



Synchronizer 5.9.1

Installation Notes and Examples

November 2017



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Introduction

Summary

This document provides guidance on how to prepare for Synchronizer installation, what inputs are required during the installation process, and an overview of what is created or modified within Windows Server during the installation process.

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 might be suggested by this document should be thoroughly tested before being applied to production systems.

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Pre-Install Integration Decisions

A review of Synchronizer integration points, and the pre-install and install-time options for each.

Synchronizer Integration Points

Synchronizer

Hyper-V

Synchronizer uses Hyper-V to author and publish master VM images to prepare them for deployment to DesktopPlayer clients.

MSSQL

Synchronizer uses Microsoft SQL Server (MSSQL) as a data store. MSSQL is the only supported database type.

Citrix Licensing

Synchronizer integrates with the standard Citrix V6 license server.

Active Directory

Synchronizer integrates with AD for authentication, importing users and groups, and creating computer accounts for DesktopPlayer VMs.

Install-Time Integration Decision Points

Integration Point	Option 1	Option 2
Hyper-V	<p style="text-align: center;">Local Hyper-V</p> <p>Synchronizer is installed directly onto the Hyper-V host. Also known as a <i>Native Installation</i>.</p>	<p style="text-align: center;">External Hyper-V</p> <p>Synchronizer is installed in a VM (usually) then configured to integrate with an external Hyper-V host. Also known as a <i>Virtual Appliance Installation</i>.</p>
Microsoft SQL Server	<p style="text-align: center;">Install New MSSQL Express Server</p> <p>The Synchronizer installer will install a new instance of MSSQL Express. Synchronizer will use simple MSSQL authentication for database server connections. This option is intended for Demo, Evaluation, and other non-production installations.</p>	<p style="text-align: center;">Use Existing MSSQL Server Instance</p> <p>The Synchronizer installer will create a new database in an existing MSSQL Server instance. Synchronizer (and the Synchronizer installer) will use Active Directory credentials for database server connections.</p>
Citrix Licensing	<p style="text-align: center;">Install New License Server</p> <p>The Synchronizer installer will automatically install a new Citrix License Server.</p>	<p style="text-align: center;">Use Existing License Server</p> <p>The Synchronizer installer will not install a new Citrix License Server. Synchronizer must be configured to integrate with an existing Citrix License Server as a post-install action.</p>
Active Directory	<p>There are no install-time decision points for Active Directory integration. Active Directory integration is configured in Synchronizer console after Synchronizer is installed.</p>	

Quick-Start Integration Options

If the goal is to get Synchronizer up and running as quickly as possible for Demo or Evaluation purposes, go with the following choices.

Hyper-V Integration

- Choose the *Native Install* option.
- Install Synchronizer directly onto the Hyper-V Host.
- Synchronizer can be migrated to a *Virtual Appliance* configuration later if desired.

Database Integration

- Choose the *Install New MSSQL Express Server* option.
- It will take longer to install MSSQL Express, but it greatly simplifies database integration.
- The Synchronizer database can be migrated to an external MSSQL server later if desired.

Citrix Licensing Integration

- Choose the *Install New License Server* option.
- Synchronizer can be migrated to a different Citrix license server later if desired.

Integration Options for this Installation Example

This Synchronizer installation example will use the following integration options.

Hyper-V Integration

- An external Hyper-V host is used.
- This is also known as *Virtual Appliance* mode.
- Because the Hyper-V host is a stateless appliance used only to start VMs managed by Synchronizer.

MSSQL Integration

- An external MSSQL Server instance is used.
- The Synchronizer installer will create a new database in the existing MSSQL Server instance.
- This is very common and best practice for all production Synchronizer installations.

Citrix License Server Integration

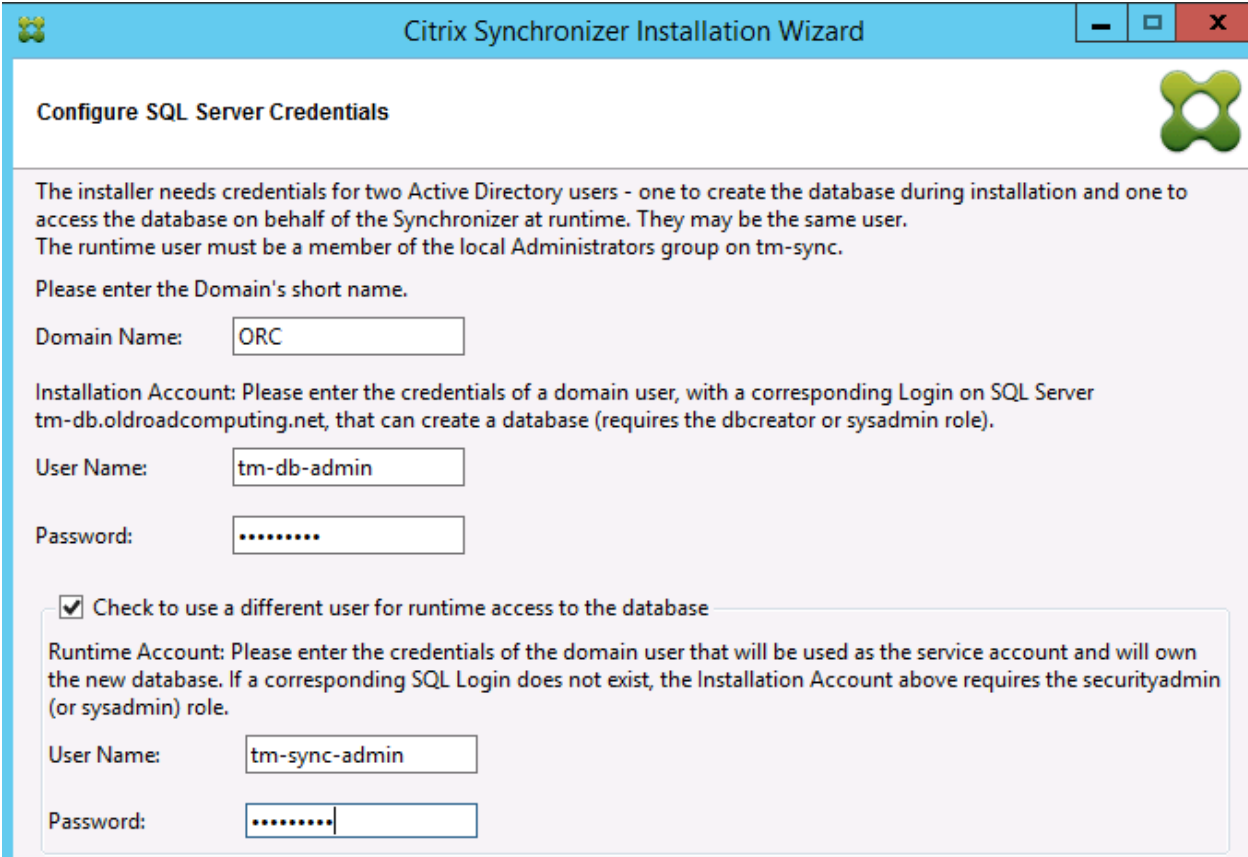
- A new Citrix license server will be installed.

Database Integration Notes

An attempt to explain the requirements for Active Directory accounts used for Synchronizer database integration.

Be Prepared For This Install Screen!

- If you will be installing Synchronizer for a Demo/Eval environment, with the *Install New MSSQL Express Server* database integration option, you can skip this section.
- But if you will be using the *Use Existing MSSQL Server Instance* database integration option, be prepared to deal with this install screen:



The screenshot shows the 'Configure SQL Server Credentials' step of the Citrix Synchronizer Installation Wizard. The window title is 'Citrix Synchronizer Installation Wizard'. The main heading is 'Configure SQL Server Credentials'. Below the heading, there is a green logo. The text explains that the installer needs credentials for two Active Directory users: one for database creation and one for runtime access. It specifies that the runtime user must be a member of the local Administrators group on 'tm-sync'. The form contains two sections: 'Installation Account' and 'Runtime Account'. The 'Installation Account' section has a 'Domain Name' field with 'ORC', a 'User Name' field with 'tm-db-admin', and a 'Password' field with masked characters. The 'Runtime Account' section is preceded by a checked checkbox labeled 'Check to use a different user for runtime access to the database'. It has a 'User Name' field with 'tm-sync-admin' and a 'Password' field with masked characters.

Citrix Synchronizer Installation Wizard

Configure SQL Server Credentials

The installer needs credentials for two Active Directory users - one to create the database during installation and one to access the database on behalf of the Synchronizer at runtime. They may be the same user. The runtime user must be a member of the local Administrators group on tm-sync.

Please enter the Domain's short name.

Domain Name:

Installation Account: Please enter the credentials of a domain user, with a corresponding Login on SQL Server tm-db.oldroadcomputing.net, that can create a database (requires the dbcreator or sysadmin role).

User Name:

Password:

Check to use a different user for runtime access to the database

Runtime Account: Please enter the credentials of the domain user that will be used as the service account and will own the new database. If a corresponding SQL Login does not exist, the Installation Account above requires the securityadmin (or sysadmin) role.

User Name:

Password:

Database Integration: MSSQL vs. Active Directory Authentication

- When the *Install New MSSQL Express Server* integration option is chosen:
 - Synchronizer will use simple MSSQL authentication for database integration.
 - The Synchronizer installer should set this all up automatically.
- But when the *Use Existing MSSQL Server Instance* option is chosen:
 - Synchronizer will use Active Directory authentication for database integration.
 - MSSQL must be configured to grant appropriate privileges to the AD accounts used by Synchronizer for database integration.

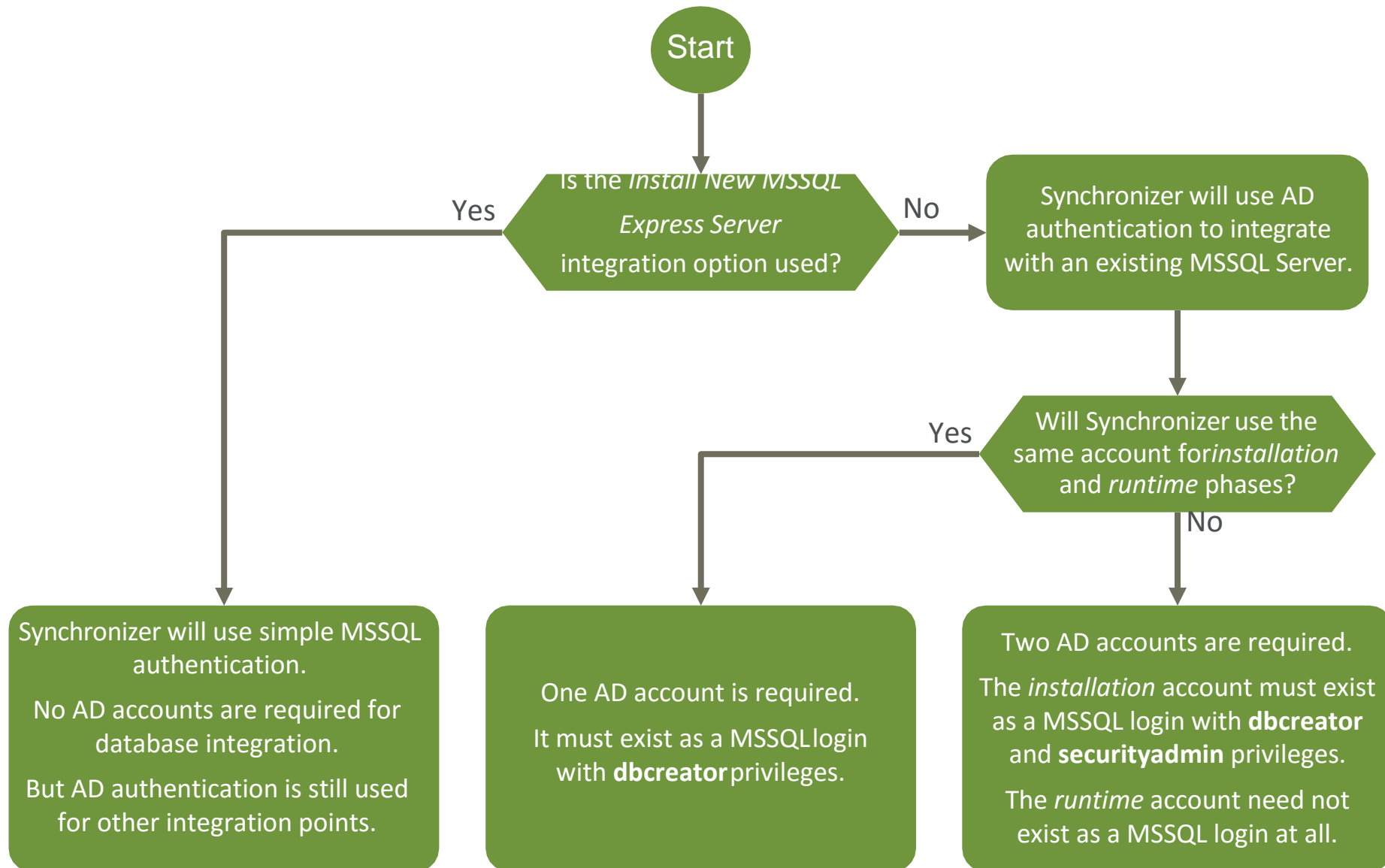
Integration with Existing MSSQL Server: Installation vs. Runtime Phases

- When integrating with an existing MSSQL server, there are two distinct phases:
 - *Installation Phase* (during initial installation of Synchronizer)
 - *Runtime Phase* (after installation when Synchronizer runs as a Windows service)
- These phases require different levels of privilege within MSSQL:
 - During *Installation Phase*, the Synchronizer installer must be able to create a new database within the MSSQL server.
 - During *Runtime Phase*, Synchronizer only needs privileges to the Synchronizer database that was created during the *Installation Phase*.

One Active Directory Account or Two?

- When integrating with an existing MSSQL server, there are two options:
 1. Use the same Active Directory account for *Installation Phase* and *Runtime Phase*.
 2. Use different Active Directory accounts for *Installation Phase* and *Runtime Phase*.
- Option #2 is recommended for production deployments. Here is why:
 - *Installation Phase* requires elevated privileges in MSSQL.
 - The *Installation Phase* account must be able to create new databases in MSSQL.
 - This is not normally a privilege that database administrators are willing to grant on a long-term basis.
- This is how it often works out:
 - During Synchronizer installation, the database administrator can allow temporary use of an Active Directory account with elevated MSSQL privileges.
 - Or, the database administrator might manually enter the credentials for a privileged account in the [Synchronizer install screen for SQL Server credentials](#) (for the *Installation Account*).
- During Synchronizer installation:
 - The Synchronizer installer has sufficient privileges to do what it needs to do in MSSQL Server:
 - Create a new database for Synchronizer.
 - Grant the Runtime Account full-control permissions over the Synchronizer database.
- When Synchronizer later runs as a Windows service:
 - It will use the Runtime Account for MSSQL integration.
 - This account has the minimal set of privileges needed for Synchronizer to run properly.

AD Account Requirements for Database Integration



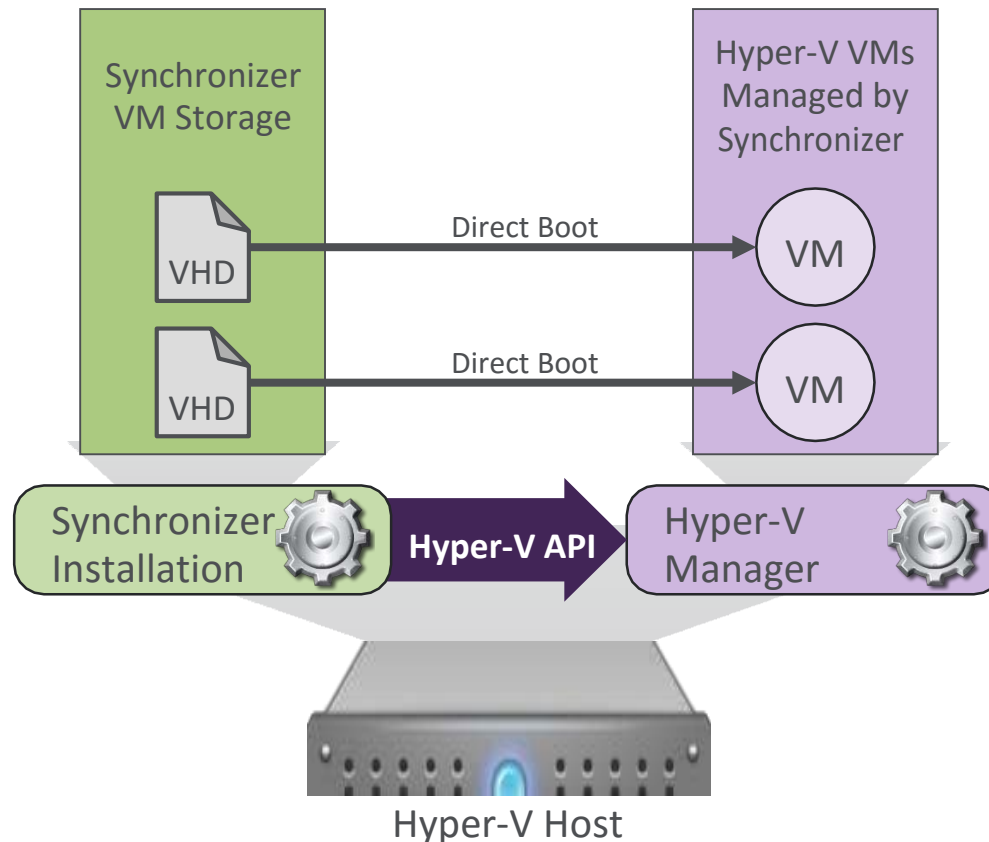
Hyper-V Integration Notes

Diagrams of various Hyper-V integration methods, and the configuration of a specific Hyper-V server that will be used for the installation example.

Hyper-V Integration: Native Installation

This diagram illustrates a *Native Installation* configuration.

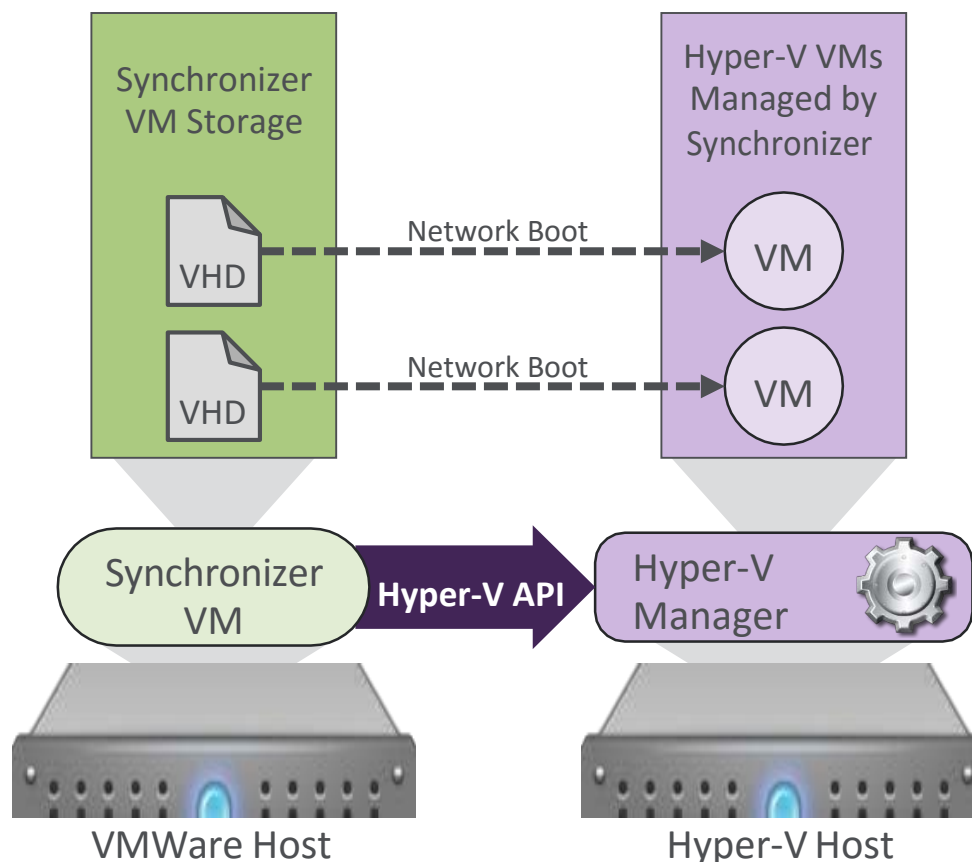
- One physical computer (the Hyper-VHost).
- Synchronizer is installed directly on the Hyper-V host (not in a VM).
- Synchronizer uses the Hyper-V API to control Hyper-V VMs.
- Managed Hyper-V VMs boot directly from VHD files in the Synchronizer install folder.
- Direct boot is possible because Synchronizer and Hyper-V use the same disk.



Hyper-V Integration: Virtual Appliance Installation(Typical)

This diagram illustrates a typical *Virtual Appliance Installation* configuration.

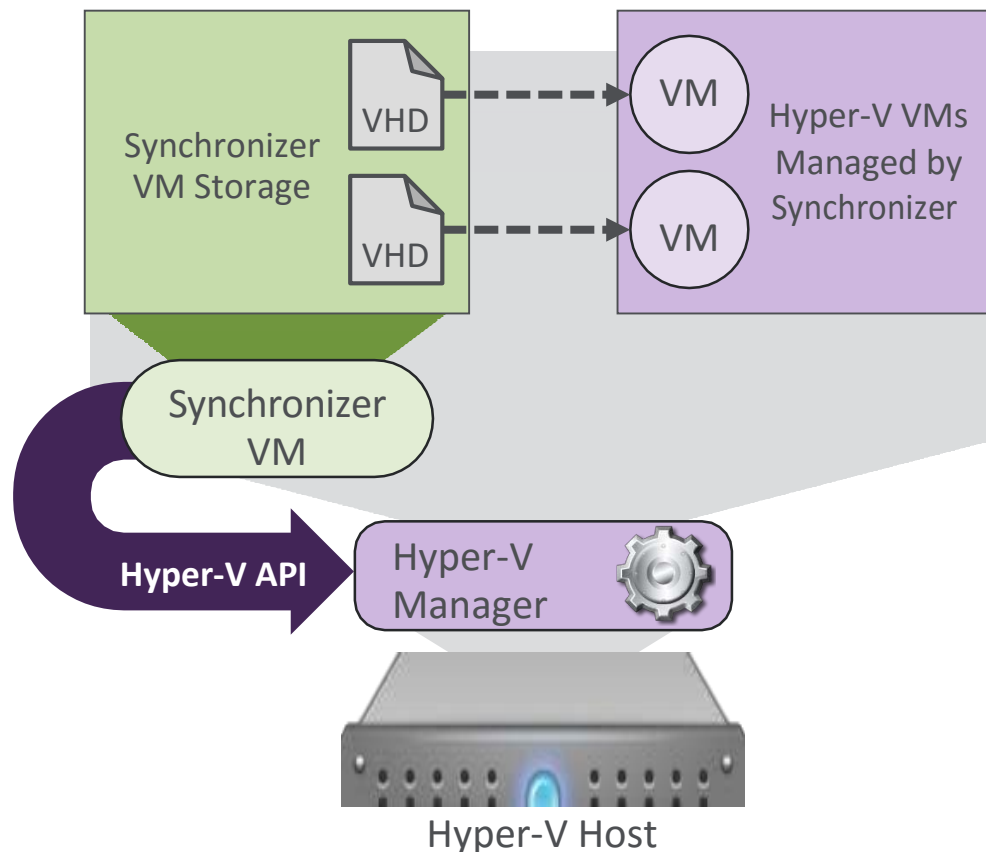
- Two physical computers (one VMWare, one Hyper-V).
- Synchronizer is installed in a VMWare VM.
- Synchronizer uses the Hyper-V API to control Hyper-V VMs.
- Managed Hyper-V VMs boot from VHD files stored in the Synchronizer VM.



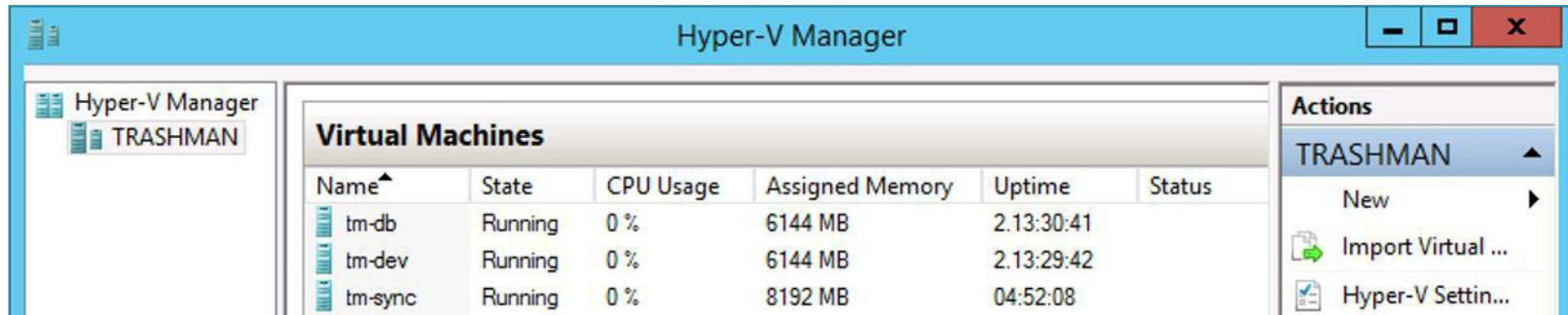
Hyper-V Integration: Virtual Appliance Installation(Alternate)

This example uses a non-typical *Virtual Appliance Installation* configuration.

- Only one physical server (the Hyper-V host).
- Synchronizer is installed in a Hyper-V VM.
- The Synchronizer VM connects back to the Hyper-V host to control Hyper-V VMs.
- This is unusual, but perfectly valid and useful for demonstration purposes.



Hyper-V Resources Used in This Example



trashman

- This is the Hyper-V Host. Windows Server 2012 R2 installed on a physical computer.
- Full hostname is **trashman.oldroadcomputing.net**.

tm-sync

- This is a Windows Server 2012 R2 VM where Synchronizer will be installed.
- Full hostname is **tm-sync.oldroadcomputing.net**.

tm-db

- This is a Windows Server 2012 R2 VM with Microsoft SQL Server already installed.
- Full hostname is **tm-db.oldroadcomputing.net**.
- The MSSQL instance name is **TM**.

tm-dev

- Another VM that plays no role in this example.

Installation Example: Pre-Install Review

A quick review of resources that will be used for the Synchronizer installation, before the installation process begins.

Active Directory Accounts

There are two Active Directory accounts of interest.

Synchronizer Installation Account

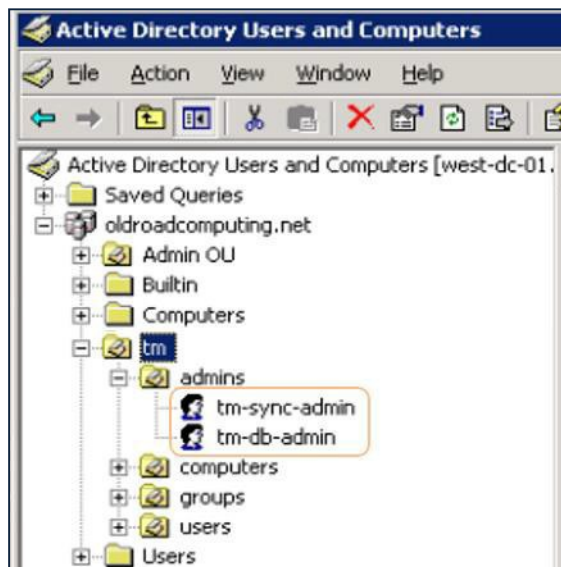
- The **tm-db-admin** account is only used during Synchronizer installation.
- This account is used to perform these actions in MSSQL:
 - Create a new database for Synchronizer.
 - Grant necessary privileges to the runtime account.
- Typically, this will be an account owned by the Database Administrator.

Synchronizer Runtime Account

- The **tm-sync-admin** account is used after Synchronizer is installed.
- When Synchronizer runs as a Windows service and connects to MSSQL.
- No special privileges are required in MSSQL for this account.
- Synchronizer installer will use the **tm-db-admin** account to add necessary privileges in MSSQL during the install process.

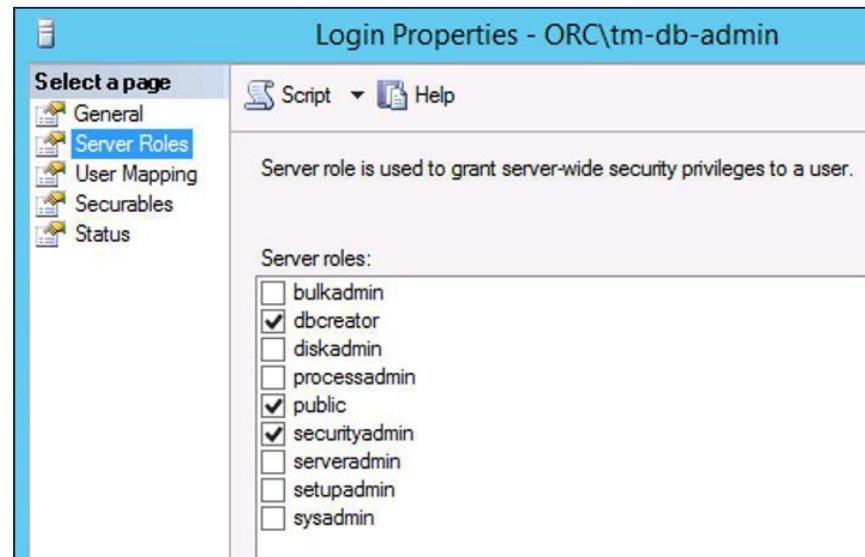
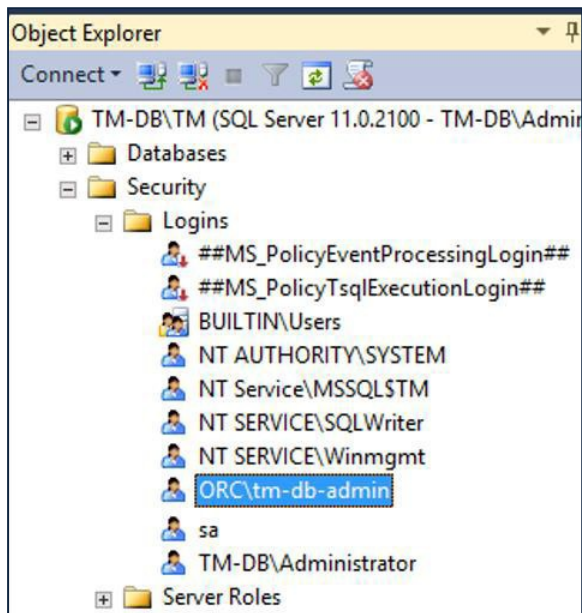
Why Two Accounts?

- The Synchronizer installer always creates a new MSSQL database.
- It cannot use an existing database pre-created by a DB admin.
- The idea is to:
 - Use a privileged account only when necessary (during installation).
 - Use a less-privileged account whenever possible thereafter.
- You can use a single account, but:
 - The same account would be used for installation and runtime.
 - You would then be using an account during runtime that has more privileges than it needs.



MSSQL Security Configuration Before Installation

- This gives a view into how the two Active Directory accounts are configured in MSSQL before installing Synchronizer.
- The installation account **tm-db-admin** exists as a MSSQL login with **dbcreator** and **securityadmin** privileges.
- The runtime account **tm-sync-admin** does not yet exist as a MSSQL login. This will be setup during Synchronizer installation.

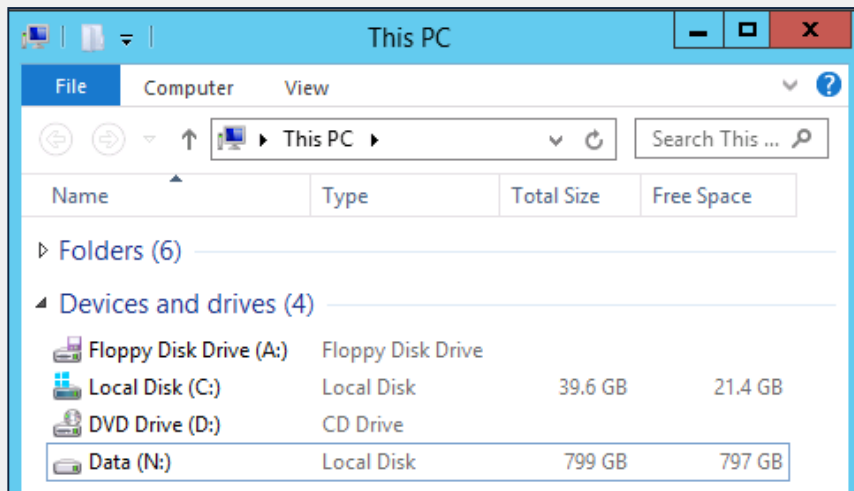


Local Group Membership Requirements

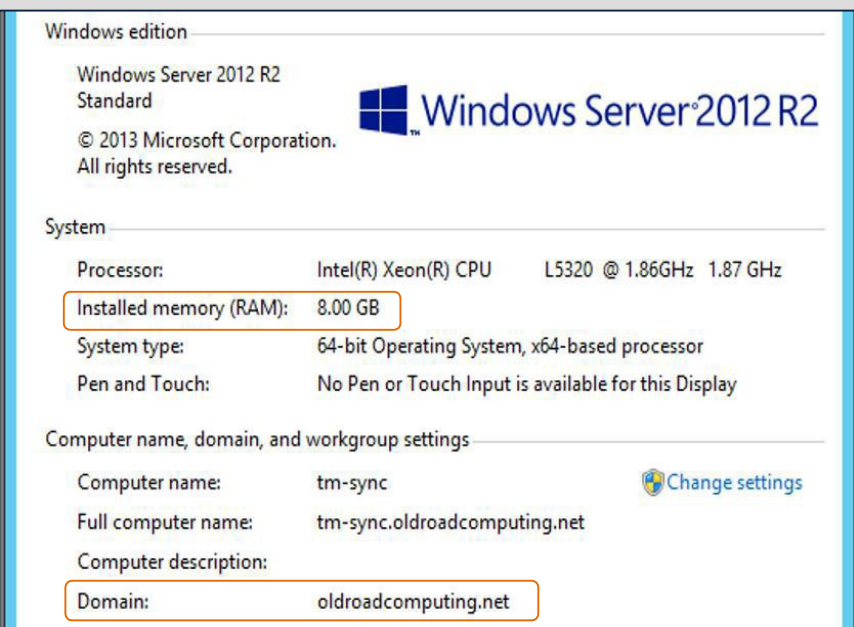
The Synchronizer runtime account (**tm-sync-admin** in this example) has the following requirements for local group membership.

- For all Synchronizer installations:
 - The runtime account must be a member of the local Administrators group on the Synchronizer host server (orVM).
- If an external Hyper-V host is used (virtual appliance mode):
 - The runtime account must also be a member of the local Administrators group on the Hyper-V host server.
- If Windows Server 2012 is used for Hyper-V (whether external or not):
 - The runtime account must also be a member of the Hyper-V Administrators group on the Hyper-V host server.
- If Windows Server 2008 is used for Hyper-V (whether external or not):
 - Windows Server 2008 does not have a Hyper-V Administrators group.
 - Instead, the HVRemote script (from Microsoft) must be used to grant Hyper-V privileges to the runtime account.
 - Script and documentation available at <https://code.msdn.microsoft.com/HVRemote>.

Synchronizer Server Disk, Memory, and Domain Membership



- This particular VM is configured with a minimal system disk (C: drive) but a large data disk (N: drive).
- Synchronizer will be installed on the N: drive.
- 800 GB is a reasonable size to get started with Synchronizer.
- Over time, disk space requirements might increase significantly.

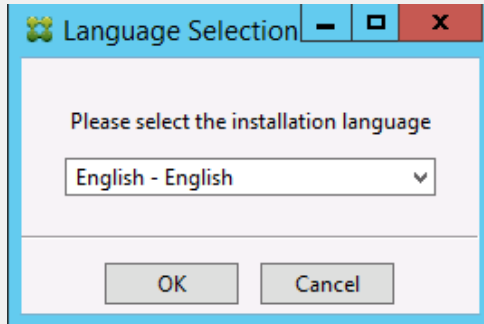


- Windows Server 2012 R2 is recommended for Synchronizer.
- 8 GB memory is considered "bare minimum" for a Synchronizer installation.
- Minimum recommended memory is:
 - 16 GB (up to 10 users)
 - 32 GB (up to 100 users)
 - 48 GB (up to 1,000 users)
- Windows must be joined to the same domain that the DesktopPlayer VMs will eventually be joined to.

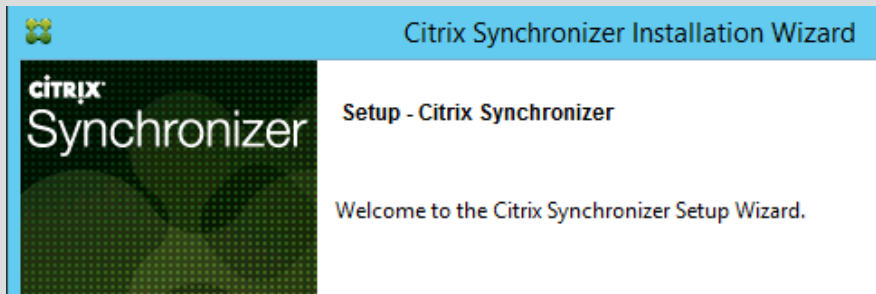
Installation Example: Installer Walk-Through

An annotated sequence of dialog screens that appear during the Synchronizer installation process.

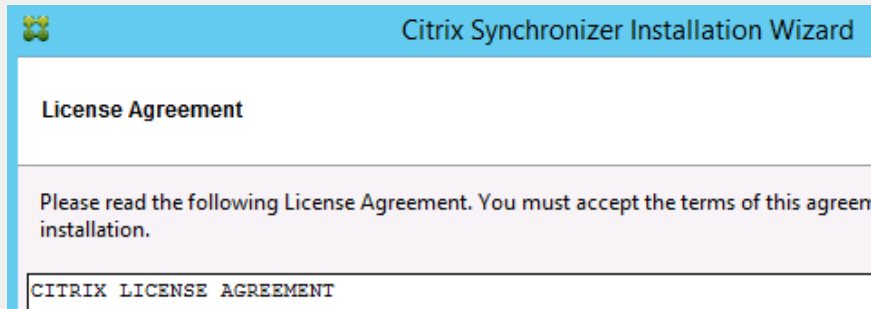
First Few Screens



The first screen is to select the installation language. This is just for the installer itself. It has no effect on the Synchronizer or other components that are actually installed.

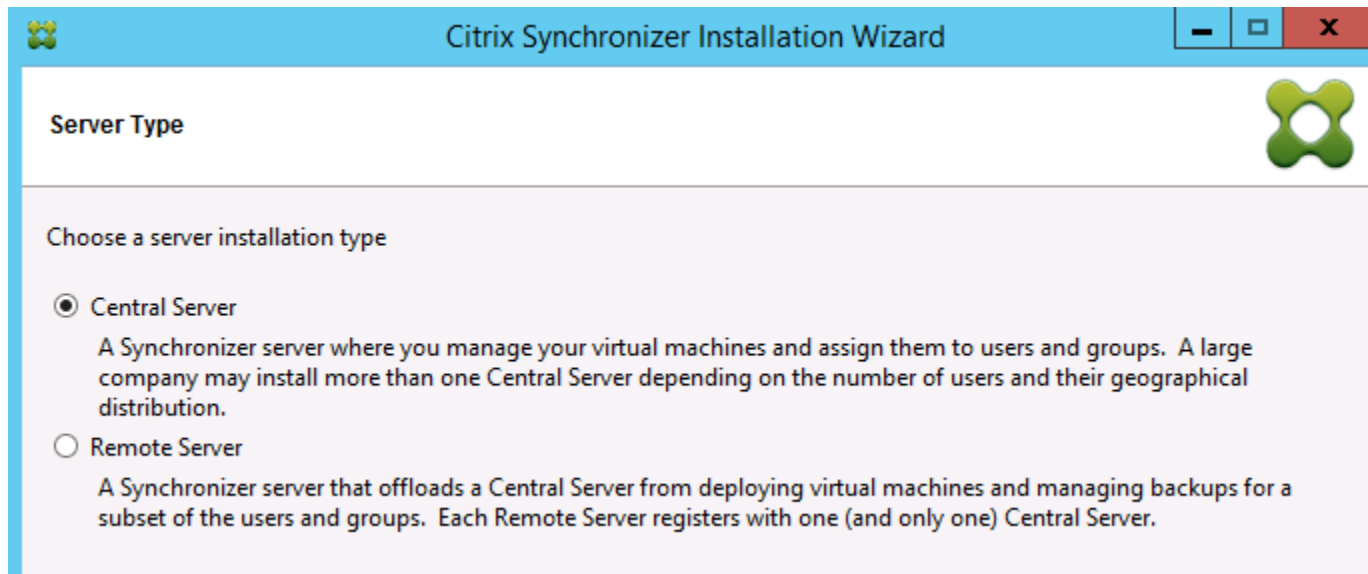


The second screen is a simple welcome screen. Nothing to do here but click **Next**.



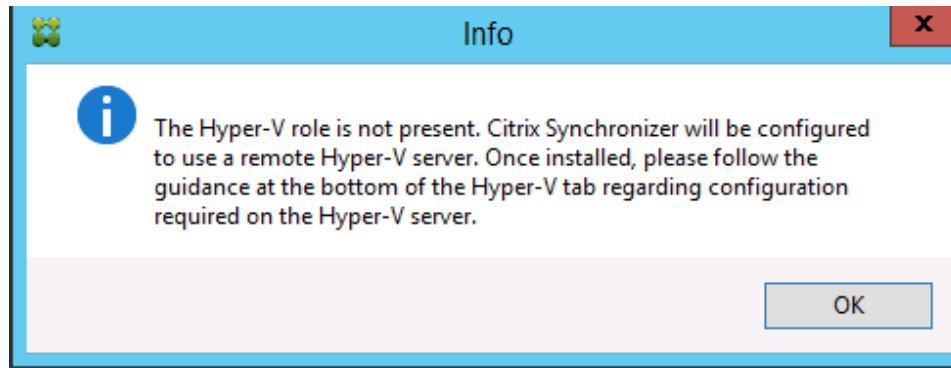
The third screen displays the Citrix License Agreement for Synchronizer. Read it and click **Next** if you agree.

Server Type



- Synchronizer supports a distributed architecture with one Central Server and multiple Remote Server installations.
- The first Synchronizer server to be installed must be the Central Server.
- Remote Server installation is covered in a different document.

Hyper-V Message



This message means Hyper-V is not present *on the Windows server where the installer is currently running*. Whether this is a problem or not depends on how Synchronizer will integrate with Hyper-V.

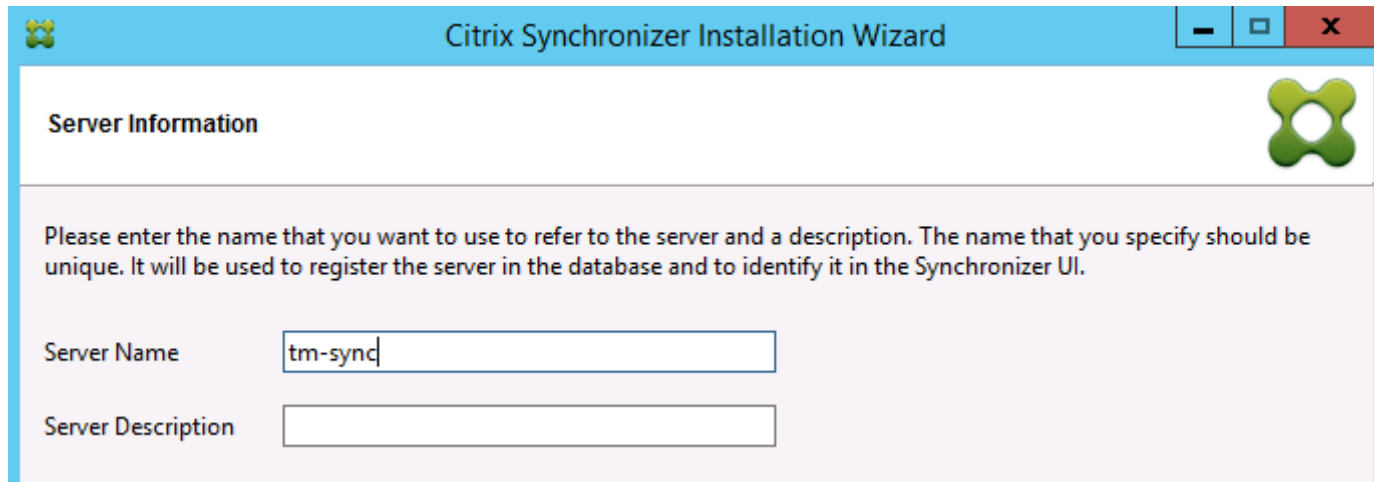
Native Installation

- The intent is to install Synchronizer directly on the Hyper-V Host.
- The Synchronizer installer should have found Hyper-V, but has not.
- This probably just means Hyper-V has not been enabled yet.
- Exit the installer, enable Hyper-V, reboot, and then restart the Synchronizer installer.

Virtual Appliance Installation

- The intent is to integrate Synchronizer with an external Hyper-V host.
- In this case, the Synchronizer installer should not find Hyper-V.
- This message is expected and can be safely ignored.

Server Information



Citrix Synchronizer Installation Wizard

Server Information

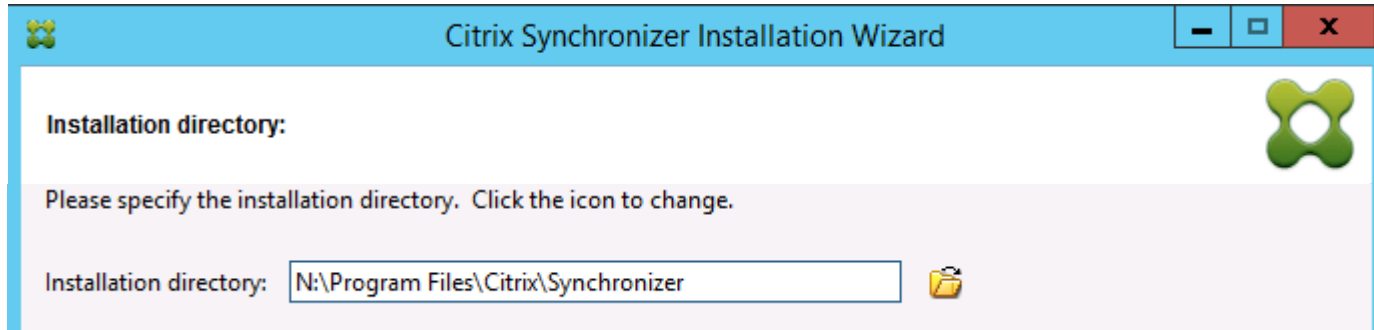
Please enter the name that you want to use to refer to the server and a description. The name that you specify should be unique. It will be used to register the server in the database and to identify it in the Synchronizer UI.

Server Name

Server Description

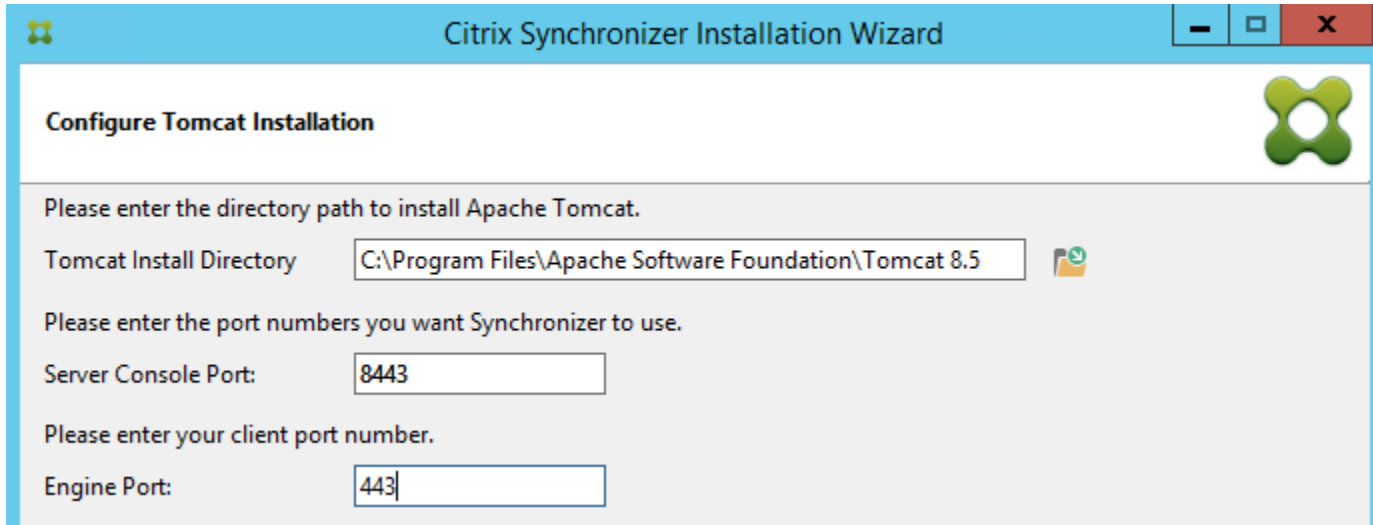
- The **Server Name** is required.
- The **Server Description** is optional.
- Both are used for display purposes in Synchronizer console.
- Any values entered here might be changed later.
- Usually the **Server Name** is simply the computer name.
- Or, it could be a short functional or geographic name.

Synchronizer Installation Directory




- Choose the location of the Synchronizer install folder.
- This folder can grow very large over time, so use a disk with sufficient space.
- When installing to a disk other than the system disk (C: drive):
 - Best practice is to change only the drive letter and keep the path the same.
 - In this example, the C: drive is changed to the N: drive.
- Synchronizer should only be installed on:
 - Local disks or RAID volumes.
 - Fibre Channel or iSCSI SAN volumes.
 - Direct-attached storage devices using SCSI, SATA, or SAS interfaces.
- Synchronizer should not be installed on:
 - USB-attached storage devices.
 - Remote disks or folders shared out through WindowsSharing.
 - NFS, CIFS, or NAS volumes, or other types of remote file systems.

Tomcat Installation Directory and Ports



The screenshot shows the 'Configure Tomcat Installation' step of the Citrix Synchronizer Installation Wizard. The window title is 'Citrix Synchronizer Installation Wizard'. The main heading is 'Configure Tomcat Installation'. Below the heading, there are three sections for configuration:

- Please enter the directory path to install Apache Tomcat.**
Tomcat Install Directory: 
- Please enter the port numbers you want Synchronizer to use.**
Server Console Port:
- Please enter your client port number.**
Engine Port:

- Guidance for the [Synchronizer install folder](#) also applies here.
- Best practice is to use the same disk for Synchronizer and Apache Tomcat folders.
- The Tomcat ports might be changed but that is very rare.
- The only reason to do that would be if Synchronizer had to run alongside another Web server that was already using these ports.

SSL Certificate Configuration

Citrix Synchronizer Installation Wizard

Configure Synchronizer SSL Certificate

Please specify the fully qualified DNS name of this server (e.g., this_machine.mycompany.com). Computers will use this name to register with the server.

Server Name:

Company Name:

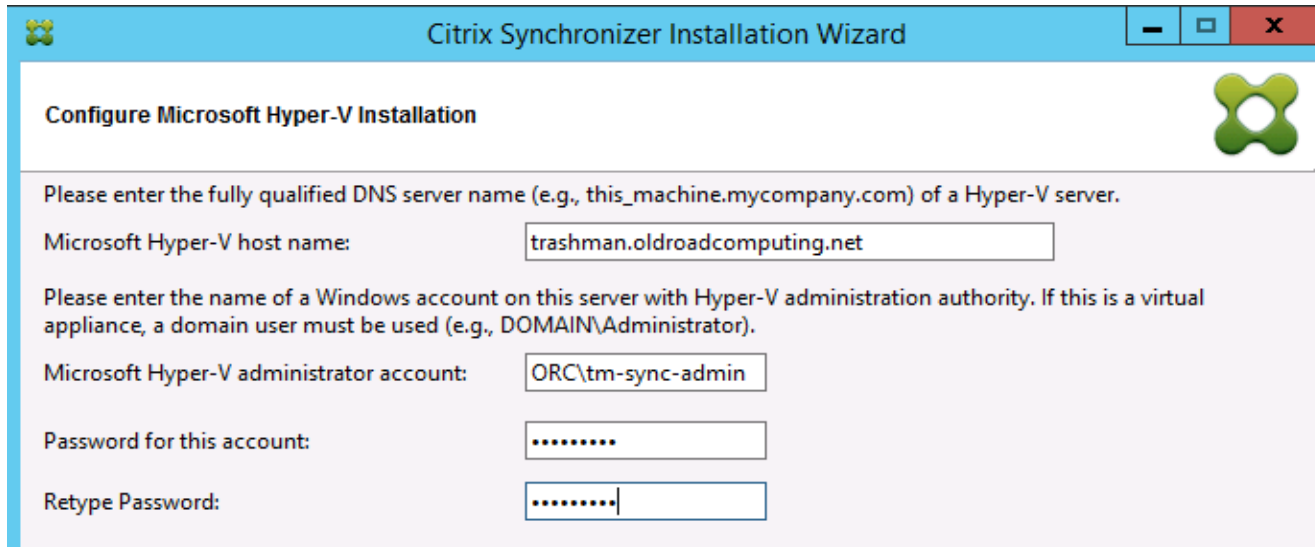
City:

State / Province:

Country:

- This information is used to generate self-signed SSL certificates for the HTTPS Client interface (port 443) and the HTTPS Console interface (port 8443).
- Replacing the self-signed certificates with commercial certificates is a complex topic that is beyond the scope of this document, but very briefly:
 - Replacing the Console interface certificate (port 8443) is relatively straightforward and can usually be done with no adverse side effects.
 - But replacing the Client interface certificate (port 443) will invalidate trust relationships for all clients that were previously registered to Synchronizer.
 - **Contact Citrix Technical Support for assistance and guidance before replacing the Client interface certificate.**

Configure Microsoft Hyper-V Installation



The screenshot shows a window titled "Citrix Synchronizer Installation Wizard" with a blue header bar. Below the header, the title "Configure Microsoft Hyper-V Installation" is displayed next to a Citrix logo. The main content area contains instructions and input fields:

Please enter the fully qualified DNS server name (e.g., this_machine.mycompany.com) of a Hyper-V server.

Microsoft Hyper-V host name:

Please enter the name of a Windows account on this server with Hyper-V administration authority. If this is a virtual appliance, a domain user must be used (e.g., DOMAIN\Administrator).

Microsoft Hyper-V administrator account:

Password for this account:

Retype Password:

This information is used to integrate Synchronizer with an external Hyper-V host. It can be changed later in the Synchronizer console, after Synchronizer is installed.

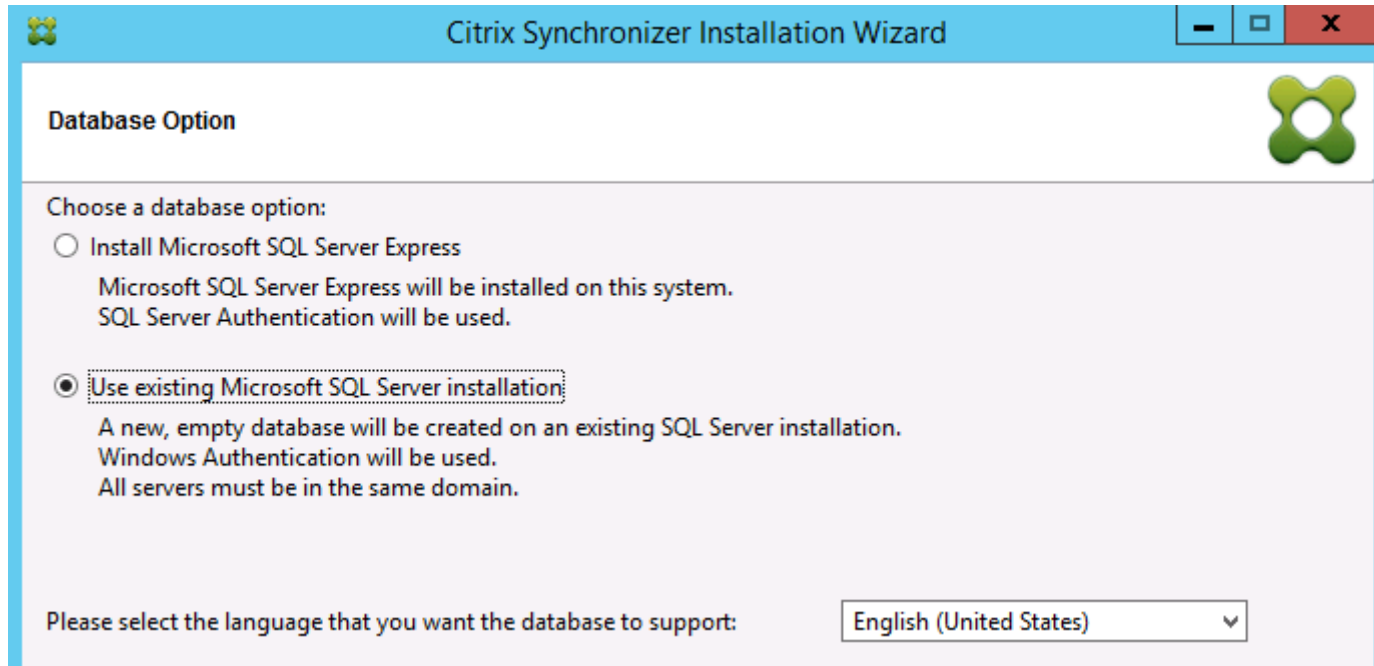
Hyper-V Host Name

- Use the fully qualified hostname of the Hyper-V server.
- The hostname is required. An IP address cannot be used.

Hyper-V Administrator Account

- The domain short-name prefix (**ORC** in this example) is required.
- This is typically the same account as the database runtime account used for MSSQL connections.
- The same account is typically also used for Active Directory integration after Synchronizer is installed.
- Thus, a single service account is used for MSSQL, Hyper-V, and Active Directory integrations.

Database Option



Database Integration Option

- In this example, Synchronizer will integrate with an existing MSSQL server, so that option is chosen.

Database Language

- This is the database collation language. It has limited effect on the installed Synchronizer.
- Mostly determines how the database sorts strings containing non-ASCII characters.

Database Connection Configuration

Citrix Synchronizer Installation Wizard

Configure Connection to an Existing SQL Server Host for a New, Empty Database

SQL Server Host Name:

SQL Server Port (preferred over instance name):

SQL Server Instance Name (only used if port is blank):

Please enter the new database name. It will be automatically prefixed with "Sync_".

Database Name:

SQL Server Host Name

- Enter the fully qualified hostname (not an IP address).

SQL Server Port or Instance Name

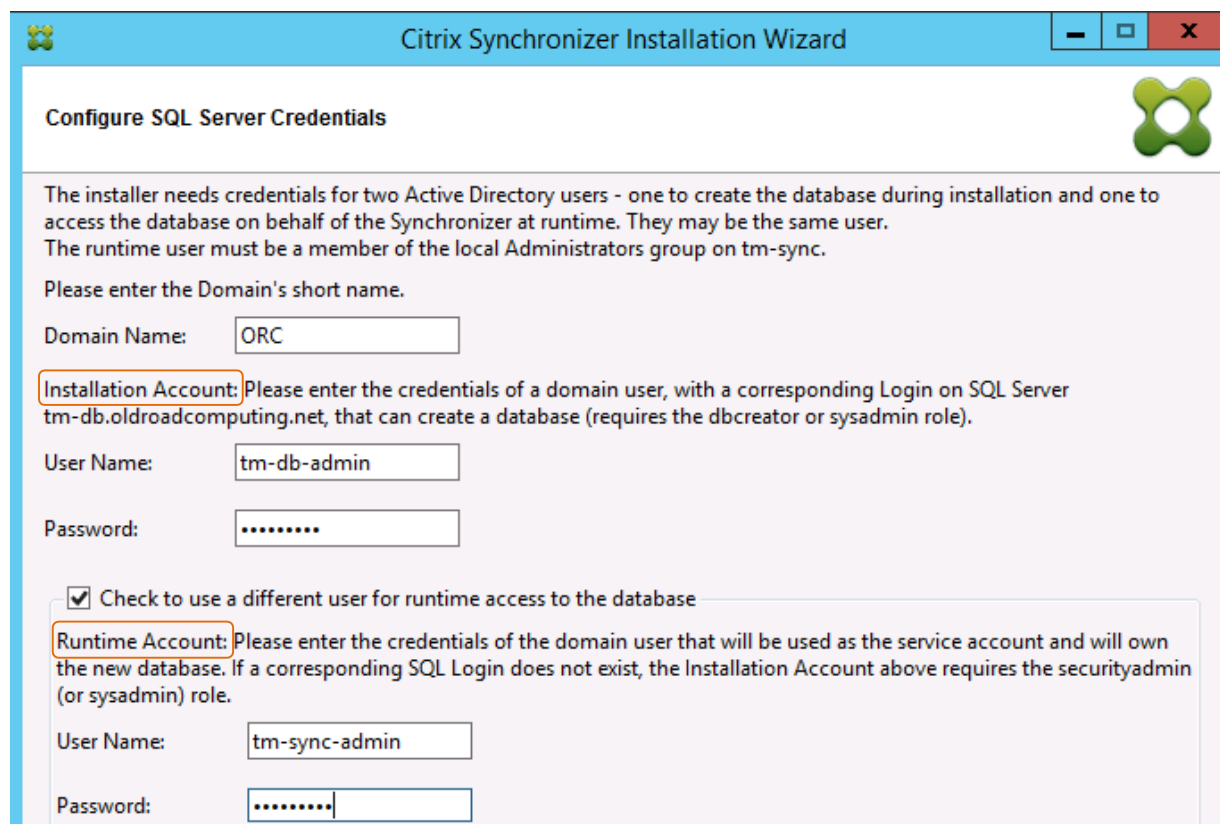
- If a **port** is specified:
 - Synchronizer will connect directly to the database server on the specified port.
 - The instance name should be blank (any value is ignored).
 - Should only be specified if the SQL server uses a static port.
- If an **instance name** is specified:
 - Synchronizer will connect to the database server through the SQL browser service.
 - The port must be left blank.
 - Should be specified if the SQL server uses dynamic ports.

Database Name

- The Synchronizer installer will create a new empty database.
- The database name will include a "Sync_" prefix ("Sync_tm-sync" in this example).

Database Server Credentials

- This screen appears only when the *Use Existing MSSQL Server* option is chosen.
- It is covered extensively in [Database Integration Notes](#).
- The method chosen for this example is to:
 - Enter an AD account with elevated MSSQL privileges for the *Installation Account*.
 - Enter an AD account with no special MSSQL privileges for the *Runtime Account*.



The screenshot shows the 'Configure SQL Server Credentials' step of the Citrix Synchronizer Installation Wizard. The window title is 'Citrix Synchronizer Installation Wizard'. The main heading is 'Configure SQL Server Credentials'. Below the heading, there is a green Citrix logo. The text explains that the installer needs credentials for two Active Directory users: one for database creation and one for runtime access. It specifies that the runtime user must be a member of the local Administrators group on tm-sync. The form includes a 'Domain Name' field with 'ORC' entered. Below that, the 'Installation Account' section is highlighted with a red box and contains a text box for 'User Name' with 'tm-db-admin' and a 'Password' field with masked characters. A checkbox is checked, labeled 'Check to use a different user for runtime access to the database'. Below this, the 'Runtime Account' section is also highlighted with a red box and contains a text box for 'User Name' with 'tm-sync-admin' and a 'Password' field with masked characters.

Configure SQL Server Credentials

The installer needs credentials for two Active Directory users - one to create the database during installation and one to access the database on behalf of the Synchronizer at runtime. They may be the same user. The runtime user must be a member of the local Administrators group on tm-sync.

Please enter the Domain's short name.

Domain Name:

Installation Account: Please enter the credentials of a domain user, with a corresponding Login on SQL Server tm-db.oldroadcomputing.net, that can create a database (requires the dbcreator or sysadmin role).

User Name:

Password:

Check to use a different user for runtime access to the database

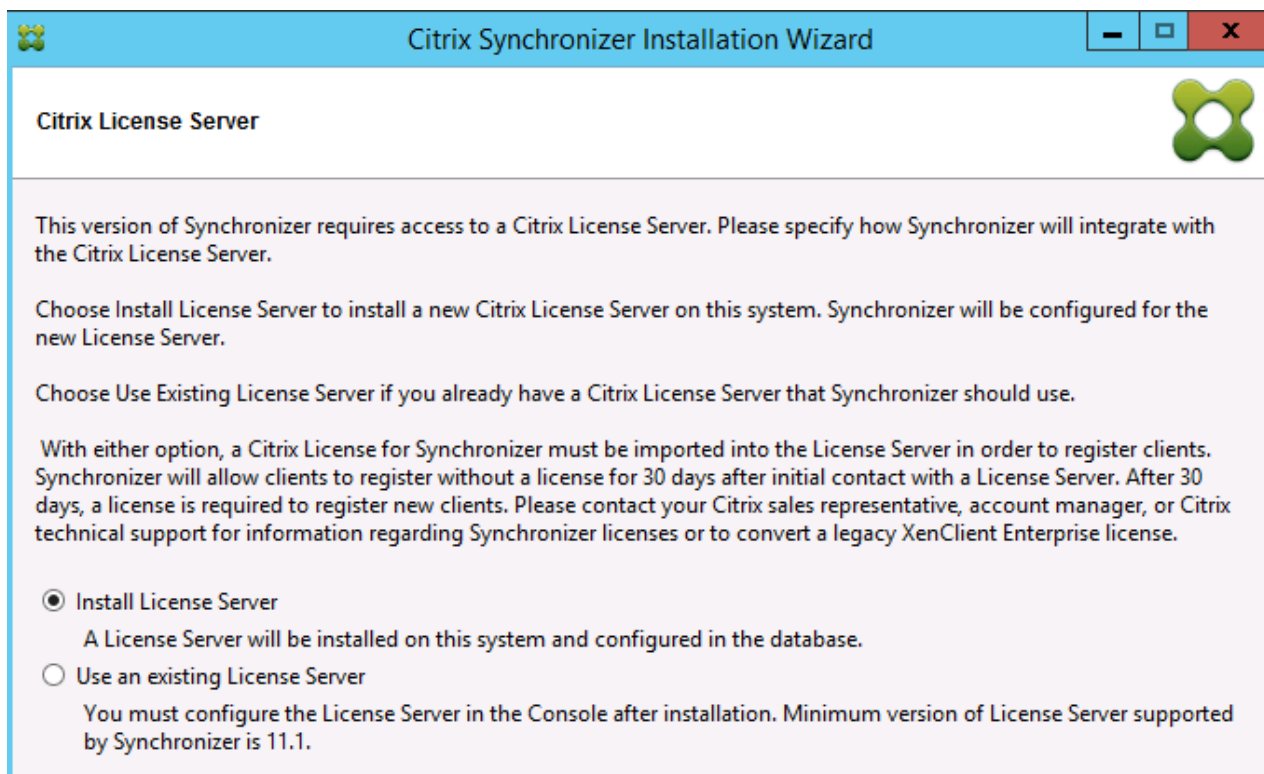
Runtime Account: Please enter the credentials of the domain user that will be used as the service account and will own the new database. If a corresponding SQL Login does not exist, the Installation Account above requires the securityadmin (or sysadmin) role.

User Name:

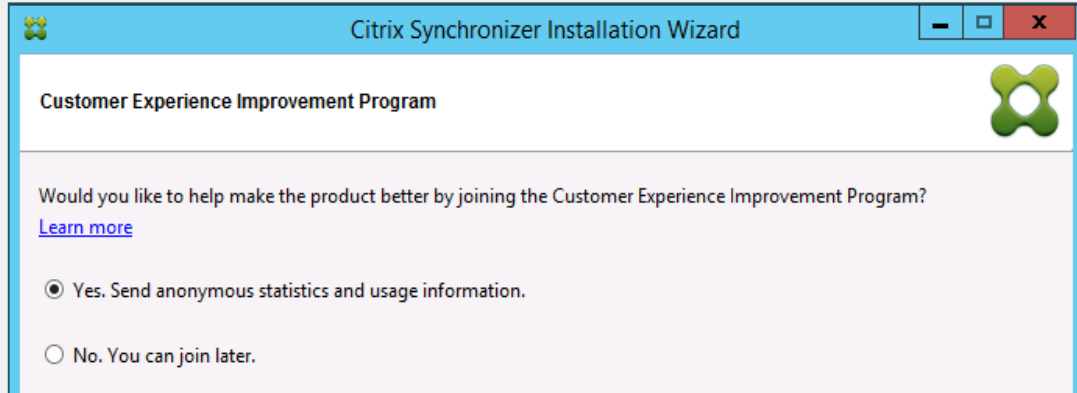
Password:

Citrix License Server

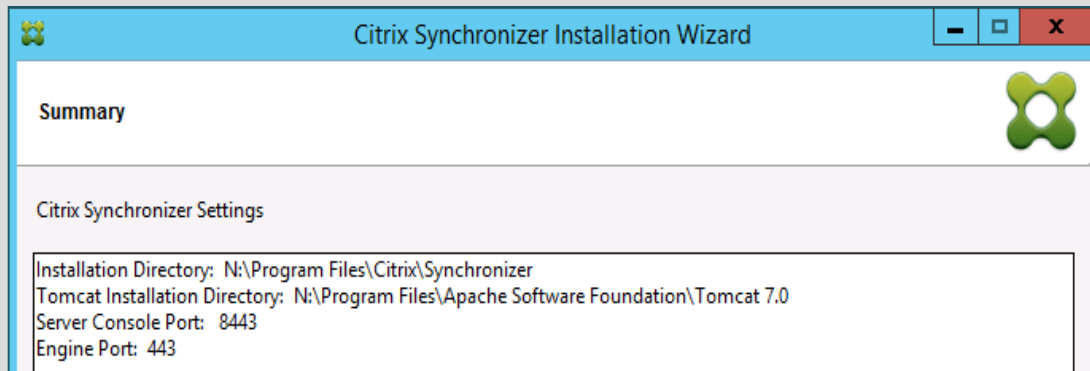
- Choose the *Install License Server* option:
 - If you do not already have a Citrix License Server that can be used with Synchronizer.
 - Or, if you would prefer to keep Synchronizer on a separate license server.
- Otherwise, choose the **Use an existing License Server** option.
 - You will need to configure Citrix License Server integration in Synchronizer Console after Synchronizer is installed.



Final Screens



The CEIP screen allows opt-in or opt-out to CEIP. Please opt-in! The data is truly anonymous and is very useful for product development.



The Summary screen is the last screen shown before the Synchronizer install begins. Review the settings displayed then proceed with the install if they are correct.

- That is effectively the end of the Synchronizer install process.
- What follows is a series of progress screens as the Synchronizer installer runs through its tasks.
- When the install is complete, the Synchronizer server (or VM) should be restarted.

Synchronizer Installation Results

A review of what is created, configured, or otherwise done during the Synchronizer installation.

Synchronizer and Tomcat Folders

- The Synchronizer installer creates two main folders.
- All folders listed below are their default locations, assuming Synchronizer is installed on the C: drive.
- When backing up the Synchronizer, you must back up the following two folders, along with the Synchronizer database.

Synchronizer Folder

- C:\ProgramFiles\Citrix\Synchronizer\
- This folder is usually around 50-100 MB after Synchronizer is installed.
- However, it can grow very large over time, possibly multiple Terabytes.
- This is where all Synchronizer VHD files are stored (among other resources).

Apache Tomcat Folder

- C:\Program Files\Apache Software Foundation\Tomcat 8.5\
- This folder should not ever grow much beyond 1 Gigabyte.
- However, it includes critical resources and must be included in Synchronizer backups.

Installed Components

- This screenshot of the Windows Add/Remove Programs control panel shows what is installed during the Synchronizer installation.
- Synchronizer requires all these components. If any components are uninstalled, Synchronizer stops working.
- Synchronizer might also depend on specific component versions. If any components are upgraded, Synchronizer might stop working. **This is especially true for Java.**

Name	Publisher
7-Zip 4.64	
Apache Tomcat 7.0 Tomcat7 (remove only)	
Citrix Licensing	Citrix Systems, Inc.
Citrix Synchronizer	Citrix
Java 8 Update 25 (64-bit)	Oracle Corporation
Microsoft SQL Server Native Client	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable...	Microsoft Corporation
Mozilla Firefox 36.0.1 (x86 en-US)	Mozilla
Mozilla Maintenance Service	Mozilla
SQL Server Command Line Query Tool	Microsoft Corporation

7-Zip Utility: Used by Synchronizer to compress and uncompress VHD files and other resources.

Apache Tomcat: Java application server used by Synchronizer.

Citrix Licensing: A new Citrix license server.

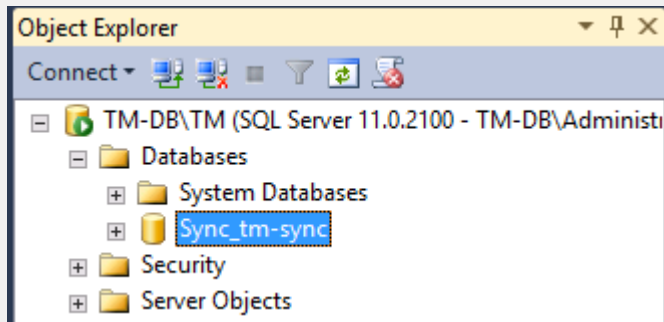
Citrix Synchronizer: The Synchronizer itself.

Java: Needed for Apache Tomcat and other Synchronizer utilities.

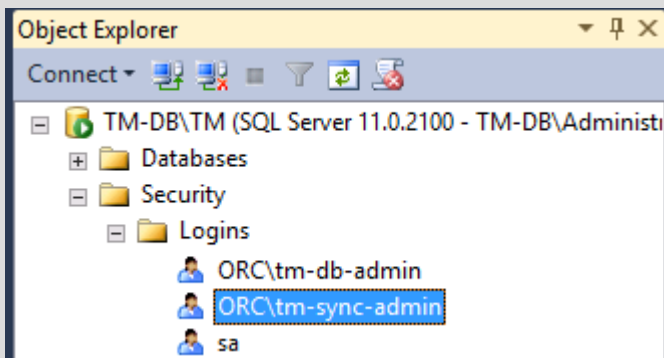
SQL Server Client Tools: Client tools for connecting to the MSSQL database.

MSSQL Changes

- This is what happens in MSSQL during the Synchronizer installation.
- Recall that in this example:
 - The privileged installation account is **tm-db-admin**.
 - The non-privileged runtime account is **tm-sync-admin**.



- A new database is created and initialized for Synchronizer.
- The new database name will always begin with a "Sync_" prefix to easily distinguish it from databases used for other purposes.



- A new MSSQL login is created for the runtime account.
- This account is also granted **dbowner** privileges for the Synchronizer database.
- But no privileges to any other database.

Apache Tomcat Service

Synchronizer and Apache Tomcat

- Synchronizer uses Apache Tomcat for an application server.
- The Synchronizer installer creates a Windows service for Apache Tomcat.
- If you want to start/stop/restart Synchronizer, this is the service to use.
- There is no service named "Synchronizer."

Apache Tomcat Service Account

- The Apache Tomcat service is configured to run as:
 - The non-privileged runtime account **tm-sync-admin**.
 - Not the privileged installation account **tm-db-admin**.
- Using the MSSQL "integrated security" feature:
 - Synchronizer will connect to MSSQL with this non-privileged account.

