Coraid® EtherDrive® HBA for RHEL and CentOS

Administration Guide

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Introduction

Thank you for purchasing a Coraid® EtherDrive® Host Bus Adapter (HBA).

You can get maximum performance from your AoE SAN with Coraid HBAs on Windows, Linux, VMWare, and Solaris operating systems. This guide explains how to install and configure your Coraid HBA to work inside a Linux host running any of the following operating systems:

- Red Hat Enterprise Linux 5.x (RHEL5) and 6.x (RHEL6) 64-bit x86

- Community ENTerprise Operating System 5.6 and 5.7 (CentOS) 64-bit x86

The Coraid EtherDrive Host Bus Adapter (HBA) card and EtherDrive HBA software driver deliver AoE technology to your host for fast and affordable EtherDrive SAN performance. The EtherDrive SAN is comprised of one or more LUNs providing shared storage. Installed in the host, the EtherDrive HBA presents the LUN as a locally attached disk. The software driver and EtherDrive HBA translate disk requests to AoE requests and transmits them to the EtherDrive SAN. As responses return from the EtherDrive SAN, the reverse translation occurs in the HBA software driver.

To use Coraid's EtherDrive SAN with your server, install the Coraid EtherDrive HBA card and driver. The EtherDrive HBA's two network ports are dedicated specifically for communication with Coraid EtherDrive storage appliances. At least one port from the EtherDrive HBA must be connected to the SAN where the EtherDrive SAN is located.

Overview of Installation

To install your Coraid EtherDrive HBA in your host:

- Configure the Coraid EtherDrive SAN. For instructions, see the *Coraid EtherDrive SR/SRX Administration Guide.* Also see the *Coraid EtherDrive VSX Administration Guide* if your configuration includes a VSX appliance.

- Install the EtherDrive HBA card in your host. For instructions, see Installing an EtherDrive HBA Card.

- Remove any previously installed versions of the HBA driver and common package.

- Download the Coraid EtherDrive HBA driver and common package and install them on your host. See Installing the EtherDrive HBA Driver and common package. This release of the driver package includes two versions; be sure to install the correct package for your configuration.

- Complete your storage configuration.

Coraid Ethernet Console (CEC)

Once the HBA and driver package is installed, you can also install CEC (Coraid Ethernet Console) which is a utility that allows a host computer to establish a console connection to the SR/SRX appliance using standard Ethernet frames. Once connected via CEC (from a Linux host connected to the SAN or a workstation logged into the Linux host), you can execute commands as though you are connected to the SR/SRX console. See the *SR/SRX Administration Guide* for more information.

Obtain the latest version of CEC from the SR/SRX support page (scroll to the *Related Software* section):

http://support.coraid.com/support/sr/.

The CEC package includes a man page explaining CEC and its usage (`man cec`).

Requirements

- The Coraid EtherDrive HBA should only be used in conjunction with Coraid EtherDrive SAN appliances (SR/SRX).

- You must create and place online one or more SR/SRX LUNs.

- The EtherDrive HBA requires an HBA driver. Install it and the common package as described in Installing the EtherDrive HBA Driver and common package.

- Install the `ethdrv` kernel module on your host.

- Because the AoE protocol is not routable, the EtherDrive HBA and the EtherDrive SAN must be connected to the same network broadcast domain.

- The EtherDrive HBA requires an available PCI Express (PCIe®) slot in the host.

- SAN Ethernet ports—HBA cards are available in the following SAN port configurations. Use high-quality cables when connecting to these ports.

  - EtherDrive EHBA-2-E-RJ45— 2 x 1GbE

  - EtherDrive EHBA-20-E-RJ45— 2 x 10GbE

  - EtherDrive EHBA-20-E-CX4— 2 x 10GbE CX4

  - EtherDrive EHBA-20-E-SFP— 2 x 10GbE SFP+

- The EtherDrive HBA must be connected to a network switch that supports flow control (IEEE 802.3) and jumbo frames with an MTU (Maximum Transmission Unit) size of 9000 or greater.

Note: Isolate the SAN from other network traffic so that it is dedicated exclusively for storage.

Terminology

The information in this guide assumes familiarity with common data storage and networking concepts and familiarity with data center operations. Users unfamiliar with standard networking and storage terminology and standard Linux tools such as `modprobe` and the **RPM Package Manager** are encouraged to find definitions for these using Web resources and Linux manual pages.

This guide uses the following terms that might be unfamiliar to you or are specific to Coraid products.

Term	Definition
AoE	ATA-over-Ethernet protocol.
AoE Target	The shelf and LUN combination used to identify a block storage device on the EtherDrive SAN.
Host	The computer accessing the storage over the EtherDrive SAN.
CorOS	Operating system software that is embedded into—and distributed as an integral part of—the Coraid hardware storage solution.
EtherDrive SAN Manager (ESM)	ESM provides live monitoring and management of EtherDrive appliances that use the AoE protocol, such as the SR and SRX,
HBA (Host Bus Adapter)	An HBA connects a host computer to network storage. The HBA consists of EtherDrive HBA card and an HBA software driver. Coraid offers a range of HBAs with support for a variety of operating systems. For more information see www.coraid.com.
LUN (Logical Unit Number)	A LUN is a grouping of uniquely numbered blocks of storage attached to a storage appliance by Ethernet SAN. LUNs can be disk drives, disk partitions, or a RAID. The terms "LUN," "target," "AoE Target," "device," and "disk" are used interchangeably in this document.

EtherDrive SAN Configuration

Before you can communicate with the EtherDrive SAN through your EtherDrive HBA, you must create and place online one or more SR/SRX LUNs. For details, see the following documents:

- *Coraid EtherDrive SR/SRX Administration Guide*

- *Coraid EtherDrive VSX Administration Guide*

- *Coraid EtherDrive SAN Manager Administration Guide*

Note: RAID performance is suboptimal while the RAID on the LUN is initializing. For optimal performance, wait until the RAID has finished initializing before using it.

Installing an EtherDrive HBA Card

Install your EtherDrive HBA in your server before you install the driver. Insert the HBA(s) into an open PCIe slot with the server powered off. Once your EtherDrive HBA is installed successfully you can install the EtherDrive HBA driver. The Coraid EtherDrive HBA utilizes a PCI interface. To install an EtherDrive HBA, perform the following procedure:

To install the EtherDrive HBA

1. **Follow ESD (electrostatic discharge) and other safety precautions when handling the EtherDrive HBA.**

   Static discharge can destroy the circuits etched in silicon microchips or dramatically shorten their life span. To protect the HBA from damage, observe standard ESD precautions.

2. **Power off the host and disconnect the power cable.**

3. **Open the host chassis and locate an available PCIe slot.**

4. **Remove the slot cover (if any) by removing the screw or releasing the lever.**

5. **Seat the EtherDrive HBA firmly into the PCIe slot.**

   You might need to remove and replace existing PCIe cards or other hardware to access an available slot.

6. **Attach the EtherDrive HBA retaining bracket using the existing screw or lever.**

   Note: Depending on whether you are using a full-height or half-height slot, you might need to change the retaining bracket on your EtherDrive HBA. Your EtherDrive HBA includes both a half-height and a full-height retaining bracket.

   • (SFP+ EtherDrive HBA only) Remove both transceivers before removing the retaining bracket.

   • (CX4 EtherDrive HBA only) If you change the retaining bracket on your HBA, make sure you remove and replace the locking pin on each port carefully. Push on the pin one side at a time, alternating sides, until it comes loose or clicks back into place. Locking pin shown below:

7. **Close the host chassis, and then connect the power cable(s).**

8. **Connect cables from the HBA SAN ports to an Ethernet switch connected to the SAN. The switch must support jumbo frames with an MTU size of 9000 (see Requirements).**

   Each EtherDrive HBA provides two ports for communicating with Coraid EtherDrive storage appliances. At least one port must be connected to the SAN network where the EtherDrive SAN is located. You can also connect directly to the ports on the SR/SRX appliance.

9. **Power on the host.**

10. **Perform the procedure Installing the EtherDrive HBA Driver and common package.**

Installing the EtherDrive HBA Driver and common package

Install the HBA driver after you install the EtherDrive HBA in the host. The host will not recognize the EtherDrive HBA until you have installed the HBA driver. In the procedure below, the version and release numbers in the file names are replaced by XXX. Substitute the actual file name of the **rpm** package you download when you install the driver.

Before you install the driver, ensure the following:

• You have uninstalled any previously installed Coraid EtherDrive HBA drivers

• The host is enabled for **ssh**

• You have **root** privileges

To install the EtherDrive HBA driver on your Linux host

1. **If applicable, uninstall any previously installed Coraid EtherDrive HBA drivers. For example (login as root to remove previously installed drivers):**

   `[root@myhost]# rpm -ev ethdrv-common-XXX kmod-ethdrv-XXX`

   Note: To get the specific package name for previously installed drivers, use the following:

   `[root@myhost]# rpm -qa | grep ethdrv`

2. **Download the latest Linux RHEL/CentOS software driver and common tools from:**

   http://www.coraid.com/support/downloads

   Note: There are two drivers available: one for RHEL5/CentOS5 and one for RHEL6. Make sure you download the appropriate driver for your configuration.

3. **Copy the package containing EtherDrive HBA driver and EtherDrive HBA common package to /tmp on your host.**

   You can use the **scp** utility to copy the file or if it is inappropriate for your configuration, use another download utility, browser, or copy tool that is more suitable.

4. **Use ssh or equivalent to log in as root on your host and change the directory to /tmp:**

   ```
   # ssh root@my_host_ip_address
   password:<root_password>
   [root@myhost]# cd /tmp
   ```

5. **Unpack and install the EtherDrive HBA Driver and common tools on your host:**

   Unpack:
   `[root@myhost]# tar -zxvf etherdrive-hba-XXX-XXX.tar.gz`

   Install:
   `[root@myhost]# rpm -i kmod-ethdrv-XXX.rpm ethdrvcommon-XXX.rpm`

   Your prompt should return with no output from **rpm**.

6. **Unmount the storage and unload the previous module.**

    ```
    [root@myhost]# rmmod ethdrv
    ```

    If the previous module fails to unload you may to need to reboot your system.

7. **Load the new `ethdrv` module:**

    ```
    [root@myhost]# modprobe ethdrv
    ```

Configuration and Management Tools

This section describes the tools available for managing and configuring your storage. Manual (man) pages containing complete information for each of these tools are available on your host. Before you can use your storage as described in this section, make sure you have satisfied the requirements detailed in Requirements.

Once your host recognizes an EtherDrive HBA, the storage associated with the EtherDrive HBA is presented in the same manner as any other standard SCSI storage.

The utilities described in this section rely on the **ethdrv** module that you loaded in To install the EtherDrive HBA driver on your Linux host. You do *not* need to be logged in as root in order to issue the commands described in this section.

ethdrv-stat

The **ethdrv-stat** command allows you to obtain the status of all attached EtherDrive devices and see the correspondence of local devices to AoE targets. The following values are displayed for each AoE target that is visible to the EtherDrive HBA:

- The AoE target (in the form **shelf.lun**, such as **7.9**)

- The device name under **/dev** (such as **sde**, **sdf**, etc.).

  If the device has yet to be initialized by the Linux SCSI layer, the device shows up as **init** instead of the device name.

- The size of the target in gigabytes

- The HBA port(s) that communicate with the AoE target.

  A value of **N/A** indicates that no port can currently contact the AoE target.

For example:

```
[user@myhost]# ethdrv-stat
e7.9   sde   6001.196GB   0,1
e7.8   sdf   8001.595GB   0,1
```

Note that **/dev/sde** is attached to AoE target **7.9** and **/dev/sdf** is attached to AoE target **7.8**. Both targets are found on EtherDrive HBA port 0 and 1.

Issuing the `ethdrv-stat` command with the optional argument `-a` displays all the AoE Mac addresses associated with a LUN. For example:

```
[user@myhost]# ethdrv-stat -a
     e7.9  sde   6001.196GB       0,1
       0 00257003edc8,00257005edc7
       1 00257003edc8,00257005edc7
     e7.8  sdf   8001.595GB       0,1
       0 003058fb30ee,003047fb30ef
       1 003058fb30ee,003047fb30ef
```

Note: HBA ports can communicate with each AoE target through more than one MAC address.

For more information, see the `ethdrv-stat(8)` man page available on your host.

ethdrv-ports

The `ethdrv-ports` command allows you to display information about the EtherDrive HBA ports.

For each HBA port the kernel discovers, the `ethdrv-ports` command displays the following information:

- HBA port number

- Type of EtherDrive card for the port

- Ethernet MAC address for the port

- Current link speed/maximum link speed for the port

For example (output for EtherDrive HBA SFP+):

```
[user@myhost]# ethdrv-ports
0  EHBA-20-E-SFP  001005013108  10000/10000
1  EHBA-20-E-SFP  001005013109  10000/10000
```

Your Coraid HBA features one of the following types of ports:

HBA type	Bus	Interface (port type)
EHBA-2-E-RJ45	1GbE PCIe	RJ-45
EHBA-20-E-RJ45	10GbE PCIe	RJ-45
EHBA-20-E-SFP	10GbE PCIe	SFP+
EHBA-20-E-CX4	10GbE PCIe	CX4

■ **ethdrv-release**

The `ethdrv-release` command displays the version of the installed Coraid EtherDrive HBA software driver. It is executed with no flags or options. For example:

```
[user@myhost]# ethdrv-release
5.2.3
```

For more information, see the man page for `ethdrv-release(8)` available on your host.

■ **ethdrv-sos**

The `ethdrv-sos` command displays a range of EtherDrive HBA state information. Issue this command to obtain the diagnostic information required by Coraid Technical Assistance Center. The `ethdrv-sos` command is executed with no flags or options.

For more information, see the man page for `ethdrv-sos(8)` on your host.

■ **ethdrv-flush**

Use the `ethdrv-flush` command to remove targets that are no longer present on the host's storage network. LUNs that are no longer present show up in `ethdrv-stat` list with N/A. Commands sent to a flushed AoE LUN are immediately rejected. When the AoE LUN reappears on the network, it will automatically reappear in HBA output and respond to commands.

Usage:

```
[user@myhost]# ethdrv-flush
```

Note: You can use this command any time a target is N/A on the host's storage network. If a target is placed online before its status is N/A, the `ethdrv-flush` command is not executed. For example, even though LUNs may be temporarily missing after rebooting an SR/SRX appliance, the LUN status doesn't change to N/A. Issuing the `ethdrv-flush` command while the LUNs are temporarily missing does not remove the LUNs.

EtherDrive HBA Configuration Notes

This section presents tips and information for installing and configuring your EtherDrive HBA. The tools mentioned here are described elsewhere in this manual and in manual pages on your host.

MultiPath

Every EtherDrive HBA has two ports. It is recommended that you connect both ports to the SAN. Having two connections to the SAN provides network redundancy and higher bandwidth capacity. Greater redundancy is achieved when the two ports of the EtherDrive HBA are connected to separate switches. Furthermore, more than one EtherDrive HBA may be installed to achieve further redundancy and throughput.

MultiPath is built into the EtherDrive HBA driver and requires no configuration. The EtherDrive HBA automatically detects all network paths to the EtherDrive SAN and utilizes each path to load balance all data packets bound for the EtherDrive SAN.

LUNs not hot-pluggable

Your AoE storage is not considered to be hot-pluggable. If you take a LUN offline while your host is attached to the LUN, access to the LUN will hang indefinitely. To avoid this problem, you should first unmount AoE storage from Linux before placing a LUN offline.

The `/proc/ethdrv/` directory

The `ethdrv` kernel module creates files in the `/proc filesystem`. These files provide detailed information about the module. The contents of the `/proc/ethdrv/` directory might change between versions.

Working with `/etc/fstab`

AoE targets might not be associated with the same device files each time they are mounted. When the **ethdrv** module is loaded, an Ethernet broadcast is emitted on all HBA ports requesting that AoE targets report their existence. The order of the responses determines which LUN is associated with devices such as **/dev/sde** or **dev/sdf**. For this reason, you should not use the **/dev/sdX** device files directly for mount points in **/etc/fstab**. Instead, use a block device's UUID to determine where it should be mounted.

To determine where to mount a device using UUID

This example assumes that the AoE target 7.9 already exists but no filesystem has been written to it yet.

1. Issue the command **ethdrv-stat** to determine which block device is currently associated with AoE target 7.9. For example:

```
[root@myhost]# ethdrv-stat
e7.9   sde   6001.196GB   0,1
```

2. Create a filesystem on the device.

   Note: No partitions are necessary.

```
[root@myhost]# mkfs.ext4 /dev/sde
mke4fs 1.41.12 (17-May-2010)
/dev/sde is entire device, not just one partition!
Proceed anyway? (y,n) y
...
```

3. Issue the **blkid** command to determine the UUID of the block device.

```
[root@myhost]# blkid /dev/sde
/dev/sde: UUID="36d19582-6a28-40c8-b54c-d91116b5ac48"
TYPE="ext4"
```

4. Create a mount point.

```
mkdir -p /mnt/accounting
```

5. Add the UUID entry and mount point to **/etc/fstab**.

```
UUID=36d19582-6a28-40c8-b54c-d91116b5ac48 /mnt/accounting ext4
defaults 1 2
```

6. Make sure it works.

```
[root@myhost]# mount /mnt/accounting
```

If everything was successful your host will always mount AoE target 7.9 into **/mnt/accounting**.

For more information on **ethdrv-stat**, see the man page for **ethdrv-stat(8)** on your host.

Frequently Asked Questions

Question: I tried to install the `kmod-ethdrv` HBA driver rpm but the installation exited and generated the error `failed dependencies`. How can I install this driver successfully?

Answer: You must update your system to the latest RHEL or CentOS kernel. Some earlier kernels are not compatible with this driver.

Question: The Coraid EtherDrive HBA looks like a standard Network Interface Card (NIC). Can I use the Coraid EtherDrive HBA for IP traffic?

Answer: No. The EtherDrive HBA is a dedicated storage device. Dedication allows the EtherDrive HBA to process storage commands at an exceptionally fast rate.

Question: What do I have to configure to use Multipath?

Answer: Nothing! The EtherDrive HBA driver automatically handles Multipath for all of the available EtherDrive HBA ports. Even if a single host has two EtherDrive HBA cards, the EtherDrive HBA driver automatically uses the ports on both devices.

Question: I understand that I need a Coraid EtherDrive HBA for my host in order to utilize my EtherDrive SAN appliances. Do I also need an EtherDrive HBA for each of my EtherDrive SAN appliances?

Answer: No. Only one EtherDrive HBA is required for each host. One EtherDrive HBA can communicate with any EtherDrive SAN appliance running a compatible version of the CorOS. You can add additional EtherDrive HBAs to your host if you have unusual security or bandwidth requirements or if your storage exceeds the limitations of your operating system.

Coraid Policy Statements, Warranty and EULA

Technical support

Do you have more questions? See the Coraid Support web site:

http://www.coraid.com/support/

Contact the Coraid Technical Assistance Center at:

support@coraid.com

To help the Technical Assistance Center diagnose your problem, send diagnostic output along with a description of your problem. To obtain diagnostic output, issue the `sos` command.

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After an RMA number has been issued by Coraid, the defective Product must be packaged securely in suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. The customer is responsible for all return shipping charges to Coraid, and Coraid will not be held responsible for any packages that are lost in transit to Coraid.

Return Product ship to address is: Coraid Inc. 2393 Pendley Rd, Suite 200, Cumming, Georgia 30041

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"**CorOS**" means the firmware operating system software that is embedded into, and distributed as an integral part of the Coraid hardware storage solution.

"**Host Bus Adaptor (HBA) Driver**" means the specific software adaptors allowing the CorOS firmware operating system to interoperate with the HBA network interface card (NIC) in the Coraid hardware storage solution.

"**Software**" means Coraid software products that are licensed to Licensee under this EULA, including, but not limited to the CorOS, the HBA Drivers, the User Interface, any related components purchased or provided with the Software, application programming interfaces, associated media, printed materials, online or electronic Documentation, and any updates and maintenance releases thereto.

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