Configuring RemoteFX on Windows Server 2012 R2

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History

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<th>Author</th>
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Scenario
In this guide, we will show how to setup and configure RemoteFX for a Hyper-V host running Windows Server 2012 R2. The host is used for testing and development purposes, it is not member of a domain. (In this guide, the name of the host machine we are configuring will be “Black”.)

Especially we are interested to have a synthesized DirectX 11 capable graphics adapter in our virtual machines. This is known as the RemoteFX vGPU feature.

The host machine has a Core i7 processor (Haswell generation). Graphics adapter is a NVIDIA Quadro K620. So the hardware meets the requirements for RemoteFX and we will not bother with discussing details of hardware requirements.

Let’s start with setting up the host machine.

Add the Hyper-V Role
1. After the basic setup of Windows Server 2012 R2 Datacenter, ask Windows Update to install all available updates. Also be sure that the latest available display driver is installed.
2. Then the Hyper-V role needs to be added. In Server Manager, choose Add Roles and Features from the Manage menu. Choose a Role-based or feature-based installation. Then select the local server to add the role to.
3. Add the Hyper-V role. Confirm to also add all required features suggested by the wizard and let the wizard finalize the job.
4. As usual, after adding the Hyper-V role the Hyper-V Manager will be available.

Add the Remote Desktop Virtualization Host Role Service and the Remote Desktop Licensing Role Service

For RemoteFX to work, the Remote Desktop Virtualization Host role service must be up and running on the Hyper-V host machine.

Also a Remote Desktop Licensing Server must be available in the network. The RD Virtualization Host needs the RD Licensing Server to confirm the availability of Remote Desktop Client Access Licenses.

Since our installation is for development and testing, we will set up the licensing server on the same machine as the Hyper-V host.

1. In Server Manager, choose Add Roles and Features from the Manage menu. Choose a Role-based or feature-based installation. Then select the local server to add the role to.

2. Add both the Remote Desktop Licensing role service and the Remote Desktop Virtualization Host role service. Confirm to also add all required features suggested by the wizard and let the wizard finalize the job.
3. Now the Remote Desktop Licensing Manager and the RD Licensing Diagnoser will be available.

![Remote Desktop Licensing Manager and RD Licensing Diagnoser](image)

**Install Remote Desktop Licenses**

Now let us install some Remote Desktop CALs. (A MSDN subscription is a good way to get RD CALs.)

1. Start the Remote Desktop Licensing Manager. Connect to the machine the Remote Desktop Licensing service is running on, i.e. to the local machine in our scenario.

2. Open the Properties in the server node’s context menu. Connection method should be *Automatic connection*. Also type in the *Required Information* (your name, your company, and your country).

![BLACK Properties](image)

3. Now choose to *Install Licenses* in the server node’s context menu. The *Install Licenses Wizard* opens up.
4. Choose the appropriate *License program*. In our example, we choose *License Pack (Retail Purchase)* which is what you typically get from a MSDN subscription.

![License Program Wizard](image)

Every client that is connecting to a Remote Desktop Session Host server or a virtual desktop in a Microsoft Virtual Desktop Infrastructure must have a valid license. Select the license program through which you purchased your licenses.

- **License program**: License Pack (Retail Purchase)
- **Description**: This is a license purchased in preset quantities through a retail store or other reseller. The package may be labeled "Microsoft Windows Client License Pack".
- **Format and location**: The license code from the License Pack will be required. The license code is a sequence of five sets of five alphanumeric characters.
- **Sample**: 1A2B3 1A2B3 1A2B3 1A2B3 1A2B3

Verify that your license information is similar to the sample before continuing.
5. Provide the required license information (depends on the chosen license program).

![License Code Window]

<table>
<thead>
<tr>
<th>License Code</th>
<th>Status</th>
<th>Product Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Type in the license code for each license you have purchased, and then click Add after entering each license code. The format for the license code is 5 sets of 5 alphanumeric digits.
6. Let the wizard finalize its job to install the licenses.

![Image of Install Licenses Wizard]

The Remote Desktop Licensing Manager indicates that the task succeeded.

![Image of RD Licensing Manager]

7. The Remote Desktop Licensing Manager indicates that the task succeeded.

Configure the License Server for the Remote Desktop Virtualization Host

1. Open up the RD Licensing Diagnoser. The Licensing Diagnoser tells us that our Remote Desktop Session Host Server cannot find a RD Licensing Server. We didn’t set up a RD Session
Host Server but a RD Virtualization Host Server, but anyway.

2. The RD Virtualization Host Server locates the RD Licensing Server via group policies. Since our server is not member of any domain we use a local group policy. So open up `gpedit.msc` and navigate to `Computer Configuration\Administrative Templates\Windows Components\Remote Desktop Services\Remote Desktop Session Host\Licensing`. From there you can configure the RD Licensing settings.
3. Open up the *Use the specified Remote Desktop license servers* policy setting. **Enable** the policy setting and type in the name of the license server to use.
4. Then open up the Remote Desktop licensing mode policy setting. **Enable** the policy setting and specify the licensing mode **Per Device**. (Remember that we installed Per Device licenses.)

5. With these policy settings the RD Licensing Diagnoser is happy now.
Choose the GPU to be used with RemoteFX

Now that the Remote Desktop Virtualization Host role is installed a RemoteFX 3D Video Adapter is available which can be added to virtual machines.

But first we need to associate the RemoteFX 3D Video Adapter with an appropriate physical GPU.

1. In Hyper-V Manager, open up Hyper-V Settings.

   ![Hyper-V Manager screen shot](image)

   ![Hyper-V Settings screen shot](image)
2. Choose the appropriate GPU to be used with RemoteFX.

Windows 8.1 as Guest
First we evaluate RemoteFX with Windows 8.1 as a guest in a virtual machine. The client from which we will connect to the VM is also running Windows 8.1.

Using the RemoteFX 3D Video Adapter in a virtual machine requires Windows 8.1 Enterprise as guest operating system. For Windows 8.1 Pro or Core the RemoteFX 3D Video Adapter will not be offered as available hardware to add.

Also be sure that you configure a Generation 1 VM. Generation 2 does not support RemoteFX.

1. Set up a Generation 1 virtual machine with Windows 8.1 Enterprise and ask Windows Update to apply all available updates.
2. In **Hyper-V Manager**, you should configure **Integration Services** to include **Guest services** (which are not included by default).

3. Windows 8.1 with all available updates has the latest integration services installed to work with Windows Server 2012 R2 as a host. So you do not need to update the Integration Services in the VM.
4. Add the RemoteFX 3D Video Adapter to your VM and configure the adapter according to your needs.

5. Connect to the VM by a Remote Desktop Connection from a Windows 8.1 client. (Note that connecting to our RemoteFX enabled VM by a Virtual Machine Connection is also supported.)

6. RemoteFX can be verified by checking the display adapter in the VM’s Device Manager. Microsoft RemoteFX Graphics Device – WDDM indicates that RemoteFX is available.
7. Executing `dxdiag.exe` from the Run dialog shows the VM’s supported DirectX features levels, the WDDM driver model, and the amount of graphics memory available.

![DirectX Diagnostic Tool](image)

8. The VM’s event log will also contain diagnostic information about the remote desktop connection and the feature support negotiated between the VM and the client. In Event Viewer, open up Applications and Services Logs\Microsoft\Windows\RemoteDesktopServices-RdpCoreTS\Operational. Event ID 34 Remote Desktop Protocol will use the RemoteFX host mode module to connect to the client computer indicates that RemoteFX vGPU is enabled.

![Event Viewer](image)

**Windows 7 with Service Pack 1 as Guest**

Now we evaluate RemoteFX with `Windows 7 with Service Pack 1` as a guest in a virtual machine. Again the client from which we connect to the VM is running Windows 8.1.

Using the RemoteFX 3D Video Adapter in a virtual machine is working with `Windows 7 Enterprise` or `Windows 7 Ultimate` as guest operating system. *(I did not evaluate other Windows 7 SKUs.)*

Also be sure that you configure a **Generation 1** VM. Generation 2 does not support RemoteFX.
1. Set up a virtual machine with Windows 7 with Service Pack 1 Enterprise. Before installing any further updates check the version of the Remote Desktop Protocol by opening up the About dialog of the Remote Desktop Connection application. The supported RDP version is 7.1.

2. Now ask Windows Update to install all available updates. Check the supported RDP version again. It is 8.1 now. So the RDP 8.1 update for Windows 7 SP1 has been installed by Windows Update. But note that as soon RemoteFX will have been enabled the RDP version effective in use when clients connect to this VM will fall back to 7.1.

3. In Hyper-V Manager, you should configure Integration Services to include Guest services (which are not included by default). Do not yet add the RemoteFX 3D Video Adapter to the
4. We need to update the Integration Services installed in the VM. So insert the Integration Services Setup Disk into the VM and install the latest version.

5. When trying to connect to a RemoteFX enabled Windows 7 VM with Virtual Machine Connection, i.e. from Hyper-V Manager without using RDP, you will find out that Virtual Machine Connection is not supported. You must use a Remote Desktop Connection. This is different from a Windows 8.1 VM with RemoteFX where you can connect with Virtual
Machine Connection.

Video remoting was disconnected

The virtual machine is currently using the RemoteFX 3D video adapter. A user is currently connected via Remote Desktop. Connect to the virtual machine by using Remote Desktop Connection.
6. Since a RDP connection is the only way to interact with a RemoteFX enabled Windows 7 VM be sure that the VM has a network adapter and that remote access is allowed in the VM.

7. Add all users who should be granted Remote Desktop access explicitly to the Remote Desktop Users group. Do not rely on the dialog claiming that members of the Administrators
group can connect even if they are not listed.

8. Since Windows 7 Service Pack 1, inbound RemoteFX connections to a VM are blocked by the Windows Firewall by default. There is a group of firewall rules we need to enable to allow RemoteFX. Inside the Windows 7 VM, open up *Windows Firewall with Advanced Security*. In the *Inbound Rules* tab, enable all rules belonging to the group *Remote Desktop – RemoteFX*.
9. Now add the RemoteFX 3D Video Adapter to your VM and configure the adapter according to your needs.

10. Start the VM, make the first connect with Virtual Machine Connection, wait for the driver installation to finish, then restart the VM.
11. Remember that after the restart you can no longer connect to the VM with Virtual Machine Connection. You must use Remote Desktop Connection instead. When connecting with Remote Desktop Connection, be sure that the user name contains the machine name of the VM.

![Remote Desktop Connection](image)

12. When connected to the VM, RemoteFX can be verified by checking the display adapter in the VM's Device Manager. Microsoft RemoteFX Graphics Device – WDDM indicates that RemoteFX is available.

![Device Manager](image)

13. Running `dxdiag.exe` does not show the DirectX feature level clearly but in a Windows 7 VM with RemoteFX it is **DX9** even if the physical graphics adapter supports DX11. (A Windows 8.1 VM with RemoteFX supports up to DirectX feature level 11.1 if it is supported by the physical
14. In Event Viewer, open up Applications and Services Logs\Microsoft\Windows\RemoteDesktopServices-RdpCoreTS\Operational. You might not find the expected event ID 34. Instead event ID 33 is present.

15. In addition, you will find a warning with event ID 5 in the Admin log claiming that the client does not support RemoteFX.
16. When a Windows 8.1 client talks to a Windows 7 SP1 VM via RDP the Remote Desktop Protocol 7.1 will be used which is less optimized to work over WAN or WLAN connections. Close the connection, i.e. log off. To improve the RemoteFX experience, on the Experience tab of the Remote Desktop Connection client application choose *LAN (10 Mbps or higher)*. Then connect again. Now at least the warning in the *Admin* log should have been gone.

![Remote Desktop Connection](image)

**Comparison: Windows 8.1 vs Windows 7 SP1**

The table summarizes the features supported by a Windows 8.1 VM and a Windows 7 SP1 VM. As always in this guide, it is assumed that the VM is hosted by Windows Server 2012 R2 and that RemoteFX vGUI is enabled.

When talking about the effective RD protocol version in use we assume that we connect to the VM from a client machine with Windows 8.1.

<table>
<thead>
<tr>
<th>VM Operating System</th>
<th>SKU Required</th>
<th>Max DirectX Feature Level Supported</th>
<th>RDP Version in use</th>
<th>Virtual Machine Connection Supported</th>
<th>Enhanced Session Mode Supported</th>
<th>Generation 2 VM Supported</th>
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<td>9</td>
<td>7.1</td>
<td>no</td>
<td>no</td>
<td>no</td>
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References

Windows Server 2012 Remote Desktop Services (RDS)

What’s New in Hyper-V for Windows Server 2012 R2?


Understanding and Evaluating RemoteFX vGPU on Windows Server 2012 R2

RemoteFX vGPU Improvements in Windows Server 2012 R2

RemoteFX Features for Windows 8 and Windows Server 2012