DELLEMC

Quick Boot on Dell EMC PowerEdge servers

This paper provides an overview of VMware vSphere Quick Boot feature. It also talks about Hardware and software considerations for Quick Boot feature on Dell EMC PowerEdge Platforms.

Dell EMC OS and Hypervisor Engineering
May 2018

Revisions

Date		Description
May 2018		Initial release

Table of Contents

Table of Figures

1   Purpose

This document provides an overview of software and hardware configuration requirements to enable vSphere Quick Boot feature on Dell EMC's PowerEdge platforms. The goal of this document is to help guide IT architects or system administrators to build a hardware configuration and software stack that supports VMware vSphere6.7 Quick Boot feature on PowerEdge Servers.

2   Introduction

2.1   Quick Boot Overview

Quick Boot is a new type of "soft" reboot mechanism introduced in vSphere 6.7. Unlike a regular host reboot operation (warm or cold), Quick Boot does not involve going through the actual hardware reboot process. When you initiate a Quick Boot, ESXi restarts in a way similar to normal reboot operation but the hardware does not go through the normal process of reboot operations such as POST, firmware load, re-initialization of hardware resources, reload ACPI/SMBIOS tables etc...

This feature helps to speed up server management workflows which do not require a hardware reboot. For example, applying an ESXi security patch or upgrading the ESXi hypervisor will most likely not require you to have the host/hardware rebooted.

In this paper we discuss Dell EMC PowerEdge server models supported for Quick Boot feature, what the typical time saving is, and what configurations are required in order to take advantage of Quick Boot in Dell EMC PowerEdge Servers.

2.2   Quick Boot support on Dell EMC PowerEdge Servers

Quick Boot Feature is supported only on specific set of pre-qualified Dell EMC PowerEdge Platforms at vSphere 6.7 GA. Below are the supported server models.

NOTE: The below list may get extended in the future.

1. R740
2. R740xd
3. R640
4. R730
5. R730xd
6. R630

3   Quick Boot Support Requirements

This section talks about minimum hardware and software configurations to enable Quick Boot. This section also helps the end user aware of Quick Boot enablement status from Dell EMC customized VMware ESXi 6.7 A00 image.

3.1 Software Components

3.1.1 vSphere Requirements

Quick Boot feature is supported from vSphere 6.7. ESXi 6.7 is the minimum hypervisor version required to exercise Quick Boot feature. vSphere Update Manager (VUM) installed on vCenter 6.7 enables Quick Boot by default on platforms that support this feature.

3.1.2 Device Driver requirements

Device drivers built using vSphere 6.7 Native Driver Development Kit (NDDK) support Quick Boot. Note that vmklinux DDK based drivers do not support Quick Boot. Refer to the VMware IOVP HCL to verify if the driver that you are interested in is listed for ESXi 6.7 and built with vSphere 6.7 NDDK. The IO vendor HCL selected for a specific peripheral provides a 'Type' field for the corresponding drivers supported where it says if the driver is native/vmklinux.

You can either rely on ESXi 6.7 inbox drivers or vSphere 6.7 IOVP certified asynchronous drivers (drivers released after the base vSphere build, referred to as "async") built using ESX 6.7 NDDK to build your device driver stack to support Quick Boot. ESXi 6.7 has a device driver file which is used to validate if the loaded device drivers in a system meet the minimum driver version required to support Quick Boot.

The ESXi hypervisor has the device driver file located at **/usr/lib/vmware/loadesx/whitelist.txt**

A deployed ESXi image may contain drivers that are not Quick Boot qualified, however Quick Boot may still work only if all the loaded drivers meet the Quick Boot driver support requirements. In other words, ESXi while performing Quick Boot does not check the drivers that are not loaded during run time.

For example, the Dell EMC customized 6.7 A00 image contains lsi_mr3 driver version 7.703.18.00. This is compiled using 6.5 NDDK and hence does not support Quick Boot. For example, you will not be able to successfully execute Quick Boot on PowerEdge R740xd with H730P as the storage controller since H730P uses lsi_mr3 device driver. Please refer to Section **"Known Issues for more details"**

To summarize, for an inbox or async driver to support Quick Boot, below are the criteria to be met.

1. Driver can be inbox or async.
2. Driver should be built using vSphere 6.7 NDDK and listed as certified in VMware`s HCL.
3. Driver should be listed in "**/usr/lib/vmware/loadesx/whitelist.txt"** file and should have a version that is same or greater than what is listed in this file.

3.1.3 Quick boot compatibility for Dell EMC Customized VMware ESXi ISO Images

Dell EMC releases their own customized VMware ESXi images on a periodic basis. The Dell EMC customized VMware ESXi 6.7 A00 image has the following async driver versions apart from the inbox versions.

- lsi_mr3 – 7.703.18.00
- dell-shared-perc8 – 06.806.90.00

As these are drivers built using 6.5.x Native DDK, any hardware configuration which has these drivers loaded will not be able to support Quick Boot. Refer to 6.7 customization guide for more information.

NOTE: Customers upgrading to ESXi 6.7 using the Dell EMC customized ESXi 6.7 A00 image from previous versions of ESXi may observe Quick Boot not being enabled even on supported Server configurations. This

behavior is mostly observed because some of the ESXi 6.5 async drivers may be retained and loaded by default post upgrading to ESXi 6.7.

For example, below are the versions of driver VIBs (vSphere Installation Bundles) which are retained from Dell EMC 6.5U1-A10 Image to Dell EMC 6.7-A00.

```
[root@he-dhcp-100-98-14-220:~] esxcli software vib list | grep -i oem  | sort
bnxtnet            20.6.302.0-10EM.650.0.0.4598673    BCM     VMwareCertified    2018-04-13
bnxtroce           20.6.300.0-10EM.650.0.0.4598673    BCM     VMwareCertified    2018-04-13
dell-shared-perc8  06.806.90.00-10EM.650.0.0.4598673  Avago   VMwareCertified    2018-04-13
i40en              1.5.6-10EM.650.0.0.4598673         INT     VMwareCertified    2018-04-13
igbn               1.4.1-10EM.600.0.0.2768847         INT     VMwareCertified    2018-04-13
ixgben             1.6.5-10EM.600.0.0.2768847         INT     VMwareCertified    2018-04-13
lpfc               11.4.142.11-10EM.650.0.0.4598673   EMU     VMwareCertified    2018-04-13
lsi-mr3            7.703.18.00-10EM.650.0.0.4598673   Avago   VMwareCertified    2018-04-13
misc-cnic-register 1.713.30.v60.1-10EM.600.0.0.2494585 QLogic VMwareCertified    2018-04-13
net-bnx2           2.2.6b.v60.2-10EM.600.0.0.2494585  QLogic  VMwareCertified    2018-04-13
net-bnx2x          2.713.30.v60.8-10EM.600.0.0.2494585 QLogic VMwareCertified    2018-04-13
net-cnic           2.713.30.v60.6-10EM.600.0.0.2494585 QLogic VMwareCertified    2018-04-13
net-i40e           2.0.7-10EM.600.0.0.2494585         INT     VMwareCertified    2018-04-13
net-igb            5.3.3-10EM.600.0.0.2494585         INT     VMwareCertified    2018-04-13
net-ixgbe          4.5.1-10EM.600.0.0.2494585         INT     VMwareCertified    2018-04-13
nqlcnic            6.0.63-10EM.650.0.0.4240417        QLC     VMwareCertified    2018-04-13
qcnic              1.0.4.0-10EM.650.0.0.4598673       QLC     VMwareCertified    2018-04-13
qedentv            3.0.7.5-10EM.650.0.0.4598673       QLC     VMwareCertified    2018-04-13
qedrntv            3.0.7.5.1-10EM.650.0.0.4598673     QLC     VMwareCertified    2018-04-13
qfle3              1.0.55.0-10EM.650.0.0.4240417      QLC     VMwareCertified    2018-04-13
qfle3f             1.0.31.0-10EM.650.0.0.4598673      QLC     VMwareCertified    2018-04-13
qfle3i             1.0.5.0-10EM.650.0.0.4598673       QLC     VMwareCertified    2018-04-13
scsi-bnx2fc        1.713.30.v60.6-10EM.600.0.0.2494585 QLogic VMwareCertified    2018-04-13
scsi-bnx2i         2.713.30.v60.5-10EM.600.0.0.2494585 QLogic VMwareCertified    2018-04-13
scsi-megaraid-sas  06.805.56.00-10EM.600.0.0.2494585  VMW     VMwareCertified    2018-04-13
scsi-qedil         1.0.19.0-10EM.600.0.0.2494585      QLC     VMwareCertified    2018-04-13
scsi-qla4xxx       644.6.06.0-10EM.600.0.0.2494585    QLogic  VMwareCertified    2018-04-13
[root@he-dhcp-100-98-14-220:~]
```

Figure 1 : ESXi Package list post upgrade

3.2   Hardware Components

3.2.1   Host Requirements

As detailed in Section 3.2, Quick Boot support is limited to only specific set of platforms that have been jointly qualified by VMware and Dell EMC. This platform support list is expected to expand in future vSphere releases. ESXi hypervisor maintains a platform list that is used to validate Quick Boot compatibility. Below command helps to identify the platforms which are qualified for quick boot.

#/usr/lib/vmware/loadesx/platforms.txt

ESXi relies on platform name exposed by SMBIOS tables via VSI node /hardware/bios/dmiInfo. Quick Boot uses this value to match the server model listed in the platform list.

3.2.2   Device Considerations

One of the easiest way to check if your Platform configuration (host type, peripherals and device drivers) supports Quick Boot feature is by executing the following script available as part of ESXi 6.7 installed image.

 # /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py

If your platform configuration meets the Quick Boot hardware and software requirements then executing the loadESXCheckCompat.py script should yield a similar output as shown in Figure 2.

```
[root@he-dhcp-100-98-14-220:~] esxcli hardware platform get
Platform Information
   UUID: 0x4c 0x4c 0x45 0x44 0x0 0x4d 0x46 0x10 0x80 0x32 0xc7 0xc0 0x4f 0x47 0x4c 0x32
   Product Name: PowerEdge R640
   Vendor Name: Dell Inc.
   Serial Number: GMF2GL2
   Enclosure Serial Number: GMF2GL2
   BIOS Asset Tag:
   IPMI Supported: true
[root@he-dhcp-100-98-14-220:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
Congratulation - your system is compatible with loadESX
[root@he-dhcp-100-98-14-220:~]
```

Figure 2 : Quick Boot compatibility check on a supported Platform

Figure 3 provides a sample output of another configuration where we there are multiple instances of Quick boot compliance check failure.

```
[root@he-dhcp-100-98-14-38:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
LoadESX is not compatible with TPM.
This platform (Dell Inc.:PowerEdge R440) is not compatible with loadESX.
The current system uses incompatible drivers: lsi_mr3.
Compatibility check failed: violating one or more strict requirements (loadESX is not supported on this machine)
[root@he-dhcp-100-98-14-38:~]
```

Figure 3 : Quick Boot Compatibility check on an unsupported Platform

Figure 4 provides a scenario of ESXi upgraded from 6.5.x branch to 6.7. The loadESXCheckCompat.py shows the incompatibility message with the list of drivers incompatible.

```
[root@he-dhcp-100-98-14-220:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
The current system uses incompatible drivers: ixgben.
Compatibility check failed: violating one or more soft requirments (usage of loadESX is not recommended)
[root@he-dhcp-100-98-14-220:~] _
```

Figure 4 : Quick Boot compatibility failure post ESXi upgrade

One of the ways to build a Quick Boot supported Dell EMC PowerEdge server configuration is to use the server configuration profiles listed for Dell EMC vSAN Ready Node(vSRN). However, you need to make sure that you refer a vSRN configuration based on platforms listed in Section 3.2 and has only HBA330 as the storage controller (refer Section 4.2.2.1).

NOTE: Whether you build a server configuration on your own or based on a Dell EMC vSRN server profile, please make sure that your platform configuration meets the requirements detailed in Sections 4

3.2.2.1   Known Limitation
   Below are some of the points to be noted when you want to use Quick Boot on a hardware configuration.

   - Support for PERC controllers (http://www.dell.com/learn/us/en/04/campaigns/dell-raid-controllers) is provided by "lsi_mr3" device driver in ESXi 6.7. Due to a known issue that affects the Quick Boot feature, the lsi_mr3 device driver is not part of ESXi 6.7 GA driver list. A Dell

EMC PowerEdge server configuration which has any of these PERC controllers will not be able to support Quick Boot in ESXi 6.7 GA as well as Dell EMC customized VMware ESXi 6.7 A00 image.

- Figure 5 shows a sample output when you run loadESXCheckCompat.py on quick boot supported server that has PERC controller.

```
[root@he-dhcp-100-98-13-134:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
The current system uses incompatible drivers: lsi_mr3.
Compatibility check failed: violating one or more soft requirments (usage of loadESX is not recommended)
[root@he-dhcp-100-98-13-134:~] _
```

Figure 5 : Quick Boot compatibility check failure when lsi_mr3 driver is loaded into vmkernel

- Figure 6 shows an example output when **loadESXCheckCompat.py** is executed on an R740xd server which has HBA330 connected and lsi_msgpt3 driver loaded into vmkernel.

```
[root@he-dhcp-100-98-14-174:~] esxcli hardware platform get | grep -i PowerEdge
    Product Name: PowerEdge R740xd
[root@he-dhcp-100-98-14-174:~] esxcli storage core adapter list
HBA Name  Driver      Link State  UID                  Capabilities  Description
--------  ----------  ----------  -------------------  ------------  ------------------------------------------------------
----------------------
vmhba0    vmw_ahci    link-n/a    sata.vmhba0                        (0000:00:11.5) Intel Corporation Lewisburg SATA AHCI Contr
oller
vmhba1    vmw_ahci    link-n/a    sata.vmhba1                        (0000:00:17.0) Intel Corporation Lewisburg SATA AHCI Contr
oller
vmhba2    lsi_msgpt3  link-n/a    sas.5d09466024db9100               (0000:18:00.0) Avago (LSI Logic) Dell HBA330 Adapter
vmhba3    vmw_ahci    link-n/a    sata.vmhba3                        (0000:86:00.0) Marvell Technology Group Ltd. 88SE9230 PCIe
 SATA 6Gb/s Controller
vmhba32   vmkusb      link-n/a    usb.vmhba32                        () USB
[root@he-dhcp-100-98-14-174:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
Congratulation - your system is compatible with loadESX
[root@he-dhcp-100-98-14-174:~] vmware -lv
VMware ESXi 6.7.0 build-8169922
VMware ESXi 6.7.0 GA
[root@he-dhcp-100-98-14-174:~] _
```

Figure 6 : Configuration with Dell EMC HBA330 driver loaded

NOTE:

➢ Trying to execute Quick Boot on such unsupported configurations can result in system performing a normal reboot operation.

➢ Alternatively, you can use the Host Bus Adapter (HBA330) as the storage controller which supports Quick Boot.

➢ Most firmware updates will require a system reboot. If your ESXi update path includes updating the BIOS and firmware stacks, then the firmware update process will require a hardware reboot regardless of Quick Boot compliance.

4   Quick Boot and VMware Update Manager (VUM)

4.1   Introduction to VUM

VMware Update Manager provides an automated & centralized patch management for VMware Sphere. Listed here are the primary features of VUM:

- Upgrade and patch ESXi hosts
- Install and update third-party software on hosts

Quick Boot on Dell EMC PowerEdge servers

- Upgrade virtual machine hardware, VMware Tools, and virtual appliances

4.2   Quick Boot with VUM

VUM leverages Quick boot feature to reduce the time required for ESXi maintenance workflows by reducing the reboot time of ESXi hosts. The steps below are to be followed to utilize Quick Boot for a patch upgrade using VUM. A patch could be anything (ESXi patches, VIBs) which needs a system reboot. Quick Boot is enabled by default in VUM. To see the settings, traverse to "Update manager -> Host & Cluster settings -> Enable Quick Boot".
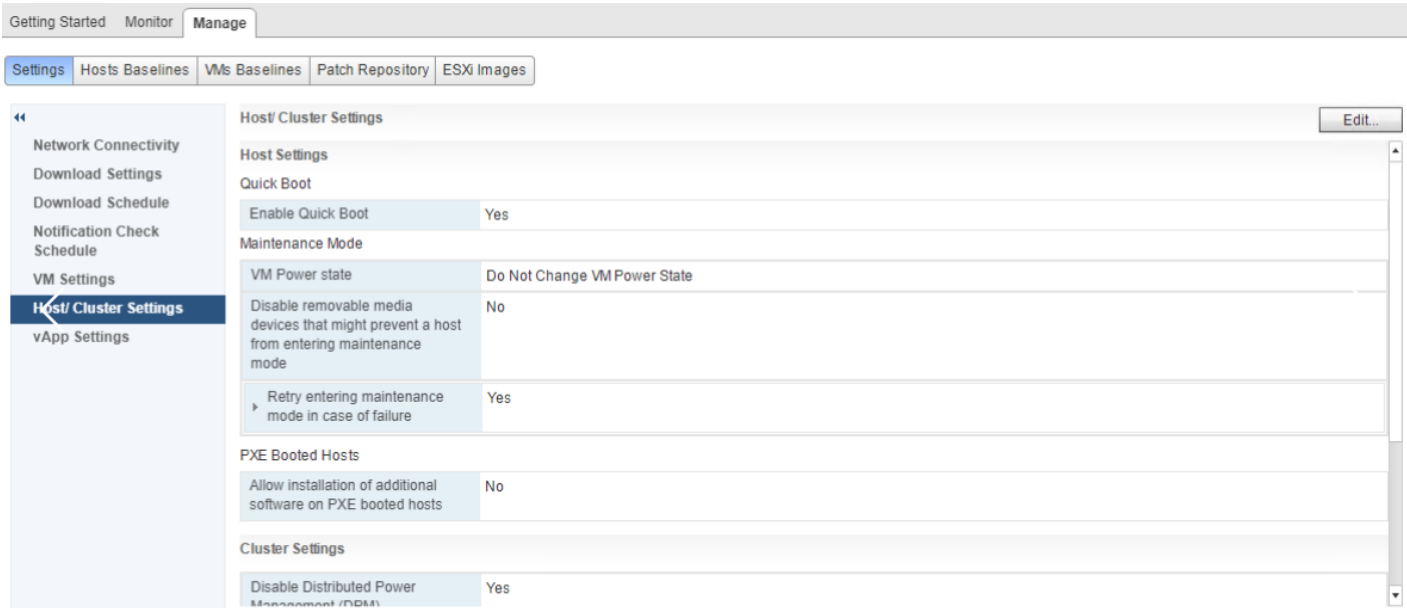

Figure 7 : VMware Update Manager Quick Boot Setting

Refer to [vSphere Update Manager and Installation guide](#) for more information on how to make use of Quick Boot in VUM. Refer to sections such as **"Quick Boot Setting for Optimizing Host Patch and Host Upgrade Operations"** and **"System Requirements for Using Quick Boot During Remediation"**

5   Testing and Observations

This section provides details on some of the hardware configurations Dell EMC have tested Quick Boot and the tips to use Quick Boot on standalone servers which is not managed by VUM.

5.1   Hardware Configuration Under Test

Below table gives an overview of the hardware under test.

Component	Model
Server	Dell EMC PowerEdge R740xd
CPU	2 X Intel(R) Xeon(R) Gold 6126 CPU @ 2.60GHz
Memory	12 X 32GB DDR4
BIOS	
Storage Controller	Dell HBA330

| HDD | 10 x 2.5' Samsung |
| Network Controller | Intel® 10GbE 4P X710 rNDC |

5.2   Software Configuration Under Test

Below section gives an overview of the software versions used for Quick Boot.

Component	Version
VMware ESXi (Hypervisor)	Dell EMC customized 6.7. 0 version A00
VMware vCenter Server Appliance (VCSA)	6.7.0-8217866

5.3   Quick Boot on standalone host

1. Below command provides Quick Boot compatibility as we discussed in previous sections.

   #/usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py

```
[root@he-dhcp-100-98-14-174:~] esxcli hardware platform get | grep -i PowerEdge
   Product Name: PowerEdge R740xd
[root@he-dhcp-100-98-14-174:~] esxcli storage core adapter list
HBA Name  Driver      Link State  UID                 Capabilities  Description
--------  ----------  ----------  ------------------  ------------  --------------------------------------------------------
--------------------
vmhba0    vmw_ahci    link-n/a    sata.vmhba0                       (0000:00:11.5) Intel Corporation Lewisburg SATA AHCI Contr
oller
vmhba1    vmw_ahci    link-n/a    sata.vmhba1                       (0000:00:17.0) Intel Corporation Lewisburg SATA AHCI Contr
oller
vmhba2    lsi_msgpt3  link-n/a    sas.5d09466024db9100              (0000:18:00.0) Avago (LSI Logic) Dell HBA330 Adapter
vmhba3    vmw_ahci    link-n/a    sata.vmhba3                       (0000:86:00.0) Marvell Technology Group Ltd. 88SE9230 PCIe
 SATA 6Gb/s Controller
vmhba32   vmkusb      link-n/a    usb.vmhba32                       () USB
[root@he-dhcp-100-98-14-174:~] /usr/lib/vmware/loadesx/bin/loadESXCheckCompat.py
Congratulation - your system is compatible with loadESX
[root@he-dhcp-100-98-14-174:~] vmware -lv
VMware ESXi 6.7.0 build-8169922
VMware ESXi 6.7.0 GA
[root@he-dhcp-100-98-14-174:~] _
```

Figure 8 : Quick Boot compatibility check on a standalone host

2. Enable Quick Boot on standalone host as below:-

```
[root@he-dhcp-100-98-14-174:~] /bin/loadESXEnable -e
INFO: LoadESX Enabled
INFO: Prechecks are Enabled
[root@he-dhcp-100-98-14-174:~] _
```

Figure 9 : Enable Quick Boot on a standalone host

3. Prepare Quick Boot by loading the script

Figure 10 : Prepare for Quick Boot

4. Reboot the system by initiating a graceful reboot either from DCUI or from the ESXi shell.
   NOTE: At this step you will see the host is actually performing Quick Boot by skipping the Hardware reboot
5. Verify loadESX.stats at /scratch/vmware/loadESX/ to see if the system has successfully gone for a Quick Boot.

Figure 11 : Quick Boot Stats

5.4   VUM Upgrade scenario involving Quick Boot

In this section we demonstrate a VUM upgrade scenario which involve Quick Boot. As an example we show case an upgrade scenario from previous version of ESXi to Dell EMC customized VMware ESXi 6.7 A00 image. Detailed steps are as follows:-

1. Launch Update manager in your vSphere Web client (HTML5)
2. Navigate to ESXi image section and import the ESXi Image to the Update manager as shown in Figure 12.

Figure 12 : Import ESXi Image in VUM

3. Create a custom Baseline for the Imported Image by selecting the New Baseline
4. Verify the Baseline created in previous step is listed under the Baseline section as shown in Figure 13.

Update Manager

Home | Baselines | Updates | ESXi images

NEW ⌄   EDIT   DELETE   DUPLICATE

	Baselines	▼	Content	▼	Type	▼	Last Modified
○	6.7_A00_RTM		Upgrade		Custom		4 days ago
○	Non-Critical Host Patches (Predefined)		Patch		Predefined		4 days ago
○	Critical Host Patches (Predefined)		Patch		Predefined		4 days ago

Figure 13 : Baseline Creation

5. Select the host to upgrade
6. Navigate to Updates tab
7. Attach the Baseline which was created at step 4.

Attach Baselines - 100.98.14.174   ✕

	Name	▼	Content	▼
☑	6.7_A00_RTM		Upgrade	
☐	Non-Critical Host Patches (Predefined)		Patch	
☐	Critical Host Patches (Predefined)		Patch	

☑ 1   3 Baselines

CANCEL   OK

Figure 14 : Attach the Baseline

8. Select the "Attached Baseline" and Click "Remediate"

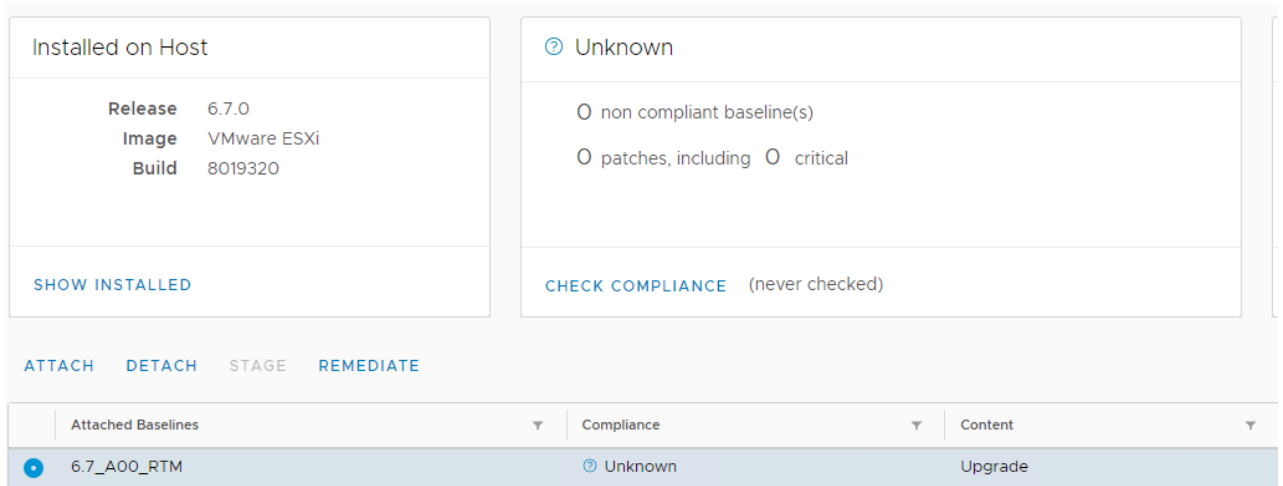Quick Boot on Dell EMC PowerEdge servers

Figure 15 : Add Baseline and Remediate

9. Remediate starts and processes upgrade to the new image exported
10. Under Remediation settings, ensure that Allow Quick Boot is enabled

Figure 16 : Remediation Settings

11. Host enters into Maintenance mode and the Upgrade process is started
12. Once Update process completes, the host enters into Quick Boot cycle. Host skips performing a Hardware reboot cycle.

5.5 Performance test results

This section talks about a performance comparison between Quick Boot and a regular boot. Obviously, the time taken to conduct a regular boot depends upon the hardware configuration. More the PCIe devices present in the system, regular boot takes more time to reboot compared to Quick Boot where it only does a reload of vmkernel and the subsequent service reboots. Here we demonstrate the time taken by the hardware configuration (noted in Section 6.1).

Mode of Reboot	Time Taken to complete the boot process
Quick Boot	1min ~38seconds
Regular Boot	4mins ~40 seconds

14

As we expect, there is a considerable time difference and hence the overall downtime for an ESXi host gets reduced with the introduction of Quick Boot support.

6   References

- [VMware Quick Boot Compatibility](#)
- [Quick Boot of VMware ESXi on DellEMC Power Edge Servers](#)
- [vSphere Update Manager Installation and Administration Guide](#)
- [Introducing VMware vSphere 6.7](#)
- [Dell EMC vSphere 6.7 Installation Instructions and Important Information Guide](#)
- http://www.yellow-bricks.com/2018/04/17/vsphere-6-7-announced/