HP Scripting Toolkit Linux Edition User Guide

Abstract

The Toolkit is designed for IT experts with experience in scripting operating system installations and configuring HP ProLiant server hardware.

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1 Introduction

Scripting Toolkit

The Scripting Toolkit is a server deployment product for IT experts that delivers an unattended automated installation for high-volume server deployments. This document describes how to best use the Toolkit to configure HP ProLiant servers. It also contains information about the Toolkit utilities and how to use them in an unattended environment. This document does **not** include information about installing the operating system.

△ **CAUTION:** Improper use of the Toolkit utilities can result in loss of critical data. Because of the potential data-loss risk, only individuals experienced in scripting operating system installations and configuring ProLiant server hardware should use the Toolkit utilities. Before using the Toolkit, all necessary precautions must be taken to ensure that mission-critical systems remain online if a failure occurs.

Minimum requirements

Before beginning the deployment process, be sure to have the following items available:

- Scripting Toolkit Linux Edition
- *HP Scripting Toolkit Linux Edition User Guide*
- A Linux workstation (any Linux distribution)

2 Deployment using the Scripting Toolkit

Deployment overview

The Scripting Toolkit includes a set of utilities for configuring and deploying servers in a customized, predictable, and unattended manner. These utilities enable you to duplicate the configuration of a source server on target servers with minimal user interaction.

IMPORTANT: HP ProLiant 100 series servers do not support all toolkit commands. See the following descriptions for utility usage. Commands that are supported might not work as expected. For a better understanding, read each section of the documentation carefully.

You can perform server deployments in many different ways using the Toolkit, but every deployment must include the following basic steps:

1. Create a network share.
2. Prepare the bootable media (CD/DVD, USB drive key, or PXE).
3. Configure the system and storage hardware on the target server.
4. Perform the operating system installation.

HP also recommends installing the latest version of the HP SPP. To obtain the most current SPP, see the SPP website (http://www.hp.com/go/spp).

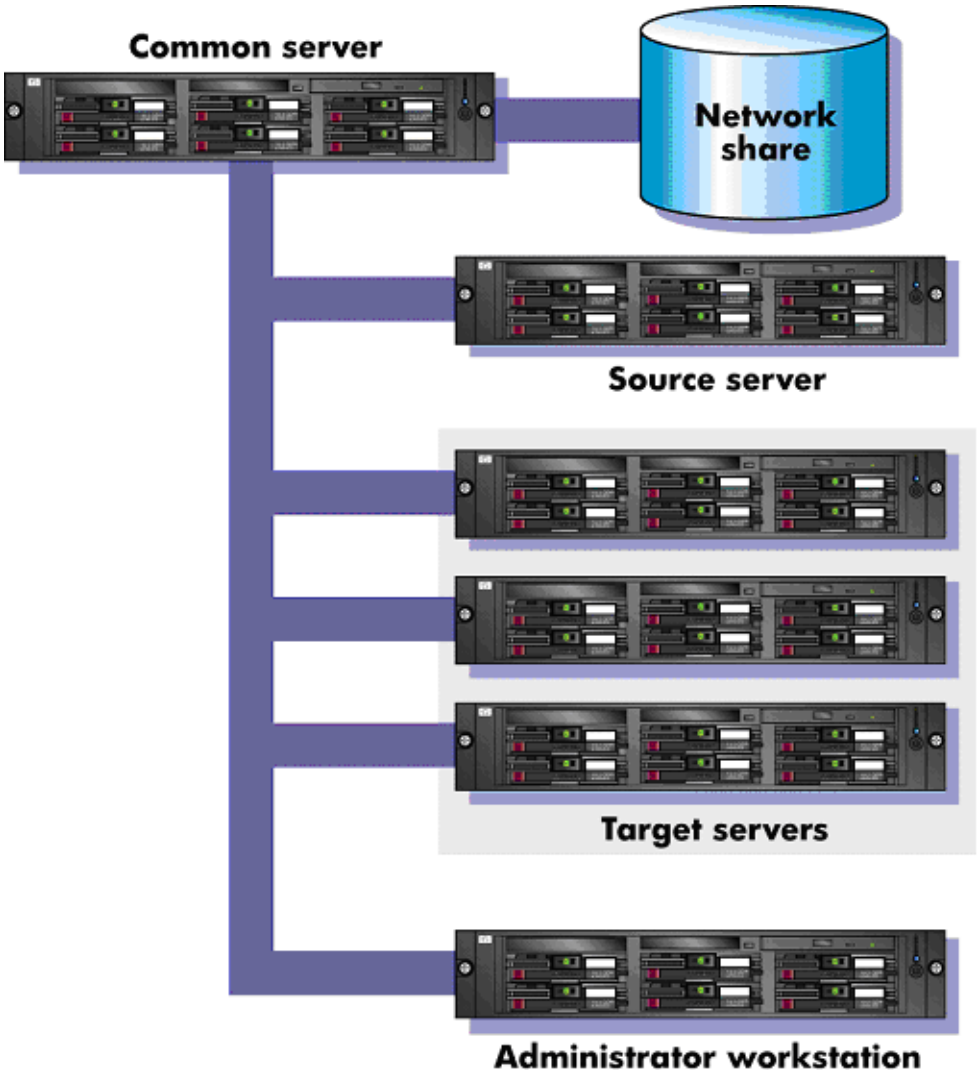
IMPORTANT: Not all options can be configured using Toolkit utilities. Some options must be configured manually or with other configuration utilities, which are available online, before they can be used with the Toolkit. For more information on configuration, see the option documentation.

Sample deployment procedure

The following procedure is a case study of a typical deployment. This procedure assumes that you are performing a CD-based installation and that you want to replicate an existing server configuration. The process described in this section can vary depending on your specific requirements.

This section provides a simple overview of a basic deployment, but the flexibility of the Scripting Toolkit enables you to do much more. With an understanding of the basic steps and your own deployment environment, you can use the Toolkit to further customize and automate the deployment process. For information on automating deployments, see "Booting and OS installation" (page 11).

Creating a network share



To create a network share:

1. Download the appropriate Scripting Toolkit package from the Toolkit website (http://www.hp.com/go/ProLiantSTK).
2. Extract the Toolkit package on a common server that resides on the same network as the servers to be deployed.
3. Use the Linux NFS Server Configuration Tool to share the directory in which you extracted the Toolkit package and to assign read and write permissions for all hosts.

Capturing a reference configuration from the source server

1. At the source server, boot the CD that contains the custom Linux Toolkit image.
2. At the boot prompt, type `bash`, and then press **Enter.** When the process is complete, a command prompt appears.
3. Load the network drivers using the loadnet script:

   ```
   /loadnet.sh
   ```

4. Load appropriate storage controller drivers:

   ```
   modprobe -f cciss
   ```

5. Load the channel interface driver for iLO:

   ```
   insmod /opt/hp/hp-ilo/bin/`uname -r`/hp_ilo.ko
   ```

6. Mount the network share:
   ```
   mkdir /mnt/toolkit_share
   ```
7. Capture a hardware discovery report using the HPDISCOVERY utility:
   ```
   cd /mnt/toolkit_share/utilities
   ```
8. Capture the system BIOS configuration using the CONREP utility:
   ```
   cd /mnt/toolkit_share/utilities
   ./conrep -s -f/mnt/toolkit_share/data_files/conrep.dat
   ```
9. Capture the Smart Array configuration using the ACU utility:
   ```
   cd /mnt/toolkit_share/utilities/hpacuscripting
   ./hpacuscripting -c /mnt/toolkit_share/data_files/hpacuscripting.dat
   ```
10. Capture the iLO configuration using the HPONCFG utility:
    ```
    cd /mnt/toolkit_share/utilities
    ./hponcfg -w /mnt/toolkit_share/data_files/hponcfg.dat
    ```
11. Edit the iLO configuration report to create an iLO configuration script:
    ```
    vi /mnt/toolkit_share/data_files/hponcfg.dat
    Unmount the network share
    umount /mnt/toolkit_share
    ```
12. Reboot the source server, and then eject the Toolkit CD.

Creating an ISO image to be written to CD

The `mkisofs` command is used to create an ISO image. The following table describes the arguments used with this command.

Argument	Description
`-o linuxbootCD.iso`	This argument is the output of the `mkisofs` command, the ISO file.
`-b isolinux/isolinux.bin`	This argument sets `isolinux.bin` as the bootloader.
`-V LinuxBootCD`	This argument sets the volume label of the CD.
`./linuxbootCD`	This argument specifies the target directory that will be the root of the CD.

To create the ISO image, execute the following command at the shell prompt:

```
mkisofs -J -iso-level 3 -R -L -o linuxbootCD.iso \
-b isolinux/isolinux.bin -c isolinux/boot.cat \
-V LinuxBootCD \
-no-emul-boot -boot-load-size 4 \
-boot-info-table \
./linuxbootCD
```

Now, the ISO file can be written to a CD.

Configuring the target server

1. At the target server, boot the CD that contains the custom Linux Toolkit image.
2. At the boot prompt, type `bash` and then press **Enter.** When the process is complete, a command prompt appears.
3. Load the network drivers using the loadnet script:
   ```
   /loadnet.sh
   ```

4. Load appropriate storage controller drivers:
   ```
   modprobe -f cciss
   ```
5. Load the channel interface driver for iLO:
   ```
   insmod /opt/hp/hp-ilo/bin/`uname -r`/hp_ilo.ko
   ```
6. Mount the network share:
   ```
   mkdir /mnt/toolkit_share
   ```
7. Apply the system BIOS configuration using the CONREP utility:
   ```
   ./conrep -l -f/mnt/toolkit_share/data_files/conrep.dat
   ```
8. Apply the Smart Array configuration using the ACU utility:
   ```
   cd /mnt/toolkit_share/utilities/hpacuscripting
   ```
9. Apply the iLO configuration using the HPONCFG utility:
   ```
   cd /mnt/toolkit_share/utilities
   ```
10. Unmount the network share:
    ```
    umount /mnt/toolkit_share
    ```
11. Insert the operating system CD.
12. Reboot the server to run the operating system installation.

Installing the operating system

For information on performing an unattended operating system installation, see "Booting and OS installation" (page 11). For additional information, see the following resources:

- Operating system documentation
- Kickstart or AutoYAST documentation

3 Booting and OS installation

SYSLINUX

SYSLINUX is a free third-party bootloader available at the SYSLINUX web page (http://syslinux.zytor.com/index.php).

SYSLINUX is a suite of programs that perform various boot functions. The Scripting Toolkit uses the following bootloader programs:

- `isolinux.bin`—Boot from ISO media.
- `pxelinux.0`—Boot using PXE protocol.
- `ldlinux.sys`—Boot from a USB drive key.

The bootloaders each require a configuration file to run:

- `isolinux.cfg`—Use when booting from ISO media.
- `default`—Use when booting using PXE.
- syslinux.cfg—Use when booting from a USB drive key.

In the boot files (`isolinux.cfg`, `default`, and `syslinux.cfg`), the following options are supported in the append statements.

Option	Description
`sstk_mount=<device>`	This command specifies the device node or name to mount; for example, `/dev/hdc` or `10.0.0.1:/nfs_bootstrap`
`sstk_mount_type=<mount type>`	This command specifies the file system type of the device; for example, `nfs`, `vfat`, or `iso9660`
`sstk_mount_options=<mount options>`	This command specifies the options for mounting the device; for example, `ro`, or `ro,nolock` for NFS
`sstk_script=<script filename>`	This command specifies the administrator-created script that executes to continue the process. Typically, the script uses Toolkit tools to configure and update the system, and then begins an operating system installation.
`network=1`	This command causes the bootstrap script to load network drivers and use DHCP to acquire a network address.

The bootstrap script included with the Toolkit performs the following commands:

```
mount -t $sstk_mount_type $sstk_mount /mnt/main -o $sstk_mount_options
exec /mnt/main/$sstk_script
```

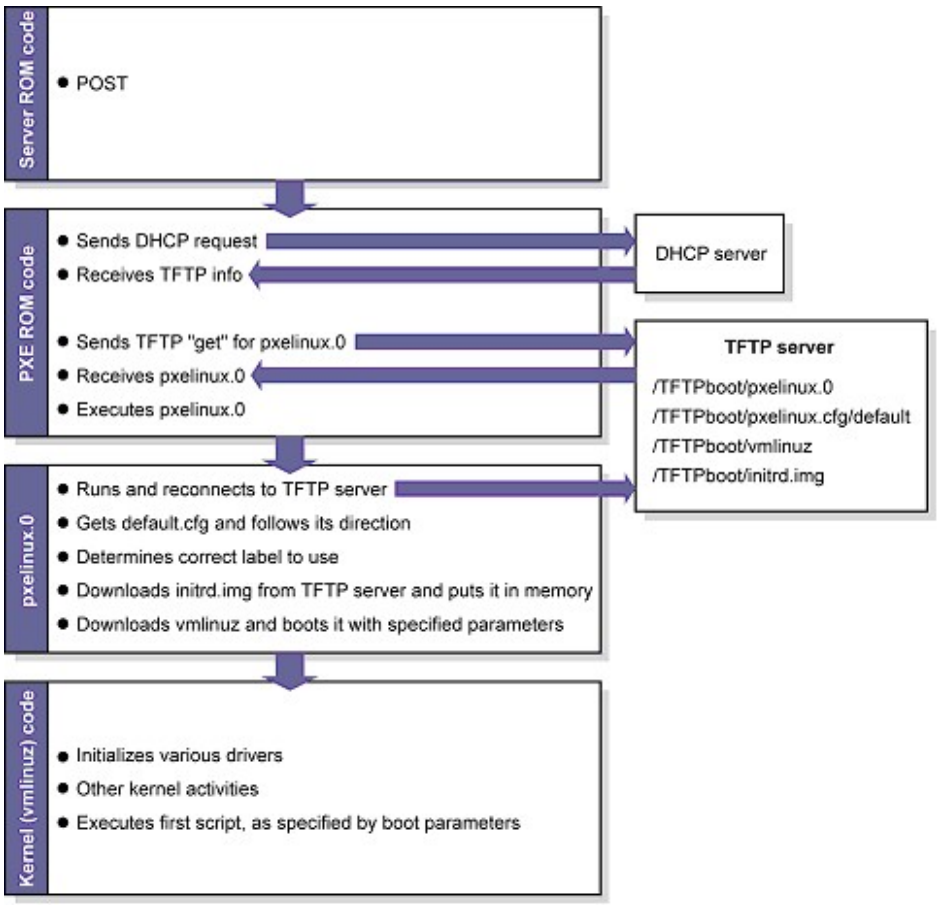
For more information about SYSLINUX usage, see the SYSLINUX web page. (http://syslinux.zytor.com/index.php)

Booting using PXE

A basic understanding of DHCP, PXE, and TFTP is required to perform the procedure described in this section.

Examples in this section might not be specific to your operating system environment. For more information about your particular environment, see the Linux system administrator's guide.

The following figure illustrates a simplified Toolkit PXE boot.



Setting up a PXE boot environment requires the following general steps:

1. Set up a DHCP server with the appropriate options.
2. Set up a TFTP server with the appropriate options.
3. Populate the TFTP directory share with the Linux Toolkit boot components.

These steps assume that a Linux workstation is used as the DHCP/TFTP server. You might need to download additional components and adapt the following instructions to suit your environment.

Setting up a TFTP server

Most Linux installations include a TFTP server and an automated method of launching the server upon receiving a TFTP request. The parent process for detecting a TFTP request and launching the TFTP server is called xinetd. However, you might have to enable the TFTP service. The TFTP file is located in the /etc/xinetd.d/ directory. The following is a sample TFTP file:

```
# default: off
# description: The tftp server serves files using the \
# trivial file transfer protocol. The tftp protocol is \
# often used to boot diskless workstations, download \
# configuration files to network-aware printers and to \
# start the installation process for some operating systems.
service tftp
{
socket_type = dgram
protocol = udp
wait = yes
user = root
```

```
server = /usr/sbin/in.tftpd
server_args = -s /tftpboot
disable = yes
per_source = 11
cps = 100 2
}
```

In this example, `disabled` is the default setting, and `/tftpboot` is the root directory for all client access.

To enable the TFTP service on your server, edit the disable line to read:

```
disable = no
```

Populating the TFTP directory share

Use the `/tftpboot` directory from the "Setting up a TFTP server" (page 12) section as the directory where TFTP clients get their files. To populate the TFTP directory share:

1. Create a `/tftpboot` directory, if needed.
2. Copy the necessary boot files to the `/tftpboot` directory:
   - `pxelinux.0` (the SYSLINUX binary used for PXE boot)
   - `initrd.img` (the Linux file system)
   - `vmlinuz` (the Linux kernel)
3. Create a pxelinux configuration file subdirectory called `/tftpboot/pxelinux.cfg`.
4. Copy the default file (the boot configuration used by `pxelinux.0`) into the `/tftpboot/pxelinux.cfg/` directory.

The `tftpboot` directory should now contain the following items:

```
/tftpboot/pxelinux.0
/tftpboot/initrd.img
/tftpboot/vmlinuz
/tftpboot/pxelinux.cfg/default
```

Setting up a DHCP server

To set up a DHCP server, create and edit a `dhcpd.conf` file in the `/etc` directory of your server. The following is a sample `dhcpd.conf` file:

```
allow booting;
allow bootp;
ddns-update-style interim;
```

[You must customize the file by inserting the appropriate DHCP directives, IP ranges, subnet masks, and so on here.]

```
next-server IP_ADDRESS_OF_TFTP_SERVER;
filename "pxelinux.0";
```

The `next-server` command tells the DHCP client where to send the TFTP get request.

The `filename` command tells the DHCP client which file to get. In this example, the file is `pxelinux.0`.

When you have finished creating the dhcpd.conf file, restart the DHCP server:

```
/etc/init.d/dhcpd restart
```

Booting from a USB drive key

Some applications require the use of a writable medium. While booting from CD is not suitable for this purpose, a USB drive key provides the ideal medium as a writable medium.

NOTE: Booting from a USB drive key is supported only on certain ProLiant servers. For more information, see the HP S PP website (http://www.hp.com/go/spp).

To set up a USB drive key to boot the Toolkit environment:

1. Download `ss_toolkit.linux.tar.gz@8.40_pubsw-linux_en` from (http://www.hp.com).

   Extract the file to a directory of your choice. (The following example uses `/Toolkit`).
2. Make a directory, extract the files, and then change the directory to the extracted toolkit directory.

   ```
   mkdir -p /Toolkit
   tar xfz ss-scripting-toolkit-linux-8.50.tar.gz -C /Toolkit
   cd /Toolkit/ss-scripting-toolkit-linux-8.50
   ```
3. Enter the following command on the BASH command-line prompt:

   ```
   ./mkusbkey.sh /dev/XXX
   ```

   where *XXX* is the device node of your USB drive key.

   If you do not know the device node associated with your USB drive key, run the `fdisk -l` command to view the devices available to the operating system.

If the script creates the key successfully, the following message appears:

```
USB Key created successfully on device /dev/XXX
```

Performing an unattended operating system installation

Sample scripts are provided with the Toolkit to simplify the installation process. These scripts are used for the following:

- System hardware configuration
- Operating system preinstallation configuration

However, these scripts **must** be modified for your particular environment.

System hardware configuration

The sample `install_rhel4.sh` script performs many hardware configuration tasks, including:

- Copying all toolkit utilities from the network share to the target server
- Running hardware discovery to determine server type
- Obtaining server ID information from the hardware discovery file
- Copying server-specific configuration script and data files from the network share
- Loading drivers for storage controllers and any other devices that must be configured
- Running the CONREP utility
- Running the HPACUSCRIPTING utility, if needed (this action is server-specific)
- Running any other configuration utilities
- Running hardware discovery to determine the boot controller
- Obtaining the device node of the boot controller (this information is required for the disk-carving portion of the operating system setup)
- Running the operating system-specific setup script

The scripting for these steps **must** be adapted to your server deployment process. In particular, be sure to change the IP address and path of the NFS server to match your environment. You might also need to make other modifications, such as adding extra configuration steps (for instance, running HPONCFG to configure iLO) or additional servers.

The sample `install_rhel4.sh` script is similar to the following:

```
#!/bin/bash
## this script's methods work for RHEL 5
## SAMPLE. Change the NFS mount points to match your environment
export NFS_TOOLKIT_DIR=10.0.0.1:/TOOLKIT
## Internal Variables, do not modify
export TOOLKIT=/TOOLKIT
export NFS_MAIN=/mnt/nfs
export HPDISCOVERY_FILE=/TOOLKIT/hpdiscovery.xml
export SERVERNAME=
export BOOTDEVNODE=
clear
echo "*** Performing RHEL4 installation ***"
echo "Mounting NFS share"
mkdir ${NFS_MAIN}
mount -t nfs ${NFS_TOOLKIT_DIR} ${NFS_MAIN} -o ro,nolock
if [ $? != 0 ]; then
echo "Unable to mount NFS share, make sure you updated the $0 script
with the location of your NFS server."
exec /bin/bash
fi
echo "Copying over toolkit scripts and utilities from NFS share"
cd ${TOOLKIT}
cp -a ${NFS_MAIN}/scripts/* ${TOOLKIT}
cp -a ${NFS_MAIN}/utilities/* ${TOOLKIT}
cp -a ${NFS_MAIN}/data_files ${TOOLKIT}
echo ""
echo "Loading storage drivers for hardware"
./load_modules.sh
echo ""
echo "Pausing to allow drivers to finish loading"
sleep 15
echo ""
echo "Configure server"
## run hardware discovery
./hpdiscovery -f ${HPDISCOVERY_FILE}
## use hwquery to fetch the SystemName from hardware discovery file. ( extra " " are required )
export "`./hwquery ${HPDISCOVERY_FILE} allboards.xml SERVERNAME=SystemName`";
echo "Server Type: ${SERVERNAME}"
case "${SERVERNAME}" in
"ProLiant DL380 G4" )
# Apply System Configuration
./conrep -l -fdata_files/dl380g4_conrep.dat
# Apply Array Configuration for Smart Array 6i Controller if present
```

```
./ifhw ${HPDISCOVERY_FILE} allboards.xml "PCI:Smart Array 6i Controller" 2> /dev/null
if [ $? = 0 ] ; then
cd ${TOOLKIT}/hpacuscripting
./hpacuscripting -i ../data_files/dl380g4_sa6i_hpacuscripting.dat
fi
# Apply Array Configuration for Smart Array P600 Controller if present
./ifhw ${HPDISCOVERY_FILE} allboards.xml "PCI:Smart Array P600 Controller" 2> /dev/null
if [ $? = 0 ] ; then
cd ${TOOLKIT}/hpacuscripting
./hpacuscripting -i ../data_files/dl380g4_p600_hpacuscripting.dat
fi
## ADD EXTRA DL380 G4 Configuration Steps HERE
;;
"ProLiant BL45p G1" )
./conrep -l -fdata_files/bl45pg1_conrep.dat
# Apply Array Configuration for Smart Array 6i Controller if present
./ifhw ${HPDISCOVERY_FILE} allboards.xml "PCI:Smart Array 6i Controller" 2> /dev/null
if [ $? = 0 ] ; then
cd ${TOOLKIT}/hpacuscripting
./hpacuscripting -i ../data_files/bl45pg1_sa6i_hpacuscripting.dat
fi
## ADD EXTRA BL45p G1 Configuration Steps HERE
;;
"ProLiant ML310 G2" )
./conrep -l -fdata_files/ml310g2_conrep.dat
./ifhw ${HPDISCOVERY_FILE} allboards.xml "PCI:Intel(R) 6300ESB Ultra ATA Storage/SATA Controller"
if [ $? = 0 ] ; then
echo "Plain SATA found"
# Plain SATA, set BOOTDEVNODE manually since hardware discovery won't find IDE devices
export BOOTDEVNODE=/dev/hda
fi
## ADD EXTRA ProLiant ML310 G2 Configuration Steps HERE
;;
## ADD MORE SERVERS HERE
ProLiant* )
echo "No configuration process defined for this ProLiant server"
echo "Update $0 with steps for this ProLiant server"
exec /bin/bash
;;
* )
echo "Unrecognized Server"
exec /bin/bash
;;
esac
## CONTINUE COMMON INSTALL PROCESS
cd ${TOOLKIT}
echo "Pausing to allow drivers to catch up"
sleep 5
```

```
echo ""
echo "Rerun hardware discovery to find boot device"
./hpdiscovery -f ${HPDISCOVERY_FILE}
## use hwquery to fetch the boot dev node from hardware discovery file.
if [ -z ${BOOTDEVNODE} ]; then
export `./hwquery ${HPDISCOVERY_FILE} allboards.xml BOOTDEVNODE=DevNode`
fi
echo "Boot Device=${BOOTDEVNODE}"
if [ -z ${BOOTDEVNODE} ]; then
echo "MISSING boot device dev node. Check that the drivers are loaded."
exec /bin/bash
fi
ls -al ${BOOTDEVNODE}*
ln -s ${BOOTDEVNODE} /dev/sssd
echo "### Linux Unattended Install using Kickstart ###"
echo "clearing mbr and a few more sectors"
dd if=/dev/zero of=/dev/sssd bs=512 count=32
echo "forcing kernel to re-read partition table"
sfdisk --re-read /dev/sssd
sleep 5
echo "landing mbr"
dd if=${NFS_MAIN}/linux_unattend/generic.mbr of=/dev/sssd bs=512 count=1
echo "create new 256M FAT16 partition using sfdisk"
echo "0,256,6,*" | sfdisk -uM -D /dev/sssd
echo "forcing kernel to re-read partition table"
sfdisk --re-read /dev/sssd
sleep 5
## make symlink for first partition, usually sda1 or c0d0p1
if test -e ${BOOTDEVNODE}1 ; then
ln -s ${BOOTDEVNODE}1 /dev/sssd1
elif test -e ${BOOTDEVNODE}p1 ; then
ln -s ${BOOTDEVNODE}p1 /dev/sssd1
else
echo "Partition 1 missing, check that partition creation succeeded"
exec /bin/bash
fi
ls -al /dev/sssd1
cd ${NFS_MAIN}/linux_unattend/rhel4/
echo "landing diskboot.img from RHEL4-disc1/images/"
dd if=diskboot.img of=/dev/sssd1
## mount disk
echo "mounting to /mnt/dos"
mount -t vfat /dev/sssd1 /mnt/dos
##### MAKE SURE YOU MODIFY syslinux-rh.cfg FOR YOUR ENVIRONMENT #######
cp -a syslinux-rh.cfg  /mnt/dos/syslinux.cfg
cd ${TOOLKIT}
## unmount disk
```

```
umount /mnt/dos
umount ${NFS_MAIN}
## unmount everything else
#umount -a
#echo "Rebooting"
#sleep 5
#/bin/reboot c:
```

Microsoft Windows install_win.sh sample script

The `install_win.sh` sample script performs many of the same hardware configuration tasks described in "Performing an unattended operating system installation" (page 14).

Additionally, the sample `install_win.sh` script for Microsoft Windows performs preinstallation tasks, including:

- Creating a 2 GiB FAT16 primary partition
- Formatting the partition for the FAT file system
- Creating a boot sector for the partition
- Copying the FreeDOS operating system to the new C drive
- Copying the Windows installation sources, the `$oem$` directory, and `unattend.txt` files to the C drive

To use the `install_win.sh` sample script to install Microsoft Windows and `install_w2k8.sh` sample script to install Windows Server 2008:

1. Create an `unattend.txt` file by following the instructions in the Microsoft documentation (http://support.microsoft.com/kb/155197). A sample `unattend.txt` file is included in the `windows_unattend` directory.
2. Copy the Windows source files to the installation source. In this sample script, the installation source is a NFS file share.
3. Adapt the script to perform the correct hardware configuration, and change the NFS server IP address and path to match your environment.
4. Update the syslinux configuration file (`pxelinux.cfg`, `isolinux.cfg`, or `syslinux.cfg`) to reference the `install_win.sh` or `install_w2k8.sh` sample script.

Red Hat Linux anaconda-ks.cfg sample file

The operating system-dependent unattended installation file is not created by the Toolkit utilities. The user must create the file separately. In the following example, bold lines indicate modifications made to fully automate the installation of the operating system.

For a complete description of the options that can be modified in the `anaconda-ks.cfg` unattended installation file to customize the installation of Red Hat Linux, see the operating system documentation or the *Red Hat Linux 9: Red Hat Linux Customization Guide* (http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/custom-guide/part-install-info.html).

```
lang en_US
REM *** Modify the network settings to reflect required
REM *** network settings.
network --bootproto dhcp
REM *** The IP address should be the address of the
REM *** Linux repository server. The /SHAREVOL/RedHatCD
REM *** must be shared as an NFS volume.
nfs --server 192.1.1.3 --dir /SHAREVOL/RedHatCD
device ethernet eepro100
```

```
keyboard "us"
zerombr yes
clearpart --Linux
part /boot --size 30
part swap --size 128
part / --size 100 --grow
install
mouse genericps/2
timezone Etc/GMT-6
#xconfig --server "Mach64" --monitor "generic monitor"
skipx
rootpw iscrypted $1$ltK6jzho$7pPbE8WPNAeg44UlXqG27
auth --useshadow --enablemd5
lilo --location partition
reboot
%packages
ElectricFence
setup
filesystem
basesystem
ldconfig
glibc
shadow-utils
mkkickstart
mktemp
termcap
libtermcap
bash
MAKEDEV
SysVinit
XFree86-Mach64
ncurses
info
grep
XFree86-libs
chkconfig
XFree86-xfs
anacron
anonftp
fileutils
mailcap
textutils
apache
apmd
arpwatch
ash
at
```

```
authconfig
autoconf
automake
yp-tools
ypbind
ypserv
zlib
zlib-devel
%post
```

The previous example contains a limited list of packages to be installed. Add to this section any other packages to be installed.

The server deployment configuration and operating system installation process is complete.

4 Toolkit utilities

Syntax conventions

Syntax refers to the way a command and parameters must be entered. Unless specified otherwise, enter commands, parameters, and switches in all uppercase or all lowercase letters.

Sample syntax line:

```
SAMPLE[-R][PATH]FILENAME[...]
```

Command element	Description
SAMPLE	Specifies the name of the command.
-	Indicates a command line switch for executable files.
PATH	Specifies the route the operating system must follow through the directory structure to locate a directory or file. A path and file name must be specified only if the file is not in the current directory.
FILENAME	Specifies a file name. This document uses uppercase file names. A device name or a drive letter cannot be specified for a file name.
. . .	Indicates that the previous parameter or switch can be repeated several times in a command. Enter only the information, not the ellipsis (…).

In this document, the length of an example command or syntax might require it to continue on another line. When this happens, the second line and any additional lines are indented under the first line.

Placeholder items used in the syntax lines in this chapter include:

- Source—Specifies the location of the data to be transferred to a specified destination or used as input to a command. The source can consist of a drive letter and colon, a directory name, a file name, or a combination of these items.
- Destination—Specifies the destination to which the source transfers the data. The destination can consist of a drive letter and colon, a directory name, a file name, or a combination of these items.
- String—Specifies a group of characters to be treated as a unit. A string can include letters, numbers, spaces, or any other character and is usually enclosed in double quotation marks.

Utility online help

Most Toolkit utilities include usage instructions. To obtain help with the syntax, parameters, and switches of a particular Toolkit utility, enter the file name followed by `/?` in the command line. For example, for usage instructions on the CONREP utility, enter the following command:

```
CONREP /?
```

The utility displays information about its command line syntax, argument, and switches.

Using toolkit utilities

The Toolkit utilities control the installation process, read the source server configuration, and duplicate the configuration on a target server through a generated script file.

The Toolkit utilities include:

- REBOOT
- SETBOOTORDER (Limited functionality for HP ProLiant 100 series servers)
- STATEMGR (Utility is not supported on 100 series servers)
- RBSURESET
- BOOTEXTRACT
- HPDISCOVERY
- IFHW
- HWQUERY
- CONREP
- HPRCU
- HPACUSCRIPTING
- HPLPCFG
- LO100CFG (Utility only supports HP ProLiant 100 series servers)
- HPQLAREP
- HPONCFG (Not supported on HP ProLiant 100 series servers using the Oxx ROM family)

Using REBOOT

REBOOT, together with other utilities, is used from a batch file to control server reboots. This utility enables the user to reboot the server with control over which device is the boot device. If no boot drive argument is passed on to REBOOT, then the utility reboots the server using the drive specified as the default drive.

REBOOT command-line syntax

```
REBOOT [DRIVE:] [/?]
```

REBOOT command-line arguments

Command line argument	Description
`[DRIVE:]`	Valid arguments that can be passed to REBOOT are A:, C:, CD, RBSU, or PXE. By specifying an argument, the drive indicated is set to boot on the next reboot, and the system is restarted. If no argument is provided, then the system is set to boot using the defined boot order.
`/cold`	This argument performs a one-time cold boot of the system.
`/?`	This argument displays help information.

REBOOT return codes

There are no return codes for the REBOOT utility.

REBOOT command-line examples

Command-line argument	Description
`REBOOT A:`	This command reboots the system to the A: drive.
`REBOOT PXE`	This command reboots the system by itself to the PXE NIC.

Using SETBOOTORDER

SETBOOTORDER enables you to set the order in which devices are booted, including diskette drives, CD-ROM drives, hard drives, PXE, and USB devices. This utility sets the boot order only for devices that exist for a server. The devices can be set to boot in any order.

SETBOOTORDER cannot be used to set the storage controller order. You must use the CONREP utility. For more information about setting the controller order, see "Using CONREP" (page 29).

NOTE: Any changes made to the SETBOOTORDER take affect at the next reboot. For HP ProLiant servers with Oxx ROM Family (most 100 series servers), only one device can be set as the boot device and others cannot be re-ordered. These Oxx servers do not support the *default* or *usb* parameters.

SETBOOTORDER command-line syntax

```
setbootorder [floppy cdrom pxe hd usb | default] [/?]
```

SETBOOTORDER command-line arguments

Options are disabled if not listed in the argument.

Command-line argument	Description
`floppy cdrom pxe hd usb`	The order of these arguments sets the boot order for the system devices. Each term can be used only once in any order. It is not necessary to use all terms. HP ProLiant 100 series servers can only pass in one option.
`default`	This argument resets the boot order to the factory default.
`/?`	This argument displays help information.

SETBOOTORDER return codes

Value	Meaning
`0`	The boot order was set successfully.

SETBOOTORDER command-line examples

Command-line argument	Description
`SETBOOTORDER cdrom hd pxe usb floppy`	This command sets the system devices to boot in this order: CD-ROM drive, hard drive, PXE, USB, diskette drive.
`SETBOOTORDER default`	This command sets the boot order to the factory default.

Using STATEMGR

The STATEMGR utility enables the user to keep track of the execution state during system reboots. This utility saves persistent state information across reboots of the system.

NOTE: The STATEMGR utility is not supported on 100 series servers.

STATEMGR command-line syntax

```
STATEMGR [/R | -R] [EVNAME] [/?]
```

- or -

```
STATEMGR [/W | -W] [EVNAME] [VALUE] [/?]
```

STATEMGR command-line arguments

Command-line argument	Description
`/R or –R`	This argument reads the state of the environment variable defined by [EVNAME]. The value of the environment variable is returned as a return code.
`/W or -W`	This argument writes the state defined by [VALUE] to an environment variable defined by [EVNAME].
`EVNAME`	This argument creates an environment variable used to represent the state to manage. The variable can be any word that is eight characters or less.
`VALUE`	This argument is used only with the `/W` or `-W` arguments to indicate the value of the environment variable to maintain. [VALUE] is limited to integers between 0 and 254. If no value is provided when using `/W` or `-W`, the state environment variable is cleared.
`/?`	This argument displays help information.

STATEMGR return codes

Value	Meaning
`0`	The command was completed successfully.
n	*N* arguments were ignored because they were not in the *variable=<string>* format.

STATEMGR command-line examples

Command-line argument	Description
`STATEMGR /W PHASE 3`	STATEMGR writes the state value 3 to the PHASE environment variable.
`STATEMGR /R PHASE`	STATEMGR reads the PHASE environment variable and returns its value as a return code. If the environment variable has been reset or no value has been stored, the return code is 0.

Using RBSURESET

RBSURESET resets the BIOS settings for a server by reapplying the default factory setting at the next reboot. RBSURESET does not erase array configurations or logical storage volumes.

NOTE: This command is not yet supported on HP ProLiant 100 series servers, but will be in futures releases.

RBSURESET command-line syntax

```
rbsureset [/?]
```

RBSURESET command-line arguments

Command-line argument	Description
[/?]	This argument displays help information.

RBSURESET return codes

Value	Meaning
0	The BIOS settings have been successfully reset to the factory default.
1	The BIOS settings have not been reset.

Using BOOTEXTRACT

BOOTEXTRACT is used to extract the boot sector files from Windows Server 2003. These files can be used later in the installation of Windows Server 2003.

BOOTEXTRACT command-line syntax

```
bootextract [ufat.dll][ntldr.bss][ntldr2.bss]
```

BOOTEXTRACT command-line arguments

Command-line argument	Description
ufat.dll	Full path to the ufat.dll (from Windows 2003) file to extract the boot sector.
ntldr.bss	Full path to the output file to save the first part of the boot sector.
ntldr2.bss	Full path to the output file to save the second part of the boot sector.

BOOTEXTRACT return codes

Value	Meaning
0	The command was completed successfully.
n	Any non-0 return code is an error. For details, see the error message.

Using HPDISCOVERY

HPDISCOVERY provides an inventory of the server being configured and must run on each deployed server. HPDISCOVERY is executed by the server configuration script and captures the following information:

- System ID (This field is not supported on 100 series servers)
- System name
- ROM information

- Processor information
- NIC information
- PCI devices present in the system
- HP Smart Array controller information

User process decisions can be made based on data that is in the file created by this utility.

NOTE: Information may not be as detailed on HP ProLiant 100 series servers.

HPDISCOVERY command-line syntax

```
hpdiscovery [-f filename] [/?]
```

HPDISCOVERY command-line arguments

Command-line argument	Description
`-f filename`	This argument specifies the location and name of the Hardware Discovery data file.
`-?`	This argument displays help information.

HPDISCOVERY return codes

Value	Meaning
`0`	The command was completed successfully. A usage message might appear.
`1`	The command contained an invalid parameter.

HPDISCOVERY command-line examples

Command-line argument	Description
`hpdiscovery -f /toolkit/hpdiscovery.xml`	This command generates the file hpdiscovery.xml in the /toolkit directory.

Using IFHW

IFHW is used from a script file, in conjunction with other utilities, to control the deployment. The IFHW utility enables you to make intelligent queries against the hardware discovery file. Queries take the form of a logical expression, and the result of the expression is returned as the return code of the tool, which the hosting script can use to conditionally perform actions.

IFHW command-line syntax

```
ifhw [path]hpdiscoveryfilename [path]allboards.xml <expression>
```

IFHW command-line arguments

Command-line argument	Description
`[path]hpdiscoveryfilename`	This argument specifies the hardware discovery file used to run the query.
`[path]allboards.xml`	This argument specifies the `allboards.xml` PCI device list file, which is used to convert PCI IDs found in hardware

Command-line argument	Description
	discovery into device names, such as "Smart Array 5i Controller."
`<expression>`	This argument specifies the query expression. See "Expression operators and terms" (page 27).

IFHW return codes

Value	Meaning
`0`	The expression is true.
`1`	The expression is false.
`2`	The expression was not understood or an argument was invalid.

IFHW command-line examples

Command-line argument	Description
`ifhw hpdiscovery.xml allboards.xml "PCI:Smart Array 5i"`	This command returns the following error levels: • ERRORLEVEL 0 (True) if the Smart Array 5i is present • ERRORLEVEL 1 (False) if the device is not present • ERRORLEVEL 2 (Error) if the expression could not be understood

Expression operators and terms

Operator or term	Result
`and`	True if both operands are true
`or`	True if either operand is true
`gt`	True if the first operand is greater than the second
`lt`	True if the first operand is less than the second
`gte`	True if the first operand is greater than or equal to the second
`lte`	True if the first operand is less than or equal to the second
`eq`	True if the two operands are equal
`neq`	True if the two operands are not equal
`not`	True if the operand is false
`PCI:<string>`	True if a PCI device whose name includes <*string*> is found in the hardware discovery file. <*string*> is case-sensitive.
`HWQ:<string>`	The hardware discovery file is searched for <*string*>, and the corresponding value is the value of this term. <*string*> is case-sensitive.
`<string>`	A literal string, used for comparison
`<number>`	A literal number, used for comparison

Expression examples

Expression input	Result
`"PCI:Smart Array 5i"`	True if the Smart Array 5i Controller is found in the system
`HWQ:TotalRAM gte 512`	True if the amount of RAM in the hardware discovery file is at least 512
`HWQ:ROMDate neq "11/12/2004"`	True if the ROM date in the hardware discovery file is not 11/12/2004
`HWQ:SystemName eq "ProLiant DL380 G2"`	True if the system name in the hardware discovery file exactly matches "ProLiant DL380 G2"
`HWQ:SystemName eq "ProLiant DL380 G2" and "PCI:Smart Array 5i" and HWQ:ROMDate eq "11/12/2004"`	True if the system is a ProLiant DL380 G2 with a Smart Array 5i Controller present and a ROM date of 11/12/2004
`"PCI:Smart Array 5i" or "PCI:Smart Array 6i"`	True if the system contains a Smart Array 5i Controller or a Smart Array 6i Controller

Using HWQUERY

HWQUERY is used from a script, in conjunction with other utilities, to control the deployment. The HWQUERY utility enables you to use data from the hardware discovery file in your own scripts. HWQUERY cannot alter environment variables directly. To set the variable, the output of HWQUERY must be used by the hosting script. The most common way to use it is to write the output to an intermediate script that is subsequently called by the hosting script.

HWQUERY command-line syntax

`hwquery [path]hpdiscoveryfilename [path]allboards.xml variable=<string> ...`

HWQUERY command-line arguments

Command-line argument	Description
`[path]hpdiscoveryfilename`	This argument specifies the hardware discovery file used to run the query.
`[path]allboards.xml`	This argument specifies the allboards.xml PCI device list file, which is used to convert PCI IDs found in hardware discovery into device names, such as "Smart Array 5i Controller."
`variable=<string>`	In this argument, *variable* is the name of an environment variable and <*string*> is a PCI device name or the name of an element from the hardware discovery file. Arguments must be in quotes if <*string*> contains spaces. <*string*> is case-sensitive.
`...`	You can specify multiple *variable*=<*string*> arguments.

HWQUERY return codes

Value	Meaning
0	The command was completed successfully
n	*N* arguments were ignored because they were not in the *variable*=<*string*> format.

HWQUERY command-line examples

Command-line argument	Description
`hwquery hpdiscovery.xml allboards.xml MY_SYS_RAM=TotalRAM`	For a `hpdiscovery.xml` file that contains `<TotalRAM>768</TotalRAM>`, HWQUERY produces the following: `MY_SYS_RAM=768`
`hwquery hpdiscovery.xml allboards.xml "TEST=Smart Array"`	For a `hpdiscovery.xml` file that indicates a Smart Array 5i Controller is present, HWQUERY produces the following: `TEST=Smart Array 5i Controller`

`hwquery hpdiscovery.xml allboards.xml MYRAM=TotalRAM MYROMDATE=ROMDate`	For a hpdiscovery.xml file that contains <TotalRAM>768</TotalRAM> and <ROMDate>11/15/2002</ROMDate>, HWQUERY produces the following:
	`MYRAM=768`
	`MYROMDATE=11/15/2002`

`hwquery hpdiscovery.xml allboards.xml "TEST=smart array 5i"`	Although the controller is present, HWQUERY produces the following: `TEST=` This behavior is correct. The string is case-sensitive, and the argument uses lowercase lettering instead of the uppercase found in the allboards.xml file.

Using CONREP

The CONREP utility generates a system configuration XML file used to duplicate the hardware configuration of one ProLiant server onto another. The CONREP utility uses the hardware configuration XML file to identify and configure the system, which defaults to `conrep.xml`. You can change the default using the -x option. The actual system configuration file is captured as an XML data file. The default name is `conrep.dat`.

△ **CAUTION:** Improper modification of the CONREP data files can result in the loss of critical data. Only experienced users of the Toolkit should attempt to modify the data files. Because of the potential risk of data loss, take all necessary precautions to ensure that mission-critical systems remain online if a failure occurs.

The CONREP utility reads the state of the system environment settings to determine the server configuration and writes the results to a file that you can edit. The CONREP utility uses the data in the generated file to configure the target server hardware.

The CONREP utility uses an XML definition file to determine what information to retrieve from and restore to the server. You can modify this file to update new features or restrict features when capturing configurations. The default `conrep.xml` file contains common hardware configuration settings for most ProLiant series servers other than HP ProLiant 100 series servers using the Oxx ROM family. Some platforms require special settings that are contained in other XML files. These files are included in the Scripting Toolkit and are available from the HP website (http://www.hp.com) on the support page for each platform. You can use these files with the -x option to configure systems that are not supported by the default hardware configuration file.

Many fields in the `conrep.xml` file contain help text that enables you to configure the field meanings. This information is also added to the `conrep.dat` file. Hardware features that are not supported by the existing platform or ROM version appear in the `conrep.dat` file.

⓪ **IMPORTANT:** The file format for the DOS version of CONREP and the current version of CONREP are not compatible.

CONREP command-line syntax

```
conrep [-s | -l] [-xhardware_definition_file] [-fsystem_configuration_file] [-?]
```

CONREP command line arguments

Command-line argument	Description
`-s`	This argument saves the system configuration to a file.
`-l`	This argument loads the system configuration from a file and writes it to the target server.
`-xfilename`	This argument defines the name and location of the XML hardware definition file. The default file is conrep.xml.
`-ffilename`	This argument defines the name and location of the system configuration data file. The default file is conrep.dat.
`-?`	This argument displays help information.

CONREP return codes

Value	Meaning
0	The command was completed successfully.
1	The hardware definition data file (conrep.xml) is corrupt or not found.
2	The system configuration data file (conrep.dat) is corrupt or not found.
4	The system administrator password is set. The settings cannot be changed unless this password is cleared.
5	The XML hardware definition file (conrep.xml) is corrupt or not appropriate for the current platform.

CONREP screen output

A typical screen output generated by CONREP is similar to the following:

```
conrep 3.00 3.10 - Scripting Toolkit Configuration Replication Program
Copyright (c) 2007-2012 Hewlett-Packard Development Company, L.P.
System Type: ProLiant DL360 G4
ROM Date: 08/16/2005
ROM Family: P52
XML System Configuration: conrep.xml
Hardware Configuration: demo.dat
File contains global platform restrictions
Global Restriction: [minimumconrepversion] OK
Platform check:
[ProLiant DL3] match
[ProLiant DL5] no match
Saving configuration data to demo.dat.
CONREP Return code: 0
```

CONREP -s (Store to Data file) Example usage for HP ProLiant 100 series servers

To extract the BIOS settings from an SL160z G6 server and save the configuration to an "sl160zconrep.dat" data file:

```
[root@ilo002481b08134 conrep]# ./conrep -s -xconrepSL160zg6_20090728.xml -fsl160zconrep.dat
conrep 3.00 - Scripting Toolkit Configuration Replication Program
Copyright (c) 2007-2012 Hewlett-Packard Development Company, L.P.
System Type: ProLiant SL160z G6
ROM Date : 07/28/2009
ROM Family : O33
Processor Manufacturer : Intel
XML System Configuration : conrep_SL160zg6_20090728.xml
Hardware Configuration : sl160zconrep.dat
Saving configuration data to sl160zconrep.dat.
CONREP Return code: 0
```

NOTE: The file names after the `-x` and `-f` options must be specified, otherwise, the default file names `conrep.xml` and `conrep.dat` are used, respectively.

NOTE: A platform specific XML file needs to be used for HP ProLiant 100-series servers. If you use the default name this may cause an error while running the CONREP utility.

CONREP –l (Load from Data File) Example Usage for HP ProLiant 100 series servers

To load the BIOS configuration settings from a previously captured/edited data file (in this case "sl160zconrep.dat") to an SL160z G6 server:

```
[root@ilo002481b08134 conrep]# ./conrep -l -xconrepSL160zg6_20090728.xml -fsl160zconrep.dat
conrep 3.00 - Scripting Toolkit Configuration Replication Program
Copyright (c) 2007-2012 Hewlett-Packard Development Company, L.P.
System Type: ProLiant SL160z G6
ROM Date : 07/28/2009
ROM Family : O33
Processor Manufacturer : Intel
XML System Configuration : conrep_SL160zg6_20090728.xml
Hardware Configuration : sl160zconrep.dat
Loading configuration from sl160zconrep.dat.
ASM values not set! aborting
CONREP Return code: 0
```

CONREP Data File Sample Contents for HP ProLiant 100 series servers

A typical data file generated by CONREP is similar to the following:

```
<Conrep_data>
<Section name="Controller_Order">
<Id0>0e 11 40 80 </Id0>
<Slot0>00 </Slot0>
<BusDev0>00 08 </BusDev0>
<Rest0>01 </Rest0>
<Id1>0e 11 ff ff </Id1>
<Slot1>00 </Slot1>
<BusDev1>00 78 </BusDev1>
<Rest1>c1 </Rest1>
```

```
</Section>
<Section name="Language">ENGUSAus </Section>
<Section name="System_WOL">Disabled</Section>
<Section name="System_APIC">Auto Set</Section>
<Section name="System_COMA">COM1</Section>
<Section name="System_COMA_IRQ">IRQ4</Section>
<Section name="System_COMB">Disabled</Section>
<Section name="System_COMB_IRQ">Undefined</Section>
<Section name="System_LPT">LPT1</Section>
<Section name="System_LPT_IRQ">IRQ7</Section>
<Section name="Diskette_Write_Control">Writes_Enabled</Section>
<Section name="NMI_Debug_Button">Disabled</Section>
<Section name="ACPI_Power_Button">Disabled</Section>
<Section name="ASR">Disabled</Section>
<Section name="ASR_Timeout">10 Minutes</Section>
<Section name="Thermal_Shutdown">Enabled</Section>
<Section name="RBSU_Language">01</Section>
<Section name="PXE_NIC1">Disabled</Section>
<Section name="PXE_NIC2">Disabled</Section>
<Section name="BIOS_Console">Disabled</Section>
<Section name="EMS_Console">Disabled</Section>
<Section name="Diskette_Boot">Enabled</Section>
<Section name="NumLock">On</Section>
<Section name="POST_Speed_Up">Enabled</Section>
<Section name="Integrated_Diskette_Controller">Enabled</Section>
<Section name="PCI_Bus_Reset">Enabled</Section>
<Section name="Hot_Plug_Reservation">Auto Set</Section>
<Section name="Memory_Protection">Standard ECC Protection</Section>
</Conrep_data>
```

CONREP command file contents for HP ProLiant servers not using the Oxx ROM family

A typical data file generated by the CONREP command is similar to the following:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--generated by conrep version 3.10-->
<Conrep version="3.00"
originating_platform=
"ProLiant DL360 G4"
originating_family=
"P52"
originating_romdate=
"08/16/2005">
<Section name="IPL_Order"
helptext=
"Current Initial Program Load device boot order">
<Index0>00 </Index0>
<Index1>01 </Index1>
<Index2>03 </Index2>
```

```
<Index3>02 </Index3>
<Index4>04 </Index4>
<Index5>ff </Index5>
<Index6>ff </Index6>
<Index7>ff </Index7>
</Section>
<Section name="PCI_Devices"
helptext=
"Lists of PCI devices and their interrupts-not displayed if default" >EMPTY_DELETE</Section>
<Section name="Controller_Order"
helptext=
"Lists the current boot controller ordering">
<Id0>80 86 25 a3 </Id0>
<Slot0>00 </Slot0>
<BusDev0>00 fa </BusDev0>
<Rest0>41 </Rest0>
<Id1>0e 11 ff ff </Id1>
<Slot1>00 </Slot1>
<BusDev1>00 78 </BusDev1>
<Rest1>c1 </Rest1>
</Section>
</Conrep>
```

Using HPRCU

HPRCU is an RBSU configuration utility similar to CONREP. This utility is supported on Gen8 ProLiant servers and later. This utility does not use a definition XML file like the Conrep utility, but directly reads the same table that RBSU uses for feature names and settings. All features and options are now number based. Each feature and option has a unique number.

Benefits of using HPRCU over CONREP are the following:

- Simpler user interface— All system ROM settings and the current selections are listed together in one output/input XML file.
- Fewer updates—No updated binary or XML file is needed when BIOS adds or changes features. HPRCU now reads the same tables that RBSU does, which are located in the memory at system boot. When the BIOS changes or adds a new setting, no update to HPRCU is needed.
- Default ROM settings enhancement—The HPRCU XML file now shows users the default settings for each RBSU option.

HPRCU command-line syntax

```
hprcu -s | -l [-f  file.xml ] [ -h ]
```

HPRCU command line arguments

Command line argument	Description
`-s`	This argument saves the system configuration to a file.
`-l`	This argument loads the system configuration from a file and writes it to the target server.

Command line argument	Description
-f{file.xml}	Name of the input or output file. If not specified, the XML configuration defaults to hprcu.xml.
-h	This argument displays program usage.

HPRCU return codes

Command line argument	Description
0	The command was completed successfully.
1	The server is not supported by this utility.
2	The input XML file is missing or invalid format.
3	One of the dependencies is missing. See error message for details.
4	The system RBSU password is set. Settings cannot be changed until the password is cleared from within RBSU.
5	An error occurred reading the supported features on the server.
6	Invalid command line syntax. Use the -h parameter for complete command line parameters.
7	A general error occurred saving or loading the server settings. See error message for details.

HPRCU sample XML format

Sample XML format generated by HPRCU is similar to the following:

```
<hprcu>
  <informational>
   <product name>ProLiant DL380 Gen8</product_name>
    <system_rom_family>P64</ system_rom_family >
    <system_rom_date>11/01/2011</system_rom_date>
  </informational>
 <feature feature_id='176' selected_option_id='2' default_option_id='1' feature_type='option'>
      <feature_name>Intel(R) Hyperthreading Options</feature_name>
      <option option_id='1'><option_name>Enabled</option_name></option>
      <option option_id='2'><option_name>Disabled</option_name></option>
  </feature>
  <feature feature_id='100' feature_type='string'>
      <feature_name>Server Name - Line 1</feature_name>
      <feature_value>SERVERNAME</feature_value>
  </feature>
</hprcu>
```

Using HPACUSCRIPTING

Starting with version 8.28.13.0, ACU Scripting is now a standalone application that is distributed with the ACU CLI application. In ACU versions prior to 8.28.13.0, the scripting executable was provided with the ACU GUI component.

Users familiar with the previous versions of ACU Scripting must now install the ACU CLI application to obtain the scripting executable. The new ACU scripting executable (`hpacuscripting`) replaces the former executable (`cpqacuxe`) in all scripts.

The ACU Scripting application has two scripting modes:

- Capture mode for capturing a configuration (page 35)

  ACU inspects the configuration of all internal and external array controllers connected to the server and then writes a script file describing this configuration.

- Input mode for using an Input script (page 35)

ACU reads the array configuration described in a specified script file. See "Creating an ACU script file" (page 36). ACU then applies this configuration to a target system.

NOTE: For a complete list of all command-line parameters, execute the `/?` utility.

Capturing a configuration

To capture the configuration of a system, enter the following command at the system command line prompt:

```
hpacuscripting -c [drive:][path] OUTPUTFILENAME.ext [-internal |
-external] -e [drive:][path]ERRORFILENAME.ext
```

OUTPUTFILENAME is the name of the capture file, and `ext.` is the file extension. If you do not specify a name and location for this file, ACU uses the default name `ACUOUTPUT.ini`, and places the file in the ACU working directory.

The `-internal` and `-external` switches limit capture to internal or external controllers.

The `-e` switch information is used only if ACU must generate an error file. By default, ACU names the error file `ERROR.ini` and places it in the ACU working directory.

Using an Input script

To use an Input script to configure or reconfigure a system, first locate a suitable ACU script or see "Creating an ACU script file" (page 36).

Then, enter the following command at the system command line prompt:

```
hpacuscripting -i [drive:][path]FILENAME.ext [-internal | -external]
[-reset] -e [drive:][path]ERRORFILENAME.ext
```

FILENAME is the name of the ACU input file, and `ext` is the file extension. If you do not specify the name and location of this file, ACU searches for `ACUINPUT.ini` in the ACU working directory.

The `-internal` and `-external` switches limit configuration operations to internal or external controllers.

The `-reset` flag destroys any existing data and overwrites the current configuration with the configuration specified in the script.

The `-e` switch information is used only if ACU must generate an error file. By default, ACU names the error file `ERROR.ini` and places it in the ACU working directory.

Creating an ACU script file

To create a valid ACU script file, use one of the following methods:

- Modify the sample custom input script (page 36).
- Create a Capture file for capturing a configuration (page 35).

  You can create a capture file from any server that has ACU loaded, and then modify the values of options in the file as necessary for the target system. This method is useful for applying a standard configuration to several servers that have similar storage resources.
- Write an original script.

  Each line of text in an ACU script file is in the format *option = value* and can be written in uppercase or lowercase letters. For information about possible option values and the minimum configuration information that a valid script must have, see "Sample custom input script" (page 36).

You can add blank lines and comments to any script to make it easier to read and understand. To create a comment, enter a semicolon, and then enter the comment text. ACU ignores all text on the same line after a semicolon.

Sample custom input script

The sample script in this section gives all possible values for each option.

- If an **option** is shown in bold type, you must enter a value for that option when writing your own script.
- If a **value** is shown in bold type, ACU uses that value as a default setting when creating new logical drives.

You can use this script as a template for your own script. The Control category has the following options:

- Action mode
- Method mode

```
Action = Configure|Reconfigure

Method = Custom|Auto ; COMMENT: ACU cannot create a RAID 50 or RAID
60 configuration in Auto mode. You must create such configurations
manually using the Custom setting.

Controller = All | First | Slot [N][:N]| WWN [N]| SerialNumber [N]|
IOCabinet [N],IOBay [N],IOChassis [N],Slot [N],Cabinet [N],Cell [N]

ClearConfigurationWithDataLoss = Yes|No ; COMMENT: This option is now
deprecated.

LicenseKey = XXXXX-XXXXX-XXXXX-XXXXX-XXXXX

DeleteLicenseKey = XXXXX-XXXXX-XXXXX-XXXXX-XXXXX | * ; COMMENT: *
is a wild card that enables you to delete all license keys on the
specified controller.

RAIDArrayID = "XXXXXXXXXXXXXXXXXXXX"

ReadCache = 0|10|20|25|30|40|50|60|70|75|80|90|100

WriteCache = 0|10|20|25|30|40|50|60|70|75|80|90|100

RebuildPriority = Low|Medium|High

ExpandPriority = Low|Medium|High

SurfaceScanDelay = N

SSPState = Enable|Disable
```

```
PreferredPathMode = Auto|Manual
; COMMENT: the following five entries are used to optimize the
controller performance for video
MNPDelay = 0|1|2|...|60 ; units are minutes, zero indicates disabled
IRPEnable = Yes|No
DPOEnable = Yes|No
ElevatorSortEnable = Yes|No
QueueDepth = 2|4|8|16|32|Auto
Array = A|B|C|D|E|F|G|...Z|a|b|c|d|e|f
OnlineSpare = None | N | Port:ID,Port:ID... | Box:Bay,Box:Bay... |
Port:Box:Bay,Port:Box:Bay,... ; COMMENT: These values are available
only in Custom method mode. In Auto method mode, the choices are
Yes|No.
Drive = * | N | Port:ID,Port:ID... | Box:Bay,Box:Bay... |
Port:Box:Bay,Port:Box:Bay,...
DriveType = SCSI | SAS | SATA
LogicalDrive = 1|2|3|...32
RAID = 0|1|5|50|6|60|adg|auto ; COMMENT: RAID 6 and 60 are only
available when SAAP is installed and the license key registered
ParityGroups = 2|N ; COMMENT: Necessary only for RAID 50 or 60. N
> 2
Size = [N]|Max
Sectors = 32|63
StripeSize = 8|16|32|64|128|256
ArrayAccelerator = Enable|Disable
LogicalDriveSSPState = Enable|Disable
SSPAdaptersWithAccess = [N],[N]...|None
PreferredPath = 1|2
HBA_WW_ID = WWN
ConnectionName = UserDefinedName
HostMode = Default | Windows | Windows(degrade | openVMS | Tru64 |
Linux | Solaris | Netware | HP | Windows Sp2 ; COMMENT: The
Windows(degrade value must be entered as written.
```

Script file options

Options in ACU script files are divided into the following categories:

- "Control category" (page 39)
- "Controller category" (page 39)
- "Array category" (page 42)
- "Logical Drive category" (page 43)
- "HBA category" (page 45)

Each category has several scripting options, but you do not always need to assign values to every option. ACU can use default values in some instances, while in other instances, a listed option might not be relevant for a particular configuration or scripting mode.

The options for each category are listed in the following table and described in more detail in the remainder of this section.

Category	Options	Description
Control	Action Method	These options define the overall behavior of ACU when it processes scripts and creates configurations. Control options can occur only once in a script file and must be listed first.
Controller	Controller ChassisName ClearConfigurationWithDataLoss DeleteLicenseKey DPOEnable ElevatorSortEnable ExpandPriority IRPEnable LicenseKey MNPDelay PreferredPathMode QueueDepth ReadCache RebuildPriority SSPState SurfaceScanDelay WriteCache	Options in this category specify the controller that is to be configured (or the controller that had its configuration captured). Although the Controller option must begin this section of the script, you can script other options in this category in any order. You can use one script file to configure all controllers in a system, and you can configure the controllers identically or individually. If you define each controller configuration individually, enter the option values for one controller and its arrays and logical drives before specifying the option values for another controller.
Array	Array Drive DriveType OnlineSpare	These options describe an array that is to be configured on the controller that was previously specified in the script. (If no controller was previously specified, ACU stops processing the script and creates an error file.) Although the Array option must begin this section of the script, you can script the other options in this category in any order.
Logical Drive	ArrayAccelerator LogicalDrive LogicalDriveSSPState ParityGroups PreferredPath RAID Sectors Size SSPAdaptersWithAccess StripeSize	These options describe a logical drive that is to be configured on an array that was previously specified in the script. (If no array was previously specified, ACU stops processing the script and creates an error file.) Although the LogicalDrive option must begin this section of the script, you can script the other options in this category in any order.
HBA	ConnectionName HBA_WW_ID HostMode	These options specify an HBA that is to be configured.

Control category

The Control category has the following options:

- "Action mode" (page 39)
- "Method mode" (page 39)

Action mode

You must specify an Action mode:

- In Configure mode, you can create new arrays, but you cannot modify existing arrays. The controller must be connected to unassigned physical drives for this mode to be available.
- In Reconfigure mode, you can modify existing arrays. For example, you can set up an array expansion, a logical drive extension, or a migration. These procedures do not destroy data, unless you specifically want the data to be deleted. In this mode, ACU does not change an existing option setting unless you specifically script a different value for that option.

Method mode

The default value for this option is Auto. If you want to use Custom mode, you must specify it.

In Auto mode, ACU can perform an expansion, extension, or migration without user intervention if the values that you set for other options imply that such an operation is necessary.

Controller category

The Controller category has the following options:

- Controller (page 39)
- ChassisName (page 40)
- ClearConfigurationWithDataLoss (page 40)
- DeleteLicenseKey (page 40)
- DPOEnable (page 41)
- ElevatorSortEnable (page 41)
- ExpandPriority (page 41)
- IRPEnable (page 41)
- LicenseKey (page 40)
- MNPDelay (page 41)
- PreferredPathMode (page 40)
- QueueDepth (page 41)
- ReadCache (page 40)
- RebuildPriority (page 41)
- SSPState (page 41)
- SurfaceScanDelay (page 41)
- WriteCache (page 40)

Controller

You must enter a value for this option because it identifies the controller that you want to configure:

- `All`—Configure all detected controllers in the system.
- `Slot [`*`N`*`][:`*`M`*`]`—Configure the internal controller in slot number *N*, or the external controller at port *M* in slot *N*.

- `WWN [N]` —Configure the external controller that has the World Wide Name *N*.
- `SerialNumber [N]` —Configure the shared storage controller that has serial number *N*.
- `IOCabinet[N],IOBay[N],IOChassis[N],Slot[N],Cabinet[N],Cell[N]` —Configure the controller in the Integrity server that has the slot path information defined by this sequence of identifiers.

ChassisName

Enter the user-defined character string that identifies the controller. Any of the following characters can be used in the string:

a–z, A–Z, 0–9, !, @, #, *, (,), ,, -, _, +, :, ., /, [space]

You do not need to use quotation marks around the string, but doing so allows the string to begin with a space character. However, the string cannot end with a space character.

Currently, only shared-storage controllers such as the RA4x00, MSA1000, and Smart Array Cluster Storage support the ChassisName option. The RA4x00 controller uses a 24-character string, while other applicable controllers use a 20-character string.

ClearConfigurationWithDataLoss

This command is now deprecated.

The default value for this option is No. Clearing the configuration causes data loss because it deletes all logical volumes and arrays on the controller. If you clear a configuration, you can write commands later in the script file to create a new configuration from the liberated drive capacity.

LicenseKey, DeleteLicenseKey

These options enable you to enter a 25-character license key to activate or uninstall some controller features. Hyphens can be entered, but are not required.

PreferredPathMode

The setting that you select for this option determines how the preferred I/O path to a particular logical drive is set for a redundant array controller that is in an active/active configuration.

Not all controllers support this feature, and controllers in an active/standby configuration disregard this option.

- **Auto** is the default setting for new configurations. In this case, the storage system automatically selects the I/O path from the redundant controller to the logical drive and dynamically load balances all paths.
- **Manual** enables you to assign the logical drive to a specific redundant controller. If you select this setting, use the

  `PreferredPath`

  command to specify the path.

If you are reconfiguring a controller and do not specify a setting for this option, the existing setting remains unchanged.

ReadCache, WriteCache

Enter a number between 0 and 100 to specify the percentage of cache that is to be allocated to drive reads or writes. The default value for both options is 50.

The allowable cache ratios depend on the controller model and whether it has battery-backed write cache, as described in the following table.

A "+" indicates that the specified cache ratio is allowed for that type of controller, while a "–" indicates that the ratio is not allowed.

Read:write ratio	RA4x00 with 16MB cache	RA4x00 with 48MB cache	All other controllers with battery-backed write cache	All other controllers without battery-backed write cache
100:0	+	+	+	+
90:10	+	+	–	–
80:20	+	+	–	–
75:25	–	–	+	–
70:30	+	+	–	–
60:40	+	+	–	–
50:50	+	+	+	–
40:60	–	+	–	–
30:70	–	+	–	–
25:75	–	+	+	–
0:50*	+	–	–	–
0:75*	–	+	–	–
0:100	–	–	+	–

* The cache ratio percentages do not total 100 in these cases because the additional 16-MB or 48-MB cache modules are not used. Only the battery-backed write cache is used.

RebuildPriority, ExpandPriority

This option has three possible values: Low, Medium, and High.

SSPState

There are two settings for this option: Enable and Disable. If you do not specify a value for the SSP State, the existing setting remains unchanged.

NOTE: The SSPState option is valid only for controllers that enable SSP on a controller basis, such as the MSA1000 or the Smart Array Cluster Storage controllers. RA4x00 controllers support SSP that is enabled on a logical drive basis, and use the LogicalDriveSSPState option (page 44) instead.

If you enable SSP, you must also specify an adapter for one or more logical drives by using the SSPAdaptersWithAccess option (page 45). Otherwise, SSP is automatically disabled.

SurfaceScanDelay

Enter a number between 1 and 30 to specify the duration of the surface scan delay in seconds.

Video performance options

To optimize the controller performance for video, set values for the following options as indicated:

```
DPOEnable = No
ElevatorSortEnable = Yes
IRPEnable = No
```

In addition, do the following:

- Set the `MNPDelay` to any integer value from 1 to 60 (units are minutes). If you want to disable this option, set a value of zero instead.
- Set the `QueueDepth` to any integer value from 2 to 32, or to Auto.

Array category

The Array category has the following options:

- "Array" (page 42)
- "Drive" (page 42)
- "DriveType" (page 42)
- "OnlineSpare" (page 43)

Array

Enter a letter or pair of letters to identify the array that is to be created or reconfigured, and observe these additional limitations:

- In Configure mode, ACU creates a new array. The value that you specify for the array option must be the next available letter or pair of letters in the sequence, according to the number of existing arrays on the controller. AA follows Z, and BA follows AZ.
- In Reconfigure mode, ACU can either create a new array or reconfigure an existing array. In this case, the value that you specify can identify an existing array, or it can correspond to the next available array letter or pair of letters in the existing configuration.

Drive

You can use this option to add a drive to an existing array (to expand an array) or to build a new array. If you are expanding an array, each drive that you add must have a capacity no less than that of the smallest drive already in the array. The added drives and the existing drives in the array must all be the same type (for example, SAS or SATA).

If the value of the `ClearConfigurationWithDataLoss` option is Yes, you can use the `Drive` option to remove drives from an array. However, the `ClearConfigurationWithDataLoss` option is now deprecated.

If you use Auto method mode, ACU configures all the available drives on the controller into one array. If the drives are of different capacities, ACU determines the capacity of the smallest drive and uses the same amount of space on all other available drives.

If you use Custom method mode, choose one of the following methods to specify the drives to be used in the array. (Different arrays on the same controller can use different methods.)

- To specify individual drives, use the applicable convention (port:ID, box:bay, or port:box:bay).
- To specify only the number of drives to use (not which specific drive IDs to use), enter that number as the value for this option. For example, if you enter

  ```
  drive=3,
  ```

  ACU uses the first three available drives to build or expand the array that you define in the remainder of the script. ACU automatically determines which drives are suitable to use.
- To use all available drives, enter an asterisk as the value for this option. An array that is configured using this method cannot have a spare.

DriveType

The value that you enter for this option specifies the type of drive (SAS, SATA, or parallel SCSI) that ACU must use to build the array.

OnlineSpare

The value for this option determines whether the array specified previously in the script will be configured with spare drives.

Method mode	Possible values	Default value
Custom	To specify exactly which drives to use as spares, use the applicable convention (port:ID, box:bay, or port:box:bay). To specify only the number of spares (not the exact IDs), enter that number as the value for this option. ACU automatically selects only those drives that are suitable for the array. To specify that the array should not have spares, enter `None`.	In Configure action mode: None In Reconfigure action mode, ACU ignores any value entered for this option and keeps any spares that are already present in the configuration
Auto	Yes (indicating one spare) No	In Configure action mode: Yes (indicating one spare) In Reconfigure action mode, ACU ignores any value entered for this option and keeps any spares that are already present in the configuration

Logical Drive category

The Logical Drive category has the following options:

- "ArrayAccelerator" (page 43)
- "LogicalDrive" (page 43)
- "LogicalDriveSSPState" (page 44)
- "ParityGroups" (page 44)
- "PreferredPath" (page 44)
- "RAID" (page 44)
- "Sectors" (page 44)
- "Size" (page 45)
- "SSPAdaptersWithAccess" (page 45)
- "StripeSize" (page 45)

ArrayAccelerator

This option specifies whether the array accelerator is enabled or disabled for the specified logical drive. The default value is Enabled.

LogicalDrive

The value that you enter for this option specifies the ID number of the logical drive that is to be created or modified. The first logical drive on an array must have an ID of 1 (not 0), and logical drive numbering must be contiguous.

- In Configure action mode, ACU accepts only the ID number of the next possible logical drive.
- In Reconfigure action mode, ACU also accepts the ID number of any existing logical drive.

LogicalDriveSSPState

This option is valid only for controllers that enable SSP on a logical drive basis. Other controllers that support SSP use the SSPState option (page 41).

The following defaults apply:

- For new logical drives, the default value is Disabled.
- For existing logical drives, the default value is the current logical drive setting.

ParityGroups

When you create a RAID 50 or RAID 60 configuration, you must also set the number of parity groups.

You can use any integer value greater than 1 for this setting, with the restriction that the total number of physical drives in the array must be exactly divisible by the number of parity groups.

The maximum number of parity groups possible for a particular number of physical drives is the total number of drives divided by the minimum number of drives necessary for that RAID level (three for RAID 50, four for RAID 60).

PreferredPath

If you select the Manual setting for `PreferredPathMode` , use the `PreferredPath` command to specify the path for I/O to the logical drive on a redundant controller in active/active mode.

The default setting for this option is **1.** With this setting, the controller in chassis slot 1 is the preferred controller for I/O to the logical drive. If you select **2,** the controller in chassis slot 2 becomes the preferred controller for the logical drive.

To determine the chassis slot numbers, use the

`show`

command on a controller that supports redundant controllers.

RAID

The value that you enter for this option specifies the RAID level of the logical drive.

- When the Action mode is Configure, and the Method mode is Auto, ACU automatically selects the highest RAID level that the controller and drive configuration can support except RAID 50 or RAID 60. To specify RAID 50 or 60 for a controller that supports either of these RAID levels, use the Custom setting. In this case, you must also specify the number of parity groups (page 44).
- When the Action mode is Reconfigure, the default value is the existing RAID level for that logical drive. If you specify a different RAID setting, then ACU either ignores the new setting (when Method mode is Auto), or attempts to migrate the logical drive to the specified RAID level (when Method mode is Custom).

Sectors

This option specifies the number of sectors that are to comprise each track. Enter 32 to disable MaxBoot or 63 to enable it.

- For new logical drives, the default setting is 63 if the logical drive is larger than 502 GB. Otherwise, the default setting is 32.
- For an existing logical drive, the default setting is the existing setting.

Logical drive performance is likely to decrease with MaxBoot enabled.

Size

Enter the capacity that you want the logical drive to have, in megabytes. The default size setting for new logical drives is MAX. In this case, ACU creates a logical drive of the maximum possible size from the physical drives that you assigned to the array.

In Reconfigure mode, the default setting is the existing size of the logical drive. If you enter a larger value, ACU extends the logical drive to the new size if there is unused drive capacity on the same array, as long as the operating system supports logical drive extension. You cannot reduce the size of the logical drive.

CAUTION: Back up all data before extending a logical drive.

SSPAdaptersWithAccess

Enter values here to identify the SSP adapters that you want to have access to a logical drive. The values are processed only if either SSPState or LogicalDriveSSPState is set to Enable. Otherwise, the values are ignored.

NOTE: Be sure that every HBA in the system has access to the logical drives for which multi-path will be used.

StripeSize

You can enter a numerical value for this option to specify the size of the data stripes (in kilobytes), or you can leave this option blank and allow ACU to use a default value.

The valid stripe size values depend on the RAID level.

- For RAID 0, RAID 1, or RAID 1+0 arrays, you can enter any of the stripe size values listed in the sample script.
- For RAID 5 arrays, the maximum stripe size in most cases is 256 KB, but old controller models are often limited to 64 KB.
- For RAID 6 arrays, the maximum stripe size is either 64 KB or 256 KB, depending on the controller.

The default stripe size value depends on the action mode.

- In Configure action mode, the default value is determined by the RAID level that you specified earlier in the script. (In some cases, it also depends on the ACU version, the controller model, and the controller firmware version).
  - For RAID 0, RAID 1, or RAID 1+0, the default value is 128 KB.
  - For RAID 5, the default value is usually 64 KB, but on some controller models it is 16 KB or 128 KB.
  - For RAID 6, the default value is usually 16 KB, but on some controller models it is 64 KB or 128 KB.
- In Reconfigure action mode, the default value for this option is the stripe size that is already configured for the logical drive. If you enter a value that is different from the existing stripe size, ACU attempts to migrate the logical drive to the stripe size that you specify. (If you intend to migrate the logical drive, back up all data before starting the migration procedure.)

HBA category

The HBA category has the following options:

- "ConnectionName" (page 46)
- "HBA_WW_ID" (page 46)
- "HostMode" (page 46)

ConnectionName

This option is a user-defined string used as the connection name for the specified HBA.

The string can consist of the following:

- A maximum of 16 characters
- Embedded space characters but cannot end with a space character
- Any of the following characters: a–z, A–Z, 0–9, !, @, #, *, (,), -, _, +, :, ., /, and [space]

HBA_WW_ID

This option specifies which HBA, based on its assigned WWN, is modified by the configuration changes.

HostMode

This option specifies the HostMode for a selected HBA. Setting the Host Mode optimizes the storage array for the selected operating system. The available host modes for an HBA are device-specific. Not all modes are available on all devices. Not all HBAs support a HostMode.

The following operating system options might be available:

- Default
- Microsoft Windows
- OpenVMS
- Tru64
- Linux
- Solaris
- Netware
- HP-UX

ACU scripting error messages

Error code	Error message	Comment or clarification
1	General error.	The ACU process cannot be initiated. You might see this error message if you are not authenticated to use ACU or if ACU is already running.
268	Error saving controller.	ACU cannot save one or more controller configurations.
278-282	Controller is locked by another machine or user.	—
290	Error communicating with controller.	—
516	Internal error.	An error occurred during the configuration process, but ACU cannot identify the error because there is an internal ACU error.
1052	Array requires an odd number of drives.	This error message occurs if you attempt to add an odd number of drives to an array that has RAID 1 logical drives, and the controller does not support RAID-level migration.
1053	Cannot remove physical drives from existing array.	This error message occurs if a script that is running in Reconfigure action mode lists fewer physical drives than already exist in the array. ACU interprets this script as a request to remove physical drives from an existing array, but satisfying this request causes data loss, so ACU prevents the script from running.

Error code	Error message	Comment or clarification
1065-1066	Too many coinciding expansion, migration, or extension operations.	ACU does not support multiple simultaneous expansions, migrations, or extensions without saving the configuration between operations. Limit the number of such configuration changes in the script.
1091	Controller does not support SSP.	—
1093	Controller requires physical drives to set license keys.	—
1102	Slot information is not available.	You cannot run a script in Input mode on internal controllers that do not have slot information online. Systems running Microsoft Windows must have the System Management Driver loaded.
1110	Controller does not support license keys.	—
1111	Invalid license key.	—
1112	Controller has maximum number of license keys.	—
1114	Controller requires non-failed physical drives to set license keys.	—
2564	Controller is locked by another machine or user.	—
2818	Invalid Method.	The scripted Method value is not valid.
2819	Invalid Controller.	The scripted controller does not match any existing controllers.
2820	Could not detect controller *<text>*.	—
2821	No controllers detected.	This error applies to Input mode only. If no controllers are detected in Capture mode, the capture file is empty.
2822	Invalid read cache/write cache ratio.	The specified cache ratio is not supported by either the controller or the current controller configuration.
2823	Invalid rebuild priority.	—
2824	Invalid expand priority.	This error message appears if the expand priority value specified in the script is not supported. This message also appears if expansion is not possible because the Expand Priority feature is then not supported. (Expansion might be temporarily unavailable on a controller that normally supports expansion if, for example, the cache battery has low charge, another expansion or migration is already in progress, or the array has the maximum supported number of physical drives.)
2825	Invalid array.	The array ID is invalid.
2826	Array not specified.	The script file has commands that require an array, but no array is specified.
2827	New array ID does not match the next available array ID.	The scripted array ID is not the next ID in sequence, based on the IDs of the existing arrays. For example, only array A exists and the script file specifies creation of array C (omitting array B).
2828	New array ID already exists.	This error occurs in Configure mode when the array ID specified in the script file already exists in the configuration. In Configure mode, you can create only new arrays.
2829	Cannot create array.	The controller has no unassigned physical drives, or it already has the maximum number of arrays or logical drives.
2830	Cannot expand array.	The controller does not support expansion, or the current controller configuration is not expandable.

Error code	Error message	Comment or clarification
2831	Cannot change array spare.	This error message appears if you try to change the number of spares in an array when the configuration does not support the addition or subtraction of spares.
2832	Invalid physical drive.	A specified physical drive is not a valid physical drive, or it cannot be placed in the array.
2833	Invalid spare.	A specified spare is not a valid spare drive, or it cannot be placed in the array as a spare.
2834	Invalid logical drive.	—
2835	Logical drive not specified.	The script file has commands that require a logical drive, but no logical drive is specified.
2836	New logical drive ID does not match the next available logical drive ID.	The script file specifies a logical drive ID that is not the first unused ID in the sequence. For example, this message appears if the controller has only logical drive 1 and the script file specifies creation of logical drive 3 (omitting logical drive 2). A common cause of this error is that the input file specifies non-sequential logical drive numbers. In this case, change the logical drive numbers in the input file so that they are sequential.
2837	New logical drive ID already exists.	This error occurs in Configure mode when the logical drive ID specified in the script file already exists in the configuration. In Configure mode, you can create only new logical drives.
2838	Cannot create logical drive.	The array has no free space, or the maximum number of logical drives has already been reached.
2839	Cannot migrate logical drive RAID.	The controller does not support RAID migration, or migration is not possible with the current controller configuration.
2840	Cannot migrate logical drive stripe size.	The controller does not support stripe size migration, or migration is not possible with the current controller configuration.
2841	Cannot extend logical drive.	The controller does not support extension, or the current controller configuration cannot be extended. For example, extension is not possible if the array has no free space.
2842	Invalid RAID.	The specified RAID level is invalid or is not possible with the current configuration.
2843	Invalid size.	The specified size is invalid or is not possible with the current configuration.
2844	Invalid stripe size.	The specified stripe size is invalid, or not supported by the current RAID level, or not possible with the current configuration.
2845	Invalid sectors.	The specified MaxBoot setting is invalid or is not possible with the current configuration.
2846	Cannot change logical drive sectors.	You cannot change the MaxBoot setting on a configured logical drive because doing so causes data loss.
2847	Invalid array accelerator setting.	The specified array accelerator setting is invalid or is not supported by the current configuration.
2848	Cannot change logical drive array accelerator setting.	You cannot change the array accelerator setting for the current controller configuration.
2849	Invalid ClearConfigurationWithDataLoss parameter.	—
2850	Controller does not support RAID Array ID.	—

Error code	Error message	Comment or clarification
2851	Invalid RAID Array ID.	The scripted RAID Array ID is invalid. Use characters from the set a–z, A–Z, 0–9, !, @, #, *, (,), ,, -, _, +, :, ., /, and [space]. The ID cannot end with a space character or exceed the maximum number of characters allowed by the controller.
2852	Invalid SSP state.	—
2853	Cannot change SSP settings.	—
2854	Invalid SSP adapter ID.	—
2855	Controller does not support logical drive SSP states. Use the SSPState controller command to set the controller SSP state.	—
2856	Controller does not support controller SSP state. Use the LogicalDriveSSPState logical drive command to set SSP states for each logical drive.	—
2857	Invalid surface scan delay.	—
2861	Controller does not support redundancy settings.	The controller is not redundant or does not support redundancy settings.
2864	Invalid preferred path mode.	The specified value for the preferred path mode is not valid, or the controller is not available.
2865	Invalid preferred path.	The specified preferred path is not a valid chassis slot for an available active controller, or the controller is not available.
2866	Failure opening capture file *<text>*.	—
2867	Failure opening input file *<text>*.	—
2868	Failure opening error file *<text>*.	—
2869	*<text>* command expected.	The *<text>* command is missing or in the wrong place in the script file.
2870	*<text>* is not a supported command.	—
2871	*<text>* is not a Controller command.	The *<text>* command does not belong in the Controller section of the script file.
2872	*<text>* is not an Array command.	The *<text>* command does not belong in the Array section of the script file.
2873	*<text>* is not a Logical Drive command.	The *<text>* command does not belong in the Logical Drive section of the script file.
2874	*<text>* is not an HBA command.	The *<text>* command does not belong in the HBA section of the script file.
2875	More than one *<text>* command cannot exist in the same section.	—
2876	Invalid physical drive count.	The script specifies more drives than are available of the specified drive type.
2877	No spares available.	No drives were found that could be used as spares for the specified array.
2878	Spare request for RAID 0 is invalid.	RAID 0 does not support spares.
2879	Reset and reconfigure combined error.	A controller reset with data loss was specified while in Reconfigure mode.
2880	Invalid drive type specified.	—

Error code	Error message	Comment or clarification
2882	Invalid value for MNPDelay. Valid range is 0 (disabled) to 60 minutes.	—
2883	Invalid controller configuration value. Expecting Yes or No.	—
2884	Invalid value for QueueDepth. Valid range is from 2 to 32, or Auto.	—

Using HPLPCFG

You must edit the text file to insert the WWID of the boot volume and the LUN number that the WWID boots from. The HPLPCFG utility discovers the WWID of the HBA in the server blade and writes the information in the text file. The text file presents the options in human readable format. The HPLPCFG utility updates the hardware with the boot volume WWID and boot LUN read from the text file.

HPLPCFG command-line syntax

```
hplpcfg /s filename hplpcfg /l filename hplpcfg /v
[HBA0] WWID=11223344 HostAdapterBiosEnable=1 SelectBootEnable=1
BootDeviceWWID=22334455 BootDeviceLUN[0]=1111
```

HPLPCFG command-line arguments

Command-line argument	Description
`hplpcfg /s filename`	This argument saves the HBA configuration to the filename.
`hplpcfg /l filename`	This argument loads the HBA configuration to the filename.
`hplpcfg /v`	This argument displays the tool version information.
Where filename has the following format:	
`[HBA0]`	Section for each HBA
`WWID=11223344`	Read-only variable
`HostAdapterBiosEnable=1`	Your input or current value when read from HBA
`SelectBootEnable=1`	Your input or current value when read from HBA
`BootDeviceWWID=22334455`	Your input or current value when read from HBA
`BootDeviceLUN[0]=1111`	Your input, default LUN, or current value when read from HBA

HPLPCFG return codes

Value	Meaning
0	The command was completed successfully.
1	There was an invalid command line option.
2	There was a file open error.
3	There was an NVRAM checksum error.
4	There was an NVRAM data error.

Value	Meaning
5	There was no adapter or Emulex HBA found on this host.
6	There was an error retrieving the I/O address.
7	The WWID was invalid because of one of the following: • An invalid value for WWID and BootDeviceWWID, and not a hex value • The WWID specified for HBA in the .ini file does not match any HBAs found on the host (for the /l option only)
8	The LUN was invalid.
0x10	Invalid value; for enable/disable value is not 0 or 1 (for /l option only)
0x11	Incorrect iboot BIOS code loaded (for /l option only)
0xFF	General error: • Initialization error (for both /l and /s option) • Cannot read HBAs WWPN (for /s option only)

HPLPCFG command-line examples

hplpcfg /s hba.ini generates hba.ini with the following content:

```
[HBA0]
WWID=11111111
HostAdapterBiosEnable=1
SelectBootEnable=1
BootDeviceWWID=
BootDeviceLUN[0]=
```

You must edit hba.ini and add the following boot device information:

```
[HBA0]
WWID=11111111
HostAdapterBiosEnable=1
SelectBootEnable=1
BootDeviceWWID=22222222
BootDeviceLUN[0]=3
```

You must then invoke the tool to load the contents of hba.ini input to the HBA NVRAM: hplpcfg /l hba.ini.

Using LO100CFG

The LO100CFG utility enables you to configure the Lights Out 100 device that is available on the HP ProLiant 100 series servers.

Under Linux, LO100CFG uses the OpenIPMI library to communicate with the system firmware.

LO100CFG command-line syntax

```
lo100cfg [ -h | -x | -v | -i "file.xml" | -o "file.xml" | -s ]
```

LO100CFG command-line arguments

Command-line argument	Description
`-x`	This argument displays example XML to perform configuration.
`-v`	This argument outputs the current copyright and version information and then exits.
`-s`	This argument captures the current status and outputs it to the console.
`-h`	The argument lists basic command line arguments and supported XML tags.
`-i "file.xml"`	This argument loads and runs the given XML configuration file.
`-o "file.xml"`	This argument saves the current configuration to a file.
`-k "<xml/>"`	This argument has been deprecated and is no longer supported.

LO100CFG return codes

Value	Meaning
0	All operations succeeded.
10	A required command-line parameter is missing. See console output for details.
12	An unknown command-line parameter was passed to the utility.
14	File error, the specified file is empty or not found.
16	Syntax error, must specify exactly one option from -i -o -s.
17	An invalid command-line parameter was passed to the utility.
18	Invalid command-line syntax was used.
50	The IPMI driver may not be loaded or installed properly.
101	XML failed validity tests.
102	Field in the XML file has invalid values. Valid fields still applied.
103	The Lights Out 100 returned a code the application did not expect. See console output for code returned from the LO100 processor.
104	System is unsupported or is not running IPMI drivers.

NOTE: Return codes of 100 or higher are returned from the LO100 processor.

LO100CFG command-file contents

A typical data file generated by LO100CFG is similar to the following:

```
<lo100cfg>
<serial_port mode="dedicated" />
```

```
<nic mode="dhcp">
<ipv4 address="10.10.10.18" mask="255.255.252.0" gateway="10.10.10.1" />
<firewall http_active="yes" ping_active="yes" telnet_active="yes" />
</nic>
<users>
<user id="1" name="" privilege_level="user" />
<user id="2" name="operator" privilege_level="operator" />
<user id="3" name="admin" privilege_level="admin" />
<user id="4" name="oem" privilege_level="oem" />
</users>
</lo100cfg>
```

To disable the shared NIC configuration and make the Lights-Out 100 NIC dedicated, enter the following in your data file:

```
<lo100cfg>
<nic type="dedicated" />
</lo100cfg>
```

Using HPQLAREP

You must edit the text file to insert the WWID of the boot volume and the LUN number that they will boot from. The `hpqlarep` utility discovers the WWID of the HBA in the server blade and writes the information in the text file. The text file presents the options in human readable format. The `hpqlarep` utility updates the hardware with the boot volume WWID and boot LUN read from the text file.

HPQLAREP command-line syntax

```
hpqlarep /s filename hpqlarep /l filename
[HBA0] WWID=11223344 HostAdapterBiosEnable=1 SelectBootEnable=1
BootDeviceWWID=22334455 BootDeviceLUN[0]=1111
```

HPQLAREP command-line arguments

Command-line argument	Description
`hpqlarep /s filename`	This argument saves the HBA configuration to the filename.
`hpqlarep /l filename`	This argument loads the HBA configuration to the filename.
Where `filename` has the following format:	
`[HBA0]`	Section for each HBA
`WWID=11223344`	Read-only variable
`HostAdapterBiosEnable=1`	Read-only variable
`SelectBootEnable=1`	Read-only variable
`BootDeviceWWID=22334455`	Your input
`BootDeviceLUN[0]=1111`	Your input and default LUN

HPQLAREP return codes

Value	Meaning
0	The command was completed successfully.
1	There was an invalid command line option.
2	There was a file open error.
3	There was an NVRAM checksum error.
4	There was an NVRAM data error.
5	There was no adapter found on this host.
6	There was an error retrieving the I/O address.
7	The WWID was invalid.
8	The LUN setting was invalid.
9	The EFI Enable Selective LUN setting was invalid.
10	The BIOS Enable setting was invalid.
11	The Selectable BIOS setting was invalid.
12	The EFI Selective login settings were invalid.
13	The EFI WWID (Boot Node Name) was invalid.
14	There was a Memory Allocation error.
15	The adapter has no VPD.
16	There was a failure reading the adapter VPD.
17	The adapter has no VPD.
18	VPD has bad checksum.
19	The adapter serial number is missing in the VPD.

HPQLAREP command-line examples

`hpqlarep /s hba.ini` generates `hba.ini` with the following content:

```
[HBA0]
WWID=11111111
HostAdapterBiosEnable=1
SelectBootEnable=1
BootDeviceWWID=
BootDeviceLUN[0]=
```

You must edit hba.ini and add the following boot device information:

```
[HBA0]
WWID=11111111
HostAdapterBiosEnable=1
SelectBootEnable=1
BootDeviceWWID=22222222
BootDeviceLUN[0]=3
```

You must then invoke the tool to load the contents of hba.ini input to the HBA NVRAM: hpqlarep /l hba.ini.

Using HPONCFG

HP offers support for the iLO features available on ProLiant servers with the HPONCFG utility.

HPONCFG is an online configuration tool used to set up and reconfigure iLO without requiring a reboot of the server operating system. The utility runs in a command-line mode and must be executed from an operating system command line.

HPONCFG enables you to initially configure features exposed through the RBSU or iLO. This utility is not intended for continued administration. CPQLOCFG should be used for ongoing administration of user rights and network functionality on the server.

Observe the following requirements before using HPONCFG:

- The iLO Management Interface Driver must be loaded on the server. HPONCFG displays a warning if the driver is not installed.
- HPONCFG requires minimum iLO firmware versions. To determine the minimum firmware version required, see the *HP Scripting Toolkit Linux and Windows Editions Support Matrix.*

For more information, see the Remote Management website (http://www.hp.com/servers/lights-out).

HPONCFG command-line syntax

```
hponcfg [-help][-?][-reset][-f filename][-l filename]
[-w filename][-get_hostinfo][-m firmwarelevel]
```

IMPORTANT: Because the `-w` argument does not capture certain types of information, such as the administrator password, data files created with HPONCFG using the `-w` argument cannot then be used as input files for HPONCFG, unless they are modified first.

HPONCFG command-line arguments

Command-line argument	Description
`-help or -?`	These arguments display simple help messages.
`-reset`	This argument resets the iLO to factory defaults.
`-f` *filename*	This argument sets the iLO configuration based on the information in the XML input file named *filename.*
`-l` *filename*	This argument logs replies to the text log file named *filename.*
`-w` *filename*	This argument writes the iLO configuration obtained from the device to the XML output file named *filename.*
`-get_hostinfo`	This argument returns the host server name and serial number.
`-m`	This argument indicates to HPONCFG the minimum firmware level that must be present in the management device to execute the RIBCL script. If the minimum level is not met, HPONCFG returns an error without performing any additional actions.
`-mouse`	This argument causes HPONCFG to configure the server for optimized mouse handling.

NOTE: For a complete list of all command-line parameters, execute the `/?` utility.

HPONCFG return codes

Value	Meaning
0	The script was sent successfully to the device.
1	The script could not be sent to the device. There is an error in xml.
2	The Management processor is not present, or the driver is not running.
3	The iLO flash is still in progress.
255	The script is unable to create an output file.

If the script itself fails, errors are reported in the log file created by HPONCFG.

HPONCFG command file contents

HPONCFG can be used to perform the following tasks:

- Obtain an entire configuration
- Obtain a specific configuration
- Set a configuration

Obtaining an entire configuration

HPONCFG can be used to obtain an entire configuration from iLO. In this case, the utility executes from the command line without specification of an input file. The name of the output file is given on the command line. For example:

```
hponcfg -w config.xml
```

In this example, the utility indicates that it obtained the data successfully and wrote it to the output file as requested. The following is a typical example of the contents of the output file:

```
<HPONCFG VERSION = "1.1">
<!--- Generated 04/15/04 15:20:36 --->
<MOD_DIR_CONFIG>
<DIR_AUTHENTICATION_ENABLED VALUE = "N"/>
<DIR_LOCAL_USER_ACCT VALUE = "Y"/>
<DIR_SERVER_ADDRESS VALUE = ""/>
<DIR_SERVER_PORT VALUE = "25"/>
<DIR_OBJECT_DN VALUE = " "/>
<DIR_OBJECT_PASSWORD VALUE = ""/>
<DIR_USER_CONTEXT_1 VALUE = ""/>
<DIR_USER_CONTEXT_2 VALUE = "_"/>
<DIR_USER_CONTEXT_3 VALUE = ""/>
</MOD_DIR_CONFIG>
<MOD_NETWORK_SETTINGS>
<SPEED_AUTOSELECT VALUE = "Y"/>
<NIC_SPEED VALUE = "100"/>
<FULL_DUPLEX VALUE = "Y"/>
<IP_ADDRESS VALUE = "16.100.241.229"/>
<SUBNET_MASK VALUE = "255.255.252.0"/>
<GATEWAY_IP_ADDRESS VALUE = "16.100.240.1"/>
```

```
<DNS_NAME VALUE = "ILOD234KJ44D002"/>
<PRIM_DNS_SERVER value = "16.81.3.242"/>
<DHCP_ENABLE VALUE = "Y"/>
<DOMAIN_NAME VALUE = "americas.cpqcorp.net"/>
<DHCP_GATEWAY VALUE = "Y"/>
<DHCP_DNS_SERVER VALUE = "Y"/>
<DHCP_STATIC_ROUTE VALUE = "Y"/>
<DHCP_WINS_SERVER VALUE = "Y"/>
<REG_WINS_SERVER VALUE = "Y"/>
<PRIM_WINS_SERVER value = "16.81.3.247"/>
<STATIC_ROUTE_1 DEST = "0.0.0.0" GATEWAY = "0.0.0.0"/>
<STATIC_ROUTE_2 DEST = "0.0.0.0" GATEWAY = "0.0.0.0"/>
<STATIC_ROUTE_3 DEST = "0.0.0.0" GATEWAY = "0.0.0.0"/>
</MOD_NETWORK_SETTINGS>
<ADD_USER
USER_NAME = "Administrator"
USER_LOGIN = "Administrator"
PASSWORD = "">
</ADD_USER>
<ADD_USER
USER_NAME = "Landy9"
USER_LOGIN = "mandy9"
PASSWORD = "">
</ADD_USER>
<RESET_RIB VALUE = "Y"/>
</HPONCFG>
```

For security reasons, the user passwords are not returned.

Obtaining a specific configuration

A specific configuration can be obtained using the appropriate XML input file. For example, the contents of a typical XML input file, `get_global.xml` are the following:

```
<!-- Sample file for Get Global command -->
<RIBCL VERSION="2.0">
<LOGIN USER_LOGIN="x" PASSWORD="x">
<RIB_INFO MODE="read">
<GET_GLOBAL_SETTINGS />
</RIB_INFO>
</LOGIN>
</RIBCL>
```

The XML commands are read from the input file

`get_global.xml`

and are processed by the device:

```
HPONCFG /f get_global.xml /l log.txt > output.txt
```

The requested information is returned in the log file, which, in this example, is named `log.txt`. The contents of the log file are as follows:

```
<GET_GLOBAL_SETTINGS>
<SESSION_TIMEOUT VALUE="30"/>
<ILO_FUNCT_ENABLED VALUE="Y"/>
```

```
<F8_PROMPT_ENABLED VALUE="Y"/>
<REMOTE_CONSOLE_PORT_STATUS VALUE="3"/>
<REMOTE_CONSOLE_ENCRYPTION VALUE="N"/>
<PREFER_TERMINAL_SERVICES VALUE="N"/>
<HTTPS_PORT VALUE="443"/>
<HTTP_PORT VALUE="80"/>
<REMOTE_CONSOLE_PORT VALUE="23"/>
<TERMINAL_SERVICES_PORT VALUE="3389"/>
<VIRTUAL_MEDIA_PORT VALUE="17988"/>
<MIN_PASSWORD VALUE="4"/>
</GET_GLOBAL_SETTINGS>
```

Setting a configuration

A specific configuration can be sent to the iLO by using the command format:

```
HPONCFG /f add_user.xml /l log.txt
```

In this example, the input file has the following contents:

```
<!-- Add user with minimal privileges to test default setting of
assigned privileges to 'N' -->
<RIBCL version="1.2">
<LOGIN USER_LOGIN="x" PASSWORD="x">
<USER_INFO MODE="write">
<ADD_USER USER_NAME="Landy9" USER_LOGIN="mandy9"
PASSWORD="floppyshoes">
<RESET_SERVER_PRIV value="Y" />
<ADMIN_PRIV value="Y" />
</ADD_USER>
</USER_INFO>
</LOGIN>
</RIBCL>
```

The specified user will be added to the device.

HPONCFG command-line examples

For HPONCFG command line examples, see the appropriate user guide on the Remote Management website (http://www.hp.com/servers/lights-out).

5 Troubleshooting

Troubleshooting table

Issue	Troubleshooting
Data loss in Toolkit	Improper use of the Toolkit utilities and modification of the CONREP data files can result in loss of critical data. Because of the potential data-loss risk, only experienced individuals should use the Toolkit utilities. Before using the Toolkit, all necessary precautions must be taken to ensure that mission-critical systems remain online if a failure occurs.
Setting up a PXE boot environment	A basic understanding of DHCP, PXE, and TFTP is required to perform the procedure. The examples in this guide might not be specific to your operating system environment. For more information about your particular environment, see the Linux system administrator's guide
Configuring options using Toolkit utilities	Not all options can be configured using Toolkit utilities. Some options must be configured manually or with other configuration utilities, which are available online, before they can be used with the Toolkit. For more information on configuration, see the option documentation
Input files for HPONCFG	Because the -w argument does not capture certain types of information, such as the administrator password, data files created with HPONCFG using the -w argument cannot be used as input files for HPONCFG, unless they are modified first.
CONREP version compatibility	The file format for the DOS version of CONREP and the current version of CONREP are not compatible.
HPACUSCRIPTING support	HPACUSCRIPTING supports only HP Smart Array controllers. Review the HPACUSCRIPTING documentation for the latest information.
Booting from a USB drive key	Booting from a USB drive key is supported only on certain ProLiant servers. For more information, see the HP SPP website (http://www.hp.com/go/spp).
CONREP data file editor	Only the fields that are present in the CONREP file being edited will be shown. The CONREP data file editor cannot add or remove fields. Some fields, such as the server OS selection, cannot be edited.
Kernels	The kernel is generally static and cannot be modified easily. HP recommends that you use the kernel that is shipped with the Toolkit because it has been tested on all servers supported by the Toolkit.
SETBOOTORDER changes	Any changes you make to the SETBOOTORDER will take effect at the next reboot.

6 Support and other resources

Information to collect before contacting HP

Be sure to have the following information available before you contact HP:

- Software product name
- Hardware product model number
- Operating system type and version
- Applicable error message
- Third-party hardware or software
- Technical support registration number (if applicable)

How to contact HP

Use the following methods to contact HP technical support:

- See the Contact HP worldwide website:
  http://www.hp.com/go/assistance
- Use the `Contact hp` link on the HP Support Center website:
  http://www.hp.com/go/hpsc
- In the United States, call +1 800 334 5144 to contact HP by telephone. This service is available 24 hours a day, 7 days a week. For continuous quality improvement, conversations might be recorded or monitored.

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website: http://www.hp.com/country/us/en/contact_us.html After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

Documentation feedback

HP welcomes your feedback. To make comments and suggestions about product documentation, send a message to docsfeedback@hp.com. Include the document title and manufacturing part number. All submissions become the property of HP.

Related information

For support software and drivers, see the HP software and drivers website (http://www.hp.com/support/files). HP also recommends installing the latest version of the HP SPP. To obtain the most current SPP, see the SPP website (http://www.hp.com/go/spp).

For more information on the Toolkit, see the additional documentation found on the Toolkit website (http://www.hp.com/go/ProLiantSTK).

For more information on unattended installation, see the following resources:

- Operating system documentation
- *Windows Server Technical Reference* (http://technet.microsoft.com/en-us/library/bb625087.aspx)

Toolkit support

E-mail support for the Scripting Toolkit is available from the HP support website (http://h18013.www1.hp.com/products/servers/management/toolkit/smartsetup_E-support.html).

Typographic conventions

Table 1 Document conventions

Convention	Element
Blue text: Table 1 (page 61)	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Website addresses
Bold text	• Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
Italic text	Text emphasis
`Monospace` text	• File and directory names • System output • Code • Commands, their arguments, and argument values
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text

WARNING! Indicates that failure to follow directions could result in bodily harm or death.

CAUTION: Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

TIP: Provides helpful hints and shortcuts.

Acronyms and abbreviations

ACU	Array Configuration Utility
BIOS	Basic Input/Output System
CONREP	Configuration Replication utility
CPQACUXE	Array Configuration Utility XE
CPQLOCFG	Lights-Out Configuration Utility
DHCP	Dynamic Host Configuration Protocol
DOS	disk operating system
FAT	file allocation table
GUI	graphical user interface
HBA	host bus adapter
HPDISCOVERY	HP Discovery Utility
HPONCFG	HP Lights-Out Online Configuration utility
HPQLAREP	HP QLogic FC HBA BIOS configuration utility
HPRCU	HP ROM Configuration Utility
HWQUERY	Hardware Query Utility
I/O	input/output
IFHW	IF Hardware Utility
iLO	Integrated Lights-Out
IP	Internet Protocol
IPL	initial program load
IPMI	Intelligent Platform Management Interface
ISO	International Organization for Standardization
LO100CFG	Lights-Out (100 series) Online Configuration utility
LUN	logical unit number
MBR	master boot record
NFS	network file system
NIC	network interface controller
NVRAM	non-volatile memory
OS	operating system
PCI	peripheral component interface
PSP	ProLiant Support Pack
PXE	Preboot Execution Environment
RAID	redundant array of inexpensive (or independent) disks
RAM	random access memory
RBSU	ROM-Based Setup Utility
RHEL	Red Hat Enterprise Linux
RIBCL	Remote Insight Board Command Language
RILOE II	Remote Insight Lights-Out Edition II
ROM	read-only memory
SAS	serial attached SCSI
SATA	serial ATA
SCSI	small computer system interface

SLES	SUSE Linux Enterprise Server
SPP	HP Service Pack for ProLiant
SSP	Selective Storage Presentation
STATEMGR	State Manager utility
TFTP	Trivial File Transfer Protocol
USB	universal serial bus
VPD	vital product data
WOL	Wake-on LAN
WWID	World Wide ID
WWN	World Wide Name
WWPN	worldwide port name
XML	extensible markup language

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