



# Synchronizer 5.9.1

## Pre-Install Checklist

November 2017



# Table of Contents

<a href="#"><u>Introduction</u></a>	Page 3	<a href="#"><u>Synchronizer Disk Space Notes</u></a>	Page 17
<a href="#"><u>Synchronizer Pre-Install Checklist</u></a>	Page 4	<a href="#"><u>System BIOS Configuration</u></a>	Page 18
<a href="#"><u>Checklist Overview</u></a>	Page 5	<a href="#"><u>Install Microsoft .NET</u></a>	Page 19
<a href="#"><u>Server Computer Preparation</u></a>	Page 6	<a href="#"><u>Firewall Configuration</u></a>	Page 20
<a href="#"><u>Active Directory Configuration</u></a>	Page 7	<a href="#"><u>Antivirus Software Configuration</u></a>	Page 21
<a href="#"><u>Hyper-V Configuration</u></a>	Page 8	<a href="#"><u>Active Directory Configuration</u></a>	Page 22
<a href="#"><u>.NET, Firewall, and Antivirus</u></a>	Page 9	<a href="#"><u>Active Directory Service Account</u></a>	Page 23
<a href="#"><u>Windows Roles, Features, and Other Apps</u></a>	Page 10	<a href="#"><u>Computer Accounts for DesktopPlayer VMs</u></a>	Page 24
<a href="#"><u>Supplemental Information</u></a>	Page 11	<a href="#"><u>Active Directory Computers OU Example</u></a>	Page 25
<a href="#"><u>Physical Computer Requirement</u></a>	Page 12	<a href="#"><u>Hyper-V Configuration</u></a>	Page 28
<a href="#"><u>Synchronizer System Requirements Notes</u></a>	Page 13	<a href="#"><u>Enable the Hyper-V Role</u></a>	Page 29
<a href="#"><u>Synchronizer CPU and Memory Recommendations</u></a>	Page 14	<a href="#"><u>Hyper-V Virtual Switch Configuration</u></a>	Page 30
<a href="#"><u>Synchronizer Disk Space Recommendations</u></a>	Page 15	<a href="#"><u>Hyper-V Quick Validation</u></a>	Page 31
<a href="#"><u>Synchronizer Memory Notes</u></a>	Page 16		

# Introduction

## Summary

This document presents a checklist of activities that might be performed before installing Synchronizer, to help ensure a successful installation and a good experience with Synchronizer after it is installed. This document was originally prepared to support Proof of Concept installations so the emphasis is skewed towards "Quick Start", or getting the Synchronizer up and running quickly. Modifying or migrating the Synchronizer installation later on, to suit the needs of a production deployment, is usually possible. This is a common type of service request handled by the Citrix Technical Support team.

## Applicability

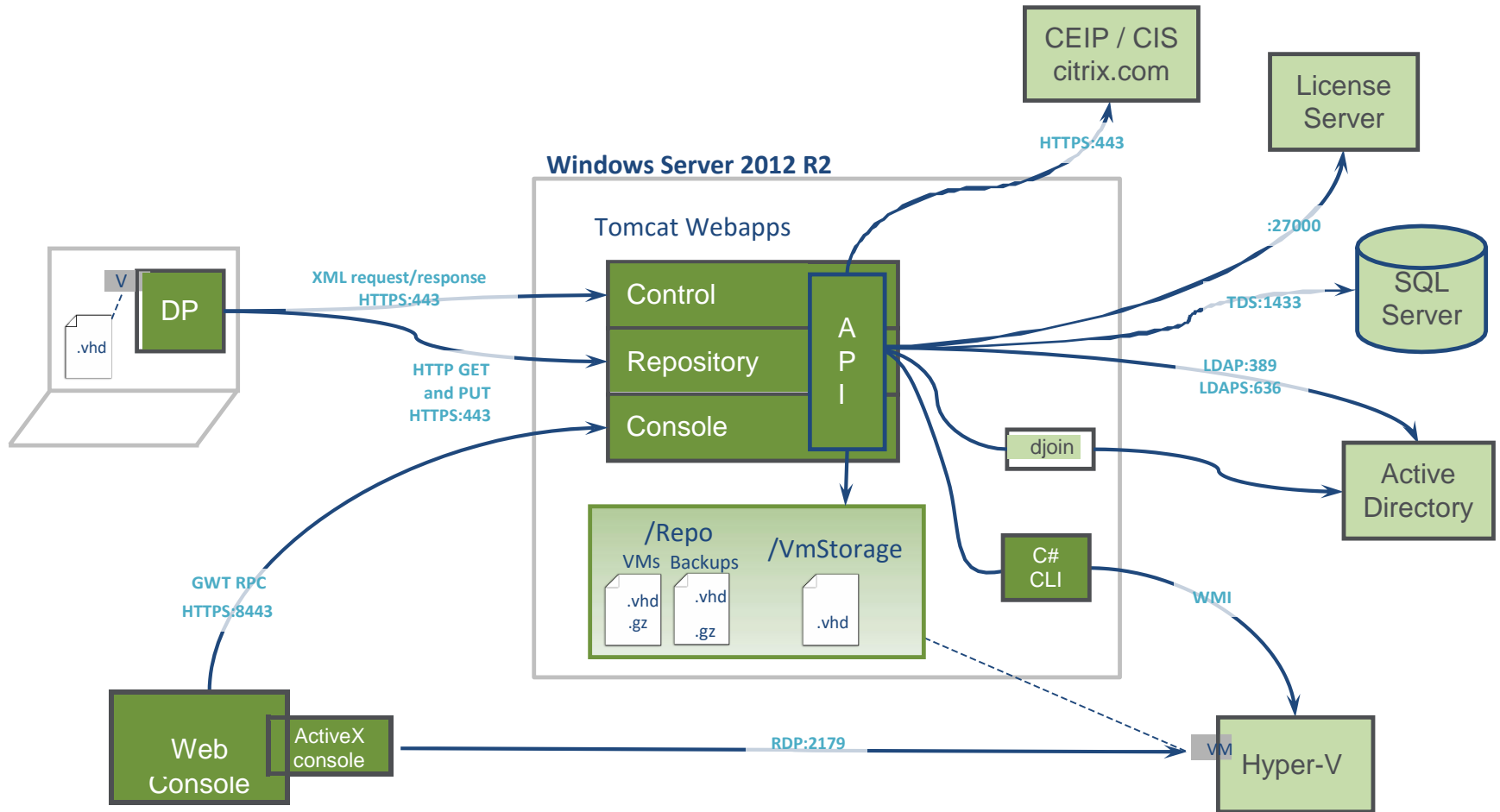
This document is applicable to Synchronizer version 5.9. Portions of this document might not be applicable to earlier or later versions of Synchronizer. Each Synchronizer installation is unique and the information presented in this document might lack context or consideration of specific environments or use cases. Any changes or processes that are suggested in this document should be thoroughly tested before being applied to production systems.

## Disclaimer

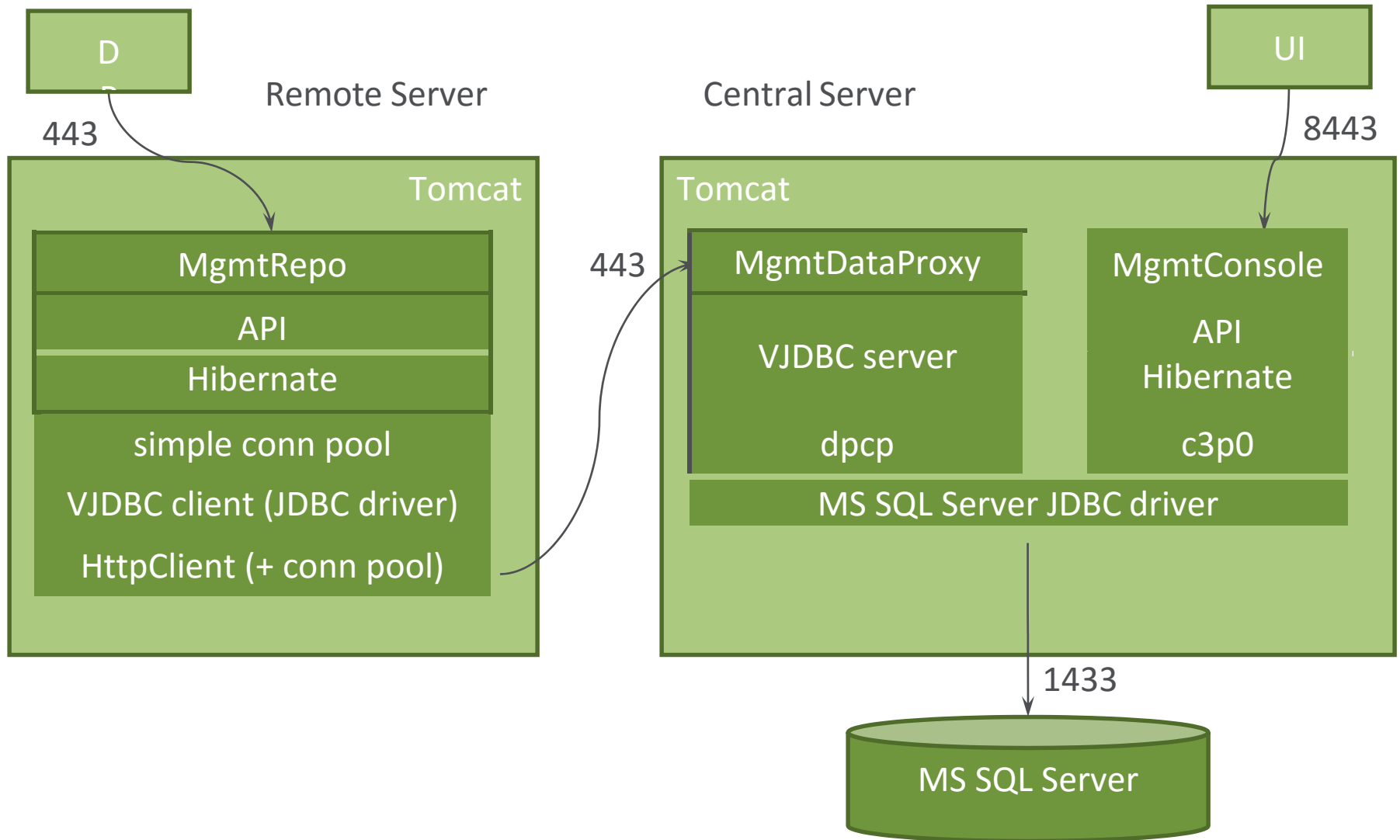
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# Synchronizer Pre-Install Checklist

# Synchronizer Network Communication Diagram



# Sync 5.9 Data Access Architecture



# Checklist Overview



# Server Computer Preparation

## Server Computer Preparation

- The presumed starting point is a fresh installation of Windows Server 2012 R2 on a suitable physical computer.
- Windows Server 2008 R2 is also supported. But Windows Server 2012 R2 is recommended and will be used for all examples within this guide.
- A physical computer is required due to the Hyper-V dependency. For more information, see [Physical Computer Requirement](#).

## Activity Checklist

1. Get a [suitable computer](#) for the Synchronizer server with sufficient [disk space](#) and [memory](#).
2. Check (and possibly update) the [BIOS configuration](#).
3. Install a fresh copy of Windows 2012 R2 Server (Standard or Datacenter edition).
4. Apply all Windows updates and servicepacks.
5. Make sure the Windows computer name is set correctly.
6. Make sure Windows is activated properly.
7. Join Windows to the domain.



## Active Directory Configuration

- Two things need to be done in Active Directory for Synchronizer:
  - **Required:** Create a service account that will be used by Synchronizer to integrate with Active Directory and Hyper-V (and might be also SQL Server).
  - **Optional:** Create an OU in Active Directory in which Synchronizer will manage computer accounts for DesktopPlayer VMs.

## Activity Checklist

1. Create a new Active Directory service account for Synchronizer, such as "sync-admin".
  - See [Active Directory Service Account](#) for details.
2. Create a new OU in Active Directory for computer accounts created by Synchronizer.
  - See [Computer Accounts for DesktopPlayer VMs](#) for details.

# Hyper-V Configuration

## Hyper-V Configuration

Synchronizer uses Hyper-V for the *authoring* and *publishing* VM lifecycle phases.

Phase	What It Means	How Hyper-V Is Used
<b>Authoring</b>	Manual creation or configuration of a VM by installing Windows, installing applications, applying patches, or other configuration activities.	The VM is started in the Synchronizer console. This causes a Hyper-V VM to start. The admin has access to the VM console for installation, update, or other configuration work.
<b>Publishing</b>	An automated process whereby Synchronizer creates a new VM version that can be deployed to DesktopPlayer clients.	The VM is published in the Synchronizer console. This causes a Hyper-V VM to start. The VM will run through a set of automated publish scripts to prepare the VM for deployment.

## Activity Checklist

1. [Enable the Hyper-V role](#) on the Synchronizer Windows server.
2. Configure a [Hyper-V virtual switch](#) for Synchronizer VMs.
3. Verify that Hyper-V is able to boot a VM (see [Hyper-V Quick Validation](#)).

## Microsoft .NET Framework

- .NET is needed for two components of a Synchronizer installation:
  - The Synchronizer itself uses .NET to interface with Windows features.
  - The bundled Microsoft SQL Server Express also needs .NET for its own purposes.
- These components use different versions of .NET so two versions need to be installed.

## Windows Firewall Configuration

- As a network service, Synchronizer requires certain ports to be open in the firewall.
- Some ports might be open by default, or opened automatically during Synchronizer installation. Other ports might need to be opened manually.

## Antivirus Software

- Antivirus software is a leading cause of issues with Synchronizer and DesktopPlayer.
- If antivirus software is installed on the Synchronizer server, it must be configured correctly.

## Activity Checklist

1. [Install .NET](#) (two versions).
2. [Configure the Windows firewall](#) (or disable it).
3. Ensure that any antivirus software is [configured appropriately](#) (or uninstall/disable it completely).

# Windows Roles, Features, and Other Apps

## Windows Roles

- No other Windows Server roles should be enabled, other than the Hyper-V role.
- In particular, the Windows Server must not be configured as a primary or backup domain controller.
- The Web Server (IIS) role can also be a problem due to network port conflicts with Synchronizer.

## Windows Features

- Other Windows features generally have no impact on the Synchronizer and can be installed if desired.
- But consider disabling Internet Explorer Enhanced Security Configuration.

## Other Applications or Services

- If there are any other applications or services installed, check for conflicts in these areas:
  - Network port conflicts (especially with Microsoft IIS or other web servers).
  - Apache Tomcat or Microsoft SQL Server (both are bundled with the Synchronizer installer).
  - Java applications (Synchronizer will install its own Java which could affect existing Java services or apps).
  - Symantec BackupExec (has been known to cause problems with Hyper-V).

## Activity Checklist

1. Confirm no Windows Server roles are enabled other than the Hyper-V role.
2. Disable Internet Explorer Enhanced Security Configuration (optional but recommended).
3. Check for potential conflicts with other installed services or applications.

## Supplemental Information

# Physical Computer Requirement

Why is a physical computer required?

Because Synchronizer uses Hyper-V which will not run properly on anything but a native Windows server installation.

Can Synchronizer be installed in a VM?

Yes, but a physical computer is still required for Hyper-V. Synchronizer can be installed in *virtual appliance* mode:

- Synchronizer runs in a VM,
- All Synchronizer data is stored in the VM,
- But Synchronizer integrates with an external Hyper-V server for VM authoring and publishing.

What about remote Synchronizer servers?

Only the primary Synchronizer server uses Hyper-V. Remote servers do not use Hyper-V so they can be fully installed within VMs with no external physical computer dependency.

What about VMWare Nested Virtualization?

Nested virtualization is a VMWare feature that in theory allows Hyper-V to run within a VMWare VM. This is not supported and has been known to have issues with performance, stability, and networking. Please do not attempt this.

Why Hyper-V?

Integration with Hyper-V was an early design decision for Synchronizer that has been carried forward to current versions. The reasoning was, Hyper-V and Synchronizer use the same virtual disk file format (VHD), and Hyper-V is freely available as part of Windows Server, so it was a natural choice at the time.

# Synchronizer System Requirements Notes

What would be a reasonable Synchronizer system configuration for a small Demo or Evaluation installation?

The following configuration should serve well for a Demo/Eval installation with 1-10 users:

- 4 CPU cores, 16 GB RAM, 1 TB disk.
- Assuming VMs are not being backed up to Synchronizer.
- Backups can increase disk space requirements dramatically.

How would the recommended system configuration change as the deployment expands?

That is a very important question. A main goal during the Proof of Concept phase should be to understand how the Synchronizer will need to either scale up (with more/better/faster hardware) or scale out (with remote servers) as a deployment grows. However, the following configuration should give a very rough guideline:

- 8 CPU Cores, 48 GB RAM, 2 TB disk.
- For a single-site deployment up to 1000 users.
- Assuming VMs are not being backed up to Synchronizer.
- And with reasonable expectations regarding:
  - How frequently clients can check for updates with Synchronizer.
  - How long it will take to deploy VM update to all clients.

Is server-class hardware needed?

Not necessarily. It is very common to run Synchronizer on desktop-class computers for Demo/Eval purposes. Even a laptop would work, if it could support a Windows Server installation, but performance might be underwhelming.

# Synchronizer CPU and Memory Recommendations

The following table gives some very general guidelines on CPU and memory recommendations for Synchronizer. You might be able to get by with less, or you might need more, depending on your specific circumstances.

Installation Type	Description	CPU Cores	Memory
<b>Bare Minimum</b>	Minimally adequate configuration to get through the basic mechanical process of installing Synchronizer, creating and publishing a VM, and deploying the VM to a single user.	2	8 GB
<b>Very Small</b>	Non-production Demo/Eval installation, up to 10 users.	4	16 GB
<b>Small</b>	Up to 100 users. This can be a small production deployment, or the Pilot or Proof of Concept phase of a larger project.	6	32 GB
<b>Medium</b>	Up to 1000 users.	8	48 GB
<b>Large</b>	Beyond 1000 users. When a Synchronizer deployment grows to this size, it usually makes sense to "scale out" by deploying remote Synchronizer servers, not "scale up" by adding more CPU and memory resources to the central Synchronizer server.		



# Synchronizer Disk Space Recommendations

## Synchronizer Backups

Synchronizer includes a legacy feature whereby user data from DesktopPlayer VMs can be backed up to Synchronizer (as VHD files). This feature is no longer recommended and might be deprecated in a future version. Best practice is to use backup or replication software in the VM (like Citrix ShareFile).

## Without Synchronizer Backups

Without Synchronizer backups, total disk space for Synchronizer should be more or less proportional to the number of managed VMs. Use this formula:

$$\text{Required Disk Space} = (300 \text{ GB}) + (150 \text{ GB}) \times (\text{Number of VMs})$$

This sets a lower limit to how much free disk space should be available on the Synchronizer server before installing Synchronizer. If you do not yet know how many VMs your Synchronizer will manage, plan for at least four.

## Example (Without Backups)

Consider a very simple Synchronizer installation with only a single VM. According to the formula, recommended disk space is 450 GB. A server computer with a 500 GB disk would be adequate for this task. This allows 50 GB for the base Windows Server installation (assuming no other large software components are installed).

## With Synchronizer Backups

Synchronizer backups can have a profound effect on Synchronizer disk space and disk performance requirements. Often the limiting factor is disk performance, not disk size. So it might not be possible to provide a simple formula, like "10 GB per user." If you really want to move forward with Synchronizer backups, please contact Citrix Technical Support for guidance.

Why are the Synchronizer memory recommendations so high?

## Reason 1: Bundled Components

Synchronizer includes two bundled components (Apache Tomcat and SQL Server) that can use significant amounts of memory. The Synchronizer console also uses memory, and of course, Windows Server needs memory for its own purposes.

## Reason 2: Hyper-V VMs

Synchronizer uses Hyper-V for VM authoring and publishing. When a VM is started or published in the Synchronizer console, a corresponding Hyper-V VM is booted. Hyper-V VMs use large blocks of memory (typically 2-4 GB each) and it can be desirable to have multiple Hyper-V VMs running simultaneously.

## Reason 3: File System Caching

Deployment of VMs from Synchronizer to DesktopPlayer involves downloading large VHD files from Synchronizer. When a new VM version is deployed, it is often the case that many DesktopPlayer clients will download the new version at the same time. Having extra memory available allows Windows Server to cache VHD files in memory instead of re-reading them from disk for each download request.

# Synchronizer Disk Space Notes

Why is so much disk space required for Synchronizer?

Synchronizer manages VHD files for VMs which can grow very large. Synchronizer will usually manage multiple VMs, and multiple versions of each VM, which all increase the VHD file count and the amount of disk space consumed.

Also, Synchronizer stores VHD files in two places: in a VmWorkingStorage folder (uncompressed), and in a Repository folder (compressed). VHD files are stored compressed so clients can download them faster. But Hyper-V cannot boot compressed VHD files so they also need to be stored uncompressed.

Some Synchronizer operations require a large amount of temporary disk space. For example, rolling up VM versions, VM disk expansion, and cloning VMs.

Can additional disk space be added later?

Yes, by extending the Windows disk volume where Synchronizer is installed, or by relocating folders to other Windows disk volumes using junction points. Synchronizer itself does not get involved in storage management, but disk expansion and migration is a common service request handled by the Synchronizer support team. It is not difficult, but it can be time consuming because large amounts of data might need to be relocated.

What about VM backups?

Disk space guidelines provided in this document are based on the assumption that VMs are not being backed up to Synchronizer. Enabling VM backups will increase required disk space even further. But it is not a simple matter to scale-up Synchronizer disk space to hold the backups. There is also backup processing performed by Synchronizer which can have a profound effect on storage scalability. Current best practice for backing up VM user data is to use ShareFile or similar tools within the VM.

# System BIOS Configuration

## Virtualization Technology: Required

- Called **VT-x** or simply **VT** for Intel processors. The AMD term is **AMD-V**.
- Usually this setting is found in a BIOS section named **Advanced CPU Options** or **Security**.
- If VT is enabled, but does not take effect right away (even if the BIOS says it is enabled):
  - Power down the computer and disconnect the power supply. For laptops, remove the battery.
  - Wait one minute, and then reconnect the battery and/or power supply and power the computer back up.

## Execute Disable Bit: Required

- This feature goes by different names in different BIOS versions, such as:
  - Execute Disable, XD, or NX.
  - Data Execution Prevention.
  - Or it might be identified as an anti-virus feature.

## Multi-Core, Hyperthreading, and 64-Bit: Required

- These features should be enabled by default.
- 64-bit is required. The other two are not strictly required but performance will suffer if they are not enabled.

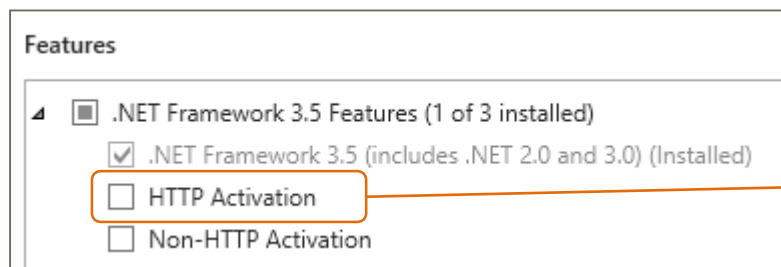
## I/O Virtualization and Intel vPro: Optional

- I/O virtualization is called **VT-d** (Intel) or **AMD-Vi** (AMD), but might appear in the BIOS under different names.
- vPro is a collection of advanced system features for computers with Intel processors.
- These features are not required by Synchronizer or Hyper-V but enabling them does no harm.

# Install Microsoft .NET

- Before installing Synchronizer, two different versions of .NET should be installed.
- Two versions are required because:
  - The Synchronizer uses .NET for its own purposes.
  - The bundled MSSQL Server Express uses an earlier version of .NET.
- The following table defines which versions of .NET should be installed based on the Windows Server version.
- When installing .NET, the HTTP Activation feature should not be installed.

.NET Version	Required for 2012 R2?	Required for 2008 R2?	How To Install?
3.5	yes	yes	Install as a Windows Feature from the Windows Server Manager tool.
4.0	no	yes	Download the installer from Microsoft: <a href="https://www.microsoft.com/download/details.aspx?id=17851">https://www.microsoft.com/download/details.aspx?id=17851</a>
4.5	yes	no	Install as a Windows Feature from the Windows Server Manager tool.



When installing .NET, do not install the HTTP Activation feature. This can cause conflicts with the Synchronizer later on.

# Firewall Configuration

- If a firewall is enabled on the Synchronizer server, it must be configured to allow inbound network traffic on these ports:

<b>Synchronizer Ports:</b>	443 and 8443
<b>Database Ports:</b>	1433 and 1434 (possibly others if dynamic ports are being used)
<b>Hyper-V Console Port:</b>	2179

- If the built-in Microsoft firewall is being used:
  - It should only be necessary to enable port 8443 manually.
  - The other ports are usually enabled automatically when Hyper-V or MSSQL is installed.
- If a third-party firewall product is being used:
  - It might be necessary to manually enable all of the ports listed above.
- If there are ever any issues with Synchronizer that might be network connectivity issues:
  - Try disabling all firewalls on the Synchronizer server.
  - Sometimes firewalls can get enabled or configured to be more restrictive as a result of new group policies, or applying Windows updates, or other reasons.

# Antivirus Software Configuration

- If antivirus software is installed on the Synchronizer server, it must be configured to exclude these folders from scanning:

<b>Synchronizer Folder</b>	C:\Program Files\Citrix\Synchronizer\
<b>Apache Tomcat Folder</b>	C:\Program Files\Apache Software Foundation\
<b>Hyper-V Folder</b>	C:\ProgramData\Microsoft\Windows\Hyper-V\
<b>Database Folder</b>	C:\Program Files\Microsoft SQL Server\
<b>VHD Mount Point</b>	The entire M: drive

- Antivirus software can be useful but it can also be highly intrusive.
- If not configured correctly, antivirus software can cause issues such as:
  - Synchronizer failing to start or Synchronizer console failing to load.
  - Synchronizer unable to start Hyper-VVMs.
  - Synchronizer installer, console, or disk operations running slowly.
  - Virtual disk corruption. This is rare but it has definitely happened in the past.
- Support team perspective:
  - Antivirus software is a common cause of Synchronizer performance or stability issues.
  - Disabling or uninstalling antivirus software is a common troubleshooting technique.

# Active Directory Configuration



# Active Directory Service Account

Synchronizer uses Windows authentication for various purposes:

- Active Directory integration
- Hyper-V integration
- Database integration
- Management console login

A Windows domain service account

- Should be created for Synchronizer/Active Directory integration.
- Can be created in any convenient OU.
- Should have a descriptive account name such as "sync-admin".
- Should have a non-expiring password.
- Must be a member of the local **Administrators** and **Hyper-V Administrators** groups on the Synchronizer server.
- Must have privileges in Active Directory:
  - Browse Active Directory for users and groups.
  - Create computer accounts in the default Computers container.
  - Delete computer accounts that were previously created by Synchronizer.

Details of interest to Active Directory administrators:

- Synchronizer integration does not require any Active Directory schema extensions.
- Synchronizer will not create, delete, or modify any Active Directory users, groups, or OUs.
- Synchronizer can be configured to create computer accounts in a non-default OU.

# Computer Accounts for DesktopPlayer VMs

## Computer Accounts for DesktopPlayer VMs

- When a VM is deployed from Synchronizer to DesktopPlayer...
- The DesktopPlayer VM needs its own unique computer account in Active Directory.
- These computer accounts are created by Synchronizer, not by DesktopPlayer.

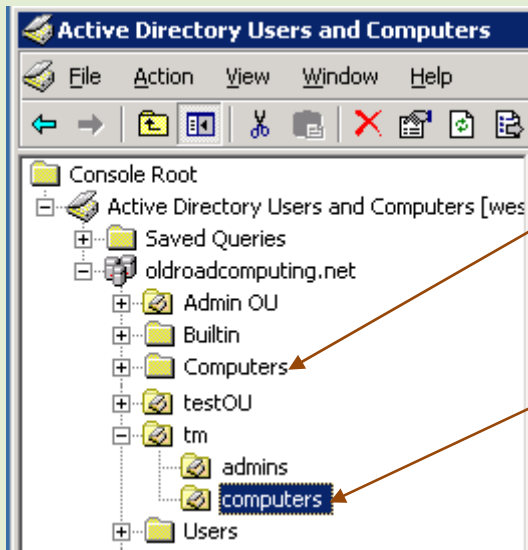
## How it Works

1. DesktopPlayer downloads the VM from Synchronizer and starts the NxPrep (VM installation) process.
2. DesktopPlayer makes a callback to Synchronizer, requesting computer account information.
3. Synchronizer creates a new computer account in Active Directory for the DesktopPlayer VM being installed.
4. Synchronizer then passes computer account information back to DesktopPlayer.
5. DesktopPlayer injects computer account information into the VM.
6. The DesktopPlayer VM is then effectively joined to the Windows domain with a unique computer account.

## Computer Account Location

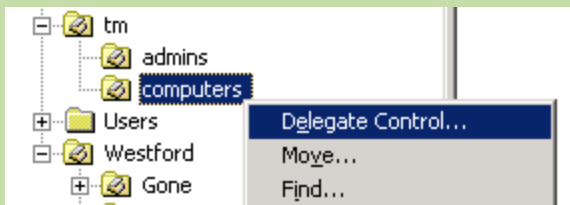
- By default, Synchronizer creates computer accounts in the default Computers container.
  - For example: CN=Computers,DC=acme,DC=com
- But Synchronizer can be configured to create computer accounts in an alternate OU.
- Computer accounts can be moved to other OUs after they are created.
  - Usually to pick up different Group Policy definitions.

# Active Directory Computers OU Example (Part 1)



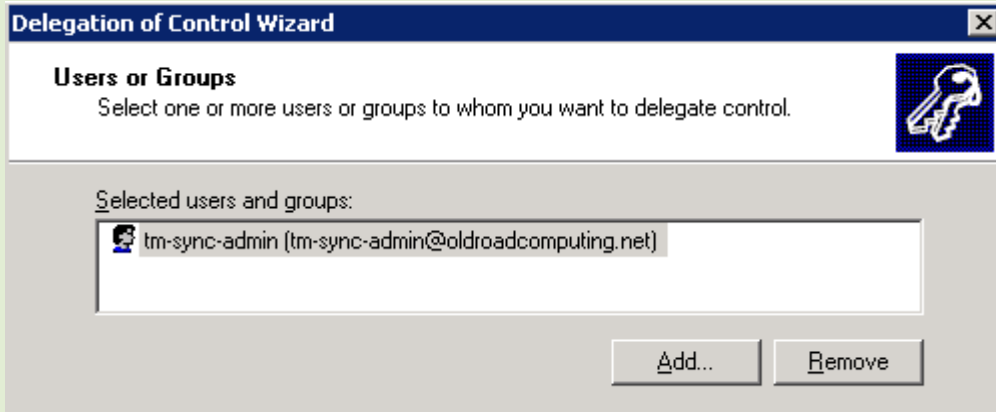
By default, Synchronizer will create computer accounts here.

But we create a new OU for Synchronizer to create computer accounts within.

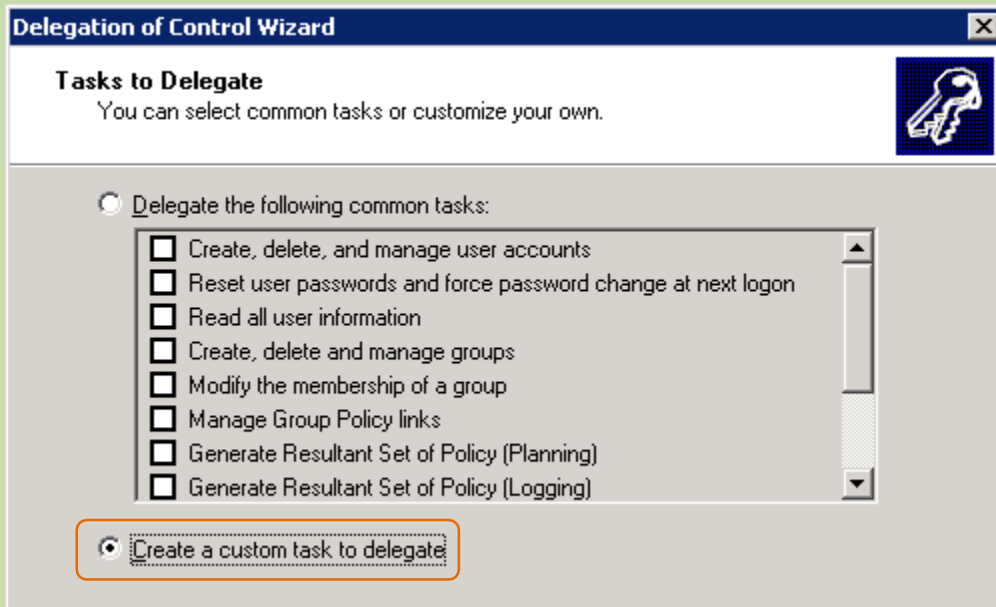


After the OU is created, we want to delegate control to the Synchronizer service account.

# Active Directory Computers OU Example (Part 2)

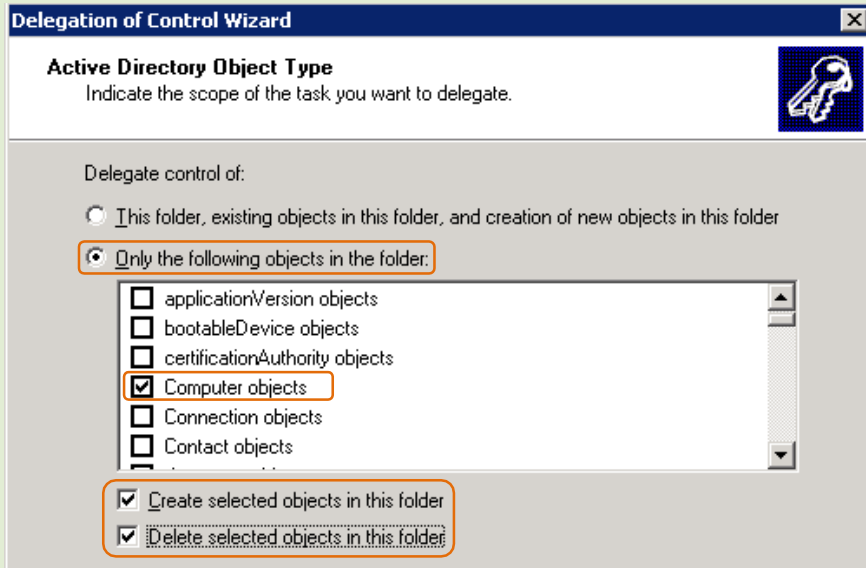


In the **Users or Groups** panel, select the Synchronizer service account.

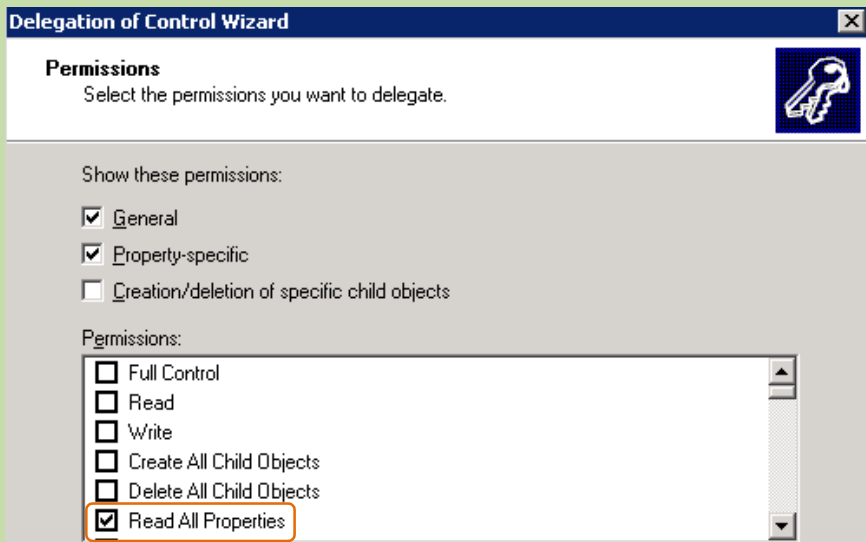


In the **Tasks to Delegate** panel, select the custom task option.

# Active Directory Computers OU Example (Part 3)



In the **Active Directory Object Type** panel, delegate control of computer objects with create and delete privileges.

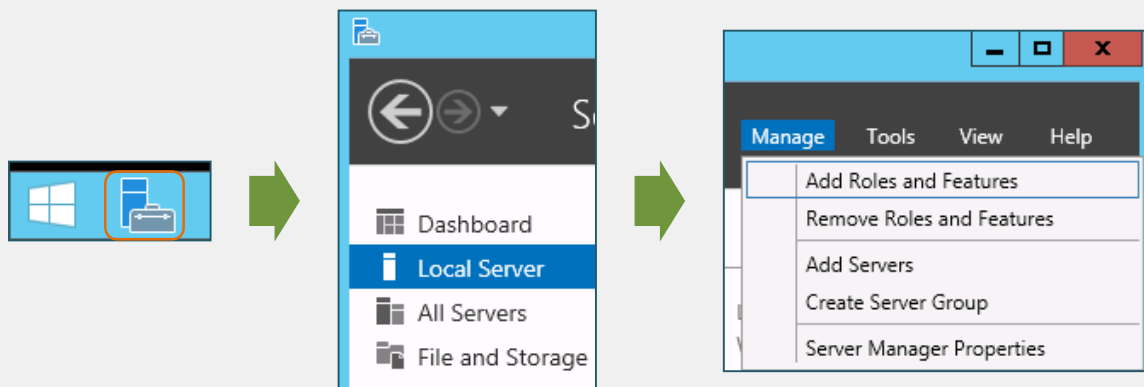


In the **Permissions** panel, add the **Read All Properties** option. This should not really be necessary but the wizard will not complete without something selected here.

# Hyper-V Configuration

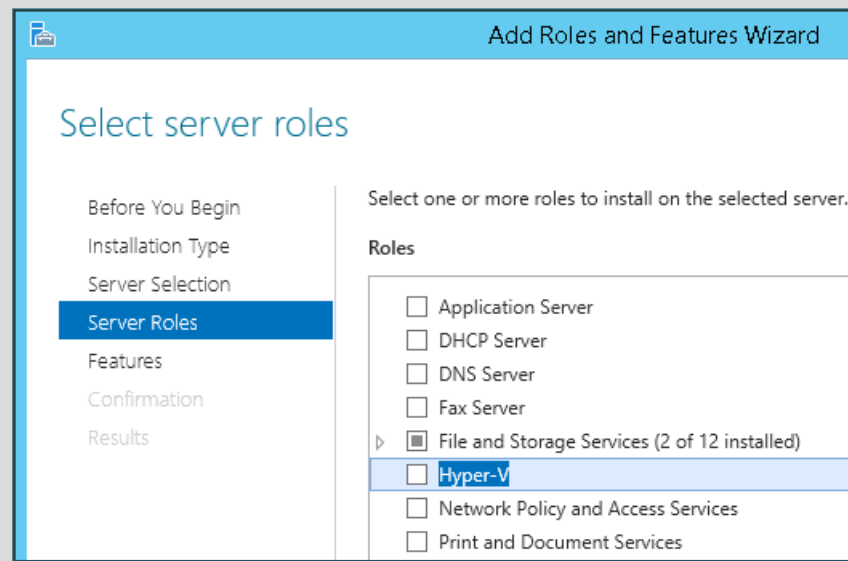
# Enable the Hyper-V Role

- Launch the Server Manager.
- Select the Local Server.
- In the **Manage** menu, select **Add Roles and Features**.



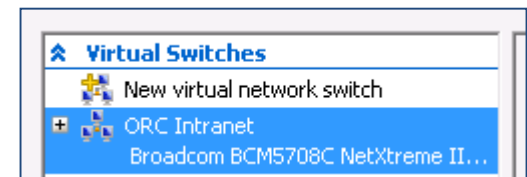
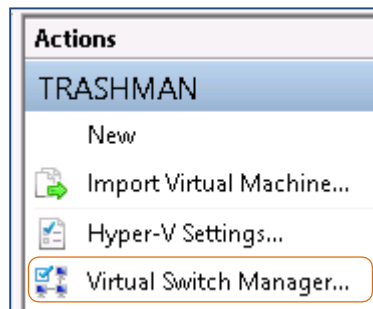
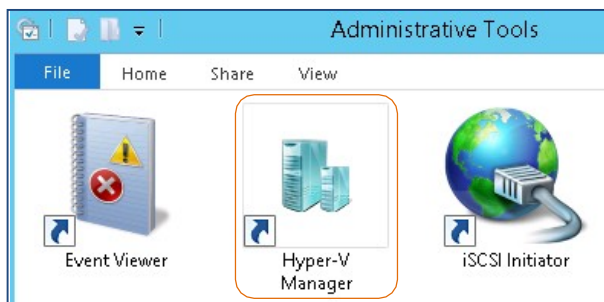
## In the **Add Roles and Features Wizard**:

- Proceed through the wizard until the **Select Server Roles** panel appears.
- Enable the Hyper-V role.
- Windows Server will need to install additional features (including Hyper-V Manager).
- Windows Server must be restarted after the Hyper-V role is enabled.



# Hyper-V Virtual Switch Configuration

- Hyper-V VMs connect to networks through virtual switches.
- When Synchronizer creates a Hyper-V VM:
  - The VM will connect to a particular virtual switch.
  - The virtual switch name is part of Synchronizer/Hyper-V integration configuration.
- To create or modify a Hyper-V virtual switch:
  - Start the Hyper-V manager tool (in Control Panel -> Administrative Tools).
  - Open the Virtual Switch Manager.
  - There should be a default virtual switch created when Hyper-V was enabled.
  - If not, create a new **External** virtual switch (not **Internal** or **Private**).
- Virtual switch configuration:
  - If the Windows Server has multiple network interfaces, make sure the virtual switch is bound to the correct interface.
  - The default virtual switch name is usually long and/or non-descriptive. Giving the virtual switch a short, descriptive name will make things easier later on.

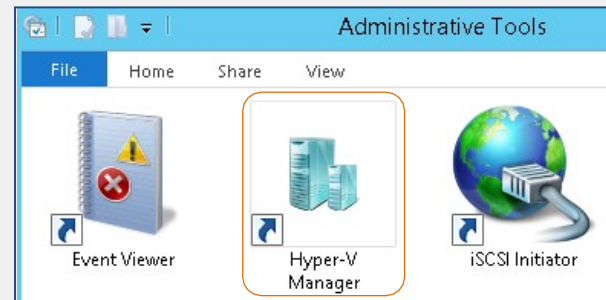




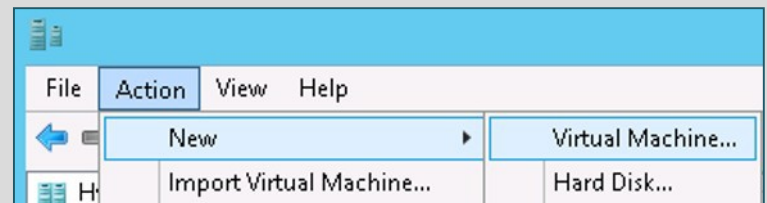
# Hyper-V Quick Validation (Part 1)

- As a troubleshooting technique, it is sometimes useful to verify that Hyper-V is able to boot a VM.
- This at least confirms Hyper-V is enabled and the system BIOS is configured correctly for Hyper-V.

Start the Hyper-V Manager  
(in Control Panel -> Administrative Tools).



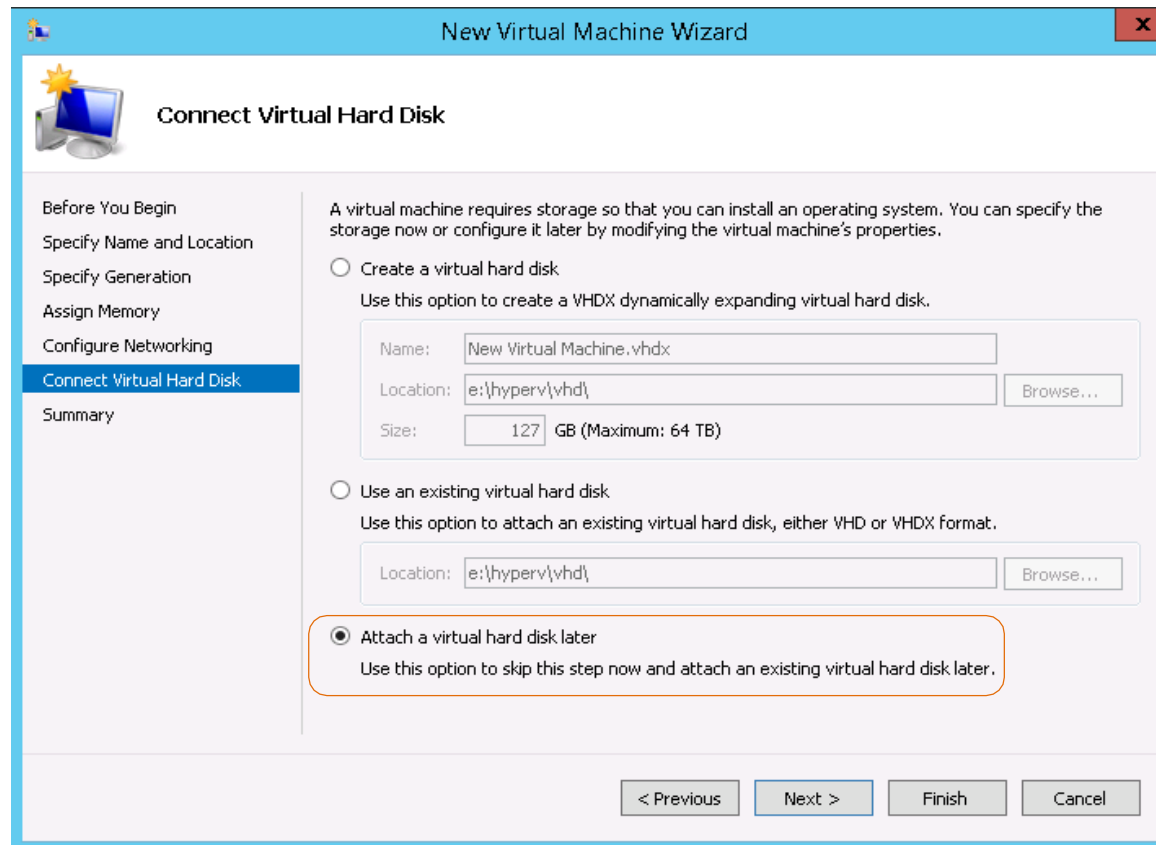
Select Action -> New -> Virtual Machine.



# Hyper-V Quick Validation (Part 2)

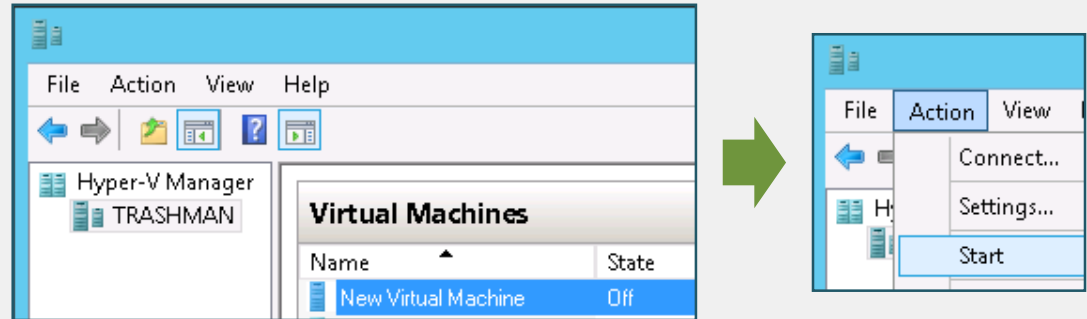
In the **New Virtual Machine Wizard**:

- Take all the defaults until you get to the **Connect Virtual Hard Disk** panel.
- On this panel, select the option to attach a virtual hard disk later.
- Then click Finish.



# Hyper-V Quick Validation (Part 3)

- After the new VM is created, it should appear in the **Off** state.
- Select the new VM and start it.



- The new VM should transition to **Running** state.
- This confirms Hyper-V is able to start VMs.
- If the VM console is launched, it will probably display an error about not having a boot device.
- This is expected, since the VM was not given a hard disk or anything else to boot from.
- The important point is that Hyper-V was able to start the VM at all.
- After validation is complete, the test VM can be stopped and deleted.

