Installing and Configuring Citrix Provisioning Services 7.6 (Part 1)

by Wilco van Bragt [Published on **21 May 2015** / Last Updated on **21 May 2015**]

In this article series we will look at installing and configuring Citrix Provisioning Services.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

Introduction

Citrix Provisioning Services (PVS) has entered the Citrix portfolio with the acquisition of Ardence back in 2006. Citrix Provisioning Services is providing what can be called best OS Streaming. For those who are new to this topic I would recommend you read more about OS Streaming. Although the articles are from 2008 (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/introduction-os-virtualization-part1.html), it's still a good starting point to familiarize yourself with the basics. In this article series we will install and configure the whole product, so at the end of the article series we will have a fully functional OS streaming infrastructure.

The Citrix Provisioning Services infrastructure has three basic components. One or more PVS servers, which are taking care of all the intelligence, a PVS Console to configure and manage the PVS infrastructure and a so called Target Device. This is a machine which will stream the OS from one of the PVS servers. In this first part we will start with the installation of all those components. We will start with the PVS server, followed by the PVS console and finally the Target Device Software.

Installation PVS Server

The installation software is available as a separate download from the Citrix website. As PVS is not available anymore as a separate product, you need to have XenApp or XenDesktop licenses to fully use the program. When mounting the ISO the installation wizard will be started.

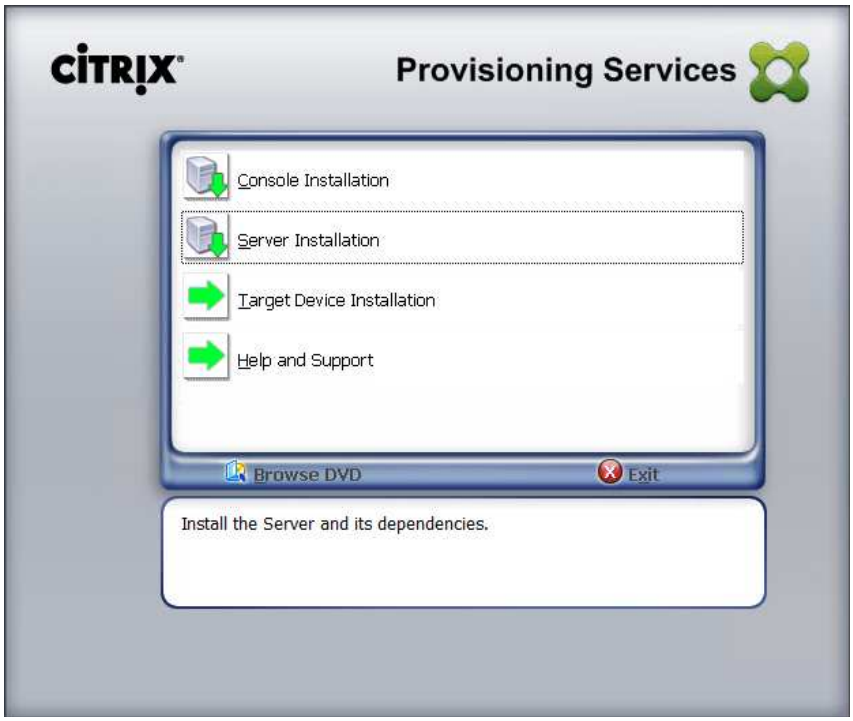

Figure 1: Citrix PVS installation wizard

All installation options are shown (console, server installation and target device installation), for now we select server installation. The server installation can be executed on Windows 2008, Windows 2008R2, Windows 2012 and Windows 2012R2. It also requires that .Net Framework 4.0 and PowerShell 2.0 are installed on the machine. The server installation has some supporting component requirements, but those are installed automatically during the installation wizard. Actually those are installed as a starting point as shown in Figure 2.

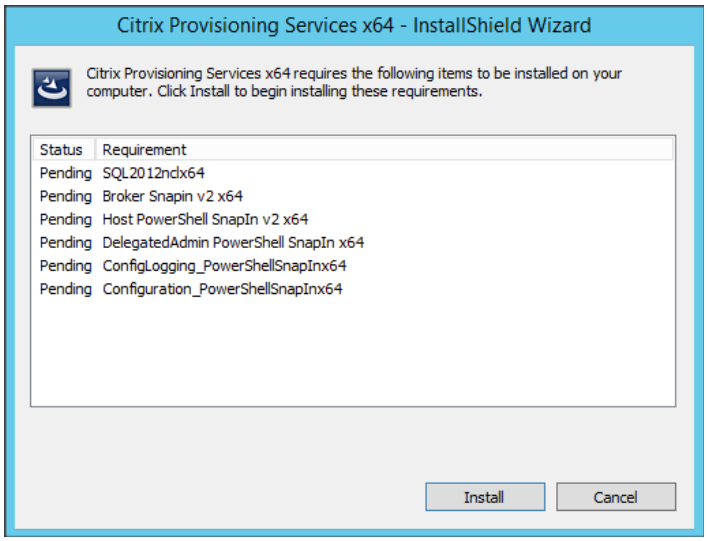

Figure 2: Citrix PVS required supporting software

Hereby is the SQL 2012 Client which is optional, but Citrix advises to install the SQL client when possible/allowed.

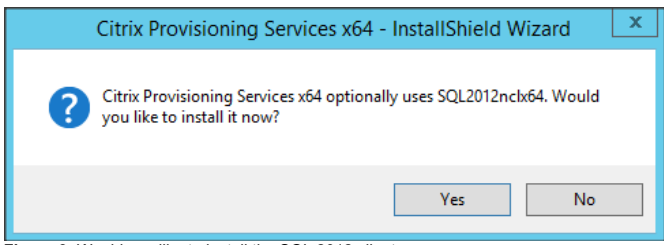

Figure 3: Would you like to install the SQL 2012 client

After the supporting software installation the PVS installation wizard continues with an informational window.

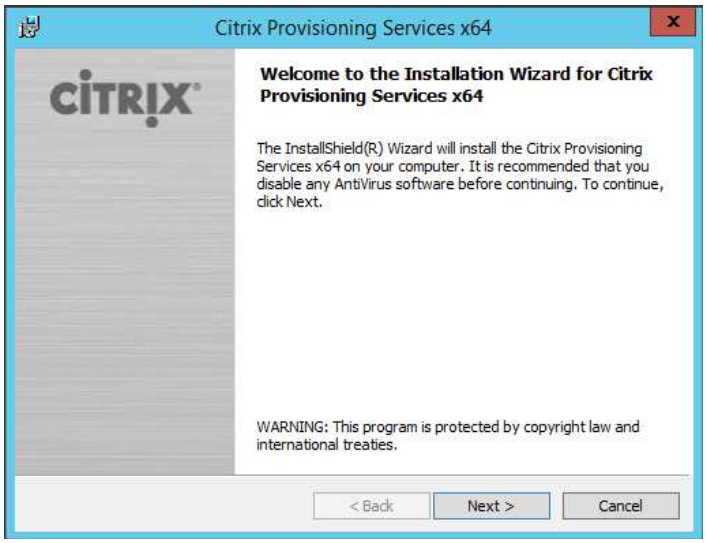

Figure 4: Welcome to the installation wizard for Citrix Provisioning Services

The following step is to read the license agreement and to accept these terms to continue with the installation wizard.

Figure 5: License Agreement

After the license agreement you need to provide the Customer Information and decide if the shortcuts are created in your own profile or in the “All Users” profile.

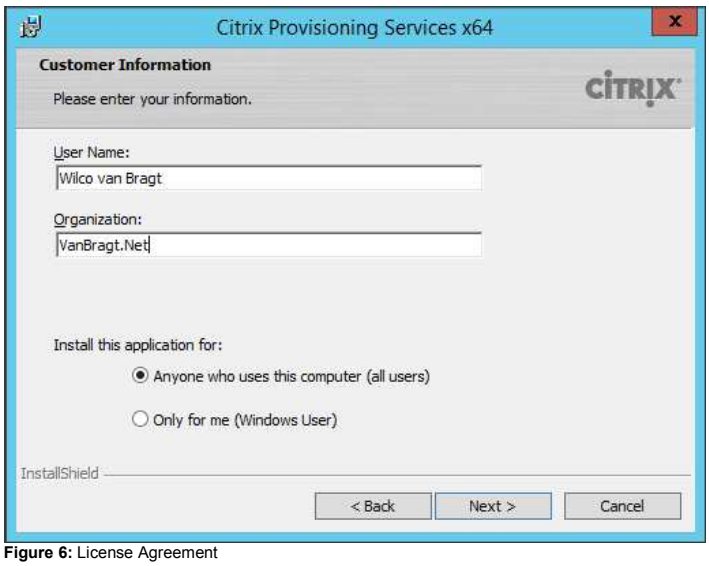

Figure 6: License Agreement

The next step is to select the Destination Folder where the actual PVS files are installed on the machine.

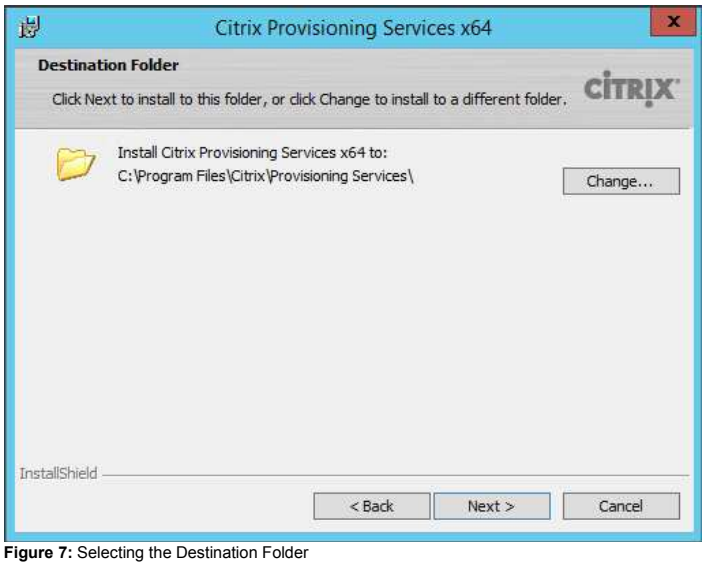

Figure 7: Selecting the Destination Folder

After selecting the destination folder, the actual installation can be started by using the Install button in the upcoming screen.

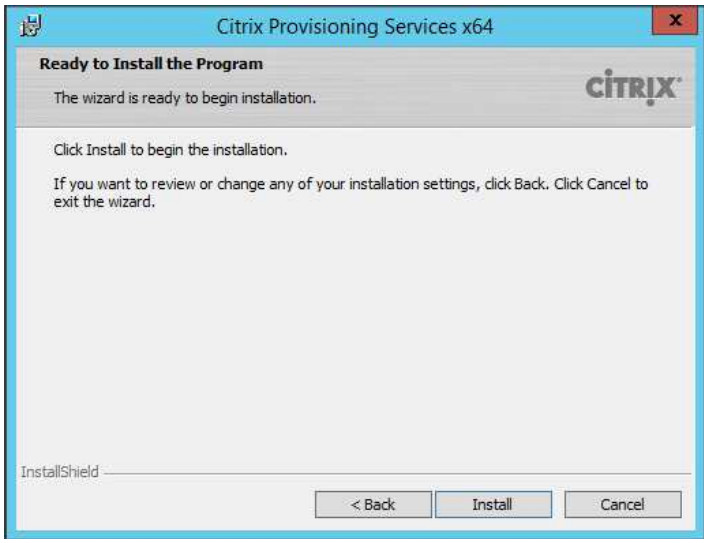

Figure 8: Ready to Install

At that moment the actual installation is executed. When this part is finished the last installation wizard will be shown stating that the installation wizard is completed.

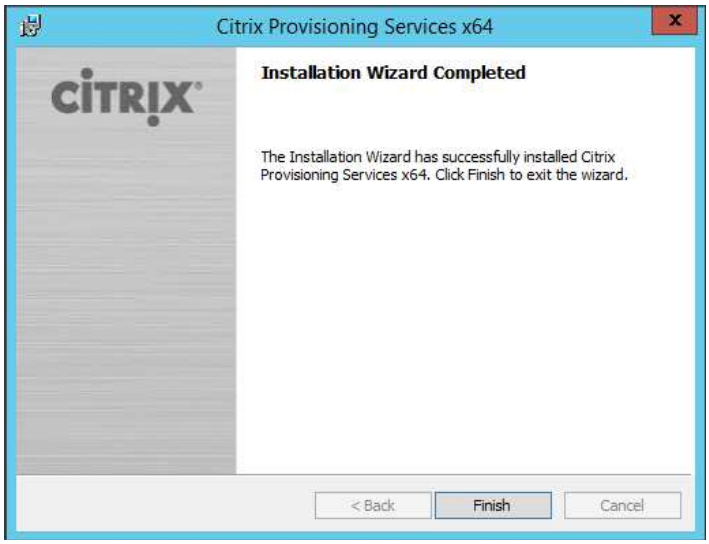

Figure 9: Installation Wizard Completed

The installation will also show a message window that PVS Console is not detected. You can install the PVS console on any machine, so it's not required to install the console on the PVS

server. Logically it can be done and can be useful, but that's up to you.

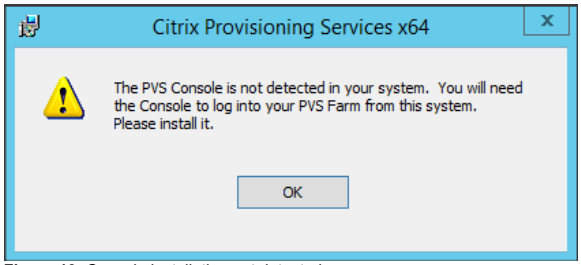

Figure 10: Console installation not detected

After this information message, the Provisioning Services Configuration Wizard is automatically started. This wizard can also be started later; it's available as an application shortcut.

Figure 11: Provisioning Service Configuration wizard is started automatically

As you can see Citrix separated the installation and configuration of the product. As Target Devices have a continuous connection to the PVS server you would need to have at least two PVS servers for fault tolerant purposes. So for both servers the actual installation steps are identical. In this article series I have two PVS servers to show the fault tolerant and load balancing capabilities, so I executed the installation wizard on two systems.

Console Installation

For now I will first continue with the installation steps by installing the PVS Console first. As mentioned before it can be installed on both the PVS server, on a local machine (Windows 7, Windows 8 or Windows 8.1) or an admin server (Windows Server 2008, Window Server 2008R2, Windows Server 2012 or Windows Server 2012R2). The PVS server should be reachable for the PVS console on port 54321 (but more about this topic later in this article series). Also MMC 3.0, Microsoft .Net Framework 4.0 and PowerShell 2.0 are required for the console functionality.

As shown in Figure 1 the PVS console installation is available from the auto run.

Figure 12: PVS Console Installation Wizard

The installation wizards starts (again) with the license agreement, followed by the user information and selecting the destination folder of the actual files, just like the PVS server

installation

Figure 13: PVS Console installation wizard screens

After these standard wizard windows, you have the possibility to do a full installation or a custom installation.

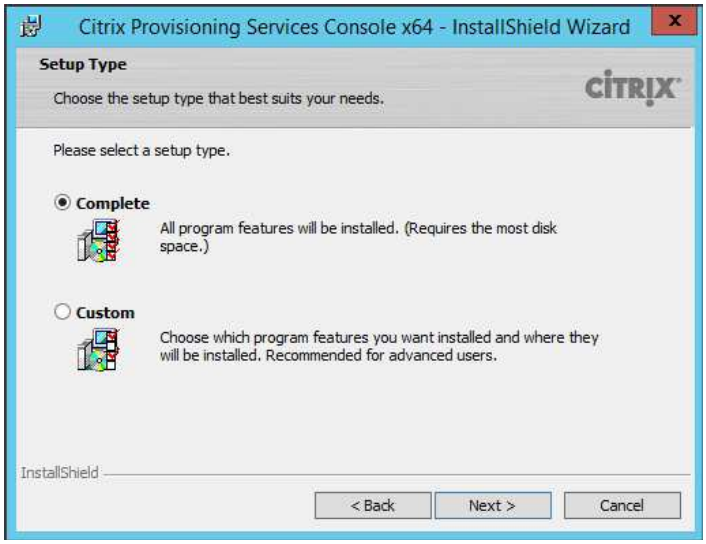

Figure 14: A Complete or Custom installation

When choosing Complete everything is installed, when choosing Custom you can decide if you want to install the Console only and don't install the Boot Device Manager (BDM Creation Tool). I will go into more detail about BDM later in this series.

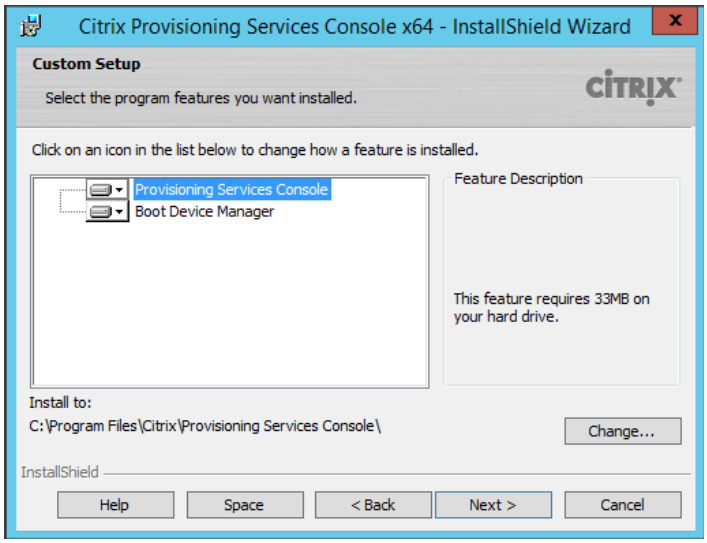

Figure 15: Custom Installation options

After the possibility to decide which items should be installed the actual installation can be started.

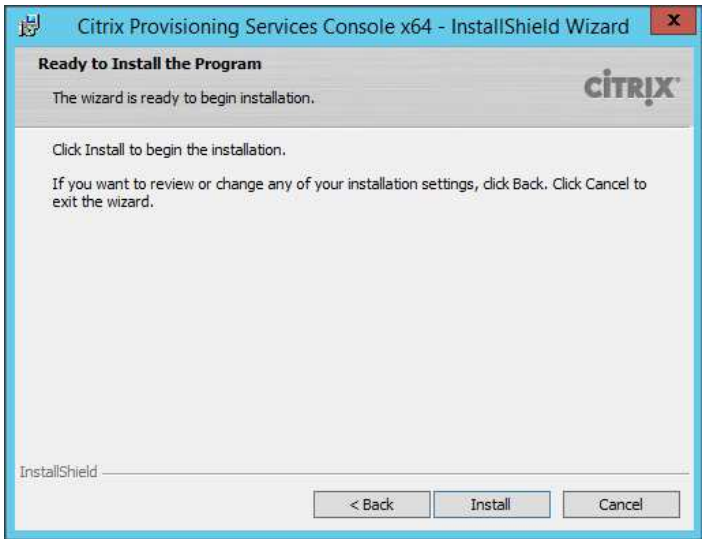

Figure 16: Custom Installation options

When the installation is finished the installation wizard will show that the installation is done.

Figure 17: Custom Installation options

Target Device Installation

With Provisioning Services you need to have a base machine where the vDisk is created from. It's actual a kind of imaging technique that's being used. On this base machine the client software (Target Device software) needs to be installed. So you install this machine traditionally (hopefully using a software deployment system) including all the applications that are required than start the Target Device installation.

The Target Device software can be installed on Windows 7 SP1 32 bit and 64 bit (Enterprise, Professional, Windows 8/8.1 32bit and 64 bit (All Editions), Windows XP Professional SP3 32 bit, Windows XP Professional SP2 64 bit, Windows Server 2008 R2 SP1 (all editions), Windows Server 2012 (all editions) and Windows Server 2012 R2 (all editions).

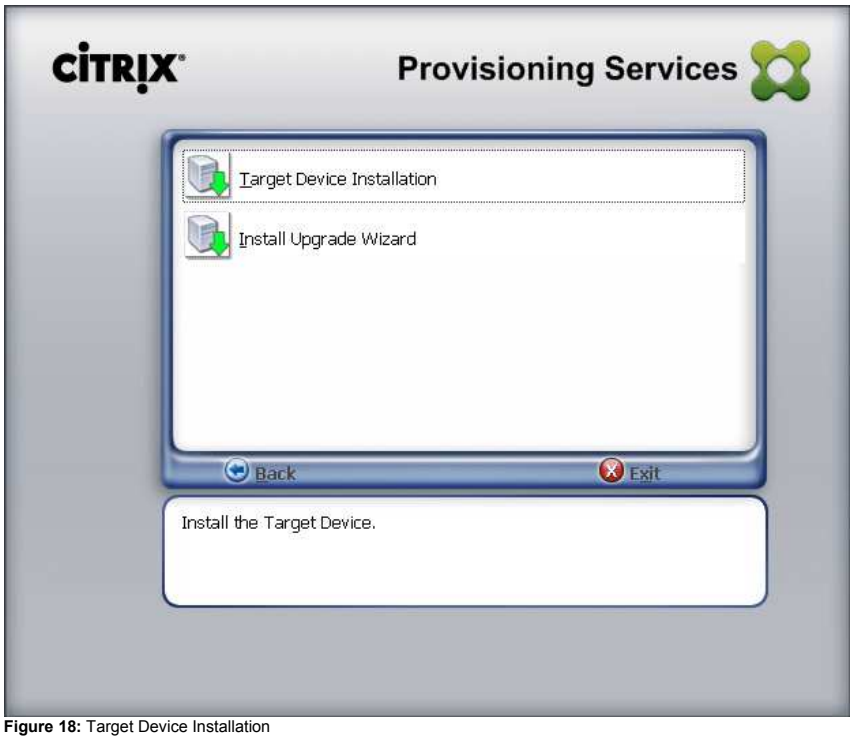

Figure 18: Target Device Installation

The target device installation wizard is very similar to the console and PVS server installation wizard. The wizard starts with a welcome window, followed by the license agreement, the user information and the location where the software will actually be installed. Just as the other installers finally the Install button is shown which starts the actual installation.

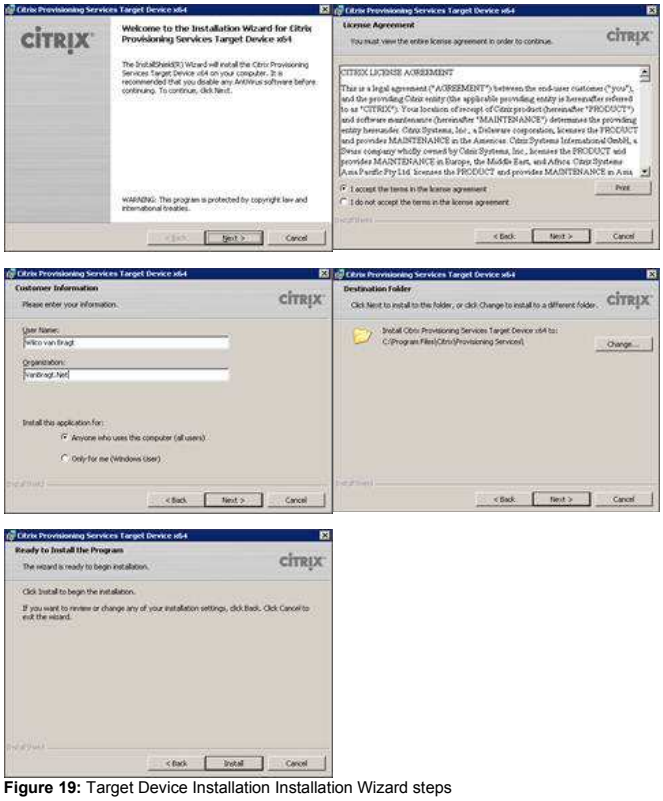

Figure 19: Target Device Installation Installation Wizard steps

When the installation is finished a new window will appear. Within this window by default the option Launch Image Wizard is selected, which will logically start the wizard for creating the vDisk image for the PVS OS streaming. This wizard will be discussed later in this article series, as it's a requirement that the back-end is fully configured. This wizard can also be started later via a shortcut in the Start Menu.

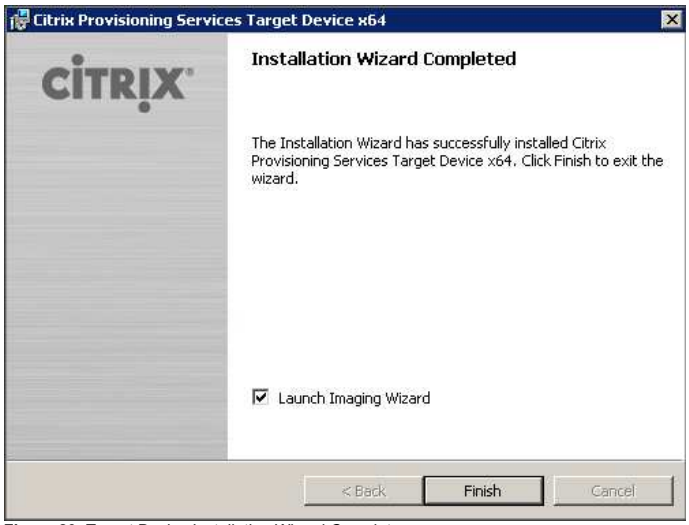

Figure 20: Target Device Installation Wizard Complete

Summary

In this article series we will go through the installation and configuration of Citrix Provisioning Services 7.6, so at the end of the series you will have a functional PVS infrastructure including OS streaming to the Target Devices. In this first part we went through the installation steps of the PVS Server, the PVS console and the PVS Target Device. In the upcoming article we will continue with the configuration of the PVS Server.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

See Also

- Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)
- Installing and Configuring Citrix XenApp XenDesktop 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part3.html)
- Whitepaper: HP Reference Architecture for XenDekstop on VMware vSphere 5 (http://www.virtualizationadmin.com/blogs/conger/news/whitepaper-hp-reference-architecture-for-xendekstop-on-vmware-vsphere-5-716.html)
- Xen 4.0 Roadmap Taking Shape (http://www.virtualizationadmin.com/blogs/conger/news/xen-40-roadmap-taking-shape-368.html)
- Free Tool: XenDesktop VDI Calculator (http://www.virtualizationadmin.com/blogs/conger/news/free-tool-xendesktop-vdi-calculator-633.html)
- Installing and Configuring Citrix XenApp/XenDesktop 7.6 (Part 5) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part5.html)
- Installing and Configuring Citrix XenApp/XenDesktop 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenappxendesktop-76-part2.html)
- Installing and Configuring Citrix XenApp/XenDesktop 7.6 (Part 4) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part4.html)

The Author — Wilco van Bragt

After working for a couple of consulting firms as a senior technical consultant and technical project leader Wilco started his own freelance company VanBragt.Net Consultancy in April 2008. Wilco is certified n Citrix (CCIA, CCEE/CCEA, CCA), Microsoft (MCITP, MCTS, MSCE, MSCA) and Prince2 (Foundation). Wilco is also a RSVP (RES Software Valued Professional), Citrix CTP (Citrix Technology Professional) and a Microsoft MVP (Most Valuable Professional) on RDS.

Latest Contributions

- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 2) - Citrix StoreFront/Web Interface and XML Broker (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part2.html) **on 24 Sept. 2015 (2015-09-24 11:28)**
- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 1) (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part1.html) **on 10 Sept. 2015 (2015-09-10 11:51)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html) **on 2 Sept. 2015 (2015-09-02 11:57)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html) **on 13 Aug. 2015 (2015-08-13 12:59)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html) **on 5 Aug. 2015 (2015-08-05 11:52)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 2)

by Wilco van Bragt [Published on **5 Aug. 2015** / Last Updated on **5 Aug. 2015**]

In this part of our article series we will continue with the configuration of the PVS Server.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

Introduction

In this article series we will go through the installation and configuration of Citrix Provisioning Services 7.6, so at the end of the series you will have a functional PVS infrastructure including OS streaming to the Target Devices. In the first part we went through the installation steps of the PVS Server, the PVS console and the PVS Target Device.

Configuration 1st PVS Server

At the end of the installation the Provisioning Service Configuration Wizard is automatically started, but can be started out of the Start Menu shortcut. The wizard starts with an informational screen.

Figure 1: Provisioning Services Configuration Wizard Introduction

PVS Target Devices normally use a DHCP IP address as the OS Streaming is based on an image. The first question in the configuration wizard is about the location of the DHCP services. In most cases the DCHP service will run on a separate computer (not on the PVS server), so that answer will be most used. If you don't have a DCHP server the PVS software includes a very small basic DHCP service.

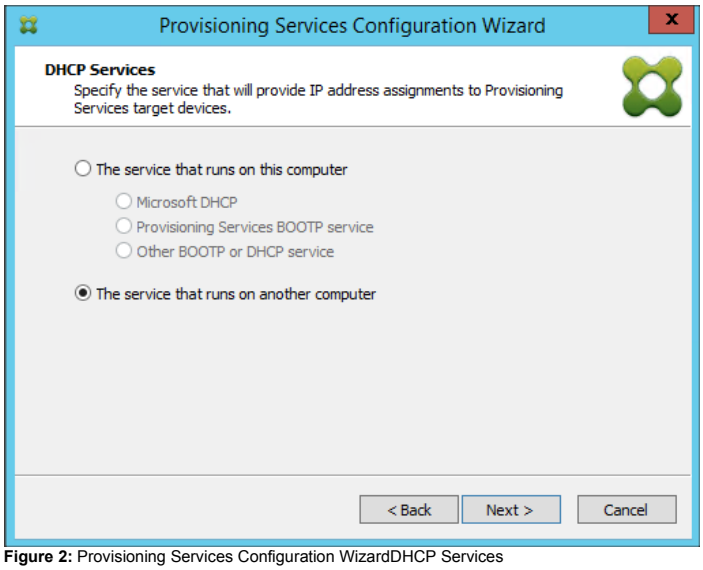

Figure 2: Provisioning Services Configuration WizardDHCP Services

Secondly the wizard would like to know which PXE services you would like to use. If you would like to use PXE (you can use an alternate method called BDM, see my article To PXE or not to PXE (http://virtualization.vanbragt.net/index.php/articles/how-to-articles/citrix-provisioning-services-to-pxe-or-not-to-pxe) for more details). If you are using PXE, I recommend using the PXE service of PVS to keep your set-up simple and understandable. However you should be sure that no other PXE services are running in the same VLAN.

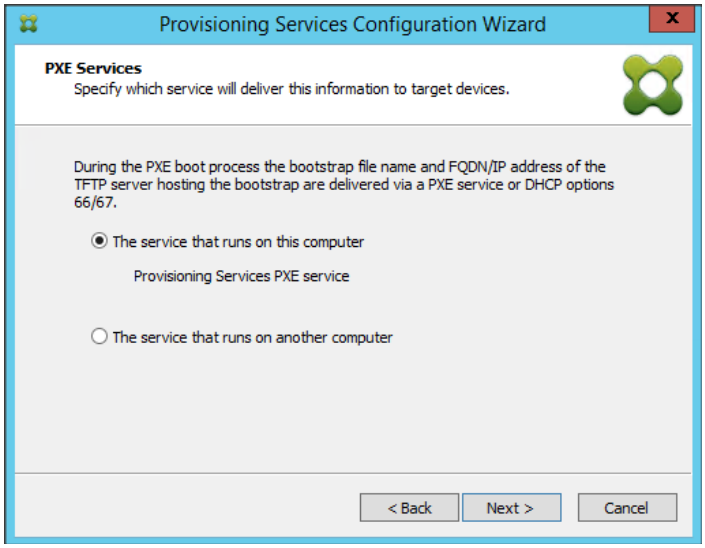

Figure 3: Provisioning Services Configuration WizardPXE Services

As this is our first PVS server we should create a new environment. An environment is called a farm within PVS, so we needed to choose Create Farm.

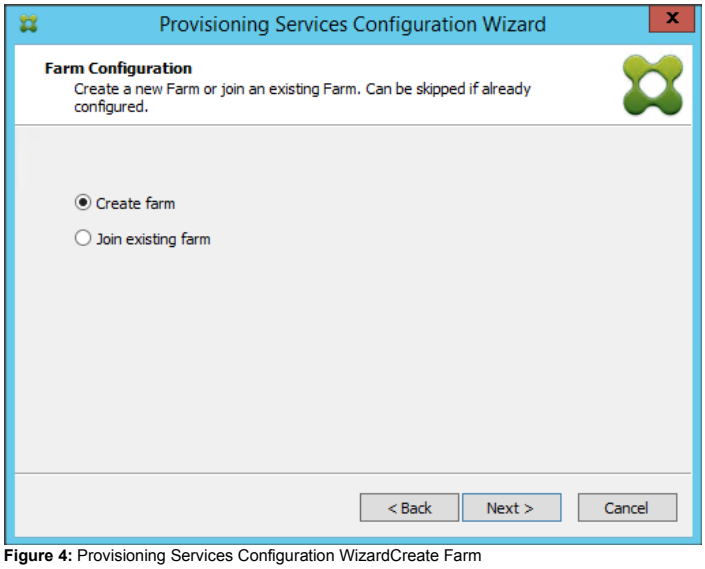

Figure 4: Provisioning Services Configuration WizardCreate Farm

PVS is using a SQL database to store the information. PVS 7.x supports SQL 2008 or higher. SQL express is also supported, but logically that's not recommended. In the next screen you specify the SQL server details. What's really nice about PVS is the full support of database mirroring including automatic failover if you specify the failover partner in the database configuration part.

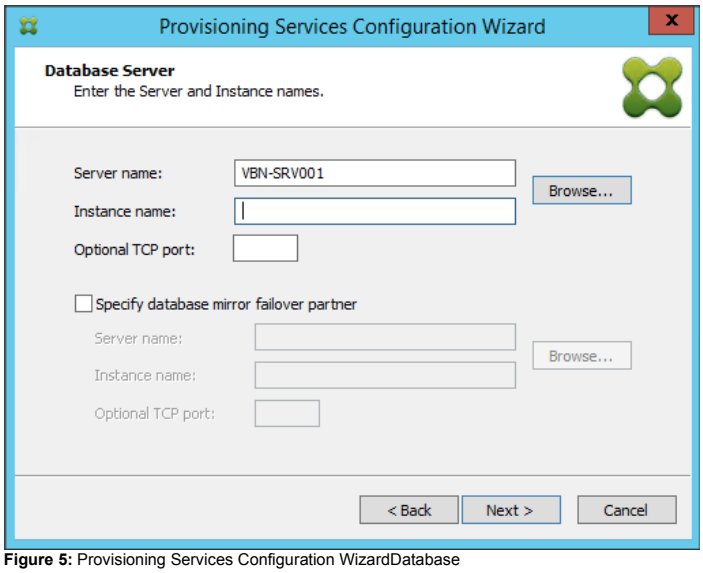

Figure 5: Provisioning Services Configuration WizardDatabase

After specify the SQL server information the database name should be provided including the name for the three levels within the PVS infrastructure (farm, site and collection). These names are only visible/used in the console and can be changed to something different without consequences after the initial configuration. Lastly we need to specify which AD group contains the accounts, which will become the PVS administrators.

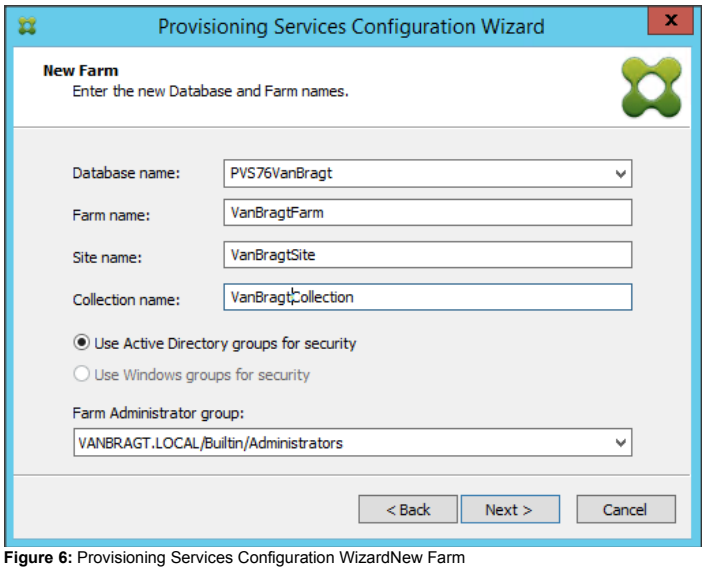

Figure 6: Provisioning Services Configuration WizardNew Farm

The next step is specifying the store name and store location. At the Store location the vDisk(s) will be stored. You can use a UNC path, shared LUN of local storage. Many types of local storage are being used to avoid that the data is travelling on the network twice (from the store to the PVS server and from the PVS server to the Target Devices). However using local storage implies that you need to arrange a sync between the PVS servers, while PVS does not have a sync mechanism in place (often DFS-R is user for this specific task).

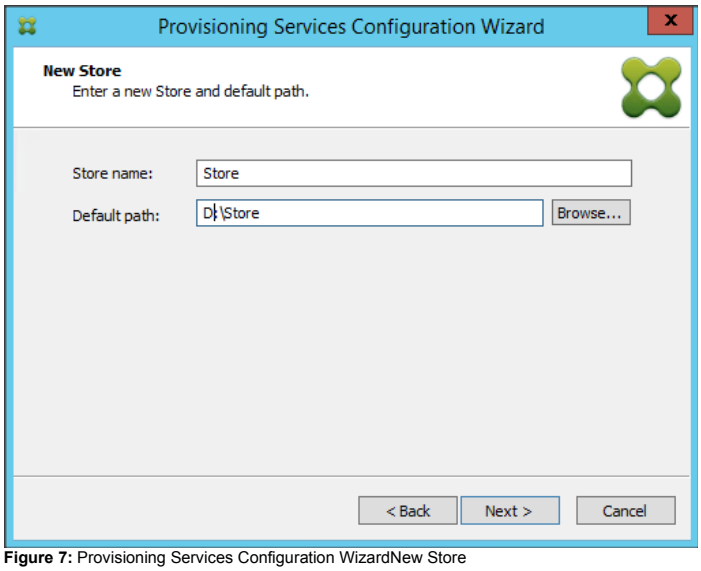

Figure 7: Provisioning Services Configuration WizardNew Store

Just like other Citrix products PVS is using the Citrix License Server. In most circumstances this will be the same server used for XenApp or XenDesktop.

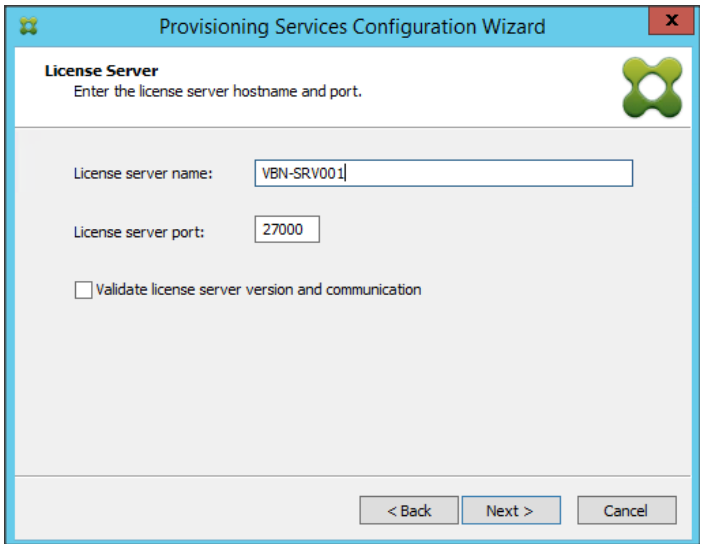

Figure 8: Provisioning Services Configuration WizardLicense Server

Optionally a user account can be provided. This user account is required when using a shared LUN or UNC path to access the vDisk on this storage location. When using local storage the network service account can be used. Citrix advises the user Network service account when possible. Take into consideration that the account provided here will also be used to contact the database. If your database administrator does not allow computer accounts as an SQL account, you should also specify a user account here.

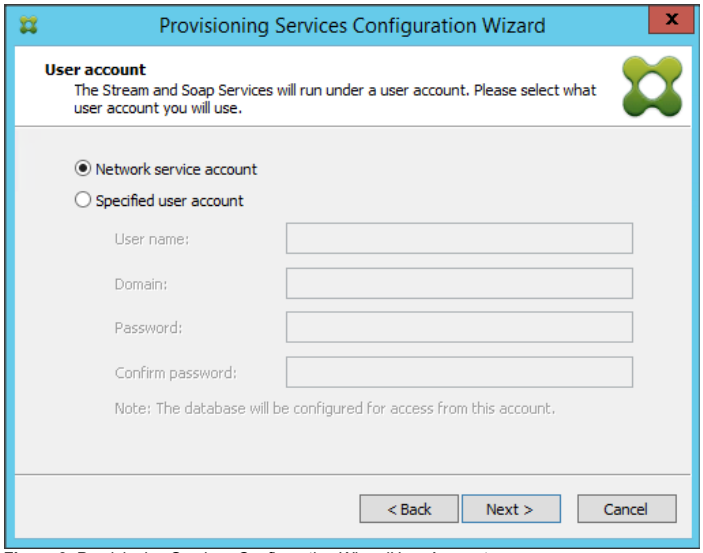

Figure 9: Provisioning Services Configuration WizardUser Account

Just like user accounts, computer objects in AD have their own password, which is changed on a regular basis. PVS has a functionality built in to arrange that this process is still functioning although the same vDisk (image) is used by multiple devices. During the initial wizard you can specify the time frame this password needs to change. There is also a group policy setting that sets the change password time frame. This policy and the configuration in PVS should match.

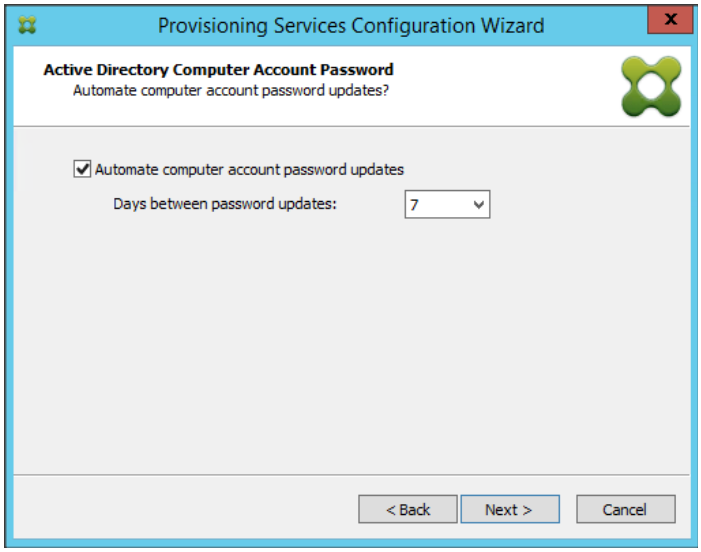

Figure 10: Provisioning Services Configuration WizardActive Directory Computer Account Password

PVS is based on demand streaming. In the Network Communications window we need to specify which network card (or actually IP address) is used for streaming the OS to the Target Devices and on which IP address management tasks are executed. The IP addresses are stored into the configuration, change the IP address later should be followed by a reconfiguration of the PVS configuration. The streaming IP address can be re-configured within the console, while the management IP address requires a re-run of the Configuration Wizard again. If required also the communication ports can be changed here.

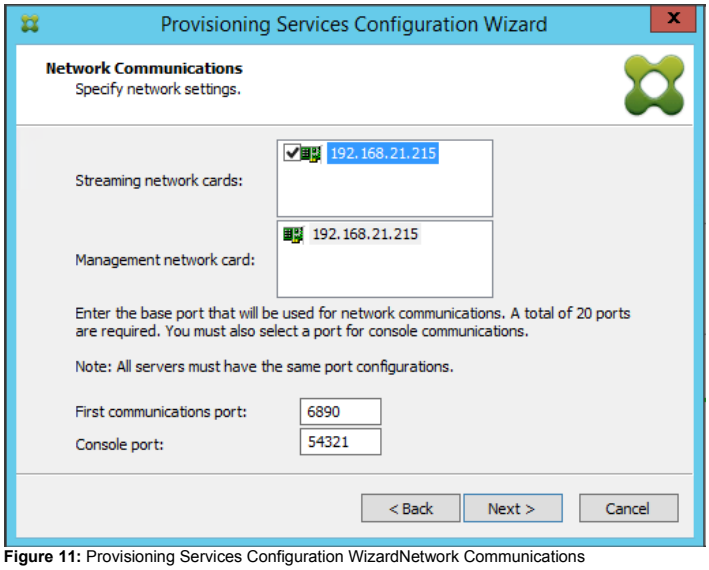

Figure 11: Provisioning Services Configuration WizardNetwork Communications

In many cases the TFTP service is used to load the bootstrap file. If you are using TFTP you need to check this option. The default file location provided is correct and does by default require no changes.

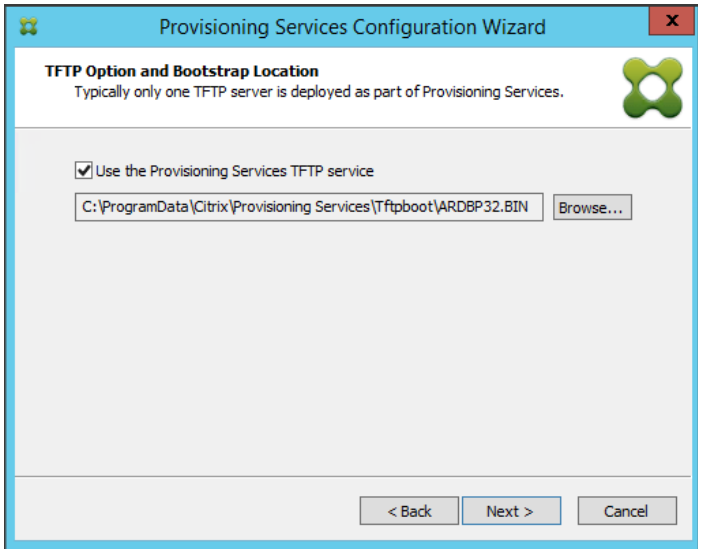

Figure 12: Provisioning Services Configuration WizardTFTP and Bootstrap

Within the configuration you need to specify which PVS server(s) can be used for starting the Target Devices. You can specify between 1 and 4 servers. As every PVS server can fulfill this role it's recommended to add as many PVS servers as possible (four as a maximum). Besides the boot process these IP address are also contacted in case a booted Target Device loses connection with his PVS server to re-connect to the PVS infrastructure.

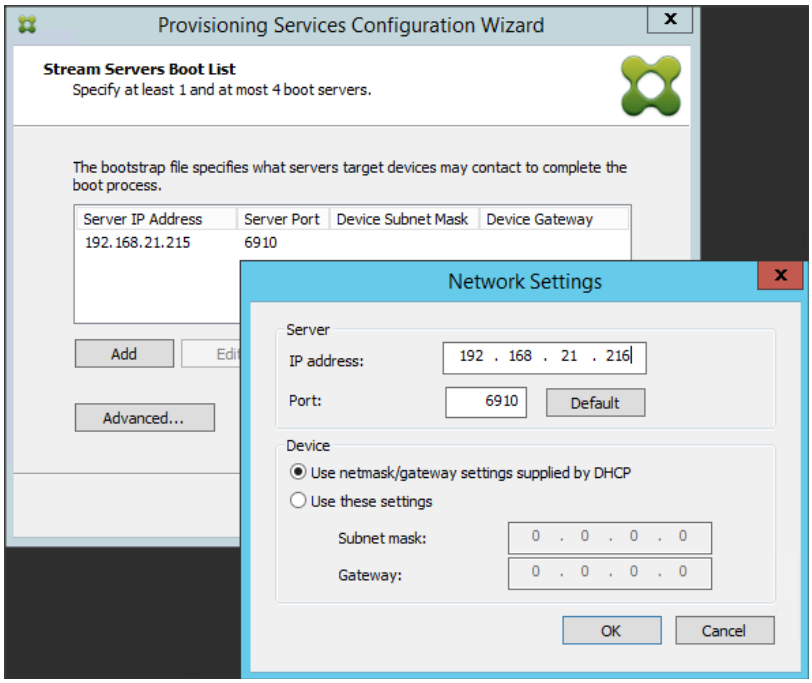

Figure 13: Provisioning Services Configuration WizardStream Servers Boot List

With this last configuration step the configuration wizard has all the information required. A summary of the configuration is shown. By pressing Finish the database will be created, the services will be configured and by default started automatically.

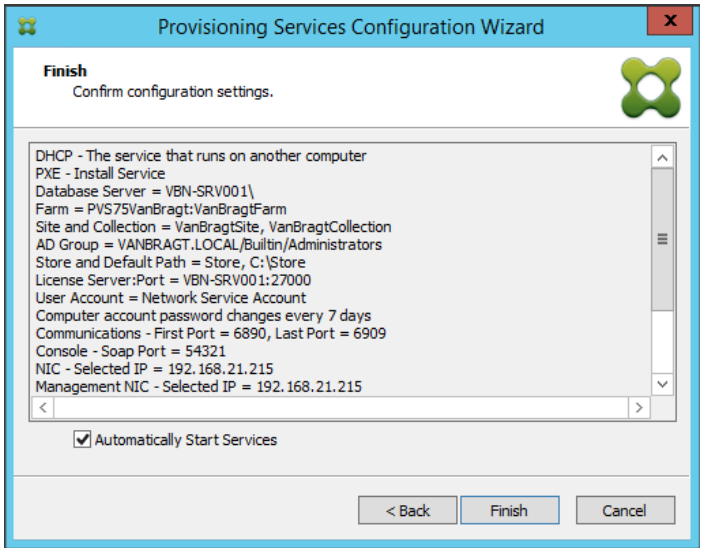

Figure 14: Provisioning Services Configuration WizardConfirm configuration settings

When you are using a Windows Firewall you need to open the necessary ports manually. Unfortunately the installation wizard does not take over that. PVS is using several port ranges, so be sure you have all ports added to the Windows Firewall. During the wizard you will get a message reminding you to about this fact, when an active Windows Firewall is detected.

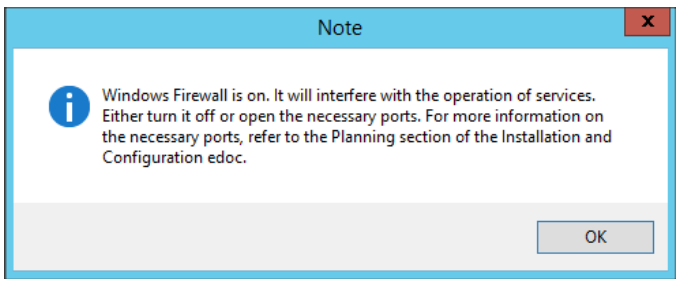

Figure 15: Provisioning Services Configuration WizardWindows Firewall

At the end of the wizard and everything went fine, we will get to see all green checkmarks at the activities executed during the configuration wizard and the first PVS is up and running.

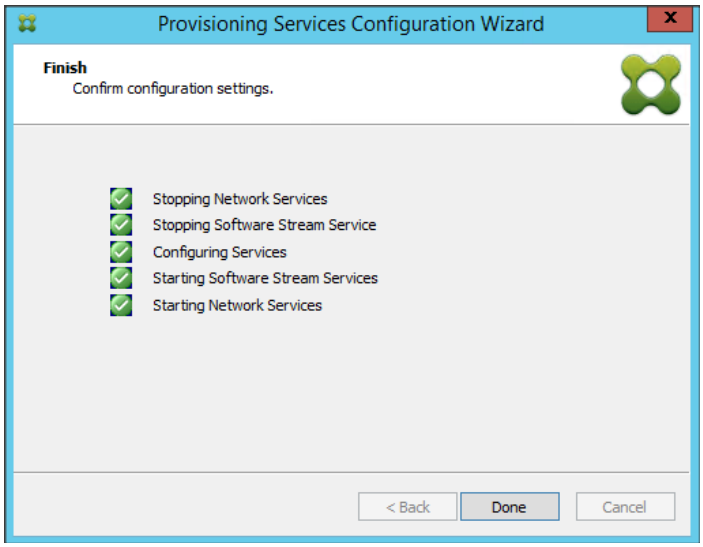

Figure 16: Provisioning Services Configuration WizardFinished

Configuration following PVS Server(s)

On the second (and following) PVS server you will start the same wizard. Normally you will answer the same questions as for the first PVS server. Starting from Figure 2 DHCP will run on another machine and in Figure 3 PXE Service will run on this machine. Next you will logically choose another option than the first server. The following servers will join an existing farm (created at the first PVS server).

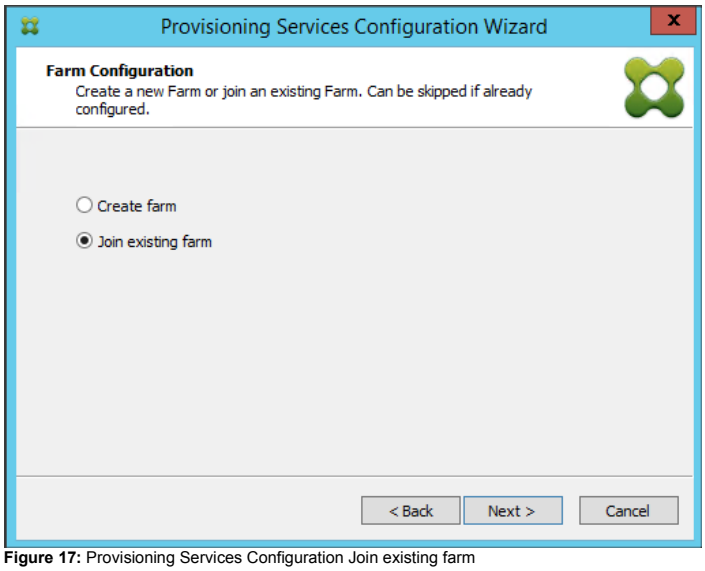

Figure 17: Provisioning Services Configuration Join existing farm

Next we need to provide the SQL server name as shown in Figure 5. As we are joining a farm, we need to select the farm. When more PVS databases are available on the same SQL server, you can choose which farm you would like to join.

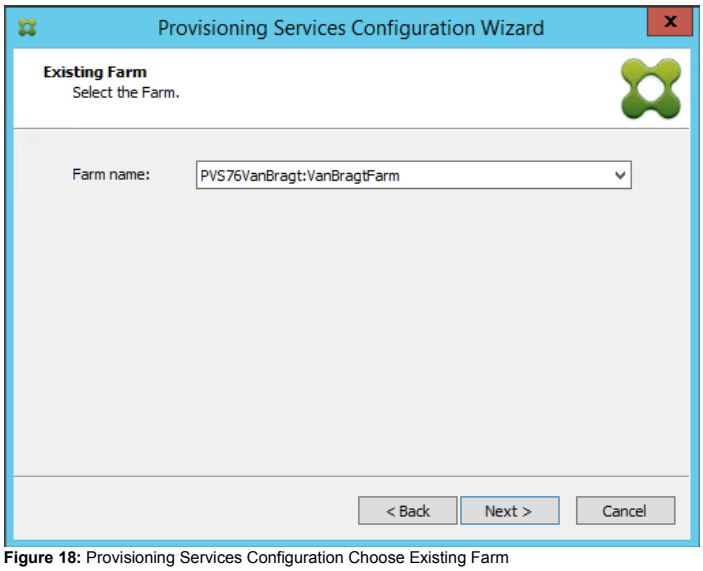

Figure 18: Provisioning Services Configuration Choose Existing Farm

The next decision is if the PVS server will join an existing site or a new site is to be created. Each site needs at least one site, while two are recommended for fault tolerance. I will use an existing site, so I can show the load balancing and fault tolerant options later in this article. You can also move a PVS server to a different site using the management console.

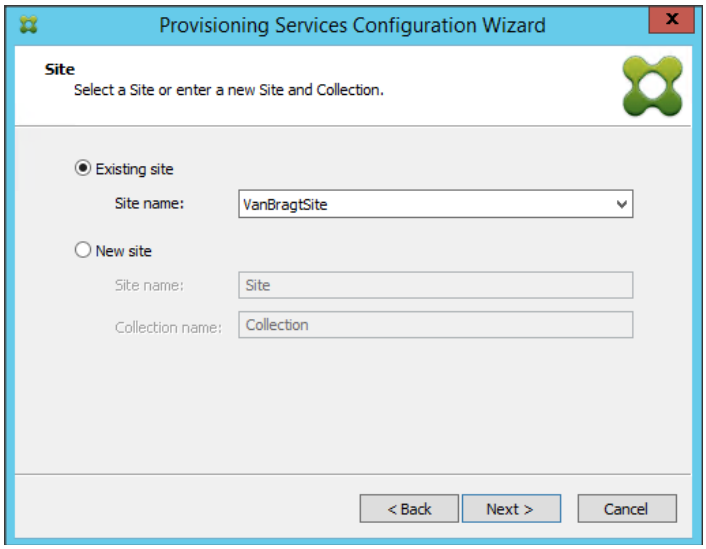

Figure 19: Provisioning Services Configuration Choose Site

The same applies to the Store. Also here you can use the existing store or create a new one. It depends on your Store set-up which option you will choose, mostly you will use the existing store.

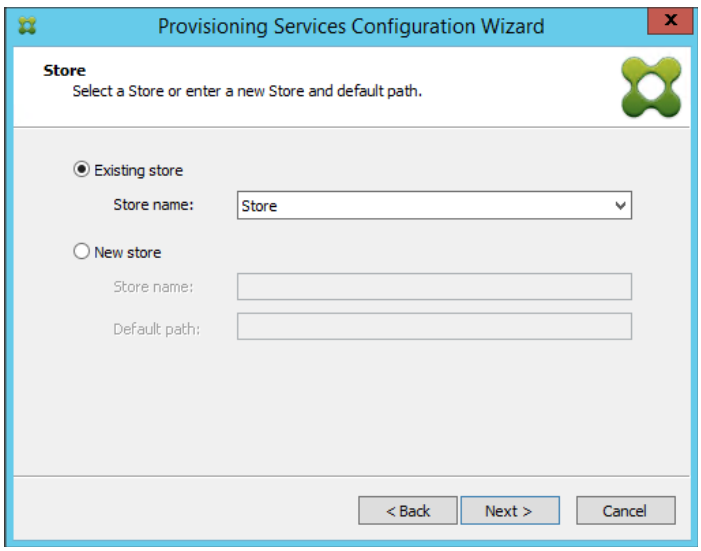

Figure 20: Provisioning Services Configuration Choose Store

Next we need to choose if we use the network service account or a specific account as shown in Figure 9. The same reasons apply for the selection as at the first PVS server. From this point the wizard is exactly the same as the first PVS server, so you follow the steps from Figure 9 also for the following PVS servers. After the wizard has fully run, the PVS server has joined the farm and we are ready to do some additional configuration, which I will describe later on in this article series.

Summary

In this article part I described the initial configuration wizard of the first and following PVS server. Now both servers have executed this initial wizard we are ready to do the preparations for creating the vDisk, which will be described in the upcoming part.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

See Also

- Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)
- Installing and Configuring Citrix XenApp XenDesktop 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part3.html)
- Whitepaper: HP Reference Architecture for XenDekstop on VMware vSphere 5 (http://www.virtualizationadmin.com/blogs/conger/news/whitepaper-hp-reference-architecture-for-xendekstop-on-vmware-vsphere-5-716.html)
- Free Tool: XenDesktop VDI Calculator (http://www.virtualizationadmin.com/blogs/conger/news/free-tool-xendesktop-vdi-calculator-633.html)
- Xen 4.0 Roadmap Taking Shape (http://www.virtualizationadmin.com/blogs/conger/news/xen-40-roadmap-taking-shape-368.html)
- OS Virtualization in Practice (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/os-virtualization-practice-part2.html)
- Performing a Bare Metal Installation of Hyper-V using System Center Virtual Machine Manager 2012 (http://www.virtualizationadmin.com/articles-tutorials/microsoft-hyper-v-articles/installation-and-deployment/performing-bare-metal-installation-hyper-v-using-system-center-virtual-machine-manager-2012.html)
- Installing and Configuring Citrix XenApp/XenDesktop 7.6 (Part 5) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part5.html)

The Author — Wilco van Bragt

After working for a couple of consulting firms as a senior technical consultant and technical project leader Wilco started his own freelance company VanBragt.Net Consultancy in April 2008. Wilco is certified n Citrix (CCIA, CCEE/CCEA, CCA), Microsoft (MCITP, MCTS, MSCE, MSCA) and Prince2 (Foundation). Wilco is also a RSVP (RES Software Valued Professional), Citrix CTP (Citrix Technology Professional) and a Microsoft MVP (Most Valuable Professional) on RDS.

Latest Contributions

- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 2) - Citrix StoreFront/Web Interface and XML Broker (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part2.html) **on 24 Sept. 2015 (2015-09-24 11:28)**
- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 1) (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part1.html) **on 10 Sept. 2015 (2015-09-10 11:51)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html) **on 2 Sept. 2015 (2015-09-02 11:57)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html) **on 13 Aug. 2015 (2015-08-13 12:59)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html) **on 5 Aug. 2015 (2015-08-05 11:52)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)

by Wilco van Bragt [Published on 13 Aug. 2015 / Last Updated on 13 Aug. 2015]

In this second part I described the initial configuration wizard of the first and following PVS server. Now both servers have executed this initial wizard we are ready to do the preparations for creating the vDisk, which we will do in this part including using the vDisk by other Target Devices.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

Creating the vDisk

After the initial configuration in part two the PVS infrastructure is now ready for use. To show the complete workflow I will now continue with the steps on the Master Target Device to create a vDisk.

We already installed the Target Device software in part one. For creating the vDisk we need to start the Image Wizard (which can be started directly after the installation or out of the Start Menu). The Image Wizard starts with a welcome screen.

Figure 1: Welcome to the Imaging Wizard

The first information we need to provide is the name or IP address of one of the PVS server to contact the PVS infrastructure. If you are logged in with limited credentials you also provide other credentials with PVS administrator rights.

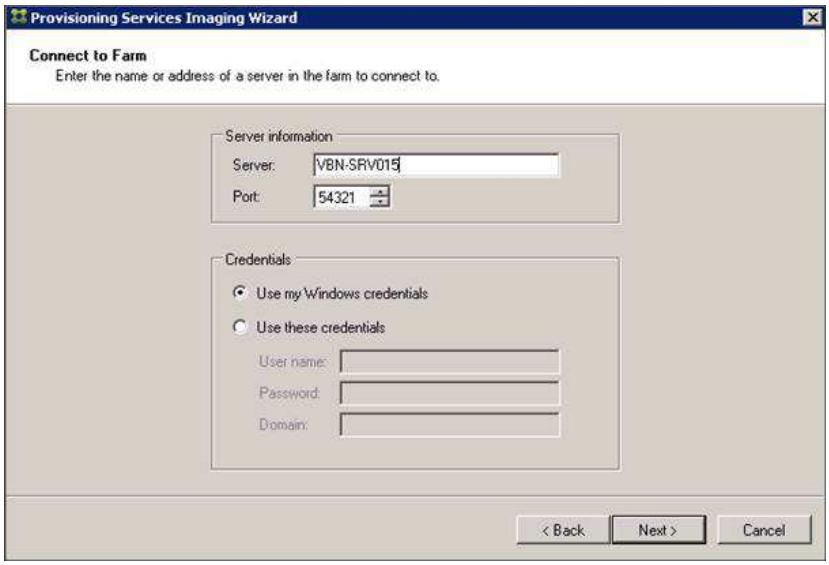

Figure 2: Welcome to the Imaging Wizard

It's possible to create the vDisk in advance using the PVS management console, but this can also be done via the Image Wizard. If you already have a vDisk available you can select it here, otherwise you choose Create new vDisk.

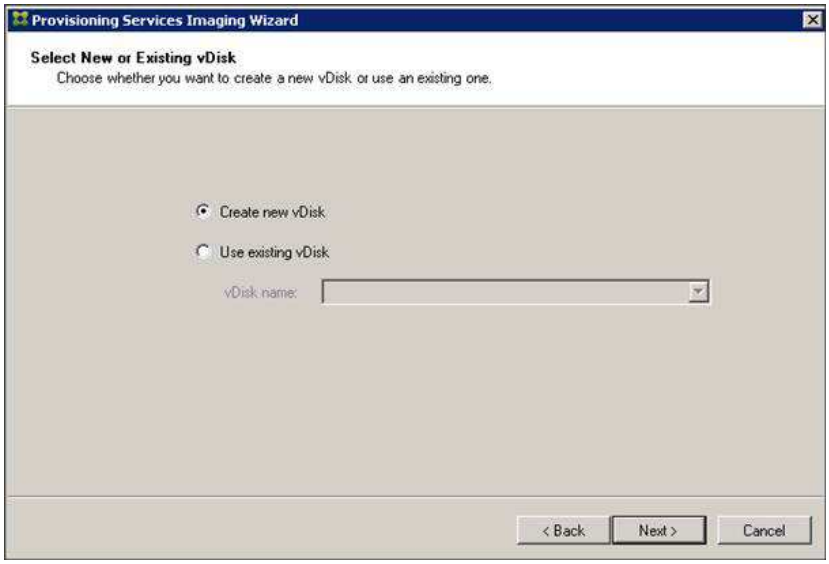

Figure 3: Select New or Existing vDisk

The new vDisk requires a unique name. When you have more stores available you also need to select the store where the vDisk should be created. At last you need to select whether to use a fixed or dynamic disk. Nowadays I recommend using a dynamic disk as test results show that there is no performance difference (anymore) between the two types and dynamic requires less disk space. When choosing Dynamic you also need to provide the block size the vDisk grows, I always choose 16 MB.

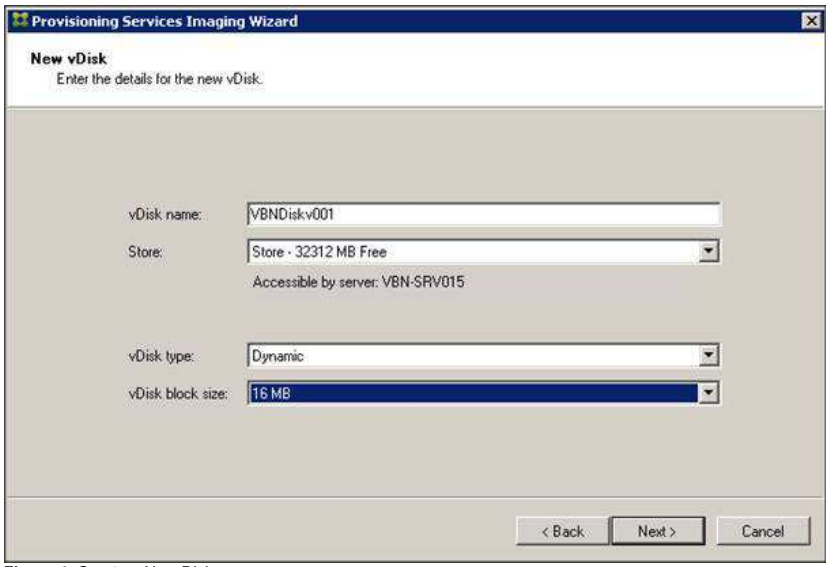

Figure 4: Create a New Disk

The next question is about Microsoft Volume licensing. I recommend checking the excellent article Enabling KMS Licensing on a vDisk (http://www.ingmarverheij.com/citrix-pvs-enabling-kms-licensing-on-a-vdisk/) by Ingmar Verheij when you are using KMS. Choose which system you are using in your organization.

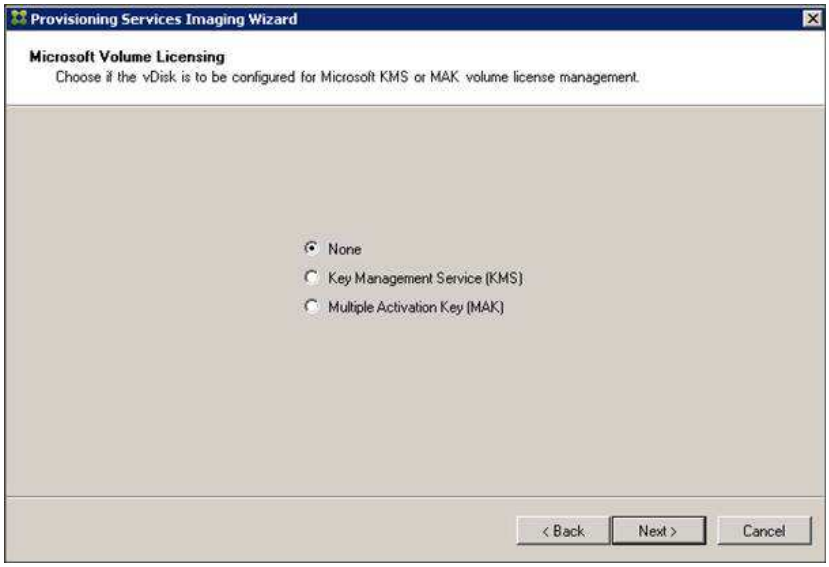

Figure 5: Microsoft Volume Licensing

In the following screen you need to specify which disk you want to have in the vDisk. It's possible to select multiple partions if that's required (for example when you install all applications on a separate partition). Logically the drive with the operating system installed should always be selected. You can also tweak the size of the vDisk within this part of the wizard.

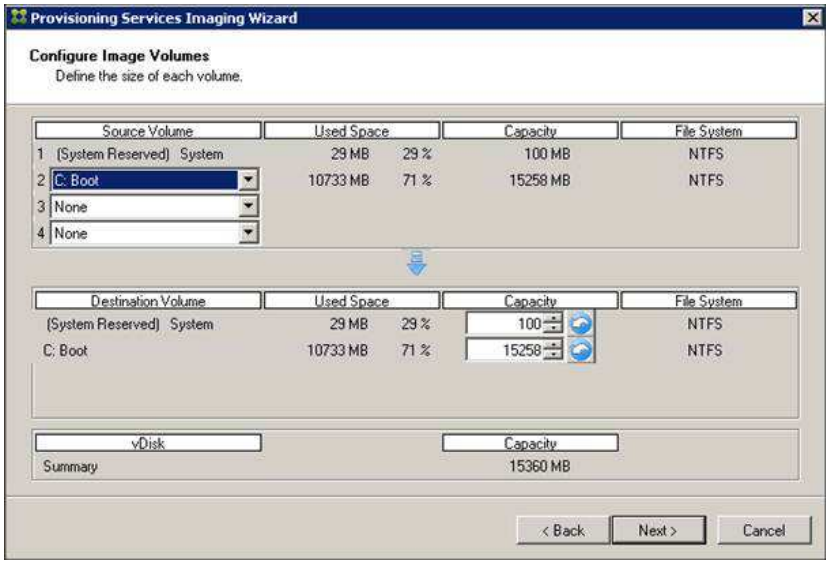

Figure 6: Configure Image Volumes

Logically the machine should be part of the PVS infrastructure. Therefore the machine should be provided with a Target Device Name. It's important to provide a different name than the actual computer name (in Active Directory). I normally just add MTD, but you can use any name. Also the network card should be selected and a Device Collection where the machine will be added to. I recommend creating a separate Device Collection for machines used as Master Target Device.

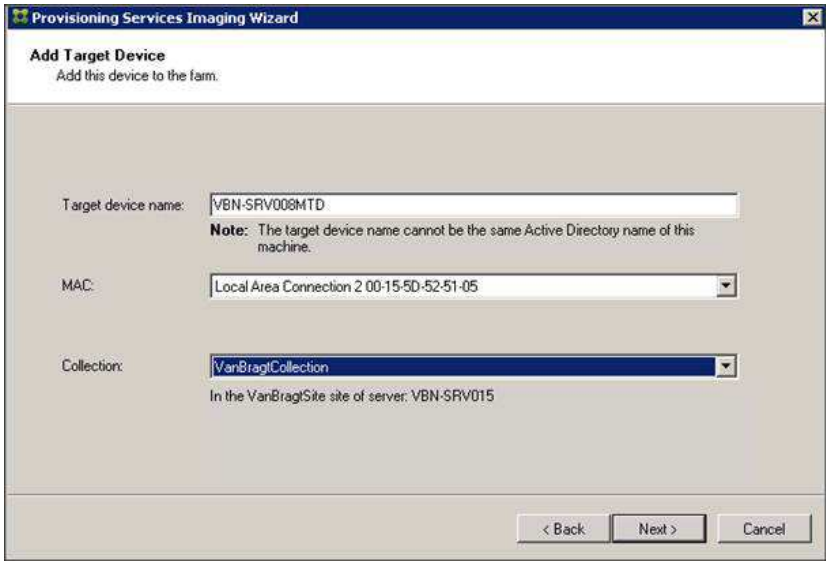

Figure 7: Add Target Device

The wizard is almost finished now. A summary is shown of the provided settings. Within this display there is a button called Optimize for Provisioning Services. Within this button several settings are available for tweaking the imaging. Be careful about accepting all values by default. Check the organization security requirements for example. A good one is Windows Search. If you are running Outlook, Windows Search is used for searching e-mails within Outlook. You understand it would not be smart to disable the Windows Search in the image.

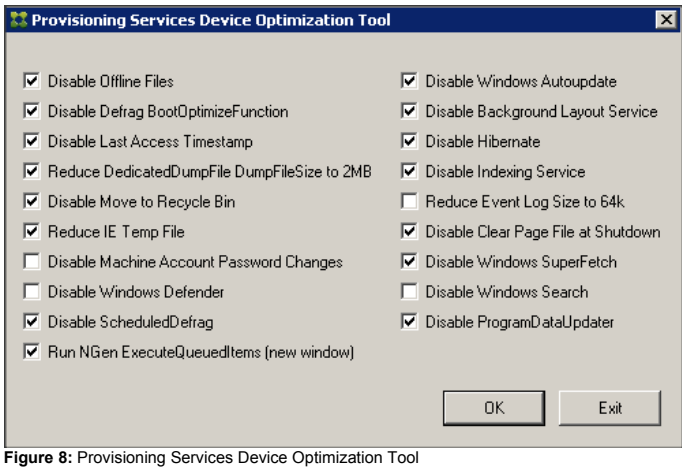

Figure 8: Provisioning Services Device Optimization Tool

After the optimization phase we can end the wizard using the Finish button.

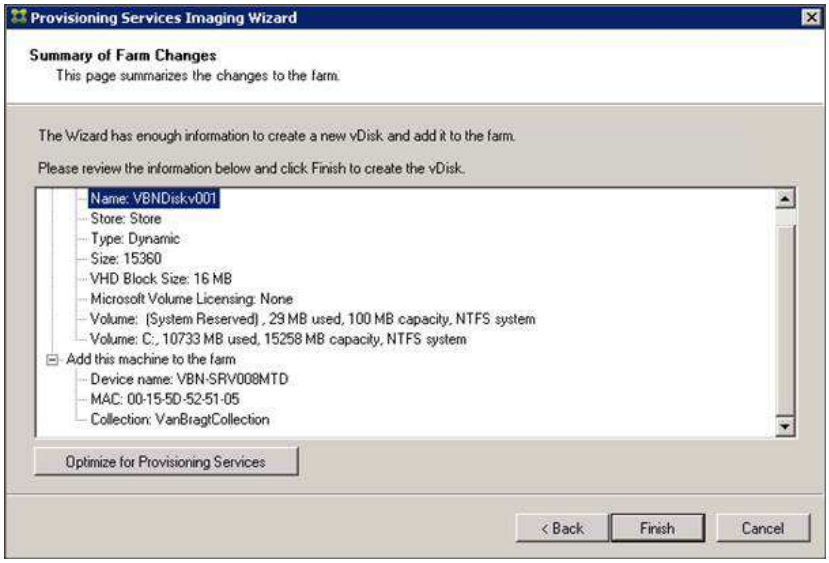

Figure 9: Summary of Farm Changes

After pressing the Finish button the actions are executed like creating the vDisk and creating the device within the PVS infrastructure. When that part is finished it's time to restart the machine to start the actual imaging process. Remember that at this phase the machine should connect to the PVS infrastructure using the PXE or BDM option.

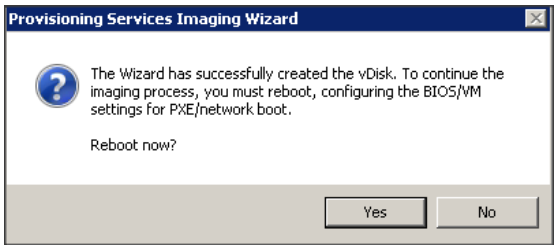

Figure 10: Restart the Master Target Device

Afterwards the machine is connected to the PVS infrastructure using PXE or BDM and is fully booted again. We can logon again and the image wizard will be started automatically, showing the progress bar.

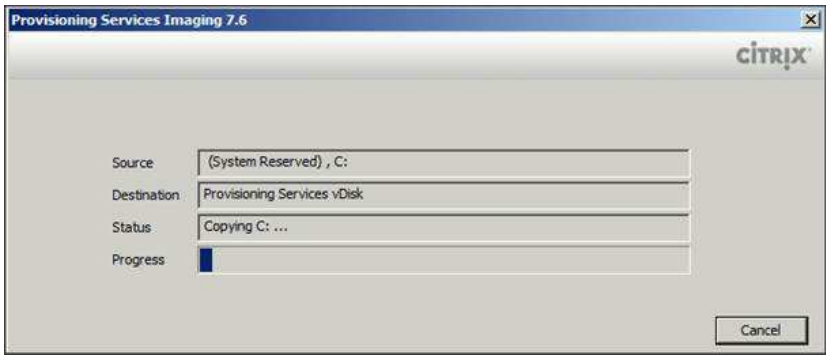

Figure 11: Imaging Progress Bar

When the imaging process is done a screen is shown that the conversion is completed.

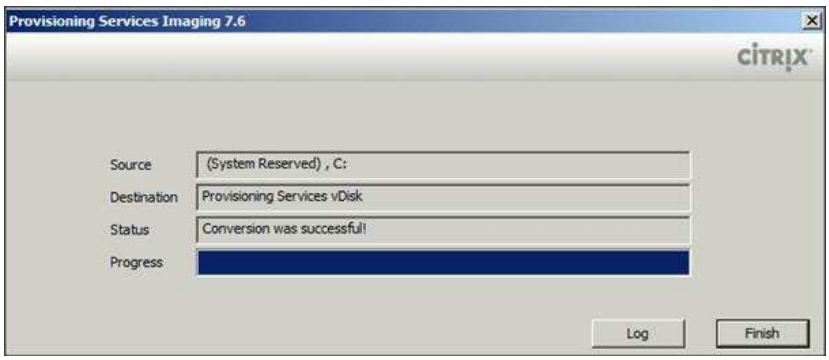

Figure 12: Imaging Process Finished

The machine will show its normal interface, you will also see an additional disk connected to the system. But logically that's not necessary. The next step is to shut down the machine, so the disk image is not in use anymore.

The next step is executed in the console. It's time to change the vDisk from the private (so it can be written) to shared mode (so the vDisk can be used by multiple Target Devices). This is done by selecting properties of the just created vDisk at the vDisk pool within the site. Here you need to change the access mode from private to standard and select the location where you would like to store the Write Cache. It's a step to far to explain the different options with their characteristics. Please check my articles series about Designing PVS on my personal website. More settings can be changed, but for simplicity I only show the required changes for now.

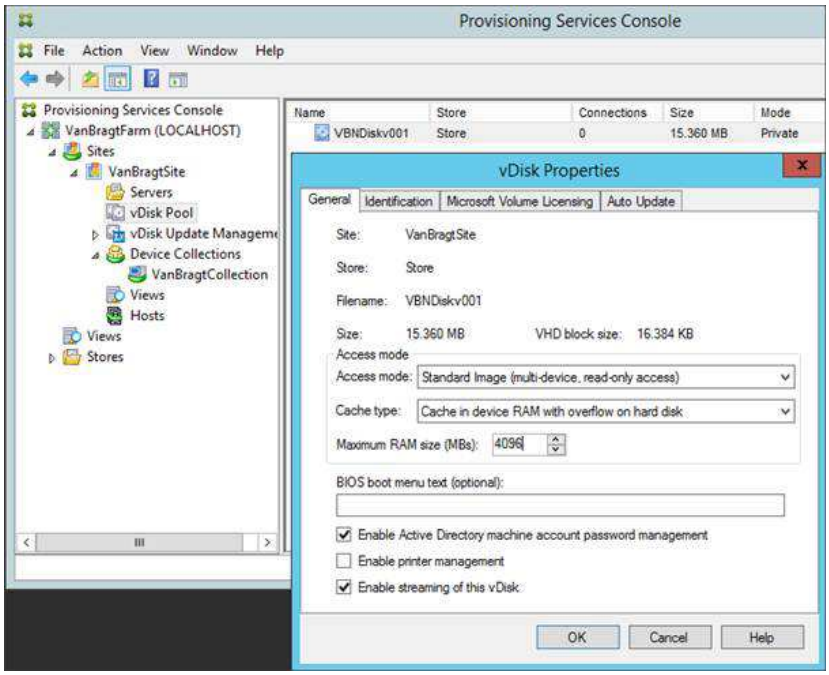

Figure 13: Changing vDisk properties

When the vDisk is reconfigured we can start machines using the vDisk for OS streaming. Therefore the machine needs to be known within the PVS infrastructure. This is done within a Device Collection by selecting New Device.

You need to provide a name (this will be the name of the computer when booted) and the MAC address. For now configure Type: Production and Boot From: vDisk. I will discuss the Type later in this article series. Also you need to assign the vDisk to the device within the vDisk tab.

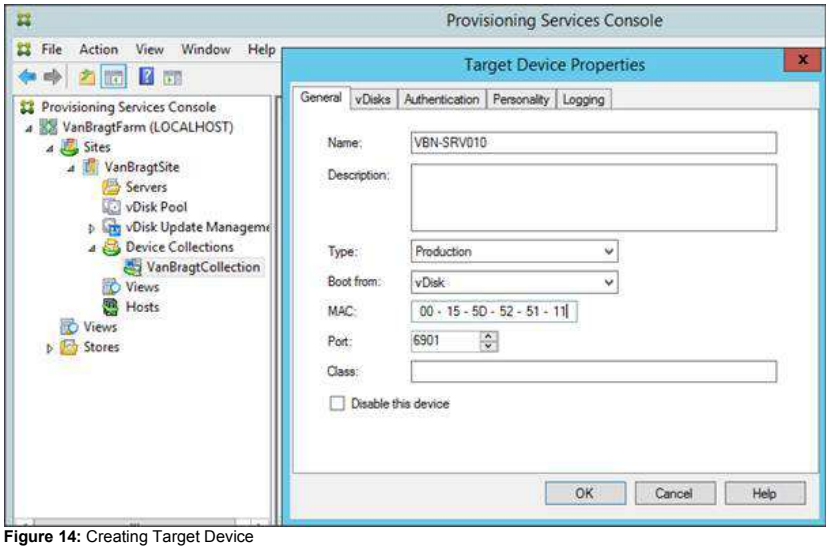

Figure 14: Creating Target Device

When the Target Device is created, we need to do one more step and that is creating the machine account in AD (so the machine is able to use the domain). Select the Target Device, right click the mouse button and select the option Active Directory – Create Machine Account.

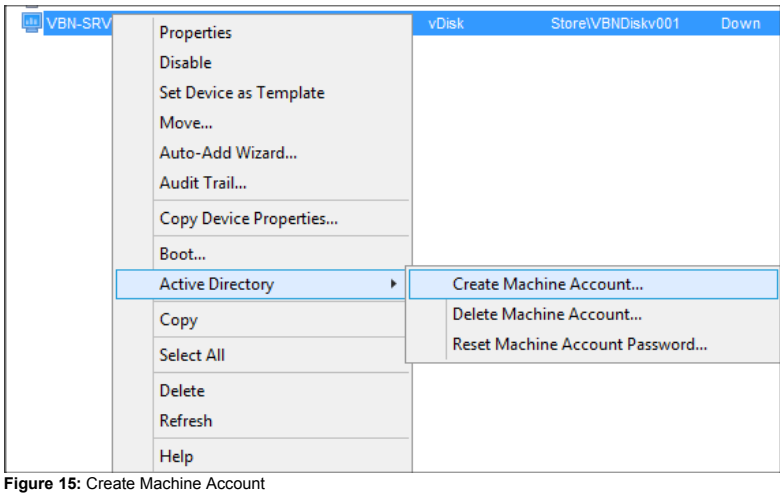

Figure 15: Create Machine Account

In the next screen you can specify in which OU the account should be placed and the machine account will actually be created. This is executed under the account which is logged into the console, so be sure that the account has the required privileges to create machine accounts.

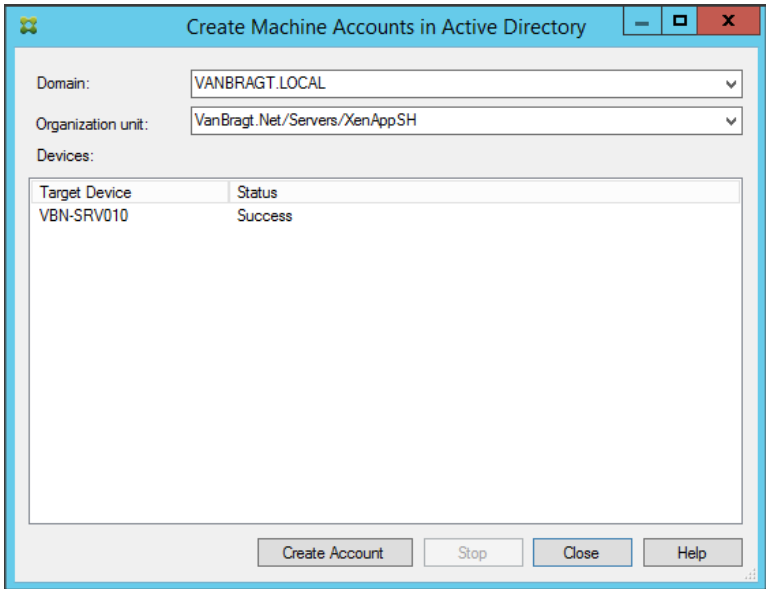

Figure 16: Create Machine Account

Now we are ready to start the machine, connect to the PVS infrastructure (via PXE or BDM) and the operating system is streamed to the device. The boot process will look like a normal machine and you can log in with a domain account. The machine will show in the properties the name provided within the PVS console joined in the domain. Now we have a machine running on the vDisk provided by the PVS infrastructure. From now you can add more target devices and boot those from the same vDisk.

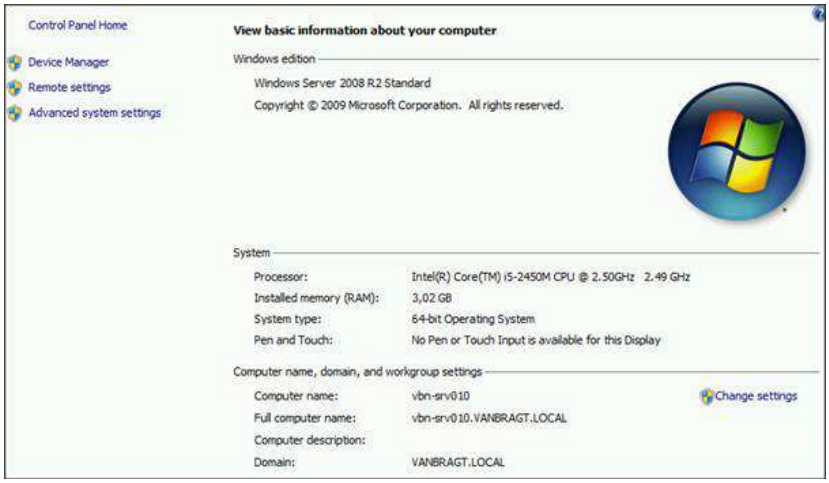

Figure 17: Machine started using a vDisk

Summary

In this article we created a vDisk using a Master Target Device. After creating the vDisk we configured the disk in the standard mode. Next we created a Target Device and added that one to the Active Directory. As the last step we booted the Target Device and streamed the OS to this machine. In the upcoming and last article I will discuss some advanced configurations and the vDisk update possibilities.

If you would like to be notified when Wilco van Bragt releases the next part in this article series please sign up to our VirtualizationAdmin.com Real-Time Article Update newsletter (http://www.virtualizationadmin.com/newsletters/).

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)

See Also

- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)
- OS Virtualization in Practice (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/os-virtualization-practice-part2.html)
- OS Virtualization in Practice (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/os-virtualization-practice-part1.html)
- Mounting VHD Files with DiskPart (http://www.virtualizationadmin.com/kbase/VirtualizationTips/ServerVirtualization/MicrosoftHyper-VR2Tips/Management/MountingVHDFileswithDiskPart.html)
- User Profile Disks in Windows Server 2012 RDS (http://www.virtualizationadmin.com/blogs/conger/news/user-profile-disks-in-windows-server-2012-rds-732.html)
- Using DiskPart to Manage VHD Files (http://www.virtualizationadmin.com/kbase/VirtualizationTips/GeneralVirtualizationTips/ServerVirtualizationTips/ManagementAdministration/UsingDiskParttoManageVHDFiles.html)
- Citrix Presentation Server and Ardence OS Streaming (http://www.virtualizationadmin.com/blogs/conger/news/citrix-presentation-server-and-ardence-os-streaming-128.html)
- Installing and Configuring Citrix XenApp XenDesktop 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part3.html)

The Author — Wilco van Bragt

After working for a couple of consulting firms as a senior technical consultant and technical project leader Wilco started his own freelance company VanBragt.Net Consultancy in April 2008. Wilco is certified n Citrix (CCIA, CCEE/CCEA, CCA), Microsoft (MCITP, MCTS, MSCE, MSCA) and Prince2 (Foundation). Wilco is also a RSVP (RES Software Valued Professional), Citrix CTP (Citrix Technology Professional) and a Microsoft MVP (Most Valuable Professional) on RDS.

Latest Contributions

- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 2) - Citrix StoreFront/Web Interface and XML Broker (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part2.html) **on 24 Sept. 2015 (2015-09-24 11:28)**
- Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 1) (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part1.html) **on 10 Sept. 2015 (2015-09-10 11:51)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html) **on 2 Sept. 2015 (2015-09-02 11:57)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html) **on 13 Aug. 2015 (2015-08-13 12:59)**
- Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html) **on 5 Aug. 2015 (2015-08-05 11:52)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 4)

by Wilco van Bragt [Published on **2 Sept. 2015** / Last Updated on **2 Sept. 2015**]

In this last article of our series I will discuss some advanced configurations and the vDisk update possibilities.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)

Introduction

In the previous articles I described the installation and configuration of the Citrix Provisioning Services back-end servers. After that we created a vDisk via the Master Target Device. After the creation we added a Target Device, which got his operating system via OS streaming by Citrix Provisioning Services. In this article I will go one step further to discuss some advanced configuration options including the update possibilities of the vDisk.

Advanced Load Balancing

As described in one of the earlier articles, Citrix Provisioning Services (PVS) has built-in load balancing. By default PVS load balances the Target Devices between all available PVS servers within the PVS Site. So step one of advanced load balancing is to set-up several sites and add specific PVS servers per site. However the same result can be achieved configuring the standard Load Balancing with some additional configuration. When selecting the Load Balancing option within the right mouse button menu on a vDisk you can configure some the load balancing algorithm.

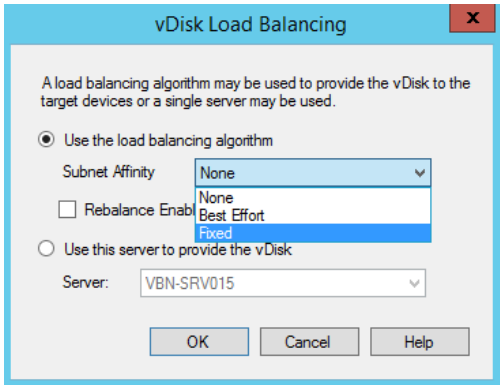

Figure 1: Load Balancing algorithm

Within the load balancing algorithm there is a subnet affinity option. By default this is configured with the option “None”. With this setting all PVS servers within the site can offer the streaming service to the Target Devices. Besides “None” there are two other settings available: Best Effort and Fixed. When Best Effort is chosen, the load balancing first checks the IP subnet of the Target Device and determines if one or more PVS servers are available within the same IP subnet. If that is the case the Target Devices are redirected to a server within the same IP range with the least load. If no server is available within the same subnet an arbitrarily available PVS server is chosen (with the least load). Logically you need to have a set-up where both the PVS Target Devices as well as the PVS Servers (which should be the primary contact point for that VLAN) should be located in the same IP range (VLAN). The second

option is Fixed, which almost works the same as Best Effort for the first phase. With Fixed the load balancing first checks the IP subnet of the Target Device and determines if one or more PVS servers are available within the same IP subnet. If that is the case the Target Devices is redirected to a server within the same IP range with the least load. If no server is available, the Target Device will not connect to the PVS infrastructure. This is similar to using several PVS sites.

Rebalance

At the same configuration part as the Load Balancing you can also configure (per vDisk) automatic rebalance. With rebalance enabled the PVS infrastructure checks every five minutes if the Target Devices are proportionally divided between the available PVS servers.

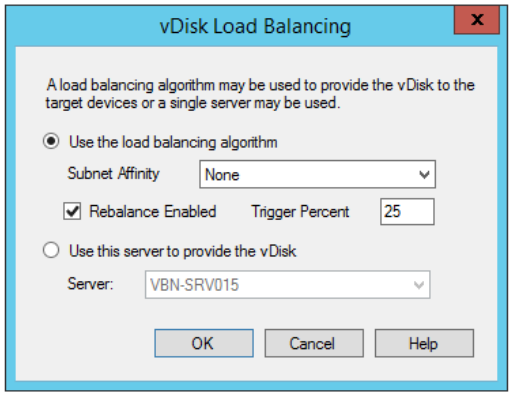

Figure 2: Rebalance Enabled

If the spread is higher than the percentage configured the PVS infrastructure a rebalance will be triggered to distribute the load equally again.

Using the automated rebalance has both advantages and disadvantages. Advantage is that the system administrator don't have to take care of the load balancing at all. However there are situations that is probably not a good idea that a server with almost no load will service target devices again. Probably the server has issues and it's not a good idea that the server will serve target devices again.

Delegation of Control

Within PVS, delegation of control can be configured. Separation in the available rights can be configured at farm, site and device collection level. At Device Collection there are two roles available: Device Operator and Device Administrator. Configuring the delegation of control is a bit different than in other products. First you need to add the persons and/or groups within the product via the Groups tab within the Farm properties.

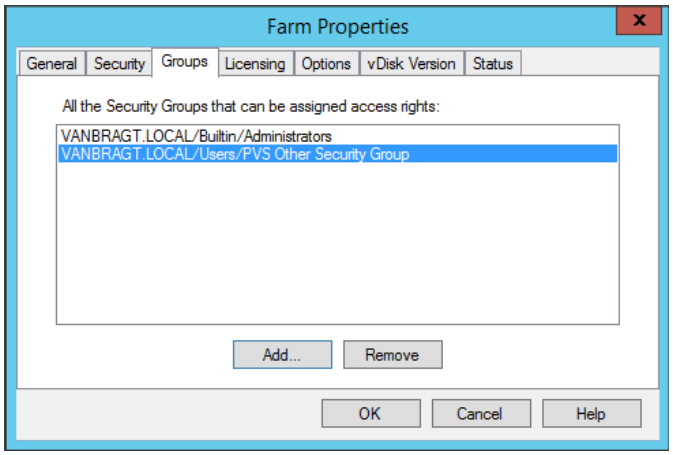

Figure 3: Adding groups to PVS for adding delegation of control.

The persons/group added there can be selected at the Security tabs at the different levels.

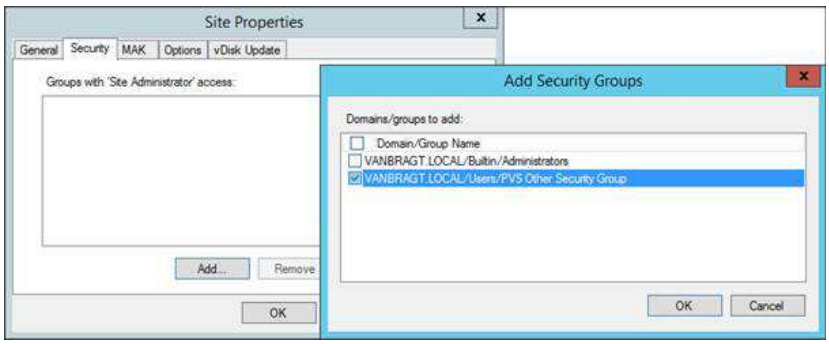

Figure 4: Configure Delegation of Control

Auditing

One other strong point of PVS is the auditing feature. With the auditing feature enabled (configurable via the Farm properties). The real strong point of this auditing option is that the changes are shown at each level within the console. For example when choosing the auditing of one PVS server only the changes of that specific server are shown. However PVS goes one step further, by choosing the button changes, you can exactly see which settings are changed including the previous and current value.

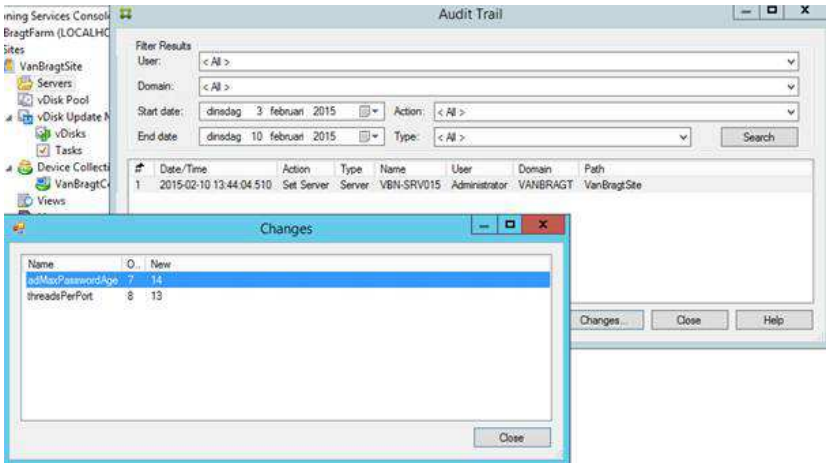

Figure 5: Auditing options

Auto Add

One other nice feature within PVS is the Auto Add feature. With this auto add feature new devices are automatically added to the PVS infrastructure when the device connects to one of the PVS servers. Based on the Device Collection properties the target device is automatically created and configuration is copied from a template target device.

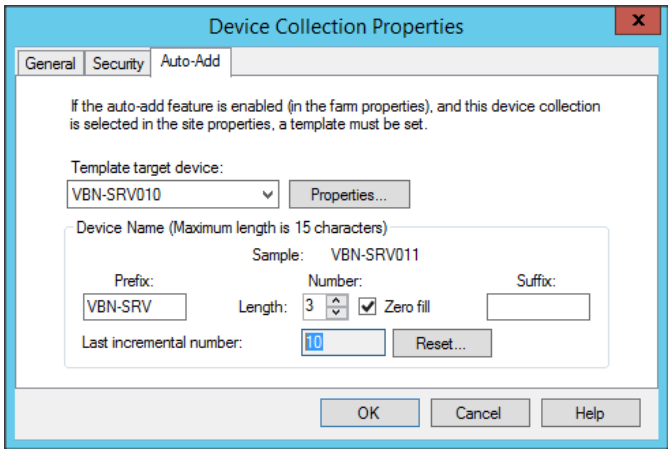

Figure 6: Auto Add configuration at Device Collection level

Remember that the configuration for auto add is available on three levels. On Farm level you enable Auto add and configure which site should be used, on site level you specific which device collection should be used and lastly on the device collection level you specify the template and naming convention.

Also be careful with enabling the auto-add feature especially when using PXE. Every device that connects via PXE with the PVS server is automatically added and I can imagine that is not desirable.

vDisk update

Last but not definitely least is the vDisk update options. In previous version (before version 6.x) the update mechanism was pretty complicated, rebuilding a new vDisk and then configuring the vDisk exactly the same. Updating via a new vDisk is still one of the possibilities however within PVS there is now a version functionality available. Within the vDisk, right-mouse menu there is an option called version.

Within this option you can create a new version. This version is automatically set in in maintenance mode. Within this mode you can make changes to the vDisk for example adding a new installation, installing security updates, remove an application or installing application updates.

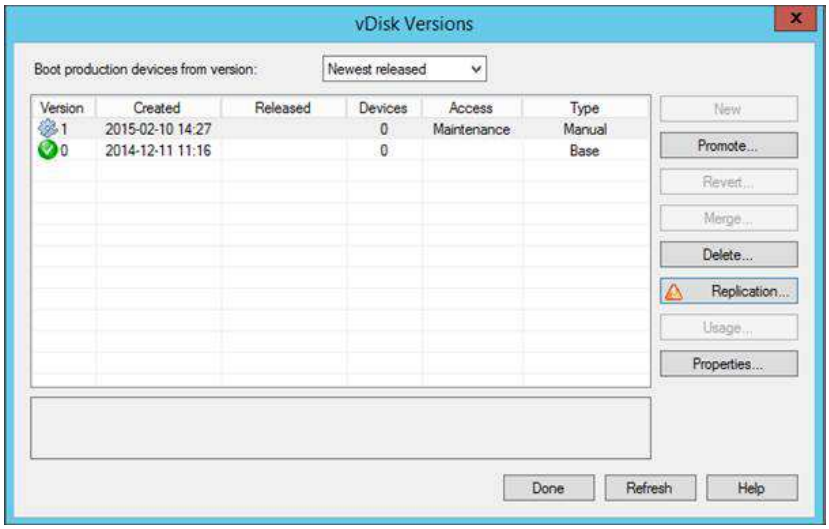

Figure 7: vDisk versions

This is accomplished by starting one of the target devices connected to this maintenance vDisk version. Therefore the Target Device should be set as Type Maintenance. The target device with type maintenance will have a boot menu where the maintenance version can be chosen. When the Target Device is booted, the changes can be made and the Target Device can be shut down (remember that some of the preparations should be done again, like creating unique registry keys for supporting applications).

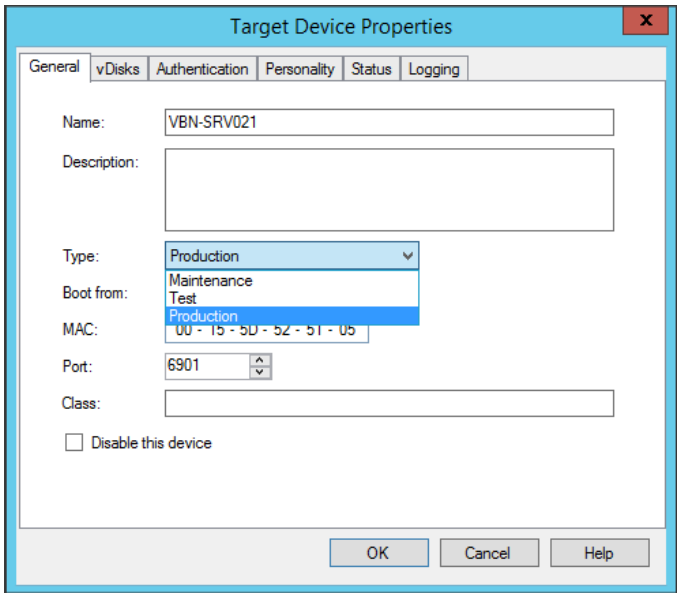

Figure 8: Type Target Device

After the shutdown the vDisk version can be changed to test. In this state the vDisk is again read only (after a reboot changes made are gone). Next step is to configure a Target Device as type Test and start this Target Device from the test version. On the target device you can confirm/test that all changes made in the maintenance version are available and working correctly.

If no issues were found in the test phase, we can promote the version to the state production. You can specify that this change is effective immediately or at the configured date. Luckily the active devices are not rebooted directly, but when they are restarted they will use the new version. In this way you can easily make changes to the production. Also one advantage is that in the case something is wrong in this version, you can easily roll-back. In that case we will revert the version to a previous state (test or maintenance) and the old version is active/production again. However active Target Devices using the version that is reverted will be shut down. This can cause down time and should be considered thoroughly including communication to the active users.

Those steps can be automated using vDisk Update Management. First your Target Devices need to be virtual machine running on Citrix XenServer, VMware ESX or Hyper-V, secondly for configuring the updates you need to have WSUS, SCCM or self-written scripts. When this is set-up, task will autorun using the versions. However the default time is pretty short (30 minutes) and you cannot test it accurately in advance. Therefore I don't see this option really used in production environment. To be fully in control use the manual version steps (which can be automated using PVS PowerShell cmdlets as well).

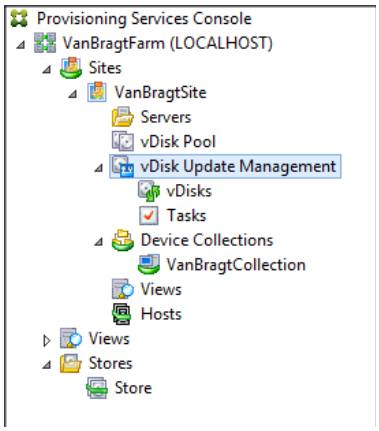

Figure 9: vDisk Update Management

Conclusion

In this fourth and last part of the article series about Citrix Provisioning Services I discussed some advanced configuration options like Load Balancing, delegation of control, auto add, rebalance and auditing. Last topic was describing the basic steps of updating the vDisk using the versions functionality.

If you would like to read the other parts in this article series please go to:

- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)*
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 2)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)
- *Installing and Configuring Citrix Provisioning Services 7.6 (Part 3)* (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)

See Also

Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html)

Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html)

Installing and Configuring Citrix Provisioning Services 7.6 (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part1.html)

OS Virtualization in Practice (Part 2) (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/os-virtualization-practice-part2.html)

OS Virtualization in Practice (Part 1) (http://www.virtualizationadmin.com/articles-tutorials/general-virtualization-articles/os-virtualization-practice-part1.html)

Installing and Configuring Citrix XenApp XenDesktop 7.6 (Part 3) (http://www.virtualizationadmin.com/articles-tutorials/citrix-articles/installing-and-configuring-citrix-xenapp-xendesktop-76-part3.html)

Xen 4.0 Roadmap Taking Shape (http://www.virtualizationadmin.com/blogs/conger/news/xen-40-roadmap-taking-shape-368.html)

Whitepaper: HP Reference Architecture for XenDekstop on VMware vSphere 5 (http://www.virtualizationadmin.com/blogs/conger/news/whitepaper-hp-reference-architecture-for-xendekstop-on-vmware-vsphere-5-716.html)

Free Tool: XenDesktop VDI Calculator (http://www.virtualizationadmin.com/blogs/conger/news/free-tool-xendesktop-vdi-calculator-633.html)

Mounting VHD Files with DiskPart (http://www.virtualizationadmin.com/kbase/VirtualizationTips/ServerVirtualization/MicrosoftHyper-VR2Tips/Management/MountingVHDFileswithDiskPart.html)

The Author — Wilco van Bragt

After working for a couple of consulting firms as a senior technical consultant and technical project leader Wilco started his own freelance company VanBragt.Net Consultancy in April 2008. Wilco is certified n Citrix (CCIA, CCEE/CCEA, CCA), Microsoft (MCITP, MCTS, MSCE, MSCA) and Prince2 (Foundation). Wilco is also a RSVP (RES Software Valued Professional), Citrix CTP (Citrix Technology Professional) and a Microsoft MVP (Most Valuable Professional) on RDS.

Latest Contributions

Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 2) - Citrix StoreFront/Web Interface and XML Broker (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part2.html) **on 24 Sept. 2015 (2015-09-24 11:28)**

Free Fault Tolerant Load Balancing using Citrix NetScaler Express (Part 1) (/articles-tutorials/citrix-articles/free-fault-tolerant-load-balancing-using-citrix-netscaler-express-part1.html) **on 10 Sept. 2015 (2015-09-10 11:51)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 4) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part4.html) **on 2 Sept. 2015 (2015-09-02 11:57)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 3) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part3.html) **on 13 Aug. 2015 (2015-08-13 12:59)**

Installing and Configuring Citrix Provisioning Services 7.6 (Part 2) (/articles-tutorials/citrix-articles/installing-and-configuring-citrix-provisioning-services-76-part2.html) **on 5 Aug. 2015 (2015-08-05 11:52)**