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FreeBSD Install and Boot through an LSI HBA

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1. Introduction

In order to install the FreeBSD OS to a disk that is attached to an LSI HBA (direct-attached or through an expander), a method must be available that allows the installation process to discover disks that may be attached to the HBA. Of course, this is only necessary when the installation media does not contain an appropriate device driver for the HBA. In Windows, for example, the method is to boot to the installation media and press the F6 key when prompted. This allows the user to load an appropriate device driver that Windows will use to communicate to the LSI HBA.

After installation is complete, if the disk is to be used as a boot device, a separate method is required so that the device can boot without manual intervention.

This document details the methods that will overcome these obstacles within FreeBSD. There may be other ways to complete the installation in these circumstances, but the following methods are proven, simple, and use common media such as CD's and USB memory drives. The example given will install FreeBSD Release 8.2.0 from a CD to a SAS disk drive directly attached to an LSI Falcon SAS2 (9211-8i), then allow booting from that SAS drive without any other media installed in the system.

2. Initial Setup

To prepare for FreeBSD installation, setup a system as follows. The system must have a CD ROM drive, a USB port, and an available PCI slot.

- 1) Download FreeBSD Release 8.2.0 from the www.freebsd.org web site. There are multiple versions of the OS, supporting several platforms and various installation options. For the purposes of this example, the 8.2 disc1.iso file for the amd64 platform is used. The full link to this exact file on the FreeBSD FTP site:
<ftp://ftp.freebsd.org/pub/FreeBSD/releases/amd64/ISO-IMAGES/8.2/FreeBSD-8.2-RELEASE-amd64-disc1.iso>
- 2) Burn this ISO image to a blank CD disk. This will be the CD that will be booted on the installation system.

- 3) Copy the mpslsi.ko device driver to a USB memory stick. Make sure that this driver was built for the Release 8.2 version of FreeBSD.
 - Insert a blank floppy diskette OR USB drive.
 - Format the USB drive. `newfs /dev/da0` (assuming da0 is the USB drive)
 - Mount the floppy drive. `mount -t ufs /dev/da0 /mnt`
 - Get the exact mpslsi.ko driver from release package. (Make sure you get the correct mpslsi.ko)
 - Copy the appropriate module from release package to USB drive. For example:

```
cp pkg/stage/8.2.0/amd64/boot/kernel/mpslsi.ko /mnt
```
- 4) If the SAS2 HBA does not have a working version of BIOS installed, use an appropriate utility to load BIOS onto the SAS2 HBA.
- 5) If not already installed, make sure the installation system is off and install the LSI Falcon SAS2 HBA into a PCI slot within the system and connect the SAS disk to the SAS2 controller.
- 6) Insert the USB stick into a USB port in the installation system.

3. Main Procedure

After the initial setup, follow these steps to install FreeBSD Release 8.2 to the SAS disk attached to the LSI SAS2 Falcon controller.

- 1) LOAD MPSLSI DRIVER FOR DEVICE DISCOVERY
 - i. Boot the installation system from the FreeBSD Release 8.2 CD created in step 2.2 above. The system BIOS may default to booting to some other device in the system, such as the USB memory stick, so make sure to modify the BIOS or use a boot menu to boot to the CD.
 - ii. The “Welcome to FreeBSD” menu will display several boot options. Select option, “6. Escape to loader prompt”. The loader prompt will be displayed (“OK ”).
 - iii. The mpslsi.ko driver will need to be loaded so that the SAS disk will be selectable during the installation process. The driver was copied to the USB memory stick in step 2.3 above. To see the

device name for the USB stick, type “lsdev” at the “OK” prompt (without quotes). Something like this will be displayed:

cd devices:

cd0: Device 0x0

disk devices:

disk0: BIOS drive A:

disk1: BIOS drive C:

disk1s1: Unknown fs: 0xbf

disk2: BIOS drive D:

disk2s1: FAT-16

pxe devices:

- iv. In the above case, the USB stick has been formatted to boot to DOS with FAT-16 sectors, so the name for the USB device is “disk2s1:” (with colon but not quotes). If the driver was copied to the root folder of the disk, load the driver by entering, “load disk2s1:/mpslsi.ko” at the “OK” prompt (without quotes). The driver can be loaded from any directory on the USB drive. After the driver is loaded a success message will be displayed like this: “disk2s1:/mpslsi.ko size 0x30888 at 0x11a0000”.
- v. Continue the boot process from the bootable CD by entering, “boot” at the “OK” prompt (without quotes). The system should continue to boot and load the mpslsi driver.

2) INSTALL FREEBSD TO THE SAS DISK

- i. After booting, the actual installation process will begin. The following actions are for reference only. Individual installations may differ.
- ii. Select “USA” as the country.
- iii. Select the “Standard” installation method.
- iv. Press “enter” or “space” to move to past the “fdisk” explanation screen.
- v. Select the disk for the installation. If only the USB and SAS drive are attached, the SAS drive should be “da0”. Be sure to verify that the correct disk is selected so that the USB disk is not overwritten with the FreeBSD installation.
- vi. Use the entire disk by pressing the ‘A’ key and then pressing the ‘Q’ key to escape the “fdisk” menu.

- vii. If the SAS disk will be used as a boot device, install the FreeBSD Boot Manager (BootMgr) or the Standard MBR.
- viii. The FreeBSD Disklabel Editor will be displayed. Press the ‘A’ key to create default partitions for the SAS disk, then press the ‘Q’ key to escape this menu.
- ix. Select the “5 Kern-Developer” distribution set.
- x. Select “en” as the installation language.
- xi. For this example, the FreeBSD Ports Collection is not installed, so “No” is selected.
- xii. Return to the previous menu by selecting the “Exit” option.
- xiii. Select “CD/DVD” to start the installation from the CD to the SAS drive.
- xiv. Finally, select “Yes” to start the installation. At this point, the SAS drive will be mounted and FreeBSD will be installed.
- xv. More configuration options can be made after the installation is complete, such as Network and Time Zone.

3) BOOTING TO THE NEW FREEBSD INSTALLATION

- i. If it is required to boot from the SAS disk with the new FreeBSD installation, remove the CD from the system but keep the USB memory stick attached. The mpslsi.ko device driver will need to be copied to the new installation because this driver will not be copied with the FreeBSD installation unless it is an in-box driver. Note that the mpslsi.ko driver is not an in-box driver through versions 7.4 and 8.2 of FreeBSD.
- ii. Follow steps ii. through v. outlined in 1) LOAD MPSSL SI DRIVER above to load the SAS2 driver for the new FreeBSD installation. Boot to the new SAS drive instead of the CD as the first step.
- iii. After the final step, the system should be booted to the new FreeBSD installation, prompting for login information. However, there is one last series of steps to perform in order to be able to re-boot the system to the new installation without having to load the mpslsi.ko driver during every boot process.

4) LOAD MPSSL SI DRIVER FOR RE-BOOTING

- i. To permanently load the mpslsi.ko driver so that re-booting to the new FreeBSD installation is possible, the mpslsi.ko driver must be copied to the /boot/kernel folder and the /boot/loader.conf file must be modified. First, mount the USB memory stick that contains the driver. In this example, the USB stick can be mounted by, “mount -t ufs /dev/dalsl /mnt”.
- ii. Copy the mpslsi.ko driver from wherever it is stored on /mnt into the /boot/kernel folder.
- iii. Edit the /boot/loader.conf file to contain the following line with quotes:
 mpslsi_load=”YES”
- iv. The system can now be rebooted using the new FreeBSD installed SAS drive alone.