FC HBA Driver for NetWare

Table of Contents

1. Package Contents

The following table describes the contents provided in the FC HBA Driver for NetWare package:

Filename	Description
ql2x00.ham	NetWare host adapter module (HAM) driver
ql2x00.ddi	NetWare driver installation description file
ql2x00d.ham	NetWare debug driver (prints on screen)
ql2x00d.ddi	NetWare debug driver installation description file
release.txt	Release notes for this version
readme.txt	Text verison of this file
history.txt	NetWare driver change history
cfg.nlm	Failover Configuration tool for QL2X00.HAM Driver
cfg.txt	Failover Configuration tool help
cfg-fo.txt	Failover configuration options

2. OS Support

This driver has been tested with NetWare 6.x and 5.x, and complies with Novell's NWPA specification.

3. Supported Features

The FC HBA Driver for NetWare supports the following:

- 2Gb and 4Gb FC HBAs
- NetWare Multi-Processor Support
- NetWare PCI Adapter Hot Plug Support
- NetWare Driver Hot Replace Support
- Driver 256 Lun Support
- Driver Fabric Name Server Support
- Driver Adapter Path Lun Failover
- Driver Storage Port Lun Failover
- Driver DMI and QMS Support

4. Using the Driver

The following subsections provide procedures for using the NetWare driver:

4.1 Creating the Driver Disk or Folder

The NetWare driver files are located on the SANsurfer CD and on the QLogic website. Please check the QLogic website for the most current version of the driver. This section describes how to download the driver from the QLogic web page or the SANsurfer CD to a floppy disk.

NOTE: During NetWare OS installation, the driver must be on a floppy disk. The NetWare installer does not allow swapping of CDs during installation.

To create a driver disk:

1. Locate the driver on the QLogic support website (http://support.qlogic.com/support/drivers_software.asp) or on the SANsurfer CD and click the Download link.
2. Insert a blank floppy disk into the A: drive.
3. If prompted to `Open the file or Save to your computer`, select **Save** and specify a temporary folder for the self-extracting file.
4. From this temporary folder, execute the self-extracting file and specify the folder `a:\nwupdate\drivers` for the files to be extracted.
5. Verify that the folder `a:\nwupdate\drivers` contains the files `ql2x00.ham` and `ql2x00.ddi`.
6. Insert this floppy disk into your NetWare server.

4.2 Installing the Driver

The following subsections describe the installation options:

- 4.2.1 Installing the Driver During NetWare OS Installation
- 4.2.2 Installing the Driver on an Existing NetWare Server
- 4.2.3 Forcing HDETECT to Install the Driver
- 4.2.4 Manually Installing the Driver

4.2.1 Installing the Driver During NetWare OS Installation

To install the FC HBA Driver for NetWare:

1. Install the QLogic adapter board in the server hardware.
2. Insert the floppy disk and the NetWare OS install CD into the NetWare server, and power on the server.
3. Follow the standard NetWare install instructions (provided by Novell).
4. If the server is booting from a device attached by the QLogic adapter, you must enable the BIOS and specify the boot device, as follows:
   a. Start *Fast!*UTIL.
   b. Enable the BIOS.
   c. Specify the boot device.
   d. Exit *Fast!*UTIL.

   If the server is booting from a device attached by some adapter other than the QLogic adapter, then you must disable the BIOS, as follows:
   a. Start *Fast!*UTIL.
   b. Disable the BIOS.
   c. Exit *Fast!*UTIL.
5. When finished installing NetWare, restart the server.

4.2.2 Installing the Driver on an Existing NetWare Server

To install the FC HBA Driver for NetWare on an already installed NetWare server:

1. Install the QLogic adapter board in the server hardware.
2. Insert the floppy disk, power on the server, and (if not done automatically) start the NetWare server.
3. HDETECT automatically detects the presence of the adapter installed and locates and loads the driver; you may have to specify the path of the floppy.

NOTE: If HDETECT fails to locate the driver automatically, you can do either of the following:

- Force HDETECT to install the driver (see section 4.2.3) or
- Manually install the driver (see section 4.2.4).

4.2.3 Forcing HDETECT to Install the Driver

To install the FC HBA Driver for NetWare when HDETECT fails to detect the adapter:

1. At the server prompt, shut down the server and power off.
2. Remove the QLogic adapter that you're trying to install.
3. Power on and start the NetWare server.
4. At the server prompt, shut down the server and power off.
5. Insert the QLogic adapter removed at step 1 above.
6. Power on and start the NetWare server.
7. HDETECT automatically detects the adapter, then locates and loads the driver.

4.2.4 Manually Installing the Driver

To install the FC HBA Driver for NetWare when HDETECT or NWCONFIG do not prompt you for storage adapter driver installation:

1. Copy the driver files (`ql2x00.ham` and `ql2x00.ddi`) to the following directories:
   `C:\NWSERVER\DRIVERS for NW6.x`
   `C:\NWSERVER for NW5.x`

   Use one of the following methods to copy the files from the floppy disk to one of the above directories:

   - Using the NetWare Remote Manager:
     Start the NetWare Remote Manager from the NetWare GUI (execute `STARTX` to start the NetWare GUI) and copy the files (drag-and-drop) from the floppy disk to one of the directories on the C: driver as specified above.
   - Using the DOS copy command:
     Open the DOS prompt (if your server does not stop at the DOS prompt, press the **F8** key at the same time the `DOS starting...` text displays during a hardware boot, and respond to all the questions by pressing **Y**, except for the last question `SERVER ?` to this respond press **N**); copy the files from the floppy disk to one of the directories specified above.
2. Start the server and manually load the driver for as many instances of QLogic adapter as are installed in the server hardware; for each manual load, take note of the slot number for each instance.
3. Start `NWCONFIG`, select **NCF Files Options**, and select **Edit STARTUP.NCF File** to edit the file `STARTUP.NCF`; at the end of this file, append the following load line once for each instance using the slot number n as noted in the previous paragraph:
   `LOAD QL2X00.HAM SLOT=n /LUNS`
   For example, if you have two QLA200 adapter boards in slots 2 and 3, you would append the following lines:
   `LOAD QL2X00.HAM SLOT=2 /LUNS`
   `LOAD QL2X00.HAM SLOT=3 /LUNS`
4. Exit from the editor (saving your changes), exit from `NWCONFIG`, and restart the NetWare server.

4.3 Removing the Driver

To remove the FC HBA Driver for NetWare:

1. Remove the QLogic adapter board from the server hardware.
2. Power on the server and (if not done automatically) start the NetWare server.
3. HDETECT should automatically detect the absence of QLogic adapter board and should remove the driver load instance; if HDETECT does not remove the driver, continue with the following procedure.

If you are leaving the QLogic adapter board in the server hardware and want to disable the driver, follow these steps:

1. Start `NWCONFIG`. Select **NCF Files Options** and select **Edit STARTUP.NCF File** to edit the file `startup.ncf`; at the start of each line that loads `ql2x00.ham`, insert a pound character (#) to comment out that line; spaces are allowed after the pound character; be sure to do this on all lines that load the QLogic driver. The following example shows the load lines for two driver instances commented out with the pound (#) character:
   ```
   # LOAD QL2X00.HAM SLOT=2 /LUNS
   # LOAD QL2X00.HAM SLOT=3 /LUNS
   ```
2. Exit from the editor (saving your changes), exit from `NWCONFIG`, and restart the NetWare server.
3. Any time you want to reload the QLogic driver again, use `NWCONFIG` (as in step 1) to edit `STARTUP.NCF` and remove the pound (#) characters that you inserted in step 2 exit the editor (saving your changes), exit `NWCONFIG`, and restart the server.

5. Driver Parameters

The HAM driver has two types of optional parameters. The following subsections describe these driver parameters:

5.1 Driver Parameters (descriptions)

Driver Parameter	Category	Description
SLOT=n	Instance	Specifies to NetWare the PCI slot number *n* of the adapter for which to load this driver instance. For example: `LOAD QL2X00.HAM SLOT=3`
/LUNS	Instance	Specifies to NetWare to scan for all LUNs during the load of this driver instance (otherwise NetWare only scans for LUN zero devices); the scanned LUN number range is 0 to (n - 1) where *n* is specified by the `/MAXLUNS=n` option. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS`
/ALLPATHS	Global	Disables adapter failover and reports to NetWare all devices on all adapter paths; this allows upper layer modules to do failover across a NetWare server's multiple adapters. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /ALLPATHS\`
/ALLPORTS	Global	Same as function as `/PORTNAMES` (see next option). For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /ALLPORTS`
/PORTNAMES	Global	Disables device port failover on each adapter and reports all ports as individual devices to NetWare; this allows upper layer modules to do failover across a storage subsystem's multiple ports; internally manages devices by `portname` rather than `nodename`; this is required when storage LUNs do not have a 1:1 correspondence across `portnames`. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /PORTNAMES`
/GANXT	Instance	Use `GANXT` sequence rather than single `GNNFT` to query the fabric name server; used for compatibility with name servers that do not support the GNNFT command. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /GANXT`
/EXECTHROTTLE=n	Global	Sets the internal execution throttle to n; this is the internal maximum number of IOs outstanding per device id. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /EXECTHROTTLE=n`
/LOGINRETRY=n	Global	Sets the fabric port login retry count to *n*; when a fabric port login fails, it is retried up to *n* times; each retry is delayed one second. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /LOGINRETRY=n`
/LINKDOWN=n	Global	Sets the link down timeout period to *n* seconds; this is the timeout period for adapter link down; the expiration of this timeout triggers adapter path failover if multiple paths are available. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /LINKDOWN=n`
/PORTDOWN=n	Global	Sets the port down timeout period to *n* seconds; this is the timeout period for storage port down; the expiration of this timeout triggers storage port failover if multiple ports are available. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /PORTDOWN=n`
/FAILBACK=n	Global	Sets the failback delay time period to *n* seconds; this is the time period that elapses when some port update has event occurred before any attempt is made to failback paths/ports. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /FAILBACK=n`
/BACKOFF	Global	Disables failback of I/O after a broken link or a broken port has been restored and made operational. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /BACKOFF`
/IGNCFG	Global	Avoids reading the configuration file `QL2x00.CFG`, and allows all devices to be reported to NetWare. This file is located in the default DOS directory (`C:\NWSERVER`), and is written by QLogic SANsurfer software or the `CFG.NLM` test tool. `LOAD QL2X00.HAM SLOT=3 /LUNS /IGNCFG`
/REQCFG	Global	Requires reading the configuration file `QL2x00.CFG`, and ignores all devices not specified therein, or ignores all devices if this file does not exist. This file is located in the default DOS directory (`C:\NWSERVER`), and is written by QLogic SANsurfer software or the `CFG.NLM` test tool. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /REQCFG`
/FDMI	Instance	Registers this adapter's FC-4 symbolic `nodename with` the fabric name server for FDMI. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /FDMI`
/HPLEDS	Instance	Enables HP LED control mode. With this option, the LEDs will blink according to HP specification. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /HPLEDS`
/CONSOLE	Global	Sends system alerts to the server console when failover and failback events occur. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /CONSOLE`

/FIRSTLID=n	Instance	Sets the loop id of the first logged in device to the value *n* (hexadecimal); used for debugging. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /FIRSTLID=B7`
/ELEVATOR=n	Instance	Sets the elevator threshold to *n*; NetWare uses this value to determine when to do scatter/gather list sorting. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /ELEVATOR=16`
/MAXLUNS=n	Global	Sets the maximum number of LUNs allowed during the LUN scan; the range of LUNs searched is 0 to (*n*-1). For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /MAXLUNS=256`
/SKIPREPORT	Instance	Avoids executing the SCSI Report Luns command during LUN scanning; otherwise if this option is not used, the information returned by the Report Luns is used to optimize the LUN scan by doing SCSI Inquiries to the LUNs listed in the Report Luns information only. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /SKIPREPORT`
/INQUIRY	Instance	Forces SCSI Inquiry commands to be used during the LUN scan regardless of the LUNs listed by the SCSI Report Luns command; the existence of a particular LUN is determined solely by the results of the Inquiry to that LUN. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /INQUIRY`
/COMPLEXTAG	Instance	Enables SCSI complex tag queuing; the `hacb preserve order` control flag maps to `ordered queue`, and the `hacb priority` control flag maps to `head of queue`; otherwise, if the absence of these `hacb` control flags maps to `simple queue` tag. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /COMPLEXTAG`
/STARTUNIT	Instance	Sends the SCSI Start Unit command to each LUN during the LUN scan; on some multiple port RAID subsystems, this may cause LUN ownership to transfer across ports. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /STARTUNIT`
/XRETRY=n	Instance	Extends the retry count to n for any IO command that experiences failure with SCSI sense info SK/ASC/ASCQ code in this list: 2/04/01, 6/8B/02. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /XRETRY=10`
/XTIMEOUT=n	Instance	Sets the minimum IO timeout period to at least n seconds. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /XTIMEOUT=120`
/QUALIFIED	Instance	Extends the Inquiry data LUN present test to allow RAID subsystem LUNs to be filtered as follows: Luns returning 20 XX are reported, Luns returning 20 00 are ignored. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /QUALIFIED`
/LUNZERO	Instance	Reports to NetWare LUN 0 regardless of its actual existence as determined by the response to the SCSI Inquiry command, as long as the port was logged in. This is used for RAID subsystems that do not report any LUNs on a port until the subsystem is configured for the first time. For example: `LOAD QL2X00.HAM SLOT=3 /ALLPATHS /LUNZERO`
/SPLITNONE	Instance	Disables the split completion timeout. This option overrides the value in nvram. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /SPLITNONE`
/ZIOMODE=n	Instance	Sets the Zero Interrupt Operation (ZIO) mode to n. The allowed values of n are as follows: 0 ZIO mode disabled 5 ZIO mode 5 (interrupt after delay) 6 ZIO mode 6 (interrupt after delay or if activity ceases) This option overrides the value in nvram. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /ZIOMODE=6`
/ZIODELAY=n	Instance	Sets the ZIO interrupt delay period in units of 100 us. This option overrides the value in nvram. For example: `LOAD QL2X00.HAM SLOT=3 /LUNS /ZIOMODE=6 /ZIODELAY=10`

5.2 Adapter Parameters

The adapter parameters are stored in the adapter's nvram; these are also referred to as adapter nvram parameters.

To modify the adapter nvram parameters:

1. Enter *Fast!*UTIL during server hardware boot (press **ALT-Q** when prompted).
2. In *Fast!*UTIL, select the host adapter, then select **Configuration Settings**.

The following headings with corresponding parameters are displayed:

```
Host Adapter Settings
---------------------
+  Frame Size
:  Loop Reset Delay
+  Adapter Hard Loop Id
+  Hard Loop Id
+  Fibre Channel Tape Support
+  Connection Options
+  Data Rate
@  Spinup Delay

Advanced Adapter Settings
-------------------------
+  Execution Throttle
+  Luns Per Target
+  Enable LIP Reset
+  Enable LIP Full Login
+  Enable Target Reset
+  Login Retry Count
+  Port Down Retry Count
+  Link Down Timeout
@  Interrupt Delay Timer
@  Operation Mode
:  Extended Error Logging

Key:
+   Used by HAM driver (change effects behavior)
@   Default value expected by HAM driver (do NOT change)
=   Overridden by HAM driver (change has no effect)
:   Not used by HAM driver (change has no effect)
```

NOTEs:

- The QLA200 does not use any of these nvram parameters.
- Enable both of the following to support FC-Tape (see "Extended Firmware Settings" above):
  `Fibre Channel Tape Support`
  `Fibre Channel Confirm`
- The timeout for port down is set [in seconds] by (see "Advanced Adapter Settings" above):
  `Port Down Retry Count`
- The timeout for link down is set [in seconds] by (see "Advanced Adapter Settings" above):
  `Link Down Timeout`
- For best results, set these parameters to 15 or 20 (seconds).

6. Additional Notes

The following subsections provide additional information about the NetWare driver:

6.1 Novell NetWare Support of QLogic HAM Driver

Novell NetWare provides the following drivers to support various Fibre Channel devices through the Fibre Channel HAM driver:

- scsihd.cdm-SCSI hard disk device driver
- scsicd.cdm-SCSI CD-ROM device device driver
- scsimo.cdm-SCSI magneto-optical device driver
- nwtape.cdm-SCSI tape device driver (replaces scsi2tp.cdm)

After loading the HAM driver, NetWare loads the CDM drivers automatically as needed.

NOTE: Contact Novell for any missing CDM drivers that you need.

6.2 PCI Hot Plug

NOTE: This procedure addresses only the driver-related portion of the PCI Hot Swap operation. The server must have PCI slots that are capable of being powered up and down independently. Depending on the server platform, this entire operation may be controlled by a platform-specific software module supplied by the platform vendor. In such case, these commands are issued directly to the driver and do not require the user to enter them.

PCI Hot Plug works by unloading a specific instance of the driverassociated with a specific host adapter. It allows a failed adapter to be removed and replaced by an adapter of the same type without disrupting the operation of other adapters of the same type.

To perform a hot swap, follow these steps:

1. Start `NCMCON.NLM` from the console. NCMCON displays each slot with its adapter and power status.
2. Select the slot and press **ENTER**. NCMCON displays the driver instances running on the ports of the adapter in that slot.
3. Select **POWER OFF** and press **ENTER**. NCMCON unloads the driver instances from that adapter and removes power from that slot.
4. You may now remove the adapter from the slot and replace it with another similar adapter.
5. At NCMCON, select the slot and select **POWER ON**. NCMCON applies power to that slot and loads driver instances on each port of the adapter in that slot.
6. When NCMCON indicates that the slot status is `Active`, press **ESC** to exit from NCMCON.

6.3 256 Lun Support

To find all LUNs, load the driver with the `/LUNS` option. For example:

```
LOAD QL2X00.HAM SLOT=3 /LUNS
```

If the driver is already loaded, use the `SCAN ALL LUNS` command at the server console prompt to find all LUNs (new and existing LUNs).

To specify the maximum LUN number, use the `/MAXLUNS=n` driver load option, or set the **Luns Per Target** parameter in *Fast!*Util to the required number of LUNs per target ID (see procedures below); if not using multiple LUNs per target, set this parameter to 0 (the driver treats this as 1 LUN per target).

To set the **Luns Per Target** parameter:

1. Reboot the hardware, then press **ALT-Q** when the QLogic banner appears.
2. Select the desired adapter.
3. Select **Configuration Settings**.
4. Select **Advanced Adapter Settings**.
5. Select **Luns Per Target** and change the LUN range.
6. Press **ESC** twice and select **Save**.
7. Press **ESC** again and select **Reboot**.

NOTE: The largest number of LUNs per device that NetWare supports is 256; therefore, the largest value of *n* specifiable by `/MAXLUNS=n` is 256; this is a NetWare limitation.

6.4 Multipath Support

By default, the driver presents only one path to NetWare if multiple adapters and/or multiple ports are connected to the same storage device. This prevents volumes from being multiple mapped and causing mount segment corruption.

To disable HAM multipath mode and allow NetWare to see all paths, load the driver with the `/ALLPATHS` and `/ALLPORTS` options. For example:

```
LOAD QL2X00.HAM SLOT=3 /LUNS /ALLPATHS /ALLPORTS
```

The `/ALLPATHS` and `/ALLPORTS` options are required if an upper layer module is going to handle failover (because it expects to see all paths).

If you want to use NetWare Multi-Path IO (MPIO), you need to ensure that `startup.ncf` contains the following line before loading any drivers:

```
SET MULTI-PATH SUPPORT = ON
```

NOTE: This line is recommended, regardless of whether you want NetWare MPIO failover or QLogic HAM failover.

You must also ensure that the latest support packs are installed.

When deciding whether to use NetWare MPIO failover or HAM failover, use the following table to consider the available possibilities:

/ALLPATHS present	/ALLPORTS present	HAM Failover	MPIO Failover
No	No	adapter & port (1x1)	none [1]
No	Yes	adapter only (1xN)	port only [N]
Yes	No	port only (Mx1)	adapter only [M]
Yes	Yes	none (MxN)	adapter & port [MxN]

Assuming there are *M* adapters and *N* storage ports:

- A number shown in parentheses () is the number of instances that the HAM reports each device to NetWare
- Numbers shown brackets [] are the number of paths per device that NetWare displays in response to the command `LIST FAILOVER DEVICES`.

In other words:

- /ALLPATHS disables HAM adapter "path" failover (and reports all adapter paths for each device; all adapters report the same devices).
- /ALLPORTS disables HAM storage "port" failover (and reports all storage ports for each device on the reporting adapter(s)).
  NOTE: /ALLPORTS and /PORTNAMES are different names for the same option.

6.5 Server Memory Recommendations

In general, at least 512Mb of memory is recommended. For large numbers of volumes, at least 1024Mb is recommended.

6.6 DOS Partition Recommendations

In general, it is recommended that you load DOSFAT.NSS in STARTUP.NCF to allow NetWare to access the DOS partition using the attaching HAM driver rather than the DOS INT 13 interface.

This allows the attaching HAM driver to apply its features to any I/Os to the DOS partition (e.g. the QL2X00.HAM driver provides a failover mechanism which the HBA BIOS does not provide).

The HAM driver and the corresponding CDM driver must be loaded prior to loading dosfat.nss; for example, startup.ncf would contain:

```
LOAD SCSIHD.CDM
LOAD QL2X00.HAM /LUNS
LOAD DOSFAT.NSS
```

You can also do this when the DOS partition is IDE attached.

7. Contacting Support

Please feel free to contact your QLogic approved reseller or QLogic Technical Support at any phase of integration for assistance. QLogic Technical Support can be reached by the following methods:

Web: http://support.qlogic.com

North America Contact Information
Email: support@qlogic.com
Phone: (952) 932-4040

Support contact information for other regions of the world is available at the QLogic website:
http://support.qlogic.com

Go to Top