Parallels

Parallels Remote Application Server

GPU Accelerated Application Publishing

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### Chapter 1

## Introduction

The number of requests where graphic intensive applications, such as Photoshop, AutoCAD, Solidworks or even heavier applications like Maya and CATIA, that are being made in the Applications and Desktop virtualization projects based on Parallels[®] Remote Application Server (RAS) is on the increase. This comes in hand in hand with the significant Remote Desktop Services (RDS) improvements released in Windows Server 2016. As such, in this document we will be looking at various options available today with Windows Server 2016 to add GPU acceleration to published resources via Parallels RAS.

The two options that can enable GPU acceleration in Windows Server 2016 for virtual desktops are:

- **RemoteFX vGPU**, a graphics virtualization technology that provides a virtual GPU adapter for redirecting API calls from a guest virtual machine (VM) to the physical GPU on the host.
- **Discrete Device Assignment (DDA)**, a GPU passthrough able to pass the physical GPU from a Hyper-V host to the guest VM directly.

This guide talks about each GPU acceleration technology and explains how to use them when publishing resources in Parallels RAS.

### CHAPTER 2

## **GPU Acceleration Technologies**

### **In This Chapter**

RemoteFX vGPU
Discrete Device Assignment (DDA)
RemoteFX vGPU vs. DDA Capabilities

## RemoteFX vGPU

RemoteFX vGPU is a graphics virtualization technology that allows the processing power of a GPU to be split across various guest operating systems. This was introduced in Windows Server 2008R2 SP1 to provide GPU acceleration for VDI environments. Further improvements were included in Windows 2012 and even more with the release of Windows Server 2016, which include:

- Support for Windows Server 2016 as a guest. This means that Windows Server OS can be used to build VDI (session based VDI or Server based VDI as a Personal Session Desktop). Particularly useful for Service providers is the ability to build VDI solutions using Windows Server 2016 inside tenant VMs and license it through SPLA.
- Improvements in application compatibility and stability now includes support for DirectX 11.1, OpenGL 4.4 and OpenCL 1.1, all of which are required by modern graphics and 3D applications.
- RemoteFX GPU video RAM limit has been extended from 256 MB to 1024 MB. Dedicated Video Memory now can be set directly without playing with monitor number and resolution. Depending on the amount of system memory assigned to the VM, this can provide up to a total of 2 GB of video RAM (1 GB dedicated and 1 GB shared).

Detailed information on what's new in RDS 2016 is available at https://docs.microsoft.com/enus/windows-server/remote/remote-desktop-services/rds-whats-new

Considering that multiple guest operating systems can use the same physical GPU via RemoteFX vGPUs, this is generally recommended if scaling is a requirement. This type of graphics virtualization is ideal to use where applications do not have as strict GPU requirements when compared to DDA. However, in the application and desktop virtualization it is critical to mention that RemoteFX vGPU and RDSH on Windows 2016 are not supported. This is because only one session can be hosted for each Windows Server 2016 running as a guest VM with RemoteFX vGPU. Instead, RemoteFX vGPU can be utilized through VM based VDIs supporting Windows 7 SP1, Windows 8.1 and Windows 10 or Windows Server 2012 R2 and Windows Server 2016 as guest VMs.

### How to Setup RemoteFX vGPU

Setting up guest VMs to use RemoteFX vGPU is a straightforward procedure, which is described in this section.

For this example the below environment was used:

### **Physical Host**

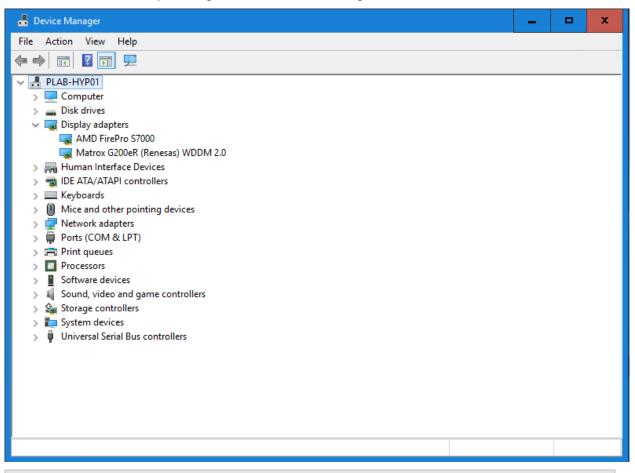
Hostname	PLAB-HYP1
Server System Model	Dell PowerEdge R730
Operating System	Windows Server 2016
Role	Hypervisor - Microsoft Hyper-V
Firmware version	2.21.21.21
GPU	AMD FirePro S7000

### Guest VM

Hostname	PLAB-RAS3
Operating System	Windows Server 2016
Role	RDSH

### Setup procedure

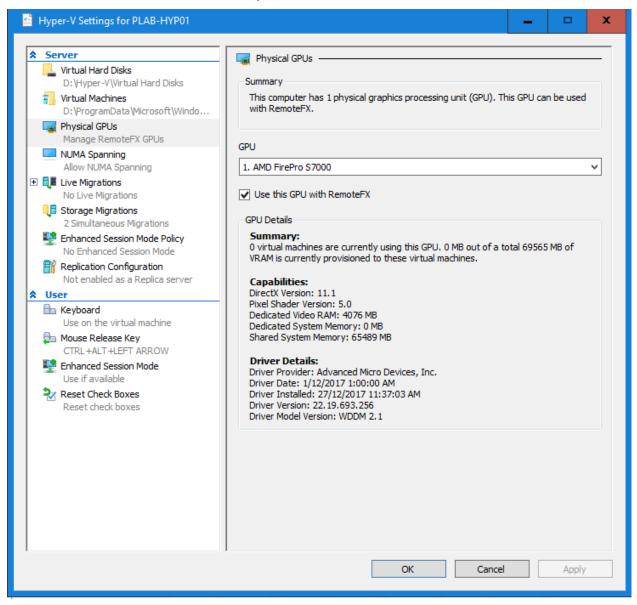
1 It is important to make sure that the correct vendor drivers are installed on the Hyper-V host. This can be confirmed by looking at hosts' device manager, in this case on PLAB-HYP1.



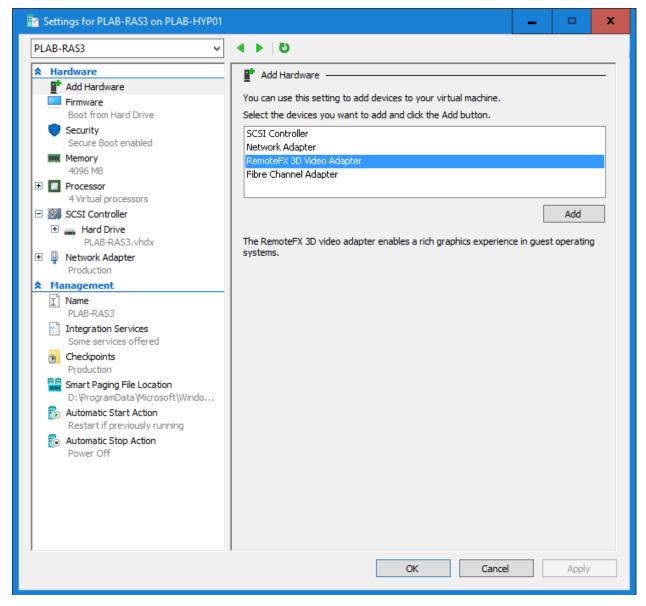
**Note:** For the list of supported Remote-FX compatible GPUs please see https://cloudblogs.microsoft.com/enterprisemobility/2013/11/05/gpu-requirements-for-remotefx-onwindows-server-2012-r2/

#### **GPU** Acceleration Technologies

To configure RemoteFX vGPU, open the Hyper-V Manager on the host and click on the Hyper-V Settings under the Actions menu on the left-hand side. This will open the Hyper-V Settings windows from where we can set the required GPU to be used with RemoteFX.



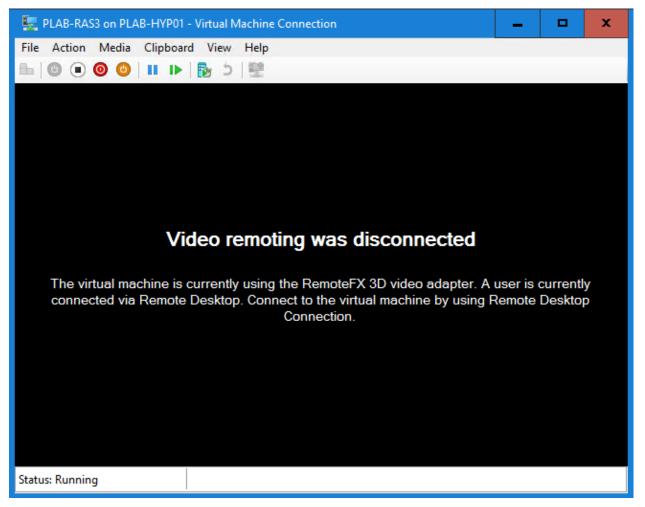
**3** Right click and open settings of the intended guest VM to use RemoteFX vGPU and add a RemoteFX 3D Video Adapter.



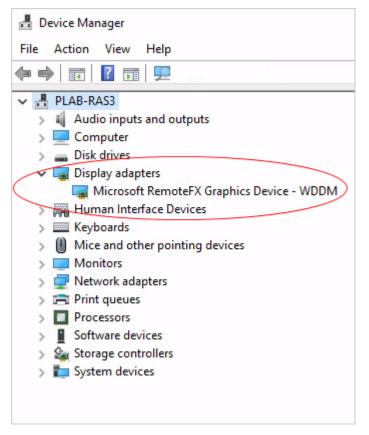
**4** Set the maximum number of monitors that this guest VM will support, the resolution for each monitor, and the dedicated video memory.

🔐 Settings for PLAB-RAS3 on PLAB-HYP01		-		x
PLAB-RAS3 V	◄ ► \			
<ul> <li>Add Hardware</li> <li>Firmware Boot from Hard Drive</li> <li>Security Secure Boot enabled</li> <li>Memory 4096 MB</li> <li>Processor 4 Virtual processors</li> <li>RemoteFX 3D Video Adapter</li> <li>SCSI Controller</li> <li>SCSI Controller</li> <li>Hard Drive PLAB-RAS3.vhdx</li> <li>Network Adapter Production</li> <li>Mame PLAB-RAS3</li> <li>Integration Services Some services offered</li> <li>Checkpoints Production</li> <li>Smart Paging File Location D: ProgramData (Microsoft (Windo Automatic Start Action Restart if previously running</li> <li>Automatic Stop Action Power Off</li> </ul>	RemoteFX 3D Video Adapter         You can set the maximum number of monitors that the virtual maximum resolution for each monitor.         Maximum number of monitors:       1 v         Maximum monitor resolution:       1920 x 1200 v         Dedicated video memory:       128 v       MB         To remove the RemoteFX 3D vide       64       from this virtual mach         256       512       1024			1e
	OK Cancel		Apply	

**5** After applying the settings, power on and RDP to the VM to confirm that RemoteFX vGPU is working as expected. As a confirmation, the VM console shows that the VM is using the RemoteFX 3D Video Adapter.



6 Opening the device manager of PLAB-RAS3, which is the guest VM with a RemoteFX 3D video adapter, shows us that Microsoft RemoteFX Graphics Device is being used.



Same can be observed if you run dxdiag from C:\Windows\System32\dxdiag.exe on the guest VM and checking the **Display** properties, as shown on the screenshot below.

😣 DirectX Diagnostic Tool			—		$\times$
System Display Input					
Device		Drivers			
Name:	Microsoft RemoteFX Graphics Device - WDDM	Main Driver:	rdvgumd64.dll,rdvgu116	4.dll,rdvgu	1
Manufacturer:	Microsoft	Version:	10.0.14393.0		
Chip Type:	Microsoft RemoteFX Graphics Adapter	Date:	6/21/2006 01:00:00		
DAC Type:	Microsoft RemoteFX Graphics Internal	WHQL Logo'd:	Yes		
Device Type:	Full Display Device	Direct3D DDI:	11.2		
Approx. Total Memory:	1280 MB	Feature Levels:	11_1,11_0,10_1,10_0,9	_3,9_2,9_	1
Current Display Mode:	1920 x 1080 (32 bit) (60Hz)	Driver Model:	WDDM 1.3		
Monitor:	Generic Non-PnP Monitor				

By looking at the Hyper-V settings we can easily note how many virtual machines are using this GPU under the GPU details.

GPU	
1. AMD FirePro S7000	~
✓ Use this GPU with RemoteFX	
GPU Details	
<b>Summary:</b> 1 virtual machines are currently using this GPU. 141 MB ou VRAM is currently provisioned to these virtual machines.	ut of a total 69565 MB of
Capabilities: DirectX Version: 11.1 Pixel Shader Version: 5.0 Dedicated Video RAM: 4076 MB Dedicated System Memory: 0 MB Shared System Memory: 65489 MB	
Driver Details: Driver Provider: Advanced Micro Devices, Inc. Driver Date: 1/12/2017 1:00:00 AM Driver Installed: 27/12/2017 11:37:03 AM Driver Version: 22.19.693.256 Driver Model Version: WDDM 2.1	

## Discrete Device Assignment (DDA)

DDA is a hardware pass-through solution which was made available on Microsoft Hyper-V with Windows Server 2016 acting as the host. Unlike RemoteFX vGPU, DDA provides a guest VM with full access to the GPU by enabling PCI-Express devices to be passed directly to the guest VM using native drivers. This enables the full set of capabilities, such as DirectX 12, CUDA, and others, and provides generally better performance compared to RemoteFX vGPU. This, however, comes at a cost on scalability because with DDA, the GPU is directly and exclusively passed to a specific VM and cannot be used by other VMs.

When looking at the GPU usage on RDSH running Windows Server 2016 for application and/or desktop publishing, the DDA configuration is the supported way forward. Please note that although some testing has been done on Windows Server 2012 R2, Parallels RAS officially supports and recommends Windows Server 2016 for the DDA solution.

### How to Setup Discrete Device Assignment (DDA)

Unlike setting up RemoteFX vGPU, there are various requirements and prerequisites that are needed to be completed to setup a DDA configuration. The necessary steps are described in this section.

For this example the below environment was used:

#### **Physical Host**

Hostname	PLAB-HYP1
Server System Model	Dell PowerEdge R730
Operating System	Windows Server 2016
Role	Hypervisor - Microsoft Hyper-V
Firmware version	2.21.21.21
GPU	AMD FirePro S7000

### Guest VM

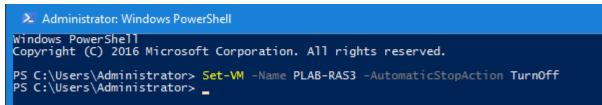
Hostname	PLAB-RAS3
Operating System	Windows Server 2016
Role	RDSH

Note: Make sure that the physical server, BIOS, firmware, and GPUs are DDA-compatible.

### Setup procedure

1 First, we need to configure a VM for DDA (in our case, it's PLAB-RAS3). To do so, we need to configure Automatic Stop Action to TurnOff by opening Powershell as an administrator on the host, PLAB-HYP1.

Set-VM -Name VMName -AutomaticStopAction TurnOff



Settings for PLAB-RAS3 on PLAB-HYP01 x D 1 PLAB-RAS3 ¥ • A Hardware Automatic Stop Action Add Hardware What do you want this virtual machine to do when the physical computer shuts down? Firmware Boot from Hard Drive Save the virtual machine state Security Hyper-V will reserve disk space equal to the amount of memory used by the virtual Secure Boot enabled machine when it is running so that memory can be written to disk when the physical computer shuts down. Memory 4096 MB Turn off the virtual machine 🛨 🔲 Processor Shut down the guest operating system 4 Virtual processors The integration service that controls shutting down the guest operating system 🖃 🗐 SCSI Controller must be installed and enabled on the virtual machine. 🗄 👝 Hard Drive Some settings cannot be modified because the virtual machine was in the following PLAB-RAS3.vhdx state when this window was opened: running. 🛨 🖳 Network Adapter To modify a setting that is unavailable, shut down the virtual machine and then Production reopen this window. Management 1 Name PLAB-RAS3 Integration Services Some services offered Checkpoints Production 🔜 Smart Paging File Location D: \ProgramData \Microsoft \Windo... To Automatic Start Action Restart if previously running Automatic Stop Action Power Off OK Cancel Apply

This changes the behavior of the VM when the physical computer shuts down.

For graphics devices, some hardware may perform better if the VM is configured in a certain way as shown below:

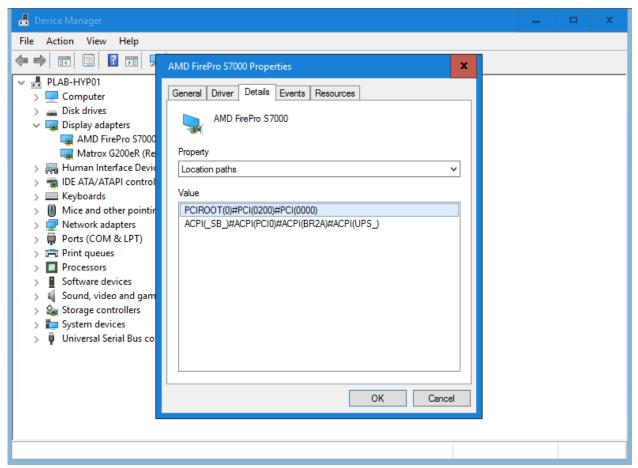
• Enable Write-Combining on the CPU:

Set-VM -GuestControlledCacheTypes \$true -VMName VMName

• Configure the 32 bit MMIO space:

Set-VM -LowMemoryMappedIoSpace 3Gb -VMName VMName

 Configure greater than 32 bit MMIO space: Set-VM -HighMemoryMappedIoSpace 33280Mb -VMName VMName 2 We need to dismount the device from the host partition to be able to assign it to a guest VM. To do so, the PCI location path is required. The PCI location path can be acquired from the Device Manager or via Powershell on the host as shown below:



Enumerate all PNP Devices on the system

\$pnpdevs = Get-PnpDevice -presentOnly

Select only those devices that are Display devices

\$gpudevs = \$pnpdevs | where-object {\$_.Class -like "Display"}

Select the location path of the first device that's available to be dismounted by the host.

\$locationPath=(\$gpudevs|Get-PnpDeviceProperty
DEVPKEY_Device_LocationPaths).data[0]

```
> Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.
PS C:\Users\Administrator> $pnpdevs = Get-PnpDevice -presentOnly
PS C:\Users\Administrator> $locationPath=($gpudevs|Get-PnpDeviceProperty DEVPKEY_Device_LocationPaths).data[0]
PS C:\Users\Administrator> $locationPath=($gpudevs|Get-PnpDeviceProperty DEVPKEY_Device_LocationPaths).data[0]
PS C:\Users\Administrator> $locationPath=($gpudevs|Get-PnpDeviceProperty DEVPKEY_Device_LocationPaths).data[0]
PS C:\Users\Administrator> $locationPath
PCIROOT(0)#PCI(0200)#PCI(0000)
PS C:\Users\Administrator> _
```

**3** We now need to disable the GPU graphics device from the host before we dismount it. Again, this can be done from Device Manager or via Powershell on the host as shown below:

📕 Device Manager	_	x
File Action View Help		
<ul> <li>PLAB-HYP01</li> <li>Computer</li> <li>Disk drives</li> <li>Display adapters</li> <li>Matrox G200eR (f</li> <li>Matrox G200eR (f</li> <li>Disable</li> <li>Dis ATA/ATAPI contr</li> <li>Keyboards</li> <li>Mice and other point</li> <li>Network adapters</li> <li>Ports (COM &amp; LPT)</li> <li>Print queues</li> <li>Software devices</li> <li>Sound, video and game controllers</li> <li>Sotorage controllers</li> <li>System devices</li> <li>Viniversal Serial Bus controllers</li> </ul>		
Disables the selected device.		

**4** Next step is to dismount the video card from the host so that it will no longer be accessible on the parent partition as shown below:



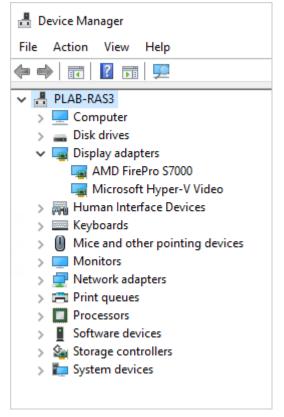
**5** After dismounting the GPU from the host, note that this is no longer listed under Display adapters from the device manager on the host.

📇 Device Manager
File Action View Help
(= -) 🖬 👔 🖬 💭
V 🛃 PLAB-HYP01
> 💻 Computer
> 👝 Disk drives
🗸 🏣 Display adapters
🕞 Matrox G200eR (Renesas) WDDM 2.0
> 📹 IDE ATA/ATAPI controllers
> 🔤 Keyboards
> III Mice and other pointing devices
> 🖵 Network adapters
> 🛱 Ports (COM & LPT)
> 🚍 Print queues
> Processors
> Software devices
🔉 🐗 Sound, video and game controllers
> 🏠 Storage controllers
> 🏣 System devices
> 🏺 Universal Serial Bus controllers

**6** Now we can assign the GPU graphics adapter to the guest VM, in this case to PLAB-RAS3. Add-VMAssignableDevice -LocationPath \$locationPath -VMName VMName

PS C:\Users\Administrator> Add-VMAssignableDevice -LocationPath \$locationPath -VMName PLAB-RAS3_

7 Now that GPU is assigned to PLAB-RAS3, we can install the GPU vendor driver on the guest VM and confirm successful installation of the right drivers from Device Manger.



8 Since we are using Windows Server 2016 with the intention of being used as an RDSH, we need to setup a group policy on the same guest VM to use the hardware graphics renderer instead of the Microsoft Basic Render Driver as the default adapter in RDS.

This can be carried out by enabling policy found under Computer Configuration / Administrator Template / Windows Components / Remote Desktop Services / Remote Desktop Session Host / Remote Session Environment to "Use the hardware default graphics adapter for all Remote Desktop Services sessions". **9** To confirm that the physical GPU is used by the guest VM, you can RDP to the guest VM and use C:\Windows\System32\dxdiag.exe on the guest VM and examine Display properties as shown below:

😣 DirectX Diagnostic Tool			_			$\times$
System Display Input						
Device		Drivers				
Name:	AMD FirePro S7000	Main Driver:	C:\Windows\System3	2\Driv	/erStore	F
Manufacturer:	Advanced Micro Devices, Inc.	Version:	22.19.693.256			
Chip Type:	AMD FirePro SDI (0x6808)	Date:	12/1/2017 01:00:00			
DAC Type:	Internal DAC(400MHz)	WHQL Logo'd:	Yes			
Device Type:	Full Display Device	Direct3D DDI:	12			
Approx. Total Memory:	6126 MB	Feature Levels:	11_1,11_0,10_1,10_	0,9_3	,9_2,9_1	1
Current Display Mode:	1920 x 1080 (32 bit) (32Hz)	Driver Model:	WDDM 2.1			
Monitor:	x					

For additional information about the procedure please see Plan for Deploying Devices using Discrete Device Assignment: https://docs.microsoft.com/en-us/windows-server/virtualization/hyper-v/plan/plan-for-deploying-devices-using-discrete-device-assignment

## RemoteFX vGPU vs. DDA Capabilities

Feature	RemoteFX vGPU	Discrete Device Assignment
Device GPU assignment	Para-virtualized (many VMs to one or more GPUs)	1 or more GPU to 1 VM
Scale	Best scale / 1 GPU to many VMs	Low scale / 1 or more GPUs to 1 VM
App compatibility	DX 11.1 OpenGL 4.4 OpenCL 1.1	All GPU capabilities provided by vendor (DX 12, OpenGL, CUDA)
AVC444	Enabled by default (Windows 10 and Windows Server 2016)	Available through Group Policy (Windows 10 and Windows Server 2016)
GPU VRAM	Up to 1 GB dedicated VRAM	Up to VRAM supported by the GPU
Frame rate	Up to 30fps	Up to 60fps
GPU driver in guest	RemoteFX 3D adapter display driver (Microsoft)	GPU vendor driver (Nvidia, AMD, Intel)
Guest OS support	Windows Server 2012 R2 Windows Server 2016 Windows 7 SP1 Windows 8.1 Windows 10	Windows Server 2012 R2 Windows Server 2016 Windows 10 Linux
Hypervisor	Microsoft Hyper-V	Microsoft Hyper-V

The following table highlights different capabilities when comparing RemoteFX vGPU and DDA.

Host OS availability	Windows Server 2012 R2 Windows Server 2016 Windows 10	Windows Server 2016
GPU hardware	Enterprise GPUs (such as Nvidia Quadro/GRID or AMD FirePro)	Enterprise GPUs (such as Nvidia Quadro/GRID or AMD FirePro)
Server hardware	No special requirements	Modern server, exposes IOMMU to OS (usually SR-IOV compliant hardware)

Table Reference: https://docs.microsoft.com/en-us/windows-server/remote/remote-desktop-services/rds-graphics-virtualization

### CHAPTER 3

## Publishing GPU Accelerated Applications with Parallels RAS

Parallels RAS can be used with both GPU acceleration options, RemoteFX vGPU or DDA, to have applications and/or desktops utilize GPU performance. When using RemoteFX vGPU, Parallels RAS can be used to publish desktop VDIs running on Windows 7 SP1, Windows 8.1 and Windows 10. With Parallels RAS v16.x and newer, server-based VDI can also be deployed with RAS VDI Guest Agent running on Windows Server 2012R2 and Windows Server 2016. Both VDI deployment procedures (Desktop or Server OS) are described in the sections that follow this one.

### **In This Chapter**

Desktop-Based VDI with RemoteFX vGPU	
Server-Based VDI with RemoteFX vGPU	
RD Session Hosts with DDA	

## Desktop-Based VDI with RemoteFX vGPU

For the below example we will use a Windows 10 RAS Template with RemoteFX vGPU and linked clones to cater for a small test user base.

**Note:** For a complete guide on how to deploy Parallels RAS VDI, please refer to Parallels RAS Administrators Guide.

- 1 Add the RemoteFX 3D Video Adapter to a guest VM which will be used as a RAS template (as shown in the previous section). In our case we will be using a guest VM with hostname PLAB-VDI-10-T1.
- 2 Open RAS Console, log in as Parallels RAS Administrator, go to **Farm** category and choose **VDI**. Add the hypervisor (in our case Microsoft Hyper V 2016) as a VDI host.
- 3 Select the **Templates** tab and choose a guest VM from which the RAS Template will be created. The VM must have the RemoteFX 3D Video Adapter already assigned to it (as described in step 1 above.

	Installing RAS	Guest Agent		? X
Agents to install:				Install
Server	Status	Туре		
10.122.33.52	In Progress	Guest		Cancel
Progress:				
			~	
			$\sim$	

4 The wizard will allow you to deploy the RAS Guest Agent on the guest VM.

**5** Once the RAS Guest Agent is deployed, we can set this VM as our VDI template.

	Guest Agent Information	? X	
Guest: Agent:	PLAB-VDI-10-T1 Agent Verified	Add	
Version: DHCP:	16.2 (build 19039) Protocol Version 0 Enabled		
VDI Host:	10.122.33.11 (Microsoft Hyper-V)		
OS Type:	Microsoft Windows 10 Enterprise Edition (WOW 64)		
	est Agent installed. Make Template		

6 Complete the RAS Template Wizard to configure the number of maximum guests and precreated guests (full or linked clones) along with other settings including hostnames, AD details, Microsoft Licensing details, etc.

Create Parallels RAS Template Wizard - Properties ? ×				
Paralle	S			
RAS Template:	PLAB-VDI-10-T1			
Maximum Guest VMs: Pre-created Guest VMs:	3		Default Default	
Guest VM Name:	PLAB-VD E.g. PLAB-VD0019	] %ID%	Default	
Delete unused guest	/Ms			
after	1 week		V	
Clone method:	○ Create a full clone			
	<ul> <li>Create a linked clone</li> </ul>			
	< Back Next >	Cancel	Help	

Create Pa	arallels RAS Template	e Wizard - Preparation 🛛 ? 🛛 🗙
Parallel	s	Туре
Select image preparation t RASprep Sysprep Computer name: Owner name: Organization: Administrator password: Join domain: Administrator: Password:	PLAB-VD%ID% rasadmin Parallels Lab  parallelslab.local administrator	Select organizational unit         Image: parallelslab         Image: par
Target OU:		OK Cancel
	< Back N	Next > Cancel Help Default

Create Parallels RAS Template Wizard - Summary
Parallels"
Template name: PLAB-VDI-10-T1 Guest VM name prefix: PLAB-VD%ID% Maximum guest VMs: 20 Pre-create guests VMs: 3 Path to the folder with guest VMs: D:\ProgramData\Microsoft\Windows\Hyper-V Computer name: PLAB-VD%ID% Domain: parallelslab.local Target OU: OU=VDI,OU=Lab,DC=parallelslab,DC=local Organization name: Parallels Lab Owner name: rasadmin Preparation: RASprep License key management: Key Management Service (KMS)
✓ Launch Parallels Test Template Wizard on completion
< Back Finish Cancel Help

- 7 It is a good practice to launch the Parallels Test Template Wizard which will create a single clone of template PLAB-VDI-10-T1 and make a series of tests to check the health of the template.
- 8 Now that the test and cloning have been carried out successfully we can review the cloned VMs. In our case we have cloned three VM instances from PLAB-VDI-10-T1 successfully as seen from the Hyper V manager.

PLAB-VD1012	Running	0 %	4096 MB	00:00:56
PLAB-VD1013	Running	0 %	4096 MB	00:00:34
PLAB-VD1014	Running	0 %	4096 MB	00:00:44
PLAB-VDI-10-T1	Off			

**9** Looking at each created VM settings, you can note that all cloned VMs have been automatically configured with RemoteFX 3D video adapter.

Settings for PLAB-VD1012 on PLAB-HYP01		-		×
PLAB-VD1012 v	⊌ ♦ 3			
<ul> <li>Hardware         <ul> <li>Add Hardware</li> <li>Firmware</li> <li>Boot from Hard Drive</li> <li>Secure Boot enabled</li> <li>Memory</li> <li>4096 MB</li> </ul> </li> <li>Processor         <ul> <li>2 Virtual processors</li> <li>RemoteFX 3D Video Adapter</li> <li>SCSI Controller</li> <li>Arad Drive                  <ul></ul></li></ul></li></ul>	<ul> <li>RemoteFX 3D Video Adapter</li> <li>You can set the maximum number of monitors that the virtual maximum resolution for each monitor.</li> <li>Maximum number of monitors: 1 ♥</li> <li>Maximum monitor resolution: 1920 x 1200 ♥</li> <li>Dedicated video memory: 128 ♥ MB</li> <li>To remove the RemoteFX 3D video adapter from this virtual machinistate when this window was opened: running.</li> <li>To modify a setting that is unavailable, shut down the virtual reopen this window.</li> </ul>	ine, dick R	emove. Remove he followir	
	OK Cancel		Apply	

**10** Finally, we can go ahead and add the guest VMs from Template in a pool and publish VDIs from pool.

Virtual Desktop				
Paralle	els			
<u>V</u> irtual Desktop				
Name:	Windows 10			
Description:	Windows 10 with RemoteFX 3D Video Adapter			
	Start automatically when user logs on			
	Change Icon			
Properties				
Connect to	Any Guest VM	~		
from Pool:	Windows 10			
	✓ P	ersistent		
Desktop Size:	Full Screen V X			
Multi-Monitor:	Use Client Settings	~		
	< Back Finish Cancel	Help		

**11** When the user launches the published desktop, we can confirm which graphics adapter is being used from C:\Windows\System32\dxdiag.exe on the published VM and check out Display properties as shown below.

Logon	×
Parallels®	
Preparing desktop on PLAB-VD 10 12	
😵 DirectX Diagnostic Tool	– 🗆 X
System Display Sound Input	
Device       Name:       Microsoft RemoteFX Graphics Device - WDDM         Manufacturer:       Microsoft         Chip Type:       Microsoft RemoteFX Graphics Adapter         DAC Type:       Microsoft RemoteFX Graphics Internal         Device Type:       Full Display Device         Approx.       Total Memory:       1152 MB         Current Display Mode:       1024 × 768 (32 bit) (60Hz)       Monitor:	Drivers Main Driver: rdvgumd64.dll,rdvgu1164.dll,rdvgu1 Version: 10.0.10586.0 Date: 6/21/2006 00:00:00 WHQL Logo'd: Yes Feature Levels: 11.1,11.0,10.1,10.0,9.3,9.2,9.1 Driver Model: WDDM 1.2
DirectX Features DirectDraw Acceleration: Enabled	
Direct3D Acceleration: Enabled	
AGP Texture Acceleration: Enabled	
Notes  No problems found.	
Help Next Page	Save All Information Exit

### Server-Based VDI with RemoteFX vGPU

Setting up a server-based VDI is similar to the procedure described in the previous section. The difference is, instead of choosing a Desktop OS for the RAS Template, we will choose a Server OS with RemoteFX 3D Video Adapter.

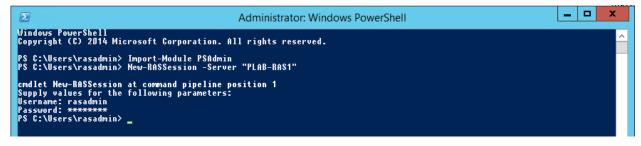
Before deploying the RAS VDI Guest Agent, we need to allow the Server OS guests to be added as VDI guests by enabling RAS option 'EnableServerGuests'. This can be done via Powershell as follows:

- **1** Create a session with the RAS setup.
  - # Import the Parallels RAS PowerShell module:

Import-Module PSAdmin

# Create a new Parallels RAS session.

```
New-RAS Session - Server "RAS Server with Powershell API installed"
```



2 Run Get-VDISettings to confirm the status of EnableServerGuests, which by default is set to False.

PS C:\Users\rasadmin> Get-VDISettings							
SiteId	ReplicatePersistentSettings	EnableServerGuests	PersistentTimeSec				
1	True	False	86400				

**3** We need to change this to true by using Set-VDISettings [-EnableServerGuests <bool>]

C:\Users\rasadmin> C:\Users\rasadmin>	Set-VDISettings -EnableServerGuests 1 -

At this point we can continue to use Powershell for deployment or revert to RAS console and carry out the remaining config to setup Server based VDI. For the complete RAS Powershell documentation, please see the **Parallels RAS PowerShell Guide**, which can be found at https://www.parallels.com/products/ras/resources/.

4 Choosing to add the Server OS as a RAS VDI template is now allowed.

	Guest Agent Information ? ×
Guest:	PLAB-VDI-SRV-T1 Add
Agent: Version:	Agent Verified Cancel 16.2 (build 19039) Protocol Version 0
DHCP:	Enabled
VDI Host:	10.122.33.11 (Microsoft Hyper-V)
OS Type:	Microsoft Windows Server 2016 Standard Edition (WOW 64)
Status: <u>Customize</u>	RAS Guest Agent installed.       Make Template         Guest Agent deployment settings

**5** The same wizard of desktop based VDI deployment is shown and now we can create full or linked clones from the Server OS template to use Server based VDI with RemoteFX 3D Video Adapter.

For this example we have pre-created three Server based VDI linked clones and assigned them to a newly created VDI pool named Windows Server 2016. From here, we can move on to publishing and providing access to users.

Virtual Desktop Hosts	Pool Management	RAS Templates	Persistent	Guest VMs	Sessions			
							🕂 🖃 🔍 Tasks	s 🔻
Name				Host		Туре 📩	Status	
PLAB-VDI-10-T1				10.122.33.	11	Microsoft Hyper	Agent OK	
PLAB-VDI-SRV-T1				10.122.33.	11	Microsoft Hyper	Agent OK	
		Temp	late Gue	st VMs Li	st		? X	
Guest VMs create	ed from PLAB-VDI-SR	/-T1:						
Guest VM	Guest VM State	VDI Conne	. User	IP	Address	License ke	Refresh	
PLAB-VS1016	Powered On	Disconnecte	d	0.0	0.0.0			
PLAB-VS1017	Powered On	Disconnecte	d	0.0	0.0.0		Recreate	
PLAB-VS1018	Powered On	Disconnecte	d	0.0	0.0.0			
							Delete	
							Send message	
							Log off	
<							ОК	
3 items							Cancel	
							.11	
Virtual Desktop Hosts	Pool Management	RAS Templates	Persistent (	Cupet VMe	Sessions	1		
ni tuai Desktop Hosts	, our management	KAS Templates	rensistent (	Suest VMs	Sessions			
Pools: + -	🔍 Tasks 🔻 🛛	Members:					🛨 🖃 🔍 Tasks	•
Name		Name					Туре	
✓ <default></default>		PLAB-VDI-SRV-T	1				RAST	
Windows 10								
✓ Windows Server	2016							

6 As user launches the published desktop, we can confirm which graphics adapter is being used from C:\Windows\System32\dxdiag.exe on the published VM and check out Display properties as shown below.

Logon	×
Parall	lels"
Preparing desktop on PLAB-VS 10 16	
😵 DirectX Diagnostic Tool	– 🗆 ×
System Display Sound Input	
	ctX components and drivers installed on your system.
If you know what area is causing the problem, click the visit each page in sequence.	the appropriate tab above. Otherwise, you can use the "Next Page" button below to
Current Date/Time:	: 03 January 2018, 16:28:01
Computer Name:	: PLAB-VS1016
Operating System:	: Windows Server 2016 Standard 64-bit (10.0, Build 14393)
Language:	: English (Regional Setting: English)
System Manufacturer:	: Microsoft Corporation
System Model:	I: Virtual Machine
BIOS:	: Hyper-V UEFI Release v1.0
Processor:	: Intel(R) Xeon(R) CPU E5-2630 v3 @ 2.40GHz (2 CPUs), ~2.4GHz
	: 4096MB RAM
	: 2020MB used, 2778MB available
DirectX Version:	: DirectX 12
Check for WHQL digital signatures	
	DxDiag 10.00.14393.0000 64-bit Unicode Copyright © Microsoft. All rights reserved.
Help	Next Page Save All Information Exit

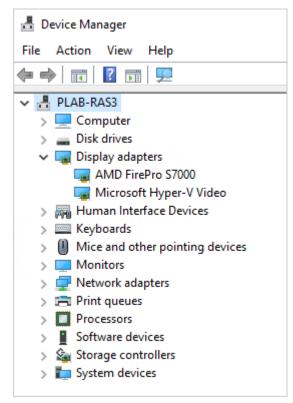
,	Dispidy	Sound Input			
Devic	e			Drivers	
		Name: Microso	ft RemoteFX Graphics Device - WDDM	Main Driver: rdvgumd64.dll,rdvgu1164.dll,rd	vgul
	Manu	ufacturer: Microso	ft	Version: 10.0.14393.0	
	C	hip Type: Microsol	ft RemoteFX Graphics Adapter	Date: 6/21/2006 01:00:00	
			ft RemoteFX Graphics Internal	WHQL Logo'd: Yes	
		vice Type: Full Disp		Direct3D DDI: 11.2	
		Memory: 1152 Mi		Feature Levels: 11_1,11_0,10_1,10_0,9_3,9_2	,9_1
Cur	rent Disp		768 (32 bit) (60Hz)	Driver Model: WDDM 1.3	
		Monitor: Generic	Non-PnP Monitor		
Direct	tX Featur	es			
	Direct	Draw Acceleration:	Enabled		
	Dire	ct3D Acceleration:	Enabled		
	AGP Tex	ture Acceleration:	Enabled		
Notes	5				
·	No proble	ems found.			_

## RD Session Hosts with DDA

After implementing DDA for Windows Server 2012R2 or Windows Server 2016 used as RDSH (as discussed in the previous section) we need to configure RDSH publishing from Parallels RAS. It's a simple procedure and the standard process of deploying the RAS RD Session Host Agent on that VM. Publishing can then be done either via RAS console or RAS PowerShell.

**Note:** For the information on how to deploy the RAS RD Session Host Agent and publish applications or session-based desktops from RDSH, please refer to the Parallels RAS Administrators Guide.

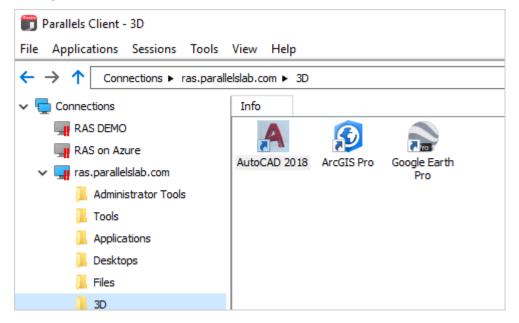
1 Use the Device Manager to confirm that the GPU has been assigned to PLAB-RAS3 and the correct drivers are installed on the RDSH. See **How to Setup Discrete Device Assignment** for instructions (p. 13).



2 Deploy RAS RD Session Host Agent to the intended RDSH with DDA configured.

■,		Parallels Remote Application Server Console	_ 0 ×
File View Language	Help		
Site: PLAB-SITE1 💌			rasadmin 🔻
	Farm - PLAB-RAS1	RD Session Hosts Groups Scheduler Sessions	
	Site - PLAB-SITE 1		
Start			🛨 🖃 😌 🔍 Tasks 🔻
	RD Session Hosts	Server	Agent State Logon Status D
Ē	VDI Hosts	✓ PLAB-RAS1	Agent OK Enabled P
Farm	PC Remote PCs	✓ PLAB-RAS2	Agent OK Enabled P
		✓ plab-ras3	🥑 Agent OK 🛛 Enabled 🛛 🛛 p
Load Balancing	I HALB		
8 - 8 - -	Settings		
Publishing			

**3** Publish applications and session-based desktops from the same RDSH while utilizing GPU directly.



### CHAPTER 4

## Conclusion

As discussed in this document, Windows Server 2016 provides two options to utilize the GPU, directly or indirectly, using DDA or improved RemoteFX vGPU respectively via Microsoft Hyper-V 2016. In general, it is recommended to use DDA for the best application compatibility and performance since the VM will have direct access to the GPU and can utilize its full capabilities. However, if applications or desktops do not have such strict GPU requirements, using RemoteFX vGPU might be the ideal setup. Another important point to consider is that with DDA the GPU is solely attached to a particular VM and cannot be used by other VMs, which makes it less scalable. This, however, is the supported way to have RDSH with multiple users utilize physical GPU power.

Parallels RAS is able to support both scenarios as the decision to use RemoteFX vGPU or DDA should be based on application compatibility and workload. If the intention is to utilize RDSH to publish your applications and desktops with GPU acceleration, DDA would be the recommended solution. If using VDI based deployments with non-specific GPU requirements, RemoteFX vGPU could be a more flexible choice.

### Chapter 5

## References

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https://blogs.technet.microsoft.com/hybridcloudbp/2016/11/15/new-rds-capabilities-in-windows-server-2016-for-service-providers/

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