HP Client Automation

OS Manager

for the Windows® operating system

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Hardware Configuration Management Guide

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The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
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Table 1 indicates changes made to this document since the last released edition.

Table 1 Document Changes

Chapter	Version	Changes
All	7.20	Rebranded documentation. Added cautions regarding Core and Satellite environments.
Chapter 1	7.50	About the Process Flow on page 12, updated steps 1 and 2.
Chapter 1	7.50	Prerequisites on page 14 updated.
Chapter 2	5.10	In To configure the Hardware Configuration Element on page 21, added information about changing the Service OS as needed.
Chapter 2	7.50	Added a note about Using Microsoft's BitLocker on page 17.

Chapter 2	7.50	Added information about using the CSDB Editor and Enterprise Manager and removed information about using the OS Manager Admin Module.
Chapter 3	7.50	Renamed to Using Shadow Hardware Configuration Elements and removed information about how to repair devices. Also, modified the information to use the CSDB editor and Enterprise Manager.
Appendix A	5.10	About the Hardware Configuration Element Class on page 33, updated the information about Service OS Needed to Run Method on page 36.
Appendix D	5.10	Added information about Maintenance on page 47.
Appendix E	5.10	Added Pre-configured Hardware Configuration Elements for use with HP ProLiant Hardware on page 49.

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Contents

1 What is Hardware Configuration Management?

Hardware Configuration Management allows you to create and apply operations to hardware on a target device. For example, although some target devices may be ready to have the operating system installed out of the box, there may be other situations when you need to identify and apply critical operations before proceeding with the operating system installation. Examples of the types of operations necessary are upgrading the BIOS firmware or configuring a disk array controller (DAC). These operations prepare the hardware configuration on the target device. After the hardware configuration is complete (i.e., the hardware configuration is in its desired state), the target device is ready for the operating system to be installed.

You may also use Hardware Configuration Management in situations where you need to apply hardware configuration changes to a target device *after* an operating system has been installed.

Using this Guide with Core and Satellite Servers

If your environment uses Core and Satellite servers, first read the *Core and Satellite Servers Getting Started and Concepts Guide* as the installation, configuration, and troubleshooting information in that guide may override the information in this guide.

About the Process Flow

Below is an overview of the process flow of Hardware Configuration Management.

1 Create one or more Hardware Configuration Elements (HWCEs).

Each element contains information about the resources required for the operation, the sequencing of operations, and how the operation should be carried out.

a. Gather the resources for your HWCEs. You may need to go to the vendor's web site to get the correct binaries and create the appropriate configuration files to apply to the target device.

b. Use the HP Client Automation Administrator Publisher to publish the HWCEs to the HP Client Automation Configuration Server Database. The HWCEs are published to the PRIMARY.OS.PACKAGE class.

c. Use the HP Client Automation Administrator CSDB Editor to create and configure the HWCE instances in the PRIMARY.OS.LME class.

d. Use the CSDB Editor to connect the PACKAGE instance to the HWCE instance.

2. Create a Hardware Configuration object.

   A Hardware Configuration object contains the information about how a target device's hardware must be configured in order for it to be ready for operating system installation. It contains one or more HWCEs.

   a. Use the CSDB Editor to create a Hardware Configuration object and specify the filters that identify to which devices to apply the hardware configuration.

   b. Connect the appropriate HWCEs to the Hardware Configuration object.

3. Set policy to ensure deployment of the hardware configuration and operating system.

   When you use Hardware Configuration Management, Model and Manufacturer are the two most often used policy classes.

4. The next time the target device connects; it detects the hardware configuration and applies the tasks connected to this hardware configuration.

   — If there is more than one task, they will be applied in the order specified by the administrator.

   — If a task needs a reboot, the HP Client Automation OS Manager will reboot the target device and proceed to the next task.

   — If the operating system needs to be re-installed after a change, then it will be re-installed.

Audience

Only experienced Client Automation and system administrators who are very familiar with manipulating hardware and system components should use Hardware Configuration Management.

Prerequisites

- HP Client Automation OS Manager 7.50 or higher
- HP Client Automation Configuration Server 7.50 for Windows or higher
- HP Client Automation Administrator 7.50 for Windows or higher
- HP Client Automation Portal 7.50 for Windows or higher
- HP Client Automation Enterprise Manager 7.50 or higher

Chapter Summaries

Chapter 1, What is Hardware Configuration Management?

This chapter provides an introduction to Hardware Configuration Management and its process flow, as well as descriptions of the target audience and prerequisite knowledge.

Chapter 2, Using Hardware Configuration Management

This chapter includes an example of how to create and apply operations to hardware on a target device.

Chapter 3, Using Shadow Hardware Configuration Elements

This chapter discusses how to use Shadow HWCEs and the special circumstances in which these are used.

Appendix A, About the Hardware Configuration Element Class

This appendix provides detailed information about the fields used to create HWCEs.

Appendix B, About the Hardware Configuration Class

This appendix provides detailed information about the fields used to create Hardware Configuration objects.

Appendix C, Best Practices

This appendix provides some best practices to follow when using Hardware Configuration Management.

Appendix D, Maintenance

This appendix specifies where to place fixes received from HP.

Appendix E, Pre-configured Hardware Configuration Elements for use with HP ProLiant Hardware

This appendix describes the pre-configured Linux-based Hardware Configuration Elements (HWCEs) that are available to allow you to perform various low-level configuration changes on HP ProLiant hardware.

Related Documents

HP Client Automation Enterprise OS Manager System Administrator User Guide

2 Using Hardware Configuration Management

At the end of this chapter, you will:

- Be able to create and apply operations to hardware on a target device.

In this chapter, you will learn how to create and apply operations to hardware on a target device, such as a ProLiant server. In this example, you must make the following changes to the hardware configuration before you can install the operating system:

- Update an old version of BIOS firmware (BIOS).
- Configure a disk array controller (DAC).
- Assemble several raw disks into logical volumes (LVOLS).

If you are using Microsoft's BitLocker, see the topic Using Microsoft's BitLocker in the *HP Client Automation OS Manager System Administrator User's Guide.*

Step 1: Create one or more HWCEs.

Step a: Gather the Resources for your HWCEs

Table 2 on page 18 defines each of the HWCEs to be used in this example. First, let us review the columns in the table.

- **Hardware Configuration Element** provides a general description for this HWCE. You should type a descriptive instance name and friendly name for the element in the CSDB Editor.
- **Operation** describes the type of operation that will be applied to the target hardware.
- **Resource files** lists the files that must be gathered into a single folder. These are the files that will perform the operations.

Be sure that text files are in the UNIX text file format.

- **Apply methods** are the commands that initiate the operations.
- **Post-requisite HWCE** is also known as a consequence. If an HWCE is applied to a target device, some HWCEs might have to be reapplied after the original is applied. For example, if you use an HWCE to change the BIOS firmware, the settings will most likely be reset to their default values. Therefore, you would need to use an HWCE to reset the default values back to the settings needed for your environment. This element would be considered the consequence (or Post-requisite HWCE) for the BIOS firmware HWCE.

- **Conditional Pre-requisite HWCE** is also known as a dependency. Use this field to set up the order in which the HWCEs are applied. This is most effective when you are first applying your hardware configuration and need to apply the HWCEs in a specific order.

Table 2 Hardware Configuration Elements example definitions

Hardware Configuration Element	Operation	Resource Files	Apply Method	Post-requisite HWCE	Conditional Pre-requisite HWCE
Update BIOS	Update firmware	`Biosfw.img` `Biosflash.exe`	`./biosflash.exe biosfw.img`	None	None

Disk Array Controller (DAC)	Configure DAC	`Array.conf`
		`Acrutil.exe`
		`arraycfg.sh`
			`./arraycfg.sh`
			Note: This script contains the command `acrutil.exe array.conf`
				LVOL	None

Logical Volumes (LVOL)	Create logical volumes	`Volume.conf`
		`Volutil.exe`
		`volume.sh`
			`./volume.sh`
			Note: This script contains the command `volutil.exe volume.conf`
				DRIVE MAP	None

The BIOS HWCE will update the firmware on the target device. To perform this operation, the command line listed in the Apply Method column initiates the specified resource files. The BIOS does not have any dependencies or consequences, therefore changes to the BIOS may happen at any time in the sequence of events.

However, the DAC HWCE specifies LVOL as a consequence. This means that the DAC must be configured on the target device before the LVOL and that LVOL must be reapplied after any change to the DAC.

The LVOL HWCE has a consequence of DRIVEMAP. This consequence is a reserved type (see Appendix A, About the Hardware Configuration Element Class for more information about reserved types) that causes an operating system installation after the OS drive is repartitioned. Therefore, this operation will invalidate any preexisting operating systems.

When all three operations have been completed successfully, the target device is considered to have its hardware configuration completed and is ready for its operating system to be installed.

Step b: Publish the HWCEs

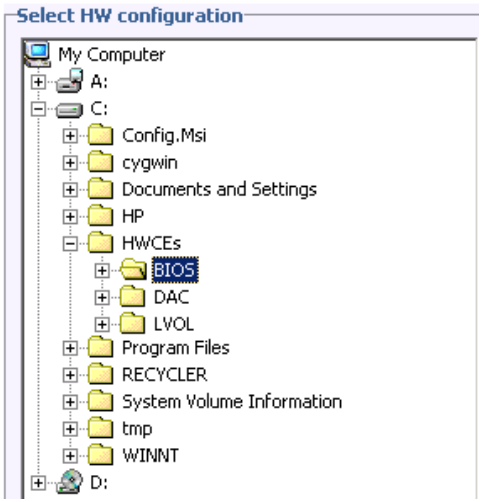
In this section, you will use the HP Client Automation Administrator Publisher to publish the HWCEs to the HP Client Automation Configuration Server Database.

Before you publish your HWCEs, gather your resource files into a single folder.

To publish an HWCE

1. Go to **Start→All Programs→HP Client Automation Administrator→HP Client Automation Administrator Publisher**. Refer to the *HP Client Automation Administrator User Guide* for details on how to use the Publisher.
2. Type your User ID and Password.
3. From the Publishing Options drop-down list, select **HW Configuration**.
4. Click **OK**.
5. Select the folder that contains the resources needed to create your HWCE. In our example, we selected `C:\HWCEs\BIOS`.

Make sure that you gathered the correct files that match the system to which you intend to deploy this. If you choose the wrong files you may leave your system in a damaged state.



6 In the Description field, type a description of the elements that you are publishing. For this example, type **`Pro32 WS Bios Rev 1.00 Resources`**.

7 In the Package Instance Name field, type the instance name for the package. For this example, type **`P32_BIOS_100`**.

8 Click **Next**.

9 Review the information and then click **Publish**. The package resources will be published in a non-compressed format.

10 When the Publisher is done, click **Finish**.

11 Click **Yes** to confirm that you want to close the Publisher.

Use the CSDB Editor to view the package that has been created in PRIMARY.OS.PACKAGE.

Repeat the steps above to create packages for the Disk Array Controller (DAC) and the Logical Volumes (LVOL). Be sure to use descriptive instance names and provide detailed descriptions. For example:

For the Disk Array Controller, set the:

- Description to Pro32 WS Array Mirrored (1 Spare) Rev 1.00 Resources
- Instance Name to P32_DAC_MIRR_100

For the Logical Volume, set the:

- Description to Pro32 WS Array 1 Drive Rev 1.00 Resources
- Instance Name to P32_LVOL_1DRV_100

Step c: Create and configure the HWCEs

In this section, you learn how to configure HWCEs that identify the resources and methods to use to bring the hardware configuration for a target device to its desired state.

This section provides simple step-by-step instructions to help you to gain a basic understanding about how to create and configure hardware elements. See Appendix A, About the Hardware Configuration Element Class for detailed information about the fields and the information you enter into the fields.

To configure the Hardware Configuration Element

1. Go to **Start→All Programs→HP Client Automation Administrator→ Client Automation Administrator CSDB Editor**.
2. Log on as the administrator (by default, the user ID is admin and the password is secret).
3. Go to PRIMARY.OS.LME.
4. Right-click the class name and select New Instance.
5. Type the display name and the instance name.

When creating the HWCE instances, you may want to use the following Instance and Friendly Names.

For the BIOS, set the:

- Display Name to Pro32 WS Bios Rev 1.00
- Instance Name to P32_BIOS_100

For the Disk Array Controller, set the:

- Display Name to Pro32 WS Array Mirrored (1 Spare) Rev 1.00
- Instance Name to P32_DAC_MIRR_100

For the Logical Volume, set the:

- Display Name to Pro32 WS Array 1 Drive Rev 1.00
- Instance Name to P32_LVOL_1DRV_100

6 Click **OK**.

7 Double-click the instance that you want to configure.

8 Enter the information needed to configure the BIOS element as described Table 3 on page 23.

See Appendix A, About the Hardware Configuration Element Class for a complete description of each of the fields below.

As identified in this appendix, you *must* type entries for the following fields.

- Friendly Name
- Class
- Type
- Instance Number
- Apply Method
- Apply Behavior
- Post Behavior
- Failure

Table 3 Configuring the BIOS HWCE

Field	Value
Friendly name	Pro32 WS Bios Rev 1.00
Version	1.00
Class	_REGULAR_
Type	BIOSFLASH
Instance Number	0
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`./biosflash.exe biosfw.img`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

9 Click **OK**.

10 Connect the PRIMARY.OS.PACKAGE instance to the PRIMARY.OS.LME instance for this Hardware Configuration Element.

11 Repeat the steps above to configure the HWCEs for the Disk Array Controller (DAC) and the Logical Volumes (LVOL). Use Table 4 and Table 5 below as a guide for the information to enter.

Table 4 Configuring the DAC HWCE

Field	Value
Friendly name	Pro32 WS Array Mirrored (1 Spare) Rev 1.00
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	0
Service OS Needed to Run Method	_SVC_LINUX_

Field	Value
Apply Method	`/arraycfg.sh`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	LDRIVCFG
Conditional Pre-requisite HWCE	N/A

Table 5 Configuring the LVOL HWCE

Field	Value
Friendly name	Pro32 WS Array 1 Drive Rev 1.00
Version	1.00
Class	_REGULAR_
Type	LDRIVCFG
Instance Number	0
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`./volume.sh`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	DRIVEMAP
Conditional Pre-requisite HWCE	N/A

Step 2: Creating the Hardware Configuration object

The hardware configuration is the configuration that a target device needs in order to be in its desired state. In this section, we will configure the Hardware Configuration object.

To create the hardware configuration

1. Go to **Start→All Programs→HP Client Automation Administrator→ Client Automation Administrator CSDB Editor**.
2. Log on as the administrator (by default, the user ID is admin and the password is secret).
3. Go to PRIMARY.OS.LDS.
4. Right-click HW Config (LDS) and select **New Instance**.
5. Type the display name, such as **`Pro32 WS CAD Setup Rev 1.00`** and the Instance name, such as **`P32_CAD_100.`**
6. Click **OK** and then double-click on the instance.
7. Use the MANUFLTR (Reg Expr to Filter Manufacturer) field *and* the MODLFLTR (Reg Expr to Filter Model) field to restrict the hardware that the hardware configuration is applied to.

   You *must* type information in the filter fields as a regular Tcl expression otherwise the hardware configuration will never be applied to your target device. Filter entries are case-sensitive.

   If you need assistance with regular Tcl expressions, refer to a manual such as *Practical Programming in Tcl and Tk* by Brent B. Welch, Prentice Hall PTR (3rd edition).

   a. Double-click the MANUFLTR (Reg Expr to Filter Manufacturer) attribute and type a regular Tcl expression to indicate the manufacturer that you want to apply this hardware configuration to. If you do not enter information in this field, no match will be made.

      – If you type a value of **`.*`** the hardware configuration will be applied to any target device. *We do not recommend this because your hardware configuration may cause damage to some of your target devices.*

      – List the items as a series of regular expressions separated by a space.

      Some example values for the manufacturing filter might be:

      ```
      HP.* Compaq.* COMPAQ.*
      ```

      or

      ```
      Dell.* DELL.*
      ```

b In the MODLFLTR (Reg Expr to Filter Model) attribute, type an expression to indicate the model that you want to apply this hardware configuration to.

– If you type a value of `.*` the hardware configuration will be applied to any target device. *We do not recommend this because the hardware configuration targeted at a particular manufacturer may cause damage to some of your target devices. It is important consider how to use your filters and be sure to filter based on both manufacturer and model.*

Some example values for the model filter might be:

```
DL360-G2.* Dl360.* PROLIANT.*DL360.*
```

or

```
Poweredge.* .*2450.*
```

These patterns match the models of DL360 servers or Poweredge 2450 server models.

Be careful not to type an expression such as DL360-C2* because in this case the asterisk is not used as a wildcard as you would expect. The asterisk will cause a match to any model that has repeated 2s in it. For example, some potential matches would be DL360-C22, DL360-C222, DL360-C2222222222 and so on.

The manufacturer and model filters must match for the hardware configuration to be applied to the target device.

8 If you want to track the versions of your configuration elements use the VERSION attribute.

9 Click **OK**.

To connect the HWCEs to the Hardware Configuration Package

1 Go to **Start→All Programs→HP Client Automation Administrator→ Client Automation Administrator CSDB Editor**.

2 Log on as the administrator (by default, the user ID is admin and the password is secret).

3 Go to PRIMARY.OS.LME and drag and drop the instances to the HW Config (LDS) instance. In this example, use the three elements created above.

Step 3: Set Policy

Before you set policy that will deploy hardware configurations to your target devices, you must understand how policy works.

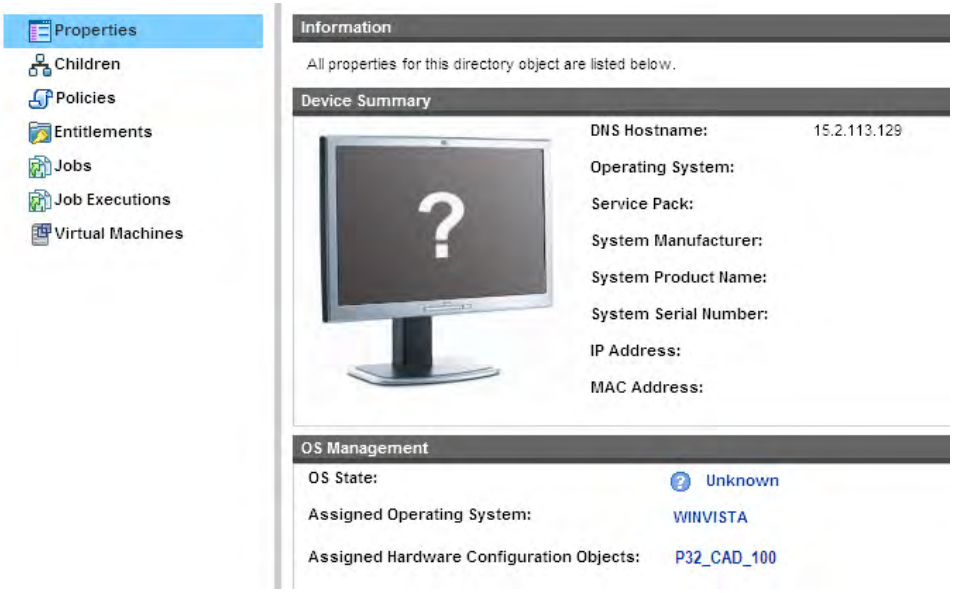
This section provides an overview of the steps needed to set policy. For details about how policy works in the OS Manager, see About Policy in the *HP Client Automation OS Manager System Administrator User Guide.*

To set policy

1. Go to **Start→All Programs→HP Client Automation Administrator→ Client Automation Administrator CSDB Editor**.
2. Log on as the administrator (by default, the user ID is admin and the password is secret).
3. Go to the LDS instance and drag and drop it on the appropriate policy class instance, typically a Machine Manufacturer or Machine Model instance.

Reviewing the Assigned Hardware Configuration Objects

After an HPCA OS connect has occurred and the hardware configuration has been deployed to a target device, you can review the Assigned Hardware Configuration Objects that have been successfully applied. To do this, go to the Device Properties sheet in the Enterprise Manager.



Modifying the Hardware Configuration on a Device

If we want to continue with our example, consider that once your hardware configuration is in its desired state, it may remain that way for quite a while. However, at some time in the future, you may need to change the hardware configuration. For example, you may want to update your BIOS with the latest version of firmware. If you want to do this, you would:

1. Publish the resources for the updated firmware. For example, you would publish the resources with the description Pro32 WS Bios Rev 2.00 Resources and the instance name P32_BIOS_200.
2. Use the CSDB Editor to make any necessary modifications to the HWCE for the updated firmware. See To configure the Hardware Configuration Element on page 21 for details.
3. Create a new Hardware Configuration object, such as Pro32 WS CAD Setup Rev 1.10 (instance name P32_CAD_110), and connect the following HWCEs to this object.
   - Pro32 WS Bios Rev 2.00
   - Pro32 WS Array 1 Drive Rev 1.00
   - Pro32 WS Array Mirrored (1 Spare) Rev 1.00

4. Change policy to deploy the new Hardware Configuration object Pro32 WS CAD Setup Rev 1.10.
5. The next time the target device does an HPCA OS connect, it detects the hardware configuration and applies the tasks connected to this hardware configuration.
6. In the Enterprise Manager go to the Device Properties sheet for the target device to view the Current Hardware Configuration again. Notice that the new Hardware Configuration object, P32_CAD_110, is listed. Access the ROM object to view the Current HWCEs. In this example, the elements, P32_DAC_MIRR_100 and P32_LVOL_1DRV_100 remain unchanged and only the new BIOS, P32_BIOS_200 will be applied to reach the new desired state.

If there were no consequences or dependencies, the elements DAC and LVOL were not modified at all. However, if there was some consequence, then one or both of the elements may have been reapplied to the device.

3 Using Shadow Hardware Configuration Elements

At the end of this chapter, you will:

- Understand what a Shadow HWCE is and when to use one.

A Shadow HWCE is an exception to how a device's state is typically managed. A Shadow HWCE is applied to your target device once and is then removed from the hardware configuration. In other words, the operation is run once on a device, but does not become part of the Current HWCEs (also known as the Last Remembered State).

This is used in rare cases where external factors or physical changes to a target device might require that a maintenance task is performed. You are not reapplying the entire hardware configuration, but are simply tweaking the configuration.

Note that there is *no way to check if a BIOS setting that you applied still exists*. You must determine whether to reapply the HWCE, apply a Shadow HWCE, or re-install the operating system.

For example, use a Shadow HWCE if you set up a disk array. If a drive fails and is replaced by a new one, the target device is still operable and the disk array HWCE is intact. However, the controller might require a trigger to synchronize the new drive as a spare. To do this, a Shadow HWCE must be defined and added to the Last Remembered State, so that the Last Remembered State reflects reality.

Shadow HWCEs:

- Must be appended to the Current Hardware Configuration in a machine object.
- Are always applied before a regular HWCE.
- Cannot have any consequences (Post-requisite HWCEs).
- Can only have dependencies (Conditional Pre-requisite HWCEs) on other Shadow HWCEs.
- Are only applied once, and then their association to the target device is removed.
- Does not alter the other Current HWCEs.

Shadow HWCEs are different from regular HWCEs because they are not assigned by policy. They are assigned to a specific device to perform a one-time operation. You are temporarily adding an element to the hardware configuration in order to put the target device back to its desired state.

To create and apply Shadow Hardware Configuration Elements

1. Use the Publisher to publish the resources for the Shadow HWCE to the HP Client Automation Configuration Server Database. For this example, you can name the package P32_DAC_MIRR_NS1_100 and type the

following description: **`Pro32 WS Array Mirrored Rev 1.00: Activate New Spare Resources`**.

2. In the CSDB Editor, go to PRIMARY.OS.LME.
3. Create an instance. The display name may be Pro32 WS Array Mirrored Rev 1.00: Activate New Spare, and the Instance name, may be P32_DAC_MIRR_NS1_100.
4. Modify the instance
5. Go to the CLASS attribute and set it to **_SHADOW_**.
6. Set the TYPE attribute to **`ACRCONFIG`**.
7. In the APPLYMTH attribute, type the apply method to be used.
8. Click **OK**.
9. Use the Perform a one-time HW Maintenance task Enterprise Manager to apply the Shadow Hardware Configuration Elements.

   No changes will be made to the target device until an HPCA OS connect occurs or you force the device to reboot. At this time, the system recognizes that the device needs to have the Shadow HWCEs applied. The Shadow HWCE is listed as part of the Current HWCEs for a short time only.

   After an HPCA OS connect occurs, the Shadow HWCEs are applied and deleted from the Current HWCEs.

A About the Hardware Configuration Element Class

This appendix provides detailed information about the attributes used to create Hardware Configuration Elements (HWCEs).

Table 6 Hardware Configuration Element Class

Name	Attribute Description	Default Value	Potential Values
Name (required)	Friendly name	N/A	N/A
Version	A user-defined version number. For reference only.	1.00	N/A
Class (required)	Identifies whether the HWCE is a Regular HWCE or a Shadow HWCE.	_REGULAR_	_REGULAR_ A regular HWCE is an object that identifies the resources and methods you use to bring a target device the state where it is ready to have an operating system installed. _SHADOW_ A Shadow HWCE is an exception to how a device's state is typically managed. A Shadow HWCE is applied to your target device one time and is then deleted. See Using Shadow Hardware Configuration Elements on page 30 for more information.
Type (required)	Generally a user-defined identifier. A hardware configuration would	N/A	**Examples of user-defined types** **BIOSFLASH** Flashes the BIOS of a

Name	Attribute Description	Default Value	Potential Values
	typically have only one HWCE with this type. If there is more than one HWCE with the same type, then only the first encountered will be applied. If a system has identical hardware components that an HWCE can be applied to, then you can set more than one HWCE to the same type and set the INSTANCE attribute to 0. See Instance Number on page 35 and About the Instance Number and Apply Method Attributes on page 40.		device. **NVRCONFIG** Configures the non-volatile RAM of a system. The purpose of this is to batch configure a system's parameters such as bootpath, PXE enable, OS type, and so on. There are many different parameters that can be set on a ProLiant server to customize its configuration. **ACRFLASH** Flashes the firmware of an array controller. **ACRCONFIG** Configures the array controller with respect to RAID volumes that are built from raw local disks or raw fiber channel LUNs (==FC disk drives). **LDRVCONFIG** Creates the logical drives (e.g., C:) from either raw local disks or by carving off a part of a RAID volume that has been set up. **NICFLASH** Flashes the firmware of network interface controllers (NIC). **NICCONFIG** Configures any programmable elements of NICs.

Name	Attribute Description	Default Value	Potential Values
			HBAFLASH Flashes the firmware of a SCSI or fiber channel host bus adapter (HBA) (disk controller). **HBACONFIG** Configures SCSI or fiber channel host bus adapter with regard to getting raw disks or FC LUNs (disks) assigned. **READ_CONFIG** Used for pre-configured HWCEs that read or capture the array/hardware/iLO/system configuration of the target device into a file that is uploaded to the OS Manager. **Reserved types** *Do not use the OS or DRIVEMAP types for your HWCEs because they are reserved for internal use only.* **OS** Causes an OS installation. **DRIVEMAP** Causes an OS installation.
Instance Number (0 -> apply to all) (required)	A unique number used to establish a convention between the apply methods and the application of the apply methods to a set of HWCEs. Information in this	0	0 or greater depending on the apply method scripts that you write. Typically, the value of 0 is used to indicate that you want an HWCE to be applied to *all identical components* of a device. If

Name	Attribute Description	Default Value	Potential Values
	field does not *do* anything until the person writing the apply method scripts uses it to establish conventions. See About the Instance Number and Apply Method Attributes on page 40 for more information.		you do this, the apply method script must interpret 0 as an indication to apply the script to all instances of the hardware configuration elements. If you set this to 1, the apply method may be applied to only one hardware configuration element. Again, the apply method script must support this. You can use values greater than 0 to indicate that the hardware configuration element should be applied to one or more identical pieces of hardware. See About the Instance Number and Apply Method Attributes on page 40 for more information.
Service OS Needed to Run Method	System defined service OS identifier.	_SVC_LINUX_	_SVC_LINUX_ to run the Linux Service Operating System. _SVC_PEX86 to run the WinPE 2.0 Service Operating System. Note: Be sure that you set the Service OS for each HWCE to ensure it will run in the required Service Operating System.
Apply Method (required)	A command line that initiates the HWCE. Note that text files	N/A	N/A

Name	Attribute Description	Default Value	Potential Values
	must be in the UNIX text file format. Also, please note that if you have an apply method that reboots the machine and you want messages to be seen by the user, you must redirect any output to `/dev/console`. For example, if your apply method flashes BIOS and you want the user to see a message indicating that the BIOS is being flashed and not to touch the power button, redirecting the output would ensure that the user sees the message before the reboot. See About the Instance Number and Apply Method Attributes on page 40 for more information.		

Name	Attribute Description	Default Value	Potential Values
Apply Behavior (required)	Defines the reboot behavior upon completion of the HWCE's apply method. Note that apply behavior must be in sync with the apply method otherwise you may run into problems deploying your hardware configuration. An example of an inconsistency would be if your apply method includes a reboot command, but the Apply Behavior is set to _NEVER_.	_NEVER_	_ALWAYS_ The apply method always triggers a reboot after the operation without returning control to the HPCA OS Manager User Agent. _OK_ After success, the apply method triggers a reboot without returning control to the HPCA OS Manager User Agent only. _NEVER_ The apply method never reboots and always returns control to the HPCA OS Manager User Agent. _ERROR_ *For future use.*
Post Behavior (required)	After an HWCE has been processed successfully, this instructs the machine being configured what to do next with regards to its boot state.	_CONTINUE_	_REBOOT_ Upon successful completion of an apply behavior operation, this triggers a reboot of system. _CONTINUE_ Upon successful completion of an apply behavior operation, the system will not reboot. It will continue on to the next HWCE or OS installation operation after HWCE processing returns.

Name	Attribute Description	Default Value	Potential Values
Failure (required)	The command or shell script returned an error and this indicates how to deal with that error.	_CRITICAL_	_CRITICAL_ Any failure of this HWCE operation is considered critical and will terminate HWCE /OS install processing. _IGNORE_ Any failure of this HWCE operation is considered a success for the purposes of HWCE processing.
Post-requisite HWCE	The HWCEs listed here must be applied after the HWCE being configured. These may also be referred to as consequences.	N/A	Type a friendly name, Type, or a combination of Type_Instance Number. A space is used as the separator between multiple items.
Conditional Pre-requisite HWCE	If there are HWCEs that need to be applied, they must be applied before the HWCE currently being configured. These may also be referred to as dependencies.	N/A	Type an HWCE's friendly name, Type, or a combination of Type_Instance Number. A space is used as the separator between multiple items. For example, the following may be a list of dependencies: `BIOSFLASH SMART5ICFG NVRAMFLASH_1` BIOSFLASH refers to the TYPE. SMART5ICFG refers to a specific HWCE. NVRAMFLASH_1 refers to the INSTANCE.

Name	Attribute Description	Default Value	Potential Values
Connections	Connections to published packages of resources.	N/A	N/A

About the Instance Number and Apply Method Attributes

You must understand the relationship between the instance number and the apply method.

The instance number is a unique, user-defined number used to establish a convention between an apply method (for an HWCE) and identical hardware in the target system. Information in this field does not *do* anything unless the person writing the apply method script uses it to establish conventions. For example, if you determine that setting the instance number to 0 means that the HWCE should be applied to all identical hardware in the target system, the person writing the apply method must establish this convention in the script, otherwise nothing will happen. Also, the person creating the HWCEs must define what is considered "identical hardware" based on the service OS, hardware configuration, and apply method.

Typically, instance values greater than zero designate that the hardware configuration element should be applied to one or more identical instances of a system's hardware components. The specific instances are defined by the script writer based on the service OS, hardware configuration, and apply method. For example, the apply method for a hardware configuration element with an instance number set to 1 may be intended to be applied to the first piece of matching hardware detected during an operating system boot. Or, it could mean that the apply method for the hardware configuration element with an instance number set to 2 may be intended to be applied to the second piece of matching hardware detected during an operating system boot. An instance number of 2 could also mean that this operation should be applied to all even numbered disks detected during operating system boot.

Remember, the value of the instance number is meaningless unless there is a convention between the HPCA use of the value and the apply method scripts that determine what is to be done with it.

Below are two examples of potential usage of these attributes.

Example 1

A system contains three identical disks that have been assigned the same HWCE. The instance number attribute in the HWCE is set to 1.

In this example, the apply method was written so that:

- An instance number set to 1 means that the operations should only be applied to one disk in the system. Whether the apply method is applied to disk 1, 2, or 3 depends on how the apply method was written.
- An instance number set to 0 means that the apply method is to apply the appropriate operations to each disk assigned to this hardware configuration element.

  To do this, the apply method script contains a loop that applies the method to all three disks. This loop ensures that the operation is applied to any number of disks that are assigned to this hardware configuration element.

If this same system contained 10 disks—five of type A and five of type B—you might want to apply the hardware configuration element only to type A disks. If this was the case, the script could be written so that if the instance number is set to 0, the HWCE would only be applied to type A disks.

Example 2

Two network interface cards (NICs) are eligible to PXE network boot but only one may be activated as PXE bootable at a time.

We could create two different Hardware Configuration Elements (HWCE) with the type set to NICCONFIG. The first HWCE enables the PXE boot and the second HWCE disables the PXE boot. All other parameters for the HWCEs are set identically.

In this case, you would not want to set the instance number to 0 for the HWCE that enables the PXE boot. If your script indicates that setting the instance number to 0 means that the operation is applied to all HWCEs, then all NICs would be enabled and this would cause issues.

However, you could set the instance number to 0 for the HWCE that disables the PXE boot. If your script indicates that setting the instance number to 0 means that the operation is applied to all HWCEs, then all NICs would be disabled and this may be useful.

Also, because you do not want the enable PXE and disable PXE HWCEs to overlap, you could create the apply method script to use an instance number set to 1 to designate the first NIC and you could use an instance number set to 2 to designate the second NIC.

B About the Hardware Configuration Class

This appendix provides detailed information about the attributes used to create Hardware Configuration objects.

Table 7 The Hardware Configuration Class

Name	Attribute Description	Default value	Potential values
Stop Expressions	For internal use only.	N/A	N/A
Connections	Allows you to manually create connections to hardware configuration elements.	N/A	N/A
Name	The name of the Hardware Configuration.	N/A	N/A
ZSVCPRI	Service Create Ordering *For internal use only.*	N/A	N/A
Version	A user-defined version number. For reference only.	1.00	N/A
MANUFLTR	Reg Expr to Filter Manufacturer Restricts the hardware that the hardware configuration is applied to based on manufacturer. You *must* enter information in the filter fields as a regular Tcl expression otherwise the hardware configuration will never be applied to	“”	Any regular Tcl expression

Name	Attribute Description	Default value	Potential values
	your target device. *We strongly recommend that you create a thorough plan for the proper filters.* See Step 2: Creating the Hardware Configuration on page 24 for detailed information.		
MODLFLTR	Reg Expr to Filter Model Restricts the hardware that the hardware configuration is applied to based on model. You *must* enter information in the filter fields as a regular Tcl expression otherwise the hardware configuration will never be applied to your target device. *We strongly recommend that you create a thorough plan for the proper filters.* See Step 2: Creating the Hardware Configuration on page 24 for detailed information.	“”	Any regular Tcl expression

C Best Practices

The following are some recommended best practices to follow when using Hardware Configuration Management.

- Deploy in a test environment before deploying Hardware Configuration Management in a production environment.
- Verify that the hardware configuration elements are correct with respect to scripts that you are running in the apply method.

D Maintenance

If you receive a fix from CPE, place it in `\IntegrationServer\OSM\SOS\linux\testing\work` and then reboot the machine.

E Pre-configured Hardware Configuration Elements for use with HP ProLiant Hardware

A number of Linux-based Hardware Configuration Elements (HWCEs) are available to allow you to perform various low-level configuration changes on HP ProLiant hardware. These are supplied as a set of files that can be imported into your HPCA Configuration Server DB.

These HWCEs have been tested and verified on various HP ProLiant ML/DL hardware, however variations in the physical configuration of the hardware may require that you make adjustments.

These Hardware Configuration Elements must be connected to a Hardware Configuration Object and then to a behavior. If multiple Hardware Configuration Elements apply to a Hardware Configuration Object, you must specify the order in which the HWCEs should be executed using the pre-requisite/post-requisite parameters specified in the HWCEs.

Importing the HWCEs to the HPCA Configuration Server DB

To import the resources for the HWCEs

1. From the HP Client Automation OS Manager media, copy the `hardware_configuration_management\HP\linux` directory which contains the resources to a temporary directory on the machine that has the Configuration Server installed.
2. Stop the Configuration Server.
3. Run `ImportLME.cmd`.

   This script populates the HPCA Configuration Server DB with the new HWCEs. All of the required resources and `.sh` files are provided.
4. When the import is complete, start the Configuration Server.

5 Use the HP Client Automation Portal and go to the HPCA Configuration Server DB, HW Config Element to confirm that the HWCEs were imported.

About the Pre-configured HW Configuration Management Elements

In this section you will learn about each of the pre-configured HWCEs that have been provided.

1 - Read ProLiant Hardware Inventory [Server Specific]

This HW Configuration Element captures the hardware configuration of the system using the hwdisc3 utility. The captured file is *machineName*.dat by default and is sent to the /upload directory of the OS Manager Server.

You can change the name of the file that gets uploaded when this HWCE is successfully executed. The name of the output file is machineName.dat by default. To change the name of the file from machineName.dat, modify the Apply Method as follows:

hpdiscovery.sh *RequiredFileName*

Packages connected to this HWCE

- SSSTLIB, which contains ssstlibs.tar.gz
- HPDISCOVERY which contains the script hpdiscovery.sh, the utility hpdiscovery, the libraries hpdiscoverylibs.tar.gz and the plugins hpdisc_plugin.tar.gz

  (HPDISCOVERY version 2.00 from HP)

Properties for the Read ProLiant Hardware Inventory [Server Specific] HWCE

You can use the Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 8 Properties

Field	Value
Friendly name	Read ProLiant Hardware Inventory [Server Specific]
Version	1.00
Class	_SHADOW_
Type	READ_CONFIG
Instance Number	2
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	hpdiscovery.sh
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

2 - Read ProLiant System Configuration

This HWCE captures the system configuration using the conrep utility. The captured file is `system.xml` by default and is sent to the `/upload` directory of the HPCA OS Manager Server.

You can change the name of the file that gets uploaded when this HWCE is successfully executed. To change the name of the file from the default `system.xml`, modify the Apply Method as follows:

`conrep.sh -s` *`FileName`*

Packages connected to this HWCE

- SSSTLIB contains `sstlibs.tar.gz`
- HW_INVENT_UTILS contains `conrep.xml`, `conrep.sh` and the utility conrep, version 1.81 from HP.

Properties for the Read ProLiant System Configuration HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 9 Properties

Field	Value
Friendly name	Read ProLiant System Configuration
Version	1.00
Class	_SHADOW_
Type	READ_ CONFIG
Instance Number	4
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`conrep.sh -s system.xml`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

3 - Read ProLiant Array Configuration

This HWCE captures the array configuration of the system using the acu utility. The captured file is `array.ini` by default and is sent to the `/upload` directory of the HPCA OS Manager Server.

You can change the name of the file that is uploaded when this HWCE is successfully executed. To change the name of the file from the default `array.ini`, modify the Apply Method as follows:

`acu.sh -c` *`FileName`*

Packages connected to this HWCE

- SSSTLIB contains `sstlibs.tar.gz`

- ARR_CONFIG_COMMON contains `acu.tar.gz` (having `.acuxebin` utility, version 7.85.18.0) and `acu.sh`

Properties for the Read ProLiant Array Configuration HWCE

You can use the HP Client Automation Portal to review the Hardware Configuration Element as specified in Table 8 on page 51.

Table 10 Properties

Field	Value
Friendly name	Read ProLiant Array Configuration
Version	1.00
Class	_SHADOW_
Type	READ_ CONFIG
Instance Number	1
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	acu.sh –c array.ini
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

4 - Read ProLiant iLO Configuration

This HWCE captures the iLO configuration of the system using the hponcfg utility. The captured file is `iLO.xml` by default and is sent to the `/upload` directory of the HPCA OS Manager Server.

You can change the name of the file that is uploaded when this HWCE is successfully executed. To change the name of the file from the default `iLO.xml`, modify the Apply Method as follows:

`hpconfg.sh -w` *`RequiredFileName`*

Packages connected to this HWCE

- iLO_CONFIG_COMMON contains `hponcfglibs.tar.gz`, utility hponcfg (version 1.60 from HP), and `hponcfg.sh`

Properties for the Read ProLiant iLO Configuration HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 11 Properties

Field	Value
Friendly name	Read ProLiant iLO Configuration
Version	1.00
Class	_SHADOW_
Type	READ_ CONFIG
Instance Number	3
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`hponcfg.sh –w iLO.xml`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

5 – Write ProLiant System Configuration

This HWCE loads the system configuration as specified in an xml file used as input to the conrep utility.

Prerequisite

You must publish an `.xml` file containing the required system configuration (e.g., `dl360g4.xml`) as a package (e.g., WRITE_SYSCONFIG_FILE) and connect it to this HWCE.

The file name in the Apply Method of the HWCE must match the name of the xml file that you publish. Modify the Apply Method as follows:

`conrep.sh -l RequiredFileName.xml`

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- SYS_CONFIG_COMMON contains conrep (version 1.81), `conrep.xml` and `conrep.sh`
- WRITE_SYSCONFIG_FILE contains the xml input file (e.g., `dl360g4.xml`)

Properties for the Write ProLiant System Configuration HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 12 Properties

Field	Value
Friendly name	Write ProLiant System Configuration
Version	1.00
Class	_REGULAR_
Type	NVRCONFIG
Instance Number	1
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	conrep.sh –l *.xml
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

6 – Write ProLiant Array Configuration

This HWCE deploys the Array (RAID) configuration of the system using the acu utility.

Prerequisite

You must publish an `.ini` file containing the required array configuration (e.g., `array.ini`) as a package (e.g., WRITE_ARR_CONFIG) and connect it to this HWCE.

The file name in the Apply Method of the HWCE must match the name of the `.ini` file that you publish. Modify the Apply Method as follows:

`acu.sh` –i *`RequiredFileName.ini`* –internal -reset

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- ARR_CONFIG_COMMON contains `acu.tar.gz` (utility `.acuxebin` ver 7.85.18.0) and the script `acu.sh`

Properties for the Write ProLiant Array Configuration HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 13 Properties

Field	Value
Friendly name	Write ProLiant Array Configuration
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	4
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	acu.sh –i *.ini –internal -reset

Field	Value
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

7 – Write ProLiant iLO Configuration

This HWCE deploys the iLO configuration to the target system using the hponcfg utility.

Prerequisite

You must publish an `.xml` file containing the required iLO configuration as a package and connect it to this HWCE.

The file name in the Apply Method of the HWCE must match the name of the `.xml` file that you publish. Modify the Apply Method as follows:

`hponcfg.sh -f` *`RequiredFileName`*.xml

Packages connected to this HWCE

- iLO_CONFIG_COMMON contains hponcfg (ver 1.60), `hponcfglibs.tar.gz` and `hponcfg.sh`.

Properties for the Write ProLiant iLO Configuration HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 14 Properties

Field	Value
Friendly name	Write ProLiant iLO Configuration

Field	Value
Version	1.00
Class	_REGULAR_
Type	ILOCONFIG
Instance Number	1
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`hponcfg.sh -f *.xml`
Apply Behavior	_NEVER_
Post Behavior	_CONTINUE_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

8 - Deploy Array Configuration RAID [Default]

This HWCE deploys the default array (RAID Default) configuration for the target device using the acu utility. Under this mode the acu utility determines the type of RAID to be configured based on the number of hard drives available (e.g., if two hard drives of same capacity are found, it automatically creates RAID 1).

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- ARR_CONFIG_COMMON contains `acu.tar.gz` (`.acuxebin` ver 7.85.18.0) and `acu.sh`
- DEP_RAID_DEFAULT_FILE contains `pl-acu-rd.ini` (this contains the default RAID configuration)

Properties for the Deploy Array Configuration RAID Default HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 15 Properties

Field	Value
Friendly name	Deploy ProLiant Array Configuration [Default]
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	0
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`acu.sh –i pl-acu-rd.ini –internal -reset`
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	DRIVEMAP
Conditional Pre-requisite HWCE	N/A

9 - Deploy Array Configuration RAID 0

This HWCE deploys the RAID 0 configuration for the target device using the acu utility.

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- ARR_CONFIG_COMMON contains `acu.tar.gz` (`.acuxebin` ver 7.85.18.0) and `acu.sh`
- DEP_RAID_0_FILE contains pl-acu-r0.ini (this contains the RAID 0 configuration)

Properties for the Deploy Array Configuration RAID 0 HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 16 Properties

Field	Value
Friendly name	Deploy ProLiant Array Configuration [RAID 0]
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	1
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`acu.sh –i pl-acu-r0.ini –internal -reset`
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	DRIVEMAP
Conditional Pre-requisite HWCE	N/A

10 - Deploy Array Configuration RAID 1

This HWCE deploys the RAID 1 configuration for the target device using the acu utility.

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- ARR_CONFIG_COMMON contains `acu.tar.gz` (`.acuxebin` ver 7.85.18.0) and `acu.sh`
- DEP_RAID_1_FILE contains pl-acu-r1.ini (this contains the RAID 1 configuration)

Properties for the Deploy Array Configuration RAID 1 HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 17 Properties

Field	Value
Friendly name	Deploy ProLiant Array Configuration [RAID 1]
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	2
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	acu.sh –i pl-acu-r1.ini –internal -reset
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	DRIVEMAP
Conditional Pre-requisite HWCE	N/A

11 - Deploy Array Configuration RAID 5

This HWCE deploys the RAID 5 configuration for the target device using the acu utility.

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- ARR_CONFIG_COMMON contains `acu.tar.gz` (`.acuxebin` ver 7.85.18.0) and `acu.sh`
- DEP_RAID_5_FILE contains pl-acu-r5.ini (this contains the RAID 5 configuration)

Properties for the Deploy Array Configuration RAID 5 HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 18 Properties

Field	Value
Friendly name	Deploy ProLiant Array Configuration [RAID 5]
Version	1.00
Class	_REGULAR_
Type	ACRCONFIG
Instance Number	3
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`acu.sh -i pl-acu-r5.ini -internal -reset`
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	DRIVEMAP
Conditional Pre-requisite HWCE	N/A

12 – Reset ProLiant System Configuration [Reset to Factory Defaults] (Shadow HWCE)

This HWCE resets the BIOS configuration of the device to the factory defaults.

Packages connected to this HWCE

- SSSTLIB contains `ssstlibs.tar.gz`
- RBSU_UTILITY contains rbsureset utility version 1.00 from HP

Properties for the Reset ProLiant System Configuration [Reset to Factory Defaults] HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 19 Properties

Field	Value
Friendly name	Reset ProLiant System Configuration [Reset to Factory Defaults]
Version	1.00
Class	_SHADOW_
Type	NVRCONFIG
Instance Number	2
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	rbusreset -reset
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

13 – ProLiant Firmware Upgrade [All Firmwares]

This HWCE upgrades the firmware of the target device using the Firmware Maintenance ISO. The Service OS mounts the Firmware Maintenance ISO over http and runs the required firmware upgrade startup script.

Prerequisites

- The Firmware Maintenance ISO. To get this ISO, go to **http://h18023.www1.hp.com/support/files/server/us/romflash.html** and click the link **Click here to download or purchase the HP ProLiant Firmware Maintenance CD**.

- Once you have the Firmware Maintenance ISO, store it in the `\upload` directory of the OS Manager.
- Change the Apply Method of the HWCE to the name of the Firmware Maintenance ISO. For example:

  `firmware_upgrade.sh` *`FileName`*.iso

- `firmware_upgrade.sh` and Firmware Maintenance CD as input, containing the firmware upgrades.

Packages connected to this HWCE

- FWUPGRADE contains `firmware_upgrade.sh`
- FW_UPGRADE_LIB contains the library `libstdc++-libc6.2-2.so.3` in `fw_upgrade_lib.tar.gz`

Properties for the ProLiant Firmware Upgrade [All Firmwares] HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 20 Properties

Field	Value
Friendly name	ProLiant Firmware Upgrade All
Version	1.00
Class	_REGULAR_
Type	BIOSFLASH
Instance Number	0
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`firmware_upgrade.sh *.iso`
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

14 – ProLiant Firmware Upgrade [Individual]

This HWCE upgrades firmwares of individual peripheral devices (e.g., NIC, Array) using the firmware upgrade `.scexe` files that are published and connected to this HWCE.

Prerequisite

Publish the required firmware upgrade files (`.scexe`) and connect them to this HWCE.

Packages connected to this HWCE

- FWUPGRADE_IND contains `fw_upgrade_individual.sh`.
- FW_UPGRADE_LIB contains the library `libstdc++-libc6.2-2.so.3` in `fw_upgrade_lib.tar.gz`.

Properties for the ProLiant Firmware Upgrade [Individual] HWCE

You can use the HP Client Automation Portal to review the hardware configuration element as specified in Table 8 on page 51.

Table 21 Properties

Field	Value
Friendly name	ProLiant Firmware Upgrade [Individual]
Version	1.00
Class	_REGULAR_
Type	BIOSFLASH
Instance Number	1
Service OS Needed to Run Method	_SVC_LINUX_
Apply Method	`fw_upgrade_individual.sh *.scexe`
Apply Behavior	_NEVER_
Post Behavior	_REBOOT_
Failure	_CRITICAL_

Field	Value
Post-requisite HWCE	N/A
Conditional Pre-requisite HWCE	N/A

Glossary

Current Hardware Configuration Elements

See Last Remembered State (LRS).

Hardware Configuration object

The Hardware Configuration object contains the information about how a target device's hardware must be configured in order for it to be ready for operating system installation. It contains one or more Hardware Configuration elements.

Hardware Configuration element (HWCE)

A Hardware Configuration Element is an object that identifies the resources and methods to be used to bring a target device the state where it is ready to have an operating system installed.

A Hardware Configuration Element must define:

- The system device or components it applies to.
- The resource files required to manage the element.
- The methods for the operations.
- Sequencing information with respect to dependencies upon other Hardware Configuration Elements.
- Additional Hardware Configuration Elements that must be applied if this Hardware Configuration Elements is applied.
- Information for handling failures, reboot sequencing, nd post-Hardware Configuration Elements completion steps

Last Remembered State (LRS)

A list of the hardware configuration elements previously configured on the device. When operating system management resolution occurs, the Last Remembered State and the new resolved state of hardware configuration elements are compared to determine what hardware configuration elements must be configured.

Also called *Current Hardware Configuration Elements*.

Shadow Hardware Configuration Elements

A Shadow Hardware Configuration Element is an exception to how a device's state is typically managed. A Shadow Hardware Configuration Element is applied to your target device one time and is then deleted. In other words, the operation is run one time on a device, but does not become part of the Current Hardware Configuration Elements (also known as the Last Remembered State).

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