FreeBSD Install and Boot through a Broadcom (Avago/LSI) HBA

Version 2.0

Revision History

Rev	Date	Description of Change	Originator
1.0	4/15/11	Initial Document Template	Stephen McConnell
1.1	5/20/11	Added more description on how to copy .ko file to thumb drive.	Kashyap Desai
2.0	1/25/16	Update and revise for MPR driver	Stephen McConnell

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1.   Introduction

In order to install the FreeBSD OS to a disk that is attached to a Broadcom 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. This is only necessary when the installation media does not contain an appropriate device driver for the HBA. The mpr driver was initially compiled into the FreeBSD kernel with version 9.3. This procedure is required only if using a FreeBSD version prior to 9.3.

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 flash drives. The example given will install FreeBSD Release 9.2.0 from a CD to a SAS disk drive directly attached to a Broadcom (Avago/LSI) SAS3 HBA (9300), 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 a FreeBSD ISO image 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 9.2 disc1.iso file for the amd64 platform is used. The full link to this exact file is:

   http://ftp-archive.freebsd.org/pub/FreeBSD-Archive/old-releases/amd64/ISO-MAGES/9.2/FreeBSD-9.2-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 mpr.ko device driver to a USB flash drive. Make sure that this driver was built for the Release 9.2 version of FreeBSD.
   - Insert a USB flash drive.
   - Format the USB drive if it has not already been formatted:
       `newfs /dev/da0` (assuming da0 is the USB drive)
   - Mount the drive:
       `mount -t ufs /dev/da0 /mnt`
   - Get the amd64 9.2 version of the mpr.ko driver from the release package.
   - Copy the mpr.ko module from release package to USB drive. For example:
       `cp pkg/stage/9.2.0/amd64/boot/kernel/mpr.ko /mnt`
4) If the SAS3 HBA does not have a working version of BIOS installed, use an appropriate utility to load BIOS onto the SAS3 HBA.
5) If not already installed, make sure the installation system is off and install the SAS3 HBA into a PCI slot within the system and connect the SAS disk to the SAS3 controller.
6) Insert the USB flash driver into a USB port on the installation system.

3.   Main Procedure

After the initial setup, follow these steps to install FreeBSD Release 9.2 to the SAS disk attached to the SAS3 controller.

1) LOAD MPR DRIVER FOR DEVICE DISCOVERY
   a. Boot the installation system from the FreeBSD Release 9.2 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 flash drive, so make sure to modify the BIOS or use a boot menu to boot to the CD.
   b. The 'Welcome to FreeBSD' menu will display several boot options. Select option '3. Escape to loader prompt'. The 'OK' loader prompt will be displayed.
   c. The mpr.ko driver will need to be loaded so that the SAS disk will be selectable at the beginning of the installation process. The driver was copied to the USB flash drive in step 2.3 above. To see the device name for the USB drive, type 'lsdev' at the 'OK' prompt. Something like this will be displayed:

cd devices:
  cd0: Device 0x0
disk devices:
  disk0:   BIOS drive A:
  disk1:   BIOS drive C:
    disk1s1: DOS/Windows
pxe devices:

d. In the above case, the USB drive has been formatted to boot to DOS, so the name for the USB device is 'disk2s1:'. If the driver was copied to the root folder of the drive, load the driver by entering the following at the 'OK' prompt:

    load disk1s1:/mpr.ko

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:

    disk1s1:/mpr.ko size 0x43398 at 0x17ba000

NOTE: If loading the driver fails because the kernel needs to be loaded first, load the kernel using this command:

    load /boot/kernel/kernel

Then retry loading the drive as described above.

e. Continue the boot process from the bootable CD by entering, 'boot' at the 'OK' prompt. The system should continue to boot with the mpr driver loaded.

2) INSTALL FREEBSD TO THE SAS DISK

After booting, the actual installation process will begin. The following actions are for reference only. Individual installations may differ.

a. Select 'Install' to start the FreeBSD OS installation.
b. Select the default keymap by selecting 'No'.
c. Enter a hostname and press 'OK'.
d. Select the system components to install and press 'OK'.
e. Select 'Guided' setup.
f. Select the SAS disk for installation and press 'OK'. NOTE: Be careful to not select the USB flash drive here or the flash drive will be erased.
g. Select 'Entire Disk' and then 'Yes' to continue.
h. Select 'Finish' and then 'Commit' to start the installation to the selected SAS disk that is attached to the SAS3 HBA.
i. After the installation completes, enter and then re-enter a root password.
j. Follow the prompts to setup network configurations, set the time zone, add

users, and setup miscellaneous options.

    k. Finally select 'Exit' to leave the configuration options and select 'Reboot' to restart the system.

More configuration options can be made after the installation is complete.

3) BOOTING TO THE NEW FREEBSD INSTALLATION

    a. 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 flash drive attached. The mpr.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 mpr.ko driver is not an in-box driver until version 9.3 of FreeBSD.

    b. Follow steps b) through e) outlined in 1) LOAD MPR DRIVER FOR DEVICE DISCOVERY above to load the SAS3 driver for the new FreeBSD installation. Boot to the new SAS drive instead of the CD this time, which may require changes to the system BIOS and will require BIOS to be installed on the HBA.

    c. After the final step e), the system should be booted to the new FreeBSD installation and prompting for login information. However, there is one last series of steps to perform in order to be able to reboot the system to the new installation without having to load the mpr.ko driver manually every time the system is booted.

4) LOAD MPR DRIVER FOR RE-BOOTING

    a. To permanently load the mpr.ko driver so that re-booting to the new FreeBSD installation is possible, the mpr.ko driver must be copied to the /boot/kernel folder and the /boot/loader.conf file must be modified. First, mount the USB flash drive that contains the driver. In this example, the USB drive can be mounted by:

        mount –t msdosfs /dev/da1s1 /mnt

    b. Copy the mpr.ko driver from wherever it is stored on /mnt into the /boot/kernel folder.

    c. Edit the /boot/loader.conf file to contain the following line with quotes:

        mpr_load="YES"

    d. The system can now be rebooted using the new FreeBSD installed SAS drive alone.