Citrix Provisioning Services (PVS) Boot Process

v1.4

1 IP Acquisition

The PVS target device acquires an IP address using the DORA process. The following configurations are supported:

DHCP

An IP Address is obtained using the following Discover, Offer, Request and Acknowledge (DORA) process.

1. The Target Device broadcasts DHCP Discover packets.

DHCP Discover Broadcast

2. The DHCP Server sends a DHCP Offer packet to the Target Device with the IP address, Subnet Mask, lease time, Default Gateway and DNS Server Domain Name information to the Target Device.

DHCP Offer Packet

3. The Target Device sends a unicast message to the DHCP Server requesting the offered IP address. A Transaction ID is used to track the accepted offer. The Target Device will send a broadcast message notifying other DHCP Servers that the offer from another DHCP Server was accepted.

DHCP Request

4. The DHCP Server sends a DHCPACK packet to the Target Device.

DHCP Acknowledgement

Target Device — DHCP Server

Network Booting – w/DHCP Options (no PXE Service)

In this configuration, the DORA process explained above is used in addition to the following:

DHCP Offer Packet

The TFTP Server Name and Bootfile Name (ardbp32.bin) is provided using options 66 & 67

Target Device — DHCP Server

Network Booting – w/PXE Service (no DHCP Options)

In this scenario, the Target Device is configured for network boot.

1. The firmware of the Target Device adds option 60 to the DHCP Discover packet being broadcast.

DHCP Discover Broadcast

2. DHCP Server responds with IP Address, Gateway and Subnet information.

DHCP Server Reply

3. The PXE Server replies with the TFTP Server address and bootstrap file name.

PXE Server Reply

4. The Target Device sends a request to the TFTP Server for the bootstrap file.

Bootstrap File Request

5. The TFTP Server replies with the bootstrap file name.

Bootstrap File Reply

Target Device — PXE & DHCP Servers — TFTP Server

Citrix Boot ISO – Static IP

ISO

When using a Citrix Boot ISO to download the bootstrap the Target Device gets the IP address information directly from the boot ISO and downloads the bootstrap manager. As configured in the Boot Device Management (BDM) configuration.

Citrix Boot ISO – DHCP

ISO

In this scenario, BDM is configured for the Target Device to use the DORA process to get the IP address information. Then the two stage bootstrap download will start.

2 Bootstrap Download

The bootstrap file is downloaded from the TFTP Server to the Target Device using the TFTP Server from DHCP option 66 and filename (ARDBP32.bin) from DHCP option 67. TSBBDM.bin is downloaded if Boot Device Manager (BDM) is used and TSBOROM.bin is used if the target devices use option ROM (OROM).

DHCP

The TFTP Server Name is obtained from DHCP option 66 and the filename is obtained from DHCP option 67.

ARDBP32.bin

Target Device — PVS Server

Boot Device Manager (BDM)

BDM uses a two-stage boot process where the PVS location is hardcoded into the bootstrap generated by BDM. The rest of the required boot information like the low level PVS device drivers is downloaded from the PVS Server using a proprietary download protocol based on TFTP that uses UDP port 6969.

Starting with PVS 7.x a BDM hard disk partition can be assigned to virtual machines during initial VM deployment via the XenDesktop Setup Wizard. This scenario does not use the two-stage boot because the newly created BDM is monolithic and already contains the low level PVS drivers. The TFTP-based download protocol is no longer needed.

TSBBDM.bin

Target Device — PVS Server

Option ROM (OROM)

On Target Devices that use option ROM, the bootstrap file name is configured on the network interface card (NIC) .

TSBOROM.bin

This option is used with devices from Dell and others that use the Intel Desktop Board. Further information can be found at: http://download.intel.com/products/motherboard/D04383/22235.pdf

Target Device — PVS Server

3 PVS Logon Process

After the Target Device gets an IP address and downloads the bootstrap file it proceeds to login to a PVS Server to start streaming the vDisk image. This steps are as follows:

Get Login Port

- The Target Device contacts the PVS Server specified in the bootstrap file using the default UDP port 6910.
- The server responds with the IP address and port to Continue the login process.

Login Start

- The Target Device identifies itself by its MAC address and specifies the type of login being requested.

Transferred to IO

- The PVS Server moves the Target Device from the login thread to the I/O thread. The PVS Server replies with all disk, client and policy information needed and sent to the Target Device.

Target Device — PVS Server

Get IO Port

The Target Device requests the IP address and port used for the single read mode.

Get IO Service

The Target Device requests the PVS Server start the I/O thread and requests information on which vDisk to use.

Login Complete

- The PVS Server grants access for the I/O operation to the Target Device.
- Additional configuration is sent specifying the boot device.

Get vDisk Information

- The Target Device requests which vDisk will be streamed.
- The PVS Server replies with the vDisk information including write cache location if the Target is in standard mode.

Target Device — PVS Server

Load Balancing Algorithm

All PVS servers are capable of acting as both a login server and an I/O server. A PVS login server normally attempts to load balance devices between all servers that have access to a given vDisk when the device initially logs in. The login server only bypasses load balancing if the server override property is set for the vDisk locator. The load balancing algorithm provides simple connection count balancing. (i.e. the login server attempts to place the same number of devices on each server that has access to a given vDisk.)

4 Single Read Mode

After a target device has logged into PVS and has been directed to a PVS Server for streaming, the bootstrap file (ARDBP32.bin, TSBBDM.bin or TSBOROM.bin) will then intercept any requests (i.e. hard disk requests) made to Interrupt 13.

Simple Requests & Replies

The Target Device and the PVS Server will continue to communicate exchanging vDisk data until the Microsoft Windows Operating Systems starts loading drivers and BNISTACK is successfully loaded.

Target Device — PVS Server

5 BNISTACK / MIO

During the final phase, the BNISTACK Driver is loaded and multiple I/O (MIO) begins

BNISTACK

The Target Device initiates a handshake with the PVS Server stating the BNISTACK driver is up. BNISTACK is loaded into memory and takes over for the bootstrap managing the MIO communication. At this point , the following information is exchanged:

- vDisk name
- Image Mode
- Active Directory Password Management Option
- Write Cache Type and Size
- Client Name
- Licensing

Target Device — PVS Server

MIO

During the MIO stage, the Target Device is operation and read /write requests occur as follows:

Typical Read Requests

Single Read Request Packet

Multiple Read Reply Packets

Typical Write Requests*

Multiple Write Request Packets

Single Write Reply Confirmation Packet

Target Device — PVS Server

*MIO writes occur when the vDisk is in private mode or the write cache is configured for server side cache.

Summary

The following summarizes the PVS Boot Process detailed on the diagram:

1. IP Acquisition – The Target Device acquires an IP address.
2. Bootstrap Download – The bootstrap file is downloaded.
3. PVS Logon Process – The Target Device logs on to PVS.
4. Single Read Mode – Single read mode communication is established between the Target Device and the PVS Server.
5. BNISTACK / MIO – The BNISTACK driver on the Target Device takes over communications with the PVS Server and Multiple I/O occurs.

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