

NVIDIA GRID DEPLOYMENT GUIDE FOR CITRIX XENDESKTOP 7.12 ON VMWARE VSPHERE 6

SP-00000-001_v01.0/. | May 2017

NVIDIA TechPub

DOCUMENT CHANGE HISTORY

Version	P-00000-001_v01.0/. Version Date Description of Change	
01	05/2015	Initial release
02	05/2017	Update to Citrix 7.12

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CHAPTER 1. ABOUT THIS DOCUMENT

This guide makes two assumptions about you: that you are interested in hosting graphics accelerated applications in a virtual environment, and that you want to get a suitable environment running quickly, even though you may have little or no experience deploying a virtualized environment. This deployment guide is written to give you enough information to successfully design, build, and execute a proof of concept (POC) project using NVIDIA GRID[™], VMware vSphere[®] 6.0 U2, and Citrix[®] XenDesktop[®] 7.12. Once completed, this POC system will allow you to deliver virtual workstations (vWS) and virtual PCs (vPC) with high resolution, graphics accelerated applications, remotely to end users.

This section contains a brief overview of the technologies presented, an overview of the chapters, and the formatting conventions. We also describe the lab environment used to test the contents of this guide and capture the screenshots used.

1.1 ABOUT THE TECHNOLOGIES

Let's start off with a brief description of the technologies involved.

1.1.1 NVIDIA GRID

NVIDIA GRID brings the power of NVIDIA GPU to virtual desktops, applications, and workstations, with an immersive user experience for everyone, from office workers to mobile professionals to designers. GRID technology meets the rising performance demands of modern applications and Windows 10, bringing graphics acceleration to the data center, enabling IT to centralize applications and data, and deliver virtual workspaces that offer improved management security, and productivity. Business can deliver cost-effective VDI performance that scales, transforming workflow and

liberating users from the confines of PC's and offices, collaborating in real-time, from anywhere, using any device. IT can now virtualize 100% its users with a native experience, achieving dramatically lower cost per desktop, with manageability that ensures a consistently great user experience. NVIDIA GRID improves security, ensuring data and IP are centrally stored and protected, while enabling business partners to securely collaborate without risk.

The following NVIDIA GRID technologies are used in this guide:

- NVIDIA GRID vGPU Manager This software runs in the hypervisor layer and allocates physical GPU resources to VMs.
- ▶ NVIDIA GRID Monitoring which provides features like:
 - vGPU Discovery, which shows the currently active vGPU as well as supported and creatable types of vGPU.
 - vGPU Properties such as number of displays, maximum resolution, frame buffer size, current license status and more.
 - Utilization Reports, that provide metrics on encode and decode engine utilization, and other features.
- NVIDIA[®] Quadro[®] Driver Vendors of high-performance graphics applications certify their software to work with NVIDIA Quadro drivers, and NVIDIA GRID provides those same drivers for use in Virtual Workstations.
- NVIDIA GRID License Manager This server software helps administrators deploy, manage, and audit GRID license usage among virtual workstations, desktops, and applications.
- NVIDIA[®] Tesla[®] multi-GPU boards These provide the physical GPU and frame buffer resources for the VMs to use.

1.1.2 VMware vSphere

VMware vSphere 6.0 U2 provides virtualization technology. vSphere consists of VMware[®] ESXiTM, which installs on bare-metal servers and provides the virtualization necessary, and VMware[®] vCenter ServerTM (simply referred to as vCenter) which manages the ESXi servers and provides a consolidated, centralized user interface. This guide uses vSphere to supply the hypervisor that will create the virtual workstations and desktops.

1.1.3 Citrix XenDesktop

The following Citrix XenDesktop technologies are included in this guide:

- ► Citrix[®] StoreFrontTM A web based, self-service portal for users to access their virtual desktops and other resources.
- Citrix Studio a centralized management console for administrators to create deployment groups of virtual workstations and desktops to be consumed.
- Citrix License server A server to audit and provision licenses for the XenDesktop environment.
- Citrix Virtual Desktop Agent (VDA) Software that resides within the virtual workstation or desktop and provides access to the end user.
- Citrix Receiver Client software enabling the end user to connect to virtual desktops and other resources.
- Citrix Director A web based, daily management console for administrators and help desk staff to view and take action on user sessions as well as environment reports.
- Citrix Delivery Controller A server to broker and manage user connections and environment configuration details.

Figure 1-1 shows the key components of a XenDesktop deployment.

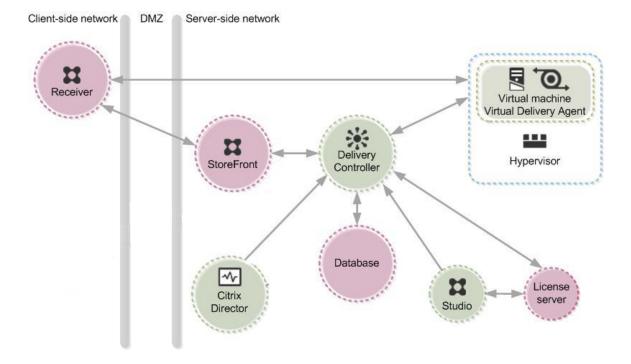


Figure 1-1 Citrix XenDesktop components diagram

1.2 ORGANIZATION

This manual contains the following chapters.

- Chapter 1 *About this Document*: Explains the conventions used in this document, related documentation, and a list of acronyms.
- Chapter 2– *Getting Started*: Introduces you to NVIDIA GRID technology and guides you through preparing to deploy GRID with Citrix XenDesktop.
- Chapter 3 *Installing VMware ESXi 6.0 U2*: Guides you through preparing a bootable USB drive and installing vSphere 6 on the selected host.
- Chapter 4 *Installing VMware vCenter Server 6.0 U2*: Instructions for installing and configuring VMware vCenter 6 Server, either Windows or OVA Linux virtual appliance.
- Chapter 5– GRID software preparation: Explains how to build a license server, obtain licenses, and register for NVIDIA Support, Update, and Maintenance Subscription (SUMS)
- Chapter 6 NVIDIA GRID vGPU Manager Installation: Step-by-step guide to downloading, preparing, uploading, installing, or uninstalling an NVIDIA GRID vGPU Manager VIB file.
- Chapter 7 Building Citrix XenDesktop 7.12: Instructions for installing and configuring Citrix XenDesktop 7.12.
- Chapter 8 Selecting GRID vGPU profiles: Understanding the range of available profiles and how to select the correct ones for your user groups.
- Chapter 9 Application Based Host Sizing Example Esri: give basic guidance on how to size host resources to accommodate a typical GPU dependent application.
- Chapter 10 Creating your first GRID Virtual workstation : Guides you through configuring a GRID vGPU for a single guest desktop to create a template.
- Chapter 11 Creating XenDesktop Machine Catalogs and Delivery Groups: Using Citrix Studio to create a random pool of GRID vGPU powered desktops using a single GRID vGPU profile.
- Chapter 12 *Testing, Monitoring, & Benchmarking*: Describes procedures for testing and benchmarking your NVIDIA GRID deployment.
- Chapter 13 *Known Issues*: Lists known issues related to vCenter, NVIDIA, and hardware.
- Chapter 14 *Troubleshooting*: Provides a procedure for resolving common issues.
- Chapter 15 *Using WINSCP*: Describes how to use WINSCP to transfer files.

1.3 FORMATTING CONVENTIONS

This document uses several formatting conventions to present information of special importance.

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bullet format:

- Item 1
- Item 2

Procedures that must be followed in a specific order appear in numbered steps:

- **1.** Perform this step first.
- **2.** Perform this step second.

Specific keyboard keys are bolded and capitalized, for example: **ESC**. If more than one key should be pressed simultaneously, it is displayed as **KEY1+KEY 2**, for example **ALT+F4**.

Interface elements such as document titles, fields, windows, tabs, buttons, commands, options, and icons appear in bold or italics text.

Menus and submenus have the notation **Menu>Submenu**. For example, "Select **File>Save**" means that you should first open the **File** menu, and then select the **Save** option.

Specific commands appear in standard Courier font. Sequences of commands appear in the order in which you should execute them and include horizontal or vertical spaces between commands. The following additional formatting also applies when discussing command-line commands:

Plain-text responses from the system appear in bold **Courier** font.

This manual also contains important safety information and instructions in specially formatted callouts with accompanying graphic symbols. These callouts and their symbols appear as follows throughout the manual:

CAUTION: Cautions alert you to the possibility of a serious error, d	lata lo	oss, c
other adverse condition		



Notes provide helpful information

1.4 RELATED DOCUMENTATION

If you're just getting started with NVIDIA GRID, see <u>NVIDIA GRID Technology</u> for basic information.

Refer to <u>Resources for NVIDIA GRID</u> for additional information about NVIDIA GRID technology, including:

- Datasheets
- Guides and Solution Overviews
- Case Studies
- ► White Papers
- Videos

For a list of GRID certified servers, see Certified Servers.

For information on VMware vSphere and ESXi installation check the documentation at <u>About vSphere Installation and Setup</u>.

1.5 THE DEPLOYMENT GUIDE LAB

To write this guide, test the steps necessary, gather the screenshots, and research what would become the contents, we used the following servers:

Table 1-1 Lab Servers

Role	Manufacturer	GPU	CPU	Memory
Management host	Supermicro	None	Intel Xeon E5- 1650 v3 @ 3.50 GHz	64 GB
vGPU host	HPE	2 X NVIDIA Tesla M60	Intel Xeon CPU E5-2697 v4 @ 2.30GHz	768 GB

The Management server hosted the following services in virtual machines (VM).

- ▶ VMware vCenter Server Appliance (VCSA), Linux based
- Microsoft Windows Active Directory server
- VMware vCenter Server on Windows
- NVIDIA GRID License server
- Citrix XenDesktop components

The production server was used to host the virtual workstations and desktops, which were based on Microsoft Windows 10 Professional x64. The management server hosted the infrastructure components (Active Directory, Citrix XenDesktop, GRID License Server) which were based on Windows Server 2012 R2, excepting the VMware vCenter Server Appliance, a Linux based system.

Centralized storage provides a host of benefits to a virtualized environment, but they can frequently be slower than local disk. Disk latency on a SAN can be problematic as well, causing overall application delays. We used a Dell EMC XtremeIO Storage device connected with 10Gb Ethernet. We found this provided adequate speed and low latency while also giving us a centralized storage environment.

It is not necessary to have all the listed equipment building a POC environment; in fact, it can be done on a single physical server. This would not, however, be representative of a recommended enterprise deployment. To give your POC the best chance of wide adoption and general favorability, build the POC as close as possible to production design. Here are some guidelines we've found useful for planning your POC:

- Given that CPU is the most common bottleneck in many visualization applications, it is strongly recommended to avoid putting non-GPU workloads on a GPU equipped host. This allows those resources to be dedicated to provisioning guests with the performance of NVIDIA GRID.
- By separating the management and production (or virtual desktop) clusters, administrators can retain foundational services and exported virtual machines while reinstalling new versions of code.

CHAPTER 2. GETTING STARTED

NVIDIA GRID software enables multiple virtual machines (VMs) to have simultaneous, direct access to pools of physical, data center proven NVIDIA Tesla GPUs, using a microhypervisor installed within the host hypervisor stack. It leverages a feature rich SDK to provide monitoring and management, and the same proven NVIDIA graphics drivers that are deployed on non-virtualized operating systems. This gives VMs unparalleled graphics performance and application compatibility, together with cost-effectiveness and scalability. This is brought about by sharing a GPU among multiple VMs.

This chapter covers how NVIDIA GRID fundamentally alters the landscape of desktop virtualization. It describes the NVIDIA GRID architecture, the types of virtual GPUs supported, and key standards supported by GRID.

This guide focuses on the deployment of full virtual desktops as opposed to streamed applications or other solutions such as Citrix XenApp[®]. Citrix XenApp is supported on NVIDIA GRID, but is outside the scope of this guide.

2.1 WHY NVIDIA GRID?

As IT seeks to fully realize the power of virtualization, end user computing has remained a stumbling block. Organizations want the benefits of greater elasticity of scale, data security, and simplified manageability. However, adoption of desktop virtualization solutions has been limited by their failure to deliver a consistently great user experience that's equivalent to physical PC's and workstations.

Increasingly, today's operating systems like Microsoft Windows 10, and modern applications including office productivity tools, browsers, and multimedia, demand

levels of graphics performance and user experience not traditionally supported by desktop and application virtualization. NVIDIA GRID addresses the deficiencies of VDI by bringing graphics acceleration to the virtualized data center, enabling IT to extend the reach of virtualization to every user, from task workers to designers, delivering unparalleled NVIDIA graphics performance and a great user experience that rivals physical PC's.

This new "graphics-accelerated data center" is the realization of a fully-virtualized end user computing environment, where NVIDIA GPU technology powers every desktop, every app, and every workstation, making virtualized workspaces accessible to an enterprise's entire workforce. NVIDIA GRID brings the power of NVIDIA GPU to virtual desktops, applications, and workstations, with an engaging user experience for everyone, from office workers to mobile professionals to designers. GRID technology meets the rising performance demands of modern apps and Windows 10, bringing graphics acceleration to the data center, enabling IT to centralize apps and data, and deliver virtual workspaces that offer improved management security, and productivity. Business can deliver cost-effective VDI performance that scales, transforming workflows and liberating users from the confines of PC's and offices, collaborating in real-time, from anywhere, using any device. IT can now virtualize 100% of its users with a native experience, achieving dramatically lower cost per workstation, with manageability that ensures a consistently great user experience. NVIDIA GRID improves security, ensuring data and intellectual property are centrally stored and protected, while enabling business partners to securely collaborate remotely.

2.2 NVIDIA GRID ARCHITECTURE

Using GRID software, NVIDIA Tesla GPUs can be virtualized, making them capable of supporting multiple *virtual* GPU devices (vGPUs) that can be assigned directly to VMs. The VMs present the vGPU to its guest OS as an instance of the shared physical GPU. The guest OS inside the VM sees the vGPU as if it were a physical GPU, down to the model number. The Guest uses the vGPU in the same way it would a physical GPU that has been passed through by the hypervisor. An NVIDIA driver loaded into the VM's guest OS leverages direct access to the GPU for performance and critical fast paths. Non-critical performance management operations use a para-virtualized interface to the GRID vGPU Manager. Figure 2-1 shows the NVIDIA GRID system architecture.

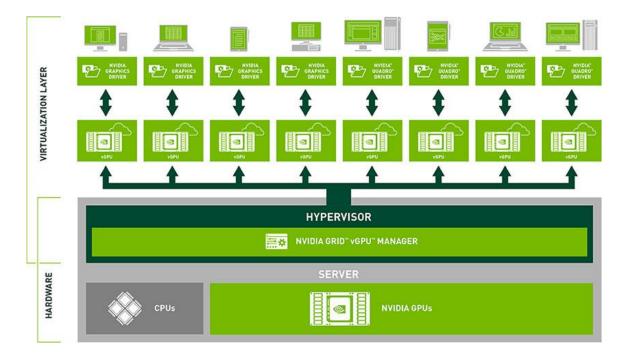


Figure 2-1 NVIDIA GRID System Architecture

GRID vGPUs are comparable to conventional GPUs in that they have a fixed amount of GPU frame buffer and one or more virtual display outputs or *heads*. Multiple heads support multiple displays. Managed by the NVIDIA GRID vGPU Manager software installed in the hypervisor, the vGPU frame buffer is allocated out of the physical GPU frame buffer at the time the vGPU is created. The vGPU retains exclusive use of that frame buffer until it is destroyed.

All vGPUs resident on a physical GPU share access to the GPU's engines, including the graphics (3D), and video decode and encode engines. The physical GPU has an internal scheduler that assigns all the GPU engine resources to a particular VM's graphics requests while that VM is scheduled. The input and output data for these requests are stored in the frame buffer assigned to that VM, so that one VM doesn't overwrite another's data. Figure 2-2 shows the vGPU internal architecture.

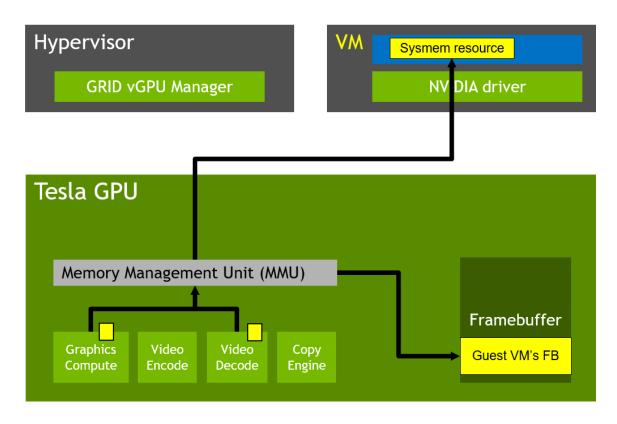


Figure 2-2 NVIDIA GRID vGPU Internal Architecture

Another innovation of the GRID architecture is support for NVIDIA Encode (NVENC) video encode acceleration with Citrix HDX 3D Pro. NVENC allows the hypervisor to use the physical GPU when encoding H.264 video output for transmission. Without NVENC, the server would use extra CPU cycles in the process of encoding the video stream. With NVENC, remote desktop software can more quickly encode frames, leading to increased performance for hosted applications. Figure 2-3 gives an overview of NVENC operation.

To find out more about NVENC, please refer to the following website:

NVIDIA VIDEO CODEC SDK

And for Citrix documentation:

GPU acceleration for Windows Desktop OS

NVENC OVERVIEW

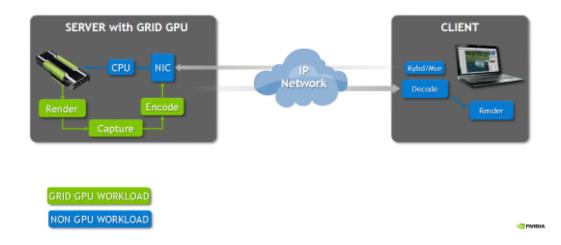


Figure 2-3 NVENC overview

2.3 SUPPORTED GPUS

NVIDIA GRID software is supported on Tesla M60 and Tesla M10 boards, both of which implement multiple physical GPUs, as well as the Tesla M6 single GPU MXM for blades:

- Tesla M60 is a PCI Express board with two high-end Maxwell GPUs, optimized for high performance
- Tesla M10 is a PCI Express board with four mid-tier Maxwell GPUs, optimized for high density
- Tesla M6 is an MXM board with a single high-end Maxwell GPU optimized for use in blade servers.

The Tesla Maxwell series succeeds the original GRID K1 and K2 cards, and provides several new features:

- Maximum screen resolutions up to 4096 X 2160
- Increased user density
- ▶ Support for NVIDIA[®] CUDA[®] and OpenCL[™] software.
- ▶ Blade server MXM support (M6)
- ► H.264 encoding on the GPU
- Monitoring and management

Linux support

The Tesla M6 is a single GPU blade optimized MXM module. The Tesla M60 and Tesla M10 are full height, full length, double width PCI-e cards, and are typically passively cooled (no onboard fan) requiring certified servers designed to properly power and cool them. Refer to <u>NVIDIA Certified Servers</u> to see all supported server platforms and cross-reference the NVIDIA list against the VMware vSphere HCL for servers. This list continues to grow rapidly, check back often for more certified platforms.

Each card requires auxiliary power cables connected to it, see the specification charts for specific pin counts. Most servers require an enablement kit for proper mounting of the Tesla and GRID GPU cards. Check with your server OEM of choice for more specific requirements.



GRID can also be run on the first-generation GRID K1 and K2 GPU cards, however they don't benefit from GRID software features.

For more information, see the NVIDIA GRID datasheet.

2.4 TESLA M60/M6 SPECIFICATIONS

Table 2-1 lists the Tesla M60 and M6 hardware specifications.

Table 2-1 Tesla M60 and Tesla M6 Hardware Specifications

	Tesla M60	Tesla M6
Number of GPUs	2	1
Total NVIDIA CUDA Cores	2048 per GPU (4096 total)	1536
Total Memory Size	8GB GDDR5 per GPU (16GB total)	8 GB GDDR5
Max Power	300 W	100 W
Board Length	10.5	4.134
Board Height	4.4	3.228
Board Width	Dual slot	MXM 3.1 type B form factor
Display IO	None	None

Aux Power	8-pin connector	8-pin connector
PCle	x16	x16
PCIe Generation	Gen3 (Gen2 compatible)	Gen3 (Gen1 compatible)
Cooling Solution	Passive	Passive
Complete Technical Specifications	See https://images.nvidia.com/content/pdf /tesla/tesla-m60-product-brief.pdf	See http://images.nvidia.com/content/pdf /tesla/tesla-m6-product-brief.pdf
Note: Refer to http://www.nvidia.com/object/grid-technology.html for more specifications.		

2.5 TESLA M10 SPECIFICATIONS

Table 2-2 lists the Tesla M10 hardware specifications.

Г

Table 2-2	Tesla M10 Hardware Specifications	

	Tesla M10
Number of GPUs	4
Total NVIDIA CUDA Cores	640 per GPU (2560 total)
Total Memory Size	8GB GDDR5 per GPU (32GB total)
Max Power	225 W
Board Length	10.5
Board Height	4.4
Board Width	Dual slot
Display IO	None
Aux Power	8-pin connector
PCle	x16
PCIe Generation	Gen3 (Gen2 compatible)
Cooling Solution	Passive
Complete Technical Specifications	See http://images.nvidia.com/content/pdf/tesla/Tesla- M10-Product-Brief.pdf
Note: Refer to http	://www.nvidia.com/object/grid-

technology.html for more specifications.

2.6 GRID K1 / K2 SPECIFICATIONS

Table 2-3 lists the GRID K1 and K2 hardware specifications

	GRID K1	GRID K2
Number of GPUs	4	2
Total NVIDIA CUDA Cores	192 per GPU (768 total)	1536 per GPU (3072 total)
Total Memory Size	4GB DDR3 per GPU (16GB total)	4 GB GDDR5 per GPU (8GB total)
Max Power	130 W	225 W
Board Length	10.5	10.5
Board Height	4.4	4.4
Board Width	Dual slot	Dual slot
Display IO	None	None
Aux Power	6-pin connector	8-pin connector
PCle	x16	x16
PCIe Generation	Gen3 (Gen2 compatible)	Gen3 (Gen2 compatible)
Cooling Solution	Passive	Passive
Complete Technical Specifications	See <u>http://www.nvidia.com/</u> <u>content/grid/pdf/</u> <u>GRID K1 BD-06633-001 v02.pdf</u>	See <u>http://www.nvidia.com/</u> <u>content/grid/pdf/</u> <u>GRID K2 BD-06580-001 v02.pdf</u>
Note: Refer to http://www.p	vidia.com/object/grid-technology.html	<u> </u>

Table 2-3 GRID K1/K2 Hardware Specifications

Note: Refer to http://www.nvidia.com/object/grid-technology.html for more specifications.

2.7 GRID VGPU PROFILES

Allocation of physical GPU frame buffer to virtual GPUs is controlled by vGPU profiles. Selection of a profile defines the amount of graphics frame buffer memory assigned to the vGPU, and subsequently how many virtual desktops can share that physical GPU. For example, a Tesla M60 physical GPU can support up to eight Tesla M60-1q vGPUs on each of its two physical GPUs (for a total of 16 vGPUs), but only two Tesla M60-4q vGPUs (for a total of eight vGPUs). You cannot oversubscribe frame buffer and it must be shared equally for each physical GPU, but you can select different profiles for each GPU. Like a GRID K2 card, the Tesla M60 with its two physical GPUs can support up to two different profiles, while the Tesla M10 can support up to four. See *Homogenous GRID vGPUs* on page 25 for more detail. Each physical GPU can support several different types of vGPU, each having a fixed amount of frame buffer, number of supported display heads and maximum resolutions, and targeted at different classes of workload.

Table 2-4 lists the GRID vGPU types supported on Tesla M60, M6, M10, with GRID software, and the GRID K1 and K2 cards. It also shows the GRID software versions for each vGPU profile: Virtual Workstation (vWS), Virtual PC (vPC), or Virtual Applications (vApps).

		GRID Software					Maxim vGPUs		
Card	Physical GPUs	Version (See section 2.10 GRID Licensing)	vGPU Profile	Frame Buffer (MB)	Virtual Display Heads	Max Resolution	Per GPU	Per Board	
Maxwell	Maxwell Architecture								
Tesla M60	Тwo	vWS	GRID M60-8Q	8192	4	4096x2160	1	2	
(PCI-e)			GRID M60-4Q	4096	4	4096x2160	2	4	
			GRID M60-2Q	2048	4	4096x2160	4	8	
			GRID M60-1Q	1024	2	4096x2160	8	16	
			GRID M60-0Q	512	1	2560x1600	16	32	
		vPC	GRID M60-1B	1024	4	2560x1600	8	16	
			GRID M60-0B	512	1	2560x1600	16	32	
		vApps	GRID M60-8A	8192	1	1280x1024	1	2	
			GRID M60-4A	4096	1	1280x1024	2	4	
			GRID M60-2A	2048	1	1280x1024	4	8	
			GRID M60-1A	1024	1	1280x1024	8	16	
Tesla M6	One	vWS	GRID M6-8Q	8192	4	4096x2160	1	1	
(MXM)			GRID M6-4Q	4096	4	4096x2160	2	2	

Table 2-4 GRID vGPU Types

			CDIC				1	
			GRID M6-2Q	2048	4	4096x2160	4	4
			GRID M6-1Q	1024	2	4096x2160	8	8
			GRID M6-0Q	512	1	2560x1600	16	16
		vPC	GRID M6-1B	1024	4	2560x1600	8	8
			GRID M6-0B	512	1	2560x1600	16	16
		vApps	GRID M6-8A	8192	1	1280x1024	1	1
			GRID M6-4A	4096	1	1280x1024	2	2
			GRID M6-2A	2048	1	1280x1024	4	4
			GRID M6-1A	1024	1	1280x1024	8	8
Tesla M10	Four	vWS	GRID M10-8Q	8192	4	4096x2160	1	4
(PCI-e)			GRID M10-4Q	4096	4	4096x2160	2	8
			GRID M10-2Q	2048	4	4096x2160	4	16
			GRID M10-1Q	1024	2	4096x2160	8	32
			GRID M10-0Q	512	1	2560x1600	16	64
		vPC	GRID M10-1B	1024	4	2560x1600	8	32
			GRID M10-0B	512	1	2560x1600	16	64
		vApps	GRID M10-8A	8192	1	1280x1024	1	4
			GRID M10-4A	4096	1	1280x1024	2	8
			GRID M10-2A	2048	1	1280x1024	4	16
			GRID M10-1A	1024	1	1280x1024	8	32
Kepler a	rchitecture							
GRID K2	Two	GRID 2.0 features	GRID K280Q	4096	4	2560x1600	1	2

(PCI-e)	(PCI-e)	not available	GRID K260Q	2048	4	2560x1600	2	4
			GRID K240Q	1024	2	2560x1600	4	8
			GRID K220Q	512	2	2560x1600	8	16
GRID F K1	K1 (PCI-e) GRID		GRID K180Q	4096	4	2560x1600	1	4
(PCI-e)		GRID 2.0 features not available	GRID K160Q	2048	4	2560x1600	2	8
			GRID K140Q	1024	2	2560x1600	4	16
		GRID K120Q	512	2	2560x1600	8	32	

2.8 SUPPORTED GRAPHICS PROTOCOLS

This release of GRID includes support for:

- DirectX 12, Direct2D, and DirectX Video Acceleration (DXVA)
- ▶ OpenGL 4.5
- ▶ NVIDIA Capture SDK 5.0 (remote graphics acceleration)

CUDA and OpenCL are supported on these vGPUs:

- ► GRID M60-8Q
- ► GRID M10-8Q
- ► GRID M6-8Q
- ► GRID M60-8A
- GRID M10-8A
- ► GRID M6-8A

2.9 HOMOGENOUS GRID VGPUS

To maintain predictable and stable performance, GRID software supports homogeneous vGPUs on each specific physical GPU. At any given time, the vGPU profiles running on a single physical GPU must be identical. However, this restriction does not extend to physical GPUs on the same card. Like the GRID K1 and K2 before, each physical GPU on

a Tesla M60 or Tesla M10 may host different types of vGPUs at the same time. For example, a Tesla M10 card has four physical GPUs and can support up to four different types of vGPU, one pre-physical GPU, allowing for great flexibility. Figure 2-4 shows an example of vGPU distribution on the Tesla M60.

In the case of the blade optimized Tesla M6 there is only one GPU per MXM, so one profile type can be assigned, but with multiple MXM's in a blade one additional profile can be chosen for each.

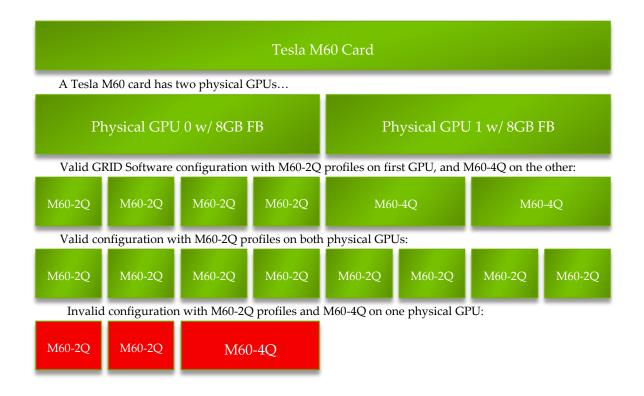


Figure 2-4 Example of GRID vGPU Configurations on Tesla M60

2.10 GRID LICENSING

These NVIDIA GRID products are available as licensed products on NVIDIA Tesla GPUs:

Virtual Workstation (vWS)

- ► Virtual PC (vPC)
- Virtual Applications (vApps)

GRID Virtual PC

This product is ideal for users who want a virtual desktop but need great user experience leveraging Windows applications, browsers, and high definition video. NVIDIA GRID Virtual PC delivers a native experience to users in a virtual environment, allowing them to run all their PC applications at full performance.

GRID Virtual Workstation

This edition is ideal for mainstream and high-end designers who use powerful 3D content creation applications such as Dassault's CATIA and SOLIDWORKS, 3DExcite, Siemens NX, PTC Creo, Schlumberger Petrel, and Autodesk Maya. NVIDIA GRID Virtual Workstation allows users to access their professional graphics applications with full features and performance, anywhere, on any device, with all the features and performance delivered by the fully tested and supported NVIDIA Quadro driver.

GRID Virtual Applications

For organizations deploying XenApp or other RDSH solutions. It delivers Windows applications at full performance. NVIDIA GRID Virtual Applications allows users to access any Windows application at full performance on any device, anywhere. This edition is suited for users who would like to virtualize applications using XenApp or other RDSH solutions.

Table 2-5 summarizes the GRID License editions

GRID License Edition	GRID Features
GRID Virtual Application	Virtual GPUs for virtual application computing
GRID Virtual PC	Virtual GPUs for business desktop computing
GRID Virtual Workstation	 Virtual GPUs for midrange and high-end workstation computing Workstation graphics on GPU pass-through

Table 2-5 GRID License Editions

Licenses can be purchased from NVIDIA (<u>http://www.nvidia.com/buygrid</u>) or customers may evaluate the licensing for a trial period. Customers who purchase licenses will receive an email with direction on how to download and install their new licenses. Evaluation customers will immediately see a link connecting them to their evaluation keys.

Once you've obtained your license, the GRID License Manager will help you manage distribution and compliance. The GRID License Manager provides monitoring and reporting on license usage for capacity planning and is included with the GRID software packages. This License Manager can be installed on either a physical server or, more likely, a dedicated virtual machine.

The following Figure 2-5 provides an overview of the GRID License management system:

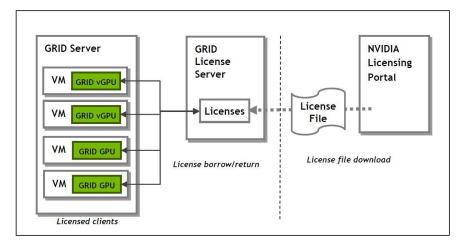


Figure 2-5 GRID Licensing management system

When enabled on Tesla GPUs, licensed editions of GRID products are activated by obtaining a license over the network from an NVIDIA GRID License Server. The license is "checked out" or "borrowed" at the time the Virtual Machine (VM) is booted, and returned when the VM is shut down.

GRID licenses come in three editions that enable different classes of GRID features. The GRID software automatically selects the right license edition based on the features being used.

For more information on NVIDIA GRID Licensing, see the <u>NVIDIA GRID Packaging</u> and <u>Licensing</u>.

Note: NVIDIA GRID and vGPUs require licensing for EULA compliance. To improve end user experience, the GRID software will run with or without a valid license server connection. NVIDIA GRID K1 and K2 GPUs do not require a license to run vGPU.

2.11 GRAPHICS VS. COMPUTE MODE

NVIDIA Tesla GPUs are shipped in a configuration optimized for graphics applications. However, they can also be configured for Compute mode, as listed in Table 2-6.

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

Table 2-6 Compute Mode Settings

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

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

To address these problems, certain NVIDIA Tesla GPUs support **graphics mode**. The settings for graphics mode are listed in Table 2-7.

Setting	Value	Notes
Classcode	VGA Controller	This classcode indicates to OS that the GPU can function as a primary display device.
Memory BAR	256 megabytes	The GPUs a smaller memory BAR for direct access to the frame buffer.
I/O base BAR	Enabled	The GPU exposes an I/O BAR to claim the resources required to operate as a VGA controller.

Table 2-7Graphics Mode Settings

Setting	Value	Notes
ECC protection	Disabled	ECC protection is disabled by default, though it can still be enabled by use of the nvidia-smi management tool

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

To learn more about graphics vs. compute mode, see the <u>apumodeswitch user guide</u>.

Tesla M10 GPU Accelerators do not enable Compute mode. These are Graphics mode only cards.

For the purposes of this guide, all GPU will be set to graphics mode.

2.12 DISTRIBUTION OF GRID VGPUS

On each host the GRID vGPU guests should be distributed across all available physical GPUs, ensuring the guests get the maximum available performance, versus loading up the first physical GPU before moving on to the next to ensure maximum density. This is referred to as breadth-first over depth-first distribution.

Tesla M60 Card							
Physical GPU 0 w/ 8GB FB Physical GPU 1 w/ 8GB FB							
Breadth-f	irst (default vSj	phere configuration) – 2 user ex	ample:				
M60-2Q			M60-2Q				
Depth-firs	Depth-first (optional vSphere configuration) – 2 user example:						
M60-2Q	M60-2Q						

Figure 2-6 Example of GRID vGPU Distribution on Tesla M60 Card

Architecturally the challenge comes with guests of different profiles but for the same card type, for example the M60-1Q and M60-8Q are both M60 profiles. In this case, it would be possible for the pool of M60-1Q guests to be spread across all available GPUs on a host, leaving no free GPUs for the M60-8Q pool. If there is another M60 host available, then the second pool can start placing guests there. Careful calculation of available hosts and GPUs, or assigning hosts to profile specific clusters, is necessary to ensure all guests have the necessary resources to power up.

2.13 THE BEFORE YOU BEGIN

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

2.13.1 General Prerequisites

The following elements are required to install and configure HDX 3D Pro with vGPU on VMware vSphere 6:

- Evaluation plan consisting of all the following:
- Listed business drivers and goals
- List of all user groups, their workloads, and applications

- Current end-user experience measurements and analysis
- ROI/density goals
- Review Citrix XenDesktop documentation

2.13.2 Build an Evaluation Plan

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

- Listed business drivers and goals with cost benefit analysis
- List of all user groups, their workloads, and applications
- Current end-user experience measurements and analysis
- ROI/density goals

2.13.3 Size Your Environment

Based on your evaluation plan, we recommend sizing an appropriate environment for each user group you are trying to reach with your evaluation. Use the system requirements for the most intensive graphics apps, as well as existing physical workstations as reference points. Often server performance hits the CPU bottleneck much before it consumes all available GPU power.-Based on all this, make sure to include enough RAM, CPUs, and GPUs to meet your sizing needs.

2.13.4 Choosing Your Hardware

The following elements are required install and configure vGPU on VMware vSphere 6:

- VMware and NVIDIA certified servers with NVIDIA Tesla M60, Tesla M6 or Tesla M10 cards (see <u>the NVIDIA Certified Server page</u> for a list of certified NVIDIA servers and cross check that against the VMware HCL) that meet the following recommended specifications:
- 2.5GHz CPU or faster (Intel "Haswell" or later)
- ► High-speed RAM
- Fast networking
- If using local storage IOPS plays a major role in performance.
- Select the appropriate NVIDIA GRID card for your use case, either Tesla M60 for higher performance solutions, Tesla M10 for density, or Tesla M6 for blade servers (refer to http://www.nvidia.com/object/grid-boards.html for details). For additional guidance, please contact your NVIDIA and Citrix reps.

- High performance storage with high IOPS SAN or similar
- Higher-performance end points for testing.

2.13.5 Choose Virtualization Components

- VMware vSphere 6.0 U2
- You may deploy vCenter Server 6 on a Windows server or as an OVA Appliance.
- Citrix XenDesktop 7.12

If needed, you may register for a free 90-day, 99-user trial to obtain the license keys, software, and quick-guides to deploy and manage XenDesktop at: http://www.citrix.com/tryxendesktop

- NVIDIA GRID software and licenses:
- NVIDIA GRID vGPU Manager VIB
- NVIDIA WDDM guest driver (32-bit and 64-bit versions)

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

- Windows Server 2012 R2 (recommended) or Server 2008 R2 (minimum)
- Windows 10 Enterprise (for use as the guest operating system)
- Your choice of a CLI/SSH/SCP tools installed on your Windows-based toolbox PC, for example:
- Putty (SSH) and WinSCP (SCP), available from http://www.putty.org and http://www.winscp.net, respectively. See Chapter 15, Using WINSCP, on page 295 for information on using WinSCP.
- Licenses:
- NVIDIA GRID licenses (or evaluation)
- VMware vSphere 6.0 U2 (or evaluation)
- Citrix XenDesktop 7.12 (or evaluation)
- Microsoft OS (volume licenses recommended)
- Testing and Benchmarking:
- NVIDIA System Management Interface
- OPTIONAL: VMware vRealize Operations Manager
- OPTIONAL: Citrix Director
- ▶ OPTIONAL: Lakeside SysTrack 7 with GPU monitoring
- Server where you will install Citrix XenDesktop 7.12 Delivery Controller:

- Windows Server 2012 R2
- Server must be joined to a domain
- Server must have a static IP address assigned

2.13.6 Pre-Installation Preparation

Perform the following procedure prior to installation:

- 1. Determine how vSphere will run on the physical hosts. Consider booting from a thumb drive or SAN.
- 2. Download and install a SSH and SCP tool, examples are:
- ► PuTTY (SSH)
- ► WinSCP (SCP)
- **3.** Set the BIOS on the physical hosts as appropriate. See 2.13.8, *Server BIOS* Settings on page 34.
- **4.** Install Virtual Clone Drive or similar to easily mount and un-mount ISO images within the virtual machines.

2.13.7 Known Limitations

See Chapter 13, Known Issues, on page 278 for a list of known limitations that is current as of the publication date of this manual.

2.13.8 Server BIOS Settings

Configure the BIOS as appropriate for your physical hosts, as per direction from your OEM for a VMware vSphere environment with NVIDIA Tesla products.

Older versions of many hypervisors were often limited to 32-bit addressing (i.e. a 4GB limit) and as such required server BIOSs to be configured such that MMIO (Memory Mapped I/O) above 4GB is disabled. This advice applies to VMware ESXi 5.1 and earlier. Information on addressing limitation can be found in

http://nvidia.custhelp.com/app/answers/detail/a id/4119/~/incorrect-bios-settings-ona-server-when-used-with-a-hypervisor-can-cause-mmio.

MMIO above 4GB should be enabled and may be necessary on many servers particularly when using NVIDIA GPUs with higher numbers of physical GPUs i.e. this is more likely to be necessary when using Tesla M10 cards (4 GPUs per card) than Tesla M60 cards (2 physical GPUs per card).

Some newer versions of VMware ESXi have raised the addressing limit to 44-bits but full 64-bit addressing is not supported in many versions of VMware ESXi. Information on the current MMIO access limits for specific versions of VMware ESXi can be found here: https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=208 7943, where it is documented for example that the Maximum Physical Address (MAXPA) is limited to 16TB in versions 6.0, 16TB (44-bit, 2 to the power of 44). However, care may need to be taken to ensure other BIOS setting prevent the use of MMIO address space above the 44-bit limit. An example is given in http://nvidia.custhelp.com/app/answers/detail/a_id/4119/~/incorrect-bios-settings-on-a-server-when-used-with-a-hypervisor-can-cause-mmio, where by a Supermicro server requires the MMIOHBase BIOS setting to be set to 2T to ensure memory indexed remains below the 16TB (44-bit) limit of VMware ESXi version 6.0. Customers are advised to consult their OEM server vendor for advice on appropriate BIOS settings.

CHAPTER 3. INSTALLING VMWARE ESXI 6.0 U2

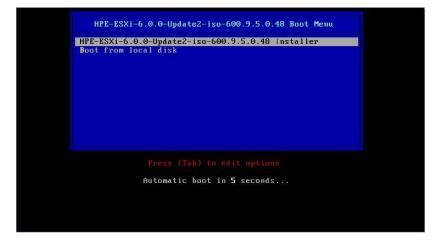
This chapter covers the following vSphere 6 installation topics:

- ▶ Installing vSphere 6.0 U2
- Initial host configuration

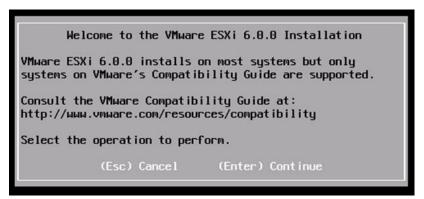
This deployment guide assumes you are building an environment as a proof of concept and is not meant to be a production deployment, thus choices made are meant to speed up and ease the process. For production use, consult the various documentation resources for each technology.

3.1 INSTALLING ESXI 6.0 U2

Use the following procedure to install the vSphere 6.0 U2. Select the boot media with the vSphere ISO on your host's boot menu.



1. Apply power to start the host. The **boot menu** displays when the host starts up.



2. Once the installation process boots, the **Welcome** screen will be displayed. press **ENTER** to continue.

End User License Agreement (EULA)
VMWARE, INC. BETA LICENSE AGREEMENT Note: BY CLICKING "I AGREE," ACCESSING, DOWNLOADING, INSTALLING, UPLOADING, COPYING OR USING THE BETA SOFTWARE, YOU CONCLUDE AND AGREE TO THIS BETA LICENSE AGREEMENT ("AGREEMENT") IN A LEGALLY BINDING MANNER WITH VMWARE, INC., 3401 HILLVIEW AVENUE, PALO ALTO, CA 94304, USA ("VMWARE"). IF YOU HAVE SPECIFIED IN CONNECTION WITH THE REGISTRATION PROCESS FOR THIS SOFTWARE BETA TEST PROGRAM THAT YOU ARE ACTING ON BEHALF OF A COMPANY OR OTHER ORGANIZATION, YOU REPRESENT THAT YOU ARE AUTHORIZED TO LEGALLY BIND SUCH ORGANIZATION AND THAT YOU CONCLUDE THE AGREEMENT ON BEHALF
OF SUCH ORGANIZATION. IN THE FOLLOWING, THE TERMS "YOU" AND "LICENSEE" SHALL REFER, JOINTLY AND SEVERALLY, TO YOU
Use the arrow keys to scroll the EULA text
(ESC) Do not Accept (F11) Accept and Continue

3. 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.

Select a Disk to Install or Upgrade * Contains a VMFS partition # Claimed by VMware Virtual SAN (VSAN)					
# Intel * ATA	RCS25ZB040LX RCS25ZB040LX INTEL SSDSC2BP24	(naa.6006055500631dc2 (naa.6006055500631dc2 (t10.ATAINTEL_S (t10.ATAINTEL_S	01b20b) 930.39 GiB SDSC2B) 223.57 GiB		
	ancel (F1) Deta	nils (F5) Refresh	(Enter) Continue		

4. Use the arrow keys to select the drive on which you will install vSphere 6 and then press **ENTER** to continue.

You can install vSphere 6 to a USB drive and then boot and run the system from that USB drive. This sample installation shows vSphere being installed on a local hard drive.

	Select a Disk to Install or Upgrade * Contains a VMFS partition # Claimed by VMware Virtual SAN (VSAN)						
St Lo #	Scanning Lo * Gathering additional information from the selected device. GiB # This will take a few moments. GiB						
#	ATA INTEL SSDSC2BP24 (t10.ATAINTEL_SSDSC2B) 223.57 note: (none) (Esc) Cancel (F1) Details (F5) Refresh (Enter) Continu						

The installer scans the chosen drive to determine suitability for install:

	ESXi and VMFS Found				
# Clai Storag	* Cont The selected storage device contains an installation of # Clai ESXi and a VMFS datastore. Choose whether to upgrade or install and overwrite the existing ESXi installation. Also choose whether to preserve or overwrite the existing VMFS datastore.				
* Int # Int * ATA # ATA	Local: * Int () Upgrade ESXi, preserve VMFS datastore # Int () Install ESXi, preserve VMFS datastore * ATA (2) Install ESXi, overwrite VMFS datastore # ATA Remote Use the arrow keys and spacebar to select an option.				
(Es	(Esc) Cancel (Enter) OK c) Cancel (F1) Details (F5) Refresh (Enter) Cont	tinue			

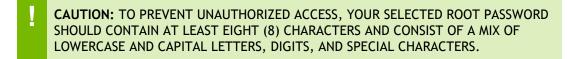
5. The **Confirm Disk Selection** window may display, if a VMFS datastore has been found on the install device. Press **ENTER** to accept your selection and continue.

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

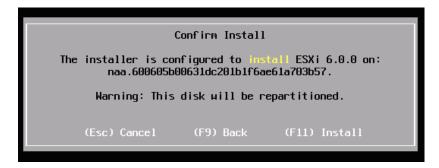
6. Select your desired keyboard layout using the arrow keys and then press ENTER.



7. Enter a root password in the **Root password** field.



8. Confirm the password in the **Confirm password** field and then press **ENTER** to proceed.

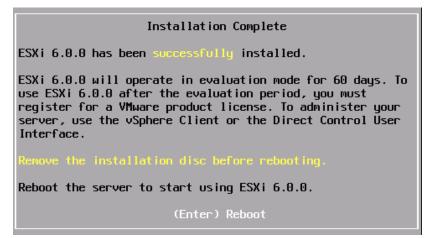


9. In the **Confirm Install** window press **F11**.

CAUTION: THE INSTALLER WILL REPARTITION THE SELECTED DISK. ALL DATA ON
THE SELECTED DISK WILL BE DESTROYED



10. The vSphere 6 installation proceeds.



11. The **Installation Complete** window displays when the installation process is completed. Press **ENTER** to reboot the system. (Make sure installation media has been ejected and bios set to boot from the boot disk.)

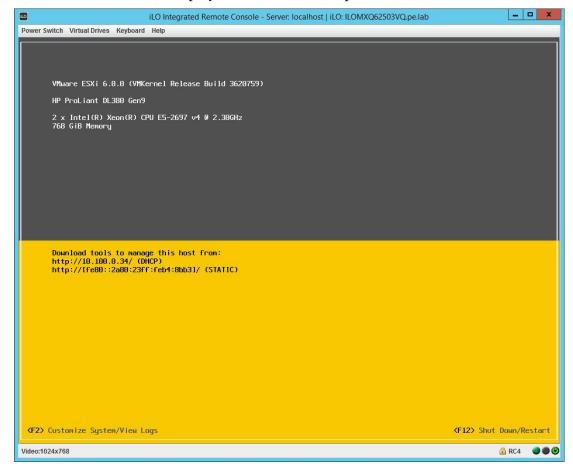
Rebooting Server The server will shut down and reboot. The process will take a short time to complete.

12. The installation is now complete.

3.2 INITIAL HOST CONFIGURATION

A countdown timer displays when you first boot ESXi 6. You can wait for the countdown to expire or press **ENTER** to proceed with booting. A series of notifications display during boot.

The VMware ESXi 6 screen displays once the boot completes:

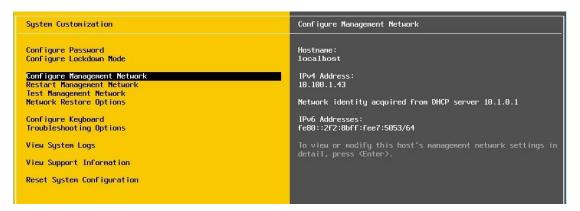


Use the following procedure to configure the host:

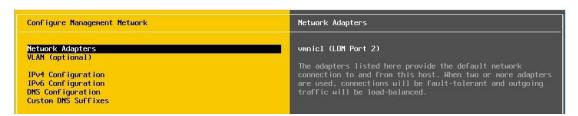
1. Press **F2**.



2. In the Authentication Required window, enter the root account credentials that you created during the installation process and then press **ENTER**.



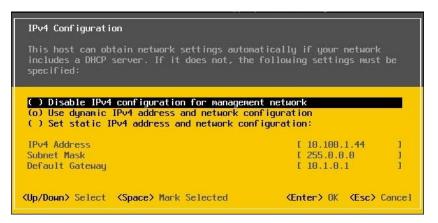
3. In the System Customization window, scroll down to select Configure Management Network and then press ENTER.



4. The Network Adapters window appears. Press ENTER.

_11			
1	Device Name	Hardware Label (MAC Address)	Status
[]	vmnic0	LOM Port 1 (:8b:e7:50:52)	Connected ()
[X]	vmnic1	LOM Port 2 (:8b:e7:50:53)	Connected ()
[]	vmnic2	SlotID:MLOM (9e:d1:59)	Disconnected
[]	vmnic3	SlotID:MLOM (9e:d1:5a)	Disconnected
[]	vmnic4	SlotID:2 (0c:c4:7a:ea:00:5e)	Connected ()
[]	vmnic5	Chassis slo (ea:00:5f)	Connected ()

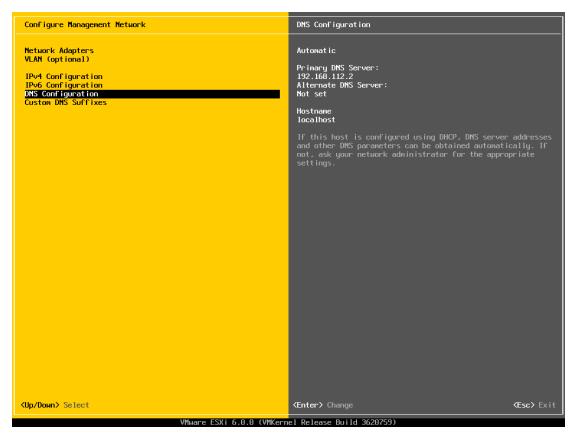
5. Use the arrow keys to select the adapter to use as the default management network, press **SPACE** to select, and then press **ENTER**.



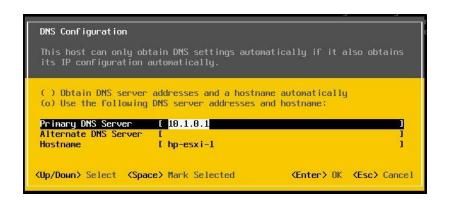
6. Scroll down to **IPv4 Configuration** and press **ENTER**. The **IPv4 Configuration** window displays.

This host can obtain network settings automatically if your network includes a DHCP server. If it does not, the following settings must be specified:					
() Disable IPv4 configuration for management () Use dynamic IPv4 address and network con	nfiguration				
	nfiguration				
() Use dynamic IPv4 address and network con	nfiguration	1			
() Use dynamic IPv4 address and network con (o) Set static IPv4 address and network conf	nfiguration figuration:	1			

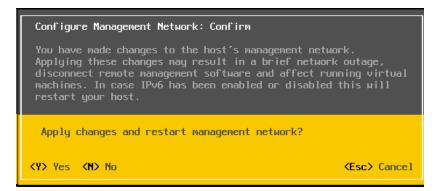
7. Use the arrow keys to select **Set static IPv4 address and network configuration** and then enter the IPv4 address, subnet mask, and default gateway in the respective fields. Press **Enter** to continue.



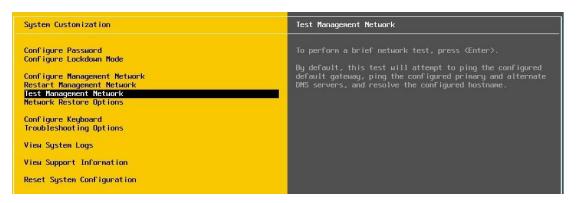
8. Scroll down to DNS Configuration and press ENTER.



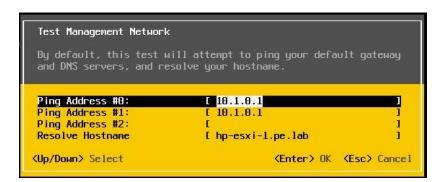
9. Add the primary and (if available) secondary DNS server address(es) in the respective fields. Set the host name for this vSphere host in the **Hostname** field. Press **ENTER** when finished.



10. Press ESC to save network changes. Press Y to confirm changes.



11. Select Test Management Network on the main vSphere 6 screen to open the Test Management Network window.



- **12.** Perform the following tests:
- Ping the default gateway.

- Ping the DNS server.
- Resolve a known address.



13. Return to the main vSphere 6 screen when you have completed testing, and then select **Troubleshooting Options**. The **Troubleshooting Mode Options** window displays.

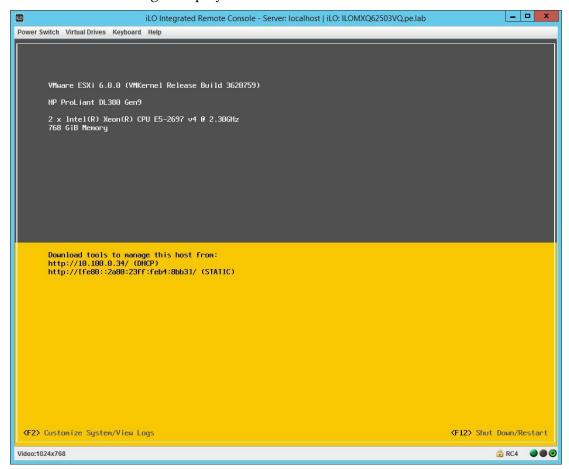
Troubleshooting Mode Options	ESXi She11
Disable ESXi Shell Enable SSH	ESXi Shell is Enabled
Modify ESXi Shell and SSH timeouts Modify DCUI idle timeout Restart Management Agents	Change current state of the ESXi Shell

14. To install the NVIDIA VIB in a later step, you will need to enable the ESXi Shell. This can be accomplished by selecting Enable ESXi Shell and pressing ENTER to toggle Enable ESXi Shell on.

The window on the right displays the status: ESXi Shell is Enabled



15. Enable SSH by selecting **Enable SSH** and pressing **ENTER** to toggle this option on. The window on the right displays the status **SSH is Enabled**.



16. Press **ESC** twice to log out of the ESXi UI.

VMware ESXi is now installed on the server.

CHAPTER 4. INSTALLING VMWARE VCENTER SERVER 6.0 U2

This chapter covers installing VMware vCenter Server 6.0 U2, including:

- Installing a vCenter Server Appliance (VCSA)
- Installing vCenter in a Windows Server 2012 VM
- ▶ The initial vCenter Server configuration
- Setting a vCenter appliance to auto-start
- Mounting an NFS ISO data store
- Creating vSphere clusters for GRID servers and management servers

Review the prerequisites in section 2.13.5, *Choose Virtualization Components* on page 31 before proceeding with these installations.

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

4.1 INSTALLING VCENTER 6.0 U2 SERVER APPLIANCE

Use the following procedure to install a vCenter 6 Server Appliance.

4.1.1 vCenter Server Client Integration Plug-in Installation

The vCenter Server Client Integration Plug-in needs to be installed to enable the vCenter Server Appliance install (as well as uploading files from your desktop to data stores). Use the following procedure to install the plug-in:

1. From any desktop client that can connect to the ESXi server previously created, mount the VMware-VCSA-all-6.0.0-3634788.iso in the CDROM drive.

Windows 10 can connect this ISO file simply by double clicking on the file in Explorer. Other operating systems may need special software for mounting ISO files to CD drives.

	Drive Tools		DVD Drive	: U
File Home Shar	· · · · · · · · · · · · · · · · · · ·			
⊜ ⇒ ↑ 🕑 ∙ :	This PC DVD Drive (F:) VMware VCSA			
🔆 Favorites	Name	Date modified	Туре	S
E Desktop	🚺 dbschema	3/8/2016 3:36 AM	File folder	
🚺 Downloads	🔰 vcsa	3/8/2016 3:36 AM	File folder	
퉬 screenshots	🌗 vcsa-cli-installer	3/8/2016 3:37 AM	File folder	
🕮 Recent places	📋 readme	3/8/2016 3:36 AM	Text Document	
🎍 e (10.200.0.37)	📋 readme-de	3/8/2016 3:36 AM	Text Document	
	📄 readme-es	3/8/2016 3:36 AM	Text Document	
🖳 This PC	📋 readme-fr	3/8/2016 3:36 AM	Text Document	
🕌 Desktop	📄 readme-ja	3/8/2016 3:36 AM	Text Document	
Documents	📄 readme-ko	3/8/2016 3:36 AM	Text Document	
퉳 Downloads	📄 readme-zh-CN	3/8/2016 3:36 AM	Text Document	
🜗 Music	📄 readme-zh-TW	3/8/2016 3:36 AM	Text Document	
崖 Pictures	🕘 vcsa-setup	3/8/2016 3:36 AM	HTML Document	
📔 Videos				
🏭 Local Disk (C:)				
👾 e (\\10.200.0.37) (E)			
DVD Drive (F:) VMv	Vē			

2. Browse to the VCSA folder:

🚺 I 🖸 🚺 = I		
File Home Share	View	
🕞 💮 🔻 🕇 🚺 🕨 Thi	s PC 🔸 DVD Drive (F:) VMware VCSA 🔸 vcsa	
😽 Favorites	Name	Date modified
E Desktop	Version	3/2 6 3:36 AM
퉳 Downloads	👿 VMware-ClientIntegrationPlugin-6.0.0	
screenshots	vmware-vcsa	376, 0 5130 AIV
🖳 Recent places		
🚇 e (10.200.0.37)		
🖳 This PC		
📔 Desktop		
Documents		
퉳 Downloads		
🚺 Music		
📔 Pictures		
📔 Videos		
🏭 Local Disk (C:)		
坖 e (\\10.200.0.37) (E:)		
💮 DVD Drive (F:) VMwa		

3. In the VCSA folder, double click the VMware-ClientIntegrationPlugin-6.0.0 installer.

🌍 User Account (Control			×		
Do you want to allow the following program to make changes to this computer?						
õ	Program name: Verified publisher: File origin:	VMware installat VMware, Inc. CD/DVD drive	ion launcher			
Show detail	ls		Yes	No		
		<u>Change</u>	when these n	otifications appear		

4. If the **Microsoft User Account Control** dialog prompts, click **Yes** to allow the install to begin.

🖓 VMware Client Integration Plug-in 6.0.0		
vmware	Welcome to the installation wizard for the VMware Client Integration Plug-in 6.0.0	
	This wizard will install the VMware Client Integration Plug-in 6.0.0 on your computer.	
	To continue, click Next.	
Client Integration Plug-in		
	Back Next Cancel	

5. The installer starts, click **Next** to continue:

NOTE: All browsers must be closed or you will be prompted to close them.

If this window pops up, close all listed browsers, and click **Retry** to continue:

📴 VMware Client Integration Plug-in 6.0.0 📃 🔲		
vm ware	X	Welcome to the installation wizard for VMware Client Integration Plug-in 6.0.0
		Wait while the wizard prepares to guide you through the installation.
	VMware 0	lient Integration Plug-in 6.0.0 🛛 🔀
	Â	Close the following browsers to proceed: - Microsoft Internet Explorer
Client Integ		Retry Cancel
Plug-in		
		Back Next Cancel

🙀 ¥Mware Client Integration Plug-in 6.0.0	
End-User License Agreement	
Read the following agreement carefully.	
VMWARE END USER LICENSE AGREEMENT	_
PLEASE NOTE THAT THE TERMS OF THIS END LICENSE AGREEMENT SHALL GOVERN YOUR U OF THE SOFTWARE, REGARDLESS OF ANY TER THAT MAY APPEAR DURING THE INSTALLATION THE SOFTWARE.	JSE RMS
IMPORTANT-READ CAREFULLY: BY DOWNLOA	
I accept the terms in the License Agreement	Print
I do not accept the terms in the License Agreement	
Back Next	Cancel

6. Accept the EULA and click **Next** to continue.

伊 ¥Mware Client Integration Plug-in 6.0.0	
Destination Folder Select the installation location.	
Install the VMware Client Integration Plug-in 6.0.0 in:	
C:\Program Files (x86)\VMware\Client Integration Plug-in 6.0\ Change	
Back Next	Cancel

7. Select the install destination folder and click **Next**.

🔀 ¥Mware Client Integration Plug-in 6.0.0	
Ready to Install the Plug-in	
Click Install to begin the installation. Click Back to review or change any of yo installation settings. Click Cancel to exit the wizard.	bur
Back Install	Cancel

8. Click Install to begin the installation.

🙀 ¥Mware Client Integration Plug-in 6.0.0	
Installing the Plug-in	
Wait while the wizard installs the VMware Client Integration Plug-in 6.0.0.	
Status: Copying new files	
	Back Next Cancel

9. Installation will progress...

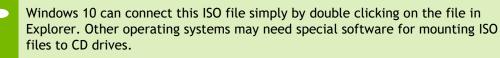
🐺 VMware Client Integration Plug-in 6.0.0		
vmware	Installation complete	
	The VMware Client Integration Plug-in 6.0.0 has been installed on your computer. Click Finish to exit the wizard.	
Client Integration Plug-in		
	Back Finish Cancel	

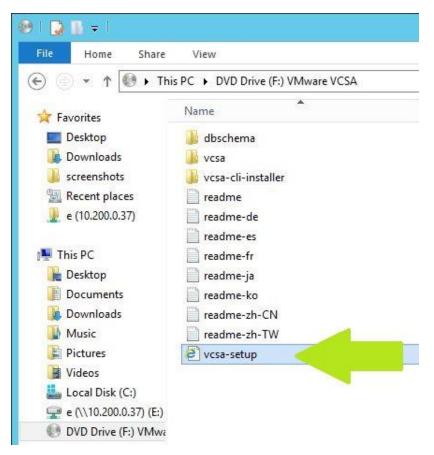
10. When install completes, click Finish:

4.1.2 vCenter Server Appliance (VCSA) Installation

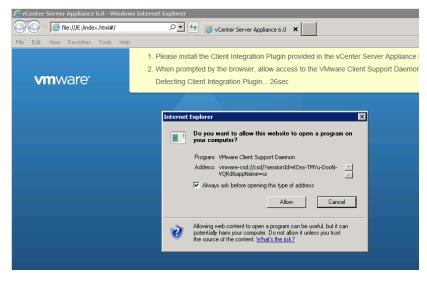
Follow this procedure to install the VCSA.

1. From any desktop client that can connect to the ESXi server previously created, mount the VMware-VCSA-all-6.0.0-3634788.iso in the CDROM drive.





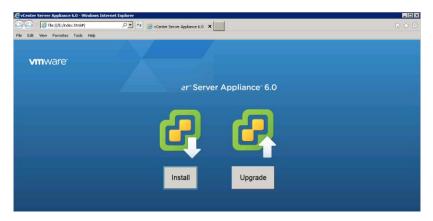
2. Open the html file vcsa-setup in Internet Explorer.



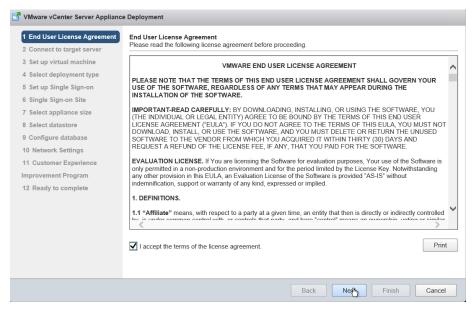
3. This alert is displayed if the VMware Client Integration Plug-in is not installed. Click **Allow**.

Center Server Appliance 6.0 - Windows In	at and the second second
Correct Server Appliance 6.0 - windows in	P S Center Server Appliance 6.0 ×
File Edit View Favorites Tools Help	
	When prompted by the browser, allow access to the Client Integration Plugin.
vm ware ⁻	
	Client Integration Access Control X This site is using VMware Client Integration Plug-In. Do you want to allow it to access your operating system? Protocol: Hostname: local host Port: Allow Deny (automatic in 293 seconds) Image: Allow Deny (automatic in 293 seconds)

4. If the plug-in is active, you are prompted to allow it access to your operating system, click **Allow**.



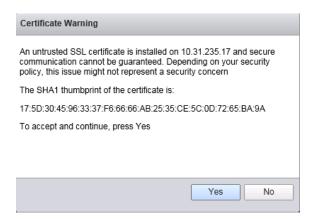
5. To begin the install of the VCSA on a host click Install.



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

S VMware vCenter Server Appliance Deployment			
 1 End User License Agreement 2 Connect to target server 	Connect to target server Specify the ESXI host or vCenter Server on which to deploy the vCenter Server Appliance.		
3 Set up virtual machine	FQDN or IP Address:	10.19.0.4]
4 Select deployment type 5 Set up Single Sign-on	User name:	root	0
6 Single Sign-on Site 7 Select appliance size	Password:	••••••]
8 Select datastore 9 Configure database 10 Network Settings 11 Customer Experience Improvement Program 12 Ready to complete	When deploying to a v	target is an ESXi host. st is not in lock down mode or maintenance Sphere Distributed Switch (VDS), the applian ment, it can be moved to a static or dynamic	ice must be deployed to an ephemeral
		Back	Naxt Finish Cancel

7. In this step select the vSphere host on which to install the VCSA as a guest. This can be a host running ESXi 5.5 or later. It is recommended that the vCenter server (Windows or appliance based) run on a separate management cluster from the one designated for VDI workloads. Enter the IP address or FQDN of the chosen host, then its root user name and password and click **Next**.



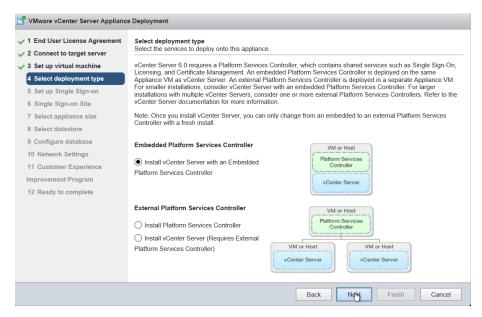
8. If the web installer can reach the host then a certificate warning will occur. Click **Yes** to continue.



9. The credentials provided are validated.

T VMware vCenter Server Appliance Deployment			
 1 End User License Agreement 2 Connect to target server 	Set up virtual machine Specify virtual machine setting	is for the vCenter Server Appliance to be de	ployed.
3 Set up virtual machine	Appliance name:	vCenter Server Appliance 6.0	0
4 Select deployment type 5 Set up Single Sign-on	OS user name:	root	
6 Single Sign-on Site 7 Select appliance size	OS password:	*****	0
8 Select datastore 9 Configure database	Confirm OS password:	•••••	
10 Network Settings			
11 Customer Experience Improvement Program			
12 Ready to complete			
		Back	Next Finish Cancel

10. Enter a name for the appliance, then enter a root password for the appliance, enter it again, and click **Next**.



11. Select Install vCenter Server with an Embedded Platform Services Controller and click Next.

🚰 VMware vCenter Server Appliance Deployment			
 1 End User License Agreement 2 Connect to target server 	Set up Single Sign-on (SSO) Create or join a SSO domain. An SSO configuration cannot be changed after deployment.		
 3 Set up virtual machine 4 Select deployment type 	 Create a new SSO domain Join an SSO domain in an existing vCenter 6.0 platform services controller 		
5 Set up Single Sign-on 6 Select appliance size	vCenter SSO User name:	administrator	
7 Select datastore 8 Configure database	vCenter SSO Password:	•••••	0
9 Network Settings	Confirm password:	•••••]
10 Customer Experience Improvement Program	SSO Domain name:	vsphere.local	•
11 Ready to complete	SSO Site name:	DefaultFirstSite	0
	A Before proceeding, make : Active Directory domain name.	sure that the vCenter Single Sign-On doma	in name used is different than your
		Back	Nett Finish Cancel

Select Create a new SSO domain. For the purposes of a proof of concept, enter (and confirm) a password, a domain name (we chose the default of vsphere.local), and a site name, then click Next.

🚰 VMware vCenter Server Applianc	e Deployment	
 1 End User License Agreement 2 Connect to target server 	Select appliance size Specify a deployment size for the new appliance	
 3 Set up virtual machine 4 Select deployment type 	Appliance size:	Tiny (up to 10 hosts, 100 VMs)
✓ 5 Set up Single Sign-on		
6 Select appliance size 7 Select datastore	Description:	
8 Configure database	This will deploy a Tiny VM config option contains vCenter Server	ured with 2 vCPUs and 8 GB of memory and requires 120 GB of disk space. This vith an embedded Platform Services Controller.
9 Network Settings		
10 Customer Experience Improvement Program		
11 Ready to complete		
		Back Negt Finish Cancel

13. Select an appliance size, appropriate for the potential scale of your proof of concept or trial. Here we have selected **Tiny**. Click **Next**.

2 Connect to target server	Select datastore Select the storage location for this deployment The following datastores are accessible. Select the destination datastore for the virtual machine configuration files and all of the virtual disks.					
 3 Set up virtual machine 4 Select deployment type 5 Set up Single Single Single 						
 5 Set up Single Sign-on 6 Select appliance size 	Name	Туре	Capacity	Free	Provisioned	Thin Provisioni
7 Select datastore	local	VMFS	232.75 GB	216.77 GB	16.14 GB	true
8 Configure database						
9 Network Settings						
10 Customer Experience						
Improvement Program						
11 Ready to complete						

14. Select a datastore from those available on the host you have connected with, select **Enable Thin Disk Mode**, and then click **Next**.

1 End User License Agreement	Configure database
2 Connect to target server	Configure the database for this deployment
3 Set up virtual machine	Use an embedded database (PostgreSQL)
4 Select deployment type	O Use Oracle database
🗸 5 Set up Single Sign-on	
6 Select appliance size	
V 7 Select datastore	
8 Configure database	
9 Network Settings	
10 Customer Experience	
Improvement Program	
11 Ready to complete	

15. Choose Use an embedded database (PostgreSQL), then click Next.

VMware vCenter Server Applianc	e Deployment	
1 End User License Agreement		
2 Connect to target server	Network type:	static
3 Set up virtual machine		
4 Select deployment type	Network address:	10.19.0.3
✓ 5 Set up Single Sign-on		
✓ 6 Select appliance size	System name [FQDN or IP	depvc.pe.lab
7 Select datastore	address]:	
✓ 8 Configure database	Subnet mask:	255.0.0.0
9 Network Settings		
10 Customer Experience	Network gateway:	10.1.0.1
Improvement Program		
11 Ready to complete	Network DNS Servers (separated by commas)	10.1.0.1
	(separated by commas)	
	Configure time sync:	O Synchronize appliance time with ESXi host
		Use NTP servers (Separated by commas)
		10.1.0.1
	 Enable ssh 	
	A Before proceeding make su deployment will fail.	ure there is time synchronization between ESXi host and the NTP servers. If not,
		Back Finish Cancel

16. Before configuring network settings, choose a static IP address, and enter that into local DNS (e.g. on the Domain Controller). Once you can resolve the address, enter that IP address, host name, and then scroll down for remaining entries. This is a long page and will require scrolling down to see all settings. Make sure the configuration leverages an NTP service. The lower half of the Network Settings pane adds NTP, enter the address of the local time server or a reachable external one. Select Enable SSH. Click Next.

 1 End User License Agreement 2 Connect to target server 	Customer Experience Improvement Program Read the following Customer Experience Improvement Program details	
 3 Set up virtual machine 4 Select deployment type 5 Set up Single Sign-on 6 Select appliance size 7 Select datastore 8 Configure database 9 Network Settings 10 Customer Experience Improvement Program 11 Ready to complete 	VMWARE Customer Experience Improvement Program VMware's Customer Experience Improvement Program ("CEIP") provides VMware with information that enables VMware to improve its products and services, to fix problems, and to advise you on how best to deploy and use our products. As part of the CEIP, VMware collects technical information about your organization's use of VMware products and services on a regular basis in association with your organization's UMware license key(s). This information does not personally identify any individual.For more details about the Program and how VMware uses the information it collects through CEIP, please see the <u>Product Documentation</u> . If you prefer not to participate in VMware's CEIP for this product, you should uncheck the box below. You may join or leave VMware's CEIP for this product at any time.	~
	✓ Soin the VMware Customer Experience Improvement Program	*

17. The VMware Customer Experience Program sends information about usage and problems directly to VMware for collection. Using this information VMware can more easily identify bugs and other discrepancies. No confidential information is ever sent. Join the Customer Experience Program or not, based on internal security requirements and desire, and click **Next**.

1 End User License Agreement	Ready to complete Please review your settings before starting the installation.	
2 Connect to target server	T lease review your seu	
3 Set up virtual machine	Target server info:	10.19.0.4
4 Select deployment type	Name: Installation type:	vCenter Server Appliance 6.0 Install
5 Set up Single Sign-on	Deployment type:	Embedded Platform Services Controller
✓ 6 Select appliance size	Deployment configuration:	Tiny (up to 10 hosts, 100 VMs)
7 Select datastore	Datastore:	local-csco-esxi-5
🗸 8 Configure database	Disk mode:	thin
9 Network Settings	Network mapping: IP allocation:	Network 1 to VM Network
10 Customer Experience	Host Name	ii v+, state
mprovement Program	Time synchronization:	10.1.0.1
11 Ready to complete	Database: Properties:	embedded SSH enabled = True Customer Experience Improvement Program = Enabled SSO User name = administrator SSO Domain name = xsphere local SSO Site name = DefaultFirstSite Network 1 IP address = 10 19.0.3 Host Name = depvc. pe lab Network 1 netmask = 255 0.0 0 Default gateway = 10.1.0.1 DNS = 10.1.0.1

18. Confirm your settings and, if correct, click Finish to deploy your VCSA.

🚰 VMware vCe	Inter Server Appliance Deployment	
D	ownloading and deploying appliance	
		Cancel

19. If all settings are correct then a progress bar will appear.

T VMware vCenter Server Appliance Deployment	
Installation Complete	
Your vCenter Server is successfully installed.	
Post install steps:	
 vCenter Server is installed in evaluation mode. Activate vC When the evaluation period of this vCenter Server expires, Use the vSphere Web Client to manage vCenter Server. Lo administrator@vsphere.local 	all hosts will be disconnected from this vCenter Server.
You can now login to vSphere Web Client: https://depvc.pe.lab/vsp	here-client as administrator@vsphere.local
	Close

20. When complete, a window appears with a link to the VCSA. Click the link to reach the login page. You can now close this page.

vm ware [,]		
User name: Password:	administrator@vsphere.local ••••••••••••••••••••••••••••••••••••	VMware "vCenter" Single Sign-On Cookies are required.
Download Client Integ	ration Plugin	

21. The VCSA is now installed and ready for use. From your browser, the login page should like this (be sure to enable cookies if you have not).

4.2 INSTALLING VCENTER 6.0 U2 SERVER ON WINDOWS SERVER 2012

This section describes how to install and configure vCenter Server 6.0 U2 in a Windows Server VM.

4.2.1 Initial Installation

Use the following procedure to install vCenter Server.

1. Open a browser and navigate to the URL for your ESXi server. A certificate error will occur. This is expected, click **ADVANCED**, then **Proceed to <your ESXi server address>**.

VMware ESXi Welcome

Getting Started

If you need to access this host remotely, use the following program to install vSphere Client software. After running the installer, start the client and log in to this host.

Download vSphere Client for Windows
 Open the VMware Host Client

To streamline your IT operations with vSphere, use the following program to install vCenter. vCenter will help you consolidate and optimize workload distribution across ESX hosts, reduce new system deployment time from weeks to seconds, monitor your virtual computing environment around the clock, avoid service disruptions due to planned hardware maintenance or unexpected failure, centralize access control, and automate system administration tasks.

- Download VMware vCenter
- If you need more help, please refer to our documentation library:
 - vSphere Documentation

For Administrators

vSphere Remote Command Line

The Remote Command Line allows you to use command line tools to manage vSphere from a client machine. These tools can be used in shell scripts to automate day-to-day operations.

Download the Virtual ApplianceDownload the Windows Installer (exe)

Download the Linux Installer (tar.gz)

Web-Based Datastore Browser

Use your web browser to find and download files (for example, virtual machine and virtual disk files).

Browse datastores in this host's inventory

For Developers

vSphere Web Services SDK

Learn about our latest SDKs, Toolkits, and APIs for managing VMware ESX, ESXi, and VMware vCenter. Get sample code, reference documentation, participate in our Forum Discussions, and view our latest Sessions and Webinars.

Learn more about the Web Services SDKBrowse objects managed by this host

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2. On the VMware ESXi Welcome screen, click Open the VMware Host Client.

vn	ware®	
User name Password	root	vm ware [®] Esxi [®]
	Log in	

3. Log in to the ESXi web client using User name root and the root password.

m ware [.] ESXi			
Navigator	🙃 csco-esxi-4.pe.lab - Virtual Machines		
 Host Manage Monitor 	Create / Register VM Console Power on Power of Virtual machine	Suspend CRefresh Col	umns 🛛 🐇 🗸 Used s
Virtual Machines 7	B Workstation B windemo. wo. grid	Normal	32 GB
 Wonitor 	The sympetry of the sympetry o	 Normal Normal 	32.18
More VMs	txdemo_w_grid txdemo_wo_grid	Normal Normal	32.18 32.18
Networking 4	B C C C C C C C C C C C C C C C C C C C	Normal Normal	17.17 1.74 K
	Guest OS		
	Console > Open browser console		
	Autostart Source of the second seco		
	Export Claunch remote console	e	
	Bit settings		
	Recent Ta	Initiator V Queued	
		VC Internal 02/15/2017 15:3 root 02/15/2017 15:3	
	CX Delete	VC Internal 02/15/2017 15:3 VC Internal 02/15/2017 15:3	
	Help	VC Internal 02/15/2017 15:3	

4. In the left-hand navigation pane, click on Virtual Machines. In the right-hand pane, right click on the VM you will be installing vCenter in and select **Console**→**Launch Remote Console**.

	Invalid Security Certificate
8	The server you are connecting to is presenting a security certificate with the following problems:
-	- A certificate in the host's chain is based on an untrusted root.
	Do you want to ignore these problems and proceed anyway?
	Always trust this host with this certificate
	View Certificate Connect Anyway Cancel

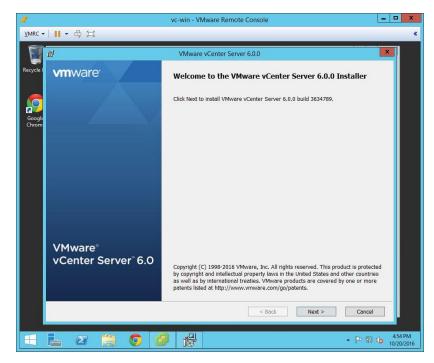
5. On the Invalid Security Certificate dialog, click Connect Anyway.

	*		vc-win - VN	٧v	vare	e Remote Console	_	
	VM	RC 🕶 📔 💌 🛱 🗄						
	C	Power		Þ				
	\odot	Removable Devices		Þ				
	÷	Send Ctrl+Alt+Del		_	ati	ation		
	٦	Manage		۲		Install VMware Tools		
	Ъ	Full Screen	Ctrl+Alt+Enter			Message Log		
		Preferences			Ð	Virtual Machine Settings	Ctrl+D	
		Help		•				
		Exit						
1								

6. In the VMware Remote Console window, click VMRC→Manage→Virtual Machine Settings...

Virtual Machine Settings					
Hardware Options					
Device Memory Processors Hard disk 1 CD/DV0 drive 11 Network adapt USB controller USB controller Video card		Device status Connected Connection Location: Use physical drive: D: Vise physical drive: D: Vise ISO image file: Z:\Software\VMware\vSphere 6.0\\ V Browse Advanced			
		OK Cancel Help			

- 7. Mount the VMware-VIMSetup-all-6.0.0-3634788 ISO to the CD drive by clicking CD/DVD drive 1, clicking Connected, Connected at power on, then Use ISO image file. Use the Browse button to find the correct ISO. Click OK. The vCenter Server software is now mounted inside the VM as the CD drive.
- **8.** Inside the VM console, right-click the CD drive and select **Install or run program** from your media.



9. Click Next to proceed with the installation.

*	vc-win - VMware Remote Console	_ 0	x
VMRC -	- Ⅲ - ● 江		*
	VMware vCenter Server 6.0.0	x	
Recycle	End User License Agreement Read the following license agreement before proceeding with the installation.		
\mathbf{p}	VMWARE END USER LICENSE AGREEMENT	^ III	
Google Chrom	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.	0	
	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 USEF 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 SOFTWARE TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT YOU PAID FOR THE SOFTWARE.	L.	
	EVALUATION LICENSE. If You are licensing the Software for evaluation purposes, Your use of the Software is only permitted in a non-production environment and for the period limited by the License Key. Notwithstanding any other provision in this EULA, an Evaluation License of the Software is provided "AS-IS" without indemnification, support or warranty of any kind, expressed or implied.	 	
	☑ I accept the terms of the license agreement.		
	< Back Next > Cancel		
	🛓 Z 🚊 🧕 💋 🙀 > 9		55 PM 20/2016

10. Check I accept the terms of the license agreement checkbox, click Next to proceed.

	vc-win - VMware	Remote Console	- 0	3		
•	Ⅱ••母□					
₿	VMware vCente	er Server 6.0.0	x			
	elect deployment type Select the component to deploy.					
	vCenter Server 6.0.0 requires a Platform Services Controller, which contains shared services such as vCenter Single Sign-On, Licensing, and Certificate Management. An embedded Platform Services Controller is deployed on the same Windows Host as vCenter Server. An external Platform Services Controllers is deployed in a separate Windows Host. For smaller installations, consider vCenter Server with an embedded Platform Services Controller. For Inster installations, consider vCenter Server with an embedded Platform Services Controller. For Inster installations with multiple vCenter Servers, consider vCenter Server with an embedded Platform Services Controller. For Inster installations with multiple vCenter Servers,					
	Note: Once you deploy vCenter Server, you can only change from fresh install.	an embedded to an external Platform Services Controller with a	3			
¢.	Embedded Deployment	VM or Host				
	vCenter Server and Embedded Platform Services Controller	Controller VCenter Server				
	External Deployment	VM or Host Platform Services				
	O Platform Services Controller	Controller				
	○ vCenter Server	VM or Host VM or Host				
	A previously installed Platform Services Controller is required	vCenter Server				
		< Back Next > Cancel				
		• P @ 0		:55 P (20/)		

11. Select **vCenter Server with an embedded infrastructure controller.** Click **Next** to proceed.

*	vc-win - VMware Remote Console	_ [x
VMRC -	- Ⅱ • 尋 □		«
	VMware vCenter Server 6.0.0	x	1
Recycle I	System Network Name Configure the name of this system.		
Google Chrom	Enter the system name to use for managing the local system. The system name will be encoded in the SSL certificate of the system so that the components can communicate with each other by using this name. Enter the system name as a fully-qualified domain name (FQDH). If DNS is not available, you can provide a static IPv4 address. IPv6 is supported only by using a name.		
	System Name: winvc.pe.lab		
	Note: The System Network Name cannot be changed after deployment.		
	< Back Next > Cancel		
	🛓 🖉 🚞 🧔 🛃 🔸		:56 PM /20/2016

12. Enter the FQDN or IP address of the host in the **System Name** field, click **Next** to proceed.

A warning dialog displays if you enter an IP address; click **OK** to proceed.

*	vc-win - VMware	Remote Console	- 🗆 X
VMRC -	- - 母 □		*
	1 VMware vCent	er Server 6.0.0	X
Recycle I	vCenter Single Sign-On Configuration Create or join a vCenter Single Sign-On domain.		
6	Create a new vCenter Single Sign-On domain		
Google	Domain name:	vsphere.local	
Chrom	user name vCenter Single Sign-On:	administrator	1
	password vCenter Single Sign-On:	•••••	
	Confirm password:	•••••]
	Site name:	Default-First-Site	
	○ Join a vCenter Single Sign-On domain		
	Platform Services Controller EQDN or IP address:		1
	HTTPS port vCenter Single Sign-On:	443	1
	user name vCenter Single Sign-On:	administrator	1
	password vCenter Single Sign-On:]
	Note: vCenter Single Sign-On configuration cannot be changed	d after deployment.	
		< Back Next > Cancel	
		• P @	5:04 PM 10/20/2016

13. The Single Sign-On Configuration window displays. Enter the administrator password for the new Single Sign-On domain in the **Password** and **Confirm password** fields. Click **Next** to proceed.

CAUTION: TO PREVENT UNAUTHORIZED ACCESS, YOUR SELECTED ROOT PASSWORD SHOULD CONTAIN AT LEAST EIGHT (8) CHARACTERS AND CONSIST OF A MIX OF LOWERCASE AND CAPITAL LETTERS, DIGITS, AND SPECIAL CHARACTERS

		vc-win - VMware Remote Console	_ 🗆 X
VMRC -	▼ ♣ \≍		*
1			
ecycle Bin	10	VMware vCenter Server 6.0.0	×
Recycle bin	vCenter Server Service Act		
	By default, the vCenter Server insta	ince runs in the Windows Local System account. To run in another administrative user account, ervice account and provide the account credentials. The user service account must be granted	
	Use Windows Local System According 1		
		ou cannot connect to an external database using Integrated Windows authentication.	
	O Specify a user service account		
	Account user name:	WIN-T2GHB5G5Q52\Administrator	
	Account password:		
			2
			£
		< Back Next > Cancel	

14. Select Use Windows Local Account. Click Next to proceed.

*	vc-win - VMware Remote Console	_ _ ×
<u>v</u> mrc ▼	Ⅲ ✓ 母 □	*
	设计 VMware vCenter Server 6.0.0	X
Recycle I	Database Settings Configure the database for this deployment.	
Google Chrom	Item use an embedded database (vPostgres) Use an external database DSN Name: DB user name: DB gassword:	
	< Back Next > Ca	incel
	🛓 🖉 🗒 🧔 💋 🙀 🔹 🖡	10:40 AM 10/21/2016

15. Select Use an embedded database (vPostgres), Click Next to proceed.

	vc-win - VMware Remote Console	
· - 4 🖂		
 ⊌	VMware vCenter Server 6.0.0	×
Configure Ports		
Configure network setting	s and ports for this deployment.	
Common Ports		
HTTP Port:		
HTTP <u>S</u> Port:	80	
Syslog Service Port:	443	
Syslog Service TLS Por	514	
Platform Services Cont	11011	
Secure Token Service		
vCenter Server Ports	ort: 7444	
	at Darts	
Auto Deploy Manageme		
Auto Deploy Service Po		
ESXi Dump Collector Po		
ESXi Heart <u>b</u> eat Port:		
vSphere Web Client P <u>o</u>	t: 9443	
The following ports n	ust also be available for this deployment:	
88, 389, 636, 2012, 2	014, 2020, 7080, 7081, 11711, and 11712	
	< Back Next > (Cancel
-	< BACK NEXC >	
		10
	S 🚱 🛃 😽 🔹 🖓	👌 🕲 🌜 10/

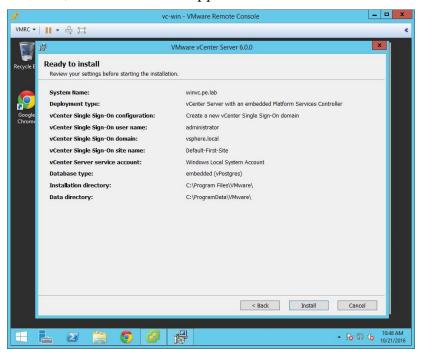
16. Ensure that the ports are configured as shown in the **Configure Ports** window and click **Next** to proceed. The *Destination Folder* window displays.

*	vc-win - VMware Remote Console	
VMRC -	Ⅱ • 尋 □	*
Recycle Bin	10 VMware vCenter Server 6.0.0	
	Destination Directory Select the storage location for this deployment.	
	Install vCenter Server with an embedded Platform Services Controller to:	
	C:\Program Files\VMware\ Change	
	Store data for vCenter Server with an embedded Platform Services Controller in:	
	C:\ProgramData\VMware\ Change	
	2	
	[_]	
	< Back Next > Cancel	

17. In the **Destination Directory** window accept the suggested path. Click **Next** to proceed.

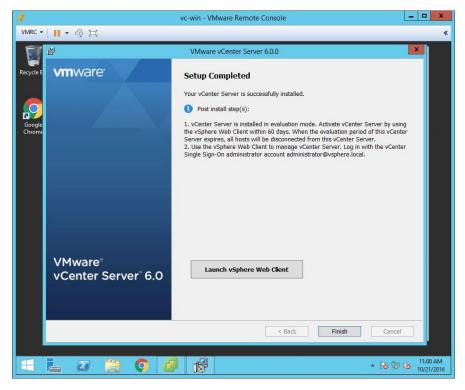
*	vc-win - VMware Remote Console	-	o x
⊻MRC ▼	■ • 母 耳		×
	y⊎ VMware vCenter Server 6.0.0	x	
Recycle E	Customer Experience Improvement Program Read the following Customer Experience Improvement Program details		
Google Chrome	VMware's Customer Experience Improvement Program ("CEIP") provides VMware with information that enables VMware to improve its products and services, to fix problems, and to advise you on how best to deploy and use our products. As part of the CEIP, VMware collects technical information about your organization's use of VMware products and services on a regular basis in association with your organization's VMware license key(s). This information does not personally identify any individual. For more details about the Program and how VMware uses the information it collects through CEIP, please see the product documentation at http://www.vmware.com/info?id=1401. If you prefer not to participate in VMware's CEIP for this product, you should uncheck the box below. You may join or leave VMware's CEIP for this product at any time.		
	☑ Join the VMware Customer Experience Improvement Program		
	< Back Next > Cancel		
	🛓 🛛 🗒 🧔 😼 🎼 - 10 10 -	100	0:45 AM 0/21/2016

18. The Customer Experience Improvement program sends benign usage data to VMware for the purposes of investigating possible defects and general enhancement of the customer experience. Enroll in the program or not, at the discretion of the installer. Click **Next** to proceed.



The Ready to install window appears.

19. Verify that all the selections are correct and click **Install** to proceed. The installation takes place.



20. Click Finish to complete the installation process

4.2.2 Adding Licenses to your vCenter Server

Use the following procedure to add licenses to your vCenter Server.

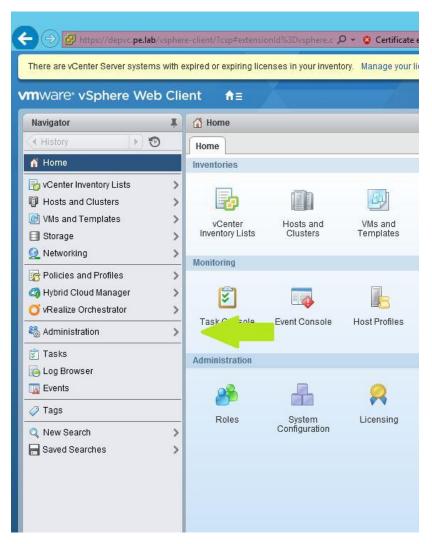


Open a web browser and navigate to the vCenter host at https://<host>, where
 <host> is either the hostname or IP address. Ignore the untrusted certificate warning
 if it displays. Select Log in to vSphere Web client.

2. Install the VMware Client Support Plug-in by selecting Always run on this site, if prompted.

vm ware [.]		
User name: Password:	administrator@vsphere.local	VMware vCenter Single Sign-On Cookies are required.
Download Client Integra	ation Plugin	

3. Enter User name **administrator@vsphere.local** and password that you specified during installation, and then click the **Login** button.



4. Click the Home icon (house) and then select Administration.

mware [,] vSphere Web C	lient n ≘		
Navigator I	Licenses		
(Home) 🔊	License provider: All 6.0 vCenter Server instances 🕞)	
Administration	Getting Started Licenses Products		
Access Control	Getting Started Licenses Froducts Sets		
Roles Global Permissions	Licentr-	Product	
 Single Sign-On 	Create New Licenses	FIGURE	This
Users and Groups			
Configuration			
- Licensing			
Licenses			
Reports			
 Solutions 			
Client Plug-Ins			
vCenter Server Extensions Deployment			
System Configuration			
Customer Experience Improvemen			
Customer Experience Improvement.			

5. Select **Licenses** from the left-hand menu and then select the **Licenses** tab. Click the green **New License** icon (plus sign) to open the **New Licenses** popup.

🔊 New Licenses		(? H
1 Enter license keys 2 Edit license names	Enter license keys Enter license keys from which to create new licenses.	
3 Ready to complete	License Keys (one per line):	
	Back Next Finish	Cancel

6. Enter the vCenter Server license key

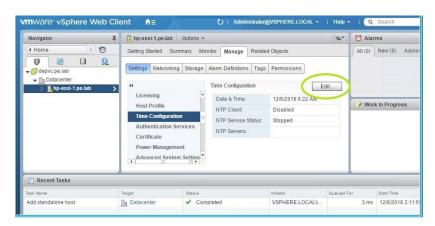
돈 New Lic	enses		?
✓ 1 Enter ✓ 2 Edit lie	enses license køys cense names y to complete	nes //s placed in a separate license. Review the licenses and name them as appropriate. //Mware vCenter Server 6 Standard EA ////////////////////////////////////	
		Back Next Finish	Cancel

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

New Licenses			? H
1 Enter license keys 2 Edit license names	Ready to complete You can now add the r	iew licenses to the inventory. Once added, assign the licenses to assets to use product features.	
2 Edit license harries 3 Ready to complete	Number of licenses: License name: License key:	1 VMware vCenter Server 6 Standard EA	
		Back Next Finish C	ancel

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

4.3 SETTING THE NTP SERVICE ON A HOST



 Click a host object in the menu on the left, click Manage→Settings→Time Configuration→Edit

🔋 10.31.235.11: Edit Time Config	juration (?)
Specify how the date and time on	this host should be set.
Manually configure the date an 12/21/2014 2:19 PM Use Network Time Protocol (El)	v
NTP Service Status:	Stopped Start Stop Restart The NTP Service settings are updated when you click Start, Restart, or Stop.
NTP Service Startup Policy:	Start and stop manually User starts and stops the service manually
NTP Servers:	10.31.235.21 Separate servers with commas, e.g. 10.31.21.2, fe00::2800
	OK Cancel

- 2. Enter a valid time server and click **OK**.
- 3. Do this for each host to ensure time is accurate for all guests.

4.4 SETTING VCENTER TO AUTO-START

Use the following procedure to set vCenter to start automatically with the management server:

Navigator I	hp-esxi-1.pe.lab	Actions *			Ξ*	🖸 Alar	ms
Home N	Getting Started Sum	mary Mo	nitor Manage Re	elated Objects		All (0)	New (0) Acknow
	Settings Networking	Storage		Tags Permissions			
þ 👖 hp-esxi-1.pe.lab 📏			Virtual Machine Sta	a vSphere HA cluster, the a	Edit		
	VM Startup/Shutdo	wn "		wn of virtual machines is dis		Worl	k In Progress
	Agent VM Settings		Order	VM Name	Startu *		
	Swap file location		Manual Startup				
	Default VM Compa	atibility		FreshWin10fromTem	Disa		
	👻 System			vCenter Server Appli	Disa		
	l icensina 1	•	•	win10-demo-1	Disa		
😨 Recent Tasks							
Task Name	Target	Status		Initiator	Queued F	07	Start Time
Add standalone host	B Datacenter	V Con	npleted	VSPHERE.LOCAL\\		3 ms	12/6/2016 2:11:5

1. In the vSphere Web Client, select the host then select Manage→Settings→VM Startup/Shutdown.

10.19.0.2: Edit VN	A Startup an	d Shutdown						
Default VM Settings								
System influence	🗹 Automa	atically start and stop the	virtual machin	es with th	ne system			
Startup delay		120 seco	nd(s) 🗌 Cont	inue imn	nediately if VM	Iware Tools	starts.	
Shutdown delay	-	120 seco	nd(s)					
Shutdown action	Power off	-						
Туре	Order	VM Name	Startup Be	Startu	VMware T	Shutdown	Shutdown	
1			-	12000	1	l'anna anna anna anna anna anna anna ann	1. Contraction of the	
Type			ourop ouro			Children	Shatuonn	Shutd
Automatic Startup			ourup oc			Chuldonn	Shadown	Shutd
							Shatdown	Shutd
Automatic Startup			Clarap Com				Sheldown	Shutd
Automatic Startup Any Order		vCenter Server Appli.		120	Continu	Use Def	Power off	Shutd 120
Automatic Startup Any Order		vCenter Server Appli.						
Automatic Startup Any Order		vCenter Server Appli.						

2. Click the **Edit** button.

hp-esxi-1.pe.lab:	Edit VM St	artup and Shutdown	h.						(
efault <mark>VM S</mark> ettings	2								
System influen.e	Autom	atically start and stop	the virtual machi	nes with t	he system	>			
Startup delay		120 56	econa(s) 🔝 Con	itinue imr	nediately if V	/Mware Tools	starts.		
Shutdown delay		120 s	econd(s)						
Shutdown action	Power of	r •]							
er-VM Overrides									
er-VM Overrides									
er-VM Overrides	Order	VM Name	Startup B	Startu	VMware T	Shutdown	Shutdown	Shutd	
↑ ₩	Order	VM Name	Startup B	Startu	VMware T	Shutdown	Shutdown	Shutd	
🎓 🦊	Order 1	VM Name vCenter Server Ap		Startu 120	VMware T Continu	Shutdown Use Def	Shutdown Power off	Shutd 120	4
🎓 🦊									1
iype Automatic Startup									
iype Automatic Startup									1
iype Automatic Startup		vCenter Server Ap	ppl Use Def	120	Continu	Use Def	Power off	120	2
iype Automatic Startup		vCenter Server Ap win10-demo-2	Use Def Use Def Use Def	120	Continu	Use Def	Power off Power off	120	1

3. Check the box marked Automatically start and stop the virtual machines with the system.

Default VM Settings										
System influence	Autom	atically start and sto	p the vir	tual machir	nes with t	he system				
Startup delay		120	second(s) 🗌 Con	tinue imn	nediately if V	Mware Tools	starts.		
Shutdown delay		120	second((s)						
Shutdown action	Power of	f 🗐								
A ♣										
1 🛃	Order	VM Name		Startup B	Startu	VMware T	Shutdown	Shutdown	Shutd	
1 🛃	Order 1									
Type Automatic Startup	Order 1	VM Name vCenter Server A		Startup B Use Def	Startu 120	VMware T Continu	Shutdown, Use Def	Shutdown Power off	Shutd 120	
Type Automatic Startup Any Order	Order 1									
Type Automatic Startup Any Order	Order 1		vppl							
Type Automatic Startup Any Order	Order 1	vCenter Server A	sppl	Use Def	120	Continu	Use Def	Power off	120	
Automatic Startup Any Order Manual Startup	Order 1	vCenter Server A win10-demo-2		Use Def	120	Continu	Use Def	Power off Power off	120	

4. Select the **vCenter Appliance** and click the **Up** arrow to move that virtual machine up to the **Automatic Startup** section.

10.19.0.2. Eult VI	M Startup and S	Shutdown								?
Default VM Settings										1
System influence	Automatic	ally start and s	top the virtual n	nachines with th	ie system					
Startup delay		120	second(s)	Continue imm	ediately if \	/Mware Tools s	tarts.			
Shutdown delay		120	second(s)							
Shutdown action	Power off	•								
Per-VM Overrides										
Per-VM Overrides										
	Order	VM Name		Startup Beha	Startup	VMware Tools	Shutdown B	Shutdown Ac	Shutdow	:
☆ ₽	Order	VM Name		Startup Beha	Startup	VMware Tools	Shutdown B	Shutdown Ac	Shutdow	*
1 Vipe	Order 1		erver Applian	Startup Beha	Startup		Shutdown B	Shutdown Ac	Shutdow 120	
1 Vipe			erver Applian							*
Type Automatic Startup			erver Applian							
Type Automatic Startup Any Order			erver Applian							
Type Automatic Startup Any Order			erver Applian							

5. Select the following options:

Set Startup Behavior to Custom and select Continue immediately if VMware Tools starts

- Set Startup Delay to 0
- Set Shutdown Behavior to Custom
- Select Guest Shutdown

Click **OK** to apply the configuration.

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.

4.5 MOUNTING AN NFS ISO DATA STORE

An NFS datastore can come in handy, since so many OS can access it. It becomes a storage point for files used by the ESXi server. We recommend using it to store ISO files for operating system installations, like Microsoft Windows.

Use the following procedure to mount an NFS ISO data store:

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

New Datastore		() H
1 Type 2 Select NFS version 3 Name and configuration 4 Ready to complete	Type • WFS Create a VMFS datastore on a diskLUN. • KFS Create at VMFS datastore on an NFS share over the network. • WOL Create a Virtual Volumes datastore on a storage container connected to a storage provider.	
	flack Next Frank	Cancel

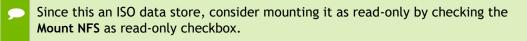
3. Select NFS and click Next to proceed.

New Datastore	•
1 Type 2 Select NFS version 3 Name and configuration	NFS Version O NFS 3 NFS 3
4 Ready to complete	O NFS 4.1 NFS 4.1
	▲ Use only one HFS version to access a given datastore. Consequences of mounting one or more hosts to the same datastore using different versions can include data corruption.
	Back Next Finish Cancel

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

New Datastore		(?) H
New Datastore 1 Type 2 Select NFS version A Ready to complete	Datastore name: FreeNAS NFS Share Details Folder: Imntbool0 E.g. rokotvol0/datastore-001 Server: Ifreenas pe laa E.g. nas, nas.it.com or 192.168.0.1	? >>
	If you plan to configure an existing datastore on new hosts in the datacenter, it is recommended to use the "Mount to additionsts" action instead. Access Mode Mount NFS as read-only	tional
	Back Next Finish C	ancel

 Enter the NFS exported folder path and the NFS server address in the Folder and Server fields, respectively. Click Next to proceed.



1 Type 2 Select NFS version	General:		
3 Name and configuration	Name	FreeNAS	
	Туре	NFS	
4 Ready to complete	Version	NFS 3	
	NES share	and access mode:	
	Server	freenas.pe.lab	
	Folder	/mnt/pool0	
	Access M		

6. Review the settings. Click **Finish** to complete adding the NFS ISO data store. This data store is now accessible as an installation source for virtual machine CD drives.

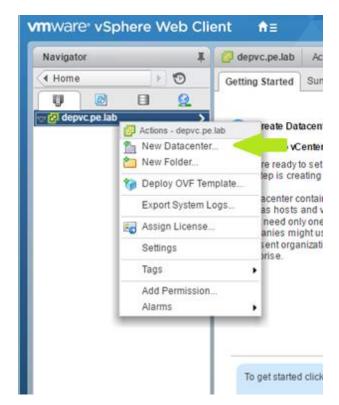
4.6 CREATING VSPHERE CLUSTERS FOR GRID SERVERS

This section covers adding logical organizational units in vCenter to cluster hosts and manage them under a data center object. This is especially important for distributing GRID vGPU-enabled desktops across clustered vSphere hosts with NVIDIA Tesla GPUs.

4.6.1 Creating a Datacenter in vCenter

Navigator	Ŧ	🚹 Home				
< History	•	Home				
🖞 Home	*	Inventories				
👌 vCenter Inventory Lists	>					0
Hosts and Clusters	>	0		(A)		S
🛃 VMs and Templates	>	vCenter	Hosts and	VMs and	Storage	Networking
Storage	>	Inventory Lists	Clusters	Templates	-	
Networking	>					
Policies and Profiles	>			0		
🗿 Hybrid Cloud Manager	>			0		
🔰 vRealize Orchestrator	>	Content Libraries	Hybrid Cloud Manager	vRealize Orchestrator		
Administration	>					
Tasks		Monitoring				
Log Browser		1				
Events		8		8	ES	
🤊 Tags		Task Console	Event Console	Host Profiles	VM Storage Policies	Customization Specification
New Search	>	Watch How	-to Videos			Manager
Saved Searches	> -					

1. Log in to vCenter Web Client and click on Hosts and Clusters.

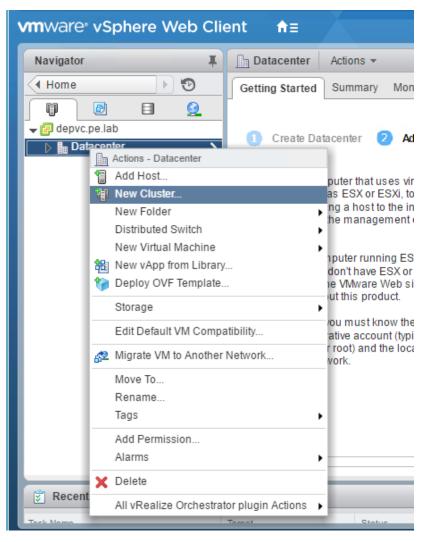


2. In the left-hand **Navigator** pane, right click on the vCenter and select **New Datacenter** from the pop-up menu.

New Datacente	r (?))
Datacenter name:	Datacenter
Location:	🔁 depvc.pe.lab
	OK Cancel

3. On the resulting pop-up, enter a name for the new Datacenter, and click OK.

4.6.2 Creating a Cluster in the Datacenter



1. In the left-hand **Navigator** pane, right click on the **Datacenter** object, then, on the menu that pops up, click **New Cluster**...

1 New Cluster		(?) ₩
Name	Production	
Location	PSG	
▶ DRS	Turn ON	
▶ vSphere HA	Turn ON	
▶ EVC	Disable	•
▶ Virtual SAN	Turn ON	
		OK Cancel

- 2. In the New Cluster dialog box, enter Production in the Name area. Click OK.
- 3. Repeat this procedure to create a cluster named Management.

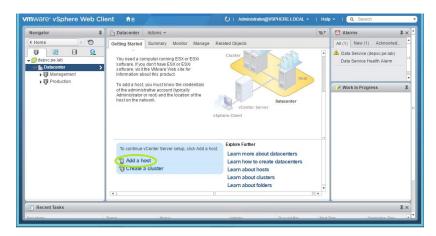
You should now have a logical organizational structure of clusters in the datacenter: one for management, the other for production VDI.

4.6.3 Adding a Host

Use the following procedure to add a host in the vCenter cluster.

m ware [®] vSphere W	eb Clie	ent nt≣	À.		ひ Administra	ator@VSPHERELOC
Navigator	Ŧ	付 Home				
(History	•	Home				
ሰ Home	^	Inventories				
b vCenter Inventory Lists	>		6	_		a
Hosts and Clusters	>	20		(Ja)		S
🛃 VMs and Templates	>	vCenter	Hosts and	VMs and	Storage	Networking
Storage	>	Inventory Lists	Clusters	Templates		
Q Networking	>					
Folicies and Profiles	>		<i>(</i> 1)	~		
A Hybrid Cloud Manager	>		U	0		
🔘 vRealize Orchestrator	>	Content Libraries	Hybrid Cloud Manager	vRealize Orchestrator		
& Administration	>					
🗊 Tasks		Monitoring				
Log Browser			_			
Events		8			8	
Tags		Task Console	Event Console	Host Profiles	VM Storage Policies	Customization Specification
Q New Search	>	😸 Watch How	-to Videos			Manager
Saved Searches	> -					

1. Select Hosts and Clusters.



2. In the left-hand Navigation pane, select the vCenter. Select the Getting Started tab and select Add a Host.

1 Add Host							? H
1 Name and location	Enter the name or IP addre	ss of the host to add to vCen	ter Server.				
Kaine and location Connection settings Hots summary Whiocation S Ready to complete	Ener ine name or IP address: Host name or IP address: Location: Type:	hp-eski-1 pe.lab Datacenter ESXI +	ler server.				
				Back	Next	Finish	Cancel

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

1	Add Host		? #
*	1 Name and location 2 Connection settings 3 Hostsummary 4 VM location 5 Ready to complete	Enter the administrative account information for the host. The VSphere Web Client will e and establish a permanent account for its operations. User name:	use this information to connect to the host
		Back	Net Finish Cancel

4. Enter the administrator account credentials in the User name and Password fields and click Next.

	The certificate store of vCenter Server cannot verify the certificate.
	The SHA1 thumbprint of the certificate is:
1	D2:7F:33:D0:E4:1D:EF:57:C4:D9:14:DD:09:92:EC:68:36:46 A8:4F
	Click Yes to replace the host's certificate with a new certificate signed by the VMware Certificate Server and proceed with the workflow.
	Click No to cancel connecting to the host at this time.

5. Click **Yes** to replace the host certificate.

1 Add Host		۲
 1 Name and location 	Name	hp-esxi-1.pe.lab
2 Connection settings	Vendor	HP
✓ 3 Host summary	Model	ProLiant DL380 Gen9
4 Assign license	Version	VMware ESXi 6.0.0 build-3620759
5 Lockdown mode 6 WMIocation 7 Ready to complete	Virtual Machines	
		Back Next Finish Cancel

6. Review the settings and click **Next** to proceed.

1 Name and location	Licenses				
2 Connection settings	+			Q Filter	
3 Host summary	License	License Key	Product	Usage	Capa.
4 Assign license	Evaluation Lice	nse	-	-	
5 Lockdown mode					
6 VM location					
7 Ready to complete					
	24			11	tems 🔒
			- +		
	Assignment Validation for I	Evaluation License			
	The license expires in	n 46 days.			

7. Confirm the license selection and click **Next**

🕤 Add Host	•
 1 Name and location 2 Connection settings 3 Host summary 4 Assign license 5 Lockdown mode 6 Whilocation 7 Ready to complete 	 When enabled, lockdown mode prevents remote users from logging directly into this host. The host will only be accessible through local console or an authorized centralized management application. If you are unsure what to do, leave lockdown mode disabled. You can configure lockdown mode later by editing Security Profile in host settings. Disabled Normai The host is accessible only through the local console or vCenter Server. Strong is accessible only through vCenter Server. The Direct Console UI service is stopped.
	R
	Back Next Finish Cancel

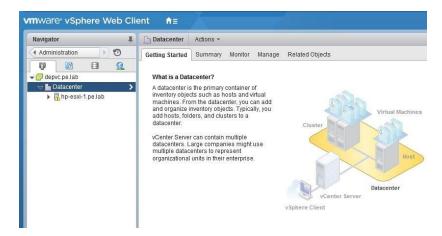
8. Accept the default setting (**Disabled**) and click **Next**.

Add Host						(?) ₩
 1 Name and location 2 Connection settings 3 Host summary 4 Assign license 5 Lockdown mode 6 Milocation 7 Ready to complete 	C Search					
			Back	Next	Finish	Cancel

9. Select a cluster or accept the default option and click **Next** to proceed.

Add Host			(?) H
 1 Name and location 	Name	hp-esxi-1.pe.lab	
 2 Connection settings 	Version	VMware ESXi 6.0.0 build-3620759	
✓ 3 Hostsummary	License	Evaluation License	
 4 Assign license 5 Lockdown mode 	Networks	VM Network DMZ	
6 VM location 7 Ready to complete	Datastores	datastore1(1) JKXIO FreeNAS	
	Lockdown mode	Disabled	
	VM location	Datacenter	
		Back Ne Finish	Cancel

10. Click **Finish** to complete adding the new host.



11. The new host is now visible in the left panel when you click the datacenter name.

CHAPTER 5. GRID SOFTWARE PREPARATION

The following steps provide needed software and licenses for your GRID installation.

They include:

- Obtaining software and evaluation licenses
- Creating the License Manager server
- Registering the License Manager server
- ▶ Installing license files in the License Manager server
- Replacing evaluation licenses with permanent licenses
- ► How to obtain Support, Update, and Maintenance (SUMS)

After we have created the first desktop VM, we will configure it to receive licenses from the License Manager server.

5.1 OBTAIN AN EVALUATION LICENSE PAK AND DOWNLOAD SOFTWARE

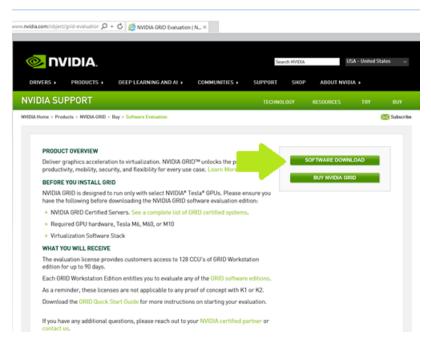
Use the following directions to obtain the GRID software and evaluation licenses.



1. In a browser navigate to <u>http://www.nvidia.com/buygrid.</u>

	centers that are virt dual-slot PCI Expres	lesigned specifically for data ualizing desktop graphics. It's a ss form factor for rack and tower upporting 32 concurrent users.		
	Downloa		E NVIDIA GRID SOFTWARE IDIA GRID software to run on your NVIDIA Tesla M6, M10, or M60 GPU. DAD EVALUATION SOFTWARE	
	NVIDIA GRID Virtual GPU Technology Try GRID for Free Applications	Resources Success Stories Datasheets App Guides Deployment Guides	Fied Us Octione Cal Lockadin WIVUA Riog Strutter Wirdsho	
I	Where to Buy Certified Servers Support GRID cloud gaming	White Papers and Reports Videos Webcasts and Webinars GRID Terms and Conditions	GRID Forum GRID Newsletter Contact Us	

2. Scroll to the bottom of the page. Click on Download Evaluation Software.



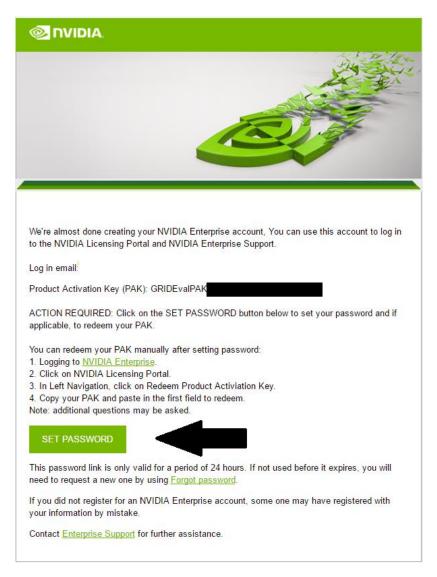
3. Click on Software Download. The NVIDIA Enterprise window opens.

🔰 🥺 NVIDIA GRID Evaluation	n NVI 🥺 NVIDIA Enterprise 🛛 🗙
	. Enterprise
CREATE YOUR N	VIDIA ENTERPRISE ACCOUNT
If you need assistance w enterprisesupport@nvid	ith registration, please email ia.com
*Required Fields	
*Email address:	Email
*Company:	Select Company Name
*First name:	Enter FirstName
*Last name:	Enter LastName
*Job role:	Please Choose One 🗸
*Industry:	Please Choose One 🗸
*Phone:	Ex:+1-222-333-4444
*Street 1:	Enter street address
Street 2:	Enter street address

4. Fill out the form completely and click **Register**. Once your account has been created, you will receive and email with further instructions.



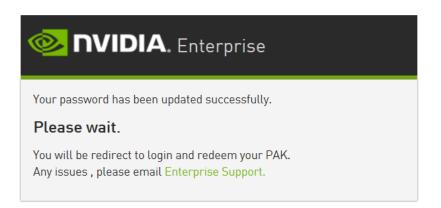
5. Check your email for licensing instructions.



6. In the email you received with your Product Activation Key, click on the **Set Password** icon. This will open a browser window.

	. Enterprise	
CREATE NEW PA	SSWORD	
New password:	Desired Password	
Re-type password:	Password	
	CANCEL	SUBMIT
	r more characters. Use a combir er and a special character - ~!@#	

7. In the Set Password window, enter a new password, re-type, and click Submit.



8. If successful, you will be advised, and redirected to the Login page.

	A. Enterprise
LOG IN	
Email address:	Enter your Email
Password:	Enter password
	LOG IN
	Forgot password?
	Need an Enterprise account? Register here
	Need help?

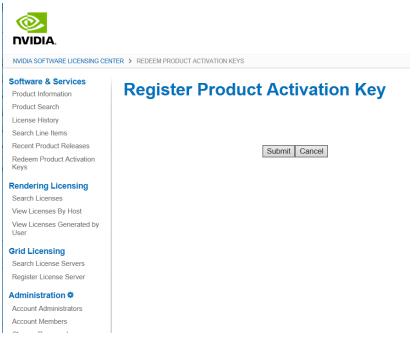
9. Login with your email address and new password.

	Help Customer Service NVIDIA Enterprise
OVIDIA .	
NVIDIA SOFTWARE LICENSING CEN	TER > REDEEM PRODUCT ACTIVATION KEYS
Software & Services Product Information Product Search License History Search Line Items Recent Product Releases Referem Product Activation	Redeem Product Activation Keys Use the form below to register additional keys for your account. GRIDEvalPAK116592:DK9V769LLS13MxbN
Keys Rendering Licensing Search Licenses View Licenses By Host View Licenses Generated by User	Redeem
Grid Licensing Search License Servers Register License Server	
Administration Account Administrators Account Members Change Password	

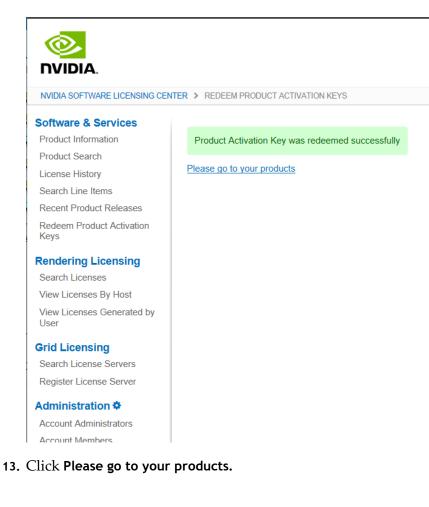
10. On the **Redeem Product Activation Keys** page, your activation key will be listed in the box. Click **Redeem.**

INVIDIA SOL IMARE LICENSING CEI	NTER > REDEEM PRODUCT ACTIVATION KEYS	
Software & Services Product Information Product Search		ct Activation Key
License History	Department:	
Search Line Items	Number of VDI Seats: *	Please Choose One V
Recent Product Releases	Timeframe for Deployment: *	Please Choose One V
Redeem Product Activation Keys	Who is your Preferred Partner? *	
Rendering Licensing	Design services or applications to be ena	bled
Search Licenses	with GRID: *	
View Licenses By Host		
View Licenses Generated by User		
Grid Licensing	Register for Nvidia Newsletters:	
Search License Servers		
Register License Server		
Administration 🌣		
Account Administrators	5	Submit Cancel
Account Members		
Change Password		

11. Fill out the Register Product Activation Key form and click Submit.

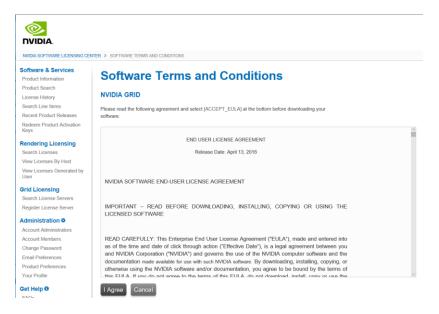


12. Click Submit.

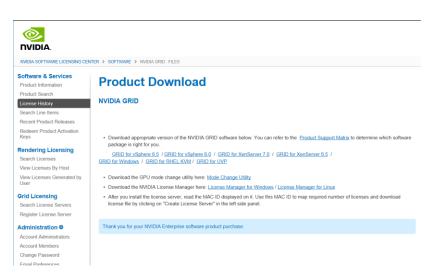


NVIDIA SOFTWARE LICENSING CE	NTER > PRODUCT INFORMATION : SOFTWARE	
Software & Services Product Information	Product Information	
Product Search License History	Software	
Search Line Items Recent Product Releases	Select a version. To access older versions, click on the "Archived Versions" tab	
Redeem Product Activation Keys	Current Releases Archived Versions	
Rendering Licensing	Version - Description	Date Available
Search Licenses	4.1 - MIDIA GRID	Nov 17, 2016
View Licenses By Host	Click here to access you	
View Licenses Generated by User	Please refer to your OEM partner's recommendations for <u>GRID version compatibility</u>	
Grid Licensing		
Search License Servers		
Register License Server		
Administration ©		
Account Administrators		
Account Members		
Change Password		
	as a reminder, these licenses are not applicable to any proof of concept with K1 or K2.	
	Download the GRID Quick Start Guide for more instructions on starting your evaluation.	
	f you have any additional questions, please reach out to your NVIDIA certified partner or contact us.	

14. On the Product Information page, click the NVIDIA GRID hyperlink.



15. Read the End User License Agreement. Click I Agree.



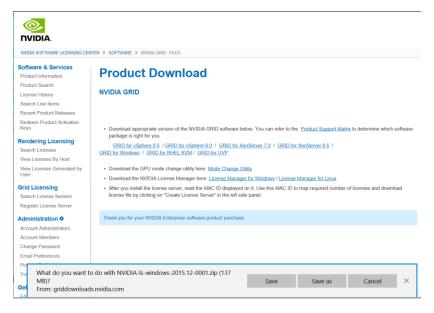
16. On the **Product Download** page you will find links to all available versions of GRID software as well as the GPU Mode Change Utility and the License Manager. Click on **GRID for vSphere 6.0.**

NVIDIA SOFTWARE LICENSING CE	ENTER > SOFTWARE > NVIDIA GRID : FILES
Software & Services Product Information Product Search License History Search Line Items Recert Product Activation Keys Rendem Product Activation Keys Barach Licenses Search Licenses Search Licenses Search Licenses Servers Stif Licenses Register Licenses Server Administration © Account Administrators	Product Download NUDIA GRID • Download appropriate version of the NVIDIA GRID software below. You can refer to the <u>Product Support Matrix</u> to determine which software package is right for you. GRID for VSphere 6.5 / GRID for VSphere 6.0 / GRID for XenServer 7.0 / GRID for XenServer 6.5 / GRID for Kindows / ORD for RHEL KVM / GRID for Longe Utility • Download the GRID mode change utility here: <u>Kinde Change Utility</u> • Download the NVIDIA License Manager here: <u>License Manager for Vindows / License Manager for Linux</u> • After you instalt the license server; rade the Alc ID displayed on it. Use this MAC ID to map required number of licenses and download license file by clicking on "Create License Server" in the left side panel. Thank you for your NVIDIA Enterprise software product purchase.
Account Members Change Password Email Preferences	

17. Click Save.

NVIDIA SOFTWARE LICENSING CEI	NTER > SOFTWARE > NVIDIA GRID - FILES					
Software & Services Product Information	Product Download					
Product Search License History	NVIDIA GRID					
Search Line Items Recent Product Releases						
Redeem Product Activation Keys	Download appropriate version of the NVIDIA GRID software below. You can refer to the <u>Product Support Matrix</u> to determine which software package is right for you. <u>GRID for vSphere 6.5 / GRID for vSphere 6.0 / GRID for XenServer 7.0 / GRID for XenServer 6.5 / GRID for VSphere 6.0 / GRID for XenServer 7.0 / GRID for XenServer 6.5 / GRID for XenServer 7.0 / GRID for XenServer 6.5 / GRID for XenServer 7.0 / GRID for XenServer 7.0 / GRID for XenServer 7.0 / GRID for XenServer 6.5 / GRID for XenServer 7.0 / GRI</u>					
Rendering Licensing Search Licenses						
View Licenses By Host	Download the GPU mode change utility here: <u>Mode Change Utility</u> Download the WVIDIA License Manager here: <u>License Manager for Windows / License Manager for Linux</u>					
View Licenses Generated by User						
Grid Licensing Search License Servers Register License Server	Download the two/onk Lotense manager nete. Litense manager bit withouts's Litense manager bit Litux After you install the license server, read the MAC ID displayed on it. Use this MAC ID to map required number of licenses and download license file by clicking on "Create License Server" in the left side panel.					
Administration 🍄	Thank you for your NVIDIA Enterprise software product purchase.					
Account Administrators Account Members						
Change Password						
Email Preferences						

18. Click on **Mode Change Utility** and save the resulting file.



19. Click on **License Manager for Windows** and save the resulting file.

5.2 CREATE THE LICENSE MANAGER SERVER

When enabled on Tesla GPUs, licensed editions of GRID products are activated by obtaining a license over the network from an NVIDIA GRID License Server. The license is "checked out" or "borrowed" at the time the VM is booted, and returned when the VM is shut down.

Use the following instructions to create an NVIDIA License Manager server.

5.2.1 Prepare the License Manager VM

The NVIDIA GRID License Manager can be installed on stand-alone hardware on in a VM. For the purposes of this procedure a VM will be used.

The license server is supported on Windows and Linux hosts. Check the GRID License Server Release Notes for supported OS.

Use the following procedure to create a Windows based License Manager server.

1. Create a VM with a supported version of Windows installed. Refer to sections 10.1 - *Creating a Virtual Machine* through 10.3 - *Installing VMware Tools on the Virtual Machine* for instructions.

- The recommended minimum configuration is 2 CPU cores, 4 gigabytes of RAM. A high-end configuration of 4+ CPU cores with 16 gigabytes of RAM is suitable for handling up to 150k licensed clients.
- The hosting platform must run a supported Windows OS.
- The platform must have a fixed (unchanging) IP address. The IP address may be assigned dynamically via DHCP or statically configured, but must be constant.
- The platform must have at least one unchanging Ethernet MAC address, to be used as a unique identifier when registering the server and generating licenses in NVIDIA's licensing portal.
- The platform's date/time must be set accurately.

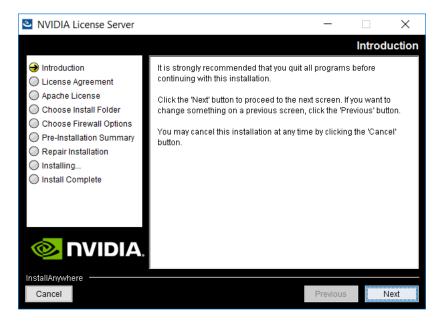
Prior to running the NVIDIA license server installer, download the current Java 32-bit runtime environment from www.oracle.com and install it.

Install the 32-bit Java runtime, regardless of whether your platform is Windows 32-bit or 64-bit.

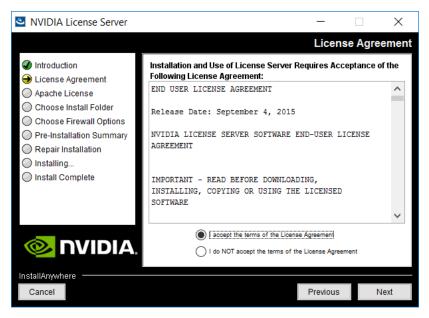
5.2.2 Install the License Server

File Home Share	View Manage			~
🔄 🍥 👻 🕆 🚺 🕨 NV	IDIA-Is-windows-20 > NVIDIA-Is-windows-20	15.12-0001 v	C Search NVIDI	A-Is-windows-20 🔎
🔆 Favorites	Name	Date modified	Туре	Size
Desktop	GRID License Server Release Notes.pdf	12/18/2015 10:15 12/18/2015 10:15	PDF File PDF File	640 KB 2,511 KB
🖳 Recent places	Setup	10/30/2016 5:03 DAA	Application Open	120 A05 VD
ni PC		٠	Run as administrat Troubleshoot com Pin to Start Share with Restore previous vi Send to Cut Copy Create shortcut Delete Rename Properties	patibility •

1. Unzip the license server installer and run **setup.exe**.



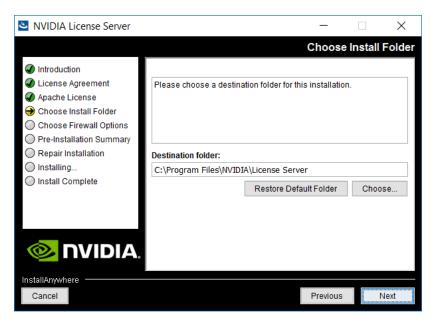
2. On the introduction screen click Next.



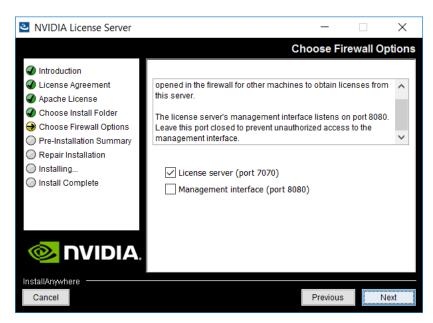
3. Accept the EULA for the license server software and click Next.



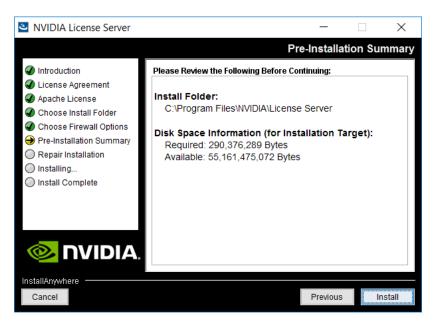
4. Accept the EULA for the Apache Tomcat software used to support the license server's management interface. Click **Next.**



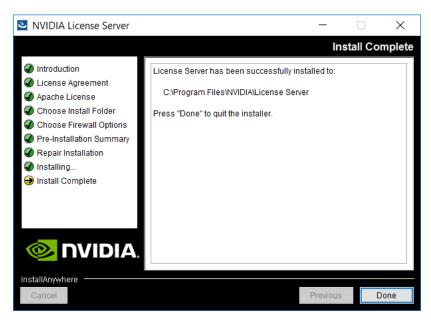
5. Accept the default destination folder and click Next.



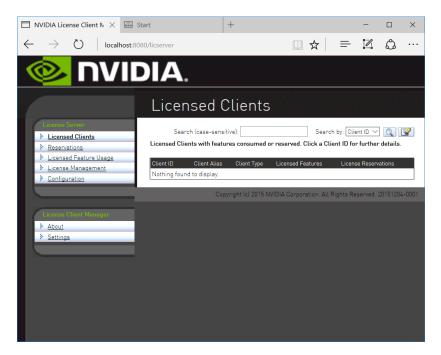
6. On the Firewall Options dialog, select the ports to be opened in the firewall. We recommend you use the default setting, which opens port 7070 so that remote clients can access licenses from the server, but leaves port 8080 closed, so that the management interface is only available via web browser running locally on the license server host. Click **Next**.



7. Click Install to commence installation.



8. Click Done.



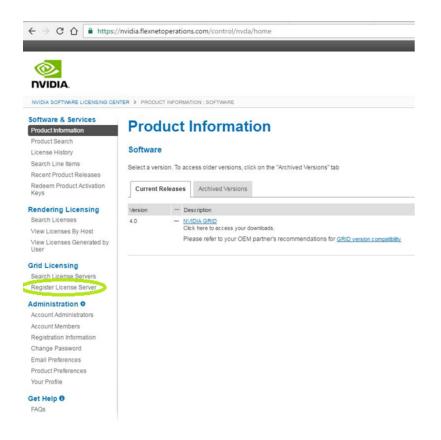
9. To verify that the license server is operating correctly, open a web browser on the license server host and connect to URL <u>http://localhost:8080/licserver</u>. The browser should display the management interface home page, as shown.

5.3 OBTAIN AND INSTALL YOUR LICENSE

Licenses can be purchased from NVIDIA (<u>http://www.nvidia.com/buygrid</u>) or customers may evaluate the licensing for a trial period. Customers who purchase licenses should receive an email with direction on how to implement licensing. Evaluation customers will immediately see a link connecting them to their evaluation keys.

	A. Enterprise
LOG IN	
Email address:	Enter your Email
Password:	Enter password
	LOG IN
	Forgot password?
	Need an Enterprise account? <u>Register here</u>
	Need help?

1. In a browser navigate to <u>https://nvidia.flexnetoperations.com</u>. Log in with your previously created credentials. If you have not created credentials, go to Section 5.1 Obtain an evaluation license PAK and download software on page 96



2. Click on Register License Server.

C		
NUDEASOFTWARE LICENSING CENTER > REGISTER LICENSE SERVER Software & Services Product filomation Product Search License History Search Licenses Recent Product Activation Key's Rendering Licenses View Licenses By Host View Licenses Generated by View Licenses Bervers Redistriction O Account Members Registration filomation Change Password	$\leftarrow \rightarrow C \bigtriangleup https:/$	/nvidia.flexnetoperations.com/control/nvda/createServer.lfs
NUDEASOFTWARE LICENSING CENTER > REGISTER LICENSE SERVER Software & Services Product filomation Product Search License History Search Licenses Recent Product Activation Key's Rendering Licenses View Licenses By Host View Licenses Generated by View Licenses Bervers Redistriction O Account Members Registration filomation Change Password		
NUDEASOFTWARE LICENSING CENTER > REGISTER LICENSE SERVER Software & Services Product filomation Product Search License History Search Licenses Recent Product Activation Key's Rendering Licenses View Licenses By Host View Licenses Generated by View Licenses Bervers Redistriction O Account Members Registration filomation Change Password	10-02	
NUDEASOFTWARE LICENSING CENTER > REGISTER LICENSE SERVER Software & Services Product filomation Product Search License History Search Licenses Recent Product Activation Key's Rendering Licenses View Licenses By Host View Licenses Generated by View Licenses Bervers Redistriction O Account Members Registration filomation Change Password	(O)	
NUDEASOFTWARE LICENSING CENTER > REGISTER LICENSE SERVER Software & Services Product filomation Product Search License History Search Licenses Recent Product Activation Key's Rendering Licenses View Licenses By Host View Licenses Generated by View Licenses Bervers Redistriction O Account Members Registration filomation Change Password		
Software & Services Product Information Product Information Product Search License History Search Line Items Recent Product Releases Redening Licensing Search Licenses By Host View Licenses Generated by User Cricatic Search Licenses Generated by User Crication Account Administrators Account Members Repistration Information Change Password	TIVIDIA.	
Product Information Product Elements Product Elements To register a license server to your account, provide the MAC address and additional information below. Search Licenses Note: Please do not use colons or spaces in the MAC address. Reendering Licensing MAC address* Search Licenses Generated by Alias View Licenses Generated by Site Name View Licenses Generated by Create Search Licenses Register License Servers Register License Servers Alias Site Name Create Account Administrators Account Administrators Account Members Register License Servers Register License Servers Provide the MAC address in the MAC Address.	NVIDIA SOFTWARE LICENSING CEN	TER > REGISTER LICENSE SERVER
Product Information Product Elements Product Elements To register a license server to your account, provide the MAC address and additional information below. Search Licenses Note: Please do not use colons or spaces in the MAC address. Reendering Licensing MAC address* Search Licenses Generated by Alias View Licenses Generated by Site Name View Licenses Generated by Create Search Licenses Register License Servers Register License Servers Alias Site Name Create Account Administrators Account Administrators Account Members Register License Servers Register License Servers Provide the MAC address in the MAC Address.	Cotturara & Convision	
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Registration Information Change Password	Account Administrators	
Change Password	Account Members	
Email Preferences	Change Password	
Product Preferences		
Your Profile	Your Profile	
Get Help 🖲	Get Help 0	
FAQs	FAQs	

3. Enter the MAC address of the network card associated with the static IP address on your license server, **without any dashes or other non-number characters.** Adding alias and site information can be beneficial for management but is not strictly required. Click **Create.**

The MAC address of the nic associated with the VM can be found in the VM settings on vCenter

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NVIDIA SOFTWARE LICENSING CE	NTER > VIEW SERVER				
Software & Services Product Information Product Search License History		0050569F1328 ETHERNET			
Search Line Items Recent Product Releases Redeem Product Activation Keys	Alias Site Name	Cable	Update	Alias	
Rendering Licensing Search Licenses	Map Add-Ons Add-Ons	View History	View Served Clients	Download License File	
View Licenses By Host View Licenses Generated by User	Add-On Name		tatus		Entitlement
Grid Licensing Search License Servers	No add-ons are currently n	парреа.			

4. In the View Server windows, click Map Add-Ons.

Map Add-Or	ıs					
Search Add-Ons for Server 005	56bc3cc2					
Activation Code		Entitlement ID				
Add-On Name		Feature Name Any	•			
Search						
Add-On Name	Activation Code	Entitlement	Expiration	Available Units in Line Item	Total Units in Line Item	Qty to Add
GRID Evaluation Edition	GRIDEvalPAK117322:XJ6R558UIX 67CybY	GRIDEvalPAK117322 XJ6R558UIX 67Cyby (2008)4297)	May 3, 2017	128	128	128

5. In the **Quantity to Add** box, enter the number of licenses to be assigned to this server. Other licenses can be assigned to other NVIDIA License Servers in future, if desired. For the purposes of this procedure, enter the entire available amount.

← → C △ P https/	/nvidia.flexnetoperations.com/cor	ntrol/nvda/viewServer.lfs?hostIdType=ETHE	RNET&publisherName=nvidia&hostI
NVIDIA SOFTWARE LICENSING CEI	VIEW SERVER		
Software & Services Product Information Product Search License History Search Line Items Recent Product Releases Redeem Product Activation Keys	View Server MAC address 00505 ID Type ETHEF Allas deplic Site Name pe.lab	RNET	1
Rendering Licensing Search Licenses View Licenses By Host View Licenses Generated by	Map Add-Ons Remove Add-On Add-Ons Add-On Name	s View History View Served Clients Do	wnload License File
User	No add-ons are currently mapped.		

6. On the **View Server** window, click on **Download License File.** Save the file to a location accessible to the License Server.

MVIDIA License Client Mar ×	
← → C 🗋 localhost:8080,	/licserver/response_upload.action 값 😮 🔳
	DIA.
	License Management
License Server A Licensed Clients	♥ Successfully applied license file to license server.
Reservations Licensed Feature Usage	Browse for the license file you received from the NVIDIA licensing portal, and then click Upload to process the license file.
License Management <u>Configuration</u>	Upload license file (Jain file): Choose File No file chosen
License Ollent Manager	Cancel Upload
 About Settings 	Generate license request file for processing by the NVIDIA licensing portal. If required, click Download to save a request from this license server into a local file for processing by the NVIDIA licensing portal.
	Download
	Copyright [c] 2015 NVIDIA Corporation . All Rights Reserved. 2015/204-0001

 Once your license file has been obtained from NVIDIA, Login to your License Server, navigate to <u>http://localhost:8080/licserver</u>. Click on License Management and upload your license file.

At this point, new clients will be able to obtain licenses automatically from the License Server.

5.4 EXCHANGING YOUR EVALUATION LICENSE FOR A PERMANENT ONE

Evaluation licenses will eventually expire, and need to be replaced with permanent licenses. Follow this procedure to replace your evaluation licenses with permanent ones.

1. Purchase NVIDIA GRID licenses

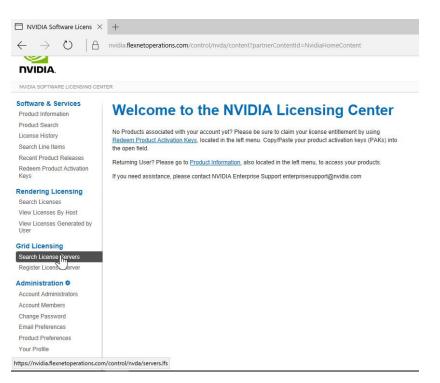
These can be obtained in many ways, see your local reseller. For help finding a reseller, open <u>http://www.nvidia.com/buygrid</u> in a web browser.

NVIDIA GRID Order Confirmation - Microsoft Edge		-		×
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NVIDIA GRID Order Confirmation				
N nvidia@flexnetoperations.com Thu 2/2, 1:14 PM REDACTED	H (Reply	all 🗸	•
Action Items			â	
Thank you registering your NVIDIA GRID order!				
The Product Activation Keys for your order are as follows:				
GRID Virtual PC Edition, Perpetual License, 1 CCU, NFR, 64, Product Activation Key: REDAC	TED			
GRID Virtual Workstation Edition, Perpetual License, 1 CCU, NFR, 16, Product Activation Key	: REC	DACTED)	
Log in to the NVIDIA Software Licensing Portal here: log in				
If you are registering more than one PAK, please complete the registration process for the f on "Register Additional Keys" link to register the additional PAKs.	first o	ne, then	click	
Questions? Please visit our enterprise support portal or contact us at enterprisesupport@r	nvidia	.com.		
Thank you!				
NVIDIA Customer Support Team				
				_

2. Open the email that came from <u>nvidia@flexnetoperations.com</u>. Click on the log in hyperlink.

NVIDIA Enterprise								
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	Passv	word:	Enter password					
				LOG IN				
				Need help?				
				[
https://nvid.nvidia.com/Nvid	diautilities/#	#/forgotPassword						

3. Log in with your email address and password.



4. On the Welcome to the NVIDIA Licensing Center screen, click on Search License Servers in the left-hand navigation area.

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Software & Services Product Information	Search Servers								
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Redeem Product Activation Keys	Activation Code								
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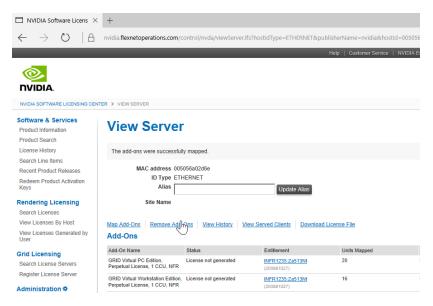
5. In the **Search Servers** screen, click on the hyperlink for your license server.

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Search License Servers									
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6. In the View Servers screen, click on Map Add-Ons.

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Administration ©	NFR		(200891027)									
Account Administrators	GRID Virtual Workstation	ASF0-EB63-FBDA-0029	INFR1235/Za513N		Permanent	16	16	F	16	_	×	
Account Members	Edition, Perpetual License, 1 CCU, NFR		(200891027)									
Change Password												1
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Product Preferences												
Your Profile												
Get Help 0												
https://nvidia.flexnetoperations.com/	control/nvda/manAddOns.lfs											

7. In the Map Add-Ons screen, find your permanent licenses. In the Qty to Add box for each license type, enter the number of licenses to add to this license server. Click Map Add-Ons.



8. In the View Server window, click Remove Add-Ons.

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9. In the **Remove Add-Ons** window, find your evaluation licenses and, in the **Quantity to Remove** box, enter all the licenses currently on the device. You will find this number in the **Currently on Device** column on the same page. Click **Remove Add-Ons**.

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Register License Server	GRID Virtual Workstation Edition, Perpetual License, 1 CCU, NFR	License not generated	INFR1235-Za513Nt (200891027)	16	Permanent	None		
Account Administrators	GRID Evaluation Edition	Copies decreasing	GRIDEvalPAK118257-ZE3U378G	0	May 4, 2017	None		
Account Members			NC19AInX					
			(200980237)					
Change Password								

10. In the **View Server** window, observe that the **Units Mapped** of evaluation licenses is now 0. Click on **Download License File** and save the file in a place accessible by your license server.

NVIDIA License Client Mar ×	⊥ _ □ X
	licserver/response_upload.action 🔂 🕑 😑
	DIA.
	License Management
License Server Licensed Clients	Successfully applied license file to license server.
<u>Reservations</u> <u>Licensed Feature Usage</u> License Management	Browse for the license file you received from the NMDIA licensing portal, and then click Upload to process the license file.
 <u>Configuration</u> 	Upload license file (.bin file): Choose File No file chosen
License Olient Manager	Cancel Upload
 About Sattinga 	Generate license request file for processing by the NVIDIA licensing portal. If required, click Download to serve a request from this license server into a local file for processing by the NVIDIA licensing portal.
	Download
	Copyright [c] 2015 NVIDIA Corporation: All Rights Reserved, 20151204-0001

 Once your license file has been obtained from NVIDIA, Login to your License Server, navigate to <u>http://localhost:8080/licserver</u>. Click on License Management and upload your license file.

At this point, any GRID clients that reboot will obtain new licenses from the permanent group.

5.5 SUPPORT, UPDATE, AND MAINTENANCE (SUMS)

NVIDIA Support, Update, and Maintenance Subscription (SUMS) for NVIDIA GRID gives you comprehensive software patches, updates, and upgrades, plus technical support from the experts. You now have an easy, reliable way to improve productivity and reduce downtime for your production systems.

NVIDIA GRID SUMS delivers a comprehensive solution for NVIDIA GRID software versions 2.0 and beyond on your NVIDIA Tesla Certified Systems, including:

- Access to the latest updates and upgrades
- Maintenance for NVIDIA GRID software
- Direct communication with NVIDIA technical experts
- Searchable knowledge base of specific documentation, application notes and articles
- Rapid response & timely issue resolution
- Active issue prioritization

SUMS comes bundled as part of an annual subscription, and can be purchased as a yearly subscription alongside a perpetual license.

	Production
Maintenance releases	Х
Updates	X
Upgrades	X
Maintenance, Updates, and Upgrades Access Period	3 Years from General Availability
Response Time	4 Hours
Online Access	NVIDIA GRID E-Mail Support Alias and NVIDIA GRID Support Portal
Support Hours	8am-5pm PST, Monday-Friday
Knowledgebase	

Support currently available only in English.

For additional service details, please review the <u>NVIDIA GRID End User License Agreement</u> and the <u>NVIDIA GRID Software Service Supplemental Terms</u>.

Use the following procedure to obtain support for your GRID products.

📴 Welcome to Enterprise Support for NVIDIA GRID - Google Chrome	-	-		\times
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Welcome to Enterprise Support for NVIDIA GRID				
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Welcome to NVIDIA Enterprise Support.				- 1
Your new NVIDIA GRID™ SUMS comes with a helpful, easy-to-use, online support portal where you can ask questions, subn cases, check a case status, and get product updates. You can also browse our knowledgebase to find useful FAQs.	nit and	priorit	tize supp	port
To get started, log into the support portal here.				. 1
Your username is:				- 1
At first login, please select the 'forgot your username or password?' link at the bottom of the page to set up your account.				- 1
While the support portal is the best way to log and track incidents, you can also call Enterprise Support M-F from 8am-5pm PS For an after-hours emergency, call our $2+x7$ team at $+1$ (800) 797-6550. They can help collect appropriate information about y internal resources as needed.				
Thank you for purchasing NVIDIA GRID SUMS and we look forward to working with you!				- 1
Best regards,				- 1
NVIDIA Enterprise Support Team EnterpriseSupport@invidia.com				
This email message is for the sole use of the intended recipient(s) and may contain confidential information. Any unauthorized distribution is prohibited. If you are not the intended recipient, please contact the sender by reply email and destroy all copies of the sender by reply email and destroy all copies of the sender by reply email and destroy all copies of the sender by reply email and destroy all copies of the sender by reply email and sender by reply email and destroy all copies of the sender by reply email and sender by reply email and destroy all copies of the sender by reply email and sender by reply emails and sender by reply				

1. Once your SUMS entitlement has been assigned, you will receive and email from NVIDIA Enterprise Support. Click the **here** hyperlink.

Enterprise Services	Home	Knowledge Base						
LOG IN								
Log in with an existing account Username Enter email Password Password LOG IN Forgot your password?			Not an Enterprise Service Customer? <u>Learn more</u> about NVIDIA Enterprise Services for Tesla benefits your organization <u>Learn more</u> about NVIDIA Grid Support					
	Ī	Copyright © 2016 N erms & Conditions	WIDIA Corporation Legal Info Policy					

2. Log in with your Username (your email address) and Password.



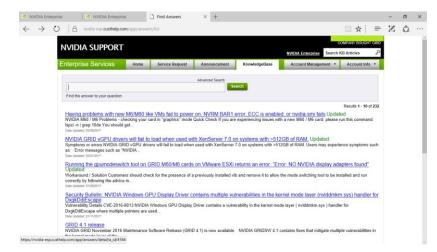
3. On the NVIDIA Enterprise Customer Service page, click the NVIDIA ENTERPRISE SUPPORT icon.

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Knowledg Updated ≎	ge Base Most Recent KB Article Having problems with n error. ECC is enabled. (- ew M6/M60 I or nvidia-smi vers will fail t	ike VMs fall to power on. N falls o load when used with Xen		Description: Dear	GRID Customer, NVI	IDIA GRID August 2016 SW release is now :	l to better

4. You will arrive at the **Home** tab. Here you will see a list of your service requests, Announcements from NVIDIA pertaining to your product, links to the Knowledge Base, and a button for submitting a service request.

NVIDIA Enterprise	rise 🤄 NVIDIA Enterprise		Ask a Question	× +				-	Ø	×
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5. When you wish to submit a service request, click the **Service Request** button.



6. The Knowledge Base has up-to-date articles and tips for maximizing your NVIDIA GRID experience.

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7. The Announcements page shows the latest versions of GRID software, and any late breaking updates or patches.

Be sure to check back at the SUMS portal frequently. This will help you stay up to date on your subscription, find patches, and keep your GRID software running smoothly.

CHAPTER 6. NVIDIA GRID VGPU MANAGER INSTALLATION

This chapter discusses the following NVIDIA GRID vGPU Manager installation topics:

- ► Installing the VIB.
- Uninstalling the VIB.
- Upgrading to Permanent GRID licenses.

Upgrading from previous versions of the VIB is not supported.

6.1 PREPARE AND INSTALL THE VIB FILES

This section guides you through installing, confirming, and uninstalling the VIB files.

6.1.1 Uploading VIB in vSphere

This section describes how to upload a VIB file to the host using the vSphere Web Client. See Chapter 15, *Using WINSCP*, on page 295 if you are using WinSCP.

To upload the file to the data store using vSphere Web Client, do the following:



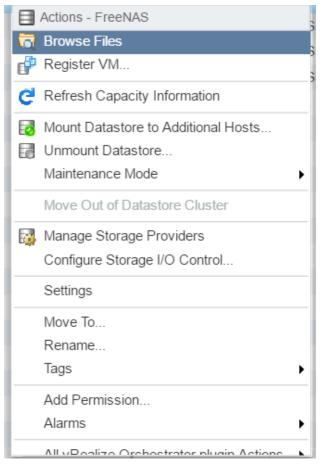
Open a web browser and navigate to the vCenter host at https:// <host>, where
 <host> is either the hostname or IP address. Ignore the untrusted certificate warning if it displays. Select Log in to vSphere Web client.

vmware [,] vSphere Web	Clie	ent ≜ ≘	À			
Navigator	Ŧ	付 Home				
Storage		Home				
ሰ Home		Inventories				
Venter Inventory Lists Hosts and Clusters Wis and Templates Storage Networking	> > > > >	vCenter Inventory Lists	Hosts and Clusters	WMs and Templates	Stora <mark>, Stora</mark> c	e Networking
Policies and Profiles Image: Policies and Policies and Policies Image: Policies Image: Policies a	> > > >	Task Console	Event Console	Host Profiles	W Storage Policies	Customization Specification Manager
 Tasks Log Browser Events ✓ Tags 	_	Administration	System		Customer	
Q New Search	> >	Koles	System Configuration	Licensing	Experience Improvement	
		Watch How	to Videos			

2. On the Home screen, click Hosts and Clusters.

Navigator Image: The second	Navigator Image: International System International System International System International International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System International System Internatinternational System Interna	1.11	-						
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Imagement Name 1 Status Type Imagement Imagement Imagement Imagement Imagement Imagement Ima	Imagement Imagement Imagement				-	Actions a			🔫 <u>In</u> Datacenter
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				VMFS5	Vormal	🙂 N	local-csco-esxi-5		
						1			
						1			

3. Click on the host in the left-hand Navigator pane, then click **Related Objects → Datastores**.



4. Right click on the datastore that will accept the upload, and click Browse Files.



5. Click the New Folder icon.

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

6. Name the new folder vib and then click **Create**.

7. Select the vib folder in the Datastore Browser window.

Q Search) C 🖆 🖇
datastore1	Name	Size	Modified	Туре	Path
) 🛅 .sdd.sf			This list is em	pty.	
>vDGA-001					
▶ 🛅 Win7-001					
mkdump					
▶ 📺 W7vGPU-001					
▶					
⊳ 🚞 vib					

8. Click the **Upload** icon.

Client Integration Access Control						
This site is using VMware Client Integration Plug-In. Do you want to allow it to access your operating system?						
Protocol: https						
Hostname: vc-1.nvidialab.com						
Port: 0						
Allow Deny (automatic in 287 seconds)						
Always ask before allowing this site						
The VMware Client Integration Plug-In will give web applications and remote VMs access to your operating system. Only allow sites you trust.						

9. Select Allow.

•	Open		x
Look in:	Vib 💌	← 🗈 📸 🕶	
(Her	Name	Date modified	Туре
	hp-esxi-2	10/28/2016 6:56 PM	Text Docu
Recent places	NVIDIA-vGPU-VMware_ESXi_6.0_Host_Driver	10/25/2016 6:55 PM	VIB File
Desktop			
Libraries			
This PC			
Network			
	< 111		>
	File name: NVIDIA-vGPU-VMware_ESXi_6.0_H	lost_Driver_	Open
	Files of type:	•	Cancel

10. Select the VIB file to be uploaded. Click **Open**.

The VIB file is uploaded to the data store on the host.

If you do not click Allow before the timer runs out, then further attempts to upload a file will silently fail. If this happens, exit and restart vSphere Web Client, repeat this procedure and be sure to click Allow before the timer runs out.

6.1.2 Place the Host in Maintenance Mode

Navigator I	hp-esxi-1.pe.lat	Action	s 🔻		
Home 🖻 😏	Getting Started	Summary	Monitor	Manage	Related Objects
		outer that u as ESX and vide the nat virt		n virtual d es use	
New vApp > New Resource P > Deploy OVF Tem		intes a		Ulage	Cluster
Connection Maintenance Mo	46	•			_ 6
Power				nance Mode	
Certificates					
Storage					vSphere Client

 Place the host into Maintenance mode by right-clicking it and then selecting Maintenance Mode > Enter Maintenance Mode. 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 INTO MAINTENANCE MODE DISABLES ANY VCENTER APPLIANCE RUNNING ON THIS HOST UNTIL YOU EXIT MAINTENANCE MODE AND THEN RESTART THAT VCENTER APPLIANCE.

2. Click **OK** to confirm your selection.

6.1.3 Installing the VIB

Use the following procedure to install the VIB file, NVIDIA-vGPU-VMware_ESXi_6.0_Host_Driver_367.43-10EM.600.0.0.2494585.vib .

1. Issue the following command to install the vGPU VIB, where **<path>** is the full path to the VIB file:

\$ esxcli software vib install -v /<path>/NVIDIA-vGPU-VMware ESXi 6.0 Host Driver 367.43-10EM.600.0.0.2494585.vib

The following error displays if you *do not* use the full path: [VibDownloadError].

When the installation is successful, the following displays:

```
Installation Result:
Message: Operation finished successfully. Reboot Required: false
VIBs Installed: NVIDIA-vGPU-VMware ESXi 6.0 Host Driver 367.43-
10EM.600.0.0.2494585
```

VIBs Removed: VIBs Skipped:

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

6.1.4 Confirm the Driver VIB Installation

1. Use the following command to determine the installation of vGPU driver in vSphere: \$ esxcli software vib list | grep -i nvidia

This command returns output similar to the following:

```
NVIDIA-vGPU-VMware_ESXi_6.0_Host_Driver_367.43-10EM.600.0.0.2494585
NVIDIA VMwareAccepted 2016-10-26
```

2. Confirm GPU detection using the following command:

\$ nvidia-smi

This command returns output similar to the following (output shown below is for a Tesla M60 card in a single host):

```
+-----+
| nvidia-smi 367.43
                     Driver Version: 367.43
                                                 1
|-----+
| GPU Name Persistence-M| Bus-Id Disp.A | Volatile Uncorr. ECC |
| Fan Temp Perf Pwr:Usage/Cap| Memory-Usage | GPU-Util Compute M. |

        Image: N/A
        44C
        P8
        24W / 150W |
        19MiB / 8191MiB |
        0%
        Default |

  -----+

        I
        Tesla M60
        On
        | 0000:06:00.0
        Off |
        Off |

        | N/A
        41C
        P8
        23W / 150W |
        19MiB / 8191MiB |
        0%
        Default |

+----+---+
| Processes:
                                           GPU Memorv |
| GPU PID Type Process name
                                          Usage |
 _____
| =
| No running processes found
 -----+
```

If the **nvidia-smi** command does not return any output, see Chapter 14, vGPU-Enabled VMs and nvidia-smi Fail to Start, on page 280)

SMI also allows GPU monitoring using the following command: \$ nvidia-smi -1 This command switch adds a loop, auto refreshing the display.

6.2 UNINSTALLING THE VIB

This section describes how to uninstall the VIB

Upgrading is not supported. The previous vib must be removed completely before installing the new vib.

Use the following procedure to uninstall the VIB:

- 1. Determine the name of the vGPU driver bundle as described in section 6.1.4 Confirm the Driver VIB Installation on page 134
- 2. Run the following command to uninstall the driver package:

```
$ esxcli software vib remove -n NVIDIA-vGPU-
VMware_ESXi_6.0_Host_Driver --maintenance-mode
```

The following message displays when uninstallation is successful:

```
Removal Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed:
VIBs Removed: NVIDIA_bootbank_NVIDIA-vGPU-
VMware_ESXi_6.0_Host_Driver_367.43-10EM.600.0.0.2494585
VIBs Skipped:
```

3. Reboot the host to complete the uninstallation process.

CHAPTER 7. BUILDING CITRIX XENDESKTOP 7.12

This chapter covers installing Citrix XenDesktop 7.12, including:

- Registering and allocating the trial license
- Installing XenDesktop
- ▶ Importing vSphere and vSphere SDK Certificates
- Using Citrix Studio to performing site setup
- Configuring Citrix license server
- Verify Citrix StoreFront Configuration

7.1 REGISTERING AND ALLOCATING THE TRIAL LICENSE

Use the following procedure to obtain and allocate a Citrix XenDesktop 7.12 license:

Testing was done on XenDesktop 7.12 though Citrix always has the latest version available for trials so please keep that in mind and note that some screenshots and steps may vary slightly.

XenApp & XenDesktop		1 800 905 6176 Request a call Try or buy
Capabilities Compare Deploy	ment Case Studies Resource Librar	y Support
lt's ea	asy to get started w XenDeskto	
	No cost, no commi	tments
We recommend that v	ou start by trying XenApp or XenDes	
	tions, pricing, implementation, or any	ktop for free. When you are ready to / other questions, contact us to talk to a
discuss purchasing opt	tions, pricing, implementation, or any op expert.	
discuss purchasing op XenApp and XenDeskt	tions, pricing, implementation, or any op expert.	y other questions, contact us to talk to a

1. Using an internet browser. Navigate to the <u>http://www.citrix.com/tryxendesktop</u> website. Under **Try XenDesktop** click **Download Now.**

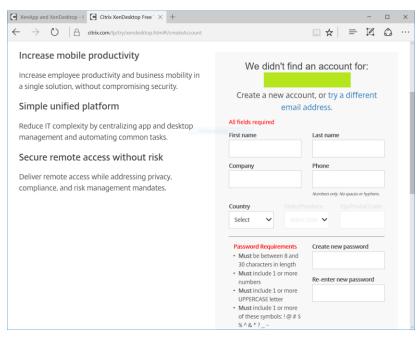
CITRIX

Try XenDesktop for free

Securely deliver Windows, Linux, web, and SaaS apps plus full virtual desktops to any device, anywhere.



2. Enter your email address and click Next.



3. Create a new account by adding your account info. Click **Create account and send license.**

$\leftarrow \rightarrow \circlearrowright$ \triangle ty/STS/Sign-In?Returr $\square \bigstar$ \equiv $\square \diamondsuit$	•••
• • • • • •	
CITRIX	
Sign In	
Oigh in	
Username	
Password	
Reset password	
☐ Keep me signed in	
Sign in	
Create Citrix Account	
Can't access your account? Let us know!	

4. Once your account has been created sign in to your account.

III ⇒ O ♦ ♣ ♣ + + File Message ♀ Tell me what you want to do	Your Trial License for XenDesidop - Message (HTML)	
Image: Space Image: Space<	Mill Move tor ? Ge To Manager □ Fases Email ■	Aragen Mass. Consponse Follow Pottoy: University of Select- Tags o Select-
Chris Trials < custoresupport []Chris.com> Your Trial License for XenDesktop Function Mio: Healt State In Entowing Start by Wednesday, December 28, 2016. Due by Wednesday, December If there are problems with how this message is displayed, Cick here to serve it is a se		12/16/2016
	сітях Thank you for trying XenDesktop	
	Your trial license code is:	
	You may activate your license using our License Management System. For step-by-step- guidance on installing, configuring and using your that, access downloads & help below.	
	Access downloads & help	
	© 1990-2016 Citrix Systems, Inc. All Rights Reserved Privacy & Terms	-

5. Open the email that you received from citrix.cs@digitalriver.com as it contains the License Code needed to allocate your trial license. This code should match the one displayed in your Citrix account.

\leftarrow \rightarrow \circlearrowright $ $ \triangle :ure/try/download-xendesktop.html \square \bigstar $ $ \equiv \blacksquare \diamondsuit	
Expand all	^
⊙ Step 1 - Review system requirements and download software	
Please review System Requirements 🛛 before downloading and installing XenDesktop.	- İ
Downloads	- 1
 XenDesktop 7.12 2 (ISO, 2.19 GB) SHA 256: 6a1ad5192911e1368d3408c40bf780329823676305abd971526ef9c423c5e53f 	
• XenDesktop Product Documentation 🛛	
Step 2 - Activate your license	
Step 3 - Install and configure your software	
⊙ Step 4 - Get the most from your free trial	
Frequently asked download and activation questions	
Expand all	
	×
You may choose to enter the license key later. Even with features are enabled and the evaluation will run success	

- 6. On the Citrix License page, Click on **Review system requirements and download**
- **software.** Click the **XenDesktop 7.12** hyperlink and download the software to a storage location accessible to the ESXi Management server.

C XenApp and XenDesktop - I C Download Citrix XenDe: X + - C X
\leftarrow \rightarrow \circlearrowright $ $ \triangle :ure/try/download-xendesktop.html \square \bigstar $ $ \equiv \mathbb{Z} \diamondsuit \cdots
Expand all
Step 1 - Review system requirements and download software
Step 2 - Activate your license
 To activate your Free Trial License code, go to My Account 2 on Citrix.com and sign in using your existing credentials (if you are not already logged in).
Choose Activate and Allocate Licenses under My Account.
• Your Free Trial License code is visible in the resulting list. You also received it in a confirmation email.
Select the license you wish to activate and click Continue.
 Follow the instructions to complete your activation. Refer to the Licensing Tools document [™] for additional information on how to use the My Account Licensing Tools to manage licensing.
⊙ Step 3 - Install and configure your software
⊙ Step 4 - Get the most from your free trial
Frequently asked download and activation questions

 Once the software has downloaded, click on Step 2 - Activate your license. Click on My Account and sign in if necessary.

CİTRİX Pr	oducts Downloads Support & Ser	rvices Partners	Sign Out	Q
All Licensing Tools				
(My Account F위 All Licensing Tools	License Overview View Licenses	Activate and Allocate Licenses		locate Redownload Return
Previews/Betas - License Retrieval	Continue	Select • Configure • Confirm	Download	Don't see your product? Don't see your product? Image: Contract of the search in the se
Upgrade My Products			Results per pa	age 30 • H 4 Page 1 of 1 > H
My Certification Manager	🛛 🍞 Name	Code	Order Number Available	Purchased Order Date Expiration
Licensing Program Registration	Citrix XenDesktop Platinum Edition	CTX34-P6KWV-L6776-HRHH4-FV6JH	N/A /00001 99	99 02 Feb 2017 03 May 2017
View Non-Disclosure Agreement			Results per pa	age 30 • H 4 Page 1 of 1 + H
View Executed Agreements	Continue			
Appliance Evaluation Agreement (AEA)				
C Renew and Manage Maintenance Programs				

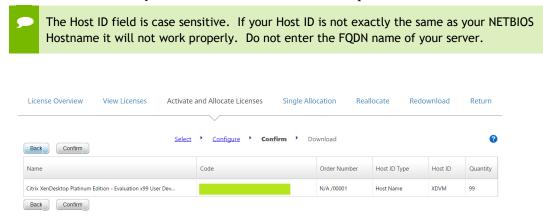
8. Click on the All Licensing Tools link. Then click Activate and Allocate Licenses.

	six	Products Downlo	oads Support & S	reivices ra	artners		Sign	out	C
ime /	My	Account / All Licensing Tools							
overvi	iew	View Licenses Activate and	Allocate Licenses Singl	e Allocation Re	allocate Redo	wnload R	eturn		
			Select Configure	Confirm	Download			Don't see you	product?
Conti	inue]			8			P Adv	anced Search
					Res	ults per page	30 • H	< Page 1	of1 ► H
	2	Name	Code		Order Number	Available	Purchased	Order Date	Expiration
		Citrix XenDesktop Platinum Edition			N/A /00001	99	99	16 Dec 2016	16 Mar 201
					Res	ults per page	30 - H	← Page 1	of1 ⊨ H

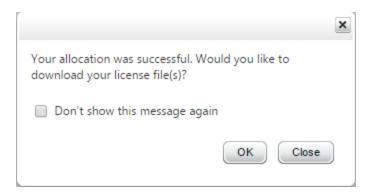
9. Click the checkbox next to your license, then click **Continue**.

License Overview	View Licenses	Activate and Allocate Licenses	Single Allocatio	on Realloca	te Redownlo	oad Return
Back Continue		<u>Select</u> Configure ' C	onfirm 🕨 Downlo	ad		Ø
Name	Code		Order Number	Host ID Type	Host ID	Quantity/Available
Citrix XenDesktop Platinum E	di		N/A /00001	Host Name 💌	-	99 / 99
Back Continue						

10. For **Host ID Type**, ensure **Host Name** is selected. Under **Host ID**, enter the NetBios name of the host on which you will install Citrix XenDesktop. Click **Continue**.



11. Confirm your selection and Host ID and click **Confirm**. Select the **Download** button to proceed to download your license file.



- **12.** A confirmation dialog will be displayed, select **OK** to proceed to download your license file.
- **13.** Once the download completes, copy the license file to the server where you will install XenDesktop 7.12.

7.2 INSTALLING XENDESKTOP 7.12

The server on which you are installing Citrix XenDesktop 7.12 must meet the requirements listed in *General Prerequisites* on page 33. As of the publication date of this manual the current version of the Citrix XenDesktop is:

```
Version: 7.12.0.81
XenApp_and_XenDesktop7_12.iso
```

Use the following procedure to install XenDesktop 7.12:

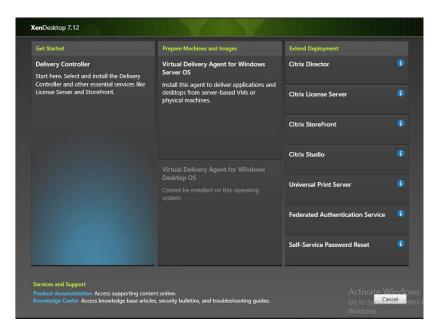
1. Log in to the vCenter Web Client.

	Virtual Ma	achine Settings	x
Hardware Options			
Device Memory Processors Hard disk 1 CD/DVD drive 1 Floppy drive 1 Video card	Summary 8 GB 4 80 GB (Thin provisioned) Using local file Z:\Software\XenDe Using local drive VM Network 1 monitor	Device status Connected Connect at power on Connection Location: Local Client Use physical drive:	•
ਸ਼	Browse for IS	O Image 🛛 🔀	~
 Image: Second state of the secon	<pre><< Softwa > XenDesktop 7.12 vfolder</pre>	Date modified Type	ed
	File name: XenApp_and_XenDeskto	pp_7_12 v CD-ROM images (*.iso) v Open Cancel	
		OK Cancel H	lelp

2. Use the vCenter Client to mount the .iso from an ISO data store to the virtual machine CD drives. Ensure the **Connected** and **Connected at power on** check boxes are selected.

Deliver applications and desktops to any user, anywhere, on any device. - Secure mobile device management - Hybrid doud, cloud and enterprise provisioning - Centralized and flexible management Manage your delivery according to your needs: XenApp Deliver applications XenDesktop Deliver applications and desktops Start Cancel
CITRIX

3. Launch the CD with AutoPlay or select the AutoSelect.exe application to start the Citrix XenApp and XenDesktop installer. Select the Start button next to XenDesktop Deliver applications and desktops.



4. Select **Delivery Controller** under **Get Started** on the **XenDesktop 7.12** window.

@	User Acco	ount Control	x
	you want to allow th nges to this compute	e following program to mak er?	e
2	Program name: Cit Verified publisher: Cit File origin: CE		
Show d	etails	Yes No	
		Change when these notifications a	ppear

5. Select **Yes** to agree to the User Account Control prompt if displayed.

KenDesktop 7.12	Software License Agreement
Licensing Agreement	Printable version
Core Components	CITRIX LICENSE AGREEMENT
Features	This is a legal agreement ("AGREEMENT") between the end-user customer ("you"), and
Firewall Summary	the providing Citrix entity (the applicable providing entity is hereinafter referred to as "CITRIX"). Your location of receipt of the Citrix product (hereinafter "PRODUCT") and maintenance (hereinafter "MAINTENANCE") determines the providing entity as
Install	identified at https://www.citrix.com/buy/licensing/citrix-providing-entities.html. BY INSTALLING AND/OR USING THE PRODUCT, YOU ARE AGREEING TO BE
Call Home	BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE
Finish	TERMS OF THIS AGREEMENT, DO NOT INSTALL AND OR USE THE PRODUCT. Nothing contained in any purchase order or any other document submitted by you shall in any way modify or add to the terms and conditions contained in this AGREEMENT. 1. PRODUCT LICENSES.
	a. End User Licenses. The software in a software PRODUCT and the software installed in an appliance PRODUCT is made available by CITRIX under the license models identified at http://www.citrix.com/buy/licensing/ product.html. Any experimental features delivered with such software will be identified and are licensed only for internal testing purposes. "Software" means a Citrix proprietary and/or open source software program in object code form licensed hereunder. "Appliance" means a hardware appliance with installed Software. Notwithstanding anything sat forth in this AGREEMENT or at the
	\bigcirc I have read, understand, and accept the terms of the license agreement $\textcircled{\bullet}$ I do not accept the terms of the license agreement

6. Check I have read, understand, and accept the terms of the license agreement radio button to accept the agreement. Select Next to continue.

For scale and performance reasons, it is recommended that Director and the License Server be installed on separate servers.
Location: C:\Program Files\Citrix Change
Component (Select all)
Delivery Controller Sector Distributes applications and desktops, manages user access, and optimizes connections.
Studio Create, configure, and manage infrastructure components, applications, and desktops
Director Monitor performance and troubleshoot problems.
License Server Manages product licenses.
StoreFront Provides authentication and resource delivery services for Citrix Receiver, enabling yo to create centralized enterprise stores to deliver applications, desktops, and other resources to users on any device, anywhere.

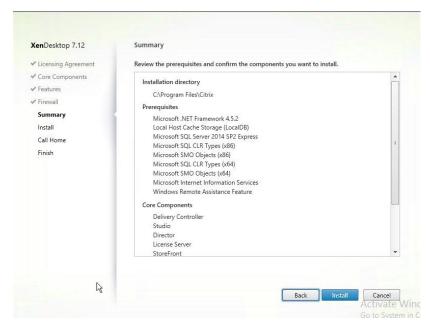
7. Select the Core Components that you wish to install, by default all components are selected. For a single server installation select **Next** with all Core Components checked to continue.

Licensing Agreement	Feature (Select all)
Core Components Features Firewall	Install Microsoft SQL Server 2014 SP2 Express This is an optional component. If you have an existing SQL Server for storing desktop and application configurations and settings, do not select this option.
Summary Install	Install Windows Remote Assistance Select this only if you need the shadowing feature of Director Server.
Call Home	
Finish	

8. Select **Features** needed for this installation. Citrix best practice is to use a SQL Server separate from the XenDesktop server. For a single server installation accept the default selections and select **Next** to continue.

XenDesktop 7.12	Firewall			
 Licensing Agreement 	The default ports are lis	sted below.		Printable version
✓ Core Components ✓ Features Firewall Summary Install Call Home Finish	Delivery Controller 80 TCP 443 TCP	Director 80, 443 TCP	License Server 7279 TCP 27000 TCP 8083 TCP 8082 TCP	StoreFront 80, 443 TCP
	be created even	n to automatically cre if the Windows Firewa	all is turned off.	ws Firewall. The rules will u want to create the rules

9. Under **Configure firewall rules:** select **Automatically**, unless you are not using Windows Firewall. Select **Next** to continue.



10. Review Summary and Select **Install** to begin installation.

(enDesktop 7.12	Installing prerequisites and components		
Licensing Agreement	Installing	About 9 minutes rem	naining
Core Components Features	Prerequisites Hide Prerequisites		-
r F	XenDesktop	Installed	
The machin	e needs to be restarted before the installation can continue. Close Core Components	Installed	
	Delivery Controller Studio		
	Studio Director		
	Studio Director License Server		
	Studio Director License Server StoreFront		
	Studio Director License Server		

11. Restart the OS as necessary. Once the OS restarts log back in to continue.

XenDesktop 7.12	Call Home
 ✓ Licensing Agreement ✓ Core Components 	Call Home monitors your deployment for common error conditions, automatically uploads systen data to Citrix, and then proactively notifies you before issues become serious problems.
 Features Firewall Summary Install Call Home Finish 	How does it work? - Configuration and usage data are gathered and periodically sent using HTTPS to Citrix You can log into Citrix Insight Services to view diagnostics results and recommendations. This information will be used for troubleshooting and diagnostic support purposes, as well as to improve the quality, reliability, and performance of Citrix products, subject to the Citrix Insight Services Policy at https://cis.citrix.com/legal/ and the Citrix Privacy Policy at http:// www.citrix.com/about/legal/privacy.html. Learn more I vant to participate in Call Home. (Recommended) I do not want to participate in Call Home.
	To participate in Call Home, you must connect to Citrix Insight Services. Connect Next

12. After install, the **Call Home** window appears. Select whether to participate in Citrix Call Home and continue.

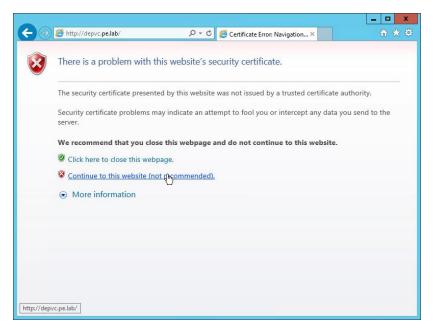
XenDesktop 7.12	Finish Installation		
 Licensing Agreement 	The installation completed successfully.		Succes
 ✓ Core Components ✓ Features ✓ Firewall ✓ Summary ✓ Install ✓ Call Home Finish 	Prerequisites Microsoft SQL Server 2014 SP2 Express Windows Remote Assistance Feature Local Host Cache Storage (LocalDB) Microsoft SQL CLR Types (x86) Microsoft SQL CLR Types (x64) Microsoft SQL CLR Types (x64) Microsoft SQL CLR Types (x64) Microsoft SMO Objects (x64) Microsoft Internet Information Services Core Components Delivery Controller Studio Director License Server StoreFront Post Install Component Initialization 	Installed Installed Installed Installed Installed Installed Installed Installed Installed Installed Installed Installed Installed Installed	

13. Select **Finish** when the **Finish Installation** dialog is displayed.

7.3 IMPORTING VSPHERE AND VSPHERE WEB SERVICES SDK CERTIFICATES

Before you can continue with the XenDesktop configuration you must import the vSphere 6.0 server certificate and vSphere Web Service SDK Certificates into the VM that contains the XenDesktop instance.

7.3.1 Importing the vSphere Certificate



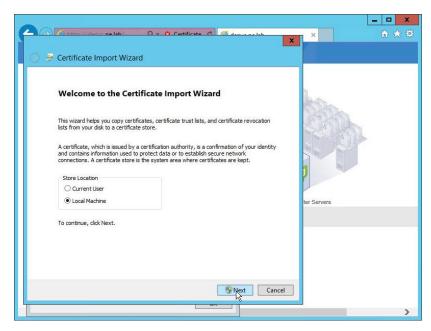
1. Navigate to the website for the VMware vCenter Server UI. Select **Continue to this** website (not recommended).

VmV	VIntrusted Certificate		
And a set of a set of the			
	The security certificate presented by this website was not issued by a trusted certificate authority. This problem might indicate an attempt to fool you or intercept any data you send to the server. We recommend that you close this webpage. About certificate errors <u>View certificates</u>	Venter Servers	
5			>

2. Click on the certificate warning next to the URL in the address bar and select View certificates.

	Certificate	×
This certi	Details Certification Path Certificate Information certificate cannot be verified up to a truste fication authority. Issued to: depvc.pe.lab	d
	Issued by: CA Valid from 12/6/2016 to 12/1/2026	vCenter Servers
	Install Ceptificate	uer Statement

3. Select the **Install Certificate** button to import the certificate into the local certificate store.



4. Select Local Machine radio button on the Certificate Import Wizard and then select Next to import the server certificate into the local machine certificate store.

	🐑 🍠 Certificate Import Wizard	X ↑ ★ 33
General	Certificate Store Certificate stores are system areas where certificates are kept. Windows can automatically select a certificate store, or you can specify a location for the certificate.	
	Automatically select the certificate store based on the type of certificate Place all certificates in the following store Certificate store:	a
	Next Cancel	
	ОК	>

5. Select **Next** to accept the default to automatically select the certificate store based on the certificate type.

		. 🗆 X
(←)⊙[₼ ☆ 🕸
	Certificate Import Wizard	
General General This cert	Completing the Certificate Import Wizard The certificate will be imported after you click Finish. You have specified the following settings: Certificate Store Selected: Automatically determined by the wizard Content Certificate	
	Finish Cancel	
	OK	
		>

6. Select **Finish** to continue.

Certificate Import Wizard	x
The import was successful.	
ОК	

7. Select **OK** to close the notice that the certificate was imported successfully.

7.3.2 Importing vSphere Web Services SDK Certificates

Attp://depvc.pe.lab/	P ~ ♥ Certificate error C Ø Welcome to VMware vSphere ×	• •
Getting Started To access vSphere remotely, use the vSphere Web Cilent. Log in to VSphere Web Cilent For help, see vSphere Documentation	varie Sever	For Administrators Web-Based Otastore Browser Use your web browser to find and download files (or example, virtual machine and virtual disk files). Browse databases in the VSphere Inventory For Developers VSphere Web Services SDK Learn about our talest SDKs, Tooktis, and APIs for managing VMware ESX. ESX, and VMware vCenter. Cet sample code, reterence documentation, participate in our Forum Discussions, and view our latest Sessions and Webinas. Learn more about the Web Services SDK Browse objects managed by vSphere Download thusky part CA cettificates
one or more patents listed at http://www.vmware.com/go/pat	oduct is protected by U.S. and international copyright and intellectual property laws. Where pro- tests, Where is a registered trademark or trademark of Whereau, toc. In the United States and/or been respective comparison. Whereae product says creation individual open source archivers com hit http://www.vensurat.com/def/14-1127 for more information.	other jurisdictions. All

1. Select **Download the trusted root CA certificates** from the vSphere Web Services SDK section.

vm ware [.]						
Getting Started	2	Sav	re As		×	ministrators
To access vSphere remotely, use the	۰ 📦 🗇 🖒	This PC > Downloads	v C S	earch Downloads	Q	ased Datastore Browser
/Sphere Web Client.	Organize 👻 New fo	lder		8==	• 0	ur web browser to find and download files (for
Log in to vSphere Web Client	Favorites	Name	•	Date modified	Туре	e, virtual machine and virtual disk files).
For help, see vSphere Documentation	Desktop	FID_26d05285_158f	8c596b8_5a6f.lic	12/16/2016 3:44 PM	LIC File	vse datastores in the vSphere inventory velopers re Web Services SDK
	r This PC					bout our latest SDKs, Toolkits, and APIs for ng VMware ESX, ESXi, and VMware vCenter.
	👊 Network					nple code, reference documentation, participate forum Discussions, and view our latest Sessions
						ebinars.
		<	III		>	m more about the Web Services SDK
	File name: do		*	vse objects managed by vSphere		
	Save as type: All	Files			*	mioad trusted root CA certificates
	Hide Folders		[Save	ancel	
Copyright © 1998-2016 VMware, Inc. All rights i one or more patents listed at http://www.vm other marks and names mentioned here in may i as its own occorright and another has the own occorright and another has the own occorright and another has been a so	ware.com/go/patents. VI/ware be trademarks of their respectiv	is a registered trademark or trai re companies. VMware products	demark of VMware, In s may contain individu	. in the United States and/	or other jurisdi	ictions. All

2. Save the file, adding ".zip" to the end. Extract the certs from the download.zip file.

Start				Ac	Everywhere ~
Server Manager	Windows PowerShell	Administrative Tools	Store		mmc Embedded Lockdown Man
This PC	Task Manager				
Control Panel	Internet Explorer				mmcap mmc rtv slo mmc lending
Desktop	· · · · · · · · · · · · · · · · · · ·				mmcz zimbra mmca mathscore Activate: Windows Go to System in Control Panel to act Windows:

3. Launch MMC control panel from the **Start→Search** menu by entering **MMC** in the search window clicking the MMC icon.

File Action View Favorites Window Help File Action View Ctrl+N Open Ctrl+S Actions Add/Remove Snap-in Ctrl+N Console Root Options There are no items to show in this view. More Actions I CAProgram File/LStudioSF Exit Exit				Console1 - [Console Root]	_ D X
Open Ctrl +0 Actions Save Ctrl +S There are no items to show in this view. Console Root Add/Remove Snap-in Ctrl +M More Actions More Actions Options 1 CAProgram Files\\StudioSF Files Save Actions		Action View Favorites Win	dow Help		_ 6 ×
Save Scheller Save As Add/Remove Snap-in Options 1 C\Program Files\\StudioSF	8	New	Ctrl+N		
Save As There are no items to show in this view. Console Root More Actions Options 1 C\Program Files\\StudioSF	a	Open	Ctrl+O		Actions
Sove As Add/Remove Snsp-in Options I C\Program Files\\StudioSF			Ctrl+S	There are no items to show in this view.	Console Root
Options 1 CAProgram Files/\StudioSF		Save As			
1 CAProgram Files\StudioSF		Add/Remove Snap-in	Ctrl+M		
		Options			
Exit		1 C:\Program Files\\StudioSF			
		Exit			

4. Select Add/Remove Snap-in from the File menu.

ActiveX Control Authorization Manager M Certificates M Citrix StoreFront C Citrix Studio C	Vendor Microsoft Cor Microsoft Cor Microsoft Cor Citrix System Citrix System	=		Console Root	Edit Extensions
Authorization Manager M Certificates M Citrix StoreFront C Citrix Studio C	Microsoft Cor Microsoft Cor Citrix System	=			Remove
Certificates N Citrix StoreFront C Citrix Studio C	Microsoft Cor Citrix System	≡			Renove
Citrix StoreFront C Citrix Studio C	Citrix System	=			
Citrix Studio C	•				
	Citrix System				Move Up
Component Services N					
	Microsoft Cor		Add >		Move Down
Computer Managem N			400 >		
	Microsoft Cor				
······	Microsoft and				
	Copyright (c)				
Folder N	Microsoft Cor				
	Warner and Charlow				Advanced
Group Policy Object N					
Group Policy Object N Internet Informatio N		~			Havancea
Folder N					0.dva

5. Select **Certificates** from the **Available snap-ins** and then click **Add** button.

Certificates snap-in	x
This snap-in will always manage certificates for: My user account Service account Computer account	
< Back Next > (Cancel

6. Select **Computer Account** radio button and then select **Next** to continue.

Select Computer	X
Select the computer you want this snap-in to manage. This snap-in will always manage: O Local computer: (the computer this console is running on) Another computer: Allow the selected computer to be changed when launching from the comonly applies if you save the console.	Browse mand line. This
< Back Finish	Cancel

7. Accept the default of **Local computer** as the computer you want to manage, and then select **Finish** to continue.

=		Console Root	Edit Extensions
=			Remove
=			
			Move Up
			Move Down
	Add >		
_			Advanced
~			Auvanced
	~	Add >	× Add >

8. Select **OK** to load the snap-in.

	a 🔒	? 📻						
Root		Issued To A		Issued By	Expiration Date	Inten ^	Actions	
	Comp	🔄 Baltimore CyberTrus	t Root	Baltimore CyberTrust Root	5/12/2025	Serve	Certificates	
		🔄 🔄 Class 3 Public Primar	y Certificat	Class 3 Public Primary Certificatio	8/1/2028	Secur		
		🔄 🔄 Commercial Private	Sub CA1	Entrust Managed Services Comm	10/13/2030	<all></all>	More Actions	
				c) 1997 Microsoft Corp.	12/30/1999	Time		
	All Task:	; •	Import	gh Assurance EV Root	11/9/2031	Serve		
	View	•	rices Com	Entrust Managed Services Comm	11/13/2030	<aid =<="" td=""><td></td><td></td></aid>		
	New Wir	ndow from Here	ices SSP CA	Entrust Managed Services Root CA	5/9/2019	<aii></aii>		
			V-CA	ent-TXAAPPNWH132V-CA	3/18/2016	<aii></aii>		
	New Tas	kpad View	ate Auth	Equifax Secure Certificate Authority	8/22/2018	Secur		
	Refresh		cy CA	Federal Common Policy CA	12/1/2030	Serve		
	Export Li	ist	ľ.	GeoTrust Global CA	5/20/2022	Serve		
			dification	Go Daddy Class 2 Certification Au	6/29/2034	Serve		
			al Root	GTE CyberTrust Global Root	8/13/2018	Secur		
				Microsoft Authenticode(tm) Root	12/31/1999	Secur		
				Microsoft Root Authority	12/31/2020	<aid< td=""><td></td><td></td></aid<>		
smarc cara ma. SMS			-	,		<aid< td=""><td></td><td></td></aid<>		
Frusted Devices						<aid< td=""><td></td><td></td></aid<>		
Web Hosting	~	Microsoft Root Certif		Microsoft Root Certificate Authori	3/22/2036	<ΔII \		
	ficates (Local C ersonal rusted Root Cr Certificates termedi rusted P hird-Par rusted P lient Aut P lient Aut ernote Desxcoj iertificate Enroi mart Card Tru: MS	ficates (Local Comp erronal unstad Root Certific Certificate (All Tasks termed) Interprise New Win Interprise New Win Interprise New Win New Win Interprise New Win New Win Interprise New Win Interprise New Win Interprise New Win New Win Interprise New Win New Win New Win Interprise New Win New Win New Win Interprise New Win New Win	Root Supervised To Supervised To Cyber True Fictes: (Iocal Compension Supervised To Cyber True Centificate: (Iocal Compension Supervised To Cyber True Centificate: (Iocal Compension Supervised To Cyber True Centificate: (Iocal Compension Supervised To Cyber True Centificate: (Iocal Compension Supervised To Cyber True Centificate: (Iocal Compension Supervised To Cyber True New Vindow from Here New Taskpad View New Taskpad View New Taskpad View New Taskpad View New Taskpad View Supervised To Cyber True Port List Effects Microsoft Authentic Microsoft Authentic Microsoft Authentic	Root Issued To Firster, ICoal Composition Cyber Trust Root Certificate. Centificate: ICoal Composition Cyber Trust Root Certificate. Centificate: ICoal Composition Cyber Trust Root Certificate. Centificate: ICoal Composition Cyber Trust Root Certificate. Centificate: ICoal Composition Cyber Trust Root Root Root Root Root Root Root Ro	Root Issued To Issued To Issued By Richter, Root Issued To Issued By Baltimore CyberTrust Root errinnal Cesting Static Primary Certificata. Class 3 Public Primary Certificata. Class 3 Public Primary Certificata. Certificater Commercial Private Sub CA1 Entrust Managed Services Comm. Interprise All Tasks Import (b) 1997 Microsoft Comm. New Window from Here Ccs Com Entrust Managed Services Root CA. New Window from Here VCA entrustApPWH132V-CA Niede Part Sec Crumon Policy CA Federal Common Policy CA Biport List frastion Go Daddy Class 2 Certificate Authonity Microsoft Root Authonity Geo Trust Global CA Ticrosoft Root Certificate Authonity Wincrosoft Root Certificate Authonity Microsoft Root Certificate Authonity Geo Trust Global CA Wincrosoft Root Certificate Authonity Microsoft Root Certificate Authonity Microsoft Root Certificate Authonity	Rot Issued To Issued By Expiration Date ficites: (Iocal Compensation CyberTrut Rot Issued By Expiration Date centrate Baltimore CyberTrut Rot Statimore CyberTrut Rot 871/2025 centrate Commercial Private Sub Cal Character Sub Cal 871/2025 centrate Commercial Private Sub Cal Entrust Managed Services Comm 10/13/2030 centrate New Window from Here Inport 10/13/2030 11/13/2030 networked View ices Comm 11/13/2030 11/13/2030 networked ices Comm ices Comm 11/13/2030 12/2/2016 minted P Petresh <td>New Stude To Issued To Issued To Issued By Expiration Date Interint Centration Construct Root Baltimore CyberTrust Root Statimore CyberTrust Root Strive Statimore Strive Strive Strive Statimore Strive Statimore</td> <td>New Issued To Issued By Expiration Date Interior Actions Centrinet Baltimore CyberTruit Root Sitewed By Expiration Date Interior Actions Centrinet Class 3 Public Primary Centricatu. Class 3 Public Primary Centricatu. 0/1/3/203 Call 3 Centrinet Commercial Private Sub Call Entrust Managed Services Comm. 10/13/2030 Call 3 Centrinet Microsoft Corp. 1/30/1999 Time More Actions View Import</td>	New Stude To Issued To Issued To Issued By Expiration Date Interint Centration Construct Root Baltimore CyberTrust Root Statimore CyberTrust Root Strive Statimore Strive Strive Strive Statimore Strive Statimore	New Issued To Issued By Expiration Date Interior Actions Centrinet Baltimore CyberTruit Root Sitewed By Expiration Date Interior Actions Centrinet Class 3 Public Primary Centricatu. Class 3 Public Primary Centricatu. 0/1/3/203 Call 3 Centrinet Commercial Private Sub Call Entrust Managed Services Comm. 10/13/2030 Call 3 Centrinet Microsoft Corp. 1/30/1999 Time More Actions View Import

 Expand Certificates, and then expand Trusted Root Certificates. Right click on Certificates under Trusted Root Certificates and select All Tasks→Import.

	x
💿 🍠 Certificate Import Wizard	
Welcome to the Certificate Import Wizard	
This wizard helps you copy certificates, certificate trust lists, and certificate revocation lists from your disk to a certificate store.	
A certificate, which is issued by a certification authority, is a confirmation of your identity and contains information used to protect data or to establish secure network connections. A certificate store is the system area where certificates are kept.	
Store Location	
O Current User	
Iccal Machine	
To continue, click Next.	
Next Cancel	

10. Select **Next** to continue to import certificates using the **Certificate Import Wizard**.

	x
📀 🔗 Certificate Import Wizard	
File to Import	
Specify the file you want to import.	
	-
File name:	
Browse	
Note: More than one certificate can be stored in a single file in the following formats:	
Personal Information Exchange- PKCS #12 (.PFX,.P12)	
Cryptographic Message Syntax Standard- PKCS #7 Certificates (.P7B)	
Microsoft Serialized Certificate Store (.SST)	
Next Cance	el

11. Click on the **Browse** button to locate the recently downloaded certificates.

a		Open		×
🔄 🕘 🔻 🚺 « Li	ocal Disk (C:) 🔸 certs	~ ¢	Search certs	م
Organize 🝷 New folder			•== •==	- 🔟 🔞
🚖 Favorites	Name	•	Date modified	Туре
💻 Desktop 🚺 Downloads 📃 Recent places	50e59146.0 50e59146.r0		4/17/2015 7:51 PM 4/17/2015 7:51 PM	
🜉 This PC				
📭 Network				
	<	Ш		>
File n	name:	~	All Files (*.*) Open	✓ Cancel

12. Locate the certs folder where you recently extracted it from the download.zip. Select All Files (*.*) file type and then select the **first certificate .0 file**. Click **Open** to choose this certificate file.

×
📀 🍠 Certificate Import Wizard
File to Import
Specify the file you want to import.
File name:
C:\certs\50e59146.0 Browse
Note: More than one certificate can be stored in a single file in the following formats:
Personal Information Exchange- PKCS #12 (.PFX,.P12)
Cryptographic Message Syntax Standard- PKCS #7 Certificates (.P7B)
Microsoft Serialized Certificate Store (.SST)
Next Cancel

13. Select **Next** to continue.

la de la constante de la constante de la constante de la constante de la constante de la constante de la const	x
📀 🖻 Certificate Import Wizard	
Certificate Store	
Certificate stores are system areas where certificates are kept.	
Windows can automatically select a certificate store, or you can specify a location for the certificate.	
\bigcirc Automatically select the certificate store based on the type of certificate	
Place all certificates in the following store	
Certificate store:	
Trusted Root Certification Authorities Browse	
Next Cancel	

14. Select Next to continue with importing the certificate into the Trusted Root Certification Authorities.

	x
📀 🍠 Certificate Import Wizard	
Completing the Certificate Import Wizard	
The certificate will be imported after you click Finish.	
You have specified the following settings:	
Certificate Store Selected by User Trusted Root Certification Authorities Content Certificate	
Content Certificate File Name C:\certs\50e59146.0	
<u>F</u> inish Cance	1

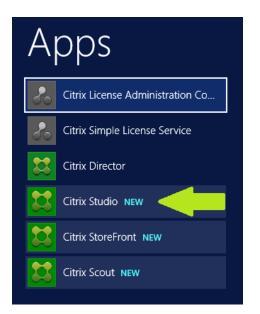
15. Select **Finish** to import the certificate.



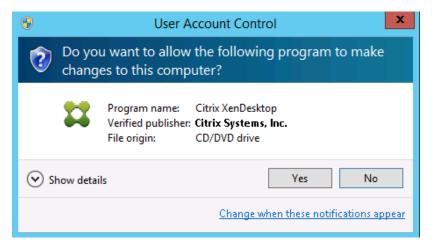
- **16.** Select **OK** to close the notice that the certificate was imported successfully.
- **17.** Repeat the import process for the vSphere Web Services SDK certificate on the second certificate .r0 file extracted from download.zip.
- **18.** Close the MMC window.
- **19.** Select **No**, to not save console settings.

7.4 USING CITRIX STUDIO TO PERFORM SITE SETUP

Use the following procedure to configure Citrix Studio, which will be used to manage the XenDesktop 7.12 deployment.



1. On the Start Menu search for and select Citrix Studio.



2. Select **Yes** to agree to the User Account Control prompt if displayed.

11	Citrix Studio		- 🗆 X
File Action View Help			
Console Root	citrix.	Actions Citrix Studio	
🗱 Citrix StoreFront	Welcome	View	•
		Refresh	
	Welcome to Citrix Studio To begin, select one of the three options below.	👔 Help	
	Site setup		
	Deliver applications and desktops to your users		
	2 Remote PC Access		
	Enable your users to remotely access their physical machines		
	Scale your deployment		
	Connect this Delivery Controller to an existing Site		
		1	

3. Under Site Setup, Select Deliver applications and desktops to your users.

If you have not joined the server to the domain you will not be able to run the Site Setup process. The following message will be displayed. If you have received this error, uninstall XenDesktop, join the server to the domain and reinstall XenDesktop before continuing.
 This machine is currently not joined to an Active Directory domain. To use Studio on this machine, join the machine to a domain.
 If you are logged in as a local user rather than a domain user you will not be able to run the site setup process. The following message will be displayed.
 The current user does not appear to be the member of an Active Directory domain. Studio cannot be run by a local user.

	Site Setup
Studio	Introduction You have two options when creating a new Site. The simplest option is to automatically
Introduction Database Licensing Connection Network Storage App-V Publishing Summary	Back Next Cancel

4. On the Site Setup: Introduction screen. Enter a site name, and select Next to continue.

Studio	Databases		
		information about Site setup, configura u want to set up the databases. Learn mo	
 Introduction Databases Licensing 		rovide details of existing empty d	enerate scripts to manually set up atabases on the database server
Connection	Provide databas	se details	
Network Additional Features Summary	Data type Site:	Database name CitrixSiteLocationNameSite	Location (formats)
	Monitoring:	CitrixSiteLocationNameMonitoring	Localhost\sqlexpress
	Logging:	CitrixSiteLocationNameLogging	Localhost\sqlexpress
	1 For an Alw	vaysOn Availability Group, specify the gro	oup's listener in the location.
	Specify addition 1 selected	nal Delivery Controllers for this Site Learn	Select

5. For a single server deployment accept the default settings. For a multi-server deployment with SQL Server 2008 R2 or newer enter the appropriate Database server location and database name. Select **Test Connection** to verify the database server connection. Click **Next** to continue.

Studio	Licensing		
	License server address: localhost:27000		
✓ Introduction	Connected to trusted serve View certificat		
🖋 Databases	I want to:		
Licensing Connection	 Use the free 30-day trial You can add a license later. 		
Network Additional Features	Use an existing license The product list below is generated by the license server.		
Summary	There are no suitable licenses on your license server. You can allocate licenses using your License Access Code or you can add licenses from your network.		
	Contracte		
	Allocate and download Browse for license file		

6. On the Licensing dialog, accept the default settings which will Use the free 30-day trial. Select Next to continue.

Studio	Connection	
	Select a Connection type hardware), select 'No ma	. If machine management is not used (for example when using physica chine management.'
✓ Introduction	Connection type:	VMware vSphere® +
✓ Databases	Connection address:	https://depvc.pe.lab/sdk
Licensing Connection Storage Management Storage Selection Network Additional Features	User name: Password: Connection name: Create virtual machines	CenectionName Using:
Summary	Studio tools (Mac	Back Next Cancel

- **7.** On the **Connection** dialog, enter the following:
- Connection type: VMware vSphere
- Connection address: The vCenter Web Services SDK url
- ► User name: <u>administrator@vsphere.local</u>
- > Password: the vCenter administrator password.
- Connection Name: ConnectionName

Accept the default for **Studio Tools (Machine Creation Services)**. Select **Next** to continue.

If you receive a certificate error, ensure that you have imported the vSphere Certificate, and vSphere Web Services SDK certificates into the Local Machines Trusted Root Certificate Authorities.

	Studio
•	Cannot connect to the VCenter server due to a certificate error. Make sure that the appropriate certificates are installed on the VCenter server, and install the appropriate certificates on the following machines: localhost Learn more
	Close

Figure 7-1 Citrix vSphere certificate error

Studio	Select a cluster	
 Introduction Databases Licensing Connection Storage Management Storage Selection Network 	Select a cluster Datacenter Select a GMT Select a GMT Select a GMT Select a GMT Datacenter Select a GMT Se	
Additional Features Summary	ок	

8. In the **Storage Management** section, select a cluster on which to run the virtual desktops by clicking **Browse**. Choose the **Production** cluster and click **Next**.

Studio	Storage Selection						
Introduction	When using shared storage, you must select the type of data to store on each shared storage device; machine operating system data, personal user data, and if not storing temporary data locally, temporary data. At least one device must be selected for each data type.						
Introduction Databases	Select data storage lo	cations:					
	Name	+	OS	Personal vDisk	Temporary		
Licensing	FreeNAS						
Connection	JKXIO						
Storage Management	JK-Citrix-XIO		V	2	✓		
Storage Selection							
Network							
Additional Features							
Summary							
Junnary							
				G.			
				45			

9. On the **Storage Selection** window, select a datastore for each of the storage categories. Then click **Next.**

Studio	Network	
 ✓ Introduction ✓ Databases 	Name for these resources: ResourceName The resources name helps identify this storage and network combination	in Studio.
 Licensing Connection Storage Management Storage Selection Network Additional Features Summary 	Select one or more networks for the virtual machines to use: Image: Constraint of the virtual machines to use: <	*

10. On the **Network** dialog box, under **Name for these resources**, enter a resource name for the vSphere networks. Select the Network(s) that you wish the virtual machines to use. Select **Next** to continue.

e your Site. You can also enable/disable and configure
Ilysis of applications and operating systems, review emedial actions to resolve them.
se applications from packages on App-V servers. If you
App-V packages on network share locations, you do not

11. Do not select additional features. Click **Next**.

Studio	Summary		
	Site name:	SiteLocationName	-
✓ Introduction	Site database:	CitrixSiteLocationNameSite	
✓ Databases		Localhost\sqlexpress (no high availability)	
✓ Licensing	Monitoring database:	CitrixSiteLocationNameMonitoring	
✓ Connection		Localhost\sqlexpress (no high availability)	
🖌 Storage Management	Logging database:	CitrixSiteLocationNameLogging	
✓ Storage Selection		Localhost\sqlexpress (no high availability)	=
✓ Network	Delivery Controllers:	XDVM.pe.lab	
✓ Additional Features	License server:	localhost:27000	
Summary	Connection type:	VMware vSphere®	
	Connection address:	https://depvc.pe.lab/sdk	
	Connection name:	ConnectionName	
	Create virtual machines with:	Studio tools (Machine Creation Services)	
	Networks:	VM Network DMZ	
	Virtual machine OS storage:	JK-Citrix-XIO	+

12. Select **Finish** to complete the Site Setup.

#	Citrix Studio	
File Action View Help		
Console Root Console Root Search Machine Catalogs Delivery Groups Configuration Configuration Configuration Configuration Configuration	cirRix Full Deployment Actions RowerShell Site Setup	Actions Citrix Studio (SiteLocationNa View Citrix Studio (SiteLocationNa View Citrix Studio (SiteLocationNa
Hoting Kicensing StoreFront Citrix StoreFront	Follow these steps to set up and deploy your virtual desktop infrastructure. Configuration 1 Configuration Successful Test site configuration	r
	Machine Catalogs 2 Set up machines for desktops and applications or remote PC access Image: Comparison of the catalog	
< III >	Delivery Groups Set up Delivery Groups to assign desktops and applications to vour users Test delivery group	*

13. Select **Test Site Configuration** to verify everything is configured properly.

Site configuration testin	g is complete.	
 238 successful tests 		
A 0 warnings		
0 failed tests		

14. Select Show Report to view any warnings or failed tests. Select Close to exit the Site Configuration Testing dialog once all errors are corrected.

7.5 CONFIGURING CITRIX LICENSES SERVER

Use the following procedure to configure the Citrix XenDesktop 7.12 Enterprise License server.

	Citrix Studio	- 0
le Action View Help		
Console Root	· · ·	Actions
	citrix	Licensing
AppDisks B Delivery Groups	kensing Overview Licensing Administrators	License Administration Cons
Applications	Site Overview	Go Add Licenses
Policies	Required product licenses are not installed. Show details	Change License Server
Configuration Administrators	License use	View
Controllers		G Refresh
Hosting	5 2 4 8 8 10	👔 Help
Zones Citrix StoreFront	Site: SiteLocationName Edition: XenDesktop Platinum (30-day trial) Server: XDVM.pelab License model: User/Device Port: 27000 Required SA date: 2016.1117	
	Licenses	
	Product + Mode: Expiration Date: Subscription Adventa Type: Quentity	

 Open Citrix Studio on the XenDesktop server. Expand Citrix Studio and then expand Configuration on the left-hand pane. Select Licensing to display the Actions menu on the right pane. The currently allocated licensing will be displayed in the center pane.

License Administration	n Console									
Allocate Licenses									Actions	
Adel Licenses Change License Server									Licensing	
Edit Product Edition		icensing Administr	ators				_		2 License Administration Con	
Refresh									Allocate Licenses	
Help	N								Add Licenses	
Policies									Change License Server	
Carlogging	Required	product licens	as are not inst	talled.				Show details 🔻	Edit Product Edition	
Configuration Administrators	License use								View	
Controllers	creatine use						5)		G Refresh	
E Hosting		1		5	- 2		5	10	Help	
Licensing	Site information				- 2					
App-V Publishi	Site mormator									
AppDNA	Site: SiteLo	ocationName		Edition	ii	XenDesktop Pl	latinum (30-d	ay trial)		
Zones		I.pe.lab			e model:	User/Device				
Citra storemont	Ports 2700)		Requir	ed SA date:	2016.1117				
	Licenses									
	Product		Modei	Expiration Date	Subr	cription Advanta	Type	Quantity		

2. Select Add Licenses from the Action pane.

		C	itrix Studio			- 0
	Open		×			
🖻 🕤 🔹 🕇 🎩 📢	This PC 🔹 Downloads 🚽 🖒	Search Downloads	9			
Organize + New fol	lder	iii • 🛅				Actions
	Name	Date modified T	ype			Licensing
Favorites Desktop	A download		ile folder			Allocate Licenses
Downloads	FID_26d05285_158f8c598b8_5a6f.lic		IC File			Add Licenses
📃 Recent places						Change License Server
					Show details 🔻	Edit Product Edition
This PC						View
Network			_			G Refresh
+ Intrisit			1		10	Help
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3. Browse the file system on the XenDesktop server to where you previously saved the .lic file downloaded from your Citrix My Account. Select the file, and then click **Open** button to continue.

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4. Select **Yes** to confirm to add the license file selected.

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	Citrix XenDesktop VDI	User/Device	3/16/2017	2016.1216	 Evaluation 	99			
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	Citrix XenDesktop Enterprise	User/Device	3/16/2017	2016.1216	S Evaluation	99			
	Citrix XenDesktop Platinum	Concurrent	3/16/2017	2016.1216	Evaluation	99			

5. The license will be displayed in the center pane of the **License Overview** panel.

7.6 VERIFY CITRIX STOREFRONT CONFIGURATION

Use the following procedure to verify the Citrix StoreFront configuration.

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💻 Machine Catalogs		View	•
Belivery Groups	View or Change Stores	Refresh	
E Policies	Add delivery controllers, change the update services, and where users can connect to the stores.	- Help	
🔺 🧒 Configuration			
Administrators			
E Hosting	Create a Store		
🚜 Licensing	Create a new store to deliver self-service applications, data, and desktops to your users.		
App-V Publishing			
Citrix StoreFront			
		Activate Windows	
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		THROTS.	

1. Open Citrix Studio on the XenDesktop server. Select Citrix StoreFront from the left pane. Select View or Change Stores to continue to the Store dialog.

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						Configure XenApp	Ser	
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						Export Provisioning	g File	
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2. Select the **Receiver for Web Sites** tab in the middle pane. Make note of the **Website URL** that is displayed on the center pane. This is the **Citrix Web Receiver** url and will be used to log in to XenDesktop from a web browser.

CHAPTER 8. SELECTING GRID VGPU PROFILES

This chapter covers GRID vGPU profiles and considerations in choosing them for your user's needs, including:

- An explanation of the profiles and what they do
- How to match profiles to user needs

8.1 PROFILES EXPLAINED

As mentioned in the NVIDIA GRID Architecture section, the GPU can be viewed as having two sections: the engines, which do the mathematics of rendering, shading, and deep learning, and the frame buffer, which is used to store the input and output results for access by the VM. To maximize GPU performance for each VM, access to the GPU engines is time sliced between VMs. When a VM has graphics processing to do, it has all the engine resources, like graphics compute engine and video encode/decode, available to it. This ensures that critical graphics functions, which must execute as fast as possible to provide a smooth, usable screen experience, have all the resources they need to finish quickly. This type of sharing means that the individual data for each VMs operations must be partitioned from each other.

GPU frame buffer memory is not, therefor, universally available. In the interest of keeping one VM from interfering with another, the frame buffer is allocated specifically to each VM. Each VM needs its own frame buffer area for the GPU to store the results of graphics operations. This frame buffer memory is allocated using vGPU profiles. GRID vGPU profiles assign custom amounts of dedicated graphics frame buffer to each VM. This way, administrators can allocate the right amount of frame buffer for the expected

role that the VM will play (workstation, desktop, or virtual application). Every virtual machine gets the resources needed to handle the expected graphics load.

Profiles also determine other graphics characteristics, such as maximum number of monitors and maximum display resolutions.

8.2 THE ROLE OF THE GRID VGPU MANAGER

GRID vGPU Manager software, running in the hypervisor layer, implements the requested profiles, and performs GPU scheduling. It allows up to 16 users to share each physical Tesla GPU. It assigns the graphics resources of the available GPUs to virtual machines using a balanced approach.

8.3 POWER USER & DESIGNER PROFILES

NVIDIA GRID was designed to provide excellent performance for all parts of the enterprise. Prior to NVIDIA GRID it was impossible to move your most demanding end users into the data center. They were essentially denied mobility, ease of management, data centrality and security, disaster recovery protection, and the rest of the benefits of virtualization. These users were chained to their workstation, which was chained to a desk. vDGA/Pass-through and other solutions were developed that allowed remote workstation access, but with a 1:1 ratio the costs were high and no resource pooling efficiency was gained. Now with GRID multiple workstation users can be placed on a single host, even combined with other less demanding users to increase density.

Start your profile selection by looking to your primary application's requirements. The software vendors work hard certifying that their application will perform well if the right hardware and software is used. Using those requirements, select the appropriate vGPU profile to meet your end user's needs. To understand more about the graphics requirements of your applications, consult your application vendor.

The key to picking a profile for these users is compatibility and performance. Leveraging the NVIDIA platform, built from proven software and hardware, means you can expect the same high quality experience you, and your key design application, expect from certifying with and using NVIDIA Quadro. The vGPU profiles ending in "Q" undergo the same rigorous application certification process as those Quadro-class processors for professional graphics stand-alone workstations. We refer to them as virtual workstation (vWS) profiles. As a result, you can expect 100% compatibility and performance with your applications, and ISVs requiring Quadro can certify against the GRID vGPU profiles as well.

8.4 KNOWLEDGE WORKER PROFILES

No user wants a flat, boring experience from their apps and desktop. Application developers know this and continue to increase the rich visual experience when interacting with their applications. While obvious with 3D applications for design or drawing, even the apps used by the clear majority of end users now leverage graphics to one degree or another. These include the underlying operating system's desktop such as Windows 10. Users expect rich web content such as Adobe Flash or HTML 5, better video playback, or the full interactive experience of Microsoft Office (PowerPoint, Excel, Word) with embedded graphics, charts, animation in presentations, etc.

The Knowledge Worker application workload is filled with subtle graphics we take for granted and miss when not present. Adobe PDF adds shading effects to the text in a document, giving it a rich, high quality appearance. When you scroll in a document, you expect the text to smoothly move up or down so you can easily scan the content. The same goes for web pages. Take these effects away from an end user and their adoption of your solution is impacted.

The letter "B" in the profile indicates a Knowledge Worker; someone who uses a virtual desktop but isn't utilizing high end professional visualization applications. The B profiles (vPC) provide more display heads at lower resolution than their Q profile counterparts. This is designed to provide more screen space for a Knowledge Worker, who doesn't need the high resolution that a Designer does.

8.5 APPLICATION DELIVERY VS FULL DESKTOP

There are times when an entire desktop isn't needed, but only one or more applications. The letter "A" indicates a profile designed to support an application versus an entire virtual workstation (vApp). XenApp and other RDSH application delivery software use this profile. These profiles provide only one display, since the application is being rendered instead of the entire desktop. They leverage the power of the NVIDIA Quadro driver, for a single application. Also, they provide lower resolutions, increasing the responsiveness of the application.

The

8.6 THE FULL LIST OF GRID VGPU PROFILES

The profiles represent a lineup of GRID vGPUs, varying in size of frame buffer and number of heads. The division of frame buffer is what defines the number of users possible per physical GPU with that specific profile, while the number of heads defines the number of displays supported. Max resolution is consistent across all the profiles.

	Frame Virtual		Virtual		Maximum vGPUs	
Card	vGPU Profile	Buffer (MB)	Display Heads	Max Resolution	Per GPU	Per Board
Tesla	M60-8Q	8192	4	4096x2160	1	2
M60	M60-4Q	4096	4	4096x2160	2	4
(PCI-e)	M60-2Q	2048	4	4096x2160	4	8
	M60-1Q	1024	2	4096x2160	8	16
	M60-0Q	512	2	2560x1600	16	32
	M60-1B	1024	4	2560x1600	8	8
	M60-0B	512	2	2560x1600	16	16
	M60-8A	8192	1	1280x1024	1	2
	M60-4A	4096	1	1280x1024	2	4
	M60-2A	2048	1	1280x1024	4	8
	M60-1A	1024	1	1280x1024	8	16
Tesla	M6-8Q	8192	4	4096x2160	1	1
M6	M6-4Q	4096	4	4096x2160	2	2
(MXM)	M6-2Q	2048	4	4096x2160	4	4
	M6-1Q	1024	2	4096x2160	8	8
	M6-0Q	512	2	2560x1600	16	16
	M6-1B	1024	4	2560x1600	8	8
	M6-0B	512	2	2560x1600	16	16

Table 8-1 NVIDIA GRID Graphics Memory Options

	M6-8A	8192	1	1280x1024	1	1
	M6-4A	4096	1	1280x1024	2	2
	M6-2A	2048	1	1280x1024	4	4
	M6-1A	1024	1	1280x1024	8	8
Tesla	M10-8Q	8192	4	4096x2160	1	4
M10	M10-4Q	4096	4	4096x2160	2	8
(PCI-e)	M10-2Q	2048	4	4096x2160	4	16
	M10-1Q	1024	2	4096x2160	8	32
	M10-0Q	512	2	2560x1600	16	64
	M10-1B	1024	4	2560x1600	8	32
	M10-0B	512	2	2560x1600	16	64
	M10-8A	8192	1	1280x1024	1	4
	M10-4A	4096	1	1280x1024	2	8
	M10-2A	2048	1	1280x1024	4	16
	M10-1A	1024	1	1280x1024	8	32

8.7 MATCHING PROFILES TO USER NEEDS

To obtain the best user experience, you need to define your user needs and match them to available NVIDIA GRID vGPU profiles.

If we take three example Revit 2016 user use cases and their computing needs, we can now match the video RAM and display needs to desired GRID vGPU profiles. Your settings may vary, adjust to best meet your user needs.

Configuration	RAM	vCPU	Frame buffer	Displays/resolution	Profile
Entry Level Engineer	4 GB	4 (2.5 GHz)	1 GB	2/1920x1080	M10-1Q or M60-1Q
Mid-Level Engineer	8 GB	4-8 (2.5 GHz)	2 GB	4/4096x2160	M10-2Q or M60-2Q

Table 8-2	User types and appropriate profiles
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Configuration	RAM	vCPU	Frame buffer	Displays/resolution	Profile
Advanced Engineer	16 GB	8 (2.5 GHz)	4 GB	4/4096x2160	M10-4Q or M60-4Q

8.8 THE 8Q AND 8A PROFILES VS VDGA/PASS-THROUGH

With the addition of these profiles, each assigned the full 8GB of Frame Buffer memory available in a GPU, you no longer must pull valuable GPUs out and manage them separately, as you would with vDGA/pass-through. Each of these profiles gives the full power of a GPU, without the drawbacks associated with forcing a VM to remain tethered to a specific GPU. When that VM isn't powered on, other VMs can use the GPU for their work, and when the VM is powered on, it can be assigned to another GPU not in use.

Now you can manage all your user groups, from high density Knowledge Workers needing the rich and responsive experience of 1GB of frame buffer and access to a shared Quadro K2200 equivalent GPU (M10-1B), to the most demanding of workstation end users needing 8GB of frame buffer and access to a full M5000 equivalent GPU (M60-8Q). When needs change, just shut down your virtual desktop and assign a new profile, which is far simpler than having to shut down a physical machine, change the PCI card (which inevitably requires a change in driver software), and reboot.

The 8Q and 8A profiles also support NVIDIA CUDA[®] (<u>https://developer.nvidia.com/cuda-zone</u>) and OpenCL (<u>https://www.khronos.org/opencl/</u>), required for such programs as XGen, part of the Autodesk Maya product, and the newest frontier in computing: <u>Deep Learning</u>. These technologies play a vital role in the future of Artificial Intelligence, and NVIDIA GRID supports them today in the 8Q and 8A profiles.

CHAPTER 9. APPLICATION BASED HOST SIZING EXAMPLE - ESRI

9.1 APPLICATION BASED SIZING

This section contains an example of the testing, the methodology, and the results that we use to determine server sizing for a given application i.e. what resources do we need to run multiple copies of an application on one server.

First, we look at the specifications of a physical workstation build based on the recommendations of the ISV.

9.2 TYPICAL PHYSICAL WORKSTATION

The ISV's website traditionally details a recommended hardware specification, and while a physical workstation is a dedicated solution very different from the shared, flexible solution of VDI, it provides a good starting point to architect your virtual desktops.

9.2.1 Recommended System Requirements

From Esri's ArcGIS product page:

CPU speed	Minimum: Hyperthreaded dual core
	Recommended: Quad core
	Optimal: 2x hyperthreaded hexa core
Platform	x64 with SSE2 extensions
Memory/RAM	Minimum: 4 GB
	Recommended: 8 GB
	Optimal: 16+ GB
Display properties	24-bit color depth
Screen resolution	1024x768 recommended or higher at normal size (96 dpi)
Visualization cache	The temporary visualization cache for ArcGIS Pro can consume up to 32 GB of space, if available, in your user profile location.
Disk space	Minimum: 4 GB
	Recommended: 6 GB or higher
Video/Graphics adapter	Minimum: DirectX 11 feature level 10.1, Shader Model 4.1, OpenGL 3.3, and the EXT_texture_filter_anisotropic and EXT_texture_compression_s3tc extensions.
	Recommended: DirectX 11 feature level 11.0; Shader Model 5.0; OpenGL 4.5; 2 GB RAM; and the EXT texture filter anisotropic,
	EXT_texture_compression_s3tc, EXT_swap_control, and
	ARB_shader_draw_parameters extensions.
	Note:
	DirectX 9 and OpenGL2 are not supported in ArcGIS Pro 1.4.
	Be sure to use the latest available driver.

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

9.3 UX - THE VDI USER EXPERIENCE

To define user experience (UX) requires defining elements of application and user interaction. These can be obvious, like the rendering time for an image to appear, or to smoothly pan across that image, or they may be subtler, like the ability to smoothly scroll down a page, or the "snappy" reaction for a menu to appear after a right click. While elements such as these can be measured, the user's perception of them is subjective, the measured values harder to interpret.

Users don't interact with the applications the way that benchmarking software does. They add variables like "think time", the time they spend looking at their display before interacting again with the application. This time offers an advantage to the underlying resources, such as CPU, as it allows tasks to finish, processes to complete, and is even more beneficial in a shared resource environment such as VDI where one user "thinking" frees up resources for another user who chose that moment to interact with their application. Now factor in other "time" away from the application (meetings, lunch, etc.) and one could expect to get more such benefit to shared resources. The benefit equates to more resources for the user's session, typically a more responsive application, and thus a better-perceived experience by the end user.

9.3.1 Esri Benchmark Metrics

Esri provides an API that when loaded allows the gathering of user experience (UX) metrics during benchmarking. Esri, as the ISV, knows their product best and defines great user experience as the combination of the following metrics:

- Draw Time Sum: Consists of the sum of time taken for all of the benchmarks to fully draw, this was defined by Esri to be acceptable up to 45 seconds, less time would be a better UX, but more would be a worsening UX.
- Frames Per Second (FPS): Esri stated that 30FPS is what most users perceive as a good UX, 60 is optimal but most users do not see a significant difference.
- ► FPS Minimum: Esri stated that a drop below 5-10FPS would appear to an end user that the drawing had stopped or "frozen".
- Standard Deviation: This would represent the number of tests that were outside the average of the others, typically representing a faulty test. Values should be <2 for 2D and <4 for 3D workloads.</p>

After initial testing it was clear that Draw Time Sum would be inside its acceptability threshold if the other three metrics were also inside their respective thresholds. This

gave us a single value to track. Once that single value was validated, we could then validate that the rest of the results were within acceptable ranges as well.

9.3.2 Real Life Experience vs Benchmarking

Our goal is to find the most accurate possible proxy for testing, but this is still not the same as real users doing real work on real data. The NVIDIA GRID Performance Engineering Labs is committed to working with customers to find more and better models, and field confirmation of findings.

9.3.3 The Importance of Eyes On

It's important to view the tests to be sure the experience is in fact something a user would enjoy. We discovered that the initial tests did not contain panning, or "Navigation", something that users do on a common basis. In adding this functionality to the "Heavy 3D + Increased Think Time" tests resulted in a drop from the maximum 16 users down to 12.

9.4 TESTING METHODOLOGY

To ensure you will be able to reproduce our results, we have deliberately chosen a peak workload and run simultaneous tests. Meaning all tested virtual desktops are doing the same activities at the same time, a "Peak Workload" that should be unrealistic of real user interaction but shows the number of users per host when extreme demand is put on the shared resources. This gives us one end of the spectrum.

In the case of ArcGIS, we focused on rendering pipeline (DirectX 11 based) to determine the impact of GPU on performance on scalability. OpenGL testing will be covered in future guides.

These tests did not focus on analytics, as this is more impactful on networking (assuming remote data) and CPU. We intend to test analytics operations in the future. Given ArcGIS Pro is synchronous you can render while running analytics in the background. The impact of this will need to be tested. The following information details the test methodology used with the Esri testing API:

- Sample workload: Esri provided their "Philly 3D" workload for us to test with. This
 test is described by Esri as representative of a "heavy 3D" map.
- Scripting: Esri provided scripting designed to run the application through several benchmarks. In later passes we added panning ("Navigation") to the script to better imitate end user behavior when viewing a map.
- Think Time: The Esri script allowed for "think time" adjustment, we started with the default of 2 seconds, then adjusted to 5 seconds, then tried 10, this to imitate time a user might think before selecting another bookmark in the test.
- Scalability: Scripting also allowed for test runs of as many virtual desktops as required. We ran 1, then 8, then 16, to get a baseline of results and accompanying logs (CPU, GPU, RAM, networking, storage IOPS, etc.).

9.5 RESULTS OVERVIEW

► vCPU:

Esri stated that ArcGIS is CPU bound, meaning it relies heavily on the CPU to perform and that this shared resource will be most likely to bottleneck first. Based on the preceding physical spec we chose 4 vCPUs/virtual workstation to start, then tested with 6 and 8 vCPUs respectively.

Result: Our testing found 4 vCPUs performed the best based on the benchmarks Esri provided.

► vRAM:

Esri stated they are not RAM intensive, based on recommended specifications we started with 6GB/virtual desktop. During testing we also tested with 4GB of RAM, but this caused CPU spikes, we determined this was caused by the application requiring 5+GB of RAM to load the "Philly 3D" dataset. Tests with 8GB of RAM per virtual desktop did not produce improved performance. You should base the amount of RAM on the needs of your actual workloads.

Result: For this workload *≥*6GB of RAM is required.

► GPU

Esri states that a GPU is required for 3D workloads. A test with the full GPU and 4GB of frame buffer, offered high performance but lacked scalability. We then tested with 2GB of frame buffer, up to its maximum of 8 users it was still within the metrics provided by Esri. This meant there was room for more users if we lowered frame buffer to 1GB. We also tried 512MB of frame buffer, but this was too little VRAM and caused CPU swapping impacting performance and scalability, and proved GPU is necessary.

Result: For ArcGIS Pro performance AND scalability, 1GB profile was best.

Storage

We used iSCSI attached SAN over 10G non-trunked networking. Our tests never exceed ~25,000 IOPS.

Result: Clearly local spindle bound storage would have been a bottleneck and impacted performance, the fast cache SAN handled the IOPS load.

Networking

We used 10G and 1GB distribution networking At no time was networking a bottleneck and results were unremarkable.

9.6 CONCLUSION

After thorough testing, we have concluded that a profile providing 1GB of frame buffer was sufficient to provide a robust, immersive and productive experience and remains within the thresholds set by Esri. **Therefor, GRID vGPU profiles M10-1Q, M60-1Q, or M6-1Q, should be sufficient to allocate to Esri ArcGIS virtual workstations.**

CHAPTER 10. CREATING YOUR FIRST GRID VIRTUAL WORKSTATION

This chapter describes how to:

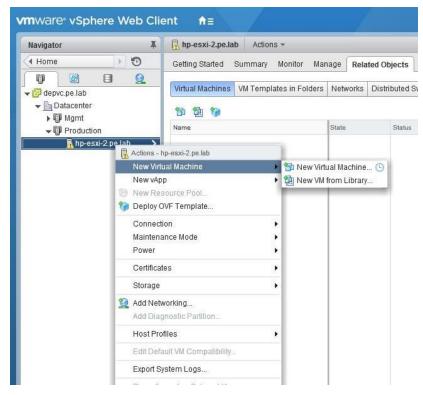
- Create and configure a virtual machine in vSphere
- ▶ Install Windows 10 and VMware Tools in the VM
- Adding the Gold Master image to the domain
- ▶ Install Citrix Virtual Desktop Agent on the VM
- Enable the vGPU in the VM
- Installing the NVIDIA Driver
- Licensing the vGPU in the VM
- Removing the vGPU in preparation for creating XenDesktop machine catalogs

10.1 CREATING A VIRTUAL MACHINE

These instructions detail making a VM from scratch that will support NVIDIA GRID. Later, the VM will be used as a "golden" master image for subsequent VMs. Use the following procedure to create the VM.

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1. Browse to the host or cluster using the vSphere Web Client.



2. Right-click the desired host or cluster and select New Virtual Machine.

1 Select creation type 1a Select a creation type	Select a creation type How would you like to create a virtual machine?	
2 Edit settings 2a Select a name and folder 2b Select a compute resource 2c Select storage 2d Select compatibility 2e Select a guest OS 2f Customize hardware 3 Scheduling options 4 Ready to complete	Create a new virtual machine Deploy from template Clone an existing virtual machine Clone virtual machine to template Clone template to template Convert lemplate 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.

3. Select Create a new virtual machine and click Next.

勃	New Virtual Machine (scheduled)		? H
~	1 Select creation type 1a Select a creation type 2 Edit settings	Select a name and folder Specify a unique name and target location Enter a name for the virtual machine.	
	2 Earl Settings 2a Select a name and folder	Workstation	_
	2b Select a compute resource 2c Select storage	Virtual machine names can contain up to 80 characters and they must be unique within each vCenter Server VM folder. Select a location for the virtual machine.	
	2d Select compatibility 2e Select a guest OS 2f Customize hardware 3 Scheduling options 4 Ready to complete	Q Search Image: Search Image: Search Image: Search Im	al
		Back Next Finish C	Cancel

4. Enter a name for the virtual machine. Choose the location to host the virtual machine using the **Select a location for the virtual machine** section. Click **Next** to continue.

1 Select creation type 1a Select a creation type	Select a compute resource Select the destination compute resource for this ope	ration	
2 Edit settings 2 a Select a name and folder 2 b Select a compute resource 2 c Select alonge 2 d Select compatibility 2 c Select guest OS 2 clustomize hardware 3 Ready to complete	Q. Search ▼ B Datacenter ▶ M ymt ▼ Production ℝ hp-esst-2 pe lab	Select a cluster, host, vApp or resource pool to run this virtual machine.	
	Compatibility: Compatibility checks succeeded.	Back Next Finish Cc	

5. Select a compute resource to run the VM. Click **Next** to continue.

This compute resource should include an NVIDIA Tesla GPU installed and configured correctly.

	Select creation type 1a Select a creation type	Select storage Select the datastore in which to store the configuration and disk files									
	2 Edit settings	VM Storage Policy:	Datastore De	fault	•	0					
,	2a Select a name and folder 2b Select a compute resource			ssible from the dest and all of the virtual		urce that	you selected. Select	the destination d	atastore for the		
1	2c Select storage	Name		Capacity	Provisione	d	Free	Туре	Storage DRS		
	2d Select compatibility	JKXIO		1,023.75 GB	292.54 0	GB	955.76 GB	VMFS 5			
	2 e Select a guest OS	datastore1 (7))	439.50 GB	17.01 G	в	430.67 GB	VMFS 5			
	2f Customize hardware	FreeNAS		190.84 GB	94.22 GI	в	177.45 GB	NFS v3			
3 Re	3 Ready to complete										
		4									
		Compatibility:				-					
		Compatibility	checks succee	ded.							

6. Select the datastore to host the virtual machine. Click Next to continue.

1 New Virtual Machine							(?) H
 Select creation type 1 a Select a creation type 	Select compatibil Select compatibili	lity ity for this virtual machine (depending on the host	ts in your environment			
2 Edit settings 2a Select a name and folder	The host or cluste	er supports more than one	e VMware virtual machi	ine version. Select a compa	tibility for 1	he virtual machii	10.
 2b Select a compute resource 	Compatible with:	ESXi 6.0 and later			•	0	
 2c Select storage 	This virtual machi	ine uses hardware version	11 and provides the l	best performance and lates	t features		
2d Select compatibility	available in ESXi						
2e Select a guest OS							
2f Customize hardware							
3 Ready to complete							
				Back	Next		Cancel

7. Select ESXi 6.0 and later. Click Next to continue.

		that will be installed on the virtual machine	Select a guest OS Choose the guest O	1 Select creation type 1a Select a creation type	
n	iate defaults for the operating syste	perating system here allows the wizard to provide the a	Identifying the gues installation.	2 Edit settings 2a Select a name and folder 2b Select a compute resource	2
	•	lindows	Guest OS Family:	2c Select storage	
	•	licrosoft Windows 10 (64-bit)	Guest OS Version:	2d Select compatibility	
				2e Select a guest OS	2
				2f Customize hardware	2
				3 Ready to complete	3 F
	Compatibility: ESXi 6.0 and later (VM				
	Compatibility: ESXi 6.0 and later (VN				

8. Select the appropriate Windows OS from the Guest OS Family and Guest OS Version pull-down menus. Click Next to continue.

 Select creation type 1 a Select a creation type 	Customize hardware Configure the virtual machin	e hardware					
2 Edit settings	Virtual Hardware VM Op	tions SDRS Rules					
 2a Select a name and folder 2b Select a compute resource 	▶ □ *CPU	2	-	0			
2c Select storage	> Memory	4096	-	MB	-	1	
 2d Select compatibility 	🕨 🥅 New Hard disk	32	* *	GB		j	
2e Select a guest OS	► 🛃 New SCSI controller	LSI Logic SAS				8	
2f Customize hardware	► 🐖 New Network	VM Network			-	Connect	
3 Ready to complete	> New CD/DVD Drive	Client Device			-	Connect	
	🕨 📻 New Floppy drive	Client Device			-	Connect	
	Video card	Specify custom sett	ings		-	1	
	▶ 🎲 VMCI device					<u>E</u>	
	> 🛞 New SATA Controller						
	 Other Devices 						
	New device:	Select			-	Add	
						Compatibility: ESXi 6.0 and later (VM version	11

9. Select 2 vCPU and 4096 MB memory. Click Next to continue.

1 Select creation type	Provisioning type:	Create a new virtual machine	
 1a Select a creation type 	Virtual machine name:	Workstation	
2 Edit settings	Folder:	Production VMs	
2a Select a name and folder	Host	hp-esxi-2.pe.lab	
2b Select a compute resource	Datastore:	JKXIO	
 2c Select storage 	Guest OS name:	Microsoft Windows 10 (64-bit)	
 2d Select compatibility 	CPUs:	2	
2e Select a guest OS	Memory:	4 GB	
2f Customize hardware	NICs:	1	
3 Ready to complete	NIC 1 network:	VM Network	
	NIC 1 type:	E1000E	
	SCSI controller 1:	LSI Logic SAS	
	Create hard disk 1:	New virtual disk	
	Capacity:	32.00 GB	
	Datastore:	JKXIO	
	Virtual device node	SCSI(0:0)	
	Mode:	Dependent	
			Compatibility: ESXi 6.0 and later (VM version 11

10. Review the **New Virtual Machine** configuration prior to completion. Click **Finish** when ready.

The new virtual machine has now been created.

10.2 INSTALLING WINDOWS 10

Use the following procedure to install Windows on the virtual machine.

There are vCenter Server systems w	ith expired or explring license	es in vitur inve	ntory Manage your lice	enses Details					
		io in you init	analy. Manage Joan ne		10				
mware [,] vSphere Web (©lient nt≣				U I Adm	inistrator@VSPHERE LO	CAL • 1 Help •	Q Search	
-	I 🚯 Workstation A	tions +					<i>W</i> *	🖸 Alarms	¥
(Home) 🕥	Getting Started Sur	nmary Mor	itor Manage Relati	ed Objects				All (0) New (0)	Acknowl
0 0 0	Settings Alarm Defi	Ween Ween	Deserve Deserve	es Scheduled Tasks					
• 🕗 depvc.pe.lab	Seconda Marm Cen	ninons i ag	Permissions Poed	es scheduled rasks					
Datacenter Mgmt	44	44 VM Hardware Edt.							
+ 🖓 Production	VM Hardware		+ CPU	2 CPU(s), 0 MHz used					
hp-essi-2 pe lab	VM Options		Memory	4096 MB. 0 MB mem	orv active				
Wronstation	VM SDRS Rules		+ Hard disk 1	32.00 GB					
	vApp Options		Network adapter 1	VM Network (disconne	cted)				
	Geest User Mapp	ings	(CD/DVD drive 1	Power on VM to connect					
			Floppy drive 1	Power on VM to connect					
			+ Video card	8.00 MB					
			+ Other	Additional Hardware					
			Compatibility	ESXi 6.0 and later (VM v	ersion 11)			Work in Progress	
								12 New Virtual Machin	b (
								Win2012-R2 Temp	
								Win2012-R2 Temp	
								Win2012-R2 Temp	
								New Datastore	(2)
👚 Recent Tasks									¥
Task Name	Tarpet	Status		Initiation	Quesed For	Start Time	Completion Time	Server	
Create virtual machine	Production VMs	✓ Com		VSPHERE LOCALIL.	4 11		10/28/2016 4.4	and the anti-	
Delete virtual machine	Workstation	✓ Com		VSPHERE LOCALIL_	4 m		10/28/2016 4:3		
Move entities	Management VMs	✓ Com		VSPHERE LOCALIL	6 m				
Move enblies	Management VMs	V Com		VSPHERE LOCALIL	9 0				
Move entities	Discovered virtual	✓ Com	bueae a	VSPHERE LOCALIL.	7 п	ns 10/28/2016 4:37:01	10/28/2016 4:3	7:01 depvc.pe.lab	

1. Select the virtual machine, click on the Manage tab and select Settings. Click on the Edit button.

Virtual Hardware VM C	ptions	SDRS Rules	VA	pp Optio	ns		
F 🔲 CPU	2		-	0			
Memory	4096		-	MB	-)	
🕨 🛄 Hard disk 1	32		*	GB	-)	
SCSI controller 0	LSI Log	jic SAS					
Network adapter 1	VM Ne	twork			-	Connect	
GD/DVD drive 1	Client	Device			-) 🔲 Connect	
Floppy drive 1	Client	Device				Connect	
Video card		ore ISO File	19				
🖌 🍥 SATA controller 0							
VMCI device							
Other Devices							

2. Locate the **CD/DVD drive 1** entry under the **Virtual Hardware** tab. Select the arrow drop down to reveal data sources for the CD/DVD media. (In this example a datastore ISO file will be used.) Check the **Connect** checkbox for **CD/DVD drive 1**.

Virtual Hardware VM Opt	ons SDRS Rules vApp Options	
F 🔲 CPU	2 🔹	
Memory	4096 V MB V	
🕨 🛄 Hard disk 1	32 * 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	[FreeNAS] ISOs/en_windo Browse	
Device Mode	Passthrough CD-ROM	
Virtual Device Node	○ IDE(0:0) ▼	
	SATA(0:0) CD/DVD drive 1	
Floppy drive 1	Client Device	
Video card	Specify custom settings	
🖌 🍥 SATA controller 0		
VMCI device		
 Other Devices 		
New device:	Select Add	

3. Toggle the carrot next to the **CD/DVD drive 1** icon to reveal the details of the virtual device. For Status check the **Connect At Power On** checkbox. This will connect the ISO file to the VM's virtual CD/DVD drive during boot up.

Datastores	Contents	Information	l
 datastore 1 (7) FreeNAS cb0ccdbe-16ec-4349-8ber ISOS Jorm.sf Win2012-R2 Template ConnectionServer vib JKXIO vmimages 	en_windows_10_enterpri	Name: Size: Modified:	en_windows_10 3.33 GB 10/28/2016 4:50
File Type: ISO Image (*.iso)	-		

4. Click on the **Browse** button for the CD/DVD Media. Navigate to and select the OS ISO file to be used. Click **OK** to select the ISO.

Navigator 🔠	Actions - Workstation	tions -					≡*	过 Ala	rms	草:
Home	Power Guest OS	Powe	er Off	Related Objects				All (0)	New (0)	Acknowledge
depvc.pe.li		Il Susp G Rese	et	Microsoft Windows 10 ESXi 6.0 and later (VM)		CPU USAGE 0.00 HZ MEMORY USAGE	Ē			
▶ 🛅 Disc 🛱	Migrate Clone Template		Down Guest OS art Guest OS DNS Name:	11) Not running, not installe		0.00 B STORAGE USAGE 32.00 GB	**	Wor	k in Progre	-ss J
	Fault Tolerance	•	IP Addresses: Host:	10.19.0.4			11			
	VM Policies	>onsole	-	10.10.0.4						
	Compatibility	•			Adva	nced Configuration				
	Export System Logs		2 CPU(s), 0 MHz			need comgaration				
	Edit Resource Settings Edit Settings		·	IB memory active	 Note: 	\$				
	Move To Rename	1	32.00 GB							
	Edit Notes Taos & Custom Attributes		00:50:56:a0:ea:1	-						
- 1	Add Permission	-	VM Network (di	•	 vApp 	Details				
	Alarms Remove from Inventory	•	Power on VM to	~			٠			
👔 Recent Tas	Delete from Disk						_			Į,

5. Right-click the virtual machine, and then select **Power >Power On** to start the virtual machine and boot from the .ISO to install the operating system.

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

	🚯 Workstation Actions 👻		=*	🔯 Alarms 🛛 🐺 🗙
∢ Home 🗼 🧐	Getting Started Summary	Monitor Manage Related Objects		All (0) New (0) Acknowledge
Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image: Control of the system Image:	Powered On Launch Remote Console Download Remote Console	Workston Gest 05: Microsoft Widows 10 (64-b) Compatibility: © 0.0 Microsoft Widows 10 (64-b) 0.0	SAGE II ISAGE II Fools	¥ Work In Progress ¥

6. Click on Launch Remote Console.

📌 Workstation -	/Mware Remote Console	_ 0 X
⊻MRC ▼ ▼ ♣		*
To return to your computer, press Ctrl+Alt.		^
To retain to your computer, press car+Ait.		
1 Windows Setup		
	Vindows	
	vindows	
Language to install: English (Jnited States)	
Time and currency format	Inited States)	Ξ
<u>K</u> eyboard or input method: <mark>US</mark>	<u> </u>	
Enter your language and other	preferences and click "Next" to continue.	
	Next	
Ø 2016 Microsoft Corporation. All rights reserved.	13ex	
		×

7. At the Windows Setup screen, enter Alt+n

*	Workstation - VMware Remote Console	_ 🗆 X
VMRC 🕶 📔 💌 🛱 🖽		*
		<u>^</u>
	📫 Windows Setup	
	Windows [.]	
	Install now	=
	Repair your computer	
	© 2016 Microsoft Corporation. All rights reserved.	
		× .

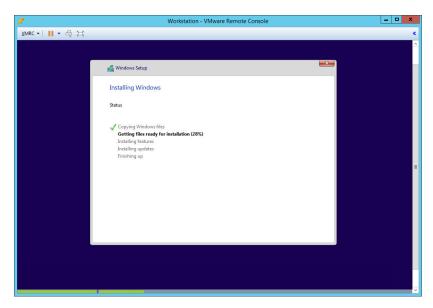
8. Enter **Atl+i** to install now.

*	Workstation - VMware Remote Console	_ D X
VMRC 🕶 📔 👻 🖧 🖽		«
		<u>^</u>
		×
G	a Windows Setup	
	Which type of installation do you want?	
	Upgrade: Install Windows and keep files, settings, and applications The files, settings, and applications are moved to Windows with this option. This option is only available when a supported version of Windows is already running on the computer.	
	Custom: Install Windows only (advanced) The files, settings, and applications aren't moved to Windows with this option. If you want to make changes to partitions and drives, start the computer using the installation disc. We recommend backing up your files before you continue.	=
	Help me decide	
		~

9. Use the arrow keys to select Custom: Install Windows only (advanced). Press Enter.

1		Workstation	n - VMware Remote C	onsole			X
VMRC 🕶 📔 👻 🖨 🖽							
	🔏 Windows Setup					X	
	windows setup						
	Where do you w	ant to install Wi	ndows?				
	Name		Total size	Free space	-	_	
		ocated Space	32.0 GB	Free space 32.0 GB	Туре		
	* Refresh		Format	<mark>₩ Ne</mark> w		-	
	Load driver	Extend	- Tourier				
					N	ext	

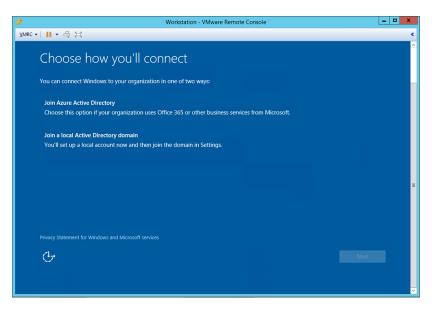
10. Select Drive 0 and press **Alt+n** to continue.



11. During installation, Windows reboots the VM several times.

	Workstation - VMware Re	mote Console	
·· • 🖶 🖂			
Get goin	g fast		
Change these at a	y time (scroll to see more). Select Use Express settings	s to:	
	eech, typing, and inking input by sending your input dat no to improve the suggestion and recognition platform		
	ps request your location, including location history, tur ID to personalize your experiences. Send Microsoft loc		
	om malicious web content and use page prediction to ir 9 your overall experience better in Windows browsers. Y		
Automatically conr	ect to suggested open hotspots. Not all networks are se	ecure.	
Get updates from a Microsoft.	nd send updates to PCs on the Internet. Send full diagn	ostic and usage data to	
Connect with friend	s. Let Skype use your contacts and verify your phone nu	umber. SMS charges may	
Ċ		<u>C</u> ustomize Use Expres	

12. At the **Get Going Fast** window, press **Alt+e** to use express settings.



13. At the **Choose how you'll connect** window, use the **TAB** and **DOWN ARROW** keys to maneuver to **Join a local Active Directory domain**. Press **ENTER**. Tab to the **Next** button and press **Enter**.

Я	Workstation - VMware Remote Console		_ D X
⊻MRC ▼ ▼ 🖶 🖽			«
Create an account fo	r this PC		<u>^</u>
If you want to use a password, choose someth others to guess.	hing that will be easy for you to remember but hard fo	or	
Who's going to use this PC?			
User name			
Make it secure.			
Enter password			
Re-enter password			
Password hint			=
(⁴ 7		Back	Next
			HCXC -

14. At the **Create an account for this PC** window, use the **TAB** key to enter a user name, password, re-enter password, and password hint. Tab over to **Next** and press **Enter**.



15. At the Meet Cortana window, press Enter to use Cortana.

			Wo	rkstation	n - VMware Remote Console
<u>v</u> M	IRC • 📕 • 🖶 🖽				<
ψ	Power				
	Removable Devices	• 🗸		•	Disconnect [local-csco-esxi-5] en_windows_10_enterprise_version_1607_updated_jul_2016_x86_dvd_9060097.iso on Serv
묵	Send Ctrl+Alt+Del		Floppy drive 1	•	Settings
2	Manage		Network adapter 1		
B		It+Enter			
	Preferences Help				
	Exit				
	Long .				
					•
					P2
					R2
					R2
					R2
	O Adk me anything			2	

16. Disconnect the .ISO from the VM when Windows is done installing.

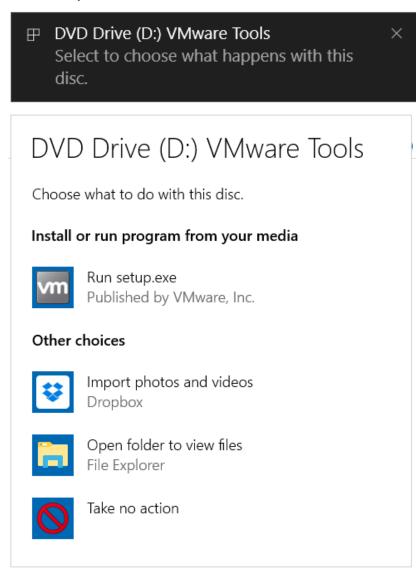
Windows 10 is now installed in the virtual machine.

10.3 INSTALLING VMWARE TOOLS ON THE VIRTUAL MACHINE

After Windows completes the initial installation and configuration process, the next step is to install VMware Tools on the virtual machine.

▲ VMware Tools is not installed on this virtual machine.					Install VMware Tools
▼ VM Hardwar	e		▼ VM Storage Policies		
▶ CPU	2 CPU(s), 0 MHz used		VM Storage Policies	-	

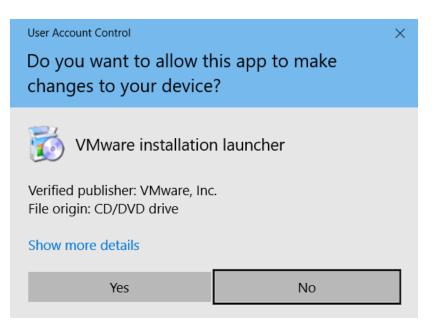
17. Select the **Summary** tab from the virtual machine console. Click the **Install VMware Tools** link in the yellow bar.



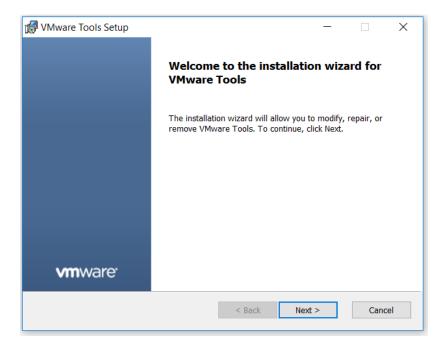
18. Back in the virtual machine console, Windows 10 detects the CD image and notifies the user. Click on the notification window. In the popup window, click Run setup.exe.

✓ Devices and drives (2)	
Local Disk (C:)	
36.4 GB free of 59.5 GB	
DVD Drive (D:) VMware Tools 0 bytes free of 104 MB CDFS	
V Network locations (1)	

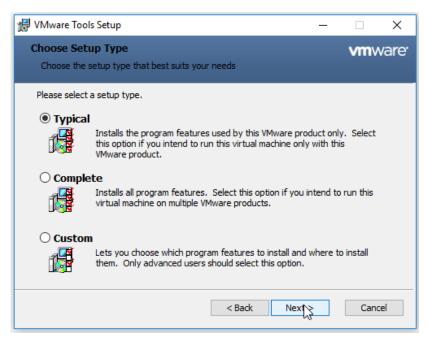
19. If the window does not display (or you miss it) then open Explorer, locate the CDROM, and double-click it.



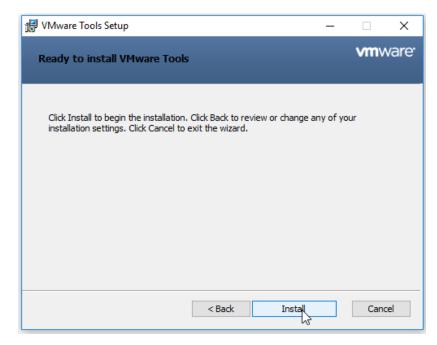
20. The User Account Control popup may display. If so, click Yes.



21. The installer begins, click **Next**.



22. When prompted, select Typical installation, click Next, and accept all defaults.



23. When prompted, select **Install** to begin installation.

🚽 VMware Tools Setup	– 🗆 X
	Completed the VMware Tools Setup Wizard
	Click the Finish button to exit the Setup Wizard.
vm ware [,]	
	< Back Finish Cancel

24. Click **Finish** in the VMware Tools installer and reboot the virtual machine when prompted.

CAUTION: This reboot is critical to ensure the tools and drivers are loaded.

VMware Tools are now installed in the virtual machine

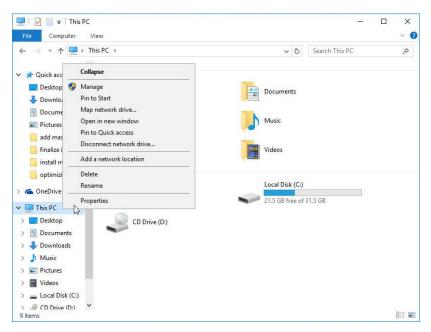
10.4 ADDING THE GOLDEN MASTER TO THE DOMAIN

By joining the VM to the Windows Active Directory domain you are then able to 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

Use the following procedure to add the VM to the domain.



1. In the VM, click **Start**, then right click on **Computer** to bring up its menu, then click **Properties**.

🚄 System				- 0	×
← → · · ↑ 🖳 > Control F	Panel > System and Security > Sy	stem 🗸	ථ Search	Control Panel	Q
Control Panel Home	View basic information	about your computer			
Device Manager	Windows edition				
Remote settings	Windows 10 Enterprise 201	6 LTSB	1000		-
System protection	© 2016 Microsoft Corporat	tion. All	Min	dows	10
Advanced system settings	rights reserved.			0000	10
	System				
	Processor:	Intel(R) Xeon(R) CPU E5-165	50 v3 @ 3.50GH	z 3.50 GHz (2 proce	ssors)
	Installed memory (RAM):	4.00 GB			
	System type:	64-bit Operating System, x6	4-based proce	ssor	
	Pen and Touch:	No Pen or Touch Input is av	v <mark>aila</mark> ble for this	Display	
	Computer name, domain, and	workgroup settings			
	Computer name:	workstation		Change s	ettings
	Full computer name:	workstation			
	Computer description:				
	Workgroup:	WORKGROUP			
	Windows activation				
	Windows is activated Rea	d the Microsoft Software Lice	nse Terms		
See also	Product ID: 00378-20000-0	0003-AA442		Change prod	uct key
Security and Maintenance					

2. On the Properties window, click Change settings.

Computer Name	Hardware	Advanced	System Prote	ction	Remote
	ows uses the e network.	e following inf	ormation to ide	ntify yo	ur computer
Computer descri	ption:	1 			
		or example: " omputer".	Kitchen Compu	ter" or	"Mary's
Full computer na	ime: w	orkstation			
Workgroup:	W		•		
To use a wizard Network ID.			group, onerc	Net	work ID
	Jan - 98			Net	WORK ID
To rename this of workgroup, click		change its do	omain or	C	hange

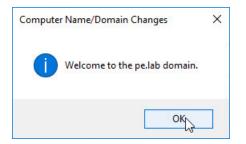
3. This brings up the System Properties window, on the Computer Name tab click Change.

ou can change the name and the membership of this imputer. Changes might affect access to network resources.	computer
omputer name:	ary's
orkstation	
Member of Domain:	rk ID
pe.lab T	igo
O Workgroup:	
WORKGROUP	
OK Cancel]
OK Cancel	Appl

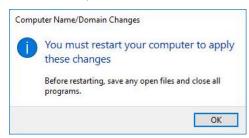
4. On the **Computer Name/Domain Changes** window, enter an appropriate computer name, then domain name, and click **OK**. Our chosen naming is shown below, use what is appropriate for your POC.

Windows S	Security		×			
Comp	Computer Name/Domain Changes					
	e name and password o he domain.	of an account with perm	nission			
8	User name					
	Password					
	Domain: pe.lab					
	ОК	Cancel				
	N					

5. A security window pops up, fill in your specific domain administrator credentials and click **OK**.



6. On successful authentication, you will see the following welcome pop-up showing your VM is now in the domain (the domain name should reflect your domain information). Click **OK**.



7. The VM needs to reboot to complete the process, click **OK** again and the VM reboots immediately.

10.5 INSTALLING CITRIX VIRTUAL DELIVERY AGENT

For the virtual machines to be managed by the XenDesktop delivery controller, a small piece of code called Virtual Delivery Agent needs to run on each desktop machine. Use the following procedure to install Citrix Virtual Desktop Agent on the master image.

	Virtual Ma	achine Settings	x
Hardware Options			
Device Memory Processors Hard disk 1 CD/0VD drive 1 Propy drive 1 Network adapt Video card	1 monitor	Device status Connected Connect at power on Connection Location: Local Client Use physical drive: D: C: S: Software WenDesktop 7.12 Ven Browse Advanced	
	🚱 Add Remove		
		OK Cancel Help	

1. Mount the .iso image using Virtual Clone Drive or similar. Alternately you can use vCenter Client to mount the .iso from an ISO datastore to the virtual machine CD drives.

	> This PC	>	~	Ü	Search This PC	م
🖈 Quick access	∨ F	olders (6)				
🔜 Desktop Documents	*	Desktop	Document	ts		
➡ Downloads ■ Pictures	*	Downloads	Music			
This PC Network		Pictures	Videos			
	~	Devices and drives (3)				
		Floppy Disk Drive (A:)	Local Disk	1	31.5 GB	
		CD Drive (D) XA and XD 0 bytes free Wi 2.19 GB UDF				

2. Launch the CD with AutoPlay or select the **AutoSelect.exe** application to start the Citrix XenApp and XenDesktop installer.

Deliver applications and desktops to any user, anywhere, on any device. • Hybrid cloud, cloud and enterprise provisioning • Centralized and flexible management	
Manage your delivery according to your needs: XenApp Deliver applications	
XenDesktop Deliving applications and desktops	
CİTRİX	

3. Select **Start** button next to XenDesktop Deliver applications and desktops.

Get Started	Prepare Machines and Images	Extend Deployment
	Virtual Delivery Agent for Windows Server OS	
		Citrix Studio
	Virtual Delivery Agent for Windows Desktop OS Install this agent to geliver applications and desktops from Windóws desktop OS-based VMs or physical machines.	
		Federated Authentication Service

4. Select Virtual Delivery Agent for Windows Desktop OS under Prepare Machines and Images on the XenDesktop 7.12 window.

0	User Account Control
	ou want to allow the following program to make ges to this computer?
8	Program name: Citrix XenDesktop Verified publisher: Citrix Systems, Inc. File origin: CD/DVD drive
Show de	tails Yes No
	Change when these notifications appear

5. Select **Yes** to agree to the User Account Control prompt if displayed.

KenDesktop 7.12	Environment
Environment	Configuration
HDX 3D Pro Core Components Delivery Controller Features Firewall Summary Install Call Home Finish	I want to: Create a Master Image Select this option if you use Machine Creation Services or Provisioning Services to create virtual desktops from this master image. Enable Remote PC Access Select this option to install the Virtual Delivery Agent onto either a physical machine or a virtual machine that has been provisioned without the VDA.

6. Accept the default Environment value of Create a Master Image radio button, and select Next to continue.

KenDesktop 7.12	HDX 3D Pro
P Environment	HDX 3D Mode is recommended for data center machines with graphics hardware (GPU).
HDX 3D Pro	Configuration
Core Components Delivery Controller Features Firewall	Install the Virtual Delivery Agent (VDA) in HDX 3D Pro mode? No, install VDA in standard mode Recommended for most VDI deployments with standard office applications and for Remote PC Access.
Summary Install Call Home Finish	Yes, install VDA in HDX 3D Pro mode Recommended for data center machines with GPUs and graphic intensive applications (3D rendering), using the GPU vendor's driver. Refer to Citrix documentation for compatible display graphics hardware.

7. Select the **Yes, install the VDA for HDX 3D Pro** radio button on the HDX 3D Pro Dialog, and select **Next** to continue.

KenDesktop 7.12	Core Components
Environment HDX 3D Pro	Location: C:\Program Files\Citrix Change
Core Components Delivery Controller Features	Virtual Delivery Agent (Required) The software agent that is installed on the virtual or physical machine that provides the virtual desktop or application to the user.
Firewall Summary Install Call Home Finish	Citrix Receiver Client software that enables users to access their documents, applications, and desktops from any device, including smartphones, tablets, and PCs.

8. Deselect the **Citrix Receiver** check box on the **Core Components** dialog, and select **Next** to continue.



Citrix Receiver can be installed separately later and would only be used if connecting to another XenApp or XenDesktop Store.

(enDesktop 7.12	Delivery Controller
P Environment	Configuration
HDX 3D Pro	How do you want to enter the locations of your Delivery Controllers?
Core Components	Do it manually
Delivery Controller Features	of the menubly
Firewall	Controller address:
Summary	xdvm.pe.lab 🗸
Install	Test connection Add
Call Home	
Finish	
	Note: Any Group Policies that specify Delivery Controller locations will override settings provided here.

- **9.** Enter the XenDesktop delivery controller address. This is the FQDN of the XenDesktop server. Click on the **Test connection**... button to validate the address.
 - IP Addresses are not supported as a controller address, only Fully Qualified Domain Names are allowed.

XenDesktop 7.12	Delivery Controller
Environment HDX 3D Pro Core Components Delivery Controller	Configuration How do you want to enter the locations of your Delivery Controllers? Do it manually
Features Firewall Summary Install Call Home Finish	Controller address: xdvm.pe.lab Test connection Add
	Note: Any Group Policies that specify Delivery Controller locations will override settings provided here.

10. A green checkmark will be displayed on the right of the controller address input box if the FQDN address of the delivery controller is verified. Click the **Add** button to confirm the delivery controller address and add this address as the Virtual Delivery Agent target.

XenDesktop 7.12	Delivery Controller		
Environment	Configuration		
✓ HDX 3D Pro	How do you want to enter the locations of your Delivery Control	llarr?	
 Core Components 	Do it manually		
Delivery Controller	Do it manually	•	
Features	✓ xdvm.pe.lab	Edit Delete	
Firewall	Controller address:		
Summary			
Install	Example: controller1.domain.com		
Call Home	Test connection Add		
Finish			
	Note: Any Group Policies that specify Delivery Controller location provided here.	ns will override settings	

11. The delivery controller FQDN will be displayed above the delivery controller address entry box once it has been added. Select **Next** to continue.

XenDesktop 7.12	Features
 Environment HDX 3D Pro Core Components Delivery Controller Features Firewall Summary Install Call Home Finish 	Feature (Select all) Optimize performance Optimize desktop settings. Learn more. Use Windows Remote Assistance Enable Windows Remote Assistance and open TCP port 3389. Learn more. Use Real-Time Audio Transport for audio Uses UDP ports 16500 - 16509. Learn more. Framehawk Opens UDP ports 3224-3324. Learn more. Enable Citrix App-V publishing components Enables this machine to launch App-V packages Learn more. Personal vDisk Enable Personal vDisk for the Virtual Delivery Agent. Learn more.

12. Optimize performance should be selected by default. Select Use Windows Remote Assistance and Use Real-Time Audio Transport for audio on the Features dialog and select Next to continue.

Personal vDisk can be enabled at a later date if desired

XenDesktop 7.12	Firewall		
Environment	The default ports are listed belo	ow.	Printable version
 HDX 3D Pro Core Components Delivery Controller Features Firewall Summary Install Call Home Finish 	Controller Communications 80 TCP 1494 TCP 2598 TCP 8008 TCP	Remote Assistance 3389 TCP	Real Time Audio 16500 - 16509 UDP
	be created even if the Wi	indows Firewall is turned off.	the Windows Firewall. The rules will all or if you want to create the rules

13. Accept the default value to automatically create the Firewall entries. Select **Next** to continue.

	Summary	
Environment	Review the prerequisites and confirm the components you want to install. (1) Restar	t require
 HDX 3D Pro Core Components Delivery Controller Features Firewall Summary Install Call Home Finish 	Installation directory CAProgram Files\Citrix Prerequisites Microsoft Visual x86 C++ 2008 Runtime Microsoft Visual x64 C++ 2010 Runtime Core Components Virtual Delivery Agent Delivery Controllers xdvm.pe.lab Features Optimize performance Remote Assistance Real Time Audio	
	UDD.Dotte: 16500 16500	

14. Review the summary and select Install to continue.

KenDesktop 7.12	Installing prerequisites and components	
 Environment HDX 3D Pro Core Components Delivery Controller Frewall Summary Install Call Home Finish 	Installing Prerequisites A Microsoft Visual x86 C++ 2008 Runtime Microsoft Visual x86 C++ 2010 Runtime Microsoft Visual x86 C++ 2010 Runtime Core Components Virtual Delivery Agent Post Install Component Initialization	Less than 1 minute remaining. Installed Installed Installing

15. Installation will progress.

XenDesktop 7.12	Call Home
Environment HDX 3D Pro	Call Home monitors your deployment for common error conditions, automatically uploads system data to Citrix, and then proactively notifies you before issues become serious problems.
 ✓ Core Components ✓ Delivery Controller ✓ Features ✓ Firewall ✓ Summary ✓ Install Call Home Finish 	How does it work? Configuration and usage data are gathered and periodically sent using HTTPS to Citrix. Vou can log into Citrix Insight Services to view diagnostics results and recommendations. This information will be used for troubleshooting and diagnostic support purposes, as well as to improve the quality, reliability, and performance of Citrix products, subject to the Citrix Insight Services Policy at https://cis.citrix.com/legal/ and the Citrix Privacy Policy at https:// www.citrix.com/legal/legal/privacy.html. Learn more I want to participate in Call Home. (Recommended) I do not want to participate in Call Home. To participate in Call Home, you must connect to Citrix Insight Services. Connect

16. At the **Call Home** dialog box, choose whether to participate in Citrix Call Home. Click **Next.**

KenDesktop 7.12	Finish Installation	
Environment HDX 3D Pro	The installation completed successfully. Prerequisites	 Success
Core Components	Microsoft Visual x86 C++ 2008 Runtime	Installed
Delivery Controller	✓ Microsoft Visual x64 C++ 2010 Runtime	Installed
Features	 Microsoft Visual x86 C++ 2010 Runtime 	Installed
/ Firewall	Core Components	
	 Virtual Delivery Agent 	Installed
Summary	Post Install	
/ Install	 Component Initialization 	Initialized
Call Home		
Finish	2	
	Restart machine	
	Kestart machine	

17. When the installation has completed successfully accept the default to restart the machine and select **Finish**.

10.6 ENABLING THE NVIDIA GRID VGPU

Use the following procedure to enable GRID vGPU for your virtual machine. This will require you to edit the virtual machine settings.

1. Close the remote console; this will not be functional when GRID vGPU is configured.

Take a snapshot of the virtual machine to preserve your work. Label this snapshot pre-vGPU, and revert back to it if you encounter any problems going forward, such as driver issues

2. Power down the virtual machine.

	.2 .7
Worksta	Actions - Workstation
	Power Guest OS Snapshots Console
	Migrate 2. Clone M Template
	Fault Tolerance
	VM Policies
	Compatibility
	Export System Logs
	Edit Resource Settings
	Move To Rename Edit Notes Tags & Custom Attributes
	Add Permission
😨 Recent Tasks	Alarms
Task Name	Remove from Inventory Delete from Disk
	All vRealize Orchestrator plugin Actions 🕨

3. Right click on the VM in the Navigator window. Select **Edit Settings.** The **Edit Settings** dialog appears.

Virtual Hardware VM O	ptions	SDRS Rules	vА	App Options			
CPU	1		-	0			
Memory	4096		-	MB	+		
Hard disk 1	- N	ew Hard Disk		GB	•)	
SCSI controller 0	4	xisting Hard Dis	ĸ				
• 🗾 Network adapter 1		DM Disk			*	Connect	
• log CD/DVD drive 1	(🖂 N	etwork			-	Connect	
Floppy drive 1		D/DVD Drive		-	-	Connect	
Video card	1-	loppy Drive			-		
SATA controller 0				-			
WMCI device		erial Port					
Other Devices	H	arallel Port ost USB Device SB Controller					
	S S	CSI Device		_			
	Passa -	CI Device hared PCI Devic	e _				
	Ç S	CSI Controller ATA Controller					
New device:		Selec	t		-	Add	

4. Click on the New Device bar and select Shared PCI device.

Virtual Hardware VM C	Options SDRS F	Rules VApp Option	ns		
CPU	1	• 0			
Memory	4096	• (MB	•		
Hard disk 1	32	GB	•		
SCSI controller 0	LSI Logic SAS				
Network adapter 1	VM Network		•	Connect	
6 CD/DVD drive 1	Client Device		-	Connect	
Floppy drive 1	Client Device		•	Connect	
Video card	Specify custom	settings	•		
SATA controller 0					
WMCI device					
• Other Devices					
Neudoice					
New device:	🚺 Sha	red PCI Device	-	Add	

5. Click on Add to continue.

Options	SDRS Rules	VA	App Options	;		
2		-	0			
4096		-	MB	-)	
32		* *	GB	-	1	
LSI Log	gic SAS					
VM N	etwork			-	Connect	
Client	Device			-	Connect	
Client	Device			-	Connect	
Speci	fy custom setting	IS		-		
NMDI	A GRID VGPU			•)	
grid_m	160-1q			٠		
PC	I/PCIe passthro spend, migrate v	ugh vith v	devices are vMotion, or	e pre	esent. You cannot	
						Act
	Shared PC	De	vice	-	Add	Go t
	4096 32 LSI Loy Client Cli	2 4096 32 LSI Logic SAS 1 VM Network Client Device Client Device Client Device Specify custom setting Interview grid_m60-1q Mote: Some virtual PCUPCle passting of such virtual mac	2 ▼ 4096 ▼ 32 ★ 32 ★ LSI Logic SAS 1 VM Network Client Device Client Device Client Device Specify custom settings NVDIA GRID vGPU grid_m60-1q ▲ Note: Some virtual machine of such virtual machine	2 ♥ 4096 ♥ 32 ♥ 32 ♥ GB LSI Logic SAS 1 VM Network Client Device Client Device Client Device Specify custom settings NVIDIA GRID vGPU grid_m60-1q ▲ Note: Some virtual machine operar suspend, migrate with vMotion, or of such virtual machines.	2 ▼ MB 4096 ▼ MB 32 ★ GB 32 ★ GB LSI Logic SAS 1 VM Network ▼ Client Device ▼ Client Device ▼ Client Device ▼ Specify custom settings ▼ Image: Some virtual machine operation PCI/PCIc passthrough devices are prosuspend, migrate with vMotion, or tak of such virtual machines.	2 ▼ 4096 ▼ 32 ↓ 32 ↓ GB ▼ LSI Logic SAS ✓ 1 VM Network ▼ Client Device ▼ Connect Client Device ▼ Connect Client Device ▼ Connect Client Device ▼ Connect Specify custom settings ▼ Molia GRID vSPU ▼ grid_m60-1q ▼ ▲ Note: Some virtual machine operations are unavailable when PCUPCic passthrough devices are present. You cannot suspend, migrate with vMotion, or take or restore snapshots of such virtual machines.

6. The new PCI device will show the NVIDIA GRID vGPU device has been added.

Virtual Hardware VM C	Options	SDRS Rules	VA	App Options	5		
CPU	2		-	0			
Memory	4096		-	MB	-)	
Hard disk 1	32 A		GB	-)		
SCSI controller 0	LSI Log	ic SAS					
Network adapter 1	VM Ne	twork			-	Connect	
Go CD/DVD drive 1	Client	Device			-	Connect	
Floppy drive 1	Client	Device			-	Connect	
Video card	Specify	/ custom setting	IS		-	1	
SATA controller 0							
VMCI device							
Other Devices							
New PCI device	NVIDIA	GRID VGPU			•)	
GPU Profile	grid_m	60-1q			*		
	grid_m	60-2a			-	s are unavailable when	
	grid_m	60-1q				esent. You cannot	
	grid_m	60-1b				e or restore snapshots	
	grid_m	60-1a					
	grid_m	60-0q			::		
					Ŀ		A
	arid m	60-0b					

7. Click the down triangle on the **GPU Profile** selection bar to drop down the list of available vGPU profiles. Select the appropriate profile for this VM.

For information about what profile to choose, see *Selecting GRID vGPU profiles* on page 176

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

10.7 INSTALLING NVIDIA DRIVER IN THE VM

- 1. Start the virtual machine, and then connect to it using VMware Remote Console through the vSphere Web Client (*When connected, a popup warning requesting that you restart the computer to apply changes will display the first time it is booted after enabling the NVIDIA GRID vGPU.*)
- 2. Click **Restart Later** to continue booting the virtual machine.

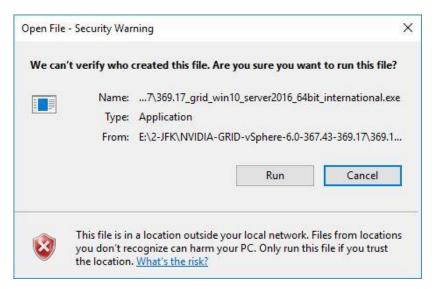
The state	
🛃 Device Manager	- 🗆 X
File Action View Help	
	×
✓ ♣ workstation	م م
> Destation	
> To Citrix Devices	
> Computer	
> Disk drives	
V III Display adapters	
Citrix Display Only Adapter	
Microsoft Basic Display Adapter	
Microsoft Basic Display Adapter	
> @ DVD/CD-ROM drives	
> Eloppy disk drives	
> 🚽 Floppy drive controllers	
> IDE ATA/ATAPI controllers	
> Keyboards	
Mice and other pointing devices	
> Monitors	
> 📮 Network adapters	e)
> 🚍 Print queues	
> Processors	
> Software devices	
> 🖬 Sound, video and game controllers	
> 🍇 Storage controllers	
> 🏣 System devices	
Universal Serial Bus controllers	
Citrix remote USB bus	
Citrix remote USB bus	v

3. Log into Windows and open the Device Manager.

The **Microsoft Basic Display Adapter** displays in the **Display adapters** section of the Device Manager with an exclamation point by it to indicate a driver problem. This is normal.

🚽 👻 🛧 📘 > This F	PC > e (\\10.200.0.37) (E:) > 2-JFK > NVIDIA-GRID-vSphere-6.0-36	7.43-369.17 >	5 V	Search NVIDIA-GRID-vSphere.	. 0
Cuick access Cuic	Name	Date modified 10/14/2016 11:03 10/14/2016 11:03 10/14/2016 11:03 10/14/2016 11:03	 ✓ Č Size 1,727 KB 1,566 KB 2,84,799 KB 254,799 KB 256,424 KB 7,663 KB 7,371 KB 40,842 KB 	Search NVIDIA-GRIDSphere.	م .
		Rename Properties	-		

4. Locate the NVIDIA driver and double-click the **Setup** icon to launch it. (Recommendation: Have the software on a shared volume that can be mounted by the VM for quick access).



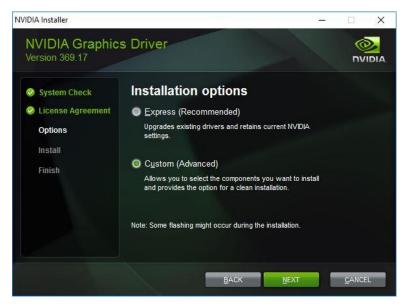
5. Accept the Security Warning to continue install.

	NA Graphics Driver (369.17) Package	×
Extract	Please enter the folder where you want to save the NVIDIA driver files. If the folder does not exist, it will be created for you.	
C:\NV	IDIA\369.17	
	OK Cancel	

6. Click **OK** to install the files to the default location.



7. The NVIDIA software license agreement window displays. Click the **AGREE AND CONTINUE** button to proceed.



8. The **Installation Options** window displays. Check the **Custom (Advanced)** radio button, then click **Next**. The **Custom installation** options window appears.

System Check License Agreement	Custom instal Select driver components:	lation optio	ons	
Options	Component	New Version	Current Version	
Install	Graphics Driver	369.17 2.27.3	None None	
Finish	✓ nView	148.03	None	
	Perform a clean install	ation		

9. Check the Perform a clean installation checkbox, and then click Next.



10. A window displays when the NVIDIA Graphics Driver installation is complete. Click **RESTART NOW** to reboot the VM and complete the installation.

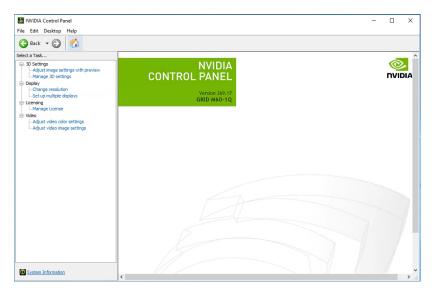
10.8 LICENSE THE DESKTOP

To manage licenses for each desktop, the FQDN or IP address of the GRID License Manager must be entered in the VM. When the VM boots, it will obtain a short-term lease for a license from the License Manager. Upon expiration, the NVIDIA driver software will automatically renew the lease, if the VM is running. If the VM shuts down, the lease will be renewed on VM startup.

Use the following procedure to license the VM.



1. Right-click on the screen and select the NVIDIA Control Panel menu option.



2. The NVIDIA Control Panel will indicate which GRID Profile is loaded.

B NVIDIA Control Panel		-	×
File Edit Desktop Help			
🔇 Back 🝷 🕥 🐇			
Select a Task	Manage License		^
	Manage License		
Manage 3D settings Display Change resolution	You can enable additional features by applying a license.		
Set up multiple displays	License Edition:		
Manage License	Your system is licensed for GRID vGPU.		
Video Adjust video color settings			
Adjust video image settings	License Server:		
	10.19.0.12		
	Port Number:		
	7070		
	Description:		
	Typical usage scenarios:		
O System Information			~
	<		>

3. Click on **Manage License** in the left-hand navigation pane. Enter the IP address of your License Server, and default port 7070. Click **Apply**.

The VM will now contact the License Manager for updated licenses upon reboot.

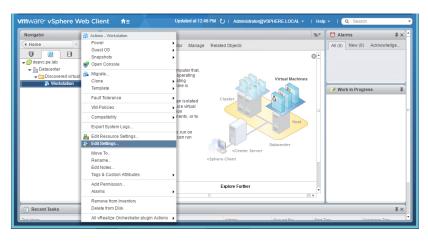
10.9 REMOVING THE GRID VGPU DEVICE FROM THE MASTER IMAGE

Use the following procedure to remove the vGPU shared PCI device from the master image before provisioning the XenDesktop machine catalog.

CAUTION: Not performing this procedure will cause device conflicts between vSphere and XenDesktop.

Navigator I	Di Workstation Actions *	#*	🖸 Alarms 🛛 📮 🛪
Home Constant	Getting Starter & Summary Monitor Manage Related Obj What is a Visual Machine? Anthat machine is a software computer that line a physical computer, runs an operating system installed on a visual machine is called a guest operating system. Because every visual machine is an isolated computing environment, you can use without environments as lessing environment, or to	ects	All (0) New (0) Acknowledge_
	consolidate sever applications. In vicents Sever, virtual machines run on hoats or ducters. The same host can not any virtual machines. Visphere Client Basic Tasks Explore	Enter Server	
	4		

1. In the vSphere Web Client Navigator left-hand pane, select the VMs and Templates tab.



2. Right-click on the master image VM and select the Edit Settings menu item.

firtual Hardware VM	Options	SDRS Rules	٧A	pp Options	5	
CPU	2		-	0	_	
Memory	4096		-	MB	-	
📇 Hard disk 1	32		* *	GB	-	
SCSI controller 0	LSI Log	ic SAS				
Network adapter 1	VM Ne	twork			-	Connected
CD/DVD drive 1	Client	Device			-	Connected
Floppy drive 1	Client	Device			-	Connected
Video card	Specif	/ custom setting	JS		-	
PCI device 0	NVIDIA	GRID VGPU			•	
SATA controller 0					_	-3
🌼 VMCI device						
Other Devices						
🔅 VMCI device						
		Select			•	Add

3. Select the gray "x" on the far right on the **PCI Device** item that is connected to the **NVIDIA GRID vGPU** to select the device for removal.

Virtual Hardware VM	Options	SDRS Rules	vAp	op Options					
F 🔲 CPU	1		•	0	_				
Memory	4096		-	MB	-)			
Hard disk 1	32			GB	-				
SCSI controller 0	LSI Log	jic SAS							
Network adapter '	VM Ne	etwork			-	Conne	ct		
⊧ 🍥 CD/DVD drive 1	Client	Device			-	Conne	ct		
Floppy drive 1	Client	Device			-	Conne	ct		
Video card	Specif	y custom setting	IS		-	·			
PCI device 0	Device	will be removed	1						10°
SATA controller 0									
VMCI device									
Other Devices									
New devic	e:	Selec	t	-	-	Add			
Compatibility: ESXi 6.0 a			(Add		ОК	Can

4. Select the **OK** button at the bottom of the **Edit Settings** dialog to save the settings.

The Recent Tasks pane at the bottom will display the status of Complete once the device has been removed. A XenDesktop machine catalog can be safely configured now.

CHAPTER 11. CREATING XENDESKTOP MACHINE CATALOGS AND DELIVERY GROUPS

This chapter describes the following:

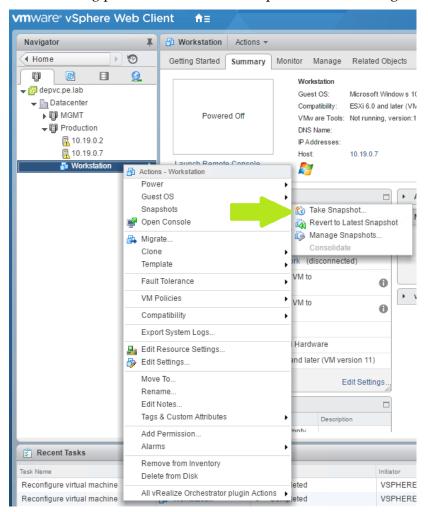
- Creating a VM snapshot
- Creating a machine catalog for the master image
- Creating a XenDesktop random machine catalog from a snapshot
- Configuring VM to enable vGPU profiles
- Creating a XenDesktop delivery group for the master image
- Creating a XenDesktop delivery group for the catalog
- Connecting to the Citrix delivered desktop for the first time

To create a pool of virtual machines, you must first take a snapshot of an existing virtual machine, which then allows you to either create a single virtual machine or use it to dynamically create virtual machines on demand.

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

11.1 CREATING A SNAPSHOT

Use the following procedure to create a snapshot for an existing virtual machine.



1. Right-click the virtual machine and then select Snapshot -> Take Snapshot...

🔞 Take VM Sna	apshot for Workstation	?)
Name	Pristine	
Description	Citrix and NVIDIA software installed.	
	virtual machine's memory st file system (Needs VMware Tools installed)	
	OK)

2. Enter a name for the snapshot. Optionally enter a description for the snapshot. Select **OK** to take the snapshot.

11.2 CREATING A MACHINE CATALOG FOR THE MASTER IMAGE (OPTIONAL)

Although this is not a required step, the following procedure can be used to validate the communication paths between the end user and the target VMs that will be created from this master before they are created. This can reduce troubleshooting time and rework.

Use the following procedure to provision a single vGPU-enabled machine catalog:

1. Logon to the XenDesktop server and open **Citrix Studio** from the start menu.

Ħ			Citrix Studio			-	. 🗆 X
File Action View Help							
◆ ◆ 2 🖬 🖬 🖬							
Console Root Citrix Studio (SiteLocationName) Search Machine Cataloge	Citrep: Machine Catalog thine Catalog No items selected	2	Machine type	No. of machines	Allocated mach	Actions Machine Catalogs Terrest Machine Catalog View Refresh Help	
< III >						vate Windows System in Control Pane Iows.	l to activate

2. Expand Citrix Studio on the left-hand pane if needed. Right-Click on Machine Catalogs menu item and select Create Machine Catalog menu item.

	Machine Catalog Setup
Studio	Introduction
Introduction Operating System Machine Management Master Image Virtual Machines Computer Accounts Summary	 Machine Catalogs are collections of physical or virtual machines that you assign to users. You create Catalogs from Master Images or physical machines in your environment. Important: The Master Image or physical machine that you use to create a Catalog must have a Virtual Delivery Agent installed. Also, ensure that the operating system is up-to-date and that applications are installed. Before you begin, make sure that you: eldentify the types of desktops and applications your users need Choose a Catalog infrastructure (for example, whether to power manage virtual machines). we a technology for creating and managing machines (such as Machine Creation Services or Provisioning Services). Prepare your environment, including the Master Image, computer accounts, and network interface card configuration.
	Don't show this again Back Next Cancel Activate W

3. Select Next button on the Machine Catalog Setup dialog to begin.

Studio	Operating System
	Select an operating system for this Machine Catalog.
 Introduction Operating System 	Server OS The Server OS Machine Catalog provides hosted shared desktops for a large-scale deployment of standardized Windows Server OS or Linux OS machines.
Machine Management Desktop Experience	 Desktop OS The Desktop OS Machine Catalog provides VDI desktops ideal for a variety of different users.
Master Image Virtual Machines Computer Accounts	Remote PC Access The Remote PC Access Machine Catalog provides users with remote access to their physical office desktops, allowing them to work at any time.
Summary	There are currently no power management connections suitable for use with Remote PC Access, but you can create one after completing this wizard. Then edit this machine catalog to specify that connection.
	Back Next Cancel

4. On the **Operating System** dialog, select the **Desktop OS** radio button and then select **Next** to continue.

	Machine Catalog Setup
Studio	Machine Management
	This Machine Catalog will use:
	 Machines that are power managed (for example, virtual machines or blade PCs)
✓ Introduction	Machines that are not power managed (for example, physical machines)
V Operating System	
Machine Management	Deploy machines using:
Desktop Experience	Citrix Machine Creation Services (MCS)
Virtual Machines	Resources: ResourceName (Zone: Primary)
Summary	Citrix Provisioning Services (PVS)
	 Another service or technology I am not using Citrix technology to manage my machines. I have existing machines already prepared.
	Note: For Linux OS machines, consult the administrator documentation for guidance.
	Back Next Cancel
	Activate

5. On the Machine Management dialog select the Another service or technology radio button for the Deploy machines using: section. Select Next to continue.

This is only used for the master image, the random pool will use Citrix Machine Creation Services (MCS)

Studio	Desktop Experience
	Which desktop experience do you want users to have?
 Introduction Operating System Machine Management Desktop Experience Virtual Machines Summary 	 I want users to connect to a new (random) desktop each time they log on. I want users to connect to the same (static) desktop each time they log on.
	Back Net Cancel Activate

6. On the **Desktop Experience** dialog, accept the default and select **Next** to continue.

	virtual machine	s and Users		
	Import or add virtu them to users:	al machines, their computer	Active Directory acc	ounts, and optionally assign
✓ Introduction	VM name	Computer AD account	t	User names
✓ Operating System				
✓ Machine Management				
 Desktop Experience 				
VMs and Users				
Summary				
	Remove		Import list	Export list
		imum functional level for this		Export list

7. On the **Virtual Machines and Users** dialog, select the **Add VMs**... button to select the master image to the machine catalog.

Select VMs
 ConnectionName Datacenter MGMT MGMT Monution Workstation 3
Cancel

8. On the **Select VMs** dialog, navigate through the vCenter VMs site tree and select the check box next to the VM you created to be the master image. Select the **OK** button to continue.

	Virtual Machines	s and	d Users			
Studio	Import or add virtu them to users:	u <mark>al m</mark>	achines, their computer Act	tive Directory ac	counts, and opt	ionally assign
✓ Introduction	VM name	+	Computer AD account		U name	s
 Operating System 	Workstation		Enter computer account i	name		
✓ Machine Management						
 Desktop Experience 						
VMs and Users						
Summary						
					~1	
	Remove			Import list	Export list	Add VMs
	Select the min	imun	n functional level 🖓 this		Export list	
	Select the min catalog:		n functional level 🔀 this	7.9 (or newe	r - recommende	ed, to acc 🔻

9. Select the ellipsis button next to the **Computer AD Account** field to search Active Directory for the machine account to add.

Select Computer	x
Select this object type: Computer	Object Types
From this location:	
Entire Directory	Locations
Enter the object name to select (<u>examples)</u> :	Check Names
Advanced OK	Cancel

10. Enter the computer name into the Active Directory **Select Computer** dialog. Click the **Check Names** button to verify the computer account exists and then select **OK** button to continue.

Studio	Virtual Machines an	d Users			
	Import or add virtual r them to users:	nachines, their computer Ac	tive Directory acc	ounts, and opti	onally assign
✓ Introduction	VM name 4	Computer AD account		User names	
✓ Operating System	Workstation	PE\WORKSTATION\$		-	
✓ Machine Management					
 Desktop Experience 					
VMs and Users					
Summary	Remove		Import list	Export list	Add VMs
Summary		m functional level for this		Export list	

11. Select the **ellipsis** next to **User Names** field to search Active Directory for the user account to add.

Select Users	x
Select this object type: Users	Object Types
From this location:	
Entire Directory <u>Enter the object names to select (examples)</u> :	Locations
	Check Names
Advanced OK	Cancel

- **12.** Enter the users name into the Active Directory **Select Users** dialog. Select the **Check Names** button to verify the users account then select the **OK** button to continue.
- **13.** Once you have completed adding computer and user account references for all machines in the catalog select **Next** to continue.

Studio	Summary	
 Introduction Operating System Machine Management Desktop Experience VMs and Users Summary 	Machine type: Machine management: Provisioning method: Desktop experience: Number of machines added: VDA version: Scopes: Zone:	Desktop OS Virtual Another service or technology Users connect to the same desktop each time they log on 1 7.9 (or newer) - Primary
	Machine Catalog name: Master Images Machine Catalog description for	administrators: (Optional)
	Example: Windows 7 SP1 desktop	os for the London Sales office
	To complete the deployment, ass Delivery Groups and then Create	ign this Machine Catalog to a Delivery Group by selecting or Edit a Delivery Group.

14. On the **Summary** dialog enter a Machine Catalog name and then select **Finish** button to continue.

12		Citrix Studio		_ _ ×
File Action View Help				
 Console Root Console Root Status (Stel ocationName) Status (Stel ocationName) Delayers (Stepp) Delayers (Stepp) Policies Configuration Adverty (Stepp) Consolers Advertised Apper Vaubiting Consortext Apper Vaubiting Christ StereFort Stores Acceler for Web NetSaler Gateway Barney 	CİTRİX Machine Catalog 4 Master Images Allocation Type Static	Machine type Window: Desktop OS (Virtual) User data: On local disk	No. of machines Allocated mach	Actions Machine Catalogs Image: Create Machine Catalog View Image: Create Machine Catalog Image: Create Machines Image: Create Machines Image: Create Machine Catalog Image: Create M
< III >>	Details - Master Images Details Machines Administrators Machine Catalog Name: Mashine Type: Provisioning Method: Manual M	Machine ages Installed VDA ver Desktop OS Operating System	- Unknown Act	wate Windows system in Control Panel to activa

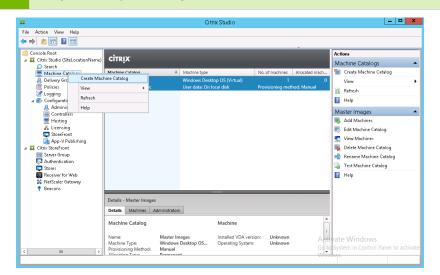
15. Once complete, the machine catalog will be displayed in the center pane.

11.3 CREATING A XENDESKTOP RANDOM MACHINE CATALOG FROM A SNAPSHOT

Use the following procedure to provision a random machine catalog.

MCS Random pool deployments require DHCP scopes to be available for the VM's. You cannot assign a static IP address to a MCS pool random VM. A DHCP IP reservation can be assigned to the VM MAC Address.

MCS Machine Catalogs require a snapshot of the Master image. Select the reference VM in the Navigator and right click. Ensure you have a snapshot of the master image before proceeding.



1. Right-Click on Machine Catalog from the left-hand pane and select Create Machine Catalog menu item.

	Machine Catalog Setup
Studio Introduction Operating System Machine Management Desktop Experience Master Image Virtual Machines Computer Accounts Summary	Introduction Machine Catalogs are collections of physical or virtual machines that you assign to users. You create Catalogs from Master Images or physical machines in your environment. Important: The Master Image or physical machine that you use to create a Catalog must have a Virtual Delivery Agent installed. Before you begin, make sure that you: Identify the types of desktops and applications your users need Choose a Catalog infrastructure (for example, whether to power manage virtual machines). Have a technology for creating and managing machines (such as Machine Creation Services or Provisioning Services) Prepare your environment, including the Master Image, computer accounts, and network interface card configuration.
	network interface card configuration. Learn more
	Don't show this again
	Back Next Cancel
	Activate

2. Select **Next** to continue.

	Machine Catalog Setup
Studio	Operating System
	Select an operating system for this Machine Catalog.
	Server OS
V Introduction	The Server OS Machine Catalog provides hosted shared desktops for a large-scale
Operating System	deployment of standardized Windows Server OS or Linux OS machines.
Machine Management	Desktop OS The Desktop OS Machine Catalog provides VDI desktops ideal for a variety of different
Desktop Experience	users.
Master Image	Remote PC Access
Virtual Machines	The Remote PC Access Machine Catalog provides users with remote access to their physical office desktops, allowing them to work at any time.
Computer Accounts	physical once desktops, allowing them to work at any time.
Summary	There are currently no power management connections suitable for use with Remote PC Access, but you can create one after completing this wizard. Then edit this machine catalog to specify that connection.
	Back Next Cancel

3. On **Operating System** dialog select **Desktop OS** radio button then select **Next** to continue.

Studio	Machine Management
	This Machine Catalog will use:
	Machines that are power managed (for example, virtual machines or blade PCs)
✓ Introduction	Machines that are not power managed (for example, physical machines)
✓ Operating System	
Machine Management	Deploy machines using:
Desktop Experience	 Citrix Machine Creation Services (MCS)
Master Image	Resources: ResourceName (Zone: Primary)
Virtual Machines	Citrix Provisioning Services (PVS)
Computer Accounts Summary	 Another service or technology I am not using Citrix technology to manage my machines. I have existing machines already prepared.
	Note: For Linux OS machines, consult the administrator documentation for guidance.
	Back Cancel

4. On Machine Management dialog accept defaults for Citrix Machine Creation Services (MCS) and then select Next to continue...

CI	Desktop Experience
Studio	Which desktop experience do you want users to have?
 ✓ Introduction ✓ Operating System ✓ Machine Management 	 I want users to connect to a new (random) desktop each time they log on. I want users to connect to the same (static) desktop each time they log on. Do you want to save any changes that the user makes to the desktop? Yes, save changes on a separate Personal vDisk.
Desktop Experience Master Image Virtual Machines Computer Accounts Summary	 Yes, create a dedicated virtual machine and save changes on the local disk. No, discard all changes and clear virtual desktops when the user logs off.
	Back Mitt Cancel

5. On the Desktop Experience dialog select the I want users to connect to a new (random) desktop each time they logon radio button. Click Next.

Studio	Master Image
✓ Introduction	The selected master image will be the template for all virtual machines in this catalog. (A master image is also known as a clone, golden, or base image.) Use the VDA for HDX 3D Pro when selecting a GPU-enabled snapshot or virtual machine. Select a snapshot (or a virtual machine):
 Operating System 	Workstation 0
 Machine Management 	▼ (Workstation LC GM ()
 Desktop Experience 	Pristine 🕈
Master Image Virtual Machines	
Computer Accounts	
Computer Accounts	
Summany	
Summary	
Summary	
Summary	
Summary	Select the minimum functional level for this 7.9 (or newer - recommended, to acc *
Summary	

6. On the Master Image dialog expand the virtual machine that you wish to deploy from and browse down until you can select the Snapshot you wish to use for the random pool. Select Next to continue.

Studio	Netw	ork Interface	Cards		
		are multiple Ne	twork Inte	rface Cards available on the selected Ma	aster Image.
✓ Introduction		Name	+	Associated network	
Operating System		0		VM Network	+
Machine Management					
✓ Desktop Experience					
✓ Master Image					
Network Cards					
Virtual Machines					
Computer Accounts					
Summary					

7. On the **Network Cards** dialog specify the network cards and networks you wish to associate. Click **Next.**

Studio Introduction Operating System Machine Management Desktop Experience Master Image Network Cards	Virtual Machines How many virtual machines do you want to create? 4 Configure your machines. Total memory (MB) on each machine: Configure a cache for temporary data on each machine. Memory allocated to cache (MB): Disk cache size (GB):	Le .	4096 256 10	
Virtual Machines Computer Accounts Summary	Caching should not be enabled if you intend to use If you clear both check boxes, temporary data is not ca for each VM. (This is the provisioning action in released	e this catalog to cr ached; it is written	eate AppDi	isks.

8. On the Virtual Machines dialog specify the Number of virtual machines needed and then select Next to continue.

Studio	Active Directory Computer Accounts	
	Each machine in a Machine Catalog needs a corresponding Active Directory computer ac	count.
	Select an Active Directory account option:	
 Introduction 	Oreate new Active Directory accounts	
 Operating System 	Use existing Active Directory accounts	
✓ Machine Management	Active Directory location for computer accounts:	
 Desktop Experience 	Domain: pellab	+
🖋 Master Image	Default OU	
🛩 Network Cards	Computers	_
✓ Virtual Machines	در 📻 لر	×
Computer Accounts	Domain Controllers	
Summary	► Time EA	
	► The EB	-
	Selected location: Default OU	
	Account naming scheme:	
	VMWXDT### 0-9 -	
	VMWXDT012	

9. On the Active Directory Computer Accounts select the Domain to create machines in, browse the OU tree and select the OU to create machine accounts in, the OU should be displayed in the Selected location display field. Specify an Account naming scheme (append ## to the name for automatic numeric increments) then select Next to continue.

Studio	Summary	
 Introduction Operating System Machine Management Desktop Experience Master Image Metwork Cards Virtual Machines Computer Accounts Summary 	Machine type: Machine management: Provisioning method: Desktop experience: Resources: Master Image name: VDA version: Network interface cards: Number of VMs to create: Machine Catalog name:	Desktop OS Virtual Machine creation services (MCS) Users connect to a new desktop each time they log on ResourceName Pristine 7.9 (or newer) 0 - Using VM Network 4
,	VMW XDT VDI Machine Catalog description fo Example: Windows 7 SP1 deskto	ups for the London Sales office sign this Machine Catalog to a Delivery Group by selecting

10. On the **Summary dialog** enter the **Machine Catalog name** and then select **Finish** button to continue.

Studio	
Creating Catalog VMW XDT VDI	
Copying the master image	
	Hide progress

11. A progress bar will be displayed on the **Studio** dialog while the machines are being provisioned. Click the **Hide progress** button to allow the process to complete in the background.

File Action View Help		_			rix Studio	Cit			
Concole Root Conco									
Citric Studie (Catalogs Machine Catalogs									🔶 🖄 📰 📓 🖬
Sunch Mochine Catalog Machine Cat		Actions							
Machine Catalog Delais / Machine S deministrators Configuration Allocation Type: Random Machine S deministrators Machine		Machine Catalogs						CITRIX	
Matter Images Matter Images Windows Desktep OS (Virtual) Polyticologing method: Machine Catalog Administrators Windows Desktep OS (Virtual) Order Matter Images Windows Desktep OS (Virtual) Order Matter Images Matter Images Matter Images Details - Master Images	alog	Create Machine Catalog	Allocated mach	No. of machines		Machine type	+	Machine Catalog	
Logging L		Vine	0	1	top OS (Virtual)	Windows Desk		Master Images	
Controller C			od: Manual	Provisioning meth	local disk	User data: On		Allocation Type: Statio	E Policies
Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators Administrators			0	0	ttop OS (Virtual)	Windows Desk		VMW XDT VDI	
Contollers Contol		👔 Help	od: Machine cr	Provisioning meth	ard	User data: Dise	dom	Allocation Type: Rand	
Konconters K		Master Images							
Licensing Sore/Fort App-V Publishing Sore/Fort Sore/Fort Sore/Fort Sore/Fort Sore/Fort Details - Master Images Details - Master Images Details - Master Images Details - Master Images									
© StoreFornt © Apply Publishing ■ 11 Circs StoreFornt ■ StoreFornt ■ StoreFornt ■ StoreFornt ■ StoreFornt ■ StoreFornt ■ Returne StoreFornt ■ Re	-								
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Bescons Details - Master Images									
Authentication Sores Receiver for Web St NetScaler Gateway Petalls - Master Images Details - Master Images Details - Master Images	ilog	🙀 Delete Machine Catalog							
Dares Dares Details - Master Images Details - Master Images Details - Master Images	atalog	📫 Rename Machine Catalog	1						
Receiver for Web Netceiver Starway Bescons Details - Master Images Details - Master Images Details - Master Images Administrators	'g	Test Machine Catalog							
NetScaler Geteway ♥ Beacons Details - Master Images Details Masteria Administrators t		7 Help							
Beacons Details - Master Images Details Machines Administrators		in the p							
Details Machines Administrators									
Details Machines Administrators								Dotaile Master Imag	
							-		
Machine Catalog Machine						rs	Administrators	Details Machines	
			Ê.		Machine			Machine Catalog	
Name: Master Images Installed VDA version: Unknown A ethication M/indicavers			=						
Machine Type: Windows Deckton OS Operating System: Unknown AFRIVALE WINDOWS									
Provisioning Method: Manual Go to System in Control Panel Manual Go to System in Control Panel Ministria Turce	nel to activ	System in Control Panel t		2	- parally of second		d: Manual	Provisioning Method:	

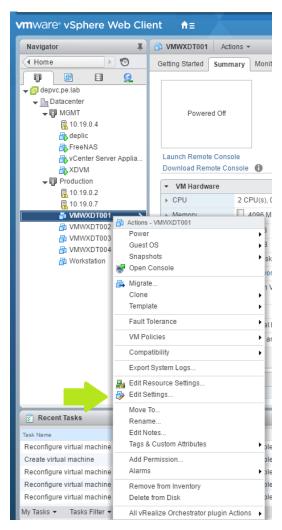
12. A progress bar continues to be displayed on the center pane of the **Machine Catalogs** screen in Citrix Studio.

Once the machine catalog is created, re-enable the vGPU profiles in the next step.

11.4 CONFIGURING CATALOG VMS TO ENABLE GRID VGPU PROFILES

Perform the following procedure to each VM provisioned in both the Random and Static Machine Catalogs. Use a Static Machine Catalog if DHCP is not available.

CAUTION: If using static assigned IP addresses boot machines up and assign IP addresses before adding Shared PCI device for vGPU. VMware console is not usable with vGPU enabled.



1. In the vSphere Web Client right click on a VM in the Catalog. Select **Edit Settings** to open the VM Settings dialog.

VMWXDT001 - Edit Se	ttings	?)
Virtual Hardware VM O	ptions SDRS Rules vApp Options	
F 🔲 CPU	2 🔹	
Memory	ADDS MB V	
F 🛄 Hard disk 1	Existing Hard Disk GB 🔻	
Hard disk 2	A RDM Disk MB 🔻	
Other disks	Network	
▶ 🛃 SCSI controller 0		
Network adapter 1	OD/DVD Drive ✓ Connect	
▶ i CD/DVD drive 1	Floppy Drive	
Video card	🚥 Serial Port	
SATA controller 0	Parallel Port	
VMCI device	Host USB Device	
 Other Devices 	🖶 USB Controller	
	SCSI Device	
	PCI Device	
	🔄 Shared PCI Device	
	SCSI Controller	
	SATA Controller	
New device:	Shared PCI Device Add	

2. On the VM Edit Settings dialog click on the New device drop down menu at the bottom and select Shared PCI device.

VMWXDT001 - Edit Se	ettings	? •
Virtual Hardware VM C	Options SDRS Rules vApp Options	
F 🔲 CPU	2 • •	
Memory	4096 V MB V	
🕨 🛄 Hard disk 1	32 A GB V	
Hard disk 2	16 MB V	
Other disks	Manage other disks	
▶ 🛃 SCSI controller 0	LSI Logic SAS	
Network adapter 1	VM Network	
▶ 🝥 CD/DVD drive 1	Client Device	
Video card	Specify custom settings	
SATA controller 0		
VMCI device		
 Other Devices 		
 New PCI device 	NVIDIA GRID vGPU	
GPU Profile	grid_m60-8q 🔻	
	Note: Some virtual machine operations are unavailable when PCI/PCIe passthrough devices are present. You cannot suspend, migrate with vMotion, or take or restore snapshots of such virtual machines.	
New device:	Ada Ada Ada Ada Ada Ada Ada Ada Ada Ada	
Compatibility: ESXi 6.0 an	nd later (VM version 11)	Cancel

3. Select Add button to add the Shared PCI Device to the VM.

VMWXDT001 - Edit Se	ettings			?)
Virtual Hardware VM C	Options SDRS Rules	vApp Optic	ons	
CPU	2	• 0		
Memory	4096	▼ MB	•	
Hard disk 1	32	▲ ▼ GB	•	
Hard disk 2	16	MB	•	
Other disks	Manage other disks			
SCSI controller 0	LSI Logic SAS	~		
Network adapter 1	VM Network		Connect	
● ⑥ CD/DVD drive 1	Client Device		Connect	
Video card	Specify custom settin	gs	•	
▶ ⊚ SATA controller 0				
VMCI device				
Other Devices				
New PCI device	NVIDIA GRID vGPU		•	
GPU Profile	grid_m60-8q		×	
	grid_m60-2a		s are unavailable when	
	grid_m60-1q	<i>h</i>	esent. You cannot or restore snapshots	
	grid_m60-1b	v		
	grid_m60-1a			
New device:	grid_m60-0q		Add	
New device.	grid m60-0b			

4. Select the **GPU Profile** for this VM and then select **OK** to close the dialog and save the VM settings.

MWXDT001 - Edit S	ettings	?₩
Virtual Hardware VM C	Options SDRS Rules vApp Options	
▶ 🔲 CPU	1 •	
▶ IIII Memory	4096 v MB v	
▶ 🛄 Hard disk 1	32 GB V	
▶ 🛃 SCSI controller 0	LSI Logic SAS	
Metwork adapter 1	VM Network 🗸 VM Network	
▶	Client Device	
Floppy drive 1	Client Device	
Video card	Specify custom settings	
▶		
VMCI device		
 Other Devices 		
- New PCI device	NVIDIA GRID VGPU	
GPU Profile	prid_m60-1q	
	Note: Some virtual machine operations are unavailable when PCI/PCIe passthrough devices are present. You cannot suspend, migrate with vMotion, or take or restore snapshots of such virtual machines.	
New device:	Shared PCI Device	
Compatibility: ESXi 6.0 ar	nd later (VM version 11)	ancel

5. Repeat for all VM's provisioned on the Machine Catalog.

11.5 CREATING A XENDESKTOP DELIVERY GROUP FOR THE MASTER IMAGE (OPTIONAL)

Although this is not a required step, the following procedure can be used to validate the communication paths between the end user and the target VMs that will be created from this master before they are created. This can reduce troubleshooting time and rework.

Perform the following procedure to configure the master image access through Citrix Receiver.

n			Citr	ix Studio				- 🗆 X
File Action View Help								
Console Root Citrix Studio (SiteLocationName) Search Machine Catalogs A Delivers Groups		Applications (0)	Machine type	No. of machines	Sessions in use	No. of applicati	Actions Delivery Groups Create Delivery Group View	-
Conce Create Delivery Conce Create Delivery Conce Create Delivery Conce Create Delivery Conce Conce Create Delivery Conce Conce Create Delivery Conce Crea	No items selected					Âct	Refresh Help	
< III >							o System in Control Pan dows	ei to activate

 Login to the XenDesktop server and open Citrix Studio. Right-click on Delivery Groups from the left-hand pane and select the Create Delivery Group menu item.

	Create Delivery Group
	6
Studio	Getting started with Delivery Groups
Introduction Machines Machine allocation	Delivery Groups are collections of desktops and applications (which could be in Application Groups) that are created from Machine Catalogs. Create Delivery Groups for specific teams, departments, or types of users. Make sure you have enough machines available in desktop OS or server OS Machine Catalogs to create the Delivery Groups you need.
Delivery Type	
Users	
Desktop Assignment Rules Summary	
	13
	Don't show this again
	Back Next Cancel
	Activate V

2. On the **Create Delivery Group** dialog select the **Next** button to continue.

	Machines		
	Select a Machine Catalog.		
	Catalog	Туре	Machines
V Introduction	 Master Images 	VDI Manual Static Local Disk	1
Machines	VMW XDT VDI	VDI MCS Random	4
		1	
	Machines assigned to users:		

3. On the **Machines** dialog select the master image catalog that we created earlier. Select the **Next** button to continue.

	Create Delivery Gr	oup	
Studio	User Assignments:		
	Machine name PE\WORKSTATION	Users	
 Introduction Machines Machine allocation Delivery Type Users Desktop Assignment Rules Summary 		PEyk	
	Import list) Export list	Back Next Can Activ	

4. On the **User Assignments** dialog optionally assign users to machines and then select the **Next** button to continue.

	Create Delivery Group
Studio Introduction Machines Machine allocation Delivery Type Users Desktop Assignment Rules Summary	Delivery Type You can use the machines in the Catalog to deliver desktops or applications to your users. Use the machines to deliver:
	Back Net Cancel Activate

5. On the **Delivery Type** dialog accept the default selection of **Desktops** radio button and then select the **Next** button to continue.

	Create Delivery Group
Studio Introduction Machines Machine allocation Delivery Type Users Desktop Assignment Rules Summary 	Users Specify who can use the applications and desktops in this Delivery Group. You can assign users and user groups who log on with valid credentials. Allow any authenticated users to use this Delivery Group. Restrict use of this Delivery Group to the following users: Add users and groups
	Add Remove Back Next Cancel

6. On the Users dialog, select Restrict use of this delivery group to the following users, then select the Add button to use the Active Directory Select Users and Groups to grant users or groups access to the delivery group.

Select Users or Groups	x
Select this object type:	
Users or Groups	Object Types
From this location:	
Entire Directory	Locations
Enter the object names to select (<u>examples</u>):	
1	Check Names
Advanced OK	Cancel

7. On the **Select Users and Groups** dialog search for and add the users and groups that will be granted access to the delivery group. Select the **OK** button to continue.

	Create Delivery Group
Studio	Users
	Specify who can use the applications and desktops in this Delivery Group. You can assign users and user groups who log on with valid credentials.
✓ Introduction	Allow any authenticated users to use this Delivery Group.
✓ Machines	Restrict use of this Delivery Group to the following users:
✓ Machine allocation	John JK. Kennedy (PE\jk)
✓ Delivery Type	Construction of the second secon
Users	
Desktop Assignment Rules	
Summary	
	Add
	Back Next Cancel
	Back Cancel

8. On the **Users** dialog select the **Next** button to continue.

Studio	Desktop Assignment Rules
✓ Introduction	Add users or groups who will be assigned a machine when they launch the desktop. When a machine is assigned to a user, it remains with that user, even if you later edit the Delivery Group and remove the assignment rule below.
✓ Machines	Add assignments
 Machine allocation 	
✓ Delivery Type	
✔ Users	
Desktop Assignment Rules	
Summary	
Summary	
	Add Edit Remove

9. On the Desktop Assignment Rules dialog, click Add. Give the new rule a display name. Select Restrict use of this delivery group to the following users, then select the Add button to use the Active Directory Select Users and Groups to grant users or groups access to the delivery group.

Select Users or Groups	x
Select this object type:	
Users or Groups	Object Types
From this location:	
Entire Directory	Locations
Enter the object names to select (<u>examples</u>):	
	Check Names
Advanced OK	Cancel

10. On the **Select Users and Groups** dialog search for and add the users and groups that will be granted access to the delivery group. Select the **OK** button to continue.

		Add Desktop Assignment Rule	_
	Display name:	ЈК	
Studic	Description:	Example: Assigned desktops for Finance Dept.	
		The name and description are shown in Receiver.	ena
		me with access to this Delivery Group to have a desktop assigned	y Gro
[®] Introdu		top assignment to:	
Machin		ennedy (PE\jk)	-
' Machin ' Deliven	JOIN 310 10	chinedy (r L gk)	
Users			
Deskto			1
Rules			
Summa			
		R	
	Add	Remove	
	Maximum deskt	ops per user: 1 -+	
		op assignment rule eck box to disable delivery of this desktop.	
		OK Cancel	ance

11. On the Add Desktop Assignment Rule dialog, click OK.

Studio	Desktop Assig	nment Rules	
✓ Introduction	machine is assig		hine when they launch the desktop. When a at user, even if you later edit the Delivery Group
✓ Introduction ✓ Machines	Name	+ Users	Desktops per user
✓ Machine allocation	JK	John JK. Kennedy (PE\jk)) 1
✓ Users Desktop Assignment Rules Summary			
		Edit Remove	

12. On the Desktop Assignment Rules dialog select the Next button to continue.

Studio	Summary	
	Machine Catalog:	Master Images
✓ Introduction	Machine type:	Desktop OS
✓ Machines	Allocation type:	Static
 Machine allocation 	Machines added:	PE\WORKSTATION 1 assigned to users
✓ Delivery Type	Delivery type:	Desktops
✔ Users	Users:	John JK. Kennedy (PE\jk)
✓ Desktop Assignment Rules	Desktop assignment rules:	JK
Summary	Launch in user's home zone:	No
	Delivery Group name:	
	Master Image	
	Delivery Group description, use	l as label in Receiver (optional):
		Back Freish Cancel

13. On the **Summary** dialog enter a unique **Delivery Group** name, and **Display Name** for the delivery group. Select the **Finish** button to complete the creation of the delivery group.

#		Citri	x Studio				_ _ ×
File Action View Help							
Concile Reat Critic Studio (StatucationName) Critic Studio (StatucationName) Critic Studio (StatucationName) Critic Studio (StatucationName) Matchine Catalogs Publicits Publicits Configuration Administrators Configuration Controllers Houting Catrix StareFront StaterFront Catrix StareFront StaterFront	CİTRİX Delivery Group Applications (b) Delivery Group 4 Master Image State: Enabled	Machine type Windows Des	No. of machines 1 Unregistered: 1	Sessions in use 0 Diaconnected	No. of applicat 0	 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	ons iivery Groups Create Delivery Group View Fafreich Help Ster Image Add Machines Edit Delivery Group Turn On Maintenance Mode Rename Delivery Group Delete Delivery Group View Machines Test Delivery Group Help
	Details - Master Image Details Machine Catalogs Usage Delivery Group	Administrators	State		<u>*</u>		
< III >	Name: Master Ima Display Name: Master Ima Description: -		Enabled: Maintenance Mode Registered Machin			Svst	e Windows em in Control Panel to activate

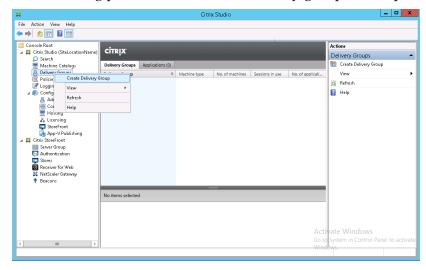
14. On the **Delivery Groups** center pane, the newly created delivery group should now be available. Double-click on the **Delivery Group** row on the center pane to view the machines that are available for delivery.

Image: Sector State Sector State (or "Geldeney Group Is "Matter Insage") Certariant Certariant Sector State (or Sector State (or "Geldeney Group Is "Matter Insage") Certariant Certariant Sector State (or State (or "Geldeney Group Is "Matter Insage") Certariant Sector State (or State (or "Geldeney Group Is "Matter Insage") Certariant Sector State (or State (or "Geldeney Group Is "Matter Insage") Certariant Sector State (or State (or "Geldeney Group Is "Matter Insage") Certariant Sector State (or State (or "Geldeney Group Is "Matter Insage") Certariant Refersh Were Matter Insage Refersh Were <th></th> <th>CITRIX</th> <th></th> <th></th> <th></th> <th><unsaved></unsaved></th> <th>×</th> <th>Saved se</th> <th>sorches 🔫</th> <th>Actions Search</th>		CITRIX				<unsaved></unsaved>	×	Saved se	sorches 🔫	Actions Search
 Appl'olsk: Delivery Gow Anatome (10) Serving Ol Machines (10) Serving Ol			r '(Delivery Group I	s "Master Image")'					Clear search	
Applications Name Machine Gallogi Delivery Group User Mainterance ML Pendit User Ch. Power State Registration SL. Mainterance ML Image: Delivery Group Image: Delivery Group User Orification SL. Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group Image: Delivery Group <t< th=""><th>AppDisks</th><th>Contract of the local division of the local</th><th></th><th></th><th></th><th></th><th>_</th><th></th><th></th><th>View</th></t<>	AppDisks	Contract of the local division of the local					_			View
€ Configuration ▲ Administratory Master image PEQk Off On Local On Registered Help ▲ Administratory Accounting		Name 4	Machine Catalog	Delivery Group	User	Maintenance M	Persist User Ch	Power State	Registration St	Refresh
	Configuration Configuration Configuration Controllers Hosting Licensing StoreFront Ap-V Publishi Ap-V Publishi Ap-V Publishi Cons Zones Cons StoreFront StoreFront StoreFront StoreFront	workstation.p	Master Images	Master Image	PE\k	Ott	On Local	On	Registered	Hep

15. The machines available for this **Delivery Group** will be listed in the center pane.

11.6 CREATING A XENDESKTOP DELIVERY GROUP FOR THE POOLED MACHINE CATALOG

Use the following procedure to create a delivery group for the pooled machine catalog.



1. Right-click on **Delivery Groups** from the left-hand pane and select **the Create Delivery Group** menu item.

		Create Delivery Group
Ø	Studio Introduction Machines Machine allocation Users Applications Desktop Assignment Rules Summary	Create Delivery Group Getting started with Delivery Groups Delivery Groups are collections of desktops and applications (which could be in Application Groups) that are created from Machine Catalogs. Create Delivery Groups for specific teams, departments, or types of users. Make sure you have enough machines available in desktop OS or server OS Machine Catalogs to create the Delivery Groups you need.
		Don't show this again Back Next Cancel Activate Win

2. On the **Create Delivery Group** dialog select the **Next** button to continue.

Studio	Machines		
	Select a Machine Catalog.		
	Catalog	Туре	Machines
 Introduction 	VMW XDT VDI	VDI MCS Random	4
Machines			
Machine allocation			
Users			
Applications			
Desktop Assignment Rules			
Summary			
Summary			
		or this Delivery Group	4 - +
	Choose the number of machines for	of this belivery broup.	
	Choose the number of machines fo	and this betweey croup.	
	Choose the number of machines fo	in this belivery croup.	

3. On the **Machines** dialog select the random pool catalog that we create earlier. Increase the counter for the number of machines in this group to 4. Select the **Next** button to continue.

Studio	Users
	Specify who can use the applications and desktops in this Delivery Group. You can assign users and user groups who log on with valid credentials.
 Introduction 	Allow any authenticated users to use this Delivery Group.
✓ Machines	Restrict use of this Delivery Group to the following users:
Users Applications Desktops Summary	Add users and groups
	Add Remove Sessions must launch in a user's home zone, if configured. Back Cancel Activate

4. On the Users dialog select the Allow any authenticated users to use this Delivery Group. Click Next.

	Create Delivery Group
Studio	Applications
 ✓ Introduction ✓ Machines 	To add applications, citck "Add" and choose a source. Then select applications from that source. If you choose Application Groups, all current and future applications in the selected groups will be added. You can also place new applications in a non-default folder and change application properties.
Visers Applications Desktops Summary	Add applications
	Add Remove Properties Place the new applications in folder: Applications Change
	Back Nigt Cancel

5. On the Applications dialog click Next.

Studio	Desktops	
Studio	Add users or groups who can launch a desktop from this Delivery Group.	
 Introduction Machines Users Applications Desktops Summary 	Add assignments	ATTACANA CANADA CANADA
	Add Edit Remove	

6. On the **Desktops** dialog box click **Add** to permit a user or group to launch desktops from this delivery group.

	Display name:		1
	Display name:	ЈК	
tudic	Description:	Example: Assigned desktops for Finance Dept.]
		The name and description are shown in Receiver.	
Introdu	Restrict laune	ches to machines with tag:	1 33
Machin	Allow everyo	me with access to this Delivery Group to use a desktop	12.
Users	Restrict desk		100
Applica		ab a fai	
Deskto	Add us	ers and groups	
Summa			
	Add	Remove	1
	Add	hemore	
	 Enable deskt 	op	-
		eck box to disable delivery of this desktop.	

7. On the **Add Desktop** dialog box, give this person or group a display name, and select the **Restrict desktop use to** radio button. Then click **Add**.

Select Users or Groups	x
Select this object type:	
Users or Groups	Object Types
From this location:	
Entire Directory	Locations
Enter the object names to select (<u>examples)</u> :	
1	Check Names
Advanced OK	Cancel

8. On the Select Users and Groups dialog search for and add the users and groups that will be granted access to the delivery group. Select the OK button to continue.

Studio	Desktops		
	Add users or gro	oups who	can launch a desktop from this Delivery Group.
	Name	+	Jsers
 Introduction 	JK	1	ohn JK. Kennedy (PE\jk)
✓ Machines			
✓ Users			
 Applications 			
Desktops			
Summary			
	Add	Edit	Remove
			Back Next Cancel

9. On the **Desktop** dialog select the **Next** button to continue.

Studio	Summary	
 Introduction Machines Users Applications Desktops Summary 	Machine Catalog; Machine type: Allocation type: Machines added: Users: Desktops: Launch in user's home zone:	VMW XDT VDI Desktop OS Random PE/VMWXDT001 PE/VMWXDT002 PE/VMWXDT003 PE/VMWXDT004 4 unassigned Allow authenticated users JK No
	Delivery Group name: Random Pool Delivery Group description, used	d as label in Receiver (optional): Back Finis Cancel

10. On the **Summary** dialog enter a unique **Delivery Group** name, and **Display Name** for the delivery group. Select the **Finish** button to complete the creation of the delivery group.

Ħ			Citri	< Studio				_ D X
File Action View Help								
🧇 🏟 🙎 📰 📓 🖬								
Console Root	CITRIX						Act	ions
Citrix Studio (SiteLocationName) Search	CIIRIX						De	elivery Groups 🔺
💻 Machine Catalogs	Delivery Groups App	ications (0)					1	Create Delivery Group
Delivery Groups Policies	Delivery Group	+	Machine type	No. of machines	Sessions in use	No. of applicati		View 🕨
Policies	Master Image		Windows Des	1	0	0	Q	Refresh
A 😨 Configuration	State: Enabled Random Pool		Windows Des	Unregistered: 0	Disconnected:	0	?	Help
Administrators Controllers	State: Enabled		windows Des	4 Unregistered: 1	U Disconnected:	U	Ra	ndom Pool
Hosting	Static Pool		Windows Des	4	0	0		Add Machines
🚜 Licensing	State: Enabled			Unregistered: 0	Disconnected:			Edit Delivery Group
StoreFront							100	Turn On Maintenance Mode
⊿ 🗱 Citrix StoreFront								Rename Delivery Group
Server Group								Delete Delivery Group
Authentication							5	View Machines
Receiver for Web								Test Delivery Group
NetScaler Gateway							?	Help
Beacons			_					
	Details - Random Pool							
	Details Machine Catal	ogs Usage	Administrators					
						*		
	Delivery Group			State				
	Name:	Random Poo		Enabled:	Yes			e Windows
< III >	Display Name: Description:	Random Poo	bl	Maintenance Mode Registered Machin		Go to	Sys	tem in Control Panel to activate
				registered Machini	c., U	Wind	bws	

11. On the **Delivery Groups** center pane, the newly created delivery group should now be available. Double-click on the **Delivery Group** row on the center pane to view the machines that are available for delivery.

2			Ci	trix Studio						
File Action View Help										
Þ 🔿 🙎 📰 📓 🖬										
Console Root	aturnus								Act	tions
Citrix Studio (SiteLocationName) Search	CITRIX	<	Unsaved>		×				Se	arch
Machine Catalogs	Search results for '(Deliven	Group Is "St	atic Pool")'				C	lear search	13	Select Columns
B Delivery Groups	Desktop OS Machines (4)	Server OS M		Sessions (0)		_			-	View
Policies	Name		Deliver	User	Mainte	Persist	Power	Registr	a	Refresh
✓ Logging	TXTVMWXDTS001.bt.tex	WINGCHINT.	Static	User	Off	On Local	On	Regist	2	Help
Administrators	TXTVMWXDTS002.txt.tex		Static		Off	On Local	Off	Unregi	-	
Controllers	TXTVMWXDTS003.txt.tex		Static		Off	On Local	Off	Unregi		TVMWXDTS001.txt.textron
Hosting	TXTVMWXDTS004.txt.tex				Off	On Local	Off	Unregi	1.55	Delete
🚜 Licensing								-	5	Suspend
App-V Publishing									5	Restart
4 🞇 Citrix StoreFront									8	Force Restart
Server Group										Shut Down
Stores										Force Shutdown
💭 Stores 🕅 Receiver for Web									1	Change User
NetScaler Gateway										Edit Tags
🕈 Beacons										Add Tag
										-
	Details - TXTVMWXDTS00	1.txt.textron.	com							Turn On Maintenance Mode
	Details Administrators								1 -	Remove from Delivery Group
	Details Training of the								-	View Sessions
	Machine			Session					?	Help
	Machine: TXT	/MWXDTS00		Current I				Acti	vat	e Windows
< III >	Power State: On	INIVIADISUU	i.txt.textf	Protocol:	izer:	-		Go to Wine		tem in Control Panel to activ

12. The machines available for this **Delivery Group** will be listed in the center pane.

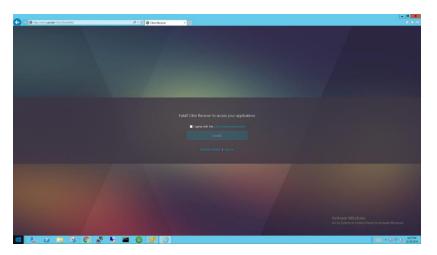
11.7 CONNECTING TO THE CITRIX DELIVERED DESKTOP FOR THE FIRST TIME

Perform the following procedure to access the Citrix delivered virtual machines for the first time.

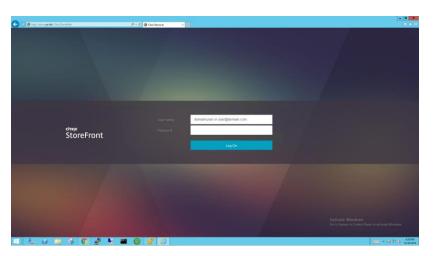
Console Root	CITRIX						Actions		
Citrix Studio (SiteLocat Search	CITRIX						Stores		
Machine Catalogs	Name	Authenticated	Subscription	Enabled	Access		Create Store		
AppDisks	Store Service	Yes	Yes		Internal network or	ıly	Export Multi-Store Provisioni.		
B Delivery Groups Applications							Manage NetScaler Gateways		
Policies							Manage Beacons		
Cogging							Set Default Website		
A 😰 Configuration							View		
Administrators	Details - Store Service						G Refresh		
E Hosting		eiver for Web Sites					Help		
Licensing	and all and a state of the stat	eiver for Web Sites	Classic Experience	Authentication Met		HTMLS Receiver			
App-V Publishi	Receiver for Web Site http://xdvm.pe.lab/Citrix/StoreWeb	-	Classic Experience	Authentication Met		Not Used	Store Service Manage Delivery Controllers		
AppDNA Zones Stores Server Group							Configure Unified Experience Manage Authentication Meth Manage Receiver for Web Site Configure Remote Access Set Configure Store Settings Export Provisioning File	15	
							Remove Store		
							I Help		
ш						Activate W Go to System Windows	indows n Control Panel to activate		

1. Using Internet Explorer or your favorite web browser navigate to the XenDesktop servers StoreFront URL. If you are not sure what this URL is, log in to the XenDesktop server and open **Citrix Studio**. On the left-hand pane, select the **Stores**

menu option. Under **Details** select **Receiver for Web Sites.** Note the **Website URL** displayed on the center pane.



 Open the Receiver for Web URL in a web browser. If Citrix Receiver client is not installed a prompt will be displayed to Install the client. Select the I agree with the Citrix license agreement check box. Select Install to begin installation of the Citrix Receiver client. Alternately select the Log on link to skip the installation and continue to Receiver for Web.



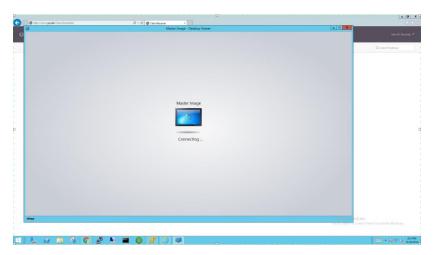
3. Enter **User name** (including domain account) and **password**, then select **Log On** to continue.

Citrix Store F	n. pe.lab /Citrix/StoreWeb/		ې - ح 🎯 Ci
	ront		
	Details		Details
ЈК		Master Image	
l l			
I I			
1 			

4. The Delivery Group resources that the logged in user has been granted access to will be displayed on the **Desktop** catalog page. Select the **Master Image** icon, to test that XenDesktop functionality is configured properly.

	Internet Explorer Security
8	A website wants to open web content using this program on your computer
	This program does not have a valid digital signature that verifies its publisher. This program will open outside of Protected mode, putting your computer at risk. You should only run programs from publishers you trust. Image: Image
	Allow Don't allow

5. If an Internet Explorer Security dialog displays, select Allow.



6. The **Desktop Viewer** will display with a connecting message.



7. When the image is fully loaded, the **Windows Desktop** will be displayed.



8. The drop down tab at the top can be accessed to enter Full Screen mode.

3	Main Functionalities:
	1) Displays a green arrow on top of the icon, if the desktop
	image is pixel perfect lossless.
	 Provides an option to switch to Always Lossless any time within Session.
	3) Alt+Shift+1 is the Hot Key to select/deselect Lossless Switch.

9. The Citrix HDX 3DPro Lossless Indicator notice is displayed when you change screen attributes such as entering full screen mode. This is indicating that the ICA session is being graphically accelerated with the HDX 3D Pro technology.

CHAPTER 12. TESTING, MONITORING, & BENCHMARKING

This chapter describes various means of testing and benchmarking your NVIDIA GRID installation, including:

- NVIDIA System Management Interface (nvidia-smi)
- Testing and simulation applications and tools

12.1 TESTING VIRTUAL DESKTOPS VS PHYSICAL ONES, IMPORTANT DIFFERENCES

Virtualization is a shared environment. It provides efficiencies and administrative ease that are impossible with bare metal installs. Where a physical workstation or PC is one solution to the problem of making professional visualization applications available, virtualizing those same workloads is a very different solution. The testing and benchmarking must be viewed accordingly. In a physical workstation, the connection to the user is immediate; screens are delivered directly to a monitor, and keystrokes and mouse operations are conducted directly to the system. In a virtualized system, the video must travel across networks to devices at the user's location. Where the goal on bare metal is to maximize performance at that desktop, with virtual desktops the goal is to maximize performance all the way across the network, to whatever device, over bandwidth and latency constraints that the end user is experiencing.

12.2 NVIDIA SYSTEM MANAGEMENT INTERFACE

The NVIDIA System Management Interface (nvidia-smi) is a command line utility based on the NVIDIA Management Library (NVML). The NVML helps you manage and monitor NVIDIA GPU devices by allowing you to query and (if you have the appropriate privileges) modify the GPU device state. Information can be reported in either XML or human-readable plain text using either standard or file output. Refer to the nvidia-smi documentation for more information.

nvidia-smi is designed for Tesla and Fermi-based Quadro devices; however, it does offer limited support for other NVIDIA GPUs as well.

Nvidia-smi ships with NVIDIA GRID vGPU Manager and with the graphics drivers for each OS.

12.2.1 Querying nvidia-smi

To obtain a system-wide overview of the NVIDIA GPUs, call the **nvidia-smi** command without any arguments:

\$ nvidia-smi

In the following example system output, a eight virtual machines are utilizing a GRID Tesla M60 with the M60-1Q vGPU profile, and the GPU utilization for the GPU that are hosting the vGPU profiles is 11% and 0% respectively.

The nvidia-smi documentation is available at http://developer.download.nvidia.com/compute/DCGM/docs/nvidia-smi-367.38.pdf.

	v 1 03			-								
						Drive						
GPU Fan	Name Temp	Perf	Pers Pwr:	istenc Usage/	e-M Cap	Bus-Id	Memo	Disp.A ry-Usage	Vo GP	latile U-Util	Uncorr. Compute	ECC M.
0 N/A	Tesla 44C	M60 P8	24	On W / 15	 0W	0000:05 4520M	:00.0 IiB /	Off 8191MiB		11%		Off ult
1 N/A	Tesla 40C	M60 P8	23	On W / 15	 0W	0000:06 3619M	:00.0 IiB /	Off 8191MiB		0%		Off ult
Proc GPU	esses:	PID	Туре	Proce	ss n	ame					GPU Mem Usage	ory
0				CLone								MiB

	0	113970	C+G	LinkedClone002	896MiB
	0	114062	C+G	LinkedClone004	896MiB
	0	114313	C+G	LinkedClone006	896MiB
	0	114314	C+G	LinkedClone007	896MiB
	1	114059	C+G	LinkedClone001	896MiB
	1	114060	C+G	LinkedClone005	896MiB
	1	114061	C+G	LinkedClone003	896MiB
1	1	114827	C+G	CLonevGPU002	896MiB
+					+

12.2.2 Monitoring

Adding command switches allows you to use nvidia-smi to monitor GPU performance metrics. To monitor the GPU utilization for the GPU hosting the vGPU (not the vGPU utilization) in the section 12.2.1, Querying nvidia-smi example on page 272, use the following command switches:

- --id is the PCI address of the device being queried. You can determine the address from the nvidia-smi output or by using the gpuvm command.
- --format is the desired output format (CSV format, in this example).
- --query is the types of data you wish to query and output. Be sure to separate date using commas, and refrain from using spaces.
- ▶ -1 is the number of seconds to loop the query (3 seconds in this example)
- ► > Win7-c01-GPU.log redirects the console output into a file.

Press **CTRL+c** to stop logging.

This following example logs GPU performance to the file Win7-c01- GPU.log:

```
$ nvidia-smi --id=0000:86:00.0 --format=csv --query-
gpu=utilization.gpu,utilization.memory,memory.total,memory.used,memory.
free -1 3 > Win7-c01-GPU.log
```

Begin collecting GPU metrics by launching an application. When finished, press **CTRL+c** to stop logging.

Use the following command to display the logging results:

```
$ cat Win7-c01-GPU.log
```

The system returns output similar to the following:

```
utilization.gpu [%], utilization.memory [%], memory.total [MiB],
memory.used [MiB], memory.free [MiB]
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
0 %, 0 %, 8191 MiB, 919 MiB, 7272 MiB
```

0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
0	°,	C)	°,	81	91	Mi	в,	91	9	Mi	в,	7	27	2	Mi	В
42	~	,	3	1	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
39	9	,	3	0	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
5	°,	1	_	°,	81	91	Mi	в,	92	0	Mi	в,	7	27	1	Mi	В
4	°,	1	_	°,	81	91	Mi	в,	92	0	Mi	в,	7	27	1	Mi	В
21	. %	,	1	2	[%] ,	81	91	MiE	З,	92	0	Mi	В,	7	2	71	MiB
23	8	,	1	2	[%] ,	81	91	MiE	З,	92	0	Mi	В,	7	2	71	MiB
18	8	,	1	0	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
81	~ ~	,	5	6	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
90	8	,	6	0	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
92	~	,	6	1	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
82	~	,	5	5	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
92	~	,	6	1	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
89	8	,	5	9	°,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
90	8	,	5	8	[%] ,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
95	8	,	6	2	[%] ,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
92	6	,	6	1	[%] ,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
82	6	,	5	4	[%] ,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
94	6	,	6	6	[%] ,	81	91	MiE	З,	92	0	Mi	Β,	7	2	71	MiB
5	°,	1	_	°,	81	91	Mi	в,	92	1	Mi	в,	7	27	0	Mi	В
2	°,	C)	°,	81	91	Mi	в,	92	1	Mi	в,	7	27	0	Mi	В

You can use a graphing application to display the overall GPU utilization and GPU memory utilization.

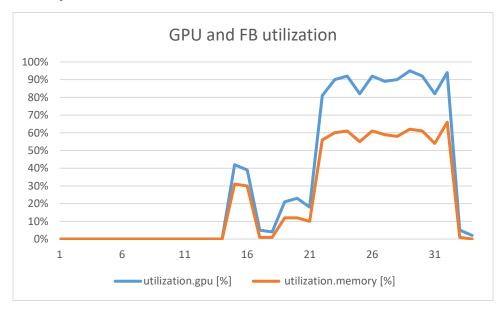


Figure 12-1 Graphed Log Output

12.3 TESTING/SIMULATING APPS AND TOOLS

This section contains numerous examples of tools and applications used for testing performance, benchmarking, and other verification purposes.

12.3.1 GPUProfiler

https://github.com/JeremyMain/GPUProfiler/releases

12.3.2 Browsers

- ► HTML 5 (Fishbowl): <u>http://ie.microsoft.com/testdrive</u>
- ► Internet Explorer: <u>http://windows.microsoft.com/en-us/internet-explorer/download-ie</u>
- Chrome: <u>http://chrome.google.com</u>
- ► Firefox: <u>www.mozilla.org/firefox</u>
- Facebook: <u>www.facebook.com</u>
- ► NVIDIA: <u>www.nvidia.com</u>
- ► ESPN: <u>www.espn.com</u>

12.3.3 Microsoft

- Office 2013 (turn on and off GPU Acceleration): <u>http://www.microsoft.com/en-us/evaluate-office-professional-plus-2013</u>
- Office 2016: <u>https://products.office.com</u>

12.3.4 Dassault Systèmes

- SOLIDWORKS: <u>http://www.solidworks.com/sw/purchase/solidworks-trial.htm</u>
- CATIA: <u>http://www.3ds.com/products-services/catia</u>

12.3.5 PTC

Creo: <u>http://www.ptc.com/product/creo</u>

12.3.6 Siemens

Siemens NX: <u>http://www.plm.automation.siemens.com/en_us/products/nx/</u>

12.3.7 OpenGL

- ► FurMark: <u>http://www.ozone3d.net/benchmarks/fur</u>
- ► Unigine: <u>http://unigine.com/products/benchmarks/</u>
- Heaven (newest): <u>http://unigine.com/products/heaven/</u>
- Valley: <u>http://unigine.com/products/valley/</u>
- ► Tropics: <u>http://unigine.com/en/products/benchmarks/tropics</u>
- Sanctuary: <u>http://unigine.com/en/products/benchmarks/sanctuary</u>

12.3.8 Lego Designer

Lego Designer: <u>http://ldd.lego.com/en-us/</u>

12.3.9 Adobe

- Reader: <u>http://get.adobe.com/reader</u>
- Acrobat: <u>http://www.adobe.com/Acrobat_XI</u>
- Creative Cloud Suite: <u>http://www.adobe.com/CreativeCloud</u>
- Photoshop (with high-resolution images): <u>http://www.adobe.com/Photoshop</u>
- ► Illustrator: <u>http://www.adobe.com/Illustrator</u>

12.3.10 BitSquid Stone Giant

Bitsquid Stone Giant: <u>http://international.download.nvidia.com/geforce-com/international/techdemos/stone_giant_setup.exe</u>

12.3.11 Google Earth

- ► Locally installed: <u>https://www.google.com/earth/explore/products/desktop.html</u>
- Chrome delivered: <u>https://www.google.com/earth/explore/products/plugin.html</u>

12.3.12 Hulu/YouTube videos

 Try an assortment of videos with dialog, as this is critical for the video playback test (making sure lips are moving in time with the audio).

12.3.13 Autodesk

- AutoCAD: <u>http://www.autodesk.com/products/autocad/free-trial</u>
- Revit: <u>http://www.autodesk.com/products/revit-family/free-trial</u>
- Revit samples: <u>http://grabcad.com/library/software/autodesk-revit</u>

12.3.14 Slicer3D

► 3D Slicer: <u>http://download.slicer.org/</u>

12.3.15 FutureMark

- ► 3DMark: <u>http://www.futuremark.com/benchmarks/3dmark</u>
- PCMark: <u>http://www.futuremark.com/benchmarks/pcmark8</u>

CHAPTER 13. KNOWN ISSUES

This section lists some of the known issues that are current as of the publication date of this manual.

13.1 UNINSTALLING EXISTING VSGA VIB TO INSTALL THE NVIDIA GRID VGPU VIB

You must uninstall an existing NVIDIA VIB file *before* installing a new vSGA or vGPU VIB. As of this publication, the NVIDIA VIBs for vSGA and vGPU are mutually exclusive.

To uninstall the NVIDIA VIB file for the purposes of upgrading the vib, issue the following command:

esxcli software vib remove -n NVIDIA-vgx-VMware_vSphere_6_Host_Driver

The output should be:

```
Removal Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed:
VIBs Removed: NVIDIA_bootbank_NVIDIA-vGPU-
VMware_ESXi_6.0_Host_Driver_367.43-10EM.600.0.0.2494585
VIBs Skipped:
```

To verify the installation status of the NVIDIA VIB, issue the following command in a vSphere shell:

esxcli software vib list | grep NVIDIA

- If an NVIDIA VIB is not installed, the command will not return any output.
- If an NVIDIA VIB is installed, the output will be:

```
NVIDIA_bootbank_NVIDIA-vGPU-VMware_vSphere_6_Host_Driver_367.43-
10EM.600.0.0.2494585
NVIDIA VMwareAccepted 2016-11-22
```

13.2 NVIDIA WDDM ISSUES

After installing the NVIDIA WDDM driver in a VM and connecting with Horizon Client, the desktop will not be visible from the Host Client console.

- Without a console, the vSphere Web Client can still provide the IP address of a VM.
- With Horizon Agent Direct Connection, a Horizon Client can connect directly to the IP address of a VM.

13.3 VGPU-ENABLED VMS AND NVIDIA-SMI FAIL TO START

If vGPU-enabled VMs are assigned too high a proportion of the server's total memory, one of more of the VMs may fail to start with the error "The available memory resources in the parent resource pool are insufficient for the operation", and nvidia-smi run in the host shell returns the error "-sh: can't fork".

For example, on a server configured with 256GB of memory, these errors may occur if vGPU-enabled VMs are assigned more than 243GB of memory. Reduce the total amount of system memory assigned to the VMs.

13.4 VMOTION AND DRS NOT SUPPORTED

Virtual machines utilizing vGPU, or vDGA/pass-through, or SR-IOV, do not support vMotion or similar live motion functionality due to the dependence on a physical hardware resource. Cold motion, shutting down the virtual machine and moving it to another identically GPU equipped host, works well.

CHAPTER 14. TROUBLESHOOTING

This section contains procedures for resolving common issues.

Before troubleshooting or filing a bug report, review the release notes for information about known issues with the current release, and potential workarounds.

14.1 TROUBLESHOOTING PROCEDURE

If a vGPU-enabled virtual machine either fails to start or does not display any output when it does start, follow these procedures to narrow down the probable cause.

14.1.1 Confirm the GPU Installation

Run the following command on the vSphere host to confirm that the graphics adapter has been physically installed correctly, and that vSphere is aware of the device:

```
$ lspci | grep -i display
```

Output should look similar to the following:

```
0000:0f:00.0 Display controller: Matrox Electronics Systems Ltd. MGA
G200e [Pilot] ServerEngines (SEP1)
0000:86:00.0 Display controller: NVIDIA Corporation NVIDIATesla M60
[vmgfx0]
0000:87:00.0 Display controller: NVIDIA Corporation NVIDIATesla M60
[vmgfx1]
```

In this example, the bottom two devices **86**:00.0 and **87**:00.0 are associated with the Tesla M60 card.

Run the following command to list details about the GPUs listed above:

```
$ esxcli hardware pci list -c 0x0300 -m 0xff
```

You should see output like the following for each of the device class 0x300 (Display):

```
0000:86:00.0
  Address: 0000:86:00.0
   Segment: 0x0000
  Bus: 0x86
  Slot: 0x00
  Function: 0x0
  VMkernel Name: vmgfx0
  Vendor Name: NVIDIA Corporation
  Device Name: NVIDIATesla M60
  Configured Owner: Unknown
  Current Owner: VMkernel
  Vendor ID: 0x10de
   Device ID: 0x13f2
   SubVendor ID: 0x10de
   SubDevice ID: 0x115e
   Device Class: 0x0300
  Device Class Name: VGA compatible controller
  Programming Interface: 0x00
  Revision ID: 0xal
  Interrupt Line: 0x0b
  IRQ: 255
  Interrupt Vector: 0x37
  PCI Pin: 0x00
   Spawned Bus: 0x00
  Flags: 0x0201
  Module ID: 21
  Module Name: nvidia
  Chassis: 0
  Physical Slot: 4294967295
  Slot Description: SlotID:5; relative bdf 01:00.0
   Passthru Capable: true
   Parent Device: PCI 0:133:8:0
  Dependent Device: PCI 0:134:0:0
   Reset Method: Bridge reset
  FPT Sharable: true
```

14.1.2 Setting the GPU Graphics Mode

To ensure that the GPUs are set to the proper GPU mode, complete the following procedure.

CAUTION: The gpumodeswitch VIB and the GPU Driver VIB cannot be simultaneously installed. Doing so prevents the gpumodeswitch driver from operating properly.

- 1. If the GPU Driver VIB is currently installed, uninstall it. Refer to Section 6.2 *Uninstalling the VIB* on page 135
- 2. Upload the gpumodeswitch software VIB to the ESXi server. Refer to Section 6.1.1 *Uploading VIB in vSphere* on page 128
- **3.** Place the server in Maintenance Mode. See Section 6.1.2 *Place the Host in Maintenance Mode* on page 133
- **4.** Issue the following command to install the gpumodeswitch VIB, where **<path>** is the full path to the VIB file:

```
$ esxcli software vib install --no-sig-check
-v /<path>/NVIDIA-GpuModeSwitch-10EM.600.0.0.2494585.x86 64.vib
```

The following error displays if you *do not* use the full path: **[VibDownloadError]**.

When the installation is successful, the following displays:

```
Installation Result:
Message: Operation finished successfully. Reboot Required: false
VIBs Installed: NVIDIA_bootbank_NVIDIA-
VMware_ESXi_6.0_GpuModeSwitch_Driver_1.0-10EM.600.0.0.2494585
```

VIBs Removed: VIBs Skipped:

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

- 5. Reboot the host by typing **Reboot** and pressing **ENTER**.
- **6.** Once the server has rebooted, log in to the console and execute the following command:

```
$ gpumodeswitch --listgpumodes
```

The following output (or similar) will be displayed.

```
NVIDIA GPU Mode Switch Utility Version 1.23.0
```

```
Copyright (C) 2015, NVIDIA Corporation. All Rights Reserved.
Tesla M60
                     (10DE, 13F2, 10DE, 115E) H:--:NRM
S:00,B:05,PCI,D:00,F:00
Adapter: Tesla M60
S:00,B:05,PCI,D:00,
                              (10DE,13F2,10DE,115E) H:--:NRM
                                 F:00
Identifying EEPROM...
EEPROM ID (EF, 3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
GPU Mode: Graphics
Tesla M60
                     (10DE, 13F2, 10DE, 115E) H:--:NRM
S:00,B:06,PCI,D:00,F:00
Adapter: Tesla M60
S:00,B:06,PCI,D:00,
                              (10DE,13F2,10DE,115E) H:--:NRM
                                   F:00
Identifying EEPROM...
EEPROM ID (EF, 3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
GPU Mode: Graphics
```

- **7.** If the GPU is not in Graphics mode, set all available GPU to graphics mode by entering the following command:
- \$ gpumodeswitch --gpumode graphics

8. When prompted, type **y** to confirm the mode switch.

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

Update GPU Mode of all adapters to "graphics"?

Press 'y' to confirm or 'n' to choose adapters or any other key to abort: $\ensuremath{\mathbf{y}}$

You should see output like the following:

```
Updating GPU Mode of all eligible adapters to "graphics"

Tesla M60 (10DE,13F2,10DE,115E) H:--:NRM

S:00,B:05,PCI,D:00,F:00

Adapter: Tesla M60 (10DE,13F2,10DE,115E) H:--:NRM

S:00,B:05,PCI,D:00,F:00

Identifying EEPROM...

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

Programming UPR setting for requested mode..

License image updated successfully.

Programming ECC setting for requested mode..
```

```
The display may go *BLANK* on and off for up to 10 seconds or more
during the update process depending on your display adapter and output
device.
Identifying EEPROM...
EEPROM ID (EF, 3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
. . . . . . . . . . . . . . . . .
Verifying update ...
Update successful.
Firmware image has been updated from version 84.04.85.00.03 to
84.04.85.00.03.
A reboot is required for the update to take effect.
InfoROM image updated successfully.
Tesla M60
                      (10DE, 13F2, 10DE, 115E) H:--:NRM
S:00,B:06,PCI,D:00,F:00
Adapter: Tesla M60
                              (10DE, 13F2, 10DE, 115E) H:--:NRM
S:00,B:06,PCI,D:00,F:00
Identifying EEPROM...
EEPROM ID (EF, 3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
Programming UPR setting for requested mode..
License image updated successfully.
Programming ECC setting for requested mode..
The display may go *BLANK* on and off for up to 10 seconds or more
during the update process depending on your display adapter and output
device.
Identifying EEPROM...
EEPROM ID (EF, 3013) : WBond W25X40A 2.7-3.6V 4096Kx1S, page
NOTE: Preserving straps from original image.
Clearing original firmware image...
Storing updated firmware image...
. . . . . . . . . . . . . . . . .
Verifying update ...
Update successful.
Firmware image has been updated from version 84.04.85.00.04 to
84.04.85.00.04.
A reboot is required for the update to take effect.
```

InfoROM image updated successfully.

9. Uninstall the gpumodeswitch VIB by executing the following command:

```
$ esxcli software vib remove -n NVIDIA-
VMware_ESXi_6.0_GpuModeSwitch_Driver
```

10. Reinstall the vGPU Manager VIB. Refer to section 6.1 *Prepare and Install the VIB Files* on page 128

14.1.3 Verify the VIB Installation

Run the following command using a shell on the host server to confirm that the VIB is installed:

\$ esxcli software vib list | grep NVIDIA

If the vib is installed, then the output should like something like this:

```
NVIDIA-vGPU-VMware_ESXi_6.0_Host_Driver 367.43-10EM.600.0.0.2494585
NVIDIA VMwareAccepted 2016-11-23
```

14.1.4 Confirm VIB Loading

To confirm that the NVIDIA module has been loaded, run the following command:

```
$ esxcfg-module -1 | grep nvidia
```

The result should be:

nvidia 2 11312

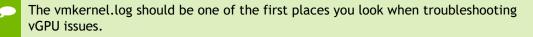
If there is no output, manually load the module by issuing the following command:

```
$ esxcli system module load -m nvidia
```

You can verify that the module loaded using the following command:

\$ cat /var/log/vmkernel.log | grep NVRM

Include any NVRM specific output from /var/log/vmkernel.log in any support requests regarding module loading errors.



14.1.5 Confirm PCI Bus Slot Order

If you installed a second lower-end GPU in the server, it is possible that the order of the cards in the PCIe slots will choose the higher-end card for the vSphere console session. If

this occurs, either swap the two GPUs between PCIe slots or change the Primary GPU settings in the server BIOS.

14.1.6 Check for X.Org Server Issues

If vGPU-enabled virtual machines fail to start, confirm that the X.Org server is functioning, as this is a fundamental service and necessary for vGPU. You can do this via the web UI of the vSphere Web Client, or via SSH to that vSphere host.

14.1.6.1 Managing X.Org Server via the Web Client

Navigator	IIIIIII Actions -			E
(• Home 🕑 🐑	Getting Started Summary M	onitor Manage Related Object	rts	
Conterapp6.nvidia.lab PSG	Settings Networking Storage		hissions	
▶ U Management	**	Direct Console UI	Running	-
- IP Production	Time Configuration *	ESXI Shell	Running	
10.31.235.11	Authentication Services	SSH	Running	_
10.31.235.12	Certificate	Load-Based Teaming Dae	Running	
10.31.235.15	Power Management	Active Directory Service	Stopped	_
🖧 Workstation	Advanced System Settings	NTP Daemon	Running	
		PC/SC Smart Card Daemon	Stopped Stopped	_
	System Resource Reservation	CIM Server		
	Security Profile	SNMP Server	Stopped	
	System Swap	Syslog Server	Running	
		VProbe Daemon	Stopped	
	✓ Hardware	VMware vCenter Agent	Running	11
	Processors	X.Org Server	Stopped	
	Memory Graphics Power Management	Lockdown Mode When enabled, lockdown mod logging directly into this host. T		

 Using the VMware vSphere Web Client, browse to the host in question via the menu on the left. From Home, click Hosts, then drill down and single click on the specific host. Using the view on the main window to the right, click the Manage tab, then the Settings sub-tab, then scroll down then menu to the Security Profile section as shown below. On the Security Profile list, scroll down to the Services section, look for X.Org Server.

Navigator		¥	🗐 10.31.235.11 Actions -			-
A Home	10)	Getting Started Summary Mor	nitor Manage Related Obje	rts	
vcenterapp6.nvidia.lab	Q		Settings Networking Storage	Alarm Definitions Tags Perm	hissions	
✓ Management			"	vsanvp	8080 (TCP) All	
		>	Time Configuration	Services	Refresh Edit	
10.31.235.12		-	Certificate	Name	Daemon	1
10.31.235.15				Direct Console UI	Running	1
B Workstation			Power Management	ESXI Shell	Running	
			Advanced System Settings	SSH	Running	
			System Resource Reservation	Load-Based Teaming Dae	Running	
				Active Directory Service	Stopped	
			Security Profile	NTP Daemon	Running	ł
			System Swap	PC/SC Smart Card Daemon	Stopped	1
				CIM Server	Stopped	1
			Processors	SNMP Server	Stopped	l
			Memory	Syslog Server	Running	
			Graphics	VProbe Daemon	Stopped	1
			Power Management	VMware vCenter Agent	Running	
			PCI Devices •	X.Org Server	Stopped	

2. In the Services section you can see the current reported status of the X.Org Server service. To change or restart it, single click on **X.Org Server**, then click **Edit**.

📋 10.31.235.11: Ee	iit Security Profile		(?)»
	o a service or client, check the corresponding bo a will start automatically when any of their ports a	ох. are opened, and stop when all of their ports are closed.	
Name	Dae	mon	
CIM Server	Sto	pped	*
SNMP Server	Sto	pped	
Syslog Server	Ru	nning	
VProbe Daemon	Sto	pped	
VMware vCenter Ag	ent Ru	nning	**
X.Org Server	Sto	pped	Ŧ
	Stopped		
Status	Stopped		
	Start Stop Restart Note: Action will take place immediately		
Startup Policy	Start and stop with host		
	unari anu olop mari nodi		
		OK Ca	ncel

3. The service edit window appears, showing current reported status and allowing you access to starting, stopping, restarting, and managing service behavior on server boot. For a vGPU host, you want the service to start and stop with the host. In the example below we show the service as stopped, click **Start**.

10.31.235.11: Edit Security Profile		?	**	
To provide access to a service or client, check the corresponding box. By default, daemons will start automatically when any of their ports are opened, and stop when all of their ports are closed.				
Name	Daemon			
CIM Server	Stopped		-	
SNMP Server	Stopped			
Syslog Server	Running			
VProbe Daemon	Stopped			11
VMware vCenter Agent Running		**		
X.Org Server	Running		•	
	Running			1
Status	Running			11
	Start Stop Restart Note: Action will take place immediately			
Startup Policy	Start and stop with host			
				1
		ОК Са	ncel),

- 4. The window will refresh and the service should start.
- 5. Check that your vGPU guests can now start.

14.1.6.2 Managing X.Org via CLI

1. Using SSH, connect to the host running vGPU and log in.

PuTTY is a useful Windows based tool to gain SSH access to a host.

2. Check the status of X.Org Server:

\$ /etc/init.d/xorg status

If the X.Org server is operating correctly, the system displays the following output:

Xorg is running

If the X.Org server is not running, the system displays the following output:

Xorg is not running

3. Start the X server using the following command, if necessary:

\$ /etc/init.d/xorg start

The system should return the following messages:

```
Xorg0 started
Xorg1 started
```

4. To troubleshoot an X.Org startup issue, examine the log file for NVIDIA- and/or GPU-related message using the following command:

```
$ cat /var/log/Xorg.log | grep -E "GPU|nv"
```

14.1.7 Check nvidia-smi

The NVIDIA System Management Interface (nvidia-smi) is the primary tool to see how much of each GPU is in use when using the NVIDIA driver. To see data about the physical card, run nvidia-smi on the host by issuing the following command in an SSH session:

```
$ nvidia-smi
```

This shows various details of GPU status and usage at the time the command is issued. (The data display is not dynamically updated).

The system returns output similar to the following:

```
Wed Nov 23 18:44:31 2016
----+
| nvidia-smi 367.43
                Driver Version: 367.43
----+
| GPU Name Persistence-M| Bus-Id Disp.A | Volatile
Uncorr. ECC |
Uncorr. ECC |
| Fan Temp Perf Pwr:Usage/Cap| Memory-Usage | GPU-Util
Compute M. |
======|
| 0 Tesla M60 On | 0000:86:00.0 Off |
Off |
| N/A 43C P8 24W / 150W | 19MiB / 8191MiB | 0%
Default |
+----
     _____+
____+
| 1 Tesla M60 On | 0000:87:00.0 Off |
Off |
| N/A 36C P8 24W / 150W | 19MiB / 8191MiB | 0%
Default |
____+
----+
```

```
      I Processes:
      GPU

      Memory |
      I

      I GPU
      PID Type Process name

      Usage
      I

      I========
      I

      I No running processes found
      I

      I +------+ +
      Image I

      The Valatile CDU Util metric is the mest meaningful for traublechapting which chaur.
```

The Volatile GPU-Util metric is the most meaningful for troubleshooting, which shows the percentage of the cores on each GPU that are busy at that point in time. This metric can help troubleshoot performance problems, such as by helping you determine whether a GPU is being overloaded.

nvidia-smi requires CPU and other system resources. Repeated loading and running of this command can cause a reduction in performance. Instead use the loop command by adding a -1 to the command, such as **#** nvidia-smi -1

If you do not specify a delay value, then nvidia-smi will refresh every five seconds. See the nvidia-smi documentation for further usage information.

14.1.8 Resolving Black Screen Errors

This issue may occur with high-resolution displays or multi- monitor configurations. Use the following procedure to correct this issue:

- 1. Open vCenter.
- 2. Select the **Settings** tab for the virtual machine.
- **3.** Select the video card.
- 4. Select Specify custom settings.
- **5.** Adjust the video memory value higher (such as 32 MB, 64 MB, or 128 MB), as needed; see the Video Memory Calculator for recommended settings.

14.1.9 Multi-monitor Display Issues

Some older GRID K1 and GRID K2 BIOS do not support multi- monitor mode. Contact the vendor for updated BIOS and updating instructions, or upgrade to Tesla M series cards.

14.2 ADDITIONAL REMEDIATING STEPS

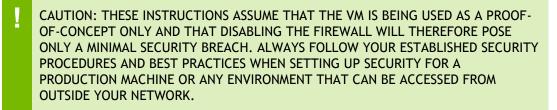
14.2.1 Enabling VM Console VNC Access

Enabling VNC support for the virtual machine console will negatively impact performance and should only be used for troubleshooting driver or Horizon connection issues when using vGPU within the virtual machine.

To enable VNC access for the virtual machine console, add the following to the virtual machine's .VMX file:

```
RemoteDisplay.vnc.enabled = TRUE
RemoteDisplay.vnc.port = 5901
RemoteDisplay.vnc.password = your-password
```

You will need to either manually open the port(s) in the virtual machine's firewall settings or disable it completely.



14.2.2 Joining an Endpoint to the Domain

If the endpoint is not joined to the domain, change the Horizon connection server settings to the IP address of the server (as opposed to the DNS name of the server), as follows:

- 1. Select the server to edit in the VMware Horizon Client.
- 2. Enter your username and password in the displayed pop-up.
- 3. Select Continue to display an alert popup with the following message: Error: Unable to resolve server address: nodename nor servname provided, or not known.
- 4. Select **OK** to continue to the Horizon interface.
- 5. Select Servers in the Horizon interface,
- **6.** Select the server to modify.

	w/server D + C	Certificate error C	Range View Admini	strator	×					
/Mware Horizon 7 Adm	inistrator									
Updated 11/23/2016 6:50 PM 🥭	Servers									
Sessions 0 Problem vCenter VMs 7	vCenter Servers Security Servers Connection Servers									
Problem RDS Hosts 0 Events 0 1 0 System Health	Enable Disable Edit Backup Now Vore Commands									
9 1 1 0	Connection Server	Version	PCoIP Secure	State	Settings					
	CONNSERVER	7.0.2-43566	Installed	Enabled	Secure tunnel connection, Smart card					
Inventory										
💫 Dashboard 🍓 Users and Groups										
► Catalog ▼ Resources										
Farms										
Machines										
Persistent Disks										
▶ Monitoring										
Policies										
View Configuration										
Servers										
Instant Clone Domain Admins										
Product Licensing and Usage										
Global Settings										
Registered Machines Administrators										
ThinApp Configuration										
Cloud Pod Architecture										
Event Configuration										

7. Select **Edit** to display the **Edit Connection Server Settings** window.

lit Connection :	Server Sel	ttings	
General A	Authentica	tion Backup	
Tags			
Tags can be Tags:	e used to i	restrict which desktop pools ca	an be accessed through this Connection Server. ————————————————————————————————————
HTTP(S) Sec			
🗹 Use Secu External UR		I connection to machine ③ https://10.19.0.10:443	Example: https://myserver.com;443 ③
PCoIP Secure	e Gateway		
		Gateway for PCoIP connection	
PCoIP Exter		10.19.0.10:4172	Example: 10.0.0.1:4172 👔
🗹 Use Blas	t Secure (Sateway for Blast connections	to machine ③
Blast Extern	nal URL:	https://10.19.0.10:8443	Example: https://myserver.com:8443 ③
			OK Cancel

8. Change the hostnames to IP addresses in the External URL and Blast External URL fields. Select **OK** to return to the Horizon interface.

14.2.3 Filing a Bug Report

When filing a bug report or requesting support assistance from NVIDIA, it is critical to include information about the environment, so that the technical staff that can help you resolve the issue. Include in this information details on the host and virtual machine builds, software versions for host and virtual machines, the hardware, the impacted applications (with versions, patch levels, etc.) with screenshots or similar, and any service ticket numbers or similar help requests with other vendors.

NVIDIA includes the **nvidia-bug-report.sh** script within the VIB installation package to help collect and package some of this critical information. The script collects the following information:

- VMware version
- X.Org log and configuration
- PCI information
- CPU information
- GPU information
- **esxcfg** information for PLX devices
- **esxcfg** information for GPU devices
- VIB information
- NVRM messages from vmkernel.log
- System **dmesg** output
- ▶ Which virtual machines have vGPU or vSGA configured
- nvidia-smi output

When running this script:

- You may specify the output location for the bug report using either the -o or –output switch followed by the output file name. If you do not specify an output directory, the script will write the bug report to the current directory.
- If you do not specify a file name, the script will use the default name nvidia-bug-report.log.gz.
- If the selected directory already contains a bug report file, then the script will change the name of that existing report file to nvidia-bug-report.log.old.gz before generating a new nvidia-bug-report.log.gz file.

To collect a bug report, issue the command:

```
$ nvidia-bug-report.sh
```

The system displays the following message during the collection process:

nvidia-bug-report.sh will now collect information about your system and create the file 'nvidia-bug-report.log.gz' in the current directory. It may take several seconds to run. In some cases, it may hang trying to capture data generated dynamically by the vSphere kernel and/or the NVIDIA kernel module. While the bug report log file will be incomplete if this happens, it may still contain enough data to diagnose your problem.

Be sure to include the **nvidia-bug-report.log.gz** file when reporting problems to NVIDIA.

CHAPTER 15. USING WINSCP

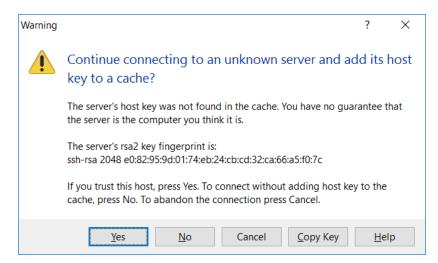
This section describes how to upload a VIB file using WinSCP. Before doing this:

- Ensure that SSH is enabled on vSphere.
- Download and install WinSCP on a Windows PC that has network connectivity to your vSphere host.

Use	e the following procedure to upload a	VIB f	ile using	WinSCF	»:
					_

🔁 Login		- 🗆 X
Login	Session File protocol: SCP	Port number: 22 💭 Password: Advanced
Tools Manage	₽ Login ▼	Close Help

1. Start WinSCP to display the Login screen. Enter the connection details required to connect to the vSphere host.



2. Select **Login** to display the **Commander** window. If this is your first time connecting to this server, a warning dialog will appear asking you to confirm the connection.

NVIDIA-GRID-vSphere-6.0-367.64-369.71 - root@192.168.112.128 - WinSCP					-		\times
Local Mark Files Commands Session Options Remote Help							
🎛 🔁 😓 Synchronize 📰 🦑 🔝 🎲 🖓 Queue 🗸 Transfer Settings Def	ault	- <i>🔂</i> -					
🛛 root@192.168.112.128 🖳 New Session							
🖕 C: Windows 🔹 🗧 🚰 🛐 🖛 🔹 🔶 🛍 🔝 🏠 🛃 🔚		📕 / <root> 🔹 🖆</root>	T	- 🗈 🖾 🔁 🛙	🗎 Find Files 🛛 🖥		
🔋 Upload 👻 📝 Edit 👻 🗶 📝 🕞 Properties 🚰 🕞 🛨 🖃 🗹		Download 👻 📝 E					
\Users\jokennedy\Downloads\GRID software\NVIDIA-GRID-vSphere-6.0-367.64-369	.71	/					
ame	Size	Name	Size	Changed	Rights	Owner	Τ
		📜 bin		2/15/2017 9:17 PM	rwxr-xr-x	root	
367.64-369.71-nvidia-grid-licensing-guide.pdf	1,729 KB	🛃 bootbank		2/15/2017 9:17 PM	rwxrwxrwx	root	
367.64-369.71-nvidia-grid-vgpu-release-notes-vmware-vsphere.pdf	1,589 KB	📜 dev		2/16/2017 12:04 AM	rwxr-xr-x	root	
367.64-369.71-nvidia-grid-vgpu-user-guide.pdf	6,335 KB	📜 etc		2/15/2017 9:30 PM	rwxr-xr-x	root	
369.71_grid_win8_win7_32bit_international.exe	184,917 KB	📜 lib		2/15/2017 9:17 PM	rwxr-xr-x	root	
369.71_grid_win8_win7_server2012R2_server2008R2_64bit_international.exe	255,095 KB	📕 lib64		2/15/2017 9:17 PM	rwxr-xr-x	root	
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3. Once the connection is established, use the left pane of the WinSCP interface to navigate to the local folder containing the VIB file that you want to upload to the vSphere host.

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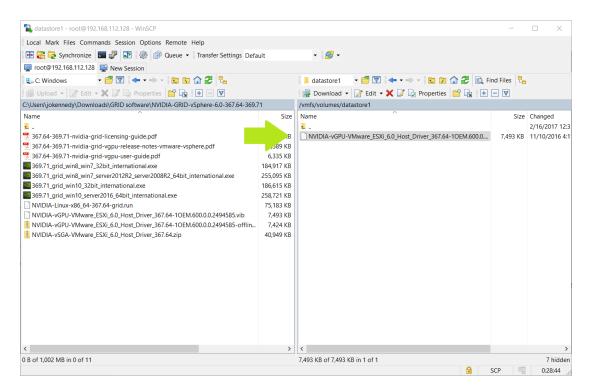
4. Navigate to the datastore using the right pane of the WinSCP interface.

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5. Right-click the VIB file and select **Upload** to upload the file to the host.

Upload	?	×
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Transfer settings Transfer type: Binary		
Transfer in background (add to transfer queue)		
Transfer settings	Help	
Do not show this dialog box again		

6. If the Upload dialog box appears, click OK.



7. Verify that the VIB file has uploaded.

APPENDIX A. ACRONYMS

CLI	"Command Line Interface" - as opposed to using a something graphical, this is ASCI text based interaction with an app or OS
GPU	"Graphics Processing Unit" - the physical chip that accelerates the creation of graphical imagery in frame buffer for output on a display.
GUI	"Graphical User Interface" - a visual, windowed based means of interacting with an app or OS
OS	"Operating System" - a base level installation such as Windows that controls the underlying hardware (or virtual hardware)
OVA	"Open Virtualization Appliance" - an OVF bundled into a discrete and portable appliance
OVF	"Open Virtualization Format" - portable files representing discrete virtual machines, these can be bundled into OVA packages as a discrete appliance as well
POC	"Proof of concept"
UI	"User Interface" - refers to a tool used to enter data or otherwise interact with an application or OS
VCSA	"vCenter Server Appliance" - The management server for a VMware vSphere instance.
VDA	"Virtual Desktop Agent" - software that allows the VM to connect to remote Citrix Receivers.
VDI	"Virtual Desktop Infrastructure" - a general term for desktop operating systems running as a guest on a host server
vGPU	"Virtual Graphics Processing Unit" - a virtual GPU provided by the hypervisor and managed by the GRID vGPU Manager to provide VM's access to the power of a physical GPU.
VIB	"vSphere Installation Bundle"
VM	"Virtual Machine" - an operating system running as a guest on a host server
vSGA	"Virtual Shared Graphics Acceleration"
WebUI	"Web User Interface" - a visual, windowed web based means of interacting with an app or \ensuremath{OS}

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