Upgrading the SMW Base Operating System to SLES 11 SP3

S–0047–A

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RECORD OF REVISION

S–0047–A Published October 2013 Supports upgrading the SMW base operating system from SLES 11 SP2 to SLES 11 SP3.

Contents

Upgrading the SMW Base Operating System From SLES 11 SP2 to SLES 11 SP3 [1]

Important: Before you perform this upgrade process, your Cray® System Management Workstation (SMW) must be running the SUSE Linux® Enterprise Server 11 (SLES 11) Service Pack 2 (SP2) as the SMW base operating system. Cray recommends that your SMW is running a release of SMW 7.0 or SMW 7.1. Cray has tested and supports releases of SMW 7.0 or SMW 7.1 running SLES 11 SP3 as the SMW base operating system; Cray will support customer efforts to upgrade earlier SMW releases.

Note: This SMW base operating system upgrade process does not require a complete fresh (initial) installation, and it does not change the Cray SMW software version currently running on your SMW.

Important: SMW High Availability (HA) sites **require** the SMW High Availability Extension for SLES11 SP3 package release; contact your Cray Service representative for availability of this SMW HA package.

1.1 Before You Start

To determine whether there are any changes to this procedure, read the Field Notice and the *README* file associated with this SMW base operating system upgrade.

1.2 Back Up Your Current Software

Before you upgrade your SMW base operating system to SLES 11 SP3, back up your current SMW software. For a rack-mount SMW, see Appendix A, Rack-mount SMW: Creating a Bootable Backup Drive on page 17; for a desk-side SMW, see Appendix B, Desk-side SMW: Creating a Bootable Backup Drive on page 27.

1.3 Shut Down the Cray System

Important: This upgrade process requires physical access to the SMW in order to shut down the SMW, boot the upgrade media, and install the SLES 11 SP3 software. Ensure that you have the SMW base operating system DVD that is labeled `Cray-SMWbase11SP3-`*yyyymmdd*. (If you are using a downloaded ISO® file, the label will be `Cray-ULC11SP3-`*yyyymmddhhmm*`.iso`.)

Procedure 1. Shutting down the Cray system

⚡ **Warning:** The procedure to install the SMW base operating system breaks the connection from the SMW; shut down your Cray system now.

1. Log on to the SMW as `crayadm` and confirm that the Cray system is shut down.

   ```
   crayadm@smw:~> ping boot
   ```

   If the command responds with `alive`, it is up and needs to be shut down.

2. Shut down the system by executing the following command.

   ```
   crayadm@smw:~> xtbootsys -s last -a auto.xtshutdown
   ```

   For more information about using automation files, see the `xtbootsys`(8) man page.

   Alternatively, you can execute these commands as `root` from the boot node to shutdown your system.

   ```
   boot:~# xtshutdown -y
   boot:~# shutdown -h now;exit
   ```

1.4 Upgrade the SMW Base Operating System to SLES 11 SP3

This section provides procedures to upgrade the SMW SLES 11 SP2 base operating system to the SMW SLES 11 SP3 base operating system.

To upgrade a rack-mount SMW, see Procedure 2 on page 6.

To upgrade a desk-side SMW, see Procedure 3 on page 11.

Procedure 2. Rack-mount SMW: Installing the base operating system

1. If the SMW is up, shut it down.

   ```
   smw:~ # shutdown -h now;exit
   ```

   The SMW should now be powered off.

2. Disconnect the boot RAID connection to the SMW.

   ⚠ **Caution:** While the SMW is powered off, unplug the boot RAID connection, and place protective covers on the fibre optic cables and connectors (if present).

3. Power up the SMW. When the BIOS power-on self-test (POST) process begins, **quickly press the F2 key** after the following messages appear in the upper-right of the screen.

   ```
          F2 = System Setup
        F10 = System Services
     F11 = BIOS Boot Manager
             F12 = PXE Boot
   ```

When the F2 keypress is recognized, the F2 = System Setup line changes to Entering System Setup.

After the POST process completes and all disk and network controllers have been initialized, the **BIOS** set-up screen appears.

4. Use the down-arrow key to highlight **Boot Settings**. Press the Enter key.

   A window listing the following appears:

   ```
   Boot Mode ........................................ BIOS
   Boot Sequence .................................... <ENTER>
   USB Flash Drive Emulation Type.................... <ENTER>
   Boot Sequence Retry .............................. <Disabled>
   ```

5. Use the down-arrow key to highlight **Boot Sequence**. Press the Enter key.

   A window listing the following appears.

   ```
   √  1. Hard Drive C: (Integrated SAS 500 ID0A LUN0 ATA)
   √  2. Virtual CD
   √  3. Sata Optical Drive
   √  4. Embedded NIC 1 MBA v6.0.11  Slot 0100
   √  5. Virtual Floppy
   ```

6. Using the up-arrow and down-arrow keys to select, and using the space key to enable/disable entries, modify the list so that only the 1. Hard Drive C: entry has a check mark.

   ```
   √  1. Hard Drive C: (Integrated SAS 500 ID0A LUN0 ATA)
      2. Virtual CD
      3. Sata Optical Drive
      4. Embedded NIC 1 MBA v6.0.11  Slot 0100
      5. Virtual Floppy
   ```

7. Press the Esc key to exit the **Boot Sequence** window.

8. Press the Esc key again to exit the **Boot Settings** window.

9. Insert the base operating system DVD labeled Cray-SMWbase11SP3-*yyyymmdd* into the CD/DVD drive.

10. Press the Esc key a final time to save changes and exit the BIOS set up. A screen listing exit options appears.

    ```
    Save changes and exit
    Discard changes and exit
    Return to Setup
    ```

11. Ensure that Save changes and exit is highlighted. Then press the Enter key. The SMW resets automatically.

12. When the BIOS POST process begins again, **within 5 seconds, press the `F11` key** after the following messages appear in the upper-right of the screen.

```
        F2 = System Setup
     F10 = System Services
    F11 = BIOS Boot Manager
            F12 = PXE Boot
```

When the `F11` keypress is recognized, the `F11 = BIOS Boot Manager` line changes to `Entering BIOS Boot Manager`.

13. Watch the screen carefully as text scrolls until you see `iDRAC6 Configuration Utility 1.57`. **Within 5 seconds, press the `Ctrl-E` key** when the prompt `Press <Ctrl-E> for Remote Access Setup within 5 sec...` displays.

```
   0   5   0  ATA      WDC WD5000BPVT-0 1A01            465 GB
LSI Corporation MPT2 boot ROM successfully installed!

iDRAC6 Configuration Utility 1.57
Copyright 2010 Dell Inc. All Rights Reserved

iDRAC6 Firmware Rivision version: 1.54.15
Primary Backplane Firmware Revision 1.07


-------------------------------

     IPv6 Settings
-------------------------------

 IPv6 Stack      : Disabled
 Address 1       : ::
 Default Gateway : ::
 -------------------------------
     IPv4 Settings
 -------------------------------
 IPv4 Stack      : Enabled
 IP Address      : 172. 31. 73.142
 Subnet mask     : 255.255.255. 0
 Default Gateway : 172. 31. 73. 1
Press <Ctrl-E> for Remote Access Setup within 5 sec...
```

The **iDRAC6 Configuration Utility** window appears.

14. In the **iDRAC6 Configuration Utility**, select **Virtual Media Configuration**.

The **Virtual Media Configuration** window appears.

15. Select the **Virtual Media** line until it indicated **Detached**.

```
Virtual Media ..................... Detached
```

16. Press the `Esc` key to exit the **Virtual Media Configuration** window.

17. Press the `Esc` key again to exit the **iDRAC6 Configuration Utility** window.

The **BIOS Boot Manager** screen appears.

18. Use the up-arrow and down-arrow keys to highlight the SATA Optical Drive entry.

19. Press the Enter key to boot from the installation DVD.

20. **Within 10 to 15 seconds** after the **SUSE Linux Enterprise Server** boot menu displays, use the down-arrow key to scroll down and select the **Cray SMW Upgrade Install** option.

    ```
    - Boot from Hard Disk
    - Cray SMW Initial Install
    - Cray SMW Initial Install Rackmount
    - Cray SMW Upgrade Install
    - Repair Installed System
    - Rescue System
    - Check Installation Media
    ```

    Then press the Enter key.

    Otherwise, the first selection on this boot menu list is activated (that is, boot from the SMW's disk).

21. A Disclaimer is displayed, indicating that the distribution media is specifically for Cray, Inc. hardware installations. Click **OK**.

    A **Welcome** window is displayed, including option settings for Language and Keyboard Layout and a License Agreement.

22. Confirm the language for the SMW.

    English (US) is the default language. To change the primary language, select your language choice from the menu. Then click on **Next** at the bottom of the window.

23. Confirm the Keyboard Layout desired for the installed SMW.

24. You must accept the distribution license agreement to continue upgrading the SMW. Click the acceptance box next to the text **I Agree to the License Terms** to accept the agreement, and then click **Next**.

25. A **Media Check** window is presented. Cray recommends that you verify the distribution DVD media before you proceed to upgrade the SMW. This verification ensures that the media is fully readable and properly formatted.

    To begin the media check, click **Start Check**. This check completes in about 4 minutes, and the Progress bar at the bottom of the screen indicates the media check progress to completion. When a successful media check has completed, the text **Result: OK – The medium has been successfully verified**, appears on the screen.

    Click **Next**.

    The installation process now analyzes and probes the SMW for hardware and installed software.

26. An **Installation Mode** screen appears to enable you to select the type of software installation process to perform:

```
Select mode
    New Installation
    Update
    Repair Installed System
```

Select **Update**.

⚡ **Warning:** You must select **Update**. Do **not** select New Installation; otherwise, all existing data on the disk drive will be lost.

27. Click **Next**.

28. The **Select for Update** window, which indicates the partition or system to update, should indicate /dev/sda2. Click **Next**.

29. A **Warning** window, stating that some partitions are mounted by kernel-device name may appear. Such partitions are acceptable on the Cray SMW. Click **OK**.

30. A **Previously Used Repositories** screen appears, indicating that repositories were found on the system being upgraded. Make no changes to this screen. Click **Next**.

31. The **Installation Settings** window appears. Verify that the Update Options indicates **Update to SUSE Linux Enterprise Server 11 SP3**. (If it does not, click **Back** to return to the **Installation Mode** window, and properly select **Update**.)

    a. Click on **Update** at the bottom of the window. The **Confirm Update** window appears. If you want to check or change settings, click on **Back**; otherwise, click on **Start Update** to confirm the settings and to install the operating system.

        Note: A pop-up window that confirms hardware detection may appear. If this occurs, click on **continue**.

    Note: The installation completes in approximately 15 minutes. During the process, the SMW automatically reboots and continues with the system configuration.

32. A **Test Internet Connection** window appears. Do not use this function. Select **No, Skip this test**, and click on **Next**.

33. The SLES 11 SP3 release notes appear. Click on **Next** to continue.

34. The **installation completion** window appears. An option to **Clone This System for Autoyast** is located near the bottom of the display.

    Deselect the **Clone This System for Autoyast** option.

35. Click **Finish**.

    The SMW boots to multi-user mode for login on the console. The SMW SLES 11
    SP3 base operating system is now installed. Continue with the next step.

36. Remove the protective covers from the fiber optic cables and connectors, clean
    the ends of the cables and connectors, and reconnect the data cables.

Procedure 3. Desk-side SMW: Upgrade the SMW base operating system

1. If the SMW is up, shut it down.

   ```
   smw:~ # shutdown -h now;exit
   ```

   The SMW should now be powered off.

2. Disconnect all extra drives and the boot RAID connection to the SMW.

   ⚠ **Caution:** While the SMW is powered off, unplug the secondary SMW disks
   and the boot RAID connection, and place protective covers on the fibre optic
   cables and connectors (if present). Disconnect all but the primary SMW drive
   being upgraded to prevent corruption during the software upgrade process.

3. Power up the SMW. When the BIOS power-on self-test (POST) process begins,
   quickly press the `Del` key after the following messages appear on the screen.

   ```
   Press DEL to run Setup
   Press F12 if you want to boot from the network
   Press F11 for BBS POPUP
   Initializing USB Controllers .. Done.
   ...
   USB Device(s): 1 Keyboard, 1 Mouse
   ```

   (The last line in this example indicates that the SMW is ready to accept keyboard
   input.)

   After the POST process completes, the **BIOS Setup Utility** screen appears.

4. Use the `right arrow` key to select the **Boot** menu. Use the `down arrow` to
   highlight **Boot Device Priority**. Press the `Enter` key.

5. Verify the boot priority list.

   ```
   1st Boot Device [SATA:3M-ST3320613A]
   2nd Boot Device [CD/DVD:PM-ATAPI DV]
   3rd Boot Device [1st Floppy Drive]
   ```

   If necessary, change the boot priority list so that the local hard drive is the first
   boot device and the local CD/DVD drive is the second boot device.

6. Press the `Esc` key to return to the **BIOS Setup Utility** screen.

7. Press the `down arrow` key to select **Hard Disk Drives**, and press the `Enter`
   key.

8. Verify that the drive order shown corresponds to the physical placement of the hard drives in the SMW.

```
1st Drive      [SATA:3M-...]
2nd Drive      (disk was removed)
3rd Drive      (disk was removed)
```

> **Note:** If any drives other than the `1st Drive` are listed, local hard drives are still connected or the boot RAID is still connected. Power down the SMW and return to step 2 of this procedure to disconnect these devices.

9. Press the `Esc` key to return to the **Boot** menu. Then press the `left arrow` key to select the **Main** menu. From the **Main** menu, use the `down arrow` key to select the **System Time** option. Set the system date and time to the time at the Coordinated Universal Time (UTC) time zone. Determine this time by running the command `date -u` on any system.

10. Insert the base operating system DVD labeled `Cray-SMWbase11SP3-`*yyyymmdd* into the CD/DVD drive. (If you are using a downloaded ISO file, the label will be `Cray-ULC11SP3-`*yyyymmddhhmm*`.iso`.)

11. Press the `F10` key to save the BIOS changes. A dialog box displays the question **Save configuration changes and exit setup?**.

   - Press the `Enter` key to save changes, exit the setup utility, and automatically reboot the SMW.

   - Alternatively, press `Tab` to highlight `Cancel` and then press the `Enter` key to cancel acceptance of BIOS changes, so that you can adjust a setting.

12. When the POST process begins again, **quickly press the F11 key** to enter `Boot Device Selection` mode.

```
Press DEL to run Setup
Press F12 if you want to boot from the network
Press F11 for BBS POPUP
Initializing USB Controllers .. Done.
...
USB Device(s): 1 Keyboard, 1 Mouse#:
```

(The last line in this example indicates that the SMW is ready to accept keyboard input.)

13. At the **Please select boot device** prompt, use the `up arrow` and `down arrow` keys to select the CD/DVD drive, and press the `Enter` key. A blue-backgrounded Cray logo screen with a **DVD-boot options** menu appears.

14. **Within 10 to 15 seconds**, after the **SUSE Linux Enterprise Server** boot menu displays, use the `down arrow` key to scroll down and select the **Cray SMW Upgrade Install** option.

```
- Boot from Hard Disk
- Cray SMW Initial Install
- Cray SMW Initial Install Rackmount
- Cray SMW Upgrade Install
- Repair Installed System
- Rescue System
- Check Installation Media
```

Then press the `Enter` key.

Otherwise, the first selection on this boot menu list is activated (that is, boot from the SMW's hard disk drive).

15. A Disclaimer is displayed, indicating that the distribution media is specifically for Cray, Inc. hardware installations. Click **OK**.

A **Welcome** window is displayed, including option settings for Language and Keyboard Layout and a License Agreement.

16. Confirm the language for the SMW.

English (US) is the default language. To change the primary language, select your language choice from the menu. Then click on **Next** at the bottom of the window.

17. Confirm the Keyboard Layout desired for the installed SMW.

18. You must accept the distribution license agreement to continue upgrading the SMW. Click the acceptance box next to the text **I Agree to the License Terms** to accept the agreement, and then click **Next**.

19. A **Media Check** window is presented. Cray recommends that you verify the distribution DVD media before you proceed to upgrade the SMW. This verification ensures that the media is fully readable and properly formatted.

To begin the media check, click **Start Check**. This check completes in about 4 minutes, and the `Progress` bar at the bottom of the screen indicates the media check progress to completion. When a successful media check has completed, the text **Result: OK – The medium has been successfully verified**, appears on the screen.

Click **Next**.

The installation process now analyzes and probes the SMW for hardware and installed software.

20. An **Installation Mode** screen appears to enable you to select the type of software installation process to perform:

```
Select mode
     New Installation
     Update
     Repair Installed System
```

Select **Update**.

⚡ **Warning:** You must select **Update**. Do **not** select New Installation; otherwise, all existing data on the disk drive will be lost.

21. Click **Next**.

22. The **Select for Update** window, which indicates the partition or system to update, should indicate /dev/sda2. Click **Next**.

23. A **Warning** window, stating that some partitions are mounted by kernel-device name may appear. Such partitions are acceptable on the Cray SMW. Click **OK**.

24. A **Previously Used Repositories** screen appears, indicating that repositories were found on the system being upgraded. Make no changes to this screen. Click **Next**.

25. The **Installation Settings** window appears. Verify that the Update Options indicates **Update to SUSE Linux Enterprise Server 11 SP3**. (If it does not, click **Back** to return to the **Installation Mode** window, and properly select **Update**.)

    a. Click on **Update** at the bottom of the window. The **Confirm Update** window appears. If you want to check or change settings, click on **Back**; otherwise, click on **Start Update** to confirm the settings and to install the operating system.

        Note: A pop-up window that confirms hardware detection may appear. If this occurs, click on **continue**.

    Note: The installation completes in approximately 15 minutes. During the process, the SMW automatically reboots and continues with the system configuration.

26. A **Test Internet Connection** window appears. Do not use this function. Select **No, Skip this test**, and click on **Next**.

27. The SLES 11 SP3 release notes appear. Click on **Next** to continue.

28. The **installation completion** window appears. An option to **Clone This System for Autoyast** is located near the bottom of the display.

    Deselect the **Clone This System for Autoyast** option.

29. Click **Finish**.

    The SMW boots to multi-user mode for login on the console. The SMW SLES 11 SP3 base operating system is now installed. Continue with the next step.

30. Remove the protective covers from the fiber optic cables and connectors, clean the ends of the cables and connectors, and reconnect the data cables.

1.5 Back Up Your Newly-installed Software

After you upgrade your SMW base operating system to SLES 11 SP3, back up your current SMW software. For a rack-mount SMW, see Appendix A, Rack-mount SMW: Creating a Bootable Backup Drive on page 17; for a desk-side SMW, see Appendix B, Desk-side SMW: Creating a Bootable Backup Drive on page 27.

Rack-mount SMW: Creating a Bootable Backup Drive [A]

A.1 Rack-mount SMW: Creating a Cray System Management Workstation (SMW) Bootable Backup Drive

The following procedure creates a bootable backup drive for a rack-mount SMW in order to replace the primary drive if the primary drive fails. When this procedure is completed, the backup drive on the SMW will be a bootable replacement for the primary drive when the backup drive is plugged in as or cabled as the primary drive.

Procedure 4. Rack-mount SMW: Creating an SMW bootable backup drive

Important: The disk device names shown in this procedure are only examples. You should substitute the actual disk device names for your system. The boot disk is phy7 and is slot 0, and the bootable backup disk is phy6 and is slot 1.

⚠ **Caution:** Shut down the Cray system before you begin this procedure.

Also be aware that there may be a considerable load on the SMW while creating the SMW bootable backup drive.

1. Log on to the SMW as crayadm and su to root.

```
crayadm@smw:~> su -
Password:
smw:~ # ls -al /dev/disk/by-path
total 0
drwxr-xr-x 2 root root 380 Mar 15 13:21 .
drwxr-xr-x 6 root root 120 Mar 11 18:42 ..
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:00:11.0-scsi-0:0:0:0 -> ../../sr0
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:00:12.2-usb-0:3:1.0-scsi-0:0:0:0 -> ../../sdf
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:00:12.2-usb-0:3:1.1-scsi-0:0:0:0 -> ../../sr1
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:00:12.2-usb-0:3:1.1-scsi-0:0:0:1 -> ../../sdg
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:00:13.2-usb-0:2.1:1.0-scsi-0:0:0:0 -> ../../sde
lrwxrwxrwx 1 root root  10 Mar 11 18:42 pci-0000:00:13.2-usb-0:2.1:1.0-scsi-0:0:0:0-part1 -> ../../sde1
lrwxrwxrwx 1 root root  10 Mar 11 18:42 pci-0000:00:13.2-usb-0:2.1:1.0-scsi-0:0:0:0-part2 -> ../../sde2
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:05:00.0-sas-phy4-...
lrwxrwxrwx 1 root root  10 Mar 14 15:57 pci-0000:05:00.0-sas-phy4-...
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:05:00.0-sas-phy5-...
lrwxrwxrwx 1 root root  10 Mar 14 16:00 pci-0000:05:00.0-sas-phy5-...
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:05:00.0-sas-phy6-...
lrwxrwxrwx 1 root root  10 Mar 15 13:21 pci-0000:05:00.0-sas-phy6-...
lrwxrwxrwx 1 root root  10 Mar 15 13:21 pci-0000:05:00.0-sas-phy6-...
lrwxrwxrwx 1 root root   9 Mar 11 18:42 pci-0000:05:00.0-sas-phy7-...
lrwxrwxrwx 1 root root  10 Mar 11 18:42 pci-0000:05:00.0-sas-phy7-...
lrwxrwxrwx 1 root root  10 Mar 11 18:42 pci-0000:05:00.0-sas-phy7-...
```

2. Standardize the SMW's boot-time drive names with the Linux run-time drive names.

> **Important: If your SMW configuration files on the SMW root drive have been modified already (that is, your site has completed this step at least once after installing your updated SMW base operating system), skip to step 3; otherwise, complete this step to standardize the SMW's boot-time drive names with the Linux run-time drive names.**

Set up ordered drives on your rack-mount SMW.

a. Identify the installed SMW drive model numbers, serial numbers, and associated Linux device (/dev) names.

Execute the smwmapdrives.sh script on the SMW to identify local (internal) drives mounted in the SMW and provide their Linux device (/dev) names.

> **Note:** Effective with the SMW 7.1.UP00 release, the smwmapdrives.sh script is provided both as a separate file in the release and in the base operating system RPM. Prior to do this update you will need to use the separate file, but when backing up your SMW at a later date you can use the installed version.

```
smw:~ # ./smwmapdrives.sh
    List of SMW-installed disk drives
    --------------------------------
    Physical slot 0:
            /dev/sda
            /dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS
            /dev/disk/by-id/scsi-SATA_FUJITSU_MHZ2160_K85DTB227RDS
            /dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0
        Physical slot 1:
            /dev/sdc
            /dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RD7
            /dev/disk/by-id/scsi-SATA_FUJITSU_MHZ2160_K85DTB227RD7
            /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0
        Physical slot 2:
            /dev/sdd
            /dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RF3
            /dev/disk/by-id/scsi-SATA_FUJITSU_MHZ2160_K85DTB227RF3
            /dev/disk/by-path/pci-0000:05:00.0-sas-phy5-0x4433221105000000-lun-0
        Physical slot 3:
            /dev/sdb
            /dev/disk/by-id/ata-ST9500620NS_9XF0665V
            /dev/disk/by-id/scsi-SATA_ST9500620NS_9XF0665V
            /dev/disk/by-path/pci-0000:05:00.0-sas-phy4-0x4433221104000000-lun-0
        Physical slot 4:
            NOT INSTALLED
        Physical slot 5:
            NOT INSTALLED
```

The device names for by-id are persistent and will reference the drive, regardless of the slot in which the drive is installed.

by-path names reference a physical drive slot only and do not identify the drive installed in that slot. This is the naming used by default for the logging and database drives when the SMW was installed. This by-path name is used to specifically install logging and database file systems because the by-id device names refer to the physical drive slots expected to be used for those file systems and are provided as the default examples in the SMW installation configuration process.

The /dev/sd*X* drive names are not persistent, except for the /dev/sda drive name, which always refers to the drive installed in physical slot 0 (zero) of the SMW; the other /dev/sd*X* names can change with each SMW boot and **will** change if drives are added, removed, or reordered in the SMW slots. Only the /dev/sda drive name may ever be used for the rack-mount SMW for this reason.

Either the by-id naming or the by-path naming should be chosen for the site administrative policy for managing the SMW-install disk drives. The following documentation provides the steps necessary to implement this selection on the SMW prior to creating an SMW bootable backup drive.

b. Back up the following files before proceeding:

```
smw# cp -p /boot/grub/device.map /boot/grub/device.map-YYYYMMDD
smw# cp -p /boot/grub/menu.lst /boot/grub/menu.lst-YYYYMMDD
smw# cp -p /etc/fstab /etc/fstab-YYYYMMDD
```

c. Edit the grub device.map file to reflect physical drive locations.

To provide a direct mapping of the SMW disk drive physical slots to the boot loader (BIOS and GRUB) drive namings, the device.map mapping file used by grub should be replaced. Perform the following steps to install new device.map file entries to effect this mapping.

1) Edit the grub device.map file.

2) Delete all lines.

3) Enter the following lines into the file. These lines show each drive slot's physical location mapped to its boot-time hd? name.

Note: by-id names should not be used in the device.map file.

```
# Dell Rackmount r805 SMW
# grub(8) device mapping for boot-drive identification
# hd? numbers are being mapped to their physical
(hd0)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0
(hd1)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0
(hd2)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy5-0x4433221105000000-lun-0
(hd3)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy4-0x4433221104000000-lun-0
(hd4)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy3-0x4433221103000000-lun-0
(hd5)    /dev/disk/by-path/pci-0000:05:00.0-sas-phy2-0x4433221102000000-lun-0
```

d.   Modify the SMW boot drive `/etc/fstab` file to utilize `by-id` or `by-path` naming.

Modify the SMW file system mounting configuration file to utilize SMW disk `by-id` or `by-path` naming. Complete this step to replace any `/dev/sd`*X* disk partition references.

> **Note:** The output of the `smwmapdrives.sh` script in step 2.a should be referenced for drive names.

Edit `/etc/fstab`, replacing drive `/dev/sd`*X* references with either the `by-id` or `by-path` name's corresponding device name.

When a reference to `/dev/sda1` is being replaced, replace it with the corresponding "partition" file system suffixed with `-part1`. File system partitions for `/dev/sda` are indicated by the numeral appended to the device name; for example, `/dev/sda1` refers to partition `1` on `/dev/sda`. Replace it with the `by-id` and `by-path` device names and suffix the device name with `-part1`, keeping the same numeral identification.

For example, if the `root` and `swap` file systems are currently configured to mount `/dev/sda2`, they should be changed. Using the `by-id` device name from the example in step 2.a, the `fstab` lines would change from:

```
/dev/sda1 swap               swap       defaults                0 0
/dev/sda2 /                  ext3       acl,user_xattr          1 1
```

to:

```
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS-part1  swap  swap   defaults        0 0
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS-part2  /     ext3   acl,user_xattr  1 1
```

e.   Modify `/boot/grub/menu.lst` to reflect the `device.map` BIOS/boot-up drive changes for the sd*X* remapping.

The same device name replacement performed on `/etc/fstab` should also be performed on the GRUB bootloader `/boot/grub/menu.lst` configuration file. All references to `/dev/sd`*X* devices should be replaced with corresponding `by-id` or `by-path` device names.

f.   Invoke the `grub` utility to reinstall the SMW boot loader on the primary boot drive.

Once the changes to `device.map`, `fstab`, and `menu.lst` have been completed, the GRUB bootloader boot blocks must be updated to reflect changes to the device names. Complete this step to update the boot loader on the boot drive.

Invoke the grub utility and reinstall SMW root-drive boot blocks.

```
smw:~ # grub --no-curses
    GNU GRUB  version 0.97  (640K lower / 3072K upper memory)
 [ Minimal BASH-like line editing is supported.  For the first word, TAB
   lists possible command completions.  Anywhere else TAB lists the possible
   completions of a device/filename. ]
grub> root (hd0,1)
  root (hd0,1)
    Filesystem type is ext2fs, partition type 0x83
grub> setup (hd0)
 Checking if "/boot/grub/stage1" exists... yes
 Checking if "/boot/grub/stage2" exists... yes
 Checking if "/boot/grub/e2fs_stage1_5" exists... yes
 Running "embed /boot/grub/e2fs_stage1_5 (hd0)"... 17 sectors \
are embedded. Succeeded
 Running "install /boot/grub/stage1 (hd0)  (hd0)1+17 p (hd0,1)/boot/grub/stage2 \
/boot/grub/menu.lst"... succeeded
       Done.
       grub> quit
```

3. If the backup drive disk partition table already exists and the partition table on the backup drive matches the partition table that is on the primary boot drive, skip this step; otherwise, create the backup drive disk partition table.

   In this example, the partition table consists of the following:

   - Slice 1: 4 GB Linux swap partition

   - Slice 2: Balance of disk space used for the root file system

   a. Use the fdisk command to display the boot disk partition layout. (Example output spacing was modified to fit on the printed page.)

```
mw:~ # fdisk -lu /dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0
Disk /dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0: 160.0 GB, \
160041885696 bytes
255 heads, 63 sectors/track, 19457 cylinders, total 312581808 sectors
Units = sectors of 1 * 512 = 512 bytes
Disk identifier: 0x00000082

                   Device
/dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0-part1 \
                                Boot    Start      End    Blocks  Id  System
                                          63  16771859  8385898+  82  Linux swap / Solaris
/dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0-part2 \
                                Boot    Start      End    Blocks  Id  System
                                 * 16771860 312576704 147902422+  83  Linux
```

   b. Use the fdisk command to configure the bootable backup disk partition layout. Set the bootable backup disk partition layout to match the boot disk partition layout. First, clear all of the old partitions using the d command within fdisk; next create a Linux swap and a Linux partition; and then write your changes to the disk. For help, type **m** within fdisk (see the following sample output, spacing was modified to fit on the printed page.)

```
smw:~ # fdisk -u /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0
```

```
The number of cylinders for this disk is set to 19457.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
1) software that runs at boot time (e.g., old versions of LILO)
2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0: 160.0 GB, \
160041885696 bytes
255 heads, 63 sectors/track, 19457 cylinders, total 312581808 sectors
Units = sectors of 1 * 512 = 512 bytes
Disk identifier: 0x00000080

                    Device
/dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0-part1 \
                                 Boot    Start        End      Blocks  Id  System
                                           63  16771859       83828  82  Linux swap / Solaris
Partition 1 does not end on cylinder boundary.
/dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0-part2 \
                                 Boot    Start        End      Blocks  Id  System
                                       167719 312581807 156207044+  83  Linux

Command (m for help): d
Partition number (1-4): 2

Command (m for help): d
Selected partition 1

Command (m for help): n
Command action
   e    extended
   p    primary partition (1-4)
p
Partition number (1-4): 1
First sector (63-312581807, default 63): (Press the Enter key)
Using default value 63
Last sector, +sectors or +size{K,M,G} (63-312581807, default 312581807): 16771859
Command (m for help): t
Selected partition 1
Hex code (type L to list codes): 82
Changed system type of partition 1 to 82 (Linux swap / Solaris)

Command (m for help): n
Command action
   e    extended
   p    primary partition (1-4)
p
Partition number (1-4): 2
First sector (16771860-312581807, default 16771860): (Press the Enter key)
Using default value 16771860
Last sector, +sectors or +size{K,M,G} (16771860-312581807, default 312581807): (Press the Enter key)
Using default value 312581807

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

      c. Display the boot backup disk partition layout and confirm it matches your phy7 sector information.

```
smw:~ # fdisk -lu /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0
Disk /dev/disk/by-path/pci-0000:05:00.0-sas-phy6:1-0x4433221106000000:0-lun0: 160.0 GB, \
160041885696 bytes
255 heads, 63 sectors/track, 19457 cylinders, total 312581808 sectors
```

4. Initialize the swap device.

```
smw:~ # mkswap /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0-part1
mkswap: /dev/disk/by-path/pci-0000:05:00.0-sas-phy6:1-0x4433221106000000:0-lun0-part1:
warning: don't erase bootbits sectors
        (DOS partition table detected). Use -f to force.
Setting up swapspace version 1, size = 8385892 KiB
no label, UUID=c0ef22ac-b405-4236-855b-e4a09b6e94ed
```

5. Create a new file system on the backup drive root partition by executing the mkfs command.

```
smw:~ # mkfs -t ext3 \
/dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0-part2
mke2fs 1.41.9 (22-Aug-2009)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
9248768 inodes, 36976243 blocks
1848812 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
1129 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872

Writing inode tables:   done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 37 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
```

6. Mount the new backup root file system on /mnt.

```
smw:~ # mount /dev/disk/by-path/pci-0000:05:00.0-sas-phy6-0x4433221106000000-lun-0-part2 \
/mnt
```

7. Confirm that the backup root file system is mounted.

```
smw:~ # df
Filesystem         1K-blocks      Used Available Use% Mounted on
/dev/sda2          303528624   6438700 281671544   3% /
udev                 1030332       116   1030216   1% /dev
/dev/sdb2          306128812    195568 290505224   1% /mnt
```

The running root file system device is the one mounted on /.

8. Dump the running `root` file system to the backup drive.

```
smw:~ # cd /mnt
smw:~ # dump 0f - /dev/disk/by-path/pci-0000:05:00.0-sas-phy7-0x4433221107000000-lun-0-part2 \
| restore rf -
  DUMP: WARNING: no file `/etc/dumpdates'
  DUMP: Date of this level 0 dump: Tue Mar 15 13:43:17 2011
  DUMP: Dumping /dev/sda2 (/) to standard output
  DUMP: Label: none
  DUMP: Writing 10 Kilobyte records
  DUMP: mapping (Pass I) [regular files]
  DUMP: mapping (Pass II) [directories]
  DUMP: estimated 7898711 blocks.
  DUMP: Volume 1 started with block 1 at: Tue Mar 15 13:44:40 2011
  DUMP: dumping (Pass III) [directories]
  DUMP: dumping (Pass IV) [regular files]
restore: ./lost+found: File exists
  DUMP: 79.34% done at 20890 kB/s, finished in 0:01
  DUMP: Volume 1 completed at: Tue Mar 15 13:52:13 2011
  DUMP: Volume 1 7908080 blocks (7722.73MB)
  DUMP: Volume 1 took 0:07:33
  DUMP: Volume 1 transfer rate: 17457 kB/s
  DUMP: 7908080 blocks (7722.73MB)
  DUMP: finished in 453 seconds, throughput 17457 kBytes/sec
  DUMP: Date of this level 0 dump: Tue Mar 15 13:43:17 2011
  DUMP: Date this dump completed:  Tue Mar 15 13:52:13 2011
  DUMP: Average transfer rate: 17457 kB/s
  DUMP: DUMP IS DONE
```

9. Modify the backup drive's `fstab` and `menu.lst` files to reflect the backup drive's device, replacing the primary drive's device name.

   Note: This step is only necessary if `by-id` names are used. If `by-path` names are being utilized for the `root` and `swap` devices, changes are not necessary; these devices reference physical slots, and the backup drive will be moved to the same physical slot (slot 0) when replacing a failed primary boot drive.

   a. Edit `/mnt/etc/fstab`; replace the `root` and `swap` partitions' `by-id` device names with those used for this backup device, replacing the original disk device name.

   For example, change:

```
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS-part1  swap  swap  defaults
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS-part2  / ext3 acl,user_xattr
```

   to:

```
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RD7-part1  swap  swap  defaults
/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RD7-part2  / ext3 acl,user_xattr
```

b. Edit /mnt/boot/grub/menu.lst; replace the root= and resume= device names with those used for this backup device, replacing the original disk device name.

> **Note:** The root= entry normally refers to partition –part2, and the resume= entry normally refers to partition –part1; these partition references **must** be maintained.

For example, replace the menu.lst configuration references of:

```
root=/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RDS-part2
```

with:

```
root=/dev/disk/by-id/ata-FUJITSU_MHZ2160BK_G2_K85DTB227RD7-part2
```

or similarly with the by-id device names, if those are preferred.

Replace the resume= references similarly.

10. Install the grub boot loader.

To make the backup drive bootable, reinstall the grub boot facility on that drive.

> **Caution:** Although all of the disks connected to the SMW are available to the system, grub only detects the first 16 devices. Therefore, if you add a disk to the SMW **after** the SMW is connected to the boot RAID, it is advisable to reboot the SMW **before** continuing this procedure.

a. Create a unique file on the backup drive to be used to identify that drive to grub boot facility.

```
smw:~ # cd /
smw:~ # touch /mnt/THIS_IS_6
```

b. Invoke the grub boot utility. Within the grub boot utility:

1) Execute the find command to locate the drive designation that grub uses.

2) Select the drive to which the boot blocks will be installed with the root command.

3) Use the setup command to set up and install the grub boot blocks on that drive.

> **Note:** The Linux grub utility and boot system **always** refer to drives as hd, regardless of the actual type of drives.

For example:

```
smw:~ # grub --no-curses
    GNU GRUB  version 0.97  (640K lower / 3072K upper memory)
 [ Minimal BASH-like line editing is supported.  For the first word, TAB
   lists possible command completions.  Anywhere else TAB lists the possible
   completions of a device/filename. ]
grub> find /THIS_IS_6
(hd2,1)
grub> root (hd2,1)
root (hd2,1)
 Filesystem type is ext2fs, partition type 0x83
grub> setup (hd2)
 Checking if "/boot/grub/stage1" exists... yes
 Checking if "/boot/grub/stage2" exists... yes
 Checking if "/boot/grub/e2fs_stage1_5" exists... yes
 Running "embed /boot/grub/e2fs_stage1_5 (hd2)"...  17 sectors are embedded.
succeeded
 Running "install /boot/grub/stage1 (hd2) (hd2)1+17 p (hd2,1)/boot/grub/stage2 \
/boot/grub/menu.lst"... succeeded
Done.
grub> quit
```

Important: For rack-mount SMWs, grub recreates device.map with the short names, not the persistent names. The /dev/sd*x* names must not be trusted. Always use find the next time you execute grub because it is possible that grub root may **not** be hd2 the next time you execute grub.

11. Unmount the backup root partition.

```
smw:~ # umount /mnt
```

The drive is now bootable once plugged in or cabled as the primary drive.

Desk-side SMW: Creating a Bootable Backup Drive [B]

B.1 Desk-side SMW: Creating an System Management Workstation (SMW) Bootable Backup Drive

The following procedure creates a System Management Workstation (SMW) bootable backup drive for a desk-side SMW in order to replace the primary drive if the primary drive fails. When this procedure is completed, the backup drive on the SMW will be a bootable replacement for the primary drive when the backup drive is plugged in as or cabled as the primary drive.

Note: In the following procedure, `/dev/sdX2` is the SMW disk (either `/dev/sdb2` or `/dev/sdc2`).

Procedure 5. Desk-side SMW: Creating an SMW bootable backup drive

Important: The disk device names shown in this procedure are only examples. You should substitute the actual disk device names for your system. For example, on an SMW with three SMW disks, the boot disk is `/dev/sda` and the bootable backup disk is `/dev/sdc`; on an SMW with two SMW disks, the boot disk is `/dev/sda` and the bootable backup disk is `/dev/sdb`.

⚠ **Caution:** Shut down the Cray system before you begin this procedure.

Also be aware that there may be a considerable load on the SMW while creating the SMW bootable backup drive.

1. Log on to the SMW as `crayadm` and `su` to `root`.

   ```
   crayadm@smw:~> su - root
   smw:~ #
   ```

2. If the backup drive disk partition table already exists and the partition table on the backup drive matches the partition table that is on the primary boot drive, skip this step; otherwise, create the backup drive disk partition table.

   Note: For optimal performance, the source and destination disks should be on different buses; drive slots 0 and 1 are on a different bus than drive slots 2 and 3.

   In this example, the partition table consists of the following:

   • Slice 1: 4 GB Linux swap partition

> • Slice 2: Balance of disk space used for the root file system
>
> a. Use the fdisk command to display the boot disk partition layout.

```
smw:~ # fdisk -lu /dev/sda
Disk /dev/sda: 320.0 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders, total 625142448 sectors
Units = sectors of 1 * 512 = 512 bytes

   Device   Boot      Start            End        Blocks   Id  System
/dev/sda1               63        8401994       4200966    82  Linux swap / Solaris
/dev/sda2    *     8401995      625137344     308367675    83  Linux
```

> b. Use the fdisk command to configure the bootable backup disk partition layout. Set the bootable backup disk partition layout to match the boot disk partition layout. First, clear all of the old partitions using the d command within fdisk; next create a Linux swap and a Linux partition; and then write your changes to the disk. For help, type **m** within fdisk (see the following sample output).

```
smw:~ # fdisk -u /dev/sdb

The number of cylinders for this disk is set to 38913.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
1) software that runs at boot time (e.g., old versions of LILO)
2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK).

Command (m for help): p
Disk /dev/sdb: 320.0 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders, total 625142448 sectors
Units = sectors of 1 * 512 = 512 bytes

   Device Boot        Start            End        Blocks   Id  System
/dev/sdb1               63        8401994       4200966    82  Linux swap
/dev/sdb2          8401995      625105214     308351610    83  Linux

Command (m for help): d
Partition number (1-5): 2
Command (m for help): d
Selected partition 1
Command (m for help): n
Command action
e extended
p primary partition (1-4)
P
Partition number (1-4): 1
First sector (63-625105215, default 63): (Press the Enter key)
Using default value 63
Last sector or +size or +sizeM or +sizeK (63-625105215, default 625105215): 8401994

Command (m for help): t
Selected partition 1
Hex code (type L to list codes): 82
Changed system type of partition 1 to 82 (Linux swap / Solaris)
```

```
Command (m for help): n
Command action
e extended
p primary partition (1-4)
p
Partition number (1-4): 2
First sector (8401995-625105215, default 8401995): (Press the Enter key)
Using default value 8401995
Last sector or +size or +sizeM or +sizeK (8401995-625105215, default 625105215): \
  (Press the Enter key)
Using default value 625105215

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

        c.   Display the boot backup disk partition layout.

```
smw:~ # fdisk -lu /dev/sdb
Disk /dev/sdb: 320.0 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders, total 625142448 sectors
Units = sectors of 1 * 512 = 512 bytes


  Device   Boot      Start          End      Blocks   Id  System

/dev/sdc1             63     8401994     4200966   82  Linux swap / Solaris
/dev/sdc2   *     8401995   625137344   308367675   83  Linux
```

3. Initialize the swap device.

        `smw:~ # mkswap /dev/sdb1`

4. Standardize the /etc/fstab and grub disk device names.

The device names that the installation process writes into the /boot/grub/menu.lst file are UDEV-based names (for example, /dev/disk/*by-id*/scsi-SATA_ST3320620AS_922J3-part2 or /dev/disk/*by-id*/ata-ST3320620A_9QFA85PV-part2) instead of the more commonly used device names (for example, /dev/sda2 or /dev/hda2). In the following procedures, edit the /boot/grub/menu.lst file to change **only** the long UDEV-based name to the shorter, commonly used device name reflected in the output of the df command on your system.

If the device names have already been standardized, skip to step 5.

⚠   **Caution:** Mistakes in the /boot/grub/menu.lst file will affect your ability to boot the SMW.

a. SLES 11 sets up /etc/fstab and /boot/grub/menu.lst with UDEV-based names for the root device. For example:

```
smw:~ # head -2 /etc/fstab
/dev/disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part2 /     ext3  acl,user_xattr  1 1
/dev/disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part1 swap  swap  defaults        0 0

smw:~ # more /boot/grub/menu.lst
###Don't change this comment - YaST2 identifier: Original name: linux###
title SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/disk/by-id/ata-ST3320620AS_5QF00F84-part2 \
    resume=/dev/sda1 splash=silent crashkernel=256M-:128M@16M
    showopts vga=0x31a initrd /boot/initrd-2.6.27.19-5-default

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/disk/by-id/ata-ST3320620AS_5QF00F84-part2 showopts \
    ide=nodma apm=off noresume edd=off powersaved=off nohz=off highres=off
    processor.max_cstate=1 x11failsafe vga=0x31a
    initrd /boot/initrd-2.6.27.19-5-default
```

b. Execute the df command to get the name of the device to use in the /etc/fstab and /boot/grub/menu.lst files to replace the long UDEV-based device name. Then edit your /etc/fstab and /boot/grub/menu.lst files appropriately.

1) Execute the df command to get the name of the device to use in the /etc/fstab and /boot/grub/menu.lst files to replace the long UDEV-based device name. For example:

```
smw:# df
    Filesystem    1K-blocks      Used Available Use% Mounted on
    /dev/sda2    303528624  40652904 247457340  15% /
    udev            1030780       460   1030320   1% /dev
```

2) Save a copy of your /etc/fstab and /boot/grub/menu.lst files.

```
smw:# cp -p /etc/fstab /etc/fstab.save
smw:# cp -p /boot/grub/menu.lst /boot/grub/menu.lst.save
```

3) Edit your /etc/fstab file appropriately; you will use the device name (dev) you got from the df command output. In this example, the "1" and "2" refer to the partition names on the device. Change the following lines, which changes the long name disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part2 to sda2 and changes disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part1 to sda1. Ensure that your swap is on sda1:

```
/dev/disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part2 /     ext3  acl,user_xattr  1 1
/dev/disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part1 swap  swap  defaults        0 0
```

to:

```
/dev/sda2   /       ext3   acl,user_xattr   1 1
/dev/sda1   swap    swap   defaults         0 0
```

4) Edit your `/boot/grub/menu.lst` file appropriately; use the device name (dev) you got from the `df` command output. Change the long name `disk/by-id/scsi-SATA_ST3320620AS_9QF922J3-part2` to `sda2`. Change the following lines:

```
title SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/disk/by-id/ata-ST3320620AS_5QF00F84-part2 \
    resume=/dev/sda1 splash=silent crashkernel=256M-:128M@16M showopts vga=0x31a
```

to:

```
title SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/sda2 resume=/dev/sda1 splash=silent \
    crashkernel=256M-:128M@16M showopts vga=0x31a
```

and change the following lines:

```
title Failsafe -- SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/disk/by-id/ata-ST3320620AS_5QF00F84part2 \
    showopts ide=nodma apm=off noresume edd=off powersaved=off nohz=off \
    highres=off processor.max_cstate=1 x11failsafe vga=0x31a
```

to:

```
title Failsafe -- SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/sda2 showopts ide=nodma apm=off noresume edd=off \
    powersaved=off nohz=off highres=off processor.max_cstate=1 x11failsafe vga=0x31a
```

5) Verify that the edited files are correct and matches the output of the `df` command.

```
smw:~ # head -2 /etc/fstab
/dev/sda2   /       ext3   acl,user_xattr   1 1
/dev/sda1   swap    swap   defaults         0 0

smw:~ # more /boot/grub/menu.lst
###Don't change this comment - YaST2 identifier: Original name: linux###
title SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.27.19-5-default root=/dev/sda2 \
    resume=/dev/sda1 splash=silent crashkernel=256M-:128M@16M showopts
    initrd /boot/initrd-2.6.27.19-5-default

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- SUSE Linux Enterprise Server 11 - 2.6.27.19-5
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.27.19-5-default \
    root=/dev/sda2 showopts ide=nodma apm=off noresume edd=off
    powersaved=off nohz=off highres=off initrd /boot/initrd-2.6.27.19-5-default
```

5. Update the `grub` device table to recognize any new drives added since the initial operating system installation.

⚠ **Caution:** Although all of the disks connected to the SMW are available to the system, `grub` only detects the first 16 devices. Therefore, if you add a disk to the SMW **after** the SMW is connected to the boot RAID, it is advisable to reboot the SMW **before** continuing this procedure.

a. Back up the current `grub` device mapping file.

```
smw:~ # mv /boot/grub/device.map /boot/grub/device.map-YYYYMMDD
```

b. Invoke the `grub` utility to create a new device mapping file.

```
smw:~ # grub --device-map=/boot/grub/device.map
Probing devices to guess BIOS drives. This may take a long time.
  GNU GRUB  version 0.97  (640K lower / 3072K upper memory)
grub> quit
```

The file `/boot/grub/device.map` is now updated to reflect all drives, utilizing the standardized drive naming. This file can be viewed for verification; for example:

```
smw:~ # cat /boot/grub/device.map
(fd0)   /dev/fd0
(hd0)   /dev/sda
(hd1)   /dev/sdc
```

6. Create a new file system on the backup drive root partition by executing the `mkfs` command.

```
smw:~ # mkfs -t ext3 /dev/sdb2
mke2fs 1.41.1 (01-Sep-2008)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
19275776 inodes, 77091918 blocks
3854595 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
2353 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872, 71663616

Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 33 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
smw:~ #
```

7. Mount the new backup root file system on `/mnt`.

```
smw:~ # mount /dev/sdb2 /mnt
```

8. Confirm the running root file system device.

```
smw:~ # df
Filesystem          1K-blocks       Used Available Use% Mounted on
/dev/sda2           303528624    6438700 281671544   3% /
udev                  1030332        116   1030216   1% /dev
/dev/sdb2           306128812     195568 290505224   1% /mnt
```

The running root file system device is the one mounted on `/`.

9. Dump the running root file system to the backup drive.

```
smw:~ # cd /mnt
smw:~ # dump 0f - /dev/sda2 | restore rf -
DUMP: WARNING: no file `/etc/dumpdates'
DUMP: Date of this level 0 dump: Thu Nov 11 06:55:29 2010
DUMP: Dumping /dev/sda2 (/) to standard output
DUMP: Label: none
DUMP: Writing 10 Kilobyte records
DUMP: mapping (Pass I) [regular files]
DUMP: mapping (Pass II) [directories]
DUMP: estimated 4003398 blocks.
DUMP: Volume 1 started with block 1 at: Thu Nov 11 06:57:38 2010
DUMP: dumping (Pass III) [directories]
DUMP: dumping (Pass IV) [regular files]
restore: ./lost+found: File exists
DUMP: 81.99% done at 10941 kB/s, finished in 0:01
DUMP: Volume 1 completed at: Thu Nov 11 07:04:01 2010
DUMP: Volume 1 4008910 blocks (3914.95MB)
DUMP: Volume 1 took 0:06:23
DUMP: Volume 1 transfer rate: 10467 kB/s
DUMP: 4008910 blocks (3914.95MB)
DUMP: finished in 383 seconds, throughput 10467 kBytes/sec
DUMP: Date of this level 0 dump: Thu Nov 11 06:55:29 2010
DUMP: Date this dump completed:  Thu Nov 11 07:04:01 2010
DUMP: Average transfer rate: 10467 kB/s
DUMP: DUMP IS DONE
```

10. Install the `grub` boot loader.

To make the backup drive bootable, reinstall the `grub` boot facility on that drive.

⚠ **Caution:** Although all of the disks connected to the SMW are available to the system, `grub` only detects the first 16 devices. Therefore, if you add a disk to the SMW **after** the SMW is connected to the boot RAID, it is advisable to reboot the SMW **before** continuing this procedure.

   a. Create a unique file on the backup drive to be used to identify that drive to `grub` boot facility.

```
smw:~ # cd /
smw:~ # touch /mnt/THIS_IS_SDX
```

   b. Invoke the `grub` boot utility. Within the `grub` boot utility:

1) Execute the find command to locate the drive designation that grub uses.

2) Select the drive to which the boot blocks will be installed with the root command.

3) Use the setup command to set up and install the grub boot blocks on that drive.

   Note: The Linux grub utility and boot system **always** refer to drives as hd, regardless of the actual type of drives.

For example:

```
smw:~ # grub --no-curses
GNU GRUB  version 0.97  (640K lower / 3072K upper memory)
[ Minimal BASH-like line editing is supported.  For the first word, TAB^[
lists possible command completions.  Anywhere else TAB lists the possible
completions of a device/filename. ]
grub> find /THIS_IS_SDX
find /THIS_IS_SDX
(hd1,1)
grub> root (hd1,1)
root (hd1,1)
Filesystem type is ext2fs, partition type 0x83
grub> setup (hd1)
setup (hd1)
Checking if "/boot/grub/stage1" exists... yes
Checking if "/boot/grub/stage2" exists... yes
Checking if "/boot/grub/e2fs_stage1_5" exists... yes
Running "embed /boot/grub/e2fs_stage1_5 (hd1)"...  17 sectors are embedded.
succeeded
Running "install /boot/grub/stage1 (hd1) (hd1)1+17 p
(hd1,1)/boot/grub/stage2 /boot/grub/menu.lst"... succeeded
Done.
grub> quit
```

11. Unmount the backup root partition.

    ```
    smw:~ # umount /dev/sdb2
    ```

    The drive is now bootable once plugged in or cabled as the primary drive.