

Dell™ Flexible Computing Solutions: Deploying On-Demand Desktop Streaming

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Introduction

The Dell™ Flexible Computing Solution for On-Demand Desktop Streaming is based on the Citrix® Provisioning Server for Desktops (formerly Ardenne Software-Streaming Platform). This solution enables streaming the operating system and applications seamlessly to diskless client machines. This document presents the steps required to deploy a Dell Flexible Computing Solution for On-Demand Desktop Streaming using a client image stored on either a standalone server or a highly available configuration of servers and shared by all clients. The steps presented apply to deployment on clients with Dell EasyConnect™ Technology and configured by Dell. EasyConnect™ Technology simplifies deployment and eliminates manual license management requirements. Manual configuration and license management procedures, which may be required under certain circumstances, are described in an appendix. Detailed information about additional features and options for deploying, configuring, customizing, and managing the solution is contained in the documentation provided with the Citrix software and is not within the scope of this document.

Overview

NOTE: Citrix® Systems, Inc. recently acquired Ardenne Inc. and is integrating operations and software into the Citrix model. The Ardenne Software-Streaming Platform version used in this Dell Flexible Computing Solution will become Citrix Provisioning Server for Desktops. In this document, general references are made to Citrix and the Citrix software, while specific references to interface components also include the Ardenne name when it is present in the currently supported version of the software.

Dell Flexible Computing Solutions based on Citrix Provisioning Server for Desktops include either a standalone streaming server or more than one server in a high availability (HA) configuration and a set of client computers. Citrix server software is installed on the streaming server. Client computers boot from the streaming server using well known mechanisms such as Dynamic Host Configuration Protocol (DHCP). The streaming server delivers the client disk image on demand to clients. The client disk image, called a “vDisk,” is prepared from a master client’s hard drive. The master client is configured with the required operating system, drivers, and applications. A vDisk image of the prepared master client’s hard drive is then built and hosted on the streaming server. Client computers are then configured to boot from the streaming server. The basic steps required to deploy the solution are illustrated in Figure 1 below.

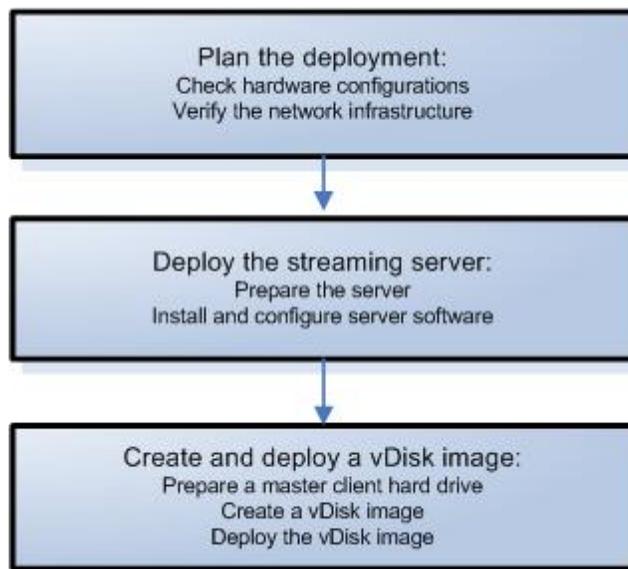


Figure 1: Basic Deployment Steps

Planning the Deployment

Before beginning the deployment, review the contents of this section and ensure that you have the necessary hardware, software, and network configuration information to support your software streaming solution. This section provides the basic requirements for deploying the streaming solution. Contact your Dell sales representative prior to purchase for specific solution and configuration recommendations and additional information.

Detailed infrastructure and network assessment may be required prior to deployment. Your Dell sales representative can work with you on available Dell assessment and deployment services. User data migration may be required from traditional client solutions to the streaming solution. Data migration activities include migrating user settings and user data from local client hard drives. User settings can be migrated through deployment of Active Directory roaming user profiles. User data can be migrated to private network shares or home drives. A thorough assessment of infrastructure and migration requirements is recommended before deploying the streaming solution.

Hardware and Software Requirements

Following are the basic requirements for hardware and software:

Streaming Server: Dell PowerEdge™ 2950

Standalone server configuration: At least one Dual Core Intel® Xeon® 5160 processor, 4 GB of 667-MHz RAM, and at least six 10,000 or 15,000 RPM SAS hard drives, with two drives in a RAID 1 configuration and the remaining drives in a RAID 10 configuration. Dell recommends no more than 100 users per server.

HA configuration: Minimum of two identically configured servers with at least one Dual Core Intel® Xeon® 5160 processor, 4 GB of 667-MHz RAM, and at least two 10,000 or 15,000 RPM SAS hard drives in a RAID 1 configuration (see “Storage Sizing Guidelines”). Dell recommends that the number of servers allow failure of one server with no more than 100 users per remaining server.

NAS Server (HA Configurations Only): Dell PowerEdge™ 2900

At least six 10,000 or 15,000 RPM SAS or 7200 RPM SATA hard drives, with two drives in a RAID 1 configuration and the remaining drives in a RAID 10 configuration (see “Storage Sizing Guidelines”). Up to 10 hard drives are supported, with two drives in an optional Flex Bay. Dell recommends no more than 200 users per NAS server.

Server Operating System: Microsoft® Windows Server® 2003 R2 Standard or Enterprise Edition (32-bit) for streaming servers and Windows Storage Server 2003, x64 Standard or Enterprise Edition for NAS servers.

Clients: Dell OptiPlex™ 755 or Dell OptiPlex 755 FLX (diskless)

For the ideal experience with multiple or memory-intensive client applications, Dell recommends 2 GB of RAM to reduce the likelihood of memory swapping across the network.

Client Operating System: Microsoft® Windows® XP Professional (32-bit or 64-bit) with SP2, Windows Vista® Business (32-bit or 64-bit), or Windows Vista® Ultimate (32-bit)

Streaming Software: Ardenne Software-Streaming Platform (Citrix Provisioning Server for Desktops), version 4.1 SP2(DELL)

Licenses: Through EasyConnect™ Technology, the Dell clients are licensed for On-Demand Desktop Streaming. Importing and installing licenses from Citrix are not required.

NOTE: A hard drive must initially be installed in at least one client computer to create the master client vDisk image. The hard drive may be removed if desired after the vDisk image has been created.

Storage Sizing Guidelines

For standalone server deployments, six hard drives are required, regardless of the number of users. Two of these drives, in a RAID 1 configuration, are used for the server operating system, the Citrix applications and database, and the vDisk client images. The other four drives, in a RAID 10 configuration, are for user scratch space.

For HA deployments, only two hard drives are required for each streaming server. Configured for RAID 1, these drives contain the server operating system and the Citrix software. The NAS server must have from six to ten drives; two drives in a RAID 1 configuration contain the storage server operating system, and the remaining drives, in a RAID 10 configuration, contain the Citrix database, vDisk images, and user scratch space.

In determining the hard drive storage capacity required, factors to be considered include the following:

- Number of client operating system versions supported
- Number of client operating system languages in use
- Number of different client images needed for each operating system
- Largest client image size, including operating system and all applications
- Scratch space required for each user
- Number of clients supported by the streaming server (standalone configuration) or NAS server (HA configuration)
- Space required for the server operating system
- Number of image versions to be maintained for version control. It is recommended that space be adequate at least for the current and previous images, as well as for creating the next image to be deployed.

Space required for the server operating system, for all client images, and for total user scratch space determines the minimum storage capacity for the standalone server or HA deployment. Scaling considerations are also important, however, to allow for potential future growth.

Downloading the Installation Files

The client computers included with the On-Demand Desktop Streaming solution are licensed and configured for ease of deployment with either a standalone server or an HA configuration. Documentation included with the servers and clients provides information about downloading the Citrix software and documentation.

The following sections describe the steps required to deploy the solution in the most efficient manner. Other deployment methods are also possible and may be appropriate in certain settings or to add additional clients to your network. The Appendix provides information about configuring individual client BIOS settings for PXE boot, importing Citrix licenses, and manually adding clients. See the Citrix documentation for detailed information about additional features and options.

Client BIOS Settings

The client computers, featuring EasyConnect™ technology, are configured by Dell for the On-Demand Desktop Streaming solution. The clients are ready to deploy after the procedures in this document have been completed for deployment of the servers and creation of a vDisk image. The following BIOS settings are already established and should not be changed for deployments following the recommended process described in this document.

- Under **System** options, **Boot Sequence** is set to **Onboard Network Controller** first.
- Under **Onboard Devices** options, **Integrated NIC** is set to **On w/ImageServer**.
- Under **ImageServer** options, **Lookup Method** is set to **DNS**.

The **ImageServer** options are used only if **Integrated NIC** is set to **On w/ImageServer**. The default **Lookup Method** is **DNS**, which simplifies deployments and is assumed in the following deployment steps. The other available setting for **Lookup Method** is **Static IP**. The other two **ImageServer** options are used only when **Static IP** is selected. **ImageServer IP** (default **255.255.255.255**) is used to specify the primary static IP address with which the clients communicate. **ImageServer Port** (default **06910**) is the primary IP port of the server with which clients communicate. **License Status** indicates that the license is **Enabled** for On-Demand Desktop Streaming solution clients.

Verifying Infrastructure Requirements

Before beginning the Dell On-Demand Desktop Streaming deployment, verify that the network infrastructure is properly set up to support the software streaming solution. The services include:

- DHCP
- DNS
- Domain Controller (Active Directory)

Spanning tree mode should be enabled on network switches to resolve loops for multi-port uplink switch configurations. Enabling spanning tree port fast mode will improve performance. Note that the switch with port fast enabled must be rebooted first if you ever add additional multi-port linked Ethernet switches to the switch configured with this mode. Switches and clients should be configured with the default autonegotiate setting; *do not* hard code speed and duplex settings except for network troubleshooting.

The remainder of this section provides a high level guide to network setup under Windows Server 2003, using example values, to promote a server to a Domain Controller with DNS and DHCP. You will need appropriate static IP addresses for the DNS server and, later, for the

streaming servers. If the required network infrastructure is already in place, then you can skip the remainder of this section. For a new network configuration, continue with the following steps, changing the example values used in this section to names or IP addresses appropriate for your environment.

The first step is configuration of DHCP services. If this server is located in an existing production network, the DHCP server could distribute addresses that are incompatible with that network and cause issues. It is recommended that this procedure be performed on an isolated network.

Assign a static IP address by performing the following steps:

1. Right-click **My Network Places** and select **Properties**.
2. Right-click the network adapter and select **Properties**.
3. Click **Internet Protocol (TCP/IP)** and click **Properties**.
4. Click **Use the following IP address** and enter the address for your DHCP server. For example:

IP address:	10.10.10.2
Subnet mask:	255.255.255.0
Default gateway:	10.10.10.1
Preferred DNS server:	10.10.10.2
5. Click **OK** twice.

To begin DHCP configuration, navigate to the **Manage your Server** window from **Administrative Tools** and perform the following steps:

1. Click **Add or remove a role**.
2. Choose **Custom Configuration**.
3. Choose server role **DHCP server**.
4. At **New Scope Wizard** enter a name (for example, `FlexClient`).

NOTE: If you have only one server, which will be used both as the DNS server and as the On-Demand Desktop Streaming server, you should name it `imageserver1`. This streaming server host name is required for the simplified deployment, using EasyConnect™ technology, as described in this document. In the next section, see “Preparing the Server,” Standalone Server RAID and Operating System Configuration,” and “Operating System Installation,” to ensure that your server is properly configured for its additional use as the streaming server.

5. Enter the Start IP Address and End IP Address (for example, `10 . 10 . 10 . 100` and `10 . 10 . 10 . 254`).
6. Set the Subnet Mask (for example, `255 . 255 . 255 . 0`).
7. Continue past **Exclusions**.
8. Set **Lease Duration** to appropriate value (default in this example).
9. Set **Router** to the default Gateway address (for example, `10 . 10 . 10 . 1`) then click **Add**.
10. Enter the **Parent Domain** (for example, `FlexClient . com`) and enter the IP address for the DNS server (for example, `10 . 10 . 10 . 2`).

11. Continue past **WINS** setup.
12. Click **Next** to activate scope.
13. Click **Finish**.

Next, configure the Domain Controller and DNS by performing the following steps:

1. Click **Add or remove a role**.
2. Choose server role **Domain Controller (Active Directory)**.
3. Choose **Domain Controller for a new domain**.
4. Select **Domain in a new forest**.
5. Enter the **Full DNS name** (FlexClient.com, for example).
6. Click **Next** at **NetBIOS Domain Name, Database and Log folders**, and **Shared System Volume**.
7. Choose **Install and configure the DNS server on this computer**.
8. Select **Permissions compatible only with Windows 2000 or 2003**.
9. Enter a password at **Restore Mode Administrator Password**.
10. Click **Next** and windows will configure your Domain Controller with the selected options. Then click **Restart now**.

Finally, perform the following steps to authorize the DHCP server:

1. Click **Start**→**Administrative Tools**→**DHCP**.
2. Right-click the name (FlexClient, for example) and select **Authorize**.
3. Right-click **Server options** and select **Configure Options**.
4. Choose option 15, **DNS Domain Name**, from the list and enter the domain (FlexClient.com, for example).

The network is now configured.

Deploying the Streaming Server

The first operation in the actual deployment process is to prepare the streaming server for standalone server deployment, or the streaming servers and the storage server for HA deployment. This involves completing appropriate RAID and operating system configuration, connecting the server to the network with a static IP address, and, for a streaming server, installing and configuring the Citrix Provisioning Server software.

Preparing the Server

Unpack the PowerEdge systems included in your solution and set up as described in your server and rack documentation.

Standalone Server RAID and Operating System Configuration

Dell recommends that you configure a two-disk RAID 1 container for the operating system, Citrix applications and vDisks, and configure a four-disk RAID 10 container for client vDisk cache. Enabling write-back cache mode for the SAS RAID controller is also recommended. This enables caching data writes to the disk drives and can improve write I/O performance. Data not yet committed to the disk is backed up via battery on the RAID controller. See your Dell PowerEdge documentation for information about RAID configuration.

High Availability RAID and Operating System Configuration

Dell recommends that you configure a two-disk RAID 1 container for the operating system on both the streaming and NAS servers. The Citrix applications are also contained in the streaming server's RAID 1 container. The remaining four to eight drives on the NAS server should be configured as a RAID 10 container for the Citrix database, vDisks, and user scratch space. Enabling write-back cache mode for the SAS RAID controllers is also recommended. This enables caching data writes to the disk drives and can improve write I/O performance. Data not yet committed to the disk is backed up via battery on the RAID controller. See your Dell PowerEdge documentation for information about RAID configuration.

Operating System Installation

NOTE: The clients included with the On-Demand Desktop Streaming solution are configured to boot to a server named imageserver1. To enable the quickest deployment, a streaming server should therefore be named imageserver1 for initial client boot. If desired, the server can then be renamed after the clients have been updated to boot to the server with the new name. (See "Configuring BIOS Bootstrap.")

If Dell installed the operating system on your PowerEdge server, it is ready for installation of the streaming server software.

If your server does not have an operating system installed, then using the latest version of the *Dell PowerEdge System Build and Update Utility* media for installation ensures that you have the necessary drivers to support Dell On-Demand Desktop Streaming deployment.

NOTE: NIC teaming drivers are not required on the streaming server. The Citrix software automatically load balances across available NICs. If desired, NIC teaming may be used on the NAS server in an HA configuration.

Making the following registry setting assures that the maximum amount of 960 MB of RAM is available for disk caching. Note that on Windows Server® 2003, the maximum supported cache size is 960 MB.

```
KEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\  
Session Manager\MemoryManagement\LargeSystemCache = 1
```

Connect the Server to the Network

Assign a static IP address for each server by performing the following steps:

1. Right-click **My Network Places** and select **Properties**.
2. Right-click the network adapter and select **Properties**.
3. Click **Internet Protocol (TCP/IP)** and click **Properties**.
4. Click **Use the following IP address**, enter the address for your streaming server, and click **OK** twice.
5. Join all servers to the domain.

Installing and Configuring the Streaming Server Software

Installing Citrix Provisioning Server for Desktops

To install Citrix Provisioning Server for Desktops on the streaming server, using the server software installation file previously downloaded (see “Downloading the Installation Files”), perform the following steps:

NOTE: Do not attempt to cancel installation once it has begun. To abort an installation, first complete the installation and then uninstall.

NOTE: Do not attempt to install the Citrix server software from a remote terminal.

1. Double-click the **ArdenceProfessionalServer.exe** file to begin installation.
2. In the Welcome window, click **Next** to begin the installation.
3. Read the License Agreement, click to accept the terms, and click **Next**.
4. Enter user and organization names, select whether all users or only you will have access to the server application, and click **Next**.
5. Click **Next** to accept the default installation path.

NOTE: You must install the Citrix server software on drive C.

6. Select **Complete** installation type and click **Next**.
7. Click **Install** to begin the installation.
8. Click **Continue Anyway** if a warning appears stating that software being installed has not passed Windows Logo testing.

NOTE: If you do not see this warning and the installation appears to be hung, check to see if the warning dialog box is hidden behind the installation window.

9. If the Welcome to the Found New Hardware Wizard appears, select **No, not this time**, and click **Next**.
10. Accept the default **Install the software automatically (Recommended)** and click **Next**.
11. Click **Continue Anyway** when another warning appears stating that software being installed has not passed Windows Logo testing.
12. Click **Finish** in the next two windows.
13. Click **Yes** to restart the system when installation is complete.

Configuring a Standalone Streaming Server

If you are deploying a standalone server configuration, follow the steps in this section. If you are deploying an HA configuration, follow the steps in the next section, "Configuring the Streaming Server for High Availability." When the system restarts, the Configuration Wizard opens automatically. You can also open the Configuration Wizard from the Windows Start menu. Perform the following steps to configure the streaming server:

1. Click **Next** to begin configuration.
2. Select **Custom** and click **Next**.
3. Verify that **The service is running on another device** is selected and click **Next**.
4. Select **The information is provided by a service on another device** and click **Next**.
With EasyConnect™, it is not necessary to use PXE to boot the clients.
5. Accept the default **Ardence Database Location** and click **Next**.
6. Select the available NICs to use for streaming, accept the default port range, and click **Next**.
7. Select the first integrated NIC for the license association and click **Next**.
8. Select **Use the Ardence TFTP Service, Configure the service to manage Ardence licenses**, and **Primary license server** and click **Next**.
9. Click **Next** to accept the **Ardence servers to boot from**.
10. Review the list of changes to be made and click **Finish**.
The services to be configured and restarted are listed. A green circle with a checkmark appears next to each upon successful completion.
11. Click **Done**.

Configuring the Streaming Server for High Availability

NOTE: Before beginning the following steps, ensure that the storage server has been set up and joined to the domain, and create a cache share with administrator read/write privileges.

When the system restarts, the Configuration Wizard opens automatically. You can also open the Configuration Wizard from the Windows Start menu. Perform the following steps to configure each streaming server for HA deployment:

1. Click **Start**→**Administrative Tools**→**Services**, right-click **Ardence Stream Service**, and click **Properties**.
2. On the **Log On** tab, change **Log on as** to **This account** and enter account information for a user with administrator privileges.
3. Click **Next** to begin configuration.
4. Select **Custom** and click **Next**.
5. Verify that **The service is running on another device** is selected and click **Next**.
If the server is properly connected to the network with the DHCP server, this selection should be made automatically.
6. Select **The information is provided by a service on another device** and click **Next**.
With EasyConnect™, it is not necessary to use PXE to boot the clients.
7. Enter the UNC path of the share on the storage server you want to use for the **Ardence Database Location** and click **Next**.
8. Select the available NICs to use for streaming, accept the default port range, and click **Next**.
9. Select the first integrated NIC for the license association and click **Next**.
10. Select **Use the Ardence TFTP Service, Configure the service to manage Ardence licenses**, and **Primary license server** and click **Next**.
11. Add the IP addresses of all streaming servers for **Ardence servers to boot from** and click **Next**.
12. Review the list of changes to be made and click **Finish**.
The services to be configured and restarted are listed. A green circle with a checkmark appears next to each upon successful completion.
13. Click **Done**.

Creating and Deploying a vDisk Image

With the servers deployed, the final operation is to create and deploy a vDisk image, which involves preparing a master hard drive, building a vDisk image from the master hard drive, and deploying the vDisk to the clients. Figure 3 illustrates the steps involved in creating and deploying a vDisk image.

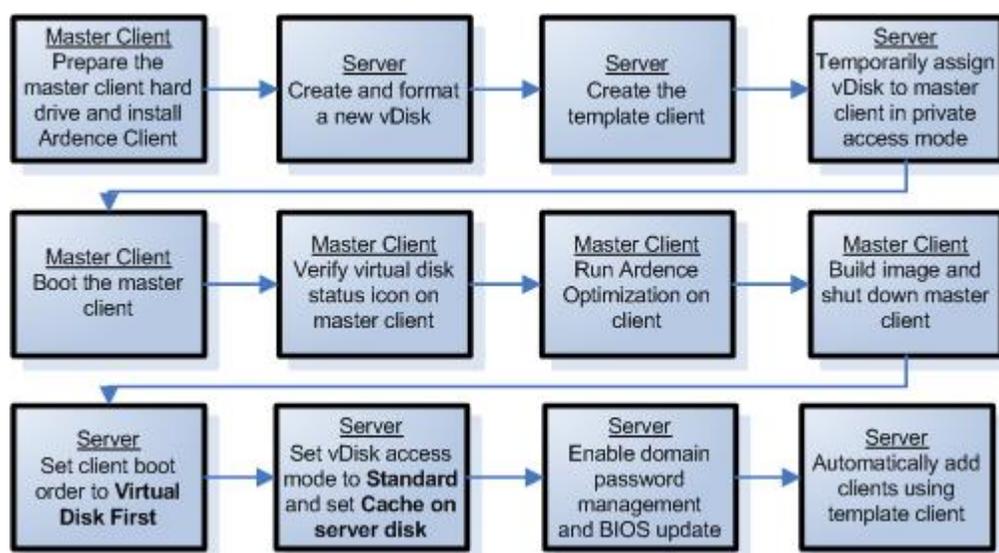


Figure 3: Creating and Deploying a vDisk Image

Preparing the Master Client Hard Drive

The master client must now have its hard drive prepared as desired for client deployment, and the Citrix client software must be installed.

Installing the Operating System and Drivers

The Registry settings, programs, and data for the vDisk that will be created on the streaming server, and which the client computers will use for boot, must first be created on a master client. Therefore, at least one client must initially include a hard drive for vDisk image creation. After the image has been created, the hard drive may be removed if desired. Configure the master hard drive as follows:

NOTE: The client computers are configured by Dell to boot to the network. While installing software on the master client hard drive, each time the computer boots, press <F12> as soon as the blue DELL™ logo appears, then select the appropriate boot device. Alternatively, enter the System Setup program and temporarily change the boot order.

1. Install the Microsoft Windows operating system, using the default NTFS file system.
If you are installing Windows XP and SP2 separately, complete step 2 to update drivers before you install SP2.

2. Download and install the latest drivers from **support.dell.com** or, if available, from the *Drivers and Utilities* CD (Resource CD).
3. Install all required application software and configure the master client as desired for the vDisk image.
It is recommended that you remove unnecessary RUN key applets from the registry and from the notification area (systray), including graphics and sound configuration utilities.

Installing the Citrix Client Software

Place the Citrix client software installation file that you previously downloaded on the master client and perform the following steps:

1. Double-click the **ArdenceProfessionalClient.exe** file to begin installation.
2. In the Welcome window, click **Next** to begin the installation.
3. If InstallShield error 1603 or Windows Logo errors appear, click **OK** or **Continue Anyway**.*

NOTE: If you do not see a message and the installation appears to be hung, check to see if a dialog box is hidden behind the installation window.

4. Read the License Agreement, click to accept the terms, and click **Next**.
5. Enter user and organization names, select whether all users or only the user associated with the computer will have access to the client application, and click **Next**.
If you wish to hide the Citrix Client application from other users who boot to a shared vDisk image, select **Only for me**.
6. Click **Next** to accept the default installation path.
7. Select **Complete** installation type and click **Next**.
8. Click **Install** to begin the installation.
9. Click **Continue Anyway** if warnings appear stating that software being installed has not passed Windows Logo testing.*
10. If the **Welcome to the Found New Hardware Wizard** appears, select **No, not this time**, and click **Next**.
11. Accept the default **Install the software automatically (Recommended)** and click **Next**.
12. Click **Continue Anyway** if another warning appears stating that software being installed has not passed Windows Logo testing.*
13. Click **Finish** in the next two windows.
14. Click **Yes** to restart the system when installation is complete.

Creating the vDisk Image

Creating a vDisk Image involves creating and formatting a vDisk on the streaming server, optimizing the client configuration for software streaming, and then building the client image on the vDisk.

* Such messages may be ignored, allowing the installation to continue. They are normally expected only when installing on a client with a Windows XP operating system.

On the streaming server, start the Ardence Administrator and verify that the **Ardence Stream Service** is running. To start the service if it is not running, right-click the server in the Administrator window and select **Start service**.

Creating and Formatting the vDisk

1. From the Ardence Administrator main window, right-click the server icon and select **New Virtual Disk**.
2. On the **Select New Disk Type** screen, select the first option to create a new virtual disk file and click **OK**.
3. Select **Create a new disk**, and enter the directory location, name, size, and description of the new disk.

NOTE: For a standalone server configuration, a local drive designation is used for the directory location. For an HA configuration, the UNC path of the storage server file share must be used; do not use a mapped network drive.

NOTE: If the vDisk name is the same as the client computer model (e.g., Optiplex 755), then the new disk becomes the default vDisk for that computer model.

NOTE: The size of the disk is fixed, so be sure to allow enough space for expected client needs. If you later need to increase the disk size, you must delete the disk and then recreate it.

4. Click **OK** to create the vDisk.
5. After the vDisk creation is complete, from the Ardence Administrator main window, select the vDisk and click **Tools→Map Virtual Disk**.
The vDisk is added as a removable disk in Windows Explorer, and in the Ardence Administrator window, the vDisk icon turns bright green. If there is more than one removable disk in Windows Explorer, check the size to verify which is the vDisk.
6. In Windows Explorer, right-click the icon for the vDisk, select **Format**, and format the vDisk using the default NTFS file system.
7. From the Ardence Administrator main window, right-click the vDisk icon and select **Unmap Virtual Disk**.
The vDisk is removed from Windows Explorer, and in the Ardence Administrator window, the vDisk icon color indicates that it is unmapped.
8. For an HA configuration, perform the following steps for each of the other streaming servers:
 - a. Right-click the server icon and select **Scan for virtual disks**.
 - b. Enter the UNC path of the NAS server file share in the dialog and click **Scan**.
 - c. Select the vDisk created on the first server and click **OK**.

Creating the Client Template

NOTE: Dell recommends that you add clients automatically. For information about adding clients manually, see “Adding Clients Manually” in the Appendix.

Create a template for adding client computers to your network by performing the following steps:

NOTE: Before you attempt to deploy a new vDisk image to your full network, it is recommended that you test the image on one client besides the master client.

1. From the Ardence Administrator main window, right-click the **Clients** icon and select **New Client**.
2. On the **General** tab of the **New Client** window, enter the name (14 characters or less) of the client computer model (e.g., Optiplex 755) and all zeros for the MAC address, and then check **Set as the template client**.

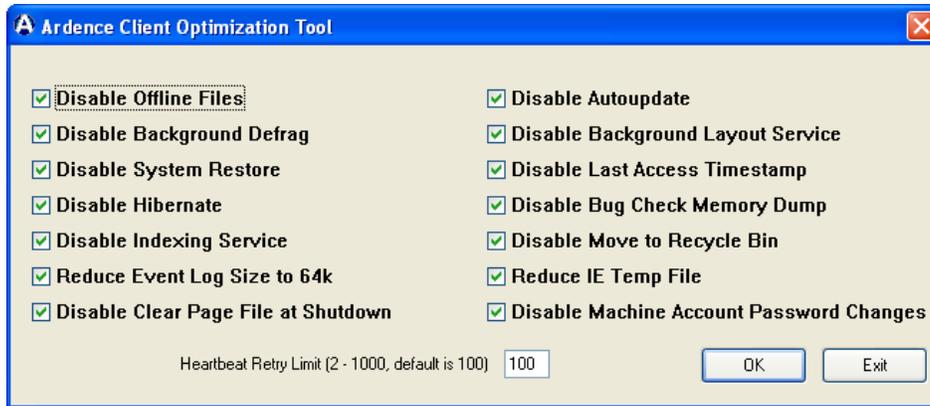
NOTE: The Citrix software currently supports only client computer names of 14 characters or less.

NOTE: If the vDisk that you previously created has the same name as the template (e.g., Optiplex 755), the disk will automatically associate with clients.

3. For standalone server configurations, on the **Disks** tab, verify that **Boot order** is set to **Hard Disk First** and leave the **Disks** tab blank.
If you do not want to use the default disk association, click **Change** on the **Disks** tab, and then select the vDisk that you previously created, click **Add**, and click **OK**.
4. For an HA configuration, perform the following steps:
 - a. Click **Change** on the **Disks** tab.
 - b. Select the vDisk that you previously created *on each server*.
 - c. Click **Add** and click **OK**.
 - d. Verify that **Boot order** is set to **Hard Disk First**.
5. Click **OK** to create the new client template.
6. From the Ardence Administrator main window, right-click each server icon, select **Properties**, and on the **General** tab enable **Automatically add new client using the client template** and deselect **Automatically add new client using BIOS prompts**.

Creating and Configuring the vDisk Image

1. From the Ardence Administrator main window, right-click the vDisk icon, select **Properties**, and verify on the **Disk Mode** tab that the private access mode is set.
2. Boot the master client computer.
3. Verify that the virtual disk status icon  appears in the master client notification area (system tray) and does not have a red X superimposed. Double-click the icon and verify that the status is **Active**.
4. From the Windows Start menu Ardence program group, start the Client Image Builder.
5. Click **Optimize** to run the Ardence Optimizer utility before creating the image.
You can also run the Optimizer from the Ardence program group on the Windows Start menu. The available options differ between Windows XP and Windows Vista and should all be selected for either operating system.



6. When optimization is complete, in the **Client Image Builder** window, set **Destination Drive** to the location of the virtual drive on the computer, select **Delete all files and folders in destination path before building image**, and click **Build**. Click **Yes** to confirm the build.
7. When the build process is complete and the message The Ardence Client image build is complete appears, click **OK** and then **Close**.
8. Shut down the master client computer.
You can now remove the master client hard drive if desired. Changes to the vDisk image can be made without a client hard drive, but creating a new image requires that a hard drive be installed.
9. From the Ardence Administrator main window, double-click the template client and the master client icons and, on the **Disks** tab, set the **Boot order** to **Virtual Disk First**, and set **Boot behavior** to **IO Server Least Busy**.
If the master client icon does not appear, press <F5> to refresh the display.
10. Right-click the vDisk icon, select **Properties**, and on the **Disk Mode** tab, set the access mode to **Standard Image** and the **Cache Type** to **Cache on server disk**, and then click **OK**.

If there is more than one type of computer within the same model (such as form factor variations, DVD writers, CPU models, or video card upgrades) to be added to the deployment, it is recommended that one client of each type be booted in private image mode, allowing time for all operating system start activities to complete. This permits drivers for all target hardware to be installed and operational immediately after client boot from the vDisk.

NOTE: For HA configurations, if you later add a new vDisk, ensure that the vDisk is assigned to each streaming server and the vDisk on each server is assigned to all clients sharing the vDisk. If you add a new client to the network, ensure that the vDisk on each server is assigned to the new client.

Deploying the vDisk Image

All clients that will use the vDisk image must now be added in the Citrix software, domain password management must be enabled, and the clients can then boot to the vDisk image.

Enabling Domain Password Management

Because the clients will belong to an Active Directory domain and share the same vDisk, you must perform the following steps to enable password management for Active Directory domains:

1. From the Ardence Administrator main window, right-click the vDisk icon, and click **Properties**.
2. On the **Options** tab, select **Enable Active Directory Machine Account Password Management**, for an HA configuration select **Enable the Ardence High Availability Option**, and click **OK**.
3. Perform one of the following steps to add clients to the Active Directory:
 - a. For each client that you assigned to the vDisk, from the streaming server **Program Files\Ardence\Ardence** directory, run the following command:
`SetComputerAccount.exe /c <computer name>`
 - b. Select the desired clients in the Ardence Administrator, right click, and select **Add client to domain**.
In the window that appears, leave options blank to accept default domain settings and click **OK** to add clients to the domain.
4. On the DNS server, disable automatic password renegotiation by enabling the group policy **Domain member: Disable machine account password changes**.

Configuring BIOS Bootstrap

For standalone server deployments, no further changes are required and the clients are ready to boot. The following steps are required for HA deployments and may be used for a standalone configuration if you wish to change either the client IP configuration or the streaming server name.

1. From the Ardence Administrator main window, click **Tools**→**Configure BIOS Bootstrap**.
2. Select **Automatically update the BIOS on the client computers with these settings** and click **OK** to confirm.
3. If required, make changes to the **Client IP Configuration** settings.
4. For a standalone server configuration, if you wish to change the name of the streaming server, select **Use DNS to find the Streaming Server** and enter the new **Host name**.
After the clients boot, shut them down; then change the name on the server and boot the clients again.
5. For an HA configuration, select **Manually enter the Streaming Server data**, click **Edit**, and enter the IP addresses of the streaming servers.
No other changes are required to the **Configure BIOS Bootstrap** settings.
6. Click **OK** and click **Yes** to confirm that the settings should be applied to clients when they next boot.

Changes made to settings through the Configure BIOS Bootstrap window are pushed to clients when they boot, and the new settings are then used on the next subsequent client boot.

Booting the Clients

After the client computers have been set up and connected to the network, start each client to verify that it has been correctly configured and added to the network and successfully boots from the vDisk image. If the previous procedures were followed, and the streaming server, vDisk, and template client were correctly named, the clients should be automatically added to the network using the template client.

For HA configurations, if the previous steps in this document were followed, then each client booting for the first time should boot to imageserver1. Using EasyConnect™ Technology, the **Server Lookup** information previously entered in the **Configure BIOS Bootstrap** window is pushed to the clients. Reboot the clients to enable HA operation.

Additional Information

If you wish to have more than one vDisk, you can follow the previous steps for creating a vDisk image. You can then use drag-and-drop to assign a vDisk to the desired clients. You can also update a vDisk image by shutting down the client computers and temporarily setting the vDisk to Private access mode, booting a client from the vDisk, and making the desired changes.

When deployment is complete, back up the Citrix database. For details about these and the many other features and options of the streaming software, see the documentation available in the Ardence program group on the Windows Start menu.

If the system board is ever replaced in any client computer, ensure that the Dell service tag is updated. When the computer is first booted with the new system board, the Citrix software must be able to detect the same service tag present when the computer was originally added to the Citrix client database.

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Appendix

Configuring Client BIOS Settings for PXE Boot

Enter the System Setup program on each client computer and enable PXE boot by performing the following steps:

1. Start the computer and, at the Dell splash screen, press <F2>.
2. Scroll down to **Onboard Devices** and press <Enter>.
3. Scroll down to highlight **Integrated NIC** and press <Enter>.
4. Select **On w/ PXE** and press <Enter>.
5. Scroll up to **Boot Sequence** and press <Enter>.
6. Select **Onboard Network Controller**.
Press the <U> key to move **Onboard Network Controller** to the first position and press <Enter>.
7. Scroll down to **Power Management** and press <Enter>.
8. Scroll down to highlight **Low Power Mode** and verify that it is set **Off**.
9. Scroll down to highlight **Remote Wake up** and press <Enter>.
10. Select **On** and press <Enter>.
11. Press <Esc> and select **Save/Exit** to exit the System Setup program and save your changes.

Importing Additional Client Licenses

It is necessary to have a license for every client that has an active session with the streaming server. If you purchased additional client licenses separately from your On-Demand Desktop Streaming solution, the license key that was e-mailed to you after your purchase identifies a pool of licenses available from the Ardence License Management System. You use this key to register the licenses with Ardence and install them on the streaming server for use in booting the clients. If you do not have an Internet connection at the streaming server, use the Ardence Web License Manager from a computer with Internet access to create and download a license file (offline mode). If your streaming server has an Internet connection, you can use the Ardence License Manager on the server (online mode), which simplifies the licensing tasks. Figure 2 outlines the steps required to make licenses available on the streaming server.

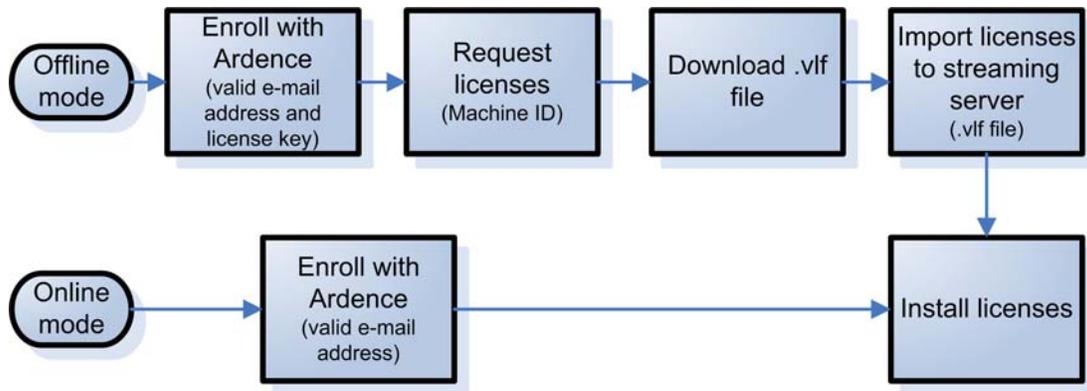


Figure 2: Licensing Tasks

Offline Mode

If you *do not* have an Internet connection at the streaming server, perform the following steps:

1. From a computer with Internet access, enter <https://licensing.ardence.com> in a browser window to open the Ardence Web License Manager.
2. Click **New User** in the Ardence License Manager **Login** window.
3. In the **New User Enrollment** screen, enter the License Key that was sent to you after your purchase.
4. Enter a valid e-mail address as **User Name**, the contact License Administrator's name, the name of the company, the License Administrator's telephone number, and a password twice for verification.
5. Click **Enroll**.
6. From the **LICENSE OPERATIONS** menu, select **REQUEST**.

NOTE: To add additional licenses later, log in to the Web License Manager, select REGISTER from the LICENSE OPERATIONS menu, and enter the new license key.

7. Select the license product from the dropdown, obtain and enter the **Machine ID** of the streaming server, enter the number of licenses requested, and click **Request**.
To obtain the Machine ID, run **GenMID.exe** from the **Program Files\Ardence\Ardence** directory on the streaming server.
8. Click **Download** to save the license **.vlf** file.

NOTE: If streaming server hardware is ever replaced, the Machine ID may change, which requires that all licenses be returned and requested again.

9. On the streaming server, start the Ardence License Manager from the Ardence program group on the Windows Start menu.
10. When the message **Failed to connect to Ardence server** appears, click **Work offline**.
11. In the Ardence License Manager **Login** window, click the **IMPORT** menu.
12. In the **Import License Files** window, click **Browse** to select the **.vlf** file that you downloaded, and click **Add**.
13. Click **Import** to import the licenses from the **.vlf** file to the server.
You can now log in to the Ardence License Manager to perform management tasks.

Online Mode

If you have a streaming server Internet connection, perform the following steps:

1. Start the Ardence License Manager from the Ardence program group on the Windows Start menu.
2. Click **New User** in the Ardence License Manager **Login** window.
After you have enrolled with Ardence, the **New User** button is disabled.
3. In the **New User Enrollment** window, enter a valid e-mail address as **User Name**, the contact License Administrator's name, the name of the company, the License Administrator's telephone number, and a password twice for verification.
4. Click **Enroll**.

Installing the Licenses

After licenses are registered and, if using the Ardence Web License Manager, downloaded and imported to the server, they must be installed in order to be available to the clients. Perform the following steps:

1. Start the Ardence License Manager from the Ardence program group on the Windows Start menu, and log in.
2. Under the **LICENSE OPERATIONS** menu, click **INSTALL**.
3. In the **Install Licenses** window, highlight the product row for installation, double-click the cell for **Quantity to Install**, and enter the number of licenses.
4. Click **Install** to complete the process.

Adding Clients Manually

NOTE: Dell recommends that you add clients automatically following the instructions provided in this document. If you wish to add clients manually, this section presents the basic procedure. For detailed information about managing your clients manually, see the Citrix documentation available in the Ardence program group on the Windows Start menu.

Add the other client computers in your network by performing the following steps:

NOTE: Before you attempt to deploy a new vDisk image to your full network, it is recommended that you test the image on one client besides the master client.

1. From the Ardence Administrator main window, right-click the **Clients** icon and select **New Client**.
2. On the **General** tab of the **New Client** window, enter the Dell service tag or other desired name (14 characters or less) and the MAC address of the client computer.

NOTE: The Citrix software currently supports only client computer names of 14 characters or less.

3. On the **Disks** tab, click **Change**, and then select the vDisk that you previously created, click **Add**, and click **OK**. Verify that **Boot order** is set to **Virtual Disk First**.
4. Click **OK** to create the new client.