

NVIDIA vGPU Software for VMware vSphere Hypervisor

Deployment Guide

Document History

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Chapter 1. Getting Started

NVIDIA virtual GPU (vGPU) software enables multiple virtual machines (VMs) to have simultaneous, direct access to a single physical GPU, using the same NVIDIA graphics drivers deployed on non-virtualized operating systems. This gives VMs unparalleled graphics performance application compatibility due to the cost-effectiveness of sharing a GPU among multiple scaled workloads.

This chapter covers how NVIDIA vGPU solutions fundamentally alter the landscape of desktop virtualization and GPU accelerated servers. NVIDIA vGPU enables users to execute these solutions with various workloads of all levels of complexity and graphics requirements. This chapter also describes the NVIDIA vGPU architecture, the NVIDIA GPUs recommended for virtualization, the NVIDIA vGPU software licensed products for desktop virtualization, as well as key standards supported by NVIDIA virtual GPU technology.

1.1 Why NVIDIA vGPU?

The promise of desktop and data center virtualization is flexibility and manageability. Initially, desktop and data center virtualization was used, as flexibility and security were the primary drivers of cost considerations. The democratization of technology has reduced the total cost of desktop virtualization, thereby expanding market accessibility and driving growth with NVIDIA as a key facilitator. This, along with advances in storage and multi-core processors, make for a good and/or competitive advantage regarding the ownership cost.

The biggest 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. Still, those technologies do not provide the rich application support needed to succeed 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 the 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 provided a challenge for broad use cases in desktop virtualization. Meanwhile, high-end 3D applications did not work in a virtualized environment or were so expensive to implement with vDGA that it was reserved for only the most limited circumstances.

Today this is no longer true. Thanks to NVIDIA vGPU technology combined with VMware Horizon, NVIDIA vGPU allows flexibility where multiple virtual desktops share a single physical GPU. This breakthrough provides the 100% application compatibility of vDGA pass-through graphics. Still, the lower cost of multiple desktops sharing a single graphics card gives a rich yet more cost-effective user

experience. With VMware Horizon, you can centralize, pool, and manage traditionally complex and expensive distributed workstations and desktops more easily. 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 unprecedented performance and enables support for more users on a server. Work typically done by the CPU can now 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 GPUs in the same manner as a physical GPU passed through by the hypervisor. In the VM itself, vGPU drivers are installed, which support the available different license levels.



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 when the vGPU is created. The vGPU retains exclusive use of that GPU Memory until it is destroyed.

Note: These are virtual heads, meaning that there is no physical connection point for external physical displays on GPUs.

All vGPUs that reside on a physical GPU share GPU engines, including the graphics (3D) and video decode and encode engines. The right side of Figure 1.1 shows the vGPU internal architecture. The VM's guest OS leverages direct access to the GPU for performance and fast critical paths. Noncritical performance management operations use a para-virtualization interface to the NVIDIA Virtual GPU Manager.

1.3 Supported NVIDIA GPUs

NVIDIA virtual GPU software is supported with NVIDIA GPUs and supported on vSphere with a vSphere/ESXi Enterprise Plus License. Determine the GPU best suited for your environment dependent upon application use, optimization for performance or density, and professional visualization via GPU acceleration.

Please refer to <u>NVIDIA GPUs for Virtualization</u> for a complete list of recommended and supported GPUs. For a list of certified servers with NVIDIA GPUs, consult the NVIDIA vGPU Certified Servers<u>page</u>. Cross-reference the NVIDIA certified server list with the <u>VMware HCL</u> to find servers best suited for your NVIDIA vGPU and VMware vSphere environment. Each card requires auxiliary power cables connected to it (except NVIDIA T4). Most industry-standard servers require an enablement kit for the proper mounting of NVIDIA cards. Check with your server OEM of choice for more specific requirements.

1.4 NVIDIA vGPU Software Licensed Products

NVIDIA virtual GPU software divides NVIDIA 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 Virtual Applications (NVIDIA vApps)
- NVIDIA Virtual PC (NVIDIA vPC)
- NVIDIA RTX[®] Virtual Workstation (RTX vWS)

CAUTION: To run these software products, you need an NVIDIA GPU supported by vGPU software and a license that addresses your specific use case bundled with a vSphere/ESXi Enterprise Plus License.

NVIDIA vGPU software allows you to partition or fractionalize an NVIDIA data center GPU. These virtual GPU resources are then assigned to VMs in the hypervisor management console using vGPU profiles. Virtual GPU profiles determine the amount of GPU frame buffer allocated to your virtual machines (VMs). Selecting the correct vGPU profile will improve your total cost of ownership, scalability, stability, and performance of your VDI environment.

The NVIDIA vGPU software solution offers unmatched flexibility and performance when correctly paired with the proper vGPU software Licenses and NVIDIA GPU combination. These vGPU software solutions are designed to meet today's modern enterprises' ever-shifting workloads and organizational needs. Refer to the <u>NVIDIA Virtual GPU Positioning Guide</u> to select the best vGPU software license and GPU combination based on your workload.

- > Please refer to <u>NVIDIA GPUs for Virtualization</u> for a product overview of each NVIDIA GPU.
- The <u>NVIDIA Virtual GPU Software User Guide</u> contains Information on Supported Graphics APIs and Support for OpenCL and NVIDIA[®] CUDA[®] applications.

1.4.1 NVIDIA AI Enterprise licensed software

The <u>NVIDIA AI Enterprise</u> software suite of licensed products is an end-to-end, cloud-native suite of AI and data analytics software that includes AI frameworks and tools for performance-optimized deep learning, machine learning, and data science workloads that simplify building, sharing, and deploying AI software. NVIDIA AI Enterprise's end-to-end software solution is for every phase of AI, from data prep (NVIDIA RAPIDS[™]) to AI training (TensorFlow, PyTorch) to inference (NVIDIA[®] TensorRT[™]), and scale (NVIDIA Triton[™] Inference Server).

The NVIDIA AI Enterprise software suite is optimized, certified, and supported by NVIDIA to run on VMware vSphere with NVIDIA-Certified Systems[™]. It includes key enabling technologies from NVIDIA for rapid deployment, management, and scaling AI workloads in the modern hybrid cloud.

Note: As of NVIDIA vGPU software release 13.0, VMware compute-intensive workloads will be supported through the NVIDIA AI Enterprise software suite of licensed products; These AI and data science applications and frameworks are optimized and exclusively certified by NVIDIA to run on VMware vSphere with NVIDIA-Certified Systems. Refer to the <u>NVIDIA AI Enterprise deployment guide</u> for more information.

1.5 Before You Begin

This section describes building a Proof of Concept (POC), sizing your VDI environment, general prerequisites, and some general preparatory steps that must be addressed before deployment.

1.5.1 Building a Proof of Concept

It is recommended that you test your unique workloads to determine the best NVIDIA virtual GPU solution to meet your organizational needs and goals. The most successful customer deployments start with a proof of concept (POC) and are "tuned" throughout the lifecycle of the deployment. Beginning with a POC enables customers to understand the expectations and behavior

of their users and optimize their deployment for the best user density while maintaining required performance levels. Continued monitoring is essential because user behavior can change throughout a project or an individual change within the organization. A user that was once a light graphics user (vApps, vPC) might become a heavy graphics user via professional visualization (RTX vWS) when they change teams and/or projects.

Consider the following during your POC:

- A comprehensive review of all user groups, their workloads, applications utilized, and current and future projections should be considered
- A vision for balancing user density with end-user experience measurements and analysis
- Gather feedback from IT and end-users regarding infrastructure and productivity needs.

1.5.2 Sizing Your Environment

Based on your Proof of Concept (POC), we recommend sizing an appropriate environment for each user group you are trying to reach with your evaluation. NVIDIA provides in-depth sizing guides to assist with the process of optimally scaling your organization's workloads.

Please refer to the appropriate sizing guides below to build your NVIDIA vGPU environment:

- NVIDIA vPC Sizing Guide
- NVIDIA Virtual Apps on Citrix Virtual Apps with VMware ESXI
- NVIDIA RTX Virtual Workstation (vWS) Sizing Guide

As an overview:

- Scope your environment for the needs of each end-user
- Run a proof of concept for each deployment type.
- Implement the NVIDIA recommended sizing methodology
- Utilize benchmark testing to help validate your deployment.
- Utilize NVIDIA-specific and industry-wide performance tools for monitoring.
- Ensure performance and experience metrics are within acceptable thresholds.

Note: It is essential to resize your environment when switching from Maxwell GPUs to newer GPUs like the Pascal, Turing, and Ampere GPUs. NVIDIA GPU Architectures that came after the Maxwell Generation of GPUs may support ECC memory which incurs a 1/15 overhead cost on the GPU frame buffer. Additional information can be found <u>here</u>.

1.5.3 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:
 - CPU for vPC/vApps:
 - Intel Xeon Gold 6338 @2.0 GHz or faster
 - AMD EPYC 7713 @2.0 GHz or faster
 - CPU for RTX vWS:
 - Intel Xeon Gold 6354 @3.0 GHz or faster
 - AMD EPYC 7763 @2.4 GHz or faster
 - Note: When considering CPUs for your vGPU deployment, NVIDIA recommends the following:

vPC deployments should have a higher core count and lower clock speeds to prioritize density.

RTX vWS deployments should have a higher clock speed priority core count to priopriorityperformance.

- High-speed RAM
- Fast networking, e.g., best-in-class Mellanox ConnectX certified by NVIDIA
- High-performance storage with Virtual SAN or high IOPS storage system
- High-performance endpoints for testing access

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

1.5.4 General Prerequisites

The following elements are required to install and configure vGPU software on VMware vSphere. For demonstration purposes, this guide uses ESXi release 7.0.2.

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 links to a list of VMware education courses and other resources.

Note: The requirements to install and configure vGPU software on VMware vSphere are the same for implementing VMware Horizon as a Server. Refer to the <u>Choosing Your Hardware</u> section for the requirements.

Ensure to use the appropriate NVIDIA GPU for your use case. Refer to the <u>NVIDIA Virtual GPU</u> <u>Positioning Guide</u> to better understand which GPU suits your deployment requirements. For additional guidance, contact your NVIDIA and VMware sales representatives.

VMware vSphere 7.0.2 build:

- vSphere and vCenter Server is available from the VMware website at <u>Product Evaluation</u> <u>Center for VMware vSphere 7.0</u>.
- As of vSphere 7.0, deploying a new vCenter Server or upgrading to vCenter Server 7.0 requires using the vCenter Server Appliance (VCSA).

VMware Horizon 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 VMware</u>.

NVIDIA vGPU software:

• NVIDIA vGPU manager vSphere Installation Bundle (VIB)

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

- For NVIDIA vGPU software builds latest releases, please refer to your NVIDIA Application Hub.
- For additional information on these current releases, please consult NVIDIA vGPU product documentation for <u>VMware vSphere</u>.

Microsoft software:

• Refer to the vGPU Software documentation for a supported Windows Guest OS list.

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 <u>the mobaxterm website download</u>; This is the recommended tool.
- Putty (SSH) and WinSPC (SPC), available from <u>www.putty.org</u> and <u>www.winscp.net</u>.
- Tight VNC Viewer (SSH) is available from <u>www.tightvnc.com/download.php.</u>

Licenses:

- From the VMWare Horizon website:
 - > vSphere/ESXi Enterprise Plus is required to use vGPU on vSphere
 - > VM vSphere
 - > VMware Horizon
- Microsoft licenses can be found at the service center <u>here</u> (volume licenses recommended) Testing and Benchmarking tools (Optional but recommended):
 - NVIDIA System Management interface (NVSMI)
 - GPU Profiler <u>GPUProfiler download</u>
 - VMware vRealize Operations for Horizon (V4H)
 - Lakeside Systrack with GPU monitoring
 - End-User satisfaction survey

A Virtual GPU Certified Server on which to install VMWare Horizon

- VMware vSphere ESXi
- VMware vCenter
- Must be joined to a domain
- Must be assigned a static IP address

Note: VMware Horizon consists of many components working together in concert. Many environments are built on the vSphere virtual infrastructure. Refer to the <u>VMware Horizon Documentation</u> page for a complete list of components and features.

The versions of vCenter and ESXi supported by Horizon 8 can be found in the <u>VMware Product</u> Interoperability Matrix.

1.5.5 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)
 - WinSCP, which handles both SSH and SCP functions
 - MobaXterm, which handles both SSH and SCP functions
 - Tight VNCViewer (Remote console)

1.5.6 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)
- SR-IOV enabled
- VT-d/IOMMU Enabled

Note: NVIDIA GPU architectures after the Maxwell architecture (Pascal, Turing, & Ampere) support VT-d and IOMMU.

Chapter 2. Installing VMware ESXi

This chapter covers the following ESXi installation topics:

- Choosing an Install Method
- Preparing the USB boot media
- Installing VMware ESXi
- Initial host configuration

Note: 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

VMware vSphere offers several methods to install the ESXi hypervisor. These installation methods include CD/DVD (burning the ESXi Installer ISO), USB Flash drive (formatting a USB flash drive to Boot the ESXi Installation), and PXE Boot Installation (Booting from a location on the network). The ESXi Installer must be accessible to the system you are installing ESXi. See the <u>vSphere documentation</u> regarding best practices for logs when booting from a USB flash drive or similar device. This guide uses an IPMI and virtual media to boot from an ISO file and install local storage.

2.2 Preparing USB Boot Media

Note: Booting vSphere from a USB flash drive is useful if your host has an existing vSphere Version or earlier installation that you want to retain. Installing ESXi on a supported USB flash drive or SD flash card (2004784).

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

- 1. Download UNetbootin from the GitHub UNetbootin page.
 - The Windows version does not include an installer; however, the OSX version is packaged in a .DMGizing 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>.
- 2. Start the application, select **Diskimage**, and click the "..." button in the bottom right corner to browse for the installation . ISO file:



- 3. Browse to the location that contains the installation . ISO file, then select **Open.**
- 4. Select the mounted USB flash drive location where you perform the installation, then click **OK**. The copying process begins, and UNetbootin displays a series of progress bars.

UNetbootin			- • ×
Distribution	== Select Distribution ==	← == Select Version	
Welcome to UNetboo	tin, the Universal Netboot Installer. Usag	je:	
1, Select a distr load below. 2, Select an insi	ibution and version to download from th tallation type, and press OK to begin ins	e list above, or manually talling.	specify files to
Diskimage	[ISO		
Space used to preserv	ve files across reboots (Ubuntu only): (0	MB
Type: USB Drive	▼ Drive: :\	- OK	Cancel

5. When the copying process is complete, click **Exit**, then **remove the USB flash drive**.

6. To install from this USB flash drive, insert it into the host using either an internal USB port or an external USB port, then set the port as the primary boot source or select from the boot menu on power-up.

2.3 Installing VMWare 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.
- 2. Select the installer using the arrow keys and press **[ENTER]** to begin booting the ESXi installer. A compatibility warning is displayed.



3. Press [ENTER] to proceed. The End User License Agreement (EULA) displays.

End User License Agreement (EULA)	
VMWARE END USER LICENSE AGREEMENT	
PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLES OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF TH SOFTWARE.	SE
IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY) AGREE TO BE BOUND BY THE TERMS OF THIS END USER LICENSE AGREEMENT ("EULA"). IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL, OR USE THE SOFTWARE, AND YOU MUST DELETE OR RETURN THE UNUSED SOFTWAR TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30 DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT	
Use the arrow keys to scroll the EULA text	
(ESC) Do not Accept (E11) Accept and Continue	

4. Read the EULA and then press **[F11]** to accept it and continue the installation. The installer scans the host to locate a suitable installation drive:

Scanning...

Scanning for available devices. This may take a few seconds.

5. It should display all drives available for install.

(any existing * Contains a VMFS # Claimed by VMwa	Select a Disk t VMFS-3 will be partition re vSAN	o Install or Upg automatically up	rade graded to	VMFS-5)
Storage Device				Capacity
Local: NMe Dell Remote: (none)	Ent WYNe y2 Ceuri	. 364346385268122	200253)	5,82 118
(Esc) Cancel	(F1) Details	(F5) Refresh	(Enter)	Continue

6. Use the arrow keys to select the drive you want to install ESXi, and then press [ENTER] to continue.

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

7. The installer scans the chosen drive to determine suitability for install

((any existing	VMFS-3 will be	o Install or Upg automatically up	rade graded to VMFS-5:)
* Cor # Cla	ntains a VMFS aimed by VMwa	re vSAN			
St		Scan	ning		ity
Lo	Gathering a	dditional inform This will tak	ation from the s e a few moments.	elected device.	TH
Re (r	none)				

8. The Confirm Disk Selection window displays.

# Cla	Confirm Disk Selection	
Stora Local NV	You have selected a disk that contains at least one partition with eviding data. If you continue the selected disk will be overwritten.	acity 2 Til
Remot (n	(Esc) Cance) (Enter) OK	

- 9. Press **[ENTER]** to accept your selection and continue.
- 10. Please select a keyboard layout window displays. Select your desired keyboard layout using the arrow keys and press [ENTER].

	Trease	SCIECT O K	cybudi	a rugoor	
Suiss	French				
Suiss	German				
Turkis	sh				
US Del	ault				
US Dy	nak				
Ukraiı	nian				
United	I Kingdon				
	Use th	e arrow ke	ys to :	scroll.	
	A Second Second	Termina Termina			

11. The Enter a root password window displays. Enter a **root password** in the Root password field. Confirm the password in the **Confirm password field** and press **[ENTER]** to proceed.

	Enter a ro	oot passi	word	
Root password: Confirm password:	Possuoro	ds natch		
(Esc) Canc	:1 (F9) f	Back	(Enter) Continue	

CAUTION: To prevent unauthorized access, your selected root password should contain at least eight (8) characters and a mix of lowercase and capital letters, digits, and special characters.

12. The installer rescans the system.



13. When the installer finishes rescanning, it displays the **Confirm Install** window. Press **F11** to proceed with the installation.



CAUTION: The installer will repartition the selected disk. All data on the selected disk will be destroyed.

• The ESXi installation proceeds.



14. The installer displays the **Installation Complete** window. Confirm that your installation medium has been unmounted and your system is set to the boot disk. Then press **Enter** to reboot the system.



15. The server will shut down and reboot.

Rebooting Server The server will shut down and reboot. The process will take a short time to complete.

16. VMWare ESXi has been installed successfully.

2.4 Initial Host Configuration

A countdown timer displays when you first boot ESXi. You can wait for the countdown to expire or press **[ENTER]** to proceed with booting. A series of notifications displays during boot, taking several

minutes to complete. When the boot process completes, VMware ESXi displays the DCUI Splash screen.



Use the following procedure to configure the host:

- 1. Press F2 to Customize the System.
- 2. ESXi displays the Authentication Required window.
 - Enter the root account credentials you created during the installation process, and then press Enter.

Authentication	Required	
Enter an author localhost.tne.r	ized login name and pass widia.com.	word for
Configured Keyb	poard (US Default)	
Configured Keyb Login Name:	poard (US Default) [root	i
Configured Keyb Login Name: Password:	poard (US Default) [root [******* _	1

3. ESXi displays the **System Customization** screen. Select the **Configure Management Network** tab using the down-arrow key, then press **Enter**.



4. ESXi displays the **Configure Management Network** window. Press **Enter** to select the **Network Adapters**.

Configure Management Network	Network Adapters
Network Adapters VLAN (optional) IPv4 Configuration IPv6 Configuration DNS Configuration Custom DNS Suffixes	<pre>vmnic0 (Enbedded NIC 1) The adapters listed here provide the default network connection to and From this host. When two or more adapters are used, connections will be fault-tolerant and outgoing traffic will be load-balanced.</pre>



5. In the **Network adapters** window, select the adapter as the default management network with the arrow keys, then press **Enter**.

Configure Management	Network	Network	Adapters		
Network Adapters VLAN (optional) IPv4 Configuration IPv6 Configuration DNS Configuration Custon DNS Suffixes	Network Adapters	vmnfcD (The adap connect are used traffic ers for this host's default me	Enbedded NIC 1) oters listed her ion to and from 1, connections w will be load-be) re provide the default network this host. When two or more adapt will be fault-tolerant and outgoin alanced.	21-5
	Device Name [X] vnnic0 [] vnnic1 [] vnnic2 [] vnnic3	Hardware Label (MAC Address) Enbedded NIC 1 (d4:30:0e) Enbedded NIC 2 (d4:30:0f) Integrated (6e:31:00) Integrated (6e:31:01)	Status Connected (Disconnected Disconnected Disconnected		
	⟨D⟩ View Details	<space> Toggle Selected</space>	Kenter> OK	Kese> Cance1	
		(Enter) (Change	(Esc)	

- 6. Select IPv4 Configuration from the Configure Management Network window and Press Enter.
- 7. In the **IPv4 Configuration** window. Select **Set static IPv4 address and network configuration** with the arrow keys:
 - Enter the IPv4 address, subnet mask, and default gateway in their respective fields.
 - Press Enter when finished reviewing to apply the new management network settings.

IPv4 Configuration	
This host can obtain network settings autom includes a DHCP server. If it does not, the specified:	atically if your network following settings must be
 () Disable IPv4 configuration for management () Use dynamic IPv4 address and network configuration (o) Set static IPv4 address and network configuration 	nt network nfiguration figuration:
IPv4 Address	[10.136.148.55]
	E 255 255 255 0 1
Subnet Mask	E 200,200,200,0 1
Subnet Mask Default Gateway	E 10.136.144.1 1

- 8. In the **Confirm Management Network** window, Press the **Y** key to confirm your selection.
- 9. ESXi displays the DNS Configuration window.
 - Add the primary and (if available) secondary DNS server IP address(es) in their respective fields.
 - Enter the vSphere host's hostname in the Hostname field, then press Enter.
- 10. Select the **Test Management Network** tab on the main ESXi screen to open the **Test Management Network** window.

Perform the following tests:

- Ping the default gateway.
- Ping the DNS server.
- Resolve any connectivity issues.
- 11. When you have completed testing, return to the main ESXi screen and select **Troubleshooting Options.**

ESXi displays the Troubleshooting Mode Options window:

• Enable the ESXi Shell by selecting Enable ESXi Shell and pressing Enter.

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

12. Enable SSH by selecting **Enable SSH** and pressing **Enter**.

The window on the right displays the SSH status.

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

13. This concludes the ESXi configuration. The ESXi host is accessible by the IP 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 General Prerequisites in section 1.5.4 before proceeding with these installations.

Note: This deployment guide assumes you are building an environment for a proof of concept. Refer to <u>VMware best practice guides</u> 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 hosts and perform configuration changes from a single pane of glass. Since the OS was developed by VMware and accelerated by NVIDIA vGPUs, 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 in tandem with the performance of NVIDIA certified servers. This results in significant optimization for vSphere environments and quicker release of security patches and bug fixes, enabling IT admins to focus on organizational goals and strategic initiatives.

The VCSA scales up to 2500 hosts and 45,000 virtual machines. Features such as Update Manager are bundled into the VCSA, file-based backups and restores, and vCenter High Availability. The appliance also saves operating system license costs and is quicker and easier to deploy and patch.



Note: 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.

• Software Considerations:

- As of vSphere 7.0, deploying a new vCenter Server or upgrading to vCenter Server 7.0 requires using the vCenter Server Appliance (VCSA). The new vCenter contains all Platform Controller services. Review the <u>vCenter Server Components and Services</u> guide for more details about the VCSA authentication services and other installed services with the new vCenter appliance.
- VCSA must be deployed to an ESXi host running version 6.5 or above. In addition, all the hosts you intend to connect to VCSA should be running ESXi 6.5 or above. Hosts running v6.0 and earlier cannot be managed by the version 7 vCenter Server Appliance, and there is no direct upgrade path.
- You must check the compatibility of any third-party products and plugins 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>.
- For more information, please refer to <u>vSphere Software Requirements</u>

• Architectural Considerations:

- When implementing a new vSphere 7 environment, you must plan its topology by the <u>vSphere</u> <u>Installation and Setup</u> guide.
- This guide uses the new vSphere 7 VCSA, which deploys the vCenter Server, vCenter Server components, and the authentication services on one system.

Note: All Platform Services Controller services are consolidated into vCenter Server, simplifying deployment and administration.

Hardware and Storage Requirements:

- See the document <u>Hardware Requirements</u> for specifications. During installation, the corresponding size you select will determine the number of CPUs and the amount of memory (disk can be thin provisioned).
- See the document <u>Storage Requirements</u> for specifications. Storage requirements for the smallest environments start at 250 GB and increase depending on your specific database.
- > The ESXi host you deploy the VCSA on 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 not start if the clocks are not synchronized.
- FQDN resolution must be enabled when you deploy the vCenter Server.
- Required Ports for vCenter Server.
- vSphere <u>VMware Configuration Maximum tool</u>.

3.1.2 vCenter Server Appliance (VCSA) Installation

Download the latest VMware vCenter Server Appliance ISO from VMWare downloads.

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-ui-installer\win32: Right-click **Installer** and select **Run as administrator.**

- · 1	> This	s PC > DVD Drive (F:) VMware VCSA > vcsa-ui	-installer > win32			5 ~	Search win32	P
		Name	Date modified	Туре	Size			
Quick access		locales	4/10/2018 4:39 AM	File folder				
Desktop	*	resources	4/10/2018 4:39 AM	File folder				
Downloads	*	blink_image_resources_200_percent.pak	2/10/2018 4:32 AM	PAK File	25 KB			
Documents	#	content_resources_200_percent.pak	2/10/2018 4:32 AM	PAK File	1 KB			
Pictures	#	content_shell.pak	2/10/2018 4:32 AM	PAK File	9,882 KB			
Bernet and	1	d3dcompiler_47.dll	2/10/2018 4:32 AM	Application extens	3,386 KB			
		ffmpeg.dll	2/10/2018 4:32 AM	Application extens	1,849 KB			
		icudtl.dat	2/10/2018 4:32 AM	DAT File	9,894 KB			
		🥝 installer	2/10/2018 4:32 AM	Application	55,547 KB			
and the second second		libEGL.dll	2/10/2018 4:32 AM	Application extens	94 KB			
		ibGLESv2.dll	2/10/2018 4:32 AM	Application extens	1,893 KB			
		LICENSE	2/10/2018 4:32 AM	File	2 KB			
	_	EICENSES.chromium	2/10/2018 4:32 AM	Chrome HTML Do	1,702 KB			
This PC		natives_blob.bin	2/10/2018 4:32 AM	BIN File	335 KB			
Network		node.dll	2/10/2018 4:32 AM	Application extens	14,693 KB			
		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			
		xinput1 3.dll	2/10/2018 4:32 AM	Application extens	80 KB			

3. As we are installing a new instance, click **Install.**

vCenter Server 7.0 Installer			ja En
		W -	
Install	Upgrade	Migrate	Restore
Install a new vCenter Server	Upgrade as existing vCintwi Server Appliance or Upgrade and Converge an existing vCenter Server Appliance were an external (Indecrm Services Controller	Migrate from an existing Windows vCenter Server or Migrate and Converge as existing Windows Ocenter Server with on external Pattorn Sonices Controller	Restore from a previous «Center Spever Backura

4. The installation is split into two stages, and we will begin with deploying the appliance. Click Next to begin.

1 Introduction	Introduction	
	A The Esternal Rattern Services Continuer desiration of the been deprecated	-iero mari
	This installer allows you to install a vCenter Server 7.0	
	Stage 1	
	3	
	Ð	
	Depky vCenter Server	in the second
	inswilling the vCenter Server is a two stage process. The first stage involves deploying a target ESO host or a carecular massive in the target vCenter Server. The second staget deployed vCenter Server, Click Next, to proceed with stage 1.	vew vCenter Surver (6) (completes the ankau of (

5. Read and accept the EULA, then click **Next** to continue.

Introduction	End user license agreement
2 End user license agreement	Read and accept the following license agreement.
3 Select deployment type	VMWARE END USER LICENSE AGREEMENT
4 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.
5 Set up appliance VM	IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY) AGREE TO BE BOUND BY THE TERMS
Select deployment size	OF THIS END USER LICENSE AGREEMENT ("FULA") IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL OR USE THE SOFTWARE, AND YOU HUST DELETE OF DETUDING THE NOT DOWNLOAD, INSTALL OR USE THE SOFTWARE, AND YOU
7 Select datastore	ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REPUND OF THE UCENSE FEE, IF ANY, THAT YOU PAID FOR THE SOFTWARE.
8 Configure network settings	EVALUATION LICENSE. If You are idensing the Software for evaluation purposes, Your use of the Software is only permitted in a pon-sonduction environment and for the penetri limited by
9 Ready to complete stage 1	I accept the terms of the licerise agreement.

6. Select the ESXi host to install the VCSA as a guest. This must be a host that runs ESXi 6.5 or later. NVIDIA recommends that the vCenter Server Appliance 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:

naly the valenter Server deployer of the valenter Server will be de-	ent payer, and equilibrium. The Aurgeria the Elici Austion	Carter Since Standard or
	digyed.	
That is a Denter Server metric		1.0
PSpat	44	
()		
SAL	Lot Manual	
	inhad is adverter Server mense TPS port in Jame	In the adventer Server Herminian This party Automation Autom Automation Automation Aut

7. If your desktop can reach the host, you should see a certificate warning as it connects. This warning is due to the use of a self-signed certificate. If you use a signed certificate, you will not see this warning. Click **Yes** to continue.

Certificate Warning		
f an untrusted SSL certificate is ins	stalled on vgpu05.tme.	nvidia.com, secure
communication cannot be guarant	eed. Depending on yo	ur security policy,
his issue might not represent a se	curity concern	
The SHA1 thumbprint of the certific	cate is:	
in accent and continue, click Vet		
to accept and continue, oney res		
		0.4
		NO YES

The credentials you provided are validated:



8. When prompted after a successful connection, name the appliance, enter a root password for the appliance, confirm the root password, and click **Next**.

mandriden	Set up vCenter Serv	er VM	
Englisher liberall algements	Toronty the side settings for the	oCenter/Server (c) be déclayed.	
Contrast Servers Desilogeneer) Europer	VM Faller		w
Set up (Center Kerver VH	Bet ANIT DANNWORD		-20
	Continue to of plaakwinni		

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

(philosophia)	Select deployment size						
2 End user license agreement	Select the deployment side for this vCenter Server.						
E «Centile Schuer deployment Maget	For more information on deployment sides refer to the vSphere 7 G doctimentation						
MIN OD VOENE Narvan VM	Decloyment size Twy						
1 Select deployment size	Storage size		Owbeat	Celluit			
	Resources required fo	Resources required for offerent decloyment sizes					
	Deployment Size	VCPUI	Memory (ISB)	Storage (GB)		995 (ten 54)	
	Tmy	2	12	579	10	100	
	Email	4	10	694	100	1000	
	Medium		36	908	400	4000	
	Large	10	35	1358	1000	10000	
	X-Earge	24	:58	2283	2000	35000	

10. Select the datastore where the VCSA will be deployed, select thin provisioning if needed, then click **Next**.

vmw Install - Stage 1: Deploy vCenter	Server							
1 introduction	Select datastore							
2 End user license agreement	Select the storage location for this vCenter Server							
3 vCenter Server deployment target	Show phy compatible datastores							
4 Set up vCenter Server VM	Name Trype T Capacity 19 Find T Provincent T Thin Y							
5 Select deployment size	VGPU05-Datasto VMPS-4 2.48.18 1.99.18 1.5.18 Supported							
6 Select datastore	194							
	Enable Thin Disk Mode							
	CANCEL BACK NEXT							

11. The installer displays the *Configure network settings*. Before configuring these settings, please 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 hostname on the network setting page, then scroll down and enter the remaining items.

When all desired settings are complete, select Next.

(nindutta)	Configure network settings					
Erekaan Icental agenerment:	Configure network selfings for this vCenter Server					
vCintur Server deployment suger	Nettwork	-VM Inniwara	- 02			
Set Lo vCetter Server VM	IP-yanson	84	2			
savern ideployment size	P ista grownt	suct				
Samert (datastore	FIDDM		(D			
7. Camfigure network settings	P-address					
	Sulimet mask or prefix length		00			
	Default gateway					
	DNS bervert					
	Estimation Ports					
	нттр	é.				
	HTTPS	au .				

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



13. With the VCSA now deployed, move on to stage 2 by clicking **Continue**.
| Install - Sta | ge 1: Deploy v | /Center Server | | | | |
|----------------------------------|------------------------|------------------------|--------------------------|-------------------|---------------|----------|
| You have
Controller. | successfully dep | loyed the vCenter | Server with an En | nbedded Platf | orm Servic | es |
| To proceed with | stage 2 of the deploy | ment process; applian | ce setup, click Continue | | | |
| if you exit, you ci
interface | en continue with the a | appliance setup at any | time by logging in to th | e vCentirr Server | Appliance Mar | negement |
| | | | | CANSEL | CLOSE | CONTINUE |

14. Select **Next** to begin Stage 2 of the VCSA setup.

verw Install - Stage 2: Set Up	vCenter Server			
vew rostal - Stage 2 Set Up Setup Wizard 1 Heroduction	VCanter Server Introduction Conter Cerver intEllinitory unumer	the This Port shapp blackman record and the first sheet fo growers and th	Stage 2 The second seco	
				MICEL NEXT

15. Configure the NTP servers, enable SSH access if required, and click **Next**.

tup Wizard	vCenter Server Config	uration
Introduction	Network configuration	Assign Statu IP address
2 vCenter Server Configuration	IP vérsion	(Pv4
	System name (1)	
	iP address	
	Subnet mask or prefix length	
	Default gateway	
	DNS servers	
	Time synchronization mode	Synchronize lime with the ESXinost
	SSH access	Enabled

16. Enter a unique SSO domain name, configure a password for the SSO administrator, click Next.

The default SSO domain name is vSphere.local. The SSO domain name should not be the same as your Active Directory Domain.

tup Wizard	SSO Configuration		
1 Introduction	Create à new SSO domain		
2 vCenter Server Configuration	Single Sign-On domain name 🕕	Vsphere local	
3 SSO Configuration	Single Sign-On username	administrator	
	Single Sign-On password (j)		-30-
	Confirm password		
	Join an existing SSO domain		
		vCenter Sarver	

17. Select or deselect the customer experience improvement program box and click **Next**.



18. Review the details on the summary page and click **Finish**.

etup Wizard	Ready to complete			
1 Introduction	Review your settings before finishing the widar	d		
2 VCenter Server Configuration	Network configuration	Assign static IP address		
3 550 Configuration	IP version	IPvd		
4 Configure CEIP	IP address			
5 Ready to complete	Subnet mask			
	Host name			
	Gateway			
	DNS servers			
	v vCenter Server Details			
	Time synchronization mode			
	SSH access			
	SSO Detalls			
	SSO Defails	vsphere local		
	Username	administrator		
	Customer Experience Improvement Program			
	CEIP setting	Opted in		

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



20. When the install process is complete, click **Close** to exit the installer and complete Stage 2 of the VCSA setup.



3.2 Post Installation

This section describes the post-install and configuration of VMware's vSphere VCSA.

3.2.1 Adding Licenses to Your vCenter Server

Use the following procedure to configure vCenter:

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



2. The VMware Single Single-On page displays:

Enter the username and password you specified during installation. Click the **Login** button to continue.

VMware [®] vSphere	
eximale@domamjocal	
Pessword	
The process sense with mission	

3. The VMware vSphere Web Client page displays:

You must apply for a new vCenter license key within 60 days (about two months). If you have purchased vCenter Server, log in to your <u>VMware vSphere License 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, check with your VMware account manager).

= vSphere Client (à.									C	۵ -	WWW.	- 6	a 1	D-
K.	Shortcuts Inventories														
Δ meson Π Contex Unites Φ ητοιοιοίουσματαί Β στοιογγιατί	Hatta and Coatter	VML and Technologies	it not	Q hereitang	Sortwic		Workead Managemeet	Call David Provider Segretor							
[3] Person and Person Jahrson Strategy (Principal Strategy (Principal Strategy (Principal Strategy (Principal Strategy))	Monitoring Î	Deri Coribee	Competition	No. of the second secon	Ca.										
10 Алтеналися 10 Тана 10 Тана 10 Тана 10 Тана Алансен Алексен 10 Тана Алансен Алексен 10 Тана Алансен Алексен 10 Тана Алансен Алексен	Administratio														
 Construction Magnetion Construction Magnetion Construction Construction 															
	V Recent Task	a Alema T Gran		т. _(рек.)		1 pean			T Gamet T	Start True	, T	exercise Type	1 (m		,

14. Click the **Menu drop-down**, then click **Administration**.

Select Licenses from the left-hand menu, then select the Licenses tab.

≡ vSphere Client Q											C	g kannista	angya na	ÍDCA: V	8 0×
Administration Access Control	× ×	Licenses Licenses Products	Assets												TO AN OWNER
Roman Permittana		400 EVICAIDON	et uçente												
Licensing	Ŷ	Liorene	T License Ney	* Pridet	.4 Divide	•	Capacity	* State	'	Instation	,	My VMuart Notes	Ny Weare Colors Label	Ny VMaere Account	Ny Villeaire Lait irgort Dati
Solutions	v	D' Stimmer	ins -					Assped		A Prinkanto					
Chevel Service # Chev															
Deployment Invent Configuration	Ŷ	-													
Carlo and Experiment Recovering Press Pre-		A Exiger													-
Support	×.														
Lipicad Rile In Nervice Request															
Cwrtificates	. 40														
Certificable Management															
Single Sign On	~					116.0	Proj Belecterit								
Usero and Drougs															
Detgades															
V Recent Tasks Alarms															

4. Click Add New Licenses to open the New Licenses window.

many Louisburg	Email and Arts	1
(see here here in		
1 magestrates		

5. Enter your vCenter Server Standard license key from the <u>VMware vSphere License portal</u>. Login required.

New Linecom	Enter Mocuo ionys	
X-promition and page.	contract and provide the p	
		CANCEL MAY

- New Licenses
 Edit license names
 X

 1 Enter license keys
 License name
 License la

 2 Edit license names
 Udense key:
 JM406-PCH32-78793-0H2R0-8HV5H
 Exaines:
 Ody03/2018

 3 Ready to complete
 VMware VCenter Server 6 Standard (Instances)
 Capacity: 1 Instances
 Capacity: 1 Instances
- 6. Enter a unique name for the license in the License Name field. Click Next.

7. Review your selections and click **Finish** to close the **Enter New License** window and return to the **VMware vSphere Web Client** page.

New Licenses	Ready to complete	×
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 FINISH

3.2.2 Adding a Host

 Use the following procedure to add a host in vCenter: Select the Home icon (house) on the VMware vSphere Web Client page. Select Hosts and Clusters. Click the ACTIONS drop-down list and select New Datacenter.

vm	vSphe	re Client		Menu 🗸	Q Search			
6			Q	Summary	Monitor Virtual Mac Hosts:	ACTIONS Actions - Actions - New Datacenter New Folder Distributed Switch	nters	Hosts & Clusters
				Custom At Attribute	ttributes	Value		

2. The New Datacenter window displays.

Enter a name for the data center in the Datacenter Name field and click OK.

Name	Distances	
Value	Datacenter	
Location	₽.	

3. The new data center is visible in the left panel of the *vSphere Web Client*. Click the ACTIONS drop-down and select Add a Host.



4. The **Add Host** window box opens.

Enter the hostname or IP address of the vSphere host and click Next.

1 Name and location	Name and location			
2 Connection settings	Enter the name or IP address of the hos	t to add to vCenter Server.		
3 Host summary				
4 Assign license	Host name or IP address:			
5 Lockdown mode	Location:	Datacenter		
6 VM location				

5. The **Connection settings** window box displays.

Enter the administrator account credentials in the Username and Password fields and click Next.

1 Name and location 2 Connection settings	Connection settings Enter the host connection details		
3 Host summary 4 Assign license	User name:	roat	
5 Lockdown mode	Password:		
7 Ready to complete			

6. The **Security Alert** window displays.

Click Yes to replace the host certificate.



7. The Host summary window displays.

Review the settings and click Next to proceed.

8. The Assign license window displays.

Confirm the license selection and click Next.

8. The **Lockdown mode** window displays.

Accept the default setting (Disabled) and click Next.

9. The VM location window displays.

Select a cluster or accept the default option and click Next to continue.

10. The **Ready complete** window displays.

Click Finish to complete adding the new host.

11. The new host is now visible in the left-hand panel when clicking the datacenter name.



3.2.3 Setting the NTP Service on All Hosts

Set the NTP (Network Time Protocol) service on each host to ensure that all guests' time synchronization is accurate.

1. Click a host object in the menu on the left, click Configure> System> Time Configuration> Edit.

m vSphere Client	Menu 🗸 🔍 Search		
	Summary Monitor	ACTIONS • Configure Permissions VMs Resource Pools Datastores	Networks Updates
> Datacenter	✓ Storage	Time Configuration	
	Storage Adapters Storage Devices	Date & Time	07/28/2018, 10:10:01 AM
	Host Cache Configur. Protocol Endpoints	NTP Client	Disabled
	I/O Filters	NTP Service Status	Stopped
	 Networking Virtual switches 	NTP Servers	ntp.1e128.com
	VMkernel adapters		
	Physical adapters		
	TCP/IP configuration		
	 Virtual Machines 		
	VM Startup/Shutdo		
	Agent VM Settings		
	Derault VM Compati		
	- Sustem		
	System		
	Host Profile		
	Time Configuration		
	Authentication Servi.		

2. Enter a valid NTP time server and click **OK.**

NTP Servers	ntp1.1e128.com ntp2.1e128.comA
	Separate servers with commas, e.g. 10.31212, fe00.2800
NTP Service Status	Stopped
NTP Service Startup Policy:	Start and stop with host

3.2.4 Setting a vCenter Appliance to Auto-Start

Use the following procedure to set a vCenter Appliance to start automatically:

 Select the host in the vSphere Web Client and then select Configure> Virtual Machines> VM Startup/Shutdown.

Summary Monitor	Configure Permissions	VMs Resource Pools Datastore	es Networks Updates	
 Storage Storage Adapters Storage Devices 	Virtual Machine St If the host is part of a vSphere	tartup and Shutdown HA cluster, the automatic startup and shutc	lown 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 arc 1	Disabled	120
Virtual Machines		W	Disabled	120
VM Startup/Shutdo		D	Disabled	120
Default VM Compati		147	Disabled	120

2. Click the **Edit** button.

The Edit VM Startup and Shutdown window displays.

	Auto	imatically start a	and stop the virtual m	achines with the s	ystem	
Startup delay	120	<u> </u>	Continue if VMware T	ools is started		
Shutdown delay	120					
Shutdown action	Power	off •				
Automatic Or						
Automatic Or.						
		Enabled	120	wall for startu	Power off	120
1	AD					
1	AD VMware vCe	Enabled	120	Walt for startu	Power off	120
1 2 3	AD VMware vCe	Énàbled Enabled	120 120	Wait for startu	Power off Power off	120 120
1 2 3 Manual Start_	AD VMware vCe CS	Enabled Enabled	120 120	Walt for startu Walt for startu	Power off Power off	120 120
1 2 3 Manual Start_	AD VMware vCe CS	Enabled Enabled	120 120 120	Wait for startu Wait for startu Wait for startu	Power off Power off Power off	120 120 120
1 2 3 Manual Start	AD VMware vCeCS	Enabled Enabled	120 120 120	Wait for startu Wait for startu Wait for startu Wait for startu	Power off Power off Power off Power off	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 and set the following options:
 - Set Startup Behavior to Use specified settings
 - Select Continue immediately if VMware Tools starts
 - Set Startup Delay to 0
 - Set Shutdown Behavior to Use specified settings
 - Set Shutdown Delay to 0

Set Perform shutdown action to Guest shutdown



5. Click **OK** to apply the configuration settings.

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

3.2.5 Mounting an NFS ISO Datastore

Use the following procedure to mount an NFS ISO datastore:

- 15. In the main vSphere Web Client window, select Hosts and Clusters and select the host.
- 16. Select **Storage** -> **New Datastore** from the **Actions** drop-down menu.

The New Datastore window displays with the Type tab selected.

1 Type 2 Select NFS version	Type 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 and click Next to proceed.

The Select NFS version tab displays.

4. Select the correct NFS version and click **Next** to proceed.

The Name and configuration tab displays.

- 5. Enter the NFS exported folder path and the NFS server address in the **Folder** and **Address** fields.
 - a) Because the data store is an ISO data store, consider mounting it as read-only by checking the **Mount NFS** as read-only checkbox.
- 6. Click **Next** to proceed.

The Host accessibility tab displays.

- 7. Select the host that will use the new data store.
- 8. Select **Next** to proceed.

The *Ready to complete* tab displays.

1 Type 2 Select NFS version 3 Name and configuration	Name and configuration	on figuration			
4 Ready to complete	If you plan to con it is recommended datastore instead	nfigure an existing datastore on new hosts in the datacenter; ed 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	Server:			
		E.g: nas, nas.it.com or 192.168.0.1			
	Access Mode				
	Mount NFS as read-	only			

- 17. Review the settings.
- 18. Click **Finish** to complete the procedure for adding the NFS ISO datastore.
- 0. This datastore is now accessible as an installation source for virtual machine CD drives.

Chapter 4. Building VMware Horizon

<u>VMware Horizon®</u> is a platform for managing and delivering virtualized or hosted desktops and applications to end-users. Horizon allows you to create and broker connections to Windows virtual desktops, Linux virtual desktops, and Remote Desktop Server (RDS) – enabling hosted applications and desktops.

This chapter covers installing VMware Horizon Connection Server and its supporting components, including:

- Prerequisites for VMWare Horizon Connection Server
- Installing Horizon Connection Server
- Registering the license
- Registering vCenter Server

4.1 Prerequisites for VMware Horizon Connection Server

Note: The Horizon Connection Server is not required for connections to NVIDIA vGPU VMs. The Horizon client can connect directly to VM's, desktops, and vApps using the <u>View Agent Direct-Connection (VADC)</u> plugin.

The following elements are required to install and configure VMWare Horizon Connection Server. For demonstration purposes, this guide will use the Horizon 8 2111 release.

- A valid license for VMWare Horizon, which can be registered <u>here.</u>
- Hardware Considerations:
 - Minimum: A 2.0 GHz processor or higher, 100 Mbps NIC, and 4GB RAM or higher
 - Recommended: 4 CPU's, 1 Gbps NICs, and at least 10 GB RAM for deployments of 50 or more desktops

- You must install all Horizon Connection Server installation types, including standard, replica, and enrollment server installations, on a dedicated physical or virtual machine that meets these specific hardware requirements.
- **Important:** The virtual machine that hosts Horizon Connection Server must have an IP address that does not change. In an IPv4 environment, configure a static IP address.
- See also: <u>VMware Connection Server PreRequisites</u>
- Architectural Considerations:
 - A VMWare Horizon supported operating system and Active Directory. The Connection Server host must not be a domain controller. Please refer to the <u>VMWare knowledge base article</u> for more information.
 - A compatible version of Horizon with versions of vCenter and ESXi. Please refer to the <u>VMWare Product Interoperability Matrix</u> for details.
 - When installing replicated Horizon Connector Server instances, you must configure the instances in the same physical location and connect them over a high-performance LAN.
 - A compatible web browser
 - A Domain User Account with Administrator Privileges
 - It is recommended that you prepare a data recovery password
- Software Considerations:
 - Remote Display Protocol and Software enables access to remote desktops and applications.
 - VMware's Blast Extreme is a feature-rich display protocol that enables clients to connect to
 remote desktops and published applications. The Blast Extreme display protocol connects to
 a wide range of end-client devices and maintains network continuity in cases of network
 hiccups on windows clients. Refer to the <u>VMware Blast Extreme</u> page for a complete list of
 VMware's Blast display protocol advantages.
 - Before creating the Connection Servers virtual machine template, run Sysprep to generalize the VM; This ensures the VMs will have a unique SID when you clone it later to install primary and secondary Connection Servers.
 - Additional Considerations First, clone a virtual machine from a VM template that does not have a Connection Server installed, run Sysprep on each cloned VM, and install the Connection Server on each virtual machine separately.
 - The Connection Server software cannot coexist on the same virtual or physical machine with any other VMware Horizon software components, including a replica server, Horizon Agent, or Horizon Client.
- Review the <u>Getting Started page</u> of VMware Horizon documentation. It provides a roadmap for implementing Horizon as a server and links to a list of helpful VMware education courses.



Note: Please consult the requirements listed in <u>VMware Connection Server Prerequisites</u>.

4.2 Installing Horizon Connection Server

To find the most recent version of Horizon Connection Server, please refer to <u>VMware Horizon</u> <u>Documentation</u> for release information.

CAUTION: VMware Horizon 8 2111 is used to capture content for this guide. Text, images, and screen layout may differ from version to version.

- 1. Download the Connection Server file from the VMWare download site.
- 2. Navigate to the Connection Server installer and double-click the file to start the installation wizard. The installer filename is VMware-Horizon-Connection-Server-x86_64-*y.y.y-xxxxxx*.exe, where *xxxxxx* is the build number, and *y.y.y* is the version number.

Ex. VMware-Horizon-Connection-Server-x86_64-8.4.0-18964782.exe

- 3. If prompted to allow the app to change your device, click **Yes**. The *Welcome page* of the wizard appears.
- 4. Click **Next** to display the *End User License Agreement* screen.



5. Accept the license agreement terms, then select Next to continue.



6. The Horizon installer displays the *Destination Folder* window.

Choose an install location and select Next.

🕂 VMwar	e Horizon Connection Server			×
Destinati Click Nex	i on Folder kt to install to this folder, or clic	k Change to install	to a different folde	er.
	Install VMware Horizon Conne C: \Program Files \VMware \VM	ection Server to: ware View\Server\		Change
		< <u>B</u> ack	<u>N</u> ext >	Cancel

- 7. The Horizon installer displays the *Installation Options* screen. Configure the following:
 - Set the type of Horizon Connection Server instance to Horizon Standard Server.
 - Check the Install HTML Access checkbox
 - Select IP protocol version IPv4.
 - Click **Next** to continue.

💬 VMware Horizon Connection Server	×
Installation Options Select the type of Horizon Connection Se	erver instance you want to instali.
Select the type of Horizon Connection Se	erver instance you want to install.
Horizon Standard Server Horizon Replica Server Horizon Enrollment Server	Install HTML Access
Perform a standard full install. This is use Connection Server or the first instance o	d to install a standalone instance of Horizon f a group of servers.
Specify what IP protocol version shall be instance:	used to configure this Horizon Connection Server
<u>IPv4</u> Ті IPv6 рі	nis server will be configured to choose the IPv4 rotocol for establishing all connections.
	< Back Next > Cancel

8. The Horizon installer displays the *Data Recovery* screen.

Enter and re-enter a data recovery password, then click Next to continue.

📆 VMware Horizon Connection Server		×
Data Recovery Enter data recovery password details.		
This password protects data backups of your H will require entry of this password.	Horizon Connection Server. Recovering a backup	
Enter data recovery password:	•••••	
Re-enter password:	•••••	
Enter password reminder (optional):	1	
	< <u>B</u> ack <u>N</u> ext > Cancel	

9. The Horizon installer displays the *Firewall Configuration* screen:

Check the Configure Windows Firewall automatically checkbox. Click Next.



10. The Horizon installer displays the *Initial Horizon Administrators* screen.

NVIDIA recommends authorizing an Active Directory domain group.

🔝 VMware Horizon Connection Server 🛛 🗙					
Initial Horizon Administrators Specify the domain user or group for initial Horizon administration.					
To login to Horizon 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 Administrator.					
O Authorize the local Administrators group					
Authorize a specific domain user or domain group					
MyDomain WyGroup					
(domainname\username, domainname\groupname or UPN format)					
< <u>B</u> ack <u>N</u> ext > Cancel					

11. The Horizon install displays the User Experience Improvement Program screen:

Check or clear the Join the VMware Customer Experience Improvement Program based on preference. Select the appropriate values in the remaining fields, then click Next to continue.

12. On the *Ready to Install* page, leave **General** as the default to indicate that you are deploying the Connection Server as an on-premises environment.

Click Install to complete the installation.

🔛 VMware Horizon Connection Server 🛛 🗙
Ready to Install the Program The wizard is ready to begin installation.
VMware Horizon Connection Server will be installed in:
C:\Program Files\VMware\VMware View\Server\
Please select where you will deploy the Horizon connection server. Select General if none of the other types apply. Note that you cannot change the deployment location of the connection server after the installation is completed.
General 🗸
Click Install to begin the installation or Cancel to exit the wizard.
< <u>B</u> ack <u>I</u> nstall Cancel

13. The Horizon installer displays the *Installer Completed* screen.

Click **Finish** to exit the installer.

) VMware Horizon Conn	ection Server	×
vmware	Installer Completed	
-/-	The installer has successfully installed VMware Horizon Connection Server, Click Finish to exit the wizard,	
	Next Steps:	
	Show the documentation	
v _{Mware} Horizon®		
Product version: 2111	<back cane<="" finish="" td=""><td>el</td></back>	el

14. Open the browser page at *https://<host>/admin,* where **<host>** is the **FQDN hostname** of the server you installed Horizon.

4.2.1 Registering the Horizon License

Generate a license key from <u>VMWare Product Registration</u> if you have not already done so.

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

	weiler,1111	
NVIDIA-Admin		
		_
TME		÷
Remember use	ername	
	Sign in	

-

 Horizon defaults to the Product Licensing and Usage page. In the Right-hand pane, Horizon preselects the Licensing and Usage tab. Select the Edit License button – Horizon Administrator displays the Edit License window:



- 3. Enter your **license key** in the License serial number field. Click **OK** to decode and apply for the license.
- 4. Verify that the license is enabled by looking for the **Enabled** messages in the **License Expiration**, **Desktop License**, **Application Remoting License**, and **Instant Clone License** part of the *Licensing and Usage* window.



4.3 Registering vCenter Server

vCenter Server creates and manages the virtual machines used in Horizon desktop pools. The Connection Server uses a secure channel (TLS/SSL) to connect to the vCenter Server instance.

1. In the left-hand pane of the Horizon Administrator window, select **Settings > Server**, which takes you to the vCenter servers tab, then click the **Add** button.

VMware Horizon*		Pod Cluster-CONNSERV8	Lister Search	
7 киранине 12/15/2021 k2:04 РМ 🛛 >	Servers			
Mölitor				
Dauhboard	VCenter Servers Gat	eways Connection Servers		
Events	Last Diff. Inc.	Litter of		
Sessions	400 000 000	More -		
Help Desk				
Users and Groups				
Inventory ~	vCenter Server	VM Disk Space Reclamation	View Storage Accelerator	Pr
Desktopn				
Applications				
Farms				
Mathines				
Settings +				
Servers-				
Domeins				
Product Licenting and Lilage				
Global Settings			No constant available	
Registered Machines				
Administrations				
Cloud Pod Archimature				
Event Configuration				
Global Policies				
Troubleshooting				
	(1)			

- 2. On the Add vCenter Server page, complete the following text boxes before clicking Next:
 - Server address Enter the fully qualified domain name (FQDN) of the vCenter Server instance.
 - Username and Password Use the format name@domain.com for the name of the vCenter Server user account.

You can leave the default settings for the other text boxes. (Do Not Use View Composer)

Kenter Information	- Annes address (g			
	eCourse HielDok game			
D cursis	- Net Name			
	Address of Address A			
a many or response.				
	Description			
	* Pert			
	Deployment Type:			
	Desery	2		
	Advanced Settings			
	specify the concurrent apertonic lines. (2)			
	- Man concorrent «Center promisioning operations»			
	24			

- 3. If an Invalid Certificate Detected prompt is displayed:
 - Click View Certificate.
 - In the **Certificate Information** window, review the thumbprint of the default self-signed certificate that was generated during installation, then click **Accept**.
- 4. Click **Next** on the rest of the wizard pages to accept the defaults.

read roomer dorrer		
VCenter Information	Storage Settings @	
-	Reciem VM disk spece	
2) Storage	Enable View Storage Accelerator	
Ready to Complete	Diefmant Hissa Cache State 1024 Mit	E.
	Electre muse ser bahawan 1/03 MB and \$1,766 MB	
	Hosts	
	Show Ali Hosta	
	(endactive size)	
	Hest	Cacrye Size (Mill)
	9	Detwit
		Debut
		Detailt
		Dehalt
	1.01	Romperpage 25 V 1-30af bitmer 1 1/2 + 4

5. On the **Ready to Complete** page, select **Submit.**

ur Narre-		
(period)		
642 You money		
rugt Pizz 6	ALC: NO	
(k Provision)	20'	
w Player	50	
ar robourtent mainteoance erations	12	
a Instant Clone Engine Provision	20	
able View Storage Accelerator	TEL	
taute hand cachie star (MID)	1 1024	
Posk Space Reclamation	785	
	nug) Park a Provinsion a Provinsion a Provinsion eration a Instance Clone Engine Provinsion attre View Strange Addreserated taket front cachine star (Milli Look Space Acclanation	Nugh Park Add or Provessori 20 or Provessori 20 or Provessori 20 or Provessori 20 or productive of Angene Provessori 20 of the View Structure Structure Frommanne 20 of the View Structure Structure Frommanne 1000 the View Structure Structure Frommanne 1000 the View Structure Frommanne 1000

6. You are returned to the **Servers** > **vCenter Servers** tab, and the server you just added will appear in the list.

Chapter 5. Installing and configuring the NVIDIA vGPU Manager VIB

This chapter covers installing and configuring the NVIDIA vGPU Manager:

- Preparing the VIB file for Install
- Uploading VIB using WinSCP
- Installing vGPU Manager with the VIB
- Updating the VIB
- Verifying the Installation of the VIB
- Uninstalling the VIB
- Changing the Default Graphics Type in VMWare vSphere 6.5 and Later
- Changing the vGPU Scheduling Policy
- Disabling and Enabling ECC memory

5.1 Preparing the VIB file for Install

Before you begin, download the archive containing the VIB file from the <u>NVIDIA Enterprise</u> <u>Application Hub</u> login page and extract the archived contents to a folder. The file ends with .VIB is the file you must upload to the host datastore for installation.

Note: For demonstration purposes, these steps use WinSCP to upload the .VIB file to the ESXi host.WinSCP can be downloaded here.

5.1.1 Upload the .VIB file using WinSCP

WinSCP is a Secure Copy (SCP) protocol based on SSH (Secure Shell) that enables file transfers between hosts on a network—uploading the. **VIB** file using WinSCP is the quickest way to transfer the file from the Source location to the destination location, the ESXi datastore. Refer to the <u>WinSCP</u> <u>documentation</u> page for detailed information.

1. To upload the **.VIB** file to the ESXi datastore using WinSCP. Start WinSCP.



- 2. WinSCP opens to the **Login** window. In the Login window:
 - Select **SCP** as the file transfer protocol from the **File Protocol** dropdown menu.
 - Enter your ESXi hosts' name in the Hostname field.
 - Enter the hosts' username in the **User name** field.
 - Enter the hosts' password in the **Password** field.

Note: Optional - You may want to <u>save your session details</u> to a site, so you do not need to type them in each time you want to connect—Press the Save button and type the site name.

Select the **Login** button to connect to the ESXi host using the credentials you provided.

Vew Site		Session File protocol: SCP	-	
		Host name:		Port number:
		User name:	Password:	
		Save +	Ilectore	Advanced

- 3. Select Yes to the Host Certificate warning.
- 4. Once you are connected to the ESXi host, you will see the contents of the default remote directory (typically, this is the ESXi hosts user's home directory) on the <u>remote file panel</u>.



- 5. Upload the .VIB file from the Source location to the Destination location (the DataStore on the ESXi host).
 - In the left panel (Source Directory), navigate to the location of the .VIB file. Select the **.VIB** file.
 - Navigate to the destination location within the DataStore on the ESXi host in the right panel.
 - Select the **Upload** button over the left panel to start the .VIB file download.

B-	- ū x
Local Mark Files Commands Session Options Remote Help Transfer Settings Default root@vgpu05.tme.nvidia.com × My documents * Upload * Edit * X Properties * New + New	- 2
Name Size Type Chan	Name Si Destination Directory
9 B of 51.0 MB in 1 of 28 1 hidden	0 B of 14.3 GB in 0 of 33 10 hidden

6. The **.VIB** file is uploaded to the datastore on the ESXi host.

ā.,			- D X
Local Mark Files Commands Session Options	s Remote Help 🗿 Queue 👻 🛛 Transfer Settings Defaul	It	· ø·
i root®vgpu05.tme.nvidia.com × New S Wy documents Prove P	ession		🚬 572801c5-, - 🚔 - 🕎 - I 🗢
Upload • 🖉 Edit • 🗶 📷 La Properties	New 🕶 🛨 🖃 🗹		Avmfs/volumes/*
Name	Size Type	Chan	Name 5
9 B of 51.0 MB in 1 of 28		1 hidden	1 0 6 of 14.3 68 in 0 of 33 10 hidd

5.2 Installing vGPU Manager with the VIB

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: Before 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. Consult <u>Virtual GPU Software for VMware vSphere Release Notes</u> for further details.

To install the vGPU Manager .VIB, you need to access the ESXi host via the ESXi Shell or SSH. Refer to <u>VMware's documentation</u> on how to enable ESXi Shell or SSH for an ESXi host



Note: Before proceeding with the vGPU Manager installation, make sure that all VMs are powered off, and the ESXi host is in Maintenance Mode. Refer to VMware's documentation on how to place an ESXi host in maintenance mode.

1. Place the host into Maintenance mode by right-clicking it and then selecting Maintenance Mode - Enter Maintenance Mode.

Navigato	r 🔲 🗍 V(pu05.tme.nvidia.com	
Host Manag Monito	Host Manage with vCenter Server Disconnect from vCenter Server Create/Register VM Shut down Reboot	rver Version: State: Uptime:	7.0 Update 2 Normal (conr 68.18 days
	Services	his host is being manage	ed by vCenter Serv
	Enter maintenance mode Lockdown mode Permissions	ou are running DellEMC	Customized versio
	Generate support bundle	ifacturer	Dell Inc. PowerEdge

Note: 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.

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 place's the ESXi host in Maintenance Mode.
- 3. Enter the esxcli command to install the vGPU Manager package:

```
[root@esxi:~] esxcli software vib install -v directory/NVIDIA_bootbank_NVIDIA-
VMware_ESXi_7.0.2_Driver_470.80-10EM.702.0.0.17630552.vib
Installation Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed: NVIDIA_bootbank_NVIDIA-VMware_ESXi_7.0.2_Driver_470.80-
10EM.702.0.0.17630552
VIBs Removed:
VIBs Skipped:
```



Note: The directory is the absolute path to the directory that contains the VIB file. You must specify the absolute path even if the VIB file is in the current working directory.

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

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

5. From the vSphere Web Client, exit Maintenance Mode by right-clicking the host and selecting **Exit** Maintenance Mode.

Note: Alternatively, you may exit from Maintenance mode via the command prompt by entering:

\$ esxcli system maintenanceMode set --enable=false

This command will not return a response.

Making this change via 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.

Reboot the host from the vSphere Web Client by right-clicking the host and selecting Reboot.

Note: You can reboot the host by entering the following at the command prompt:

\$ reboot

This command will not return a response—the Reboot Host window displays.

7. When rebooting from the vSphere Web Client, enter a descriptive reason for the reboot in the Log a reason for this reboot operation field, and click **OK** to proceed.

5.3 Updating the VIB

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

- To update the vGPU Manager VIB you need to access the ESXi host via the ESXi Shell or SSH. Refer to VMware's documentation on enabling ESXi Shell or SSH for an ESXi host.
- The driver version seen within this document is for demonstration purposes. There will be similarities, albeit minor differences, within your local environment.



Note: Before proceeding with the vGPU Manager update, make sure that all VMs are powered off, and the ESXi host is placed in maintenance mode. Refer to VMware's documentation on putting an ESXi host in maintenance mode.

1. Use the esscli command to update the vGPU Manager package:

```
[root@esxi:~] esxcli software vib update -v directory/NVIDIA_bootbank_NVIDIA-
VMware_ESXi_7.0.2_Driver_470.80-10EM.702.0.0.17630552.vib
```

```
Installation Result
```

```
Message: Operation finished successfully.
    Reboot Required: false
    VIBs Installed: NVIDIA_bootbank_NVIDIA-VMware_ESXi_7.0.2_Driver_470.80-
10EM.702.0.0.17630552
    VIBs Removed: NVIDIA_bootbank_NVIDIA-
VMware_ESXi_7.0_Host_Driver_460.73.0210EM.700.0.0.15525992
    VIBs Skipped:
```

Note: *directory* is the path to the directory that contains the VIB file.

2. Reboot the ESXi host and remove it from maintenance mode.

5.4 Verifying the Installation of the VIB

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

1. Verify that the NVIDIA vGPU software package is installed and loaded correctly by checking for the NVIDIA kernel driver in the list of kernels-loaded modules.

```
[root@esxi:~] vmkload_mod -1 | grep nvidia
nvidia 5 8420
```

- 2. If the NVIDIA driver is not listed in the output, check dmesg for any load-time errors reported by the driver.
- 3. Verify that the NVIDIA kernel driver can successfully communicate with the NVIDIA physical GPUs in your system by running the nvidia-smi command.

The nvidia-smi command is described in more detail in <u>NVIDIA System Management Interface</u> <u>nvidia-smi</u>.

Running the nvidia-smi command should produce a listing of the GPUs in your platform.

Tue Jan 4 20:48:42 2022 +_____ NVIDIA-SMI 470.80 Driver Version: 470.80 CUDA Version: N/A -----+ GPU Name Persistence-M Bus-Id Disp.A | Volatile Uncorr. ECC |
 Fan
 Temp
 Perf
 Pwr:Usage/Cap
 Memory-Usage
 GPU-Util
 Compute M.
 MIG M. 0 NVIDIA A16 On | 00000000:3F:00.0 Off | 0 | 0% 33C P8 15W / 62W | 896MiB / 15105MiB | 0% Default | N/A | _____ -+-------+
 0
 NVIDIA A16
 On
 00000000:41:00.0 Off
 0

 0%
 34C
 P8
 15W / 62W
 3648MiB / 15105MiB
 0%
 Default
 N/A -----+ 0 NVIDIA A16 On | 00000000:43:00.0 Off | 0 | 0% 29C P8 15W / 62W | 0MiB / 15105MiB | 0% Default | N/A | 0% 26C P8 15W / 62W | 0MiB / 15105MiB | 0% Default | -----+ 0 NVIDIA A40 On | 00000000:D8:00.0 Off | 0 | 0% 30C P8 30W / 300W | 0MiB / 45634MiB | 0% Default | N/A -----+ Processes: GPU Memory Usage GPU GI CI PID Type Process name No running processes found _____

If nvidia-smi fails to report the expected output for all the NVIDIA GPUs in your system, see <u>NVIDIA Virtual GPU Software User Guide</u> for troubleshooting steps.

The NVIDIA System Management Interface nvidia-smi also allows GPU monitoring using the following command:

\$ nvidia-smi -1

This command switch adds a loop, automatically refreshing the display. The default refresh interval is 1 second
5.5 Uninstalling the VIB

To uninstall vGPU Manager:

1. Run ${\tt esxcli}$ to determine the name of the vGPU driver bundle.

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

NVIDIA-VMware_ESXi_7.0.2_Driver 470.80-10EM.702.0.0.17630552

- 2. Run the following command to uninstall the driver package. \$ esxcli software vib remove -n NVIDIA-VMware_ESXi_7.0_Host_Driver -maintenance-mode
- 3. The following message displays if the uninstall process is successful.

```
Removal Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed:
VIBs Removed: NVIDIA-VMware_ESXi_7.0_Host_Driver-460.73.02-
10EM.700.0.0.15525992
VIBs Skipped:
```

4. Reboot the host to complete the uninstall of the vGPU Manager.

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

The vGPU Manager VIBs for VMware vSphere 6.5 later provides vSGA and vGPU functionality in a single VIB. After the VIB is installed, the default graphics type is Shared, which provides vSGA functionality. To enable vGPU support for VMs in VMware vSphere 6.5, you must change the default graphics type to Shared Direct. If you do not modify the default graphics type, VMs to which a vGPU is assigned fail to start, and the following error message is displayed:

Recent Tasks Alarms												3
Taist Name T	Target	Ť	Stales.	Ŧ	Delata	τ	fribitor	т	General F 🕆	Start Time	+ +	Gers
Power bir Sirtual macrimum	@ Desktop1		O The amount of graphics resource available in the parent resource pool is insufficient for the operation				NVIDIA Admin		àms.	0005/2022 5.56	NA CHE	ave.
estation of the second se	E DataCenter		(B) concerned				NVIDIA/Admin		(249.)	0M05/2022 5/5/	AN IT'S	-
												- 1
m At - Mon Te	ei -								-			1.000

Note: 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 configuring vGPU. Output from the VM console in the VM ware vSphere Web Client is unavailable for VMs running vGPU. Before changing the default graphics type, ensure that the ESXi host is running and that all VMs on the host is powered off.

- 1. Log in to vCenter Server by using the vSphere Web Client.
- 2. In the navigation tree, select your ESXi host and click the **Configure** tab.
- 3. From the menu, choose **Graphics** and then click the **Host Graphics** tab.
- 4. On the Host Graphics tab, click Edit.

	a transmission	ACTIONS -		
Datacenter	Summary Monitor	Graphics Devices Host Graphics Edit Host Graphics Setting	source Pools Datastores. Networks	Updates
ALC: NOT THE OWNER OF THE OWNER OWNER OF THE OWNER OWNER OWNER OF THE OWNER OWNE OWNER OWNE OWNER OWNE OWNER OWNE	Certificate	Default graphics type	Shared	
	Advanced System S System Resource Re Firewall Services Security Profile System Swap Packages ▼ Hardware Processors Memory	Shared passthrough GPU assignment policy	Spread VMs across GPUs (best performance)	
	Pct Devices Graphics Power Management More Alarm Definitions Scheduled Tasks			

5. In the Edit Host Graphics Settings window box that opens, select Shared Direct and click OK.

6	Edit Host Graphics Settings	1
A Setting	gs will take effect after restarting the host or "xorg" service.	
C Sha	red	
VMv	vare shared virtual graphics	
• Sha	red Direct	
Veni	dor shared passthrough graphics	
Shared pa	ssthrough GPU assignment policy:	
. Spre	ead VMs across GPUs (best performance)	
Gro	up VMs on GPU until full (GPU consolidation)	
	OK	Cancel

Note: 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>.

After you click **OK**, the default graphics type changes to Shared Direct.

6. Restart the ESXi host or stop and restart the Xorg service and nv-hostengine on the ESXi host.

To stop and restart the Xorg service and nv-hostengine, perform these steps:

- a) Stop the Xorg service.
 [root@esxi:~] /etc/init.d/xorg stop
- b) Stop nv-hostengine.
 [root@esxi:~] nv-hostengine -t
- c) Wait for 1 second to allow nv-hostengine to stop.
- d) Start nv-hostengine.
 [root@esxi:~] nv-hostengine -d
- e) Start the Xorg service.
 [root@esxi:~] /etc/init.d/xorg start

After changing the default graphics type, configure vGPU as needed in <u>Configuring a vSphere VM with</u> <u>Virtual GPU</u>.

See also the following topics in 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 a 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 graphics-light applic performance in other VMs.

GPUs, starting with the NVIDIA Pascal[™] architecture, also support equal share and fixed share vGPU schedulers. These schedulers limit GPU processing cycles used by a vGPU which prevents graphicsintensive 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.

5.7.1 vGPU Scheduling Policies

In this section, the three NVIDIA vGPU scheduling policies are defined. The vGPU scheduling policy is designed to fully use the GPU by balancing processes during GPU availability and unavailability. The overall intent of the three vGPU scheduling policies is to keep the GPU efficient, fast, and fair.

- Best effort scheduling provides consistent performance at a larger scale and reduces the TCO per user. The best effort scheduler leverages a round-robin scheduling algorithm, which shares GPU resources based on actual demand, optimally utilizing resources. This results in consistent performance with optimized user density. The best effort scheduling policy best uses the GPU during idle and not fully utilized times, allowing for optimized density and a good QoS.
- Fixed share scheduling always guarantees the same dedicated quality of service. The fixed share scheduling policies guarantee equal GPU performance across all vGPUs sharing the same physical GPU. Dedicated quality of service simplifies a POC. It also common benchmarks to measure physical workstation performance, such as SPECviewperf, to compare the performance with current physical or virtual workstations.
- Equal share scheduling provides equal GPU resources to each running VM. As vGPUs are added or removed, the share of GPU processing cycles allocated changes, accordingly, resulting in performance to increase when utilization is low and decrease when utilization is high.

Organizations typically leverage the best effort GPU scheduler policy for their deployment to achieve better utilization of the GPU, which usually results in supporting more users per server with a lower quality of service (QoS) and better TCO per user. Additional information regarding GPU scheduling can be found <u>here</u>.

5.7.2 <u>RmPVMRL Registry Key</u>

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

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

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 a fixed share scheduler with the default time slice length. RmPVMRL=0x11

This example sets the vGPU scheduler to a 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

Perform this task in your hypervisor command shell.

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

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

Where <value> is the value that sets the vGPU scheduling policy you want, for example:

- 0x00 (default) Best Effort Scheduler
- **0x01** Equal Share Scheduler with the default time slice length
- 0x00030001 Equal Share Scheduler with a time slice of 3 ms

- 0x11 Fixed Share Scheduler with the default time slice length
- **0x00180011** Fixed Share Scheduler with a time slice of 24 ms (0x18)
 - To review: 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

For all supported values, see <u>RmPVMRL Registry Key.</u>

4. Reboot your hypervisor host machine.

Note: Confirm that the scheduling behavior was changed as explained in <u>Getting the Current Time-Sliced</u> vGPU Scheduling Behavior for All GPUs.

5.7.4 Changing the vGPU Scheduling Policy for Select GPUs

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 the secure shell (SSH) for this purpose.
- 2. Use the lspci command to obtain the PCI domain and bus/device/function (BDF) of each GPU for which you want to change the scheduling behavior.
- 3. Pipe the output of lspci to the grep command to display information only for NVIDIA GPUs. # lspci | grep NVIDIA

The NVIDIA GPU listed in this example has the PCI domain 0000 and BDF 3f:00.0.

0000:3f:00.0 3D controller: NVIDIA Corporation NVIDIANVIDIA A16 [vmgfx0]

```
4. On VMware vSphere, use the esxcli set command.
# esxcli system module parameters set -m nvidia \
-p "NVreg_RegistryDwordsPerDevice=pci=pci-domain:pci-bdf;RmPVMRL=value\
[;pci=pci-domain:pci-bdf;RmPVMRL=value...]"
```

For each GPU, provide the following information:

- pci-domain
 - The PCI domain of the GPU.
- pci-bdf

- ▶ The PCI device BDF of the GPU.
- value
 - The value that sets the GPU scheduling policy and the length of the tie slice you want. For example:
 - 0x01 Sets the vGPU scheduling policy to Equal Share Scheduler with the default time slice length.
 - 0x00030001 Sets the vGPU scheduling policy to Equal Share Scheduler with a time slice that is 3ms long.
 - **0x11** Sets the vGPU scheduling policy to Fixed Share Scheduler with the default time slice length.
 - 0x00180011 Sets the vGPU scheduling policy to Fixed Share Scheduler with a time slice that is 24 ms (0x18) long.
 - ▶ For all supported values, see <u>RmPVMRL Registry Key</u>.

This example adds an entry to the /etc/modprobe.d/nvidia.conf file to change the scheduling behavior of two GPUs as follows:

- For the GPU at PCI domain 0000 and BDF 85:00.0, the vGPU scheduling policy is set to Equal Share Scheduler.
- For the GPU at PCI domain 0000 and BDF 86:00.0, the vGPU scheduling policy is set to Fixed Share Scheduler.

options nvidia NVreg_RegistryDwordsPerDevice=

"pci=0000:85:00.0;RmPVMRL=0x01;pci=0000:86:00.0;RmPVMRL=0x11"

5. Reboot your hypervisor host machine.

Note: Confirm that the scheduling behavior was changed as explained in <u>Getting the Current Time-</u> <u>Sliced vGPU Scheduling Behavior for All GPUs.</u>

5.7.5 Restoring Default vGPU Scheduling Policies

Perform this task in your hypervisor command shell.

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

esxcli system module parameters set -m nvidia -p "module-parameter="

module-parameter

The module parameter to set, which depends on whether the scheduling behavior was changed for all GPUs or select GPUs:

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

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 NVIDIA GPUs support error-correcting code (ECC) memory with NVIDIA vGPU software. 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. Refer to the NVIDIA Virtual GPU Software Documentation for detailed information about ECC Memory.

Note: Enabling ECC memory has a 1/15 overhead cost because it uses the GPU VRAM to store the ECC bits —resulting in a less usable frame buffer for the 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 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 usable by the 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.

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

If you use 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 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 use 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 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 where 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, 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.

[...]

- 2. Change the ECC status to off for each GPU for which ECC is enabled.
 - a) 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
```

b) 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.

[...]

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 this task is performed 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 where 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, 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.

CUDA Version	:	Not Found
Attached GPUs GPU 00000000:3F:00.0	:	5
[]		
Ecc Mode		
Current Pending	: :	Disabled 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

```
# nvidia-smi -q
```

```
======NVSMI LOG==========
```

Timestamp	:	Fri Dec	3	20:50:42	2021
Driver Version	:	470.80			
Attached GPUs	:	5			
GPU 0000000:3F:00.0					
[]					
Ecc Mode					
Current	:	Enabled			
Pending	:	Enabled			
[]					

Chapter 6. NVIDIA License Server System

This chapter covers The NVIDIA Licensing System, including:

- NVIDIA License Server Documentation.
- License Purchasing
- Server Instance types

6.1 NVIDIA License Server Documentation

The NVIDIA License System serves licenses to NVIDIA software products. To activate licensed functionalities, a licensed client leases a software license served over the network from an NVIDIA License System service instance. The <u>NVIDIA License System Documentation</u> explains in full detail how to install, configure, and manage licenses for virtual GPU software.

NVIDI RTX Virtual Workstation (vWS), NVIDIA Virtual PC (vPC), and NVIDIA Virtual Applications (vApps) are available as licensed products on NVIDIA GPUs. To enable the full features of the vGPU, configure the licensing for these products. NVIDIA vGPUs that require licensing run at a reduced capability until a license is acquired.

6.2 License Purchasing

NVIDIA vGPU software products can be purchased as either a perpetual license with a Support Updates and Maintenance Subscription (SUMS) or an annual subscription. The perpetual license gives the user the right to use the software indefinitely, with no expiration. All NVIDIA vGPU software products with perpetual licenses must be purchased in conjunction with a four-year or five-year SUMS. A one-year SUMS is available only for renewals. For more information, refer to the <u>Virtual GPU</u> <u>Packaging and Licensing Guide</u>.

6.3 Server Instance Types

The role of the service instance is to distribute licenses to client systems from the license server to which it is linked. Summarizing the process; A client system passes its client configuration token to the server instance. Information in the client configuration token enables the service instance to identify the licensed client, the License Server, and the entitlements (or software functionality) to distribute with the requested license.

Note: A Service Instance is required to serve licenses to licensed clients. You must choose a service instance type for your environment before proceeding. Refer to the <u>NVIDIA License System</u> <u>Documentation</u> for more information.

The NVIDIA License System has two types of Service Instances:

- Cloud License Service (CLS) instance (Recommended) NVIDIA CLS Instance is a cloudbased service hosted on the NVIDIA Licensing Portal and managed by NVIDIA and the cloud service provider.
 - Quick setup: The process for configuring a CLS instance is designed for ease of use and simplicity.
 - > You do not need dedicated resources; NVIDIA manages the infrastructure entirely.
 - The CLS Instance provides robustness and dynamic scalability, and maintenance updates are generally transparent.
- 2. **Delegated License Service (DLS) instance -** NVIDIA DLS instance is hosted on-premises at a location accessible from your private network, such as inside your data center. The DLS instance is installed as a virtual appliance.
 - The DLS virtual appliance is on-premises and is entirely disconnected from the NVIDIA Licensing Portal.
 - You can choose which data Centers to deploy your DLS instances and how many DLS instances you need.
 - Review the <u>DLS Virtual Appliance Platform Requirements</u> documentation for configuration and installation information.

Note: Refer here for <u>NVIDIA Virtual GPU Software License Server Documentation</u>.

Chapter 7. Selecting the Correct vGPU Profiles

This chapter covers selecting the correct vGPU Profiles:

- Creative and Technical Professionals
- Knowledge Worker profiles
- Frame buffer Utilization and vGPU Profile selection

Selecting the right vGPU profile based on the users' tasks and workloads maximizes the whole virtualization experience. Virtual GPU profiles determine the amount of frame buffer allocated to your virtual machine and which license is used for the virtual instances. This section provides vGPU profile guidance and additional references for these NVIDIA licensed software products - <u>NVIDIA RTX Virtual</u> <u>Workstation (RTX vWS)</u>, <u>NVIDIA Virtual PC (vPC)</u>, and <u>NVIDIA Virtual Applications (vApps)</u>.

7.1 Creative and Technical Professionals

Previously, creative and technical professionals were limited to physical devices like laptops or desktop workstations due to their demanding tasks and heavy workloads. But now, the NVIDIA Virtual GPU (vGPU) paired with the <u>NVIDIA RTX Virtual Workstation (RTX vWS)</u> software solution enables creative and technical professionals the ability to access their most demanding applications from anywhere with performance that rivals physical workstations. NVIDIA RTX vWS software accelerates professional design and visualization applications, including Autodesk Revit, Maya, Dassault Systèmes CATIA, Solidworks, Esri ArcGIS Pro, Petrel, and more.

Considerations for selecting the right vGPU profile for creative and technical professionals are compatibility and performance. The Q-series vGPU profiles undergo the same rigorous application certification process as the <u>NVIDIA RTX™ Enterprise platform drivers</u> for professional graphics applications. RTX vWS software supports RTX Enterprise drivers, allowing users to benefit from the acceleration and stability that RTX brings to professional applications used by the most demanding customers today. As a result, you can expect 100% compatibility and performance within your applications using the NVIDIA RTX vWS software licensed product.

Begin your profile selection by considering the requirements of your users' primary applications. Professional application software vendors certify their products to run with NVIDIA vGPU software, ensuring that the performance is tuned for maximum efficiency. Most vendors' websites have a dedicated page indicating the proper GPU hardware; 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.

7.1.1 Matching Profiles to User Needs

As stated earlier in the <u>Size Your Environment</u> section, you must define your users' needs and match them to the NVIDIA vGPU profiles that provide the right amount of frame buffer and the correct software licenses. By categorizing a user's workload as Light, Medium, and Heavy, we can illustrate a base VM configuration for an NVIDIA RTX vWS deployment.

- Light user
 - 8 GB RAM
 - Four vCPUs (2.4 GHz)
 - A40-8Q vGPU Profile
- Medium
 - 16 GB RAM
 - Eight vCPUs (2.6 GHz)
 - A40-12Q
- Heavy user
 - 32 GB RAM
 - 12 vCPUs (3.2 GHz)
 - A40-24Q

Note: These VM configurations are benchmark testing for the RTX vWS "Dedicated Performance" user type quality of service (QoS). For more RTX vWS Benchmarking results and vGPU sizing guidance, refer to the <u>NVIDIA RTX vWS Workstation Sizing Guide</u>.

7.2 Knowledge Worker Profiles

Today's digital workplace has become a hybrid workforce that is more now than ever dependent on desktop virtualization with increased graphics requirements for productivity applications. The workload of the digital worker (aka Knowledge Worker) includes a graphics-rich experience with immersive visual quality and processing speed. Selecting the right NVIDIA virtual GPU (vGPU) profile can meet the increasing demands of the Knowledge worker in a virtual desktop (VDI) environment. NVIDIA vGPU profiles determine the amount of frame buffer allocated to your virtual machine. The vGPU profiles supported on NVIDIA GPUs with NVIDIA software are the 1B (with 1024 MB of frame buffer) and 2B (with 2048 MB of frame buffer).

The NVIDIA vPC licensed software is selected for knowledge worker workloads within a virtual desktop infrastructure (VDI) environment. Workloads configured with the NVIDIA vPC software accelerates office productivity applications, streaming video, Windows, RDSH, multiple and high-resolution monitors, and 2D electric design automation (EDA).

7.2.1 Matching Profiles to User Needs

As stated earlier in the section <u>Size Your Environment</u>, you must define your users' needs and match them to the NVIDIA vGPU profiles that provide the right amount of resources. Here is a recommended knowledge worker's virtual machine configuration.

- vPC-1B vGPU profile for a Horizon VDI Desktop
 - 6 GB RAM
 - Four vCPUs @ 2.4 GHz or faster (single-socket)
 - Dual HD Monitor (1920x1080)
- vPC-2B vGPU profile for a Horizon VDI Desktop
 - 6 GB RAM
 - Four vCPUs @ 2.4 GHz or faster (single-socket)
 - Dual Quad Monitor (2560x1440) or Single 4K Monitor (4096x2160)

Note: For more information on Knowledge Worker sizing guidance, refer to the <u>NVIDIA</u> vPC Sizing Guide.

7.3 Frame Buffer Utilization and vGPU Profile selection

As stated earlier, NVIDIA vGPU profiles determine the amount of frame buffer allocated to your virtual machine, thereby rendering frame buffer utilization a critical metric when considering vGPU Profiles for your VDI deployment. Frame buffer utilization within the VM can be affected by the application load, monitor configurations, and screen resolution.

Multiple monitors and higher screen resolutions scenarios are also impactful considerations when deciding your deployment's most optimal vGPU profile. When the number of monitors is increased, more pixels are being delivered to the screen. The NVIDIA Engineering team conducted benchmark testing to illustrate the increased advantages of VDI desktops configured with NVIDIA's vPC software over CPU-Only configured VDI desktops..

Chapter 8. Creating Your First vGPU Virtual Desktop

This chapter describes how to:

- Creating a Virtual Machine in vSphere
- Installing Microsoft Windows
- Installing VMware Tools
- 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

8.1 Creating a Virtual Machine in vSphere

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

1. Open the vSphere Web Client:

A Home & Stoncuts	Home					
Hosts end Ousters Viris and Templaters	*					
Storage Nervorving Context Lincones Workload Management Ticcoli Inventory Lists	CPU 3.29 THz free.	Memory 14.35 1	1B free 20 et te total	Storage 66 Ti	B free	
Polices and Profiles Auto Deploy Hyperd Cloud Services	@ VMs	139	E Hosts			34
Developer Cetter	89 50 Pointrea 01 Powerea 01	C) Turpender	32 Derivected	0 Discoviettes	O	
© Administration ■ Tasys ■ Events						
D. tagi 6 Culton Athlbutei Di Litecyce Manager	Objects with most alerts	10	D Installed Plugins			6
Pealize Operations	iam. Dyame	& Warnings	VMware vRops Dent Put	gin Is Manager		-1
P DRadi			VHware Cloud Deachor &	Avanutikty		-
			VMware VSAN Plugar			
	5		Pure Storage Pluger			
	8		C vCenter Gever Ute-cycel	i Managui		
	(3-1)	R K S V T 1 S REAL				

2. From the vSphere Web Client's **Home** page, select **Hosts and Clusters.** Right-click the host or cluster location the VM will be created. Select **New Virtual Machine**.

vm vSpher	e Client Menu 🗸 🔍	िन्सदीर ही न्यों स्तारेष	Consists		
<u>.</u>	8		Manifes Canifesiu	ACTIONS	VINC Date
	Actions Vigni07 the nivela.com	o	Hypervisor: Model: Processor Type: Logical Processors: NICs Virtual Machines State Uptime	VMware ESXI: 7.0.2 PowerEdge R7525 AMD EPVC 7402.24 96 4 0 Connected 14 days	18538813 -Core Processor
> 11 > 10 > 10 > 10	C Deploy OVF Template.	Hardware	DELLEN	ИС	
	Maintenance Mode	Manuta Model	acturer	Dei Inc. PowerEc	ge R7525

3. From the Select a creation type tab, select Create a new virtual machine and click Next.



4. 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.

2 Select a creation type 2 Select a name and folder	Select a creation type How would you like to create a virtual m	achine	e?
3 Select a compute resource 4 Select storage 5 Select compatibility 6 Select a guest OS 7 Customize hardware 8 Ready to complété	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 a new virtual machine. You will be able to customize processors, memory, network connections, and storage. You will need to install a guest operating system after creation.
			CANCEL BACK NE

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

2 Select a name and folder	Select a compute resource Select the destination compute resource for this operation	
Select a compute resource Select prorage Select pomparisative Select pomparisative Select a upural ON Contomize nertoenee Selects to comparise	 ○ 冊 TM ○ □ ○ □<!--</th--><th></th>	
	Compatibility	
	Comparison and the second s	

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

1 Select a creation type 2 Select a name and folder 3 Select a compute resource 4 Select storage Select convalignity promotion top	Select atomage Select the storage for the configuration and disk files							
	Encryct Mith result index VM Storage Policy Disable Storage DRS for	unie (Riegounie) - this wrtsai mae	Gey Manageround Server Datastore Defa	uit.	-			
 Cumornizo bandwate Seady to comparts 	Name DataStore	† Simage	Cor 🕈 Cadincity 🕈 8.73.TB	Frovillone + 395.35 GB	6.4 TB	Type VMES 6	• 0×	der 🔹 🕈
					_			
	() Compatibility			_	_			These

7. Compatibility settings allow the VM to run on different versions of vSphere. To run vGPUs, select ESXi 7.0 U2, and later, click **Next** to continue. vSphere prompts you to select a guest OS:

New Virtual Machine	
 1 Select a creation type 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 	The host or cluster supports more than one VMware witual machine version Select a compatibility for the virtual machine
5 Select compatibility	Compatible with ESKI7.0 U2 and later 💙 🛈
T Can learning Fan dwar	This virtual machine uses hardware version 19, which provides the best performance and latent features available in ESXI 7.0.02
Tribled A to could have	
	CANCEL BACK NEXT

8. 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:

3 Select a compute resource 4 Solect torrage 5 Select compatibility Guest OS Family Guest OS Guest Guest OS Guest Guest	efaults for the operating a	şyşteminstalisticin
5 Select compatibility Guest OS Family Windows Customily hardware Ready to complet		
6 Select a guest OS Euest CS Version Microsoft Windows 10 (64-bit) 7 Customics hardware Image: CS Version Image: CS Version 8 Ready to complete Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version Image: CS Version		
a Ready to complifie		
Con	patibility; ESX(7 O U2 and	d later fVM version

9. 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	Autoentergaware Ale Objions				
 2 Select a name and folder 3 Select a compute resource 4 Select storage 5 Select compatibility 		ADD NEW DEVICE			
	5 CPU*	8 ~	0		
	> Memory *	16 😽 GB			
6 Select a guest OS	> New Hard disk*	90 G5 ~			
E Tready to complete	> New SCSI controller	LSI Logic \$A5			
	> New Network	VM Network ~	Comuse L		
	> New CD/DVD Drive 1	Client Device			
	> New USB Controller	US8 31 ~			
	> Video card 1	Specify custom settings ~			
) Security Devices	Not. Configured			
	VMCI device				
	New SATA Controller	New SATA Controlle			
	> Other	widditional Hardware			

10. 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.

I Select a creation type	Virtual machine name	
 2 Select a name and folder 3 Select a compute resource 4 Select storage 5 Select compatibility 5 Select a compatibility 	Folder	
	Hast	
	Datatiore	
7 Customize hardware	Guest OS name	Maryasoft Windows 10 (64-bit)
B Ready to complete	Virtualization Based Security	Creatiled
	ĊPMa	¢
	Memory	til GB
	RICs.	1
	NIC 1 network	VM Network
	NIC 1 type-	VMXNET3
	5C5) controlier 1	LSI Logic SAN
	Crewte hard dive 1	New Virtual dask
	Capacity	40.6B
	Detestore	
	Virtual device node	3c5(0-0)
	Mode	Dependent

8.2 Installing Microsoft Windows

CAUTION: Windows 11 is used to capture content for this section in the guide. Text, images, and screen layout may differ from version to version. Refer here for the <u>Windows 11 requirements</u>.

To install Microsoft Windows on the virtual machine:

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



		ADD NEW DEVICE
> CPU	8 ~	0
> Memory	16 😽	GB v
> Hard disk 1	90 GB 🐱	
> SCSI controller 0	LSI Logic SAS	
> Network adapter 1	VM Network ~	Connect
y CD/DVD drive 1	Client Device 🗸	
> USB KHCI controller	Client Device	
> Video card	Datastore ISO File	
> Security Devices	Content Library ISO File Not Configured	
VMCI device		
SATA controller 0	AHCI	
> Other	Additional Hardware	

2. vSphere displays the Edit Settings window:

3. 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:

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

	ADD NEW DEVIC
> CPU	<u>s ~</u>
> Memory	16 🍾 GB 🔶
> Hard disk 1	90 GB ~
> SCSI controller 0	LSI Logic SAS
> Network adapter 1	VM Network ~
✓ CD/DVD drive 1 [€]	Datastore ISO File 🗸
Status	Connect At Power On
CD/DVD Media	[Datastore1] Win 11 media BROWSE
Device Mode	⊂арыттоцал СС-ЭЮМ м
Virtual Device Node	SATA controller 0 ~ SATA(0:0) CD/DVD drive 1 ~
> USB xHCl controller	LISB 3.1
) Video card	Specify custom settings ~
> Security Devices	Not Configured
VMCI device	
SATA controller 0	AHCI
- Oliver	Automatic International

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** window:

		ADD NEW DEVICE
5 CPU	8 ~	0
> Memory	16 🗸 68	Ŷ
> Hard disk 1	90 GB 🐱	
3 SCSI controller 0	LSI Logic SAS	
> Network adapter 1	VM Network ~	Conhect
CD/DVD drive 1 *	Datastore ISO File 🛛 🛩	
Status	Connect At Power Cin	
CD/DVD Media	VGPL/07-Datastorel] Win BROWSE	
Device Mode	an at House an CD 4/2M .♥	
Virtual Device Node	SATA controller 0 ~ SATA(0:0) CD/DV	D drive 1 ~
) USB xHCl controller	(E Bau	
> Video card	Specify custom settings \sim	
3. Security Devices	Not Configured	
VMCI device		
SATA controller 0	AHGI	
> Other	Additional Hardware	

5. Navigate to and select the OS ISO file for installation. Click **OK** to select the file.

Select File		×
Datastores	Contents	information
> Datastore1		Parte: Windows-TE-VPC.isc Size 4.16 GB Modified 10/06/2021, 617:35 PM Encrypted: No
	Windows-THAPC iso	
File Type: ISO Image (* Iso) -		
		CANCEL

6. Right-click the virtual machine, select Power>Power On to start the virtual machine, boot the ISO file, and install the operating system.

The virtual machine boots from the selected ISO file.

Suppose you create a new virtual machine and use vSphere Web Client's VM console functionality. In that case, the mouse may not be usable in the virtual machine until after both the operating system and the VMware tools have been installed.

7. Perform a Custom (fresh) installation of Microsoft Windows 11 on the virtual machine.

During installation, Windows reboots the VM several times.

- 8. When Windows is installed, 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 11 is now installed on the virtual machine.

8.3 Installing VMware Tools

After installing the Microsoft Windows OS on the virtual machine, you must install <u>VMware Tools</u>. VMware Tools is a suite of utilities that enhances the performance of virtual machines and their guest operating systems and improves the management of virtual machines. VMware tools provide many benefits for the VM and the Guest OS; Benefits include improved network adapter, Smoother mouse experience, copying and pasting, drag and drop files, Sound quality, and the ability to take quiesced snapshots of the Guest OS. Refer to the <u>VMware Tools Services</u> page for more information.

The VMware Tools Administration document describes the necessary steps for <u>Manually Installing</u> <u>VMware Tools on Windows</u>.

After going through the manual installation process in the provided link, VMware Tools is installed on the virtual machine.

8.4 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:

2. In the Windows Desktop. Open the Run dialog box by pressing the Windows-Logo Key + R. Type "sysdm.cpl" and press enter in the command box. The **System Properties** window opens.



3. Enter a Computer description in the **System Properties** window (Optional). Select the change button.

System Properties		×
Computer Name Hardw.	are Advanced Remote	
Windows use on the networ	s the following information to identify your computer k.	
Computer description:	1	
	For example: "IIS Production Server" or "Accounting Server".	
Full computer name:		
Domain:		
To rename this compute workgroup, click Chang	r or change its domain or Change e.	

4. The **Computer Name/Domain Changes** window opens. Enter an appropriate name in the Computer name field. Select Domain and enter a proper name in the Domain name field. (The names in the illustration are examples and are not necessarily appropriate for your VM.)

Systen	n Properties	-
Comp	Computer Name/Domain Changes X	
-	You can change the name and the membership of this computer. Changes might affect access to network resources.	ter
Con		
	Computer name:	
-	vGPU	
Full	Full computer name:	
Don	ConnServ82111.tme.nvidia.com	
To	More	
won	Member of	Г
	Domain:	
	NVIDIA.com	
	Wetamun	
	O workgroup.	
	OK Cancel	

5. Enter your domain administrator credentials in the **Windows Security** window, click OK. If the credentials are valid, Windows sets the domain name as you have specified it and opens a "Welcome..." window.

Windows Security	
Computer Name/Dom	nain Changes
Enter the name and password to join the domain.	d of an account With permission
administrator	
	1
OK	Cancel

6. Click OK to close the Domain Welcome window.



7. Windows displays a "You must restart your computer..." window.



8. Click OK. The VM reboots when you close the System Properties window.

8.5 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. On the virtual machine where the software will be installed, download the VMware Horizon 8 2111 software and extract the installers.
 - For 64-bit virtual machines, install VMware-Horizon-Agent-x86_64-2111.1-8.4.0-19066669.
- 2. Launch the installer. It displays the "VMware Horizon Agent" Welcome window. Select Next.

VMware Horizon Agent	1987	×
vmware:	Welcome to the installer for VMware Horizon Agent	
	The installer will allow you to modify, repair, or remove VMware Horizon Agent. To continue, click Next.	
v _{Mware} Horizon		
Product version: 2111.1	< Back Next > Cancel	

3. The installer displays the **License Agreement** screen. Select the *"I accept the terms..."* radio button. Then click next.



4. The installer displays the Network protocol configuration screen. Choose the appropriate network protocol (typically IPv4), then click Next to continue.

🛃 VMware Horiz	con Agent	×
Network proto	col configuration	11
Select the com	nunication protocol	
Specify the prot	tocol to be used to configure this Horizon Agent i	nstance:
IPv4 IPv6	This agent will be configured to choose the all connections.	IPv4 protocol for establishing
	< Back	Next > Cancel

5. The installer displays the Custom Setup window. Accept all default options; click Next.

🔂 VMware Horizon Agent	X
Custom Setup	
Select the program features you want installed.	
Click on an icon in the list below to change how a fe	ature is installed.
	Feature Description
X VSB Redirection	VMware Horizon Agent core functionality
VMware Virtualization Pack for : Real-Time Audio-Video	
VMware Horizon Instant Clone	
Horizon Monitoring Service Age	This feature requires 236MB on your hard
Scanner Redirection	unve.
Install to:	
C:\Program Files\VMware\VMware View\Agent\	Change
Help Space <	Back Next > Cancel

Note: The <u>Horizon Agent Custom Setup Options</u> article should be used to learn more about the default options and additional custom options.

6. The installer displays the **Ready to install the program** window. Select *Install* to continue. The installer installs Horizon Agent on the VM.



7. The **Installer Completed** window shows the installation completed successfully. Select **Finish** to close the installer. The installer prompts you to reboot:



8. The installer prompts you to reboot. Select **Yes** to reboot the VM.



9. VMware Horizon Agent is installed on the virtual machine.

8.6 Installing Horizon Direct Connection

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

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

CAUTION: VMware Horizon 8 2111 is used to capture content for this guide. Text, images, and screen layout may differ from version to version.

To install the Horizon Agent Direct-Connect on your VM:

- 1. On the virtual machine, download the VMware Horizon 8 2111 software and extract the installers.
 - For 64-bit virtual machines, install VMware-Horizon-Agent-Direct-Connet-x86-8-4-0-18964730
- 2. Launch the installer. It displays the "VMware Horizon Agent Direct-Connect Plugin Setup" window. Select *Next*.

42	Welcome to the Installation Wizard for VMware Horizon Agent Direct-Connection Plugin
	The Setup Wizard will install VMware Horizon Agent Direct-Connection Plugin on your computer. Click Next to continue or Cancel to exit the Setup Wizard.
VMware Horizon " View Agent Direct- Connection Plugin	Copyright (c) 1998-2021 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: 8,4,0,189647	30 Bad: Next Cancel

3. The installer displays the **License Agreement** screen. Select the *"I accept the terms..."* radio button. Then click next.

	Agreement		
Please read the fo	lowing license agreement carefully	11	
		_	1
1	VMWARE END USER LICENSE AGREEME	NT	
Last updated: 03 M	ay 2021		
THE TERMS OF	THIS END USER LICENSE AGREEMENT HE SOFTWARE, REGARDLESS OF ANY THE INSTALLATION OF THE SOFTWARE.	("EULA") GOVERN TERMS THAT MAY	
APPEAR DURING			

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

Check the Configure Windows Firewall automatically checkbox. Then click Next to continue.

VMware Horizon Agent Direct	-Connection Plugin Setup	
Configuration Information		11
Please specify port information)	11
VMware Horizon Agent Direct-Cor order to accept remote connection enabled, the installer can automat	nection Plugin requires that a firewans on the specified TCP port number tically add this for you.	all exception is added in . If Windows Firewall is
Listen for HTTPS connections on t	he following TCP port:	
Configure Windows Firewall au	tomatically	
£		
		_
		t Count

5. The installer displays the **Ready to install VMware Horizon Agent Direct-Connection Plugin** window. Select **Install** to continue. The installer installs Horizon Agent Direct-Connect on the VM.

🕎 VMware Horizon Agent Direct-Co	onnection Plugin Setup	- B	×
Ready to install VMware Horiz	zon Agent Direct-Conne	ection Plugin	
Click Install to begin the installation installation settings. Click Cancel to	. Click Back to review or chang exit the wizard.	e any of your	
	Back Insta	I Car	ncel

6. The **Installer Completed** window shows the installation completed successfully. Select **Finish** to complete the install.

VMware Horizon Agent Di VMware Horizon Agent Di	rect-Connection Plugin Setup — 🗆 🛛 🛛
	Completed the VMware Horizon Agent Direct-Connection Plugin Setup Wizard
	Click the Finish button to exit the Setup Wizard.
VMware Horizon [™]	
View Agent Direct- Connection Plugin	
	Back Finish Cancel

7. When Windows has fully booted, test the 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 installed on the virtual machine.

8.7 Optimizing Windows

<u>Windows OS Optimization Tool for VMware Horizon</u> is VMWare's official release of the Optimization Tool. The Windows OS Optimization Tool provides the easiest way to optimize windows desktops and server master images for VMware Horizon. 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 disable unnecessary services and allow 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.

With the release of Windows OS Optimization Tool for Horizon version 1.0 (2111), a single template is built that includes support for all versions of Windows 10, Windows 11, Windows Server 2019, and Windows Server 2022.

Note: VMware recommends using this tool in a development lab before running in a production environment. It would be best to understand the recommended settings before applying any changes, as this could have adverse effects and can cause damage to your deployment.

8.8 Additional Virtual Machine Settings

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

1. . <u>Turn Off Windows Firewall for all network types.</u>

CAUTION: These instructions assume that the VM is for proof-of-concept only and that disabling the firewall poses only a minimal security breach. Always follow your established security procedures and best practices when setting up security for a production machine or for any environment that can be accessed from outside your network.

8.9 Enabling the NVIDIA vGPU

The following steps will enable vGPU support for Windows OS virtual machines and Linux OS virtual machines. The virtual machine settings must be edited.

- 1. Power down the VM.
- 2. Click on your VM in the inventory window: Right-click your VM and select Edit Settings.



3. Select Add New Device, then Select PCI device from the dropdown menu.

		ADD NEW DEVICE
> CPU	8. ~	Disks, Drives and Storag
> Memory	16 🗸 GB 🗸	Hard Disk
> Hard disk 1	80 OB ¥	Existing Hard Disk
5 SCSI controller 0	LSI Logic SAS	Host USB Device
> Network adapter 1	VM Network 🗢	NVDIMM
> CD/DVD drive 1	Datastore ISO File	CD/DVD Drive Controllers
> USB xHCl controller	JUSB 3,1	NVMe Controller
> Video card	Specify custom settings \sim	SATA Controller
> Security Devices	Not Configured	USB Controller
VMCI device		Other Devices
SATA controller 0	AHCI	PCI Device
> Other	Additional Handware	Precision Clock
		Serial Port Network Network Adapter

4. The new PCI device shows that an NVIDIA vGPU device has been added.

		ADD NEW DEVICE
> CPU	<u>8, ~ ~</u>	١
> Memory	15	×
Hard disk 1	9C SB M	
SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network 🛩	Connect
CD/DVD drive 1	Datastore ISO File 🛛 🗸	Connect
USB xHCl controller	USB 3,1	
New PCI device	NVIDIA GRID vGPU nvidia_a16-1b	
Video card	Specify custom settings 😒	
Security Devices	Not Configured	
VMCI device		
SATA controller 0	AHCI.	
Other	Additional Hardware	

5. Expand the **New PCI device**, expand the **NVIDIA GRID VGPU Profile** dropdown and select your vGPU Profile.

				ADD NEW DEVICE
CPU	в 🐱			١
Memory	16	¥	GB. 🗸	
Hard disk 1		68 🐱		
> SCSI controller 0	LSI Logic SAS			
> Network adapter 1	VM Network ~			Connected
> CD/DVD drive 1	Client Device	÷.		
> USB xHCl controller	USB 3,1			
✓ PCI device 0	NVIDIA GRID VGPU	nvidia_a16-1b	-	
NVIDIA GRID vGPU Profile	nvidia_a16-1b	<		
	Note: Some vii PCI/PCIe passthrou virtual machine op devices.	rtual machine op ugh devices are eration limitation	erations are u present. Cons ns with PCI/PC	inavailable when ult user guide for Ile passthrough
> Video card	Specity custom se	ettings 🗸		
> Security Devices	Not Configured			

6. Click **OK** to complete the configuration.

8.10 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 enable GPU operation fully.

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 enabling an NVIDIA 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.

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.

📇 Device Manager
File Action View Help
 VGPU-VMware Audio inputs and outputs Batteries Computer Disk drives Display adapters Whicrosoft Basic Display Adapter VMware Horizon Indirect Display Driver VMware SVGA 3D DVD/CD-ROM drives Whare SVGA 3D DVD/CD-ROM drives Maman Interface Devices IDE ATA/ATAPI controllers Monitors Monitors Network adapters Network adapters Software devices Software devices<

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



NVIDIA recommends that the installer share volume that the VM can mount for quick access.

4. Click OK to accept the default driver directory.



5. Read through the NVIDIA software license agreement. Click OK to Agree and Continue.



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



7. Check the Perform a clean installation checkbox, then click Next. The installer begins installing the driver.



8. Click **Restart Now** to restart the VM and complete the install.

NVIDIA Installer		_	- 🗆 X
NVIDIA Graphic Version 472.39	s Driver		
 System Check License Agreement 	NVIDIA Installe	r has finis	hed
 Options Install Finish 	Component NVIDIA WMI RTX Desktop Manager Graphics Driver	Version 2.36.0 202.21 472.39	Status Installed Installed Installed
	Do you want to restart n	on, restart the com ow? <u>R</u> ESTART NOW	RESTART LATER

directly to the VM.

8.11 Installing the NVIDIA vGPU Driver: Linux

Create a Linux VM configured with a virtual GPU. This section will install the vGPU driver and license the vGPU software for full functionality within the VM.

In this guide, the Ubuntu 20.04 LTS operating system is used. It is important to note there are two Ubuntu ISO types: Desktop and Live Server. The Desktop version includes a graphical user interface (GUI), while the Live Server version only operates via a command line. This document uses the Live Server version 20.04 (amd64 architecture) of Ubuntu. If needed, a GUI can be installed later.

Installing the vGPU Driver in the Ubuntu VM 8.11.1

After you have created the Linux VM on the hypervisor and have booted the VM, install the NVIDIA vGPU software graphics driver in the VM to enable GPU operations fully.

Note: 64-bit Linux guest VMs are supported only on Q-series, C-series, and B-series NVIDIA vGPU types. They are not supported on A-series NVIDIA vGPU types.

Note: The procedure for installing the driver is the same in a VM and bare metal.

Prerequisites

Installing the NVIDIA vGPU software display driver for Linux requires:

- Compiler toolchain
- Kernel headers

To install the NVIDIA vGPU driver for Linux

1. Use WinScp to copy the NVIDIA vGPU software Linux driver package to the Ubuntu vGPU VM.

The NVIDIA vGPU driver for Linux uses this naming convention or a similar one: NVIDIA-Linux_x86_64-470.82.01-grid.run

2. Log in to the VM and check for updates.

\$ sudo apt-get update

3. Install the GCC compiler and make the tool in the terminal.

\$ sudo apt-get install build-essential

4. Navigate to the directory containing the NVIDIA Driver .run file. Then, add the Executable permission to the NVIDIA Driver file using the chmod command.

\$ cd /vgpu-driver/ NVIDIA-Linux_x86_64-470.82.01-grid.run

\$ sudo chmod +x NVIDIA-Linux_x86_64-470.82.01-grid.run

5. Run the driver installer as the root user from a console shell and accept defaults.

\$ sudo sh ./NVIDIA-Linux_x86_64-470.82.01-grid.run

6. When the installer prompts you, accept the option to update the X configuration file Xorg.conf:

Note: Screenshots are based on the X OS.

NVIDIA Accelerated Graphics Driver for Linux-x86_64	4 (470.82.01)
Would you like to run the nvidia-xconfig utility to automatically (update your X configuration
configuration file will be backed up.	Hny pre-existing x
Yes No	
NVIDIA Software Installer for Univ/Linuv	www.nvidia.com

7. Select OK to close the installer when the install is finished.

NVIDIA Accelerated Graphics Driver for Linux-x86_64 (470.82.01)	
Your X configuration file has been successfully updated. Installation of the NVII Breaking Driver for Linux-x86 64 (version: 470 82 01) is now complete	DIA Accelerated
NVIDIA Software Installer for Unix/Linux	www.nvidia.com

8. Reboot the system and log in.

\$ sudo reboot

9. Verify that the NVIDIA vGPU driver is operational by running the nvidia-smi command.

\$ nvidia-smi

```
Thur Dec 16 12:34:21 2021
_____
NVIDIA-SMI 470.82.01 Driver Version: 470.82.01 CUDA Version: 11.4
-----+
GPU Name Persistence-M | Bus-Id Disp.A | Volatile Uncorr. ECC |

    Fan Temp Perf Pwr:Usage/Cap
    Memory-Usage
    GPU-Util Compute M.

    |
    |
    MIG M.

0 NVIDIA A16-4Q On | 00000000:02:03.0 Off | 0 |
N/A N/A P8 N/A / N/A | 448MiB / 3932MiB | 0% Default |
                                 N/A
  Processes:
                                 GPU Memory
GPU GI CI PID Type Process name
                                Usaqe
No running processes found
 _____
```

8.12 Licensing NVIDIA vGPU Software (Update 13.1)

To use an NVIDIA vGPU software licensed product, each client system to which a physical or virtual GPU is assigned must obtain a license from the NVIDIA License System. A client system can be a VM configured with an NVIDIA vGPU, a VM configured for GPU pass through or a physical host to which a physical GPU is assigned in a bare-metal deployment.

Client Configuration Token

The client config token is a file that must be copied to the licensed client's default location when generated. The client system requests a license from the service instance using the Client Configuration token. Information within the client configuration token identifies the service instance, license server, and fulfillment conditions used to serve a license in response to the licensed client request.

- <u>Generating a Client Configuration Token</u>
- <u>Configuring a Licensed Client on Windows</u>
- <u>Configuring a Licensed Client on Linux</u>

8.13 Finalizing the Installation

The final phase of the NVIDIA vGPU configuration uses the Horizon Client to directly connect to the VM with the View Direct-Connect Agent (VADC) and verify the VMs settings.

To finalize the installation:

1. Start the VMware Horizon Client. Click Add Server to register a new virtual machine connection.



2. Enter the virtual machine's IP address in the Connection Server field, click Continue. (You are connecting directly to a desktop, so do not enter the Horizon Connection Broker address at this time.)



3. Enter the local username and password (or the domain user and password if the virtual machine is a domain member), then click **Login**.

ware Honzon Client	- 0
Administrator)5 ×
VGPU-VMWARE	9

4. Open the **Device Manager** on the virtual machine and expand the **Display Adapters**. Confirm that the display adapter is now the NVIDIA vGPU.



5. Right-click the desktop and select NVIDIA Control Panel. Click the System Information link in the bottom left corner of the window

NVIDIA Control Panel File Edit Desktop Help		- 🗆 ×
🕲 Back 🕶 🌍 🚮		
Select a Task		
Select a Task 30 Settings Adjust image settings with preview Adjust image solution Set up unufuple displays - Video Adjust video color settings Adjust video image settings	NVIDIA Version 47239 NVIDIA A16-1B	n

6. Confirm that the DirectX and graphics card driver versions are correct in the System Information window, then click Close.

System Information			
Detailed information about	your NVIDIA hardware and the syste	em it's running on.	
Sustan information			
Operating system: Wi	indows 10 Pro, 64-bit		
DirectX runtime version: 12	2.0		
Graphics card information —	-		
Items	Details		
NVIDIA A 16-1B	Driver version: Driver Type: Direct3D feature level: CUDA Cores: Resizable BAR Graphics boost clock: Memory interface: Total available graphics Dedicated video memory:	472.39 Standard 12_1 1280 No 1755 MHz 128-bit 9215 MB 1024 MB GDDR6	
			About
		Save	Close

7. 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

- 8. At this point, you lose connectivity to the VM. Use the vSphere Web Client to shut down the guest OS.
- 9. The vGPU enabled virtual machine is ready to be the image for the desktop pools. The next step is to build and deploy a Horizon vGPU Desktop Pool.

Chapter 9. Creating a Horizon vGPU Pool

VMware Horizon uses desktop pools for centralized desktop management and distribution. In Horizon, you create a pool of virtual machines and select settings that give all the machines in the pool a standard desktop definition

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 can create a single virtual machine or 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.

9.1 Creating a Template

To create a template from an existing virtual machine:

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

vm vSphere Cl	lient Menu	Q Search in all environments			
	Ø	WGPU-VMware Image: Configure Summary Monitor Configure	Permissions Datastore	s Networks Snap	oshots Updates
> 11 > 11 > 11 > 11		Guest OS			ACTIONS ~ II
20	Actions - vGPU-VM	fware	Power Status	Powered On	
> (1) > (2) > (1) > (1) > (1)	Power Guest OS Snapshots	Console	Guest OS VMware Tools R DNS Name (1) IP Addresses (1) Encryption N	Microsoft Windows 10 unning, version:11334 (Curre iot encrypted	(64-bit)
ස් vGPU-VN	Clone Fault Tolerance	NCH WEB CONSOLE			
ញ្ញុ Win11-NV- ក្លិ Win11-Sc	VM Policies Template	fl Clone as Template to Lit	prary	# Relate	ed Objects II

2. vSphere displays the **Clone Virtual Machine To Template** window. With the **Select a name and folder** tab selected.

Salart sireage	Specify a unique name and I	irget location	
Ready to complete	VM template name:	vGPU-VMware-Tmp	
	Select a location for the temp	late	
	mgmt.vcenter.tme.nv	dia com	
	D Endeavor MDF		
	> 图 HG Demo Room		
	> TME Datacenter		

- 2. In the **VM template name** field, enter a name for the template.
- 3. Select a location to create the template. Click Next.
- 4. Select a compute resource for the template. Click **Next**.
- 5. Select the target datastore. Click Next.
- 6. Review the Ready to Complete window settings and click **Finish** to start cloning the virtual machine to a template.

2 Select a compute resource 3 Select storage	Ready to complete Click Finish to start creati	on.
4 Ready to complete	Source virtual machine	vGPU-VMware
	Template name	vGPU-VMware-Tmp
	Folder	Nvidia-VMware
	Host	ESXi01
	Datastore	DataStore1
	Disk storage	Same format as source

7. When the cloning process is complete, the VM template is displayed at the end of the list in the **VMs and Templates** section.

vm vSphere Client Men	u Y Q Seem maile						
Custer	VGPU-VMwa Summary Monitor	Configure Permissions Datastores Vi	ersioni	ng Updates			
	Guest OS Guest OS VMware Tools DNS Name IP Addresses Encryption	Microsoft Windows 10 (64-bit) Not running, version (1234 (Current)			в	Capacity :: Storage 90 cB useo 91.22 cB allocated	
	VM Hardware		11	Tags	8	Notes ii	
	CPU Memory Hard disk 1	8 CPU(5), 0 MHz used 16 GB, 0 GB memory active 90 GB 1 Thick Provision Lazy Zeroed () vGPU05-Datastore1				-	
	Network adapter 1 CD/DVD drive T Compatibility	VM Network (disconnected) 00:50:56:a8:84:ab Disconnected % ~ ESXI 7:0:02 and later (VM version 19)		No tags assigned.		No notes assigned.	
	1997			ASSIGN			

9.2 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 and renaming the machine.

To create a VM Customization Specification:

1. From the left-hand pane of the vSphere Client Shortcuts view, select VM Customization Specifications in the Monitoring section.

分 Home ♦ Shortcuts	Shortcuts Inventories								
III) Hots and Custers	Hosts and Crusters	VMs and Templates	Storage	Ø Networking	Content Libraries	Giobál inventory Lists	Workload Management	(Raas	Pure Storage
문, Policies and Profiles 저 Auto Deploy @ Hybrid Cloud Services @ Developer Center	Task Console	Event Console	VM Customization Specifications	VM Storage Policies	Host Profiles	Lifecycle Manager			
Administration Tasks Events C Tags & Custom Attributes Ulecycle Manager VRealize Operations DRasS Pure Storage	Administration								

2. In the VM Customization Specifications window, click New.

vm vSphere Client Mer	Nu 🗸 🔍 Search in all environments		
Policies and Profiles	VIM Customization Constitutions		
昆 VM Storage Policies	VM Customization Specifications		
Contraction Specifications			
Host Profiles	+ New 3 Import @ Edit Dublicate D Export		
L Storage Policy Components	Name		
	ProViz-Win10		
	Test Spec		
	TME nVector		
	- P		

2. For Target guest OS, select Windows.

Check the Generate New Security ID (SID) checkbox.

If your organization uses 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 checkbox cleared. Enter a name for the new specification in the Customization Specification Name field. Click **Next**.

1 Name and target OS 2 Registration information	Name and target OS Specify a unique name for	r the VM customization specification and select the OS of the target VM.
3 Computer name 4 Windows license	VM Customization Sp	secification
S Administrator password 6 Time zone	Name	Wintt
P Communds-to run once 8 Network 9 Workgroup of domain 10 Ready to complete	Description	
	vCenter Server	*
	Guest OS Target guest OS	💿 Windows 💿 Linux
		Use custom SysPrep answer (lie Generate e new security identity (SID)
		CANCEL

3. Enter the VM owner's name in the Name field and the owner's organization's name in the Organization field, then click **Next**.

1 Name and target OS	Registration information	
2 Registration information	Specify registration informat	tion for this copy of the guest operating system
3 Computer name		
4 Windows license	Owner name	TME Administrator
5 Administrator password		
6 Time zone	Owner organization	NVIDIA - TME
7 Commands to run once		
E Network		
9 Workgroup or domain		
10 Ready to complete		

4. Enter a computer name for the VM, then click Next.

1 Name and target OS 2 Registration information	Computer name Specify a computer name that will identify this virtual machine on a network.
3 Computer name	
4 Windows license	
5 Administrator password	
6 Time zone	O Enter a name in the Clone/Deploy wizard
7 Commands to run once	O Enter a name
8 Network	
9 Workgroup or domain	V2FG-VWWare
10 Ready to complete	Append a unique numeric value. (2)
	Generate's name using the sustam application configured with the vCenter Server
	Argument

5. Enter your Windows product key information or leave this field blank. Then click Next

 1 Name and target OS 2 Registration information 3 Computer name 	Windows license Specify the Windows licensing in Information. leave these fields b	nformation for this copy of the guest operating system. If the virtual machine does not require licensing lank.
4 Windows license		
5 Administrator password	March 1 and 1 and 1	
6 Time zone	Product key	
7 Commands to run once	-	
E Network	Include server license inform	ation (required for customizing a server guest QS)
B Workgroup or domain	Server license mode	O Per seat
10 Ready to complete		O Per server
		Max connections: 5

6. Enter and confirm the administrator password (it is case sensitive) in the Password and Confirm Password fields, then click Next

 1 Name and target OS 2 Registration information 	Administrator password Enter the password and au	to logon option for the administrator account
✓ 3 Computer name		
✓ 4 Windows license	Password	
5 Administrator password	r dosmord	
6 Time zone	Confirm password	
7 Commands to run once		
8 Network	Automatically logon as	Administrator
9 Warkgroup or damain		
	Number of times to logist a	sutizitiet/galiy

7. Select your time zone from the Time Zone pulldown menu, then click Next

2 Registration information	Time zone Specify a time zone for the virtual machine.				
 3 Computer name 4 Windows license 5 Administrator password 6 Time zone 7 Commands to nin once 8 Network 9 Network <l< th=""><th>Time zone</th><th>LUTIC-R0:00) HaWall (UTC-09:00) Marquesas Islands (UTC-09:00) Coordinated Universal Time-09 (UTC-08:00) Baja California (UTC-08:00) Coordinated Universal Time-08 (UTC-08:00) Pacific Time (US & Canada) (UTC-07:00) Mountain Time (US & Canada) (UTC-07:00) Mountain Time (US & Canada) (UTC-06:00) Central Time (US & Canada) (UTC-06:00) Easter Island (UTC-06:00) Easter Island (UTC-06:00) Saskatchewan (UTC-05:00) Rogota, Lima, Guito, Rio Branco (UTC-05:00) Easterin Time (US & Canada) (UTC-05:00) Havina (UTC-05:00) Havina (UTC-05:00) Havina</th></l<>	Time zone	LUTIC-R0:00) HaWall (UTC-09:00) Marquesas Islands (UTC-09:00) Coordinated Universal Time-09 (UTC-08:00) Baja California (UTC-08:00) Coordinated Universal Time-08 (UTC-08:00) Pacific Time (US & Canada) (UTC-07:00) Mountain Time (US & Canada) (UTC-07:00) Mountain Time (US & Canada) (UTC-06:00) Central Time (US & Canada) (UTC-06:00) Easter Island (UTC-06:00) Easter Island (UTC-06:00) Saskatchewan (UTC-05:00) Rogota, Lima, Guito, Rio Branco (UTC-05:00) Easterin Time (US & Canada) (UTC-05:00) Havina (UTC-05:00) Havina (UTC-05:00) Havina			

8. Enter any required one-time commands in this tab, then click Next

Enter the commands to run the first time a user logs on.	
Emeria new commans	ABA -
	Enter the commands to run the first time a user logs on.

- 9. 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.

 2 Registration information 	Network Specify the network settings for t	he virtual machine		
 3 Computer name 4 Windows license 5 Administrator password 	 Use standard network setting: Manually select custom setting 	s för the guest operating system, includin gs	g enabling DHCP on all network interfaces	
6 Time zone				
7 Commands to run once				
7 Commands to run once 8 Network S Workgroup or clomain	Descrimion	T Ord Address	T OVERSITE	7

10. 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

	Workgroup or domain How will this virtual machine participate in a network?					
 3 Computer name 4 Windows license 5 Administration 	C Workgroup					
6 Time zone	Windows Server domain	NVIDIA				
 7 Commands to run once 8 Network 	Specify a user account that has permission to add a computer to the domain					
9 Workgroup or domain 10 Ready to complete	Decement	Mahimadata				

11. 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.

1 Name and target OS	Ready to complete					
✓ 2 Registration information	Review your settings selections before finishing the wizard					
3 Computer name						
4 Windows license	Charling of the second s					
 5 Administrator password 	Name	Wintt				
🖌 6 Time zone	Target guest 0.5	Windows				
7 Commands to run once	OS options	Generate new security ID				
S Network	Proistration info	Divisor same. THE Administration				
🖌 9 Workgroup or domain	ingin contained	Organization NVIDIA - TME				
10 Ready to complete	Computer name	Use Virtual Machine name				
	Product key	No product key specified				
	Server license mode	Par server (Mauthum Connectures 5)				
	Administrator access	Do not log in automatically as Administrarium				
	Time zone	(UTC-08.00) Paoritic Time (US & Canada)				
	Network type	Standard				
	Windows Servet domain	NVIDIA				

You do not need to create a virtual machine guest customization specification every time you clone a virtual machine from a template.

Provisioning a Single Virtual Machine 9.3

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. E

nter a name for the new VM in the Virtual machine na	me field and select a location. Click Next.
--	---

vGPU-VMware-Tmp -	Deploy From Temp	plate
1 Select a name and folder 2 Select a compute resource	Select a name and folder Specify a unique name and ta	arget location
3 Select storage d Gelect clone options S Gelecty to complete	Virtual machine name:	VGPU-VMwale-2
	Series of Octation of the ynode Series of the se	id (a .com)

- 2. Select the Compute Resource, click Next.
- 3. Select the target storage type and datastore, click Next.
- 4. Check the Customize the operating system checkbox In the Select clone options window. Click Next.

 1 Select a name and folder 2 Select a compute resource 	Select clone options Select further clone options
3 Select storage	
4 Select clone options	Custômize the operating system
5 Customize guest OS	Customize this virtual machine's hardware
6 Ready to complete	Power on virtual machine after creation

5. Select the Guest OS used to create the VM. Click Next.

1 Select a name and folder 2 Select a compute resource	Customize guest OS Customize the guest OS to prevent conflicts when you deploy the virtual machine Operating System' Microsoft Windows 10 (64-bit)						
3 Select storage 4 Select clone options							
5 Customize guest OS	OVERRIDE						
6 Ready to comparts	Name T	Guest OS	Last Moothed				
	Proviz-Winto	Windows	09/07/2021. 0:33 22 PM				
	TME rivector	Windows	05/23/2021, 6:52:47 PM				
	Wintl	Windows	12/20/2021, 7:47:22 AM				

6. vSphere displays the **Ready to complete** tab of the **Deploy From Template** window, displaying the "Win11" Guest OS Customization specification properties.

Review the settings. If any are incorrect, click the Back button to make corrections. Click **Finish** to begin creating the virtual machine from the template.

1 Select a name and folder 2 Select a compute resource	Ready to complete Click Finish to start creatio	Ready to complete Click Finish to start creation					
4 Select clone options							
5 Customize guest OS	Source template	vGPU-VMware-Tmp					
6 Ready to complete	Virtual machine name	vGPU-VMware-2					
	Folder	DataCenter01					
	Host	ESXI01					
	Datastore	Datastore1					
	Disk storage	Same format, as source					
	Guest OS customization specification	Win11					

7. Once the VM is created, it becomes visible in the data center on its cloned host.

We will add the newly cloned VM to a Horizon Desktop Pool, then authorize user/groups to use it. These steps are described later in <u>Section 9.6 - Enabling User access to Desktop Pools.</u>

Horizon can leverage templates to create virtual machines automatically and on-demand to save time and resources. See the <u>Horizon 8 Documentation</u> for instructions on using this functionality.

The following sections describe how to create a desktop pool and grant entitlements to users and groups who use the pool. In Horizon 8 2111, you can create desktop pools from a gold master image with Full Clones or Linked Clones. Both use cases are explained in the following sections.

9.4 Creating Full Clone Desktop Pools

1. To create full clone desktop pools, you must have a template of the golden master image. Find the reference VM in the Navigator and right-click it. Select Clone > Clone to Template.

vm vSphere Cl	ient Menu v	Q Search in all environments				
	<u>©</u>	B VGPU-VMware	Permissions Datastor	is ✔ res Networks Snapsho	ots Updates	
>] >] ~] > □		Guest OS			ACTIONS ~	
> 0 > 0 > 0 > 0 > 0 > 0 > 0	Actions - vGPU-VM Power Guest OS Snapshots Open Remote C Migrate Clone	onsole H REMOTE CONSOLE	Power Status Guest OS VMware Tools DNS Name (1) IP Addresses (1) Encryption	Powered On Microsoft Windows 10 (64 Microsoft Windows 10 (64 Running, version:11334 (Current) vGPU-VMware.tme.nvidia.com Not encrypted	-bit)	
윤 vGPU-VN 쥰 Win11-NV 쥰 Win11-Sc	Fault Tolerance VM Policies Template	په دی در در ۲۰۰۰ بر	bbrary	II Related (Objects	#

Alternatively, you can create a VM template using <u>instructions from Section 9.1 - Creating a</u> <u>Template.</u>

The Clone Virtual Machine To Template wizard walks you through the steps. At the end of the process, click **Finish** to create the template.

 Create a Customization Specification file to deploy the full clone pool. The VM Customization Specification wizard walks you through these steps, as described in <u>Section 9.2 - Creating a</u> <u>Customization Specification</u>.

Home Shortcuts	Shortcuts								
Hosts and Clusters VMs and Templates Storage Networking Content Libraries Workload Management Global Inventory Lists	Hosts and Clusters	VMs and Templates	Storage	(Networking	Content Libraries	Global Inventory Lists	000 Workload Management	Q DRaas	Pure Storage
R Policies and Profiles 저 Auto Deploy 아 Hybrid Cloud Services IIP Developer Center	Task Console	Event Console	VM Customization Specifications	VM Storage Policies	Host Profiles	Lifecycle Manager			
Administration Tasks Events Vrags & Custom Attributes Vregitze Operations Pure Storage	Administratio	n							

3. log in to the Horizon Administrator. Select **Desktops** in the Inventory pane, then click Add.

VMware Horizon*				Pod Cluster-CONNSERV	8	User Search	Abou	0002
Sessions Problem vCenter VMs Problem RDS Hoats Events System Hadith	Add Edir Dup	inaire Defete Ende	iments >) Status >) A	ccess Groups ~	1 -		TT	lter C. 🛓
Monitor > Users and Groups Inventory - Destays Applications Farms Machines Settings Settings		Display Name	Туре	Source	User Assignment	vCenter Sarver	Entitled	Application Pools
Domains Produkt Licensing and Diage Global Settings Regratered Machines Administrations Administrations Clobal Pallone Global Pallone Troubleshooting				haree	ti postati -			
	0 (D							Rows per page 20 💌 0 row

Add Pool		
🗊 Туре	Automated Desktop Pool	0
2 vCenter Server	Manual Desktop Pool D RDS Desktop Pool D	
User Assignment		
Storage Optimization		
Desktop Pool Identification		
Provisioning Settings		
7 vCenter Settings		
Desktop Pool Settings		
Remote Display Settings		
		Cancel Pressue Next

4. Select Automated Desktop Pool, then click Next.

5. Select the **vCenter Server** instance. Select the **Full Virtual Machine** radio button to create a full clone desktop pool. Click **Next**.

Add Pool		
🕑 Туре) Instant Clone ()	Ø
2 vCenter Server	Full Virtual Machines ()	
3 User Assignment	vCenter Server	
Storage Optimization		
Desktop Pool Identification		
6 Provisioning Settings		
🕜 vCenter Settings	a	Rows per page 20 V 1 - 1 of 1 row(s)
Desktop Pool Settings	Description TME vCenter	
Remote Display Settings		Ð
· · · · · · · · · · · · · · · · · · ·		Cancel Previous Next

- Add Pool 0 🕗 Туре O Floating (1) O Dedicated (1) VCenter Server Enable Automatic Assignment Enable Multi-User Assignment User Assignment Automatic assignment is not supported for multi-user assignment pools. 4 Storage Optimization 5 Desktop Pool Identification 6 Provisioning Settings VCenter Settings B Desktop Pool Settings Remote Display Settings Cancel Previous
- 6. Select Floating as the User Assignment type. Click **Next**.

7. Select the Use VMware virtual SAN Radio button for the Storage Optimization. Click Next.

			Ē
V lype	Storage Policy Management ©		
a uCenter Senier	O Use VMware Virtual SAN		
Vecinei Jeivei	O Do not use VMware Virtual SAN		
User Assignment	Use Separate Datastores for Replica and OS Disks.		
oser rosignment			
Storage Optimization	1		
3 Desktop Pool Identification			
Provisioning Settings			
VCenter Settings	1		
B Desktop Pool Settings			
Remote Display Settings			
		1	

п

У Туре	Asterisk (*) denotes required field	0
	* ID ()	0
VCenter Server	FullClonevGPU	
	Display Name 🕥	
User Assignment	FullClonevGPU	
	Access Group	
Storage Optimization	/	w.
5 Desktop Pool Identification	Description	
6 Provisioning Settings		
7) vCenter Settings		
B) Desktop Pool Settings		
9 Remote Display Settings		

8. Enter a unique ID and Display Name for the desktop pool. Click Next.

9. Enter the Provisioning Settings for your environment. Click Next.

Туре	Asterisk (*) denotes required field		3
	Basic		0
vCenter Server	Enable Provisioning (1)		
	Stop Provisioning on Error		
User Assignment	Virtual Machine Naming ()		
	O Specify Names Manually		
Storage Optimization	0 names entered	0.000	
	Use a Naming Pattern		
Desktop Pool Identification	* Naming Pattern		
	Desktop-		
Provisioning Settings			
	Provision Machines		
vCenter Settings	Machines on Demand		
	Min Number of Machines		
Desktop Pool Settings	O All Machines Up-Front		
	Desktop Pool Sizing		
Remote Display Settings	* Maximum Machines		

10. In the vCenter Settings tab. Fill in the details for your Horizon Pool.

Vmware suggests using the <u>Worksheet to Create an Automated Full-Clone Desktop Pool</u> to prepare your configuration options before creating the desktop pool.

	1	0
Туре	Default Image	
vCenter Server	Asterísk (*) denotes required field	
	* Golden Image in vCenter	
User Assignment		Browse
	* Snapshot	
Storage Optimization		Browse
	Virtual Machine Location	
Desktop Pool Identification	* VM Folder Location	
		Brokse
Provisioning Settings	Resource Settings	
Auforetes Pattings	* Cluster	
venter settings		drawio
Desktop Pool Settings	* Resource Pool	
		BrbWsa
Remote Display Settings	* Datastores	
	 Click Browse to select. 	

11. In the Desktop Pool Settings tab. Fill in the details for your Horizon Desktop Pool.

Vmware suggests using the <u>Worksheet to Create an Automated Full-Clone Desktop Pool</u> to prepare your configuration options before creating the desktop pool.

Turne			
type	State		
Section .	Enabled	~	
vCenter Server	Connection Server Restrictions		
	None Browse		
User Assignment	Category Folder		
	None Browse		
Storage Optimization	Client Restrictions		
Desktop Pool Identification	Session Types		
	Desktop	~	O
Provisioning Settings	Log Off After Disconnect		
	Never	v	
vCenter Settings	Allow Users to Restart Machines		
	No	~	
Desktop Pool Settings	Allow Separate Desktop Sessions from Different Client Devices		
	No	~	0
Remote Display Settings			
Guest Customization			

12. In the Remote Display Settings tab. Fill in the details for your Horizon Desktop Pool.
| Add 1 col 1 dilver o cio | | | | |
|-----------------------------|---|---|---|---|
| User Assignment | * | | | 6 |
| Storage Optimization | Remote Display Protocol
Default Display Protocol | | | 0 |
| Desktop Pool Identification | VMware Blast | ~ | | |
| | Allow Users to Choose Protocol | _ | | |
| Provisioning Settings | Yes | * | | |
| | 3D Renderer | | | |
| VCenter Settings | NVIDIA GRID VGPU | * | 0 | |
| | vGPU Profile | | | |
| Oesktop Pool Settings | NVIDIA A16-1B | | | |
| | Allow Session Collaboration 💽 Enabled | | | |
| B Remote Display Settings | Requires VMware Blast Protocol | | | |
| 00 Guest Customization | | | | |
| Ready to Complete | | | | |
| | 7 | | | * |

13. Under the **Guest Customization** tab. Scroll towards the bottom and select the **Use a Customization Specification (Sysprep)**, then select the customization specification you created for the Horizon Pool..

User Assignment			Q
Storage Optimization	Post-Synchronization Script P	arameters	
Desktop Pool Identification	Example: p1 p2 p3		
	Use a customization specif	fication (SysPrep)	
Provisioning Settings			C
	Name	Guest OS	Description
vCenter Settings	O ProViz-Win10	Windows	
	O. TME nVector	Windows	nVector customization settings.
Desktop Pool Settings	Win11	Windows	
Remote Display Settings			
Guest Customization			
Ready to Complete			Rows per page 20 V 1-1 of 3 rows

14. Review your selections. If any are incorrect, click **Previous** to correct them. When your selections are correct, click **Finish** to deploy the Desktop Pool.

User Assignment	*	
Storage Optimization	Entitle Users After Adding Pool	0
and de a barring and	Туре	Automated Desktop Pool
Desktop Pool Identification	User Assignment	Floating Assignment
Provisioning Settings	vCenter Server	mgmt-vcenter.tme.nvidia.com
	Unique ID	FullClonevGPU
vCenter Settings	Description	
Desktop Pool Settings	Display Name	FullClonevGPU
	Access Group	1
Remote Display Settings	Desktop Pool State	Enabled
Guest Customization	Session Types	Desktop
Concernance of the	Client Restrictions	Disabled
1 Ready to Complete	Log Off After Disconnect	Never
		Cancel Previous Submit

Vmw VMware Horizon*				Pod Cluster-COM	INSERV8	Q. User Searc	ch	Abo	ut 😨 🚳	0 2
C Updated 12/20/2021, 9:02 AM V Sessions D	Desktop Pools									
Problem vCenter VMs 0 Problem RDS Hosts 0	Add Edit Duplica	re Delete	Entitlements ~ Status	✓ Access Groups ~	View Unentitled \sim					
Events Q System Health 29	Access Group All	~]						T	Filter	C
Monitor ·	D ID	Display Name	Туре	Source	User Assignment	vCenter Server	Entitled	Application Pool	s	Enabled
Dishboard Events Sectors Help Deck Users and Croups. friventory * Decktops Applications Farms	O C ExitCineedBU	FullClonevGPU	Automated Desktop P	vCenter (instant clone)	Roating Assignment	mgm-vcenser tree nvida com	0	NIA		~
Nachmes Sertings v Sarvers Domains Product Licensing and Usage Global Settings Registured Machines										
Administrators									_	

15. Click the Status button to display the pools' status.

9.5 Creating Linked Clone Desktop Pools

Creating a linked pool of VDI desktops is similar to creating a full clone pool. A linked pool leverages Horizon 8 to deploy multiple desktops from one 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 the golden 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. Right-click the gold master image VM.

Select **Snapshots** > **Take Snapshot** to open the Take Snapshot window.



2. Name the snapshot to conform to your VM naming standards. Give the snapshot a meaningful description, then click OK to create the snapshot.

Take shapshot	
Name	Horizon-LinkedClonePool
Description	Horizon Desktop Linked Clone Pool
and the second second	mmy.
The Sylveria	nauma MM Incha

3. Start the VMware Horizon Administrator. Select Desktops in the Inventory pane, then click the Add button. Horizon Administrator starts the Desktop Pool wizard.

vmw VMware Horizon*	
Opdated 12/20/2021, 9:02 AM ✓ Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0 Events 0 System Health 29	Add Edit Access Group All
Monitor Dashboard Events Sessions Help Desk Users and Groups Inventory Desktops Applications	D D FullClonevGPU

4. Select Automated Desktop Pool, then click Next.

Add Pool		
🗊 Туре	Automated Desktop Pool ①	0
2 vCenter Server	Manual Desktop Pool Manual Desktop Pool Pool Desktop Pool	
3 User Assignment		
Storage Optimization		
Desktop Pool Identification		
Provisioning Settings		
vCenter Settings		
B Desktop Pool Settings		
8 Remote Display Settings	-	
		Cancel Next Next

5. Select the vCenter Server instance. You must select the Instant Clone Radio button for the Linked Clones pool. Click **Next**.

Add Pool		
🕑 Туре	• Instant Clone	J
2 vCenter Server	Full Virtual Machines	
3 User Assignment	vCenter Server	
Storage Optimization		
Desktop Pool Identification		
6 Provisioning Settings		
VCenter Settings		Rows per page 20 V 1 - 1 of 1 row(s)
B Desktop Pool Settings	Description	
Remote Display Settings		A
		Cancel Previous Next

Add Pool		
📀 Туре	• Floating	0
VCenter Server	O Dedicated Enable Automatic Assignment	
3 User Assignment	Enable Multi-User Assignment 💿 Automatic assignment is not supported for multi-user assignment pools.	
Storage Optimization		
Desktop Pool Identification		
Provisioning Settings		
VCenter Settings		
B Desktop Pool Settings		
Remote Display Settings	÷	
		Cancel Previous Next

6. Select Floating as the User Assignment type. Click **Next**.

7. Select the Use VMware virtual SAN Radio button for the Storage Optimization. Click Next.

Add Pool	~			
🖉 Туре	Storage Policy Management ©			Ō
VCenter Server	 Use VMware Virtual SAN Do not use VMware Virtual SAN 			
User Assignment	Use Separate Datastores for Replica and OS Disks			
Storage Optimization				
Desktop Pool Identification				
Provisioning Settings				
VCenter Settings				
Desktop Pool Settings				
Remote Display Settings	-			
		Cancel	Previous	Next

🕗 Туре	Asterisk (*) denotes required field	0
	* ID (1)	
VCenter Server	FullCionevGPU	
	Display Name 🛞	
User Assignment	FullClonevGPU	
	Access Group	
Storage Optimization	/	
5 Desktop Pool Identification	Description	
6 Provisioning Settings		
7 vCenter Settings		
B) Desktop Pool Settings		
Remote Display Settings		

8. Enter a unique ID and a display name for the desktop pool. Click Next.

9. Enter the Provisioning Settings for your environment. Click Next.

Туре	Asterisk (*) denotes required field		(7
	Basic		
VCenter Server	Enable Provisioning (1)		
	Stop Provisioning on Error		
User Assignment	Virtual Machine Naming ()		
	O Specify Names Manually		
Storage Optimization	0 names entered	1.00	
	Use a Naming Pattern ①		
Desktop Pool Identification	* Naming Pattern		
	Deskron-		
Provisioning Settings	periop.		
	Provision Machines		
vCenter Settings	Machines on Demand		
	Min Number of Machines 1		
Desktop Pool Settings	O All Machines Up-Front		
	Desktop Pool Sizing		
Remote Display Settings	* Maximum Machines		
	* 20		

10. In the vCenter Settings tab. Fill in the details for your Horizon Pool.

Vmware suggests using the <u>Worksheet to Create an Automated Full-Clone Desktop Pool</u> to prepare your configuration options before creating the desktop pool.

	1	0
Туре	Default Image	0
vCenter Server	Asterisk (*) denotes required field	
	* Golden Image in vCenter	
User Assignment		Browse
	* Snapshot	
Storage Optimization		Browse
	Virtual Machine Location	
Desktop Pool Identification	* VM Folder Location	
		Broviac
Provisioning Settings	Resource Settings	
Auforetes Pattings	* Cluster	
venter settings		ditowee
Desktop Pool Settings	* Resource Pool	
		Brbilisa
Remote Display Settings	* Datastores	
	 Click Browse to select. 	

11. In the Desktop Pool Settings tab. Fill in the details for your Horizon Desktop Pool.

Vmware suggests using the <u>Worksheet to Create an Automated Full-Clone Desktop Pool</u> to prepare your configuration options before creating the desktop pool.

Time			
Type	State		
Constraint.	Enabled	~	
vCenter Server	Connection Server Restrictions		
	None Browse		
User Assignment	Category Folder		
	None Browse		
Storage Optimization	Client Restrictions C Enabled		
Desktop Pool Identification	Session Types		
	Desktop	~	O
Provisioning Settings	Log Off After Disconnect		
	Never	~	
vCenter Settings	Allow Annual Proton Markense		
	Allow Users to Restart machines	-	
Desktop Pool Settings	NO	~	
	Allow Separate Desktop Sessions from Different Client Devices		
Remote Display Settings	No	~	٢
remore publicly security.			
Court Coloring			
Guest Customization			

12. In the Remote Display Settings tab. Fill in the details for your Horizon Desktop Pool.

 User Assignment User Assignment Storage Optimization Provisioning Settings Venter Settings Desktop Pool Settings Desktop Pool Settings Desktop Pool Settings Remote Display Settings Guest Customization Ready to Complete 					
Storage Optimization Remote Display Protocol Desktop Pool Identification VMware Blast Allow Users to Choose Protocol Yes 3D Renderer Vcenter Settings Vcenter Settings VVDIA ARID VGPU VGPU Protile NVIDIA A15-18 Allow Session Collaboration Product Display Settings Requires VMware Blast Protocol Requires VMware Blast Protocol	Oser Assignment	•			(3)
Image: Construction Image: Construction	Storage Optimization	Remote Display Protocol Default Display Protocol			0
Allow Users to Choose Protocol Yes 3D Renderer NVIDIA GRID VGPU VGPU Profile NVIDIA A15-18 Allow Session Collaboration Image: Protocol Requires VMware Blast Protocol	Desktop Pool Identification	VMware Blast	~		
Provisioning Settings Ves 3D Renderer NVIDIA GRID VGPU VGPU Profile NVIDIA A16-18 Allow Session Collaboration Produires VMware Blast Protocol. Requires VMware Blast Protocol.		Allow Users to Choose Protocol			
3D Renderer VCenter Settings NVIDIA GRID VGPU VGPU Profile NVIDIA A16-18 Allow Session Collaboration Collaboration Requires VMware Blast Protocol Requires VMware Blast Protocol	Provisioning Settings	Yes	*		
VCenter Settings NVIDIA GRID VGPU VGPU Profile NVIDIA A15-18 Allow Session Collaboration Image: Requires VMware Blast Protocol. Requires VMware Blast Protocol.		3D Renderer			
vGPU Profile NVIDIA A15-18 Allow Session Collaboration Image: Requires VMware Blast Protocol Requires VMware Blast Protocol	VCenter Settings	NVIDIA GRID VGPU	*	O	
 Desktop Pool Settings NVIDIA A16-18 Allow Session Collaboration Enabled Requires VMware Blast Protocol. Guest Customization Ready to Complete 		vGPU Profile			
 Allow Session Collaboration Requires VMware Blast Protocol Guest Customization Ready to Complete 	Oesktop Pool Settings	NVIDIA A16-1B			
Requires VMware Blast Protocol Guest Customization Ready to Complete		Allow Session Collaboration 🕝 Enabled			
O Guest Customization Ready to Complete	Bemote Display Settings	Requires VMware Blast Protocol			
Ready to Complete	00 Guest Customization				
	Ready to Complete				
		2			

13. In the **Guest Customization** tab. Scroll towards the bottom and Select the customization specification (Sysprep), then select the customization specification you created for the Horizon Pool..

User Assignment	*		0
Storage Optimization	Post-Synchronization Script P	arameters	
Desktop Pool Identification	Example: p1 p2 p3		
	 Use a customization specific 	fication (SysPrep)	
Provisioning Settings			C
	Name	Guest OS	Description
vCenter Settings	O ProViz-Win10	Windows	
	O. TME nVector	Windows	nVector customization settings.
Desktop Pool Settings	Win11	Windows	
Remote Display Settings			
Guest Customization			
Ready to Complete	0		Rows per page 20 V 1-3 of 3 rows

14. Review your selections. If any are incorrect, click Back to correct them. When your selections are correct, click Finish to deploy the Desktop Pool.

2 Liser Assignment		
Oper Applement	•	0
Storage Optimization	Entitle Users After Adding Pool	
Storage Optimization	Туре	Automated Desktop Pool
Desktop Pool Identification	User Assignment	Floating Assignment
Provisioning Settings	vCenter Server	mgmt-vcenter.tme.nvidia.com
	Unique ID	FullClonevGPU
VCenter Settings	Description	
Desktop Pool Settings	Display Name	FullClonevGPU
	Access Group	X
Remote Display Settings	Desktop Pool State	Enabled
Guest Customization	Session Types	Desktop
Sec. in case of the	Client Restrictions	Disabled
1 Ready to Complete	Log Off After Disconnect	Never
		Cancel Previous Submit

15. Click the Status button to display the pools' status.

VMware Horizon*			Po	d Cluster-CONNSERV8		User Search		About 🕲 (0 8	
C Updated 12/21/2021, 2:15 AM v Sections 0 Problem vCenter VMs 0 Problem ROS Hoats 0 Events 0 System Health 22	Add Edit: Duplicate	Delete Entitlements	 ✓ Status → Access G 	roups >	ied *			T Filter]c+
Monitor 🔷 着	D ID	Display Name	Туре	Source	User Assignment	vCenter Server	Entitled	Application Pools	Enabled	A
Dashboard	🗇 🛤 FullClonevGPU	FullClonevGPU	Automated Desktop Pool	vCenter (instant clone)	Roating Assignment	mgmt-vcenter.tme.nvidia.com	1	N/A.	~	
Events Sessions Help Desk	LinkedDesktopPool	LinkedDesktopPool	Automated Desktop Pool	vCenter (Instant clone)	Floating Assignment	mgmt-vcenter.tme.nvidia.com	Ť	N/A.	~	
Users and Groups										
Desktons										
Applications										
Farms										
Machines										

9.6 Enabling User Access to Desktop Pools

Entitle users to access the VDI desktops in a desktop pool.

1. Start or return to VMware Horizon Administrator and click Desktop Pools in the left-hand pane.

VMware Horizon*			Pod Clus	ter-CONNSERV8	(D) User Sea	rch Abou	
C Updated 12/23/2021, 9:02 AM v Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0 Events 0 System Health 29	Desktop Pools Add Edit Duplica Access Group All	te Delete Enotlemu v Add Ent Remove	ents Status Access Gro attements Entitlements	aps v		T	ilter
Monitor 🤟 🎽	0 10	Display Name	Туре	Source	User Assignment	vCenter Server	Entitled
Dashboard	C C FullClonevGPU	FullClonevGPU	Automated Desktop Pool	vCenter (instant clone)	Floating Assignment	mgmt-vcenter.tme.nvidia.com	1
Events	LinkedDesktopPool	LinkedDesktopPool	Automated Desktop Pool	vCenter (instant clone)	Floating Assignment	mgmt-vcenter tme.nvidia.con	1
Sessions Help Desk							
Inventory							
Desktops							
Applications							

2. Click the Add button to enter your entitlements.

Add Remove	no can use the selected pool(s).	
Name	Domain	Email
	No records available.	
The section of		Rows per page 20 💙 0 row

3. In the **Find User or Group** window.

Check the Users checkbox or the Groups checkbox (or both) to display the defined users or groups.

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.

ind oser of oroup			×
Гуре	Users 🔽 Groups		
Domain	Entire Directory		4
Name/User Name	Starts with	~	
Description	Starts with	~	
FINO			
Name User Name	Email	Description	In Folder
Name User Name	e Email	Description	In Folder
Name User Name	Ma records available	Description	In Folder

4. 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 window.

Chapter 10. 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.

This Chapter covers The VMware Horizon Client:

- Installing the VMware Horizon Client
- Configuring the VMware Horizon Client Connection

10.1 Installing VMware Horizon Client

To install VMware Horizon Client:

 Log into the physical device, then open an internet browser. Navigate to the Horizon Connection Server URL installed earlier in this guide. See <u>Section 4.2 - Installing the Horizon Connection</u> <u>Server</u>. Click Install VMware Horizon Client.



2. The browser opens the **Download VMware Horizon Clients** page. Locate the download for the appropriate OS and click **Go to Downloads** to its right.

e CUSTOMER CONNECT Products and Accounts	Knowledge Communities Support Learning	
Home / VMware Horizon Clients Download VMware Horizon Select Version: HOBIZON 8 Click here for a Read More	Clients n Clients for Windows, Mac. IOS, Linux, Chrome and Android allow you to connect to your VMware Horizon to a of chrone giving you on-the-go access from any location list of certified thin clients, zero clients, and other partner solutions for VMware Horizon.	virtual desktop View My Download History Product Info Documentation Horizon Mobile Client Privacy Horizon Community
Product Downloads Drivers & Tools: Open Source Product	E Oustom ISOS OEM Addons Refease Date	
VMware Horizon Client for Windows	2021-11-29	GO TO DOWNLOADS
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VMware Horizon Client for macOS	2021-11-29	GO TO DOWNLOADS
VMware Horizon Client for Linux		
VMware Horizon Client for 32-bit Linux	2021-01-07	GO TO DOWNLOADS
VMware Horizon Client for 64-bit Linux	2021-11-29	GO TO DOWNLOADS
VMware Horizon Client for Linux tarball version	2021-11-29	GO TO DOWNLOADS
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VMware Horizon Client for Android 64-bit ARM-b	based devices 2021-12-09	GO TO DOWNLOADS
Where Horizon Clant for Android 33-bit v86-br	1001.13.00	OD TO DOWNLOADS

3. The browser opens the **Download Product** page. Click **Download Now** to begin downloading.

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Home / VMware Ho	srizen Client for Windows	
Download	d Product	1.000
Select Version	2011 🛩	Product Resources View My Download History
Documentation	Release Notes	Product info
Release Date	2021-11-29	Documentation Horizon Mobile Client Privacy
Туре	Product Binaries	Horizon Community
Product Downloads	Drivers & Tools Open Source, Custom SOs OEM Addons	Ŵ
File	Information	
	Thene for Windows	
VMware Horizon C	then for windows	DOWNLOAD NOW
VMware Horizon C File size: 317.71 MB File type: exe		DOWNLOAD NOW

4. When the download is complete, locate the downloaded installer and double-click it to begin the installation. The installer prompts you to accept the privacy agreement and license.

$\epsilon \rightarrow - \tau$		~ 0	,O Search Download	ls
🗸 🖕 Quick access	Name V Today (3)	Date modified	Type	Size
i Desktop	VMware-Horizon-Agent-x86_64-2111.1-8.4.0-190666669		Application	237,944 KB
🛓 Downloads	VMware-Horizon-Agent-Direct-Connection-x86_64-8.4.0-18964730		Application	49,056 KB
Documents	VMware-Horizon-Client-2111-8.4.0-18968194		Application	325,339 KB
Pictures	*			
Music				
Videos				
OneDrive				
This PC				

5. Click Agree & Install to continue the installation.

	×
VMware Horizon*	
Version 2111	
You must agree to the Privacy Agreement and License Terms before you can install the product	
Agree & Install	
Customize Installation	

6. The installer displays the Success window when the installation is done. Click Finish to complete the installation.



7. The installer displays the Restart window. Click **Restart Now** to restart the physical desktop. When the restart is complete, log in to see that Horizon Client installed.



10.2 Configuring the VMware Horizon Client Connection

To configure the VMware Horizon Client:

1. Start VMware Horizon Client on the desktop from which you want to connect. The application displays a splash screen, then the home window. Click **Add Server** to register a new virtual machine connection.

>
+ Add Server 🔞 Settings 🕠

 VMware Horizon Client prompts you for the Name of the Connection Server. Enter the IP address or the FQDN of the VDI desktop you want to connect to, then click Continue. (You are connecting directly to a desktop, so do not enter the Horizon Connection Broker address at this time.)

vGPU-VMware-VDI-Des	ktop

3. VMware Horizon Client displays a log-in window. 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**.

NVIDA-ADMINISTRATOR	
	1
NVIDIA-AD-Domain.com	<i>w</i>
Cancel	i migliri

Appendix A. About This Document

A.1 Related Documentation

NVIDIA publishes several other documents that are helpful to users of VMware Hypervisor with NVIDIA vGPU software. See the <u>NVIDIA Virtual GPU (vGPU) resources page</u> for additional information about NVIDIA vGPU technology, including:

- <u>NVIDIA Virtual GPU Technology</u>
- Purchasing Guide for NVIDIA vGPU Solutions
- <u>Relevant White Papers</u>
- <u>Relevant videos</u>

A.2 Support Contact Information

NVIDIA and other vendors provide several technical support resources to assist you: Contact NVIDIA Sales Representatives | NVIDIA

The <u>NVIDIA vGPU resources page</u> describes additional contact methods to help you get the answers you need as soon as possible.

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