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GPU Setup Guide with VMware®



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1. Overview

This setup guide details the basic steps necessary to enable a GPU device for VDI. AMD FirePro™ S7150 and S7150x2 family of products are recommended especially if advanced support for Multiuser GPU (MxGPU) is required. However, previous S-series products, such as the S7000 and S9050, can be used if only passthrough is required.

The guide uses VMware[®] products as an example setup. These products include VMware ESXi™ as a hypervisor, the VMware vSphere[®] client and VMware Horizon[®] View[™].

2. Hardware and Software Requirements

The sections below detail the hardware and software that are required for setting up the VMware environment.

2.1 Hardware Requirements

2.1.1 Host/Server

Graphics Adapter: AMD FirePro™ **S7100X, S7150, S7150x2** for MxGPU and/or passthrough ***note that the AMD FirePro™ S7000, S9000 and S9050 can be used for passthrough

***note that the AMD FirePro™ S7000, S9000 and S9050 can be used for passthrough only

Sample of Certified Server Platforms:

- Dell PowerEdge R730 Server
- HPE ProLiant DL380 Gen9 Server
- SuperMicro 1028GQ-TR Server

Additional Hardware Requirements:

- CPU: 2x4 and up
- System memory: 32GB & up to 1TB; more guest VMs require more system memory
- Hard disk: 500G & up; more guest VMs require more HDD space
- Network adapter: 1000M & up

2.1.2 Client

Any of the following client devices can be used to access the virtual machine once these VMs are started on the host server:

- Zero client (up to 4 connectors) with standard mouse/keyboard and monitor
- Thin client with standard mouse/keyboard and monitor running Microsoft[®] Windows[®] Embedded OS
- Laptop/Desktop with standard mouse/keyboard and monitor running with Microsoft[®] Windows[®] 7 and up

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2.2 Software Requirements

| Product | Туре | Install On | Section | Version/Download Location |
|---|--|-----------------------|---------|---|
| VMware ESXi™ | Hypervisor | Host (Server) | 3.1.1 | https://my.vmware.com/en/web/vmware/evalcenter?p=free-esxi6 |
| VMware vSphere® | Client for Host | Host Admin. System | 3.2.2 | https://mv.vmware.com/en/web/vmware/evalcenter?p=vsphere6 |
| VMware Horizon® View™ | Client Receiver | Client Terminal | 3.3.1 | http://www.vmware.com/products/horizon-view/horizon6-hol |
| Horizon® View™ Agent | Connection Broker | Virtual Machine | 3.2.4.4 | https://my.vmware.com/web/vmware/info?slug=desktop_end_user_computing/vmware_horizon 6/6_2_ |
| Horizon [®] View [™] Agent Direct-Connection Plug-in | Plug-in | Virtual Machine | 3.2.4.4 | https://my.vmware.com/web/vmware/info?slug=desktop_end_user_computing/vmware_horizon 6/6_2_ |
| Windows Client OS | Guest OS | Virtual Machine | 3.2.4 | Windows 7 64 bit, Windows 10 64 bit |
| AMD FirePro™ Driver | Guest OS Graphics Driver | Virtual Machine | 3.4.1 | http://support.amd.com/en- us/download/workstation?os=VMware%20vSphere%20ESXi%206.0#catalyst-pro |
| SSH Secure Shell | SSH Client and Download Utility | Host Admin. System | 3.2.1 | |

Table 1 : Required Software for Document

(Links to non-AMD software provided as examples)



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3. Test Environment Setup for VMware ESXi™

3.1 Host Server Setup

If ESXi is already installed on the host (server) then the steps in this section are not required.

3.1.1 Install ESXi on Host

If the VMware ESXi hypervisor is not yet installed on the host (server), then obtain a purchased copy of the software from the IT organization. Alternatively, trial versions of the hypervisor are available. The valid period of the trial licenses for ESX is 60 days.

- 1. Create a DVD ROM of the ESXi ISO after downloading the hypervisor from Table 1.
- 2. Connect a monitor to the host display, connect at least one of the network connectors (1000M Ethernet card is preferred) to the LAN, attach a USB DVD ROM to the server (or use the internal DVD ROM drive), set the DVD to be the first boot device. Next, place the DVD in the DVD ROM drive and reboot the server. After reboot, the installation starts with a screen similar to the following :

| | Loading ESXi in | staller | |
|---|-----------------|---------|--|
| Loading /tboot.b00 Loading /bu98 Loading /bu95tf.g2 Loading /bu95cf.g2 Loading /bu95cg Loading /bu95cg Loading /bu96 Loading /bu96 Loading /bu96 Loading /bu96 Loading /bu96 Loading /bu96 Loading /bu96 Loading /bu98 Loading /bu98 Loading /bu98 | | | |
| | | | |
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 Before installing the hypervisor, the installation ISO loads drivers for common hardware devices detected in the host. Installation should proceed unless an unknown device (without drivers) is detected.

| VMware ESXi 6.0.0 (VMKernel Release Build 2494585) |
|--|
| HP ProLiant DL380 Gen9 |
| 2 x Intel(R) Xeon(R) CPU E5-2688 v3 @ 2.58GHz 64 Gi8 Memory |
| nfs4iclient loaded successfully, |
| |
| |
| |
| |
| |

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4. Once all required services and drivers are loaded, the welcome screen appears and prompts for confirmation before installing ESXi.

| VMware ESXI 6.0.0 Installer |
|---|
| |
| |
| |
| |
| |
| Welcome to the VMware ESXi 6.0.0 Installation |
| Nuere ESXi 6.0.0 installs on nost systems but only gstems on VMware's Compatibility Guide are supported. |
| onsult the VMware Compatibility Guide at: ttp://www.vmware.com/resources/compatibility |
| elect the operation to perform. |
| (Esc) Cancel (Enter) Continue |
| |
| |
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Follow the instructions shown on the monitor, and choose the default settings when prompted.



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6. When prompted, create a **root password** and <u>take note of this password</u>.

| Whare ESXi 6.0.0 Installer | |
|---|--|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Enter a root password | |
| Root passuord: ####### Confirm password: | |
| Passwords natch. | |
| (Esc) Cancel (F9) Back (Enter) Continue | |
| | |
| | |
| | |
| | |
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7. Depending on the current state of the host, additional screens may appear.



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8. A final confirmation prompt appears. Select "F11".



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9. Select "Enter" to reboot the host after installation completes.



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3.1.2 Configuring the ESX® Host

After reboot, the following screen appears:



- 1. Select the "F2" button ("Customize System/View Logs")
- 2. After entering the **root password** chosen during installation, select "**Troubleshooting Options**", then select "**Enable ESXi Shell**" and "**Enable SSH**"

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3. Choose "Configure Management Network" and select "IPv4 Configuration". Use the "static" address.



4. Save the IP address shown below to access host through either SSH or vSphere client later.

| VMware ESXi 6.0.0 (VMKernel Release Build 2494585) | |
|--|--------------|
| HP ProLiant DL380 Gen9 | |
| 2 x Intel(R) Xeon(R) CPU E5-2680 v3 @ 2.58GHz 61 GiB Nenery | |
| Download tools to manage this host from: http://ife80::3a63:bbff:fe33:5d41/ (STATIC) http://ife80::3a63:bbff:fe33:5d41/ (STATIC) | |
| (F2) Custonize System/View Logs (F12) Shut | Down/Restart |
| 18 | |

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3.2 Host Administrator System Setup

3.2.1 Install SSH Secure Shell

SSH Secure Shell will be needed for future updates and installations. This section assumes that SSH has already been enabled on the host (see previous section).

- 1. On the administrator system, download SSH Secure Shell from Table 1.
- 2. Run this application.
- After installation, two utilities will be installed as Secure Shell Client & Secure File Transfer Client as the following :



3.2.2 Install vSphere Client 6.0.0

- 1. On the administrator system, download the vSphere client from Table 1.
- 2. Run this application: VMware-Setup.exe
- After installation, the VMware vSphere client will be installed as



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4. Start this application. Ensure that the ESXi host server is up and running. Enter the ESXi host IP address (as noted previously) or computer name in "IP address / Name" entry field. Type "root" in "User Name" entry field. Enter the password created while setting up ESXi in the host server. Click Login button to connect to host.

| 🕜 VMware vSphere Client | × 1 |
|--|---|
| vmware [.] VMware vSphere Client | P |
| All vSphere features available only throug vSphere Client will co feature set as vSphe To directly manage a singl To manage multiple hosts, | introduced in vSphere 5.5 and beyond are in the vSphere Web Client. The traditional Intinue to operate, supporting the same re 5.0. e host, enter the IP address or host name. enter the IP address or name of a |
| vCenter Server. | |
| IP address / Name: | 172.29.224.65 |
| User name: | root |
| Password: | ****** |
| | Use Windows session credentials |
| | Login Close |

 Once connected to the host, the vSphere client application displays a similar window to this :



Note: A server name is shown rather than the host IP address

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- 4. Click on Next and select the storage destination for the virtual machine. If there is only one hard disk on the server then, by default, it will be named, datastore1. If there are multiple hard disks on the server, there will be multiple destinations named, datastore<#>. Select the disk desired for
- Click on Next and select "ESXi 6.0 and later". With this option, the virtual machine will be set to VM version 11.

| and Location | Select a destination storage for the virtual machine files: | | | | | | |
|---|---|----------------------|------------|-------------|------|------|------|
| ige | Name | Drive Type | Capacity | Provisioned | Free | Туре | Thin |
| erating System | | | | | | | |
| nc Iontroller a Disk to Complete | | | | | | | |
| | • | | m | | | | |
| | - | | | | | | |
| | Disable Storage | DRS for this virtual | machine | | | | |
| | Select a datastore: | | | | | | |
| | Name | Drive Type | Capacity P | ovisioned | Free | Туре | Thin |
| | | | | | | | |
| | | | | | | | |

the location of the virtual machine.



 Click on Next and select the guest OS version which will be installed on this virtual machine. In this example, Microsoft Windows 7 (64-bit) is selected.

 Click on Next and enter the number of virtual CPU cores, system memory size, and hard disk size for this virtual machine; leave all the other options at default.

🕝 Create New Virtual Machine - • • Guest Operating System Specify the guest operating system to use with this virtual machine Virtual Machine Version: 11 Guest Operating System: nfiguration me and Location · Wind Virtual Machine Version Guest Operating System C Linux C Other riate defaults for (64-bit) (32-bit) < Back Next > Cancel 🕝 Create New Virtual Machine - 8 % CPUs Select the number of virtual CPUs for the virtual machine Virtual Machine Version: 11 Number of virtual sockets: 1 • 4 • Number of cores per virtual socke Total number of cores: 4

r of virtual CPU

rmation on the number of rted for various guest opera

dd to a VM st and the

< Back Next > Cancel

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 Click on Next and select the system memory size for this virtual machine.

| Configure the virtual moch Configuration Name and Costano Stanzan Virtual Machine Version Cases Cases Coversion System CPLis Methody Network Select a Dak Ready to Complete | Memory See. Memory Configuration 2170 1178 2170 1178 2170 Maximum recommended for this 9 guest OS: 128 GB. 218 GB 4 default recommended for this 9 guest OS: 128 Memory See: 4 default recommended for this 9 guest OS: 128 Memory See: 4 default recommended for this 9 guest OS: 128 Memory See: 128 GB 4 default recommended for this 9 guest OS: 128 Memory See: 128 GB 128 G | |
|--|---|--|
| | 4 GB - 2 GB - 1 GB - 512 PG - 256 PB - 128 PG - 32 PM - 32 PM - 32 PM - 164 B - 34 PM - 44 | |

 Click on Next and select the network connection for this virtual machine. Choose "VMXNET 3".

| Configuration Name and Location Storage | Create Network Connections How many NICs do you want to connect? | |
|--|--|---|
| Virtual Machine Version Guest Operating System OPUs Memory Network SCSI Controller Select a Disk | Network Adap | Connect at Power On NET 3 V |
| | If supported by this what makine version, more than HNCs or what makine is created, via its Edit Settings datage. Adapter choice can affect boths networking performance and migrat the VMmer Kondegetes of more information and boosting am supported for various questioperating systems and hosts. | an be added after the ion compatibility. Consult ong the network adapters |
| | | |
| | | |

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Virtual Machine Version: 11



11. Click on Next, select a virtual disk to use. Select create a new virtual disk.

select the SCSI

setting.



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13. Click on Next. An
"Advanced Options"
page will appear.
Don't change
anything, just click
on Next. A Ready to
complete windows
will shows the
summary of the
virtual machine will
be created.

| Create a Disk | | Virtual Machine Version: |
|---|---|--------------------------|
| Specify the virtual disk si | ze and provisioning policy | |
| Configuration Name and Location Startistic Virtual Medicine Vension Virtual Medicine Vension Metacol Gest Location Start History SCSI Configura Social Advanced Option Ready to Complete | Capacity Dek Size: 96 ☆ 06 ▼ Pok Forvisionig G Thick Provision Lary Zeroed C Thick Provision Lary Zeroed C Thin Provision Location G Sizer with the virbul machine C Sizer(y a datastore or datastore duster: | Browse |
| | | < Back Next > Cancel |
| | | |

| Configuration | Settings for the new virtual mach | ine: | |
|-------------------------|---|--|-------|
| Name and Location | Name: | New Virtual Machine | |
| Virtual Machine Version | Host/Cluster: | ws460g9-esxi6-jd.amd.com | |
| Guest Operating System | Datastore: | datastore1 (1) | |
| CPUs | Guest OS: | Microsoft Windows 7 (64-bit) | |
| Memory | CPUs: | 4 | |
| Network | Memory: | 4096 MB | |
| SCSI Controller | NICs: | 1 | |
| Select a Disk | NIC 1 Network: | VM Network | |
| Create a Disk | NIC 1 Type: | VMXNET 3 | |
| Advanced Options | SCSI Controller: | LSILogic SAS | |
| Ready to Complete | Create disk: | New virtual disk | |
| | Disk capacity: | 96 GB | |
| | Disk provisioning: | Thick Provision Lazy Zeroed | |
| | Datastore: | datastore1(1) | |
| | Virtual Device Node: | SCSI (0:0) | |
| | Disk mode: | Persistent | |
| | | | |
| | | | |
| | | | |
| | Edit the virtual machine setting | ngs before completion | |
| | Creation of the virtual mach system. Install a guest OS of | ine (VM) does not include automatic installation of the guest ope n the VM after creating the VM. | ating |

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14. After clicking on "Finish", a new virtual machine will appear under the host IP address as the following :



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16. Right click on this virtual machine again and select "Edit Settings...". A warning window will pop up indicating that advanced settings can be changed only within VMware vCenter[™]. Click OK to continue. The "Virtual Machine Properties" window appears. Within the properties windows, click the "Options" tab and select "General" under the "Advanced" section. On the right side, a "Configuration Parameters..." button will appear. Click on this button.

| Fardware Opuons Pesources | S | Settings |
|---------------------------|----------------------|--|
| General Ontions | New Virtual Machine | |
| /Mware Tools | Shut Down | |
| Power Management | Standby | Enable logging |
| Advanced | | |
| General | Normal | Debugging and Statistics |
| CPUID Mask | Expose Nx flag to | Run normally |
| Memory/CPU Hotplug | Disabled/Disabled | |
| Boot Options | Normal Boot | C Record Debugging Information |
| Fibre Channel NPIV | None | C Record Statistics |
| CPU/MMU Virtualization | Automatic | C Record Statistics and Debugging Information |
| Swapfile Location | Use default settings | |
| | | Configuration Parameters |
| | | |
| | | Click the Configuration Parameters button to edit the advanced configuration settings |
| | | advanced configuration secongs. |
| | | Configuration Parameters |
| | | |
| | | |
| | | |
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17. In the "Configuration Parameters" window, scroll through to find the parameters named "pciHole.start" and "pciHole.end". If these two parameters exist, ensure that the values are set to 2048 and 3072, respectively. If these two parameters do not exist, click the button "Add Row", and add "pciHole.start" and "pciHole.end" with the above values. Next, click OK to return to main control page of vSphere client.

Different servers will require slightly different pciHole settings. If you are experiencing isues, try setting pciHole.end = 4040.

| Name 🛆 | Value |
|----------------|--------------|
| pciBridge6.vir | pcieRootPort |
| pciBridge6.fu | 8 |
| pciBridge7.pr | TRUE |
| pciBridge7.vir | pcieRootPort |
| pciBridge7.fu | 8 |
| hpet0.present | true |
| cpuid.coresPe | 4 |
| ethernet0.up | true |
| vmware.tools | 0 |
| vmware.tools | 9536 |
| migrate.host | none |
| migrate.migra | 0 |
| migret | |
| pciHole.start | 2048 |
| pciHole.end | 3072 |
| - | |

The virtual machine is now ready for guest OS installation.

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3.2.4 Install Guest OS on Guest VM

There are several ways to install a guest OS on this newly created virtual machine:

- 1) Install a fresh OS using ISO image on the administrator system
- 2) Install a fresh OS using ISO image on ESXi data storage
- 3) Clone an OS image created and used previously

Methods 1 and 2 are similar. Method 2 will be used as an example. Obtain a licensed copy of the supported OSes listed on **Table 1**.

3.2.4.1 Upload file to host ESXi

1. Start the SSH Secure File Transfer utility and click on "Quick Connect". The application will pop up a window like the following :



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- 2. Enter the ESXi host IP address or computer name in "Host Name"; type "root" in "User Name"; select "Keyboard interactive" from "Authentication Method". Click on the Connect button to connect to host.
- 3. Enter the password created while setting up ESXi in the host server. Once connected to the host, the application should have the following windows :

| 🚰 172.29.224.65 - default - S | SSH Secure File Transfer | | | 1 · · · · | - | - | | | x |
|-------------------------------|----------------------------------|---------------------|------------|----------------|----------------------|------------|------------|-------------|------------|
| Eile Edit View Operat | tion <u>W</u> indow <u>H</u> elp | | | | | | | | |
| |) 📁 🦠 🕹 🕯 🕅 | ≗ 1- 100 mm abc 0 | 10 01 / | 群 😳 🛷 💦 | | | | | |
| 👔 Quick Connect 📄 Pi | ofiles | | | | | | | | |
| 🛛 🔁 🖆 🖉 🖄 | : _ | ▼ A | dd | 8 🗠 🗠 | × / | | | • | Add |
| Local Name / | Size Type | Modified | - | Remote Name | 🛆 Size | Туре | Modified | | - |
| 🔚 Libraries | System F | | | altbootbank 🔋 | | Folder | | | |
| 🔼 Jiang, Jerry (SW) | System F | 07/01/2015 05:16:3 | | 🔰 bin | | Folder | 09/03/20 | 13 03:06:2 | <u></u> |
| 📲 Computer | System F | | | bootbank | | Folder | | | |
| 🗣 Network | System F | | | \mu dev | | Folder | 09/03/20 | 013 04:36:4 | h |
| Control Panel | System F | | | 🐌 etc | | Folder | 09/03/20 | 13 03:06:4 | h |
| 👿 Recycle Bin | System F | | | 🔋 lib | | Folder | 09/03/20 | 13 03:05:4 | <u>e</u> l |
| Control Panel | System F | | Ξ | lib64 | | Folder | 09/03/20 | 13 03:05:4 | h 👘 |
| 😂 Canon MF Toolbox 4.9 | 2,087 Shortcut | 11/10/2013 03:46:1 | | locker | | Folder | | | |
| Garmin Express | 1,899 Shortcut | 19/02/2015 10:01:2 | | 🔒 mbr | | Folder | 09/03/20 | 013 03:05:4 | |
| iTunes | 1,794 Shortcut | 07/11/2014 11:23:2 | | apt (| | Folder | 09/03/20 | 13 03:05:4 | 6 |
| Shop Lenovo App Shop | 2,274 Shortcut | 30/07/2013 10:00:5 | | proc | | Folder | 09/03/20 | 013 04:36:4 | 6 I |
| BLenovo Solution Center | 2,002 Shortcut | 31/12/2013 11:31:4 | | productLocker | | Folder | 20/02/20 | 15 12:24:1 | 📖 |
| NWZ-B170 WALKMAN Gu. | 2,137 Shortcut | 16/03/2014 05:26:1 | | sbin | | Folder | 09/03/20 | 13 03:06:2 | <u></u> |
| Presto! PageManager 7.15 | 2,184 Shortcut | 11/10/2013 03:48:3 | | scratch | | Folder | | | |
| Reader for PC | 2,076 Shortcut | 09/11/2014 11:36:2 | | store | | Folder | | | |
| Skype | 2,515 Shortcut | 07/03/2014 10:06:3 | | ardisks | | Folder | 09/03/20 |)13 03:05:4 | |
| SSH Secure File Transfer C. | 2,305 Shortcut | 10/06/2014 01:10:5 | | ardisks.noauto | | Folder | 09/03/20 |)13 03:05:4 | |
| SSH Secure Shell Client | 1,347 Shortcut | 10/06/2014 01:10:5 | - | <u>.</u> | | e | | | |
| | | | | | | | | | , |
| Transfer Queue | | | | | | | | | |
| 🛆 Source File | Source Directory | Destination Direct | ory | Size | Status | | Speed | Tir | me |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| <u> </u> | | | | | | | | | |
| Connected to 172.29.224.65 - | / | | | SSH2 - 3des-o | bc - hmac-sha1 - nor | n 24 items | (312.3 KB) | | |
| | | | | | | | | | |

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4. The left is the administrator system, the right is the host ESXi system. On the left window, navigate to the location where the OS ISO image is stored; on the right window, navigate to /vmfs/volumes/datastore1.

| 2 172.29.224.65 - default - SSH Sec | ure File Transfer | | | | · · · · | | | X |
|-------------------------------------|-----------------------------|-----------|---------------------------|-----------------------|--------------------|---------------|--------------------|-------|
| Ele Edit View Operation W | <u>/</u> indow <u>H</u> elp | | | | | | | |
| 🛛 🖬 🍠 📭 🛍 🎒 🍎 | 🎭 4 û 📷 ª | 5 E 🗇 | abc 010 01¢ def 101 %f | 😳 🤣 🍋 | | | | |
| 👔 Quick Connect 🚊 Profiles | | | | | | | _ | |
| 📴 🚳 📾 🍫 💣 🗙 D:V | Os Image\ | | ▼ Add | 🔁 🙆 🛍 🌣 | 🔺 🖂 /vmfs/volume | es/datastore1 | | Add |
| Local Name | / Size | Туре | Modified | Remote Name | 🕗 Size | Туре | Modified | Attri |
| 8441.0.WINMAIN.120623-1614_X64 | FRE_CLIE 18446744 | Unhandl | 01/01/1980 07 | 퉬 kwin7-64x-1 | | Folder | 09/03/2013 04:24:0 | drwo |
| 200.16384.WIN8_RTM.120725-124 | 7_X64FRE 18446744 | Unhandl | 02/08/2012 11 | likwin7-64x-2 | | Folder | 09/03/2013 03:45:5 | drwo |
| 🔤 en_visual_studio_2010_premium_x | B6_dvd_5 18446744 | Unhandl | 02/03/2011 11 | - | | | | |
| 🔤 en_visual_studio_premium_2012_x | B6_dvd_2 1576,785, | Unhandl | 13/09/2013 09 | | | | | |
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 After a few minutes, the OS image will be uploaded to /vmfs/volumes/data store1 as below.

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7. This ISO image can now be used to install a fresh OS on the virtual machine.

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3.2.4.2 Install the OS

 Start vSphere client application and connect to the host. Expand the host description (host name or IP address) and click on the virtual machine that was just created. Click on the start button or "Power on the virtual machine". Click on the "Console" tab.



2. The console window should show that an operating system was not found :



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3. Click on the CD button, select the drive and select "Connect to ISO image on a datastore...", as shown below.

(note: selecting option "Connect to ISO image on a local disk" will result in navigation to the administrator system local disk image. That installation method is the same as this method).



 Once the "Browse Datastores" window appears, navigate to datastore1, select the OS ISO image previously uploaded and click on "OK" :



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5. Use a mouse click on the console window followed by an 'enter' or 'space' key. The OS installation screen appears in the console window as it would on a desktop monitor during the regular install process.



6. Follow the normal Microsoft[®] Windows[®] installation procedure. Select a user name and password and allow the installation to complete. Once the installation completes, it shows the desktop of the guest OS in console window similar to below.

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7. There might be some Windows Updates that will require rebooting the OS.

MxGPU requires the following Windows Updates to work properly in Windows 7.

- a. Windows6.1-KB2921916
- b. Windows6.1-KB3033929
- c. Windows6.1-KB3123479

If these are not already installed and you do not wish to do a full Windows Update, these specific updates can be installed by running http://hotfixv4.microsoft.com/Windows%207/Windows%20Server2008%20R2%20SP1/sp2/Fix485407/7600/free/471834 intl x64 zip.exe

This will extract the update files and all three updates must be manually installed by double clicking on them.

8. After a reboot, the guest OS should be ready to use.

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3.2.4.3 Install VMware Tools

It is necessary to install VMware tools to enable connectivity features between the virtual machine running on the host and the administrator system.

1. Once the guest VM boots to desktop, in the vSphere client, select the summary tab of the VM and click on "Install VMware Tools" :



 A pop-up window will appear as the following :

| 🔗 Install VMware Tools |
|--|
| Installing the VMware Tools package will greatly enhance graphics and mouse performance in your virtual machine. |
| WARNING: You cannot install the VMware Tools package until the guest operating system is running. If your guest operating system is not running, choose Cancel and install the VMware Tools package later. |
| OK Cancel |

3. Click OK to continue. After a few minutes (depending on network speeds), an AutoPlay window will appear as the following :



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4. After clicking on "Run setup64.exe", an installation window will be shown.



6. Once the installation is complete, a reboot of the virtual machine is required.

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3.2.4.4 Install Horizon View Agent

The Horizon View Agent acts as an intermediary software between the virtual machine and Horizon View (that is to be installed on the client terminal later). The Horizon View Agent Direct-Connection Plugin allows a View Client to directly connect to a View desktop without using View Connection Server.

1. Once the guest VM boots to desktop again, download Horizon View Agent indicate on Table 1.



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- 5. Click "Install" in next window. The View Agent will be installed on this guest VM.
- 6. Once the installation completes, a prompt for reboot will appear.
- 7. After reboot, continue with downloading the Horizon View Agent Direct-Connection plug-in indicated on **Table 1**.
- Run this Direct-Connect plug-in and accept the License Agreement



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10. Click on the Next to install the Direct-Connection Plugin. Once installation is complete, reboot the guest VM.

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3.2.1 Pass Through Device to Guest VM

Passing through a device to the guest VM means providing full access of the device residing in the host to that VM. After passing through a GPU, a VM is able to access the full hardware acceleration capabilities of that GPU remotely.

MxGPU operates as a number of devices that can be passing through to various VMs. Therefore gaining knowledge about how to pass through a single GPU device to a single VM allows the user to understand the first steps necessary to install MxGPU.

If the user already has a basic understanding of how to pass through a GPU device to the VM, then this section can be bypassed.

3.2.1.1 Select Device for Pass Through

 In the vSphere host client, click on the host description. Select the "Configuration" tab, click on "Advanced Settings" and select "Configure Passthrough..." as the shown below :

| Ø | | 172.29.229.217 - v | Sphere Client | - 🗆 🗙 |
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| 172.29.229.217 PVTEA | M6-2T7BMFS-172029229217.amc | l.com VMware ESXi, 6.0 | .0, 2494585 | |
| VMware Workbench Gettin | ig Started Summary Virtual Machi | nes Resource Allocation | Performance Configuration Users Even | ts Permissions |
| w10-clean-005 w10-clean-006 | ware | DirectPath I/O Confi | guration | |
| 🙀 w10-TH2-007 н | lealth Status | Warning: Configuri it unavailable for u | ng host hardware without special virtualization fea se except via dedicating it to a single virtual machir | itures for virtual machine passthrough will make ne. In particular, configuring a device needed |
| w7-1-s-bm-d-003 p | rocessors | for normal host bo See the online help | ot or operation can make normal host boot impossit for more information. | ple and may require significant effort to undo. |
| w8.1-s-bm-d-001 | torage | Each licted device is avai | able for direct access by the virtual machines on th | his hast |
| W6.1-S-DM-0-002 | letworking | Edd Hated device is avai | Hide | Details Refresh Configure Passtbrough |
| S | torage Adapters | | | |
| | etwork Adapters dvanced Settions | ······································ | rently enabled for passthrough | |
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| Solution | ware | | | |
| | ime Configuration | Device Details | | |
| D | NS and Routing | Device Name | Vendor N | lame |
| A . | uthentication Services | ID | Class ID | |
| Vi Vi | irtual Machine Startup/Shutdown | Vendor ID | Subdevic | e ID |
| S | ecurity Profile | Function | Slot | |
| н | lost Cache Configuration | Bus | | |
| S | ystem Resource Reservation | | | |
| | gent VM Settings | | | |
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| Name | Target | Status | Details | Initiated by Requested Start Ti 🔽 ! 🗚 |
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| Select virtual NIC | 172.29.229.217 | Completed | | vpxuser 3///2016 11:52:34 AM |
| 🖉 Tasks | | | | root // |

2. A window with devices available for passthrough will appear. Select the desired passthrough device and click on the OK button.

| | assthrough: | | , | ide Details |
|---|--|--|---|-----------------|
| | APID THE COASS> PCI Drid | ge | | |
| Ø CH 01:0 | 0.0 Advanced Micro Devio 0.1 Advanced Micro Devio | es, Inc. [AMD/ATI] | Cedar [Radeor R600 HDMI Ar | n HD 5000/E |
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| 04:0 | 0.0 Broadcom Corporation | NetXtreme BCM57 | 61 Gigabit Eth | ernet [vmnk |
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| Pevice Details This device is p Davice Name ID Davice ID Vendor ID Function | m esstitrough capable but not Cedar (Radeon HD 01:00.0 68F9 1002 0 | unning in passthrou Vendor Name Class ID Subdevice ID Subvendor ID Slat | gh mode Advanced 300 10E 1002 0 | + Micro De |
| evice Details | III cedar (Radeon HD 01:00.0 6879 1002 0 | unning in passthrou Vendor Name Class ID Subdevice ID Subvendor ID Slot | ngh mode Advanced 300 10E 1002 0 |) Micro De |

 The selected device appears in the "Direct Path I/O Configuration" window list. Use the "Edit" link to change/edit the list.

| 172.29.224.65 - vSphere Clier | nt Idministration Plumins Help | | | | |
|-------------------------------|---|--|---|--|---|
| Home Þø | Inventory > 🎁 Inventory | | | | |
| 172.29.224.65 kwin7-64x-1 | udp3348027uds.amd.com VMv | vare ESXi, 5.5.0, 20681 | 90 Evaluation (59 days remaining) | | |
| kwin7-64x-2 | Summary Virtual Machines N | DirectPath I/O Co | of configuration Local Users a Gro | ups Events Perm | ussions |
| | water water souther torage etworking torage adapters etwork adapters etwork adapters etwork adapters etwork adapters | Each listed device is a Changes made to Changes made to | regulation of the single state without special virtualization is a declarating it to a single virtualization. In pure law normal host tour subposible and may require valiable for direct access by the virtual machine o some of the devices below will not take effect distanced Micro Devices, Inc. (MMD)ATI) Codar Januared Micro Devices, Inc. (MMD)ATI) R600. | on features for virtua articular, configuring i e significant effort to s on this host. until the host is resta [Radeon HD 5000/6 HDMI Audio [Radeon | machine passifrough nill make it unavallable device needed for normal host boot or undo. See the office help for more information. rted. Hote Details Refresh Edt 000(7750)(8350 Sees) HID 2000 Series) |
| | vare censed Features | | | | |
| | me Configuration | Device Details | | | |
| | uthentication Services | 10 This device nee | ds host reboot to start running in passthrough | mode | |
| | rtual Machine Startup/Shutdown | Device Name | Cedar [Radeon HD 5000/6000/7350/8 | Vendor Name | Advanced Micro Devices, Inc. [AMD/A |
| | rtual Machine Swapfile Location | ID | 01:00.0 | Class ID | 300 |
| | ecurity Profile | Device ID | 68F9 | Subdevice ID | 10E |
| | ost Cache Configuration | Vendor ID | 1002 | Subvendor ID | 1002 |
| | ystem Resource Allocation | Function | 0 | Slot | 0 |
| | gent VM Settings | Bus | 1 | | |
| | dunned Cathians | | | | |

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4. The host reboot is required before host "releases" the new devices and makes them available for passthrough to a guest VM. To reboot the host, right click on the host description and navigate to "Reboot". Note: make sure all guest VMs are already shut down before rebooting the host.



3.2.1.2 Assign Device to Guest VM

- 1. After the host reboots, reconnect to host through vSphere client. Ensure that the guest VM targeted for GPU passthrough is shut down.
- Right click on the guest VM and navigate to "Edit Settings..." or click "Edit virtual machine settings" in the Getting Started tab.



 A window showing the virtual machine setting will appear as shown. Click on the "Add" button.



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4. An "Add Hardware" window appears. Select "PCI Device" and click on next.



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5. A "Choose PCI Device" window will appear. Choose the device from the list box, then click "Next". Add Hardware
Choose PCI Device
Which of the present PCI,PCIe devices would you like to add?

Device Turge
Connection

Select PCI/PCIe Device
Specify the physical PCI,PCIe Device to connect to:

Device Turge
Connection

Select PCI/PCIE Device
Specify the physical PCI,PCIe Device to connect to:

Device Turge
Connection

Select PCI/PCIE Device
Point Statistical PCI,PCIe Device to connect to:

Device Turge
Connection

Select PCI/PCIE Device
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI,PCIE Device to connect to:

Device Turge
Point Statistical PCI Point Statistical PCI Point Statistical PCI Point Point

 The "Ready to Complete" window appears with the device just selected. Click on the "Finish" button.

| Device Type | |
|------------------------|--|
| Select PCI/PCIe Device | Options: |
| Ready to Complete | Hardware type: PCI Device PCI/PCIe Device: 0000:0b:02.0 LAMD < daes > VGA compatible controller |
| | Terr ac server association and parts (dass/ terr companie conditioner |
| | |
| | |
| | |
| | |
| | |
| | |
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| | |
| | |

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| fardware Options Resources | | Virtual Machine Version: 1 |
|---|--|--|
| Show Al Devices Hardware Memory CPUs CPUs SSC controller 0 SSC controller 0 SSC controller 0 CD/DVD drive 1 Hard disk 1 Hopp drive 1 Hopp drive 1 New SC Device (addim) | Add Summary 4095 MB 4 Video card Deprecated LSI Logic SAS Client Device Virtual Disk Client Device Virtual | Connection Specify the physical PCI/PCIe Device to connect to: [0000:05:02.0] AND <class> VGA compatible contrc_=] M Note: the presence of a PCI/PCIe device passthrough will not be able to be supported, for how suppilots taken or restored, or to participate in whoten.</class> |
| New PCI Device (adding) | AMD <class> VGA c_</class> | • |
| | | |

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3.2.2 Guest VM management

Once a guest VM is up and running, the Snapshot feature can be used to copy an instance of that VM at a particular state. This feature can be used to create stable backup points for the VM. This feature can also be used to create templates to deploy new VMs without going through the OS installation process.

3.2.2.1 Create and Use Guest VM Snapshot

1. In the vSphere client, right click on the VM, navigate to Snapshot, and then "Take Snapshot..." :

| 172.29.224.65 File Edit View Image: Constraint of the second sec | - vSp Inv Ho | here Client entory Administration Plug-ins Help me | - - * |
|--|--------------------|---|--|
| □ 172.29.22 | 4.65 64x=1 | kwin7-64x-1 Power Guest Snapshot Open Console Edit Settings Add Permission Ctrl+P Report Performance Rename Open in New Window Ctrl+Alt+N Remove from Inventory Delete from Inventory | Resource Allocation, Performance, Events, Console, Permission, Revent to Current Snapshot Snapshot Manager Consolidate sor operaming system: machine is an isolated computing se virtual machines as desktop or ts, as testing environments, or to cations. In hosts. The same host can run |
| Recent Tasks | | | Name, Target or Status contains: • Clear |
| Name | | Target | Status Details Initiated by Requested Start Time |
| < Tasks | | m | Evaluation Mode: 59 days remaining froot |

 Enter a name and description as for the virtual machine snapshot.

| Ivanie | | |
|------------|---------------------------------|--|
| ļ. | | |
| Descriptio | n | |
| | | |
| | | |
| I | | |
| Snapsh | ot the virtual machine's memory | |
| | | |

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3. The snapshot process requires a few minutes to complete.



4. Once the snapshot is created and a rollback to that snapshot is required, shut down the guest VM, right click on the guest VM, navigate to "Snapshot" and then "Snapshot Manager..." :



5. Select the snapshot and click on the "Go to" button. Click "Yes" in the warning window to complete the reversion of the VM back to the state when the snapshot was taken.



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3.2.2.2 Create Guest VM Template

- 1. To create a template, ensure that the guest VM used for the template
 - Does not have any pass through devices

| b. | CD/DVD drive |
|----|------------------|
| | is set to Client |
| | Device |

| | | Device Status |
|-------------------|---------------|---|
| Show All Devices | Add Remove | Connected |
| Hardware | Summary | Connect at power on |
| Memory | 4096 MB | Device Type |
| CPUs | 4 | G. m. in i |
| Video card | Video card | Note: To connect this device, you must nower on |
| VMCI device | Deprecated | virtual machine and then click the Connect CD/DVI |
| SCSI controller 0 | LSI Logic SAS | button in the toolbay |
| CD/DVD drive 1 | Client Device | |
| Hard disk 1 | Virtual Disk | C Host Device |
| Floppy drive 1 | Client Device | - Instructure |
| Network adapter 1 | VM Network | |
| | | C Datastara ISO Ela |
| | | · Datastore 130 me |
| | | Browse. |
| | | |
| | | Mode |
| | | Passthrough IDE (recommended) |
| | | C Emulate IDE |
| | | · Endate IDE |
| | | Virtual Device Node |
| | | (* IDE (1:0) CD/DVD drive 1 |
| | | |
| | | |

 Select the guest VM that will be used as a template. Click on "File" and navigate to "Export", then "Export OVF Template...". If the guest VM has any passthrough devices, a warning window will pop up to prevent the export operation.



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3. In the pop up window, input a descriptive name for this template; select a location to save the template. Select single file (OVA) or folder of files (OVF), and (optionally) add a description for this template.

| | · · · · · · · · · · · · · · · · · · · | |
|--------------|---|--|
| Name: | win7-64x-16 | |
| Directory: | C:\Users\jerryj.AMD\Documents\Features\vmware | |
| Format: | Single file (OVA) | |
| Description: | Folder of files (OVF) Single file (OVA) | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | , | |

4. It will take some time to create the template. Once the template is created, it can used to deploy guest VMs with the same content and settings as the original VM.

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3.2.2.3 Deploy Guest VM Through Template

- Right click on the host name and navigate to "Deploy OVF Template..." :
- A window will pop up. Use the "Browse" button to find the template.



172.29.224.65 - vSphere Client

1 19 100

 After clicking on Next, details of the template will be shown :

| OVF Template Details Verify OVF template details | | | |
|--|--|---|------------------------------|
| Source OVF Template Detais Name and Location Disk Format Ready to Complete | Product: Version: Vendor: Publisher: Download size: Size on disk: Description: | win7-64x-template No certificate present 27.3 GB 44.3 GB (thin provisioned) 72.0 GB (thick provisioned) | |
| Help | | | <back next=""> Cancel</back> |
| 52 | | | |

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4. Click on Next and enter a name for the new guest VM :

| OVF Template Details Name and Location Disk Format | Name: v/m7-64x-3 The name can contain up to 80 characters and it must be unique within the inventory folder. |
|--|---|
| country or confighting | |
| | |
| | |
| | |
| | |

5. After clicking on Next, ensure that "Thick Provision Lazy Zeroed" is selected.



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 After clicking on Next, a summary page will show the details of the VM to be created :

| Source OVF Template Details Name and Location | When you click Finish, the dep Deployment settings: | loyment task will be started. |
|---|---|---|
| Dak Format Ready to Complete | Ovrifie: Dowillad Stee Steen of List: Name: Host(Clutate Datastore Disk provisiong) Network Mapping: | Winkcqe010JpmpUvtrualization/win7-64v-templately 23.3 GB 72.2 GB kuin7-64v-2 udp334822nd5 amd.com ddatatod Thick Provision Lays Zened "VM Network" to "VM Network" |
| | | |

7. Click on Finish. A status window will show the progress of the deployment. A new VM appears under the host description.

| Home H |
|---|
| 72.29.224.65 k Uw07.64x-1 g kwin7.64x-2 1% Deploying kwin7-64x-2 g 1% Deploying kwin7-64x-2 |
| Deploying kwin7-64x-2 Deploying dak 1 of 1 from (Imitce203)temp(Virtualization juin7-64x-template juin7-64x-template-di ak1.vmdk |
| Close this dialog when completed |

8. It will take some time for vSphere to finish the deployment. Once complete, the VM can be started. At this point, passthrough devices can be assigned to the device, as required.

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3.3 Client System Setup

Once the virtual machines are created in the host server, there are two methods for accessing these VMs :

- Connect through a Horizon View client on a laptop, desktop or thin client system -
- -Connect through a zero client

3.3.1 Horizon View Client Setup

1. On the client system or administrator system, download Horizon View indicated on Table 1.

| 2. | Run this application and accept the License Agreement | W VMware Horizon Client Setup Fud-User License Agreement Pesar read the following lenne agreement carefully VMWARE END USER LICENSE AGREEMENT PLASE NOTE THAT THE TRADS OF THIS FID USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REARMERS OF ANY VERN YOUR USE OF THE SOFTWARE, REARMERS OF ANY VERN YOUR USE OF THE SOFTWARE, NOT SALLATION OF THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL, ENTITY) AGREE TO BE BOUND BY THE TERNS OF THIS END USER LICENSE AGREEMENT (FEULA'), IF YOU DO NOT AGREE TO THE VI accept the terms in the License Agreement Print Back Mext Cancel |
|----|---|--|
| 3. | Click on Next and accept all the default features selected : | Withware Horizon Client Setup Custom Setup Select the way you want features to be installed. Click the cons in the tree below to change the way features will be installed. Click the cons in the tree below to change the way features will be installed. Withware Horizon Client Withware Horizon Client Withware Horizon Client This feature requires 4496 on your hard drive. Location: CliPitogram Files (ASS)(Withware Mithware Horizon Client Location: CliPitogram Files (ASS)(Withware Mithware Horizon View Reset Disk Usage Back Next Cancel |
| 4. | Ignore the Default Server, leave the Default Horizon Connection server empty and click on Next : | Withware Horizon Client Setup Default Server Configures the server Horizon Client Connects to by default. Specify a default server for this Horizon Client. This setting is optional. Default Horizon Connection Server: Back Next Cancel |

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= -

- 5. Create the desktop shortcut and start menu shortcut. On next page, click on Install to complete the installation.
- 6. Once the installation completes, launch Horizon View. The following window appears :

7. Clicking on "Add

prompts for the

8. Type in the IP

connection target :

address of the guest

VM to connect with.

The IP address of the

summary page in the

guest can be found

at guest VM

vSphere client

Server" will pop up a window that



application. 9. Click on the connection button after entering the IP address. A window will pop up asking for user name and password. Enter the guest VM's user name and password, then click Login button.



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10. After logging in, the virtual machine desktop will automatically snap to full screen size of the connected monitor.

3.3.2 Zero Client Setup

 Connect monitor, keyboard, mouse, network to the zero client



 If this is the first time using this zero client or the zero client has been used within other network, click on the top-left corner select options-> Configuration. Navigate to Reset tab as the following – this step is only needed for the first time that a zero client is connected on the test network.



3. Click on reset, and click on Yes button. After a few minute, the system will reboot.

- After reboot, click on the top-left corner select options-> Configuration. Navigate to Session, and select view connection server from the connection Type, type in the IP address of the guest VM
- Click on apply, and close the windows. The screen will have a connection window as:
- Click on the connect button a connect window will show up as the following

 Enter the user name and password, then click on login button. The desktop should show up on the monitor

www.like Base WWWare Horizon View Connection Type: Wwware Horizon View Connection Type: Wwware Horizon View Distance or IP Address: IT2:29:224:115 WWWare Horizon View Connection Server: Enter the address of the View Connection Server: Ital:2.29:224:115 Connection Server: Enter the address of the View Connection Server: Server: Ital:2.29:224:115 Connection Server: Enter the address of the View Connection Server: Enter Your User name and password.

Note: If the monitor's resolution is too big (ex. 1920x1080), you might encounter black screen at this stage. Using a smaller native resolution monitor (ex. 1366x768) will work around the problem at this step. The larger monitor will be supported once the AMD driver is installed.

KWIN7-64X-1 13

-

PColP

Cancel

Password:

Domain:

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3.4 Summary and GFX Driver Installation under Guest VM

The sequence described in this section applies to the AMD GFX driver installation in a guest VM. MxGPU uses SR-IOV to replicate one device into several virtual devices that can then be configured for pass through. The procedure for installing the driver on a VM using an MxGPU device is the same procedure as installing the driver on a VM using a regular passthrough device under vDGA. The following installation sequence is based on the Horizon View Agent 6.1.0 and higher. The steps for setting up a virtual machine are summarized:

- 1. Create a guest VM and fresh install guest VM without GPU pass through. Refer to section **3.2.3** and section **3.2.4** reboot the guest VM.
- From vSphere client and VM console, install VMtools. Refer to section 3.2.4.3 reboot the guest VM.
- 3. From vSphere client and VM console, install unified Horizon View Agent and Horizon View Agent Direct Connection. Refer to section **3.2.4.4** shutdown the guest VM.
- From vSphere client, assign an AMD GPU device to this guest VM. Refer to section 3.2.1 start the guest VM.
- Wait until an IP address appears for the guest VM in Summary tab. Start the Horizon View client application from client system, configure as "PCoIP and full screen" and connect to guest VM. Refer to section 3.3 for details.
- 6. Once the guest VM is powered on, a connected passthrough device becomes part of the guest VM's devices. To check that this is the case, open Device Manager and review the list of devices under "Display adapters". Before installation of the graphics adapter driver, the devices will appear as, "Standard VGA Graphics Adapter".



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3.4.1 Graphics Driver Installation

The next steps describe the graphics driver installation process inside the VM once a passthrough or MxGPU device is connected.

- 1. Log into the guest VM and obtain graphics driver install package from the location indicated in **Table 1**.
- Run setup.exe from the graphics driver install package. The first screen should be as shown on the right.

| Note : "GPU Server" |
|----------------------|
| must be present and |
| selected. |
| Otherwise, the |
| install package will |
| not recognize the |
| GPU as a |
| virtualization |
| capable device. |



Other important notes :

- During the installation process, the progress bar may spend a lot of time at "2%" but should eventually advance.
- If, during installation within a VM, the screen freezes or the primary desktop disappears, close the horizon view connection, and reconnect to the guest VM.
- Most of the installation can be done within the console. However, as soon as the driver loads, nothing more can be done from the console as it will appear frozen. The graphics driver has taken control of the desktop. From this point on, use Horizon View to view the virtual desktop.

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3. After reboot and IP address of the virtual machine appears in the Summary tab, from client system (desktop/laptop), connect to guest VM again. Right click on the desktop, select screen resolution. The screen resolution window appears and reports the resolution similar to the following :



If a window similar to the above appears then the AMD GFX driver is properly installed and the vSGA desktop is disabled.