blast	
	Allow users to choose protocol:	Yes	
	3D Renderer:	NVIDIA GRID VGPU	

25. Review your selections. If any are incorrect, click Back to correct them. When your selections are all correct, click Finish to deploy the Desktop Pool. Horizon Administrator displays the Desktop Pools window, which now shows the pool you have defined:

Lipdanid M/14/2016 1150 AM 🧕	Desitop Poo	Desition Poola											
Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0 Events 0 & 0 System Health 0 & 0	Add	Add • Access Group • More Commands											
	Filter •			Find	Clear	Access Group: All	1.						
2 2 2 2	ID	Display Na	Туре	Source	User Assi	vCenter Server	Entitled	Enabled	App Shortcuts	Sessions			
Inventory	G FullClo	PuliClonevGPI	Automated Di	vCenter	Floating	3,0,19,203,106	0	4		0			
Dashbard Suers and Groups Catalog Deskop hols Thomps Resources Machines Parinter Disks Namines Parinter													

26. Look Click the Status button to display the pools' status:

VMware Horizon 7 Adm	inistrator					Hanzon Console	About	I Holp	Logout	(administrator)
Undervid IV14/2016 1/39 AM 🔮		OPU								
Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0 Events 0 System Health 5 1 1 0	Summary	Invent	ory Sess	ons Entit	lements Ev	ents Policies				
	Madfinker Th	nApps	at i ma Na	nne_ Que	ana	• More Com	ands			
Inventory	-									1000
Dashboard	Filter -			Find	Clear					9 9
SUsers and Groups	Machine D	NS Name	User	Host	Agent Ver	D	tastore			Status
▼ Catalog	vGPU-2-Full			10.19.203.76	Unknown	da	tastore1		Custom	izing
LE Desktop Pools	vGPU-3-Full			10,19,203,76	Unknown	da	tastore1		Custom	izing
ThinAppr	VGPU-1-Full VG	pie 1 full g	vgpu-1-lu	10.19.203.76	7.5.1	da	tastore1		Connec	ted
Resources Farms Machines Persistent Disks Monitoring Policies										
► View Configuration										

The Status column, near the right edge of the window, should say that the status of the pool you defined is "Connected." This means that the desktops in the pool are ready for use.

10.5 Creating Linked Clone Desktop Pools

Creating a linked pool of VDI desktops is very similar to creating a full clone pool. A linked pool leverages the Horizon Composer to deploy multiple desktops from one gold master image. Linked clones consume less disk space than full clones, and are easier to manage, upgrade, and deploy with little impact on the end user.

As for a clone pool, you begin by selecting a VM as gold master image. Instead of using a template of the VM, though, you take a snapshot of it.

To create a linked clone desktop pool:

1. Start vSphere Web Client:

vm VSphere Client	Menu 🗸 🔍 Search	i		C 0	Administrator@VSPHER	ELOCAL - (
	2 🗗 Win10-1709	ACTIONS ~					
10.19.203.106	Summary Monitor	Configure Permissions D	atastores	Networks			
> Datacenter > DFC > DFC		Guest OS. Microsoft Windows Compatibility ESXi 6.7 and later (V VMware Tools: Not running, version	10 (64-bit) VM version 14 110304 (Curr	1) (ent)			
> VMwareViewComp	Actions - Winito-1709	More info				O B	
	Power Guest OS	Addresses: 2st: 10.19.203.76			8	STORAGE USAGE 18.21 GB	
Eh Winto 1709	Snapsnots	To Take Snapshot					
Winto-1709-Temp	A Migrate	Revert to Latest Snapshot	~	Notes		^	
WinSrv2012	Clone	· Conrolante	^	Edit Notes			
	Fault Tolerance	Delete All Snapshots		Custom Attributes		~	
	VM Policies	10 19 203 76	Attribute		Value		
	Template	VM Network					

2. Right click the gold master image VM.

Select Snapshots > Take Snapshot to open the Take Snapshot dialog:

Take Snapshot	Win10-1709	×
Name	VM Snapshot 8/14/2018, 3:24:19 AM	-
Description	Linked Clone	
_ Engottont the Witherum		le
_ Chiesce guest file og sto	em (Needs VMinore Tools installed)	OK

- 3. Name the snapshot to conform to your VM naming standards. Give the snapshot a meaningful description, then click OK to create the snapshot.
- 4. Start VMware Horizon Administrator:

VMware Horizon 7 Adn	ninistrato	r.				Hon	zon Console	I Ab	out (Help	Logou	e (administ	trator)
Updared #/)A/DDTs 1:55 AH Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts Events 0 0 ± 0 System Health E 2 ≤	Desidop Pro)	1 (200	Find (itlements 🔻	Status Group: All	Access	• Group	More Comm	ands	4
3 1 1 0	ID	Display	Type	Source	User Assi	vCenter Server	Entitled	Enabled	App Shortcuts	5	essions	
Inventory	FullCl	PullClonev	Automater	vCenter	Floating	10,19,203.106	1			1		
Dashboard Users and Groups Catalog Desktop Pools Application Reds												
Appleation Polis ThisAppl Resources Farms												
Machines Persistent Disks Monitoring Polities												
► View Configuration												
5. Select Desktop Pools in the Inventory pane, then click the Add button. Horizon Administrator starts the Desktop Pool wizard:



6. Select Automated Desktop Pool, then click Next. The wizard displays the User assignment screen:



7. Click Floating, then click Next. The wizard displays the vCenter Server screen:



8. Select Horizon Composer linked clones. Verify the vSphere Server and Horizon Composer are correct, then click Next. The wizard displays the Desktop Pool Identification screen:



9. Enter a unique ID and a display name for the linked pool, then click Next. The wizard displays the Desktop Pool Settings screen:

Add Desktop Pool - LinkedClor	18YGPD		~
Desktop Pool Definition	Desktop Pool Settings		
Туре	General		
VSer Assignment vCenter Server	State:	Enabled •	
Setting Desktop Pool Identification	Connection Server restrictions:	None Browse	
Desktop Pool Settings	Category Folder:	None Browse	
Phresoning School	Remote Settings		
Monable Galactics	Remote Machine Power Policy:	Take no power action	
Advanced Sternar Delicor	Automatically logoff after disconnect:	Never +	
to adv to comatem.	Allow users to reset/restart their machines:	No. V	
	Allow user to initiate separate sessions from different client devices:	No (* 3)	
	Delete or refresh machine on logoff:	Never +	
	Remote Display Protocol		
	Default display protocol:	VMware Blast 🔹	
	Allow users to choose protocol:	Yes -	
	3D Renderer:	Disabled I . andoure D	
	Max number of monitors:	2 10	

10. Set Remote Display Protocol to Blast.

Set Allow users to choose protocol to Yes.

Set 3D Renderer to NVIDIA GRID VGPU. (In this version, HTML Access is fully supported and can be set to Enabled.)

Click Next. The wizard displays the Provisioning Settings screen:

Type						
	Basic			Naming Pattern		
User Assignment vCenter Server Setting	 Enable provisioning Stop provisioning on error 			Virtual machines will be named according to the specified naming pattern.		
Desktop Pool Identification Desktop Pool Settings Provisioning Settings	Virtual Hochine Naming Specify names manually: Start machines in maintenance mode Uses a name pattern Name Pattern: VGPU-(n)-4 Desktop Pool Sizing Max number of machines: Number of spare (powered on) machines: Mumber of spare (powered on)	nked		by distate, time damager appendia any exercised automatic to the exercised automatic provide a unique pame for earth virtual machine. To place the unique number disenvirus in the pattern, use' (7), (for example: vm-(n)-estars.). The strengte number can be able to make a fixed branchi, (for asample: on- (n/fixed-3)-asiles). Says the help for more naming pattern writine potions.		
	Provisioning Timing					
	 Provision machines on demand 					
	Min number of machines:					
	 Provision all machines up-frond 					

11. Configure the provisioning settings to conform to your infrastructure and testing needs, then click Next. The wizard displays the Horizon Composer Disks screen:

Desktop Pool Definition View Composer Disks Visposable File Redirection Disposable File Redirection Visposable File Redirection Redirect disposable File Redirection Desktop Fool Statings Provisioning Settings Mile (minimum 512 MB) Drive letter: Autor Dive letter: Autor Dive letter: Autor Dive letter: Autor Dive letter: Autor	3
Setting Desktop Providenting Desktop Providenting Providenting Settings View Composer Diskt	Disposable File Redirectio
	Use thus optime to realised disposable free to a nor- desk that will be desk that will be desk that automotio automo

12. For simplicity, select Do not redirect disposable files, then click Next. The wizard displays the Storage Optimization screen:

Type Storage Policy Hanagement Storage Policy Hanagement Storage Policy Hanagement Victore Surgers Storage Policy Hanagement Storage Policy Hanagement Storage Policy Hanagement Storage Didentification Storage Policy Hanagement Storage Policy Hanagement Storage Policy Hanagement Points on Storage Policy Hanagement Munda Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Dotting End Storage Control of the Storage Policy Hanagement Munda Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Dotting End Storage Control of the Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Control of the Storage Policy Hanagement Storage Dotting End Storage Control of the Storage Policy Hanagement Anagement Anagement Policy Hanagement Policy Han	Desktop Pool Definition	Storage Optimization	and the second s
	Type User Ausgrenent. Ucentre Server Setting Desktop Pool Jentification Desktop Pool Jentification Desktop Pool Jentification Desktop Pool Jentification Desktop Pool Jentification Userverse Desktop View Composer Disks Storage Diskstop View Composer Disks Storage Diskstop View Composer Disks Storage Diskstop View Composer Disks Storage Diskstop View Composer Diskstop	Storage Optimization Storage Policy Hanagement Storage Policy Hanagement Storage Policy Hanagement Storage Policy Hanagement Storagement Stora	Storage Optimization Storage can be optimized by suparately. Applica diske Applica diske

13. No changes are needed in this window. Click Next. The wizard displays the vCenter Settings screen:

Pyser Assert Asserters Settings Parent VM: Desktop Fool Identification Desktop Fool Settings Provisioning Settings Yeary Composer Disks Storage Optimization Image: Control Interview		Desktop Pool Definition		
Variante Sarbar Station Station Station Station Station Desktop Pois Estings Provisioning Settings Verk Compose Disks Storage Optimization Vertified Stations Storage Optimization Storage Optimization Storage Optimization Vertified Settings Network Distancessory Anther Distancessory Result Distancessory Result Distancessory Optimization Mediate Instaling Click Browsell Storage Optimization Storage Optimization Vertified Settings Advances Storage Optimization Click Browsell Storage Optimization Desktop Pois Distance Feak of Click Browsell Storage Optimization Optimization Click Browsell Storage Optimization Distance Dool Click Browsell Storage Optimization	Default Image	Contraction of the	Default Image	Type User Assignment
Dasktop Pool Settings Provisioning Sattings Verw Composer Disks Storage Optimization Vocanter Sattings Virtual Machine Location Verw Composer Disks Storage Optimization Vocanter Sattings Virtual Machine Location Verw Composer Disks Storage Optimization Vocanter Sattings Virtual Machine Location Verw Composer Disks Storage Optimization Verw Verw Verw Verw Verw Verw Verw Verw	Simplifier CERTERIANS	xCfol.IItawaaa	Singshat	Setting Desktop Pool Identification
View Concoper Disks VM foldar Insultimit CCid:0: 00 vpau	/irtual Machine Location		Virtual Machine Location	Desktop Pool Settings Provisioning Settings
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Datasdoreu Cikit Bruwne by adart Brymne	Rémutice pool Chick Browsen>	-Click @rowne	, Reimunni pool:	fearly to complete
	7 Distundores. Cida browne to select Browne -	chile throwne by instruct	balandores.	

14. Click the Parent VM > Browse button to display the Select Parent VM dialog:

top Pool Definition	vCerker Settings			
in is Assignment	Default Image	_		
Select Parent VM				1
Select the virtual mach	nine to be used as the parent VM fo	r this deskto	ap pool	al.
Show all parent VM	s 🗈 Filter 🕶		Find Clear	8
Name		Path		- 10
Win10-1709	/Dacaeunter/vm/Wm10-1709			
				1.04
	·			_
			OK	Cancel
		_		
			< Back	

- 15. Select the gold master image VM. You can use the Filter option to condense the display if there are too many VMs to search easily. Click OK to close the dialog.
- 16. Click the Snapshot > Browse button to display the Select Default Image dialog:

Select default image			
Parent VM: /Datacente Snapshot: Show all images 2 Snapshot Details	r/vm/Win10-1709		ş
Snapshot	Time created	Description	Path
VM Snapshot 8%252f4	8/4/2018 8:44:30 PM	dean	/VM Snapshot 8%252f4%252f2018
			OK Cancel

17. Select a snapshot to provide the default image, then click OK to close the dialog.

18. Click the VM Folder > Browse button to display the VM folder location dialog:

/M Folder Location	
Select the folder to store the VM	
Show all folders	2
Datacenter	
T FC	
IC IC	
LC	

- 19. Navigate to VM Folder location and select a folder, then click OK to close the dialog.
- 20. Click Select a Host or Cluster > Browse to open the Host or Cluster dialog:



21. Navigate to Host or Cluster and select a host or cluster, then click OK to close the dialog.

22. Click Resource pool > Browse to open the Resource Pool dialog:



- 23. Navigate to and select a Resource Pool, then click OK to close the dialog.
- 24. Click Datastore > Browse to open the Select Linked Close Datastores dialog:



- 25. Select a datastore for the linked clone pool, then click OK to close the dialog.
- 26. Click Next to leave the vCenter Settings screen. The wizard displays the Add Desktop Pool screen:



27. To improve performance and efficiency, check the Horizon Storage Accelerator checkbox and click the Reclaim VM disk space radio button if those controls are enabled. Then click Next. The wizard displays the Guest Customization screen:

Desktop Pool Definition	Guest Customization		
Type User Assignment vCenter Server	Domain:	grid.com(Administrator) -	
Setting Deaktor Pool Identification Deaktor Pool Identification Deaktor Pool Identification Provisioning Settings Novage Optimization vecnets Settings Advanced Storage Options Iodent CuteMinization Provision of comment	AD container: Allow reuse of pre-existing Use QuickPrep Power-off script name: Power-off script paramete Post-synchronization scrip Post-synchronization scrip	7) Example: p1 p2 p3 (p) Example: p1 p2 p3	
	yesta n 2005		

28. Click the Use QuickPrep radio button. (QuickPrep is a VMware system tool executed by Horizon Composer during a linked-clone desktop deployment. QuickPrep personalizes each desktop created from the Master Image.)

Click Next. The wizard displays the Ready to Complete screen, which shows the settings you have entered for the new linked pool:

Desktop Pool Definition	Ready to Complete						
Type		Entitle users after this wizard finishes					
User Assignment							
vCenter Server	Type:	Automated					
Setting	User assignment:	Floating assignment					
Desktop Pool Identification	vCenter Server:	10.19.203.106(administrator@vsphere.local)					
Desktop Pool Settings	Use View Composer:	Yes					
Provisioning Settings	Unique ID:	LinkedClonevGPU					
View Composer Disks	Description:						
Storage Optimization vCenter Settings Advanced Storage Options	Display name:	LinkedClonevGPU					
vCenter Settings	Access Group:	1					
Advanced Storage Options	Desktop pool state:	Enabled					
Ready to Complete	Remote Machine Power Policy:	Take no power action					
	Automatic logoff after disconnect:	Never					
	Connection Server restrictions:	None					
	Category Folder:	None					
	Allow users to reset/restart their machine:	No					
	Allow user to initiate separate sessions from different client devices:	No					
	Delete or refresh machine on logolf:	Never					
	Default display protocol:	VMware Blast					
	Allow users to choose protocol:	Yes					

29. Review the settings. If any are incorrect, click Back to correct them. When all of them are correct, click Finish. The wizard creates the linked pool and displays the Desktop Pools window, which displays all of the desktop pools that have been defined:

altimate d'have alle alter a	Desidop +0	ore									
Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0	Add+++	Edit	Clone	Delete.	🛛 🕶 En	titlements] - s	itatus	+ Access	Group	More Commands	
System Health	Filter •	1	_		Find	lear Access 0	aroup: All	1	•		4 2
	ID .	Display	Туре	Source	User Assi	vCenter Server	Entitled	Enabled	App Shortcuts	Sessions	
nventory	D FullCl	FuliCionev	Automater	VCaritan	Finabrid	10.19.203.105	1	*		1	
Catalog	Linke	LinkedClo	Automater	vCenter (I	Floating	10,19.203.105	0	*		0	

- 30. Monitor linked pool creation status. Refresh the window by clicking the recycle icon at the top of the left-hand pane.
- 31. Click Machines in the left-hand pane, under the heading "Inventory," then select the Inventory tab, which displays the status of the virtual machines that have been defined:

Mware Horizon / Aon	mustrator					Herizen Cons	ole At	xout Helo	Logout (ad	menistrat
Updame #/14/2018 4,76 AM	E LC									
Sessions 0 Droblem Conter VMs 0	Summan	Inventory	Sessions	Entitlen	ients Tasks	Events	Policies			
Problem RDS Hosts 0 Events 0 0 4 0 System Health 1 0	Mintraine 1	fachimes (View C	Composer D	stinis) Thur	Apps					
Inventory	Tool of Day	teeve weeev			· · · · · · · · · · · · ·	Lomposer	• More C	.ommands		
Dashboard	Filter +			Find	Clear					
Subers and Groups	Machine.	DNS Name	User	Host	Agent Version	Datastore		Task	Stat	4
Catalog	VGPU-3-LC				Moknown		None		Provisioning	
UII DesAtop Pools	VGPU-1-LC				Unknown		None		Provisioning	
P ThinApps	VGPU-2-LC				Unkniown		None		Provisioning	
Resources										
Farms										
Machines										
Persistent Disks										
and the strength of the state										
Monitoring										

32. When the Status column shows that all VMs are Connected, the VDI desktops are ready.

At this point the desktop VMs appear in vSphere Web Client:

vm vSphere Client			C @~	Administrator@VSPHERE	
© 10 19 203 106 ♥ ① 10 19 203 106 ♥ ① 10 Latzenter ♥ ① TM Lab □ 10 19 203 76 □ 10	VGPU-1-Full Summary Monitor Monitor Powend On Launch Web Console Launch Remote Console	ACTIONS V Configure Permissions Datastores Guest OS Microsoft Windows 10 (64-bit) Compatibility: ESX 6.2 and later (VM version 1 VM verse Tools: Running, version 10304 (Current More Info DNS Name: VGPU-1-Full grid com IP Addresses 10 19 203.76 Soft Compatibility: Soft Company (Company (Compa	Networks 4) 0		CPU USAGE 64 MHz MEMORY USAGE 8 GB STORAGE USAGE 15.08 GB
vGPU-1-Linked vGPU-2-Full	VM Hardware	~	Notes		~
VGPU-3-Full	Related Objects	^	Custom Attributes		~
VGPU-5-Full	Cluster	TM Lab	Attribute	Value	
	Host	10.19.203.76			*
世 Win10-1709	Networks	VM Network			
	Storage	datastore1	1		÷ 7

10.6 Enabling User Access to Desktop Pools

To entitle users to access VMs in a desktop pool:

1. Start or return to VMware Horizon Administrator and click Desktop Pools in the left-hand pane:

Sessions 0 Problem RDS Hosts 0 System Health 0 0 0 Filter + Find Burnove onfiltement yap: All + Access Group + More Commands Filter + Find Burnove onfiltement yap: All + 4 Dib Display Type Source User Ass vCenter Server Lintbled Linabled Apo Shortcuts Sessions System Health 0 0 Display Type Source User Ass vCenter Server Lintbled Linabled Apo Shortcuts Sessions Filter + Find Burnove onfiltement yap: All + 4 Dib Display Type Source User Ass vCenter Server Lintbled Linabled Apo Shortcuts Sessions 0 0 Catalog 0 Catalog 0 Catalog 0 Catalog 10.19.203.106 0 Catalog 0 Catalog 10.19.203.106 0 Catalog 10.19.203.106 0 Filter + Find Burnove onfiltement yap: All + 4 Catalog 10.19.203.106 0 Catalog 10.1	Wpdawid 8/14/2016 1/29 844 🖉	Desktop Po	sloc										
Events	Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0	Add	Edit	Clone	Delete	h 💌 En	ttlements	Status	★ Access	Group 👻	More Co	mmands	
Important Type Source User Assime Vicener Server Latible Labeled App Shotcuts Sessions	System Health 5 1 1 0	Filter +				Find Rb	mave entitlement	pup: All	L U	•			3
Inventory Image: FullClone viation and vicence floating 10.19.203.106 1 Image: FullClone viation and floating 0 0 0 0 0 Image: FullClone viation floating Image: FullClone viation floating 10.19.203.106 0 Image: FullClone viation floating Image: FullClone viating Image: FullClone viating		ID	Display	Type	Source	User Assi	vCenter Server	Entitled	Enabled	App Shortcuts		Sessions	
Oscillational Outroscillation Outroscillation Outroscillatio Outroscillation	Inventory	FullCl	FullClonev	Automater	vCenter	floating	10.19.203.106	1	*		4		
	Destroord Suser and Groups Catalog DestroorRoots Thindpps Resources Machines Persiteen Disks Monitoring Policies View Canfiguration	Ng Urite	LINKOLJO	Automater	vCenter 1		10.19.403.106						

2. Click the Entitlements button, then select Add entitlement from the resulting dropdown menu. VHA opens the Add Entitlements dialog:

Add Entitlements		
Add new users and grou	ps who can use the selec	ted pool(s).
Add		
Name	Domains	Email
		OK Cancel

Name/User name:	Contains + Contains +			
Name	User Name	Email	Description	In Földer

3. Click the Add button. VHA displays the Find User or Group dialog:

4. Check the Users checkbox or the Groups checkbox (or both) to display the defined users or groups (or both),

Enter a string in the Name/Username field or the Description field (or both) to limit the display to users and/or groups whose name or description (or both) match that string.

By default, "matching the string" means "containing the string." Possible matching criteria are "Contains," "Begins with," etc. You can change the criteria for a match on either field by selecting a different entry in the dropdown between the field's label and the field's matching string.

5. When the Find User or Group contains the exact set of users and/or groups that you want to entitle, click OK to entitle them and close the dialog.

Chapter 11. VMware Horizon Client

Before connecting to a virtual desktop over a Blast/PCoIP connection, VMware Horizon Client must be installed on a desktop or a device from which the virtual desktop will be accessed.

11.1 Installing VMware Horizon Client

To install VMware Horizon Client:

1. Log into the physical device, then open an internet browser. Navigate to the URL of the Horizon Connection Server installed earlier in this section. Click Install VMware Horizon Client:

	A.			
	VMware You can connect applications by usir Client of tho The Vilware Horiz	to your desktop and gig the Vilware Horizon gig the Zilware ton Client offers better		
	Install VMware Horizon Client	Movare Horizon HTML Access Cosh real and the server and prove set which choses	2	
	To see the full list of VMwa For help with VMwa	are Horizon Clients, click here are Horizon, click here.		
A STREET OF THE OWNER				

2. The browser opens the Download VMware Horizon Clients page:

/m ware ⁻	O US Login 3	Training Co	ommunity Store L1-877-485-9273
VANAME COULD RODUCTS SUPPORT SUPPORT SOUTTONS SOUTTONS SECONDA SECONDA	Home / VMusere Holtzon Clients: Download VMware Horizon Clients for Windows, Mac, 105, Linux, and Android ellow you to connect Select Versie: Wyour Memore Horizon visual desktop from your device of choice giving you on the go access from any location. Bate Mare Product Download: Mare Sologia Connect Clients for Your Sologia Content Horizon	Pro Vie Pro Do Hoi Hoi	oduct Resources w My Download History wluct Info cumeration ration Adolec Client Privacy ration Adolec Client Privacy ratio Community
	Product	Release Date	
**	VMware Horizon Client for Windows		
PARTNER PROGRAMS	VMware Horizon Client for Windows	2018-05-29	Go to Downloads
	VMware Horizon Client for Windows 10 UWP		
COMPANY	VMware Horizon Client for Windows 10 UWP for ARM-based devices	2018-05-29	Go to Downloads
	VMware Horizon Client for Windows 10 UWP for x86-based & 64-bit devices	2018-05-29	Go to Downloads
	VMware Horizon Client for Mac		
	VMware Horizon Client for macOS	2018-05-29	Go to Downloads
	VMware Horizon Client for Linux		
	VMware Horizon Client for 32-bit Linux	2018-05-29	Go to Downloads
	VMware Horizon Client for 64-bit Linux	2018-05-29	Go to Downloads
	VMware Horizon Client for IOS		
	VMware Horizon Client for IQS	2018-05-29	Go to Downloads

3. Locate the download for the appropriate OS and click Go to Downloads to its right. The browser opens the Download VMware Horizon Client for... page:

Download Whyaro Harizon Client for	Product Resources
Download viviware nonzon cheft for	View My Download History
Windows	Product Info
	Documentation
4.8.0	Horizon Mobile Client Privacy
Select Version	Horizon Community
Even Desident Disertes	
Type Product Binarles	
Product Binaries Product Downloads Drivers & Tools Open Source Custom ISOs	
Type Product Binaries Product Downloads Drivers & Tools Open Source Custom ISOs Product/Details Control of the source Custom ISOs Custom ISOs	

4. Click Download to begin downloading:

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and the second		Name		Date mo	dified	Type	Size			
R Quick access		A second s		3/12/201	5 1:08 AM	File folder				
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Downloads	1	WMware-viewcomposer-7.5.0-8463271		8/1/2018	9.16 PM	Application	32,574 KB			
Documents	.1	WMware-viewconnectionserver-x86_64-7.5.0-85	683568	8/1/2018	11:47 PM	Application	238,643 KB			
E Pictures	. *	VMware-viewcomposer-7.4.0-7312595		8/4/2018	6:40 PM	Application	32,566 K8-			
	.11	3 VMware-viewconnectionserver-x86_64-7.4.0-7	File description: VMware installation	launcher	6:41 PM	Application	237,409 KB			
100.00	1	WMware-Horizon-Client-4.8.0-8547331	File version: 11.0.0.485		8,03 PM	Application	238,826 KB			
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			Sue: 51-6 MB	-	1					
.										
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This PC	-									
a Martina										
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When the download is complete, locate the downloaded installer and double click it to begin installation. The installer prompts you to accept the privacy agreement and license:

	-
VMware Horizon	Ð
Version 4.8.0	
Privacy Agreement and License Terms before you ca	in install the product
Agree & Install	
	VMware Horizon Version 4.8.0 Privacy Agreement and License Terms before you ca Agree & Install

5. Click Agree & Install to continue installation. When the installation is done, the installer displays the Success dialog:

Success!	- ×
Finish	

6. Click Finish to complete installation. The installer displays the Restart dialog:



7. Click Restart Now to restart the physical desktop. When the restart is complete, log in to see Horizon Client installed.

11.2 Configuring VMware Horizon Client Connection

To configure VMware Horizon Client:

1. Start VMware Horizon Client on the desktop from which you want to connect. The application displays a splash screen, then its home window:



2. Click Add New Server to register a new virtual machine connection. VMware Horizon Client prompts you to enter the name of the server:

VMware Horizon Client		>
vmware Horizon		
Enter the name of the Connectio	n Server	
10, 19, 203, 108		

3. Enter the IP address of the VDI desktop to which you want to connect, then click Continue. (You are connecting directly to a desktop, so don't enter the Horizon Connection Broker address at this time.) VMware Horizon Client displays a log-in dialog:

vm ware H	lorizo	on -				
Server:		https:	//10.19.20	3.108		
<u>U</u> ser nam	ne:	administr	ator			
Password	d:		•••			
Domain:		GRID			~	

4. Enter the local username and password (or the domain user's username and password if the virtual machine is a domain member) and click Login.

Chapter 12. Troubleshooting

This chapter provides links and examples for learning more about the VMware products described in this deployment guide and for finding solutions or assistance.

Before troubleshooting or filing a bug report, review the release notes for information about known issues and potential workarounds in the current release.

12.1 Forums

NVIDIA forums are a very extensive source of solutions to problems that you may face when deploying a virtualized environment. NVIDIA recommends that you search the <u>NVIDIA Virtual GPU</u> Forums first.

You may also want to look through the <u>NVIDIA Enterprise Services Knowledgebase</u> for articles and links that provide further support.

Some issues with your deployment may not be answered in the NVIDIA vGPU forums. You may also need to reference forums from your hardware supplier, VMware, or your users' applications. Here are some examples of key forums to consult:

- VMware Forums: <u>https://communities.vmware.com/welcome</u>
- Citrix Forums: <u>https://discussions.citrix.com/</u>
- HPE ProLiant Server Forums: <u>https://community.hpe.com/t5/ProLiant/ct-p/proliant</u>
- Dell Server Forums: <u>https://www.dell.com/community/Servers/ct-p/ESServers</u>
- Lenovo Server Forums: <u>https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg</u>
- Autodesk Knowledge Network: <u>https://knowledge.autodesk.com/</u>
- Adobe Forums: <u>https://forums.adobe.com/welcome</u>
- Dassault Systèmes User Groups: <u>https://www.3ds.com/support/users-communities/</u>

12.2 Filing a Bug Report

When you must file a bug or request support assistance, it is critical to include information about your computing environment so the technical staff can help you resolve the issue. NVIDIA includes the nvidia-bug-report.sh script in the .vib installation package to collect and transmit this critical information. The script collects the following information:

VMware version

- X.Org log and configuration
- PCI information
- CPU information
- GPU information
- esxcfg information for PLX devices
- esxcfg information for GPU devices
- VIB information
- NVRM messages from vmkernel.log
- System dmesg output
- Identities of virtual machines that have vGPU or vSGA configured
- NSMI output

When you run this script you may specify the output location for the bug report using either the -o or --output switch, followed by the output file's name. If you do not specify an output directory, the script writes the bug report to the current directory.

If you do not specify a filename, the script uses the default name nvidia-bug-report.log.gz.

If the selected directory already contains a bug report file, the script changes that report file's name to nvidia-bug-report.log.old.gz before generating a new nvidia-bug-report.log.gz file.

To collect a bug report, enter the command:

\$ nvidia-bug-report.sh

The system displays the following message during the collection process:

nvidia-bug-report.sh will now collect information about your system and create the file 'nvidia-bug-report.log.gz' in the current directory. It may take several seconds to run. In some cases, it may hang trying to capture data generated dynamically by the vSphere kernel and/or the NVIDIA kernel module. While the bug report log file will be incomplete if this happens, it may still contain enough data to diagnose your problem.

Be sure to include the nvidia-bug-report.log.gz log file when reporting a problem to NVIDIA.

Appendix A. About This Document

A.1. Related Documentation

NVIDIA publishes several other documents that are helpful to users of VMware Hypervisor with NVIDIA vSPU software. See the <u>NVIDIA Virtual GPU (vGPU) resources page</u> for additional information about NVIDIA vGPU technology, including:

- NVIDIA Virtual GPU Technology
- Purchasing Guide for NVIDIA vGPU Solutions
 - NVIDIA GRID GPU Datasheets
- Application Deployment Guides and Solution Overviews
- Customer success stories
- <u>Relevant White Papers</u>
- Relevant videos

A.2. Support Contact Information

NVIDIA and other vendors provide several technical support resources to assist you:

For community support, post questions (and answers!) on the respective forums:

VMware vGPU Community (https://communities.vmware.com/community/vmtn/vmware-nvidiadirect-access-program)

You can also reach out to your local VMware Horizon and NVIDIA vGPU teams for guidance.

Should you find a bug, please follow the instructions in section 12.2 to create a bug report and submit it to the <u>VMware vGPU Community site</u>.

If you want support when architecting your solution, your VMware Horizon and NVIDIA vGPU teams are available to assist. After you contact them, make sure you keep them up to date with your progress. If you do not know your account management teams, send email to the appropriate group:

NVIDIA vGPU team: gridteam@nvidia.com

The <u>NVIDIA vGPU resources page</u> describes additional contact methods to help you get the answers you need as soon as possible.

