

**CORAIID**  
**EtherDrive® SAN Integration**  
**for**  
**VMware® vSphere™**  
ESX™ Server 4.0, ESXi Server 4.0  
vSphere™

## Table of Contents

1. Introduction.....	3
2. CORAIID EtherDrive SAN Storage .....	4
3. EtherDrive HBA Installation .....	5
4. EtherDrive HBA Network Connectivity and MultiPath .....	5
5. Understanding how ESX uses LUNs .....	5
6. EtherDrive HBA ESX Driver Installation.....	6
7. Using vSphere with an EtherDrive HBA.....	6
7.1 Recognizing the EtherDrive HBA as a Storage Adapter.....	7
7.2 Renaming the EtherDrive LUNs.....	7
7.3 Setting up a Volume on the EtherDrive SAN Storage.....	9
7.4 Extending a Volume on the EtherDrive SAN Storage.....	13
7.5 Renaming a Datastore .....	17
8. Raw Device Mappings .....	18
9. Frequently Asked Questions.....	18
Appendix .....	20
A-1. Enable ssh for ESXi.....	20
A-2. Enable ssh for ESX.....	20

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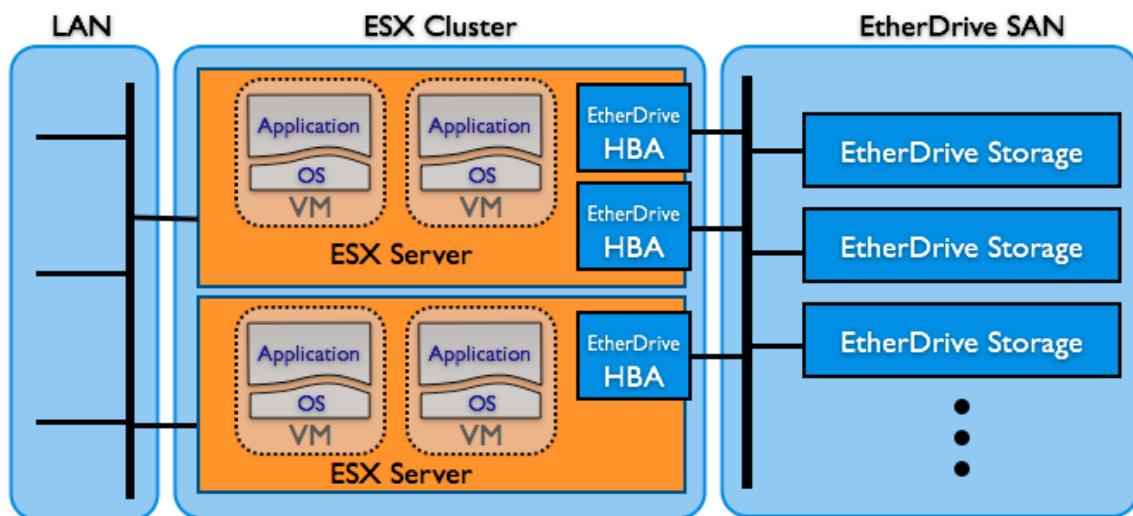
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## 1. Introduction

The CORAIID EtherDrive Host Bus Adapter and driver for VMware ESX/ESXi enable your server with AoE technology to deliver affordably fast EtherDrive SAN solutions for your virtualization environment. Enabling ESX hosts to work natively with EtherDrive storage is a highly effective way to take full advantage of VMware vSphere features including VMotion and VMFS. CORAIID EtherDrive SAN products deliver Fibre Channel speeds at Ethernet prices in an easily scalable, reliable, and simply elegant solution.

EtherDrive SAN is comprised of one or more LUNs providing shared storage for VMFS and RDM. Installed in the ESX server, the EtherDrive HBA presents the LUN on the EtherDrive SAN as a locally attached standard SCSI device to ESX. The software driver and HBA perform the translation of the SCSI disk requests to AoE requests and transmit them to the EtherDrive SAN. As responses return from the EtherDrive SAN, the reverse translation occurs in the HBA software driver.



### Terminology

**LUN (Logical Unit Number):** A LUN is a grouping of uniquely numbered blocks of storage with each block containing 512 bytes of data. LUNs can be disk drives, disk partitions, groups of disks operating as one (a RAID array), or abstracted “virtual” LUNs made from other LUNs. EtherDrive storage appears as one or more LUNs to an ESX server. VMware refers to LUNs as Volumes and/or Datastores.

**HBA (Host Bus Adapter):** A HBA is used to connect an ESX server to network storage. The following EtherDrive HBAs are available from CORAIID:

- PCIe HBA with Two 10/100/1000 ports
- PCIe HBA with Two CX-4 10 Gigabit ports
- PCI-X HBA with Two 10/100/1000 ports

**VM (Virtual Machine):** A collection of virtual hardware that collectively presents a physical machine for a guest operating system.

**ESX and ESXi:** The CORAIID EtherDrive HBA is compatible with both ESX and ESXi servers. In general, this manual uses the term ESX to refer to both the ESX and ESXi servers.

### Integration with VMware's ESX Server

In order to utilize CORAIID's EtherDrive SAN storage with a VMware ESX Server, one or more CORAIID EtherDrive HBAs must be installed in the ESX Server. Each EtherDrive HBA has two network ports that are utilized specifically to communicate with CORAIID EtherDrive storage appliances. At least one port from the EtherDrive HBA must be connected to the SAN network where the EtherDrive SAN storage is located.

On the ESX Server, EtherDrive LUNs appear as locally attached SCSI disks. The EtherDrive HBA performs the translation of SCSI disk commands to and from AoE commands. The translation of these commands is transparent to the ESX server.

### Requirements

- The CORAIID EtherDrive HBA may only be used in conjunction with CORAIID EtherDrive SAN storage. All CORAIID EtherDrive SAN storage appliances must be upgraded to firmware version **20090303** or higher in order to operate correctly with an EtherDrive HBA. The latest CORAIID EtherDrive SAN appliance firmware release may be downloaded from: <http://support.coraid.com/support/sr/index.html>
- A software driver must be installed on the ESX server in order for the CORAIID EtherDrive HBA to operate. The EtherDrive HBA driver may be downloaded from: <http://support.coraid.com/support/esx>
- Since the AoE protocol is not routable, the CORAIID EtherDrive HBA and the CORAIID EtherDrive SAN storage must be connected to the same network broadcast domain.
- The CORAIID EtherDrive HBA must be connected to a network switch that is utilizing jumbo frame support (9000 MTU).

### Recommendations

The SAN storage network should be isolated from other network traffic. This allows full utilization of the network for SAN storage.

## 2. CORAIID EtherDrive SAN Storage

Before CORAIID EtherDrive SAN storage can be used with an ESX Server, one or more LUNs must be configured on the EtherDrive SAN storage appliance. The EtherDrive SAN Software Reference Manual should be used as the complete reference for EtherDrive SAN appliance configuration and may be downloaded from: <http://support.coraid.com/support/sr/index.html>. Below is a simple example of how a LUN may be setup on an EtherDrive SAN storage appliance.

Sample steps to follow to setup a LUN on an EtherDrive Storage Appliance

1. Boot unit, and set self address:  
SR shelf unset> shelf 22
2. Install and verify disks:  
SR shelf 22> show -l
3. Create a 14-disk LUN:  
SR shelf 22> make 5 raid5 22.0-13
4. Allocate a system wide spare disk:  
SR shelf 22> spare 22.14

5. Enable the LUN:  
SR shelf 22> online 5

**NOTE: RAID performance is degraded while the RAID on the LUN is being initialized! Full performance can only be achieved once the RAID initialization is complete.**

It is also important to note here that the ESX server will not utilize a LUN greater than 2TB; this is due to VMware's utilization of the SCSI-2 standard. The SCSI-2 standard defines an addressing scheme that only supports up to 2TB of storage. For this reason, the EtherDrive HBA automatically presents a LUN greater than 2TB as multiple LUNs segmented at 2TB boundaries. For example, a 5TB LUN is presented to the ESX server as two 2TB LUNs and one 1TB LUN. Presenting the LUNs in this manner to the ESX server is done automatically by the EtherDrive HBA. The segmented LUNs can be put back together by vSphere Client by using the 'Extend Datastore' feature.

### **3. EtherDrive HBA Installation**

The CORAIID EtherDrive HBA utilizes a PCI interface. To install an EtherDrive HBA, perform the following steps:

- Step 1. Power off the ESX server and then disconnect the power cable.
- Step 2. Remove the server's cover and identify an empty PCI slot.
- Step 3. Pull out the slot cover (if any) by removing the screw or releasing the lever.
- Step 4. Seat the EtherDrive HBA firmly into the PCI slot.
- Step 5. Refasten the EtherDrive HBA's retaining bracket using the existing screw or lever.
- Step 6. Close the ESX server cover, plug in the power cable(s), and turn on the ESX server.
- Step 7. Connect the EtherDrive HBA to the SAN network by connecting a CAT 6 Ethernet cable from the EtherDrive HBA to a network switch.

### **4. EtherDrive HBA Network Connectivity and MultiPath**

Every EtherDrive HBA has two Ethernet ports. It is recommended that each port be connected to the SAN network. Having two connections to the SAN network offers two advantages: network redundancy and higher bandwidth capacity. A higher level of 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 in an ESX server; multiple HBAs offers further redundancy and data throughput.

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

### **5. Understanding how ESX uses LUNs**

With ESX, storage is not considered to be hot pluggable because Virtual Machines do not behave well when their boot storage disappears. The ESX server expects its LUNs to always be available unless the LUN has actually failed. If a LUN is taken offline while the ESX server is attached to the LUN, access to the LUN will hang indefinitely.

## 6. EtherDrive HBA ESX Driver Installation

Once the EtherDrive HBA is installed in the ESX Server, the software driver must be installed. The ESX server will not recognize the EtherDrive HBA until the software driver has been installed. The software driver may be downloaded from: <http://support.coraid.com/support/esx>. Perform the following steps to install the driver onto the ESX server:

**ASSUMPTION: The ESX(i) server must have ssh enabled and root login enabled to perform the following steps. See Appendix A-1 for ESXi and A-2 for ESX for instructions on how to enable ssh.**

**ASSUMPTION: The following instructions assume driver release 2.0.5. Change the file name below as appropriate for other release versions.**

Step 1. Copy the EtherDrive HBA driver to the ESX(i) server:

```
scp /path/to/ESX4-CRD-ethdrv-2.0.5-00034.zip root@esx_ip_address:/tmp/
```

Step 2. ssh to the ESX(i) server and change directory:

```
ssh root@esx_ip_address  
cd /tmp
```

Step 3. Install the EtherDrive HBA Driver:

```
esxupdate --bundle ESX4-CRD-ethdrv-2.0.5-00034.zip --maintenancemode update
```

Step 4. Reboot the ESX(i) server by typing reboot at the Console OS command prompt.

## 7. Using vSphere with an EtherDrive HBA

This section provides detailed instructions on how to get the VMware vSphere Client to recognize and use the EtherDrive HBA and associated EtherDrive LUNs. Once the vSphere Client recognizes an EtherDrive HBA, the storage associated with the EtherDrive HBA is presented to the vSphere Client in the same manner as any other standard SCSI storage. Once vSphere has recognized the EtherDrive HBA, all of the available features of vSphere may be utilized with the EtherDrive storage.

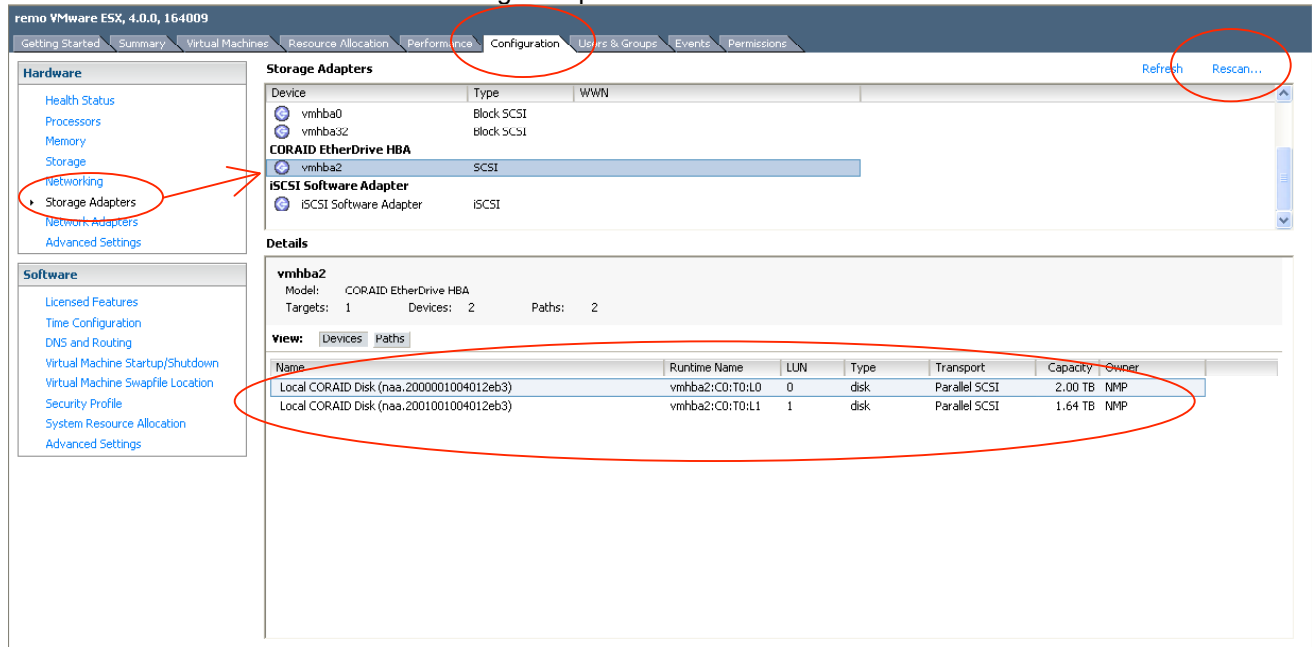
**CHECK POINT: At this point the following tasks should already be complete:**

- **The EtherDrive Storage appliance should be configured with at least one LUN.**
- **The EtherDrive HBA should be installed in an ESX server.**
- **The EtherDrive HBA driver should be installed on the ESX server**
- **After the EtherDrive HBA driver installation, the ESX server should have been rebooted**
- **The EtherDrive HBA and the EtherDrive SAN storage should be connected using CAT 6 Ethernet cable through a Jumbo Frame supported Ethernet switch.**

**ASSUMPTION: This section assumes that the vSphere Client has already been configured to manage the ESX server. Refer to VMware's ESX Configuration Guide for details about setting up vSphere.**

## 7.1 Recognizing the EtherDrive HBA as a Storage Adapter

The first step is to open the vSphere Client and select the ESX server where the EtherDrive HBA was installed. Next, from the top row of tabs, select the 'Configuration' tab. Now, select 'Storage Adapters' from the left column. Finally, click 'Rescan' to instruct the vSphere Client to refresh the list of available storage adapters.



The CORAIID EtherDrive HBA should now be displayed in the list of available storage adapters and the available LUNs (targets) should be listed under the 'Details' section.

**NOTE: As previously mentioned, the 3.64TB LUN configured on the EtherDrive Appliance is presented to the vSphere Client as a 2TB LUN and 1.64TB LUN.**

## 7.2 Renaming the EtherDrive LUNs

vSphere assigns a name to represent each LUN available to the ESX server. vSphere also offers the means to change the default name assigned to each LUN. Renaming the LUNs in vSphere is helpful for determining the best placement of Virtual Machines and Virtual Disks. Also, proper naming will aid in troubleshooting issues should they arise. The mapping of VMware's naming scheme to the EtherDrive Shelf/LUN number is found in a file on the ESX server. This file can be viewed as follows:

Step 1. Log in to the ESX server via ssh

Step 2. Issue the following command:

For ESX: `cat /proc/ethdrv.devices`

or

For ESXi: `cat /proc/scsi/ethdrv/ethdrv.devices`

```
Example: [root@remo ~]# cat /proc/ethdrv.devices
'ESX Device' 'AoE Target' Size
vmhba2:C0:T0:L0 22.5 2199.023GB
vmhba2:C0:T0:L1 22.5 1801.796GB
```

Examining the first entry 'vmhba2:C0:T0:L0 22.5 2199.023GB' tells us:

vmhba2:C0:T0:L0 : the ESX server's hardware assignment location for this LUN.  
22.5 : the shelf:LUN number configured on the EtherDrive Appliance

Step 3. Compare the output from Step 2 to the values listed for 'Runtime Name' in vSphere Client to associate the EtherDrive Shelf and LUN numbers for each LUN presented in the vSphere Client.

Step 4. Right click the LUN name from the vSphere Client and select rename

Step 5. Rename the LUN using the Shelf and LUN number from Step 3

Use the output from the ethdrv.devices file to determine the EtherDrive Shelf and LUN number:

```
'ESX Device' 'AoE Target' Size
vmhba2:C0:T0:L0 22.5 2199.023GB
vmhba2:C0:T0:L1 22.5 1801.796GB
```

EtherDrive Shelf and LUN number. Shelf 22, LUN 5

VMware Extent (or LUN) number

Name	Runtime Name	LUN	Type	Transport	Capacity	Owner
Shelf: 22 LUN:5 Extent:0	vmhba2:C0:T0:L0	0	disk	Parallel SCSI	2.00 TB	NMP
Shelf: 22 LUN:5 Extent:1	vmhba2:C0:T0:L1	1	disk	Parallel SCSI	1.64 TB	NMP

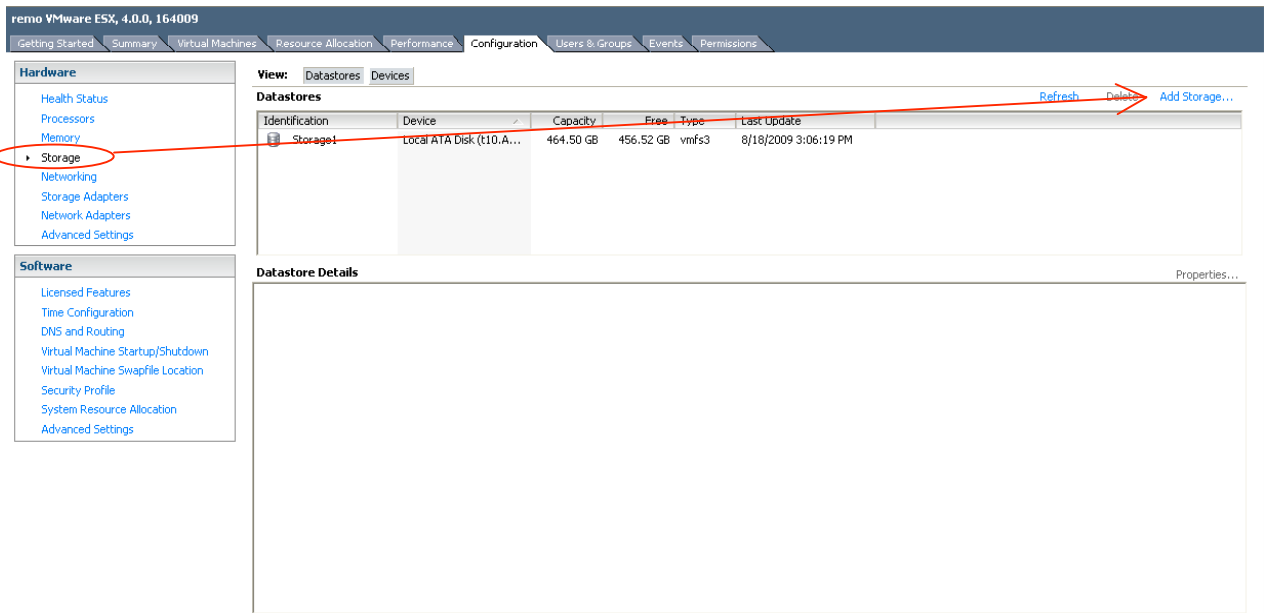
Match the value for 'Runtime Name' to the value listed in the output of ethdrv.devices, then name the LUN in vSphere with the associated EtherDrive Shelf and LUN number. If desired, use the value in the LUN column to denote the extent number (as shown).

**NOTE:** It is very important to name each LUN with the EtherDrive Shelf and LUN number. The LUN name may consist of additional characters, but the Shelf and LUN number should be a part of the name. Example: 'Accounting Dept DB: Shelf:22 LUN:5 Extent: 0' may be used instead.

**NOTE:** This LUN was configured on the EtherDrive SAN storage appliance to be 3.64TB. The EtherDrive HBA automatically segmented the LUN at the 2TB boundary and presents the 3.64TB LUN as one 2TB LUN and one 1.64TB LUN.

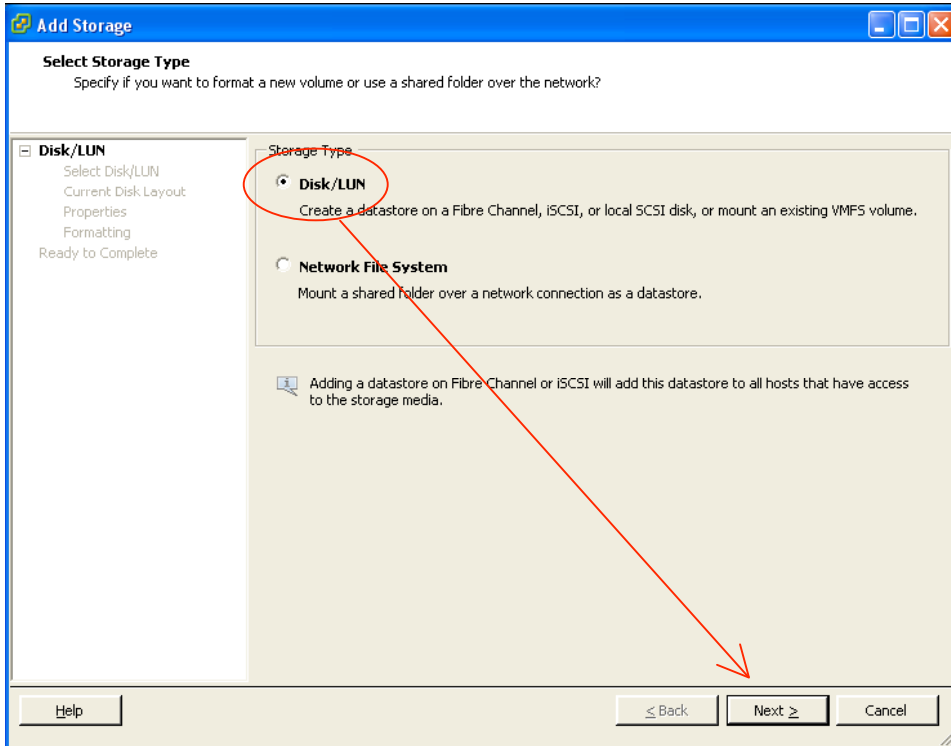
### 7.3 Setting up a Volume on the EtherDrive SAN Storage

Once the EtherDrive HBA has been recognized by the vSphere Client, the next step to using the EtherDrive storage is to setup a Volume on the EtherDrive LUN. To do this, click 'Storage' from the 'Hardware' menu. Next, click 'Add Storage' to open the 'Add Storage Wizard'.

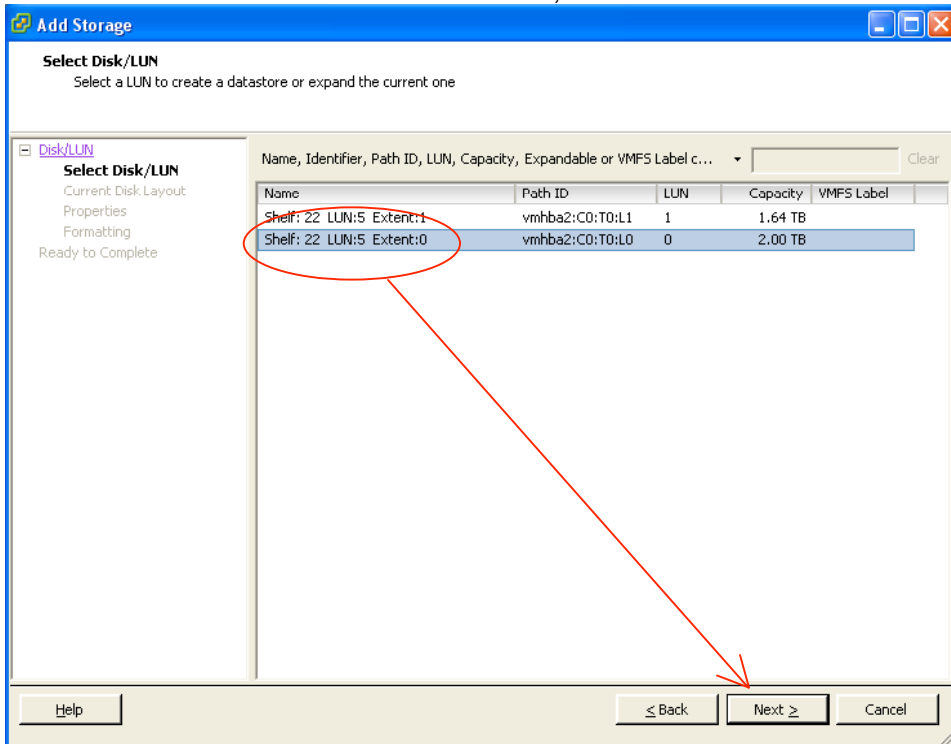


**NOTE:** The default settings are used for this example of 'Add Storage Wizard'. The use of the default settings is not required by EtherDrive storage. The VMware administrator should choose the appropriate settings for the intended application.

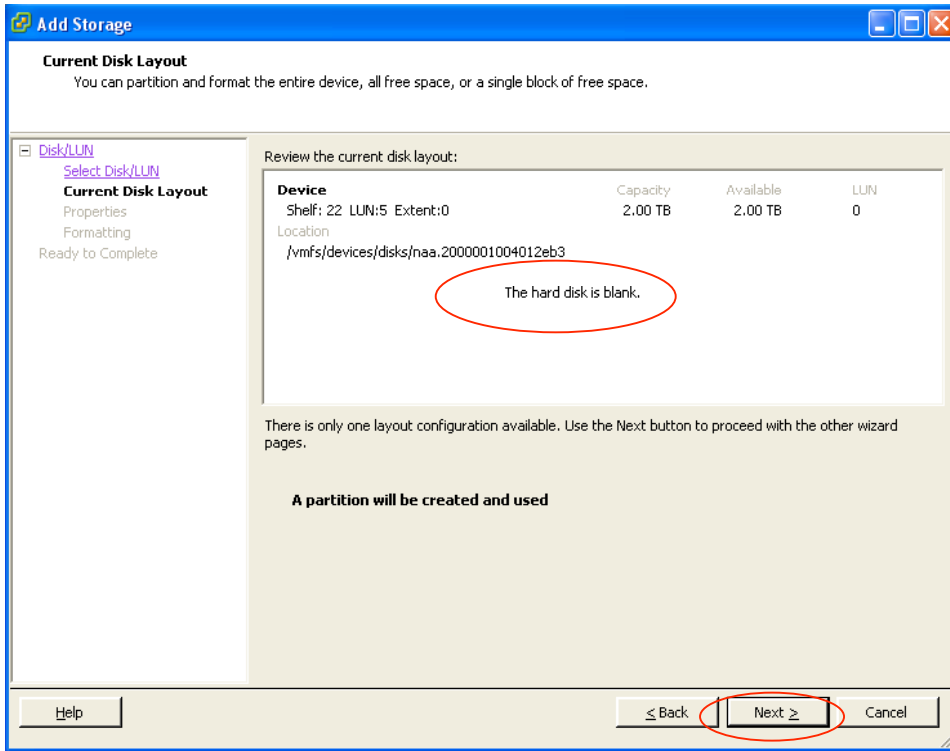
From the first page of the 'Add Storage Wizard', select 'Disk/LUN' as the Storage Type (this is the default value) and then click 'Next'.



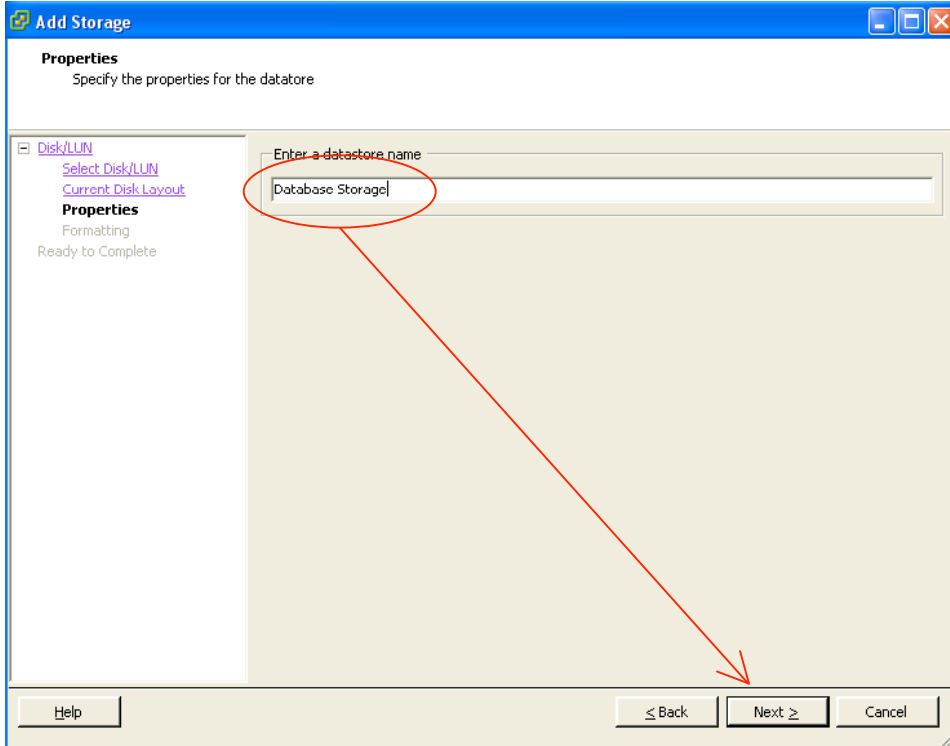
From the second page of the 'Add Storage Wizard', select the desired EtherDrive LUN. Once the desired EtherDrive LUN has been selected, click 'Next'.



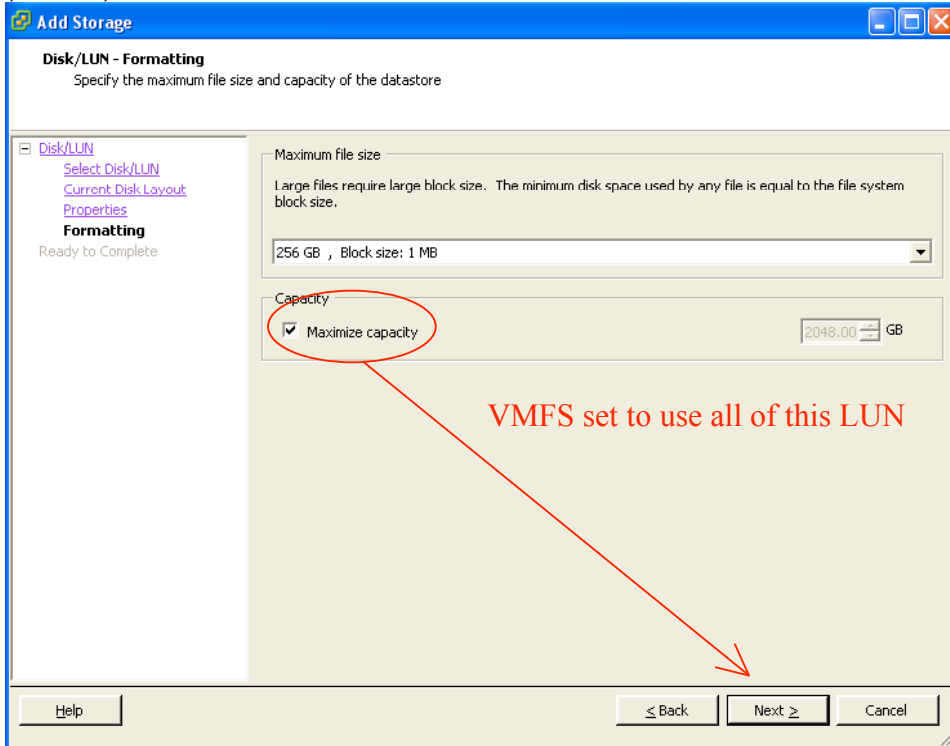
Use the third page of the 'Add Storage Wizard' to verify the correct LUN has been selected. This page also displays the current disk layout of the selected LUN. In this example, the disks are blank. If the correct EtherDrive LUN has been selected, click 'Next'.



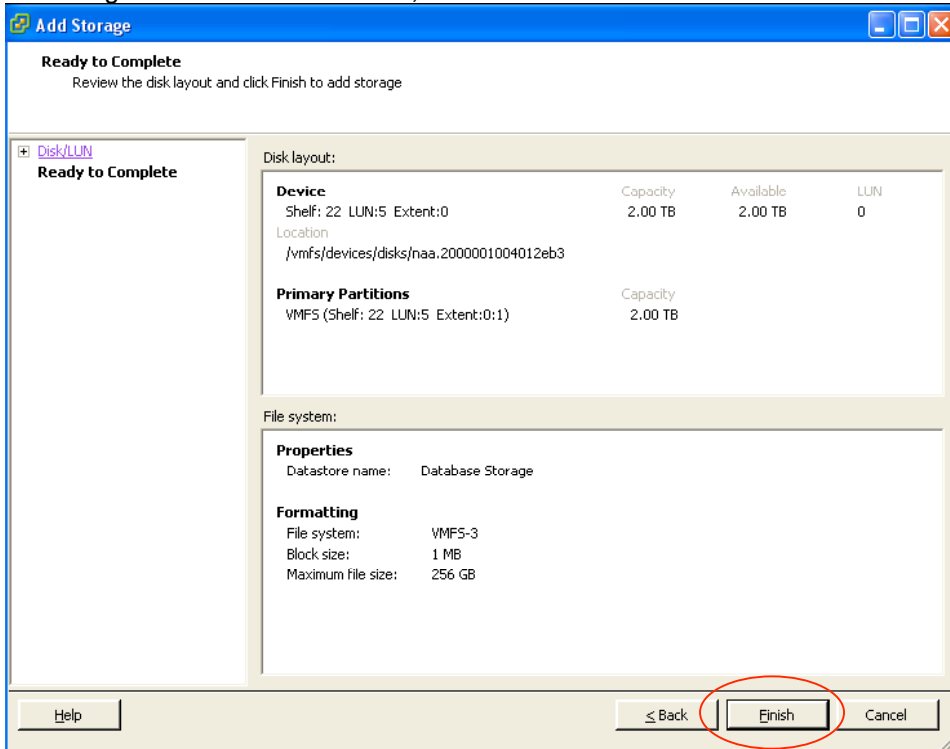
Use the fourth page of the 'Add Storage Wizard' to name the Datastore (Volume). Once the EtherDrive LUN has been named, click 'Next'.



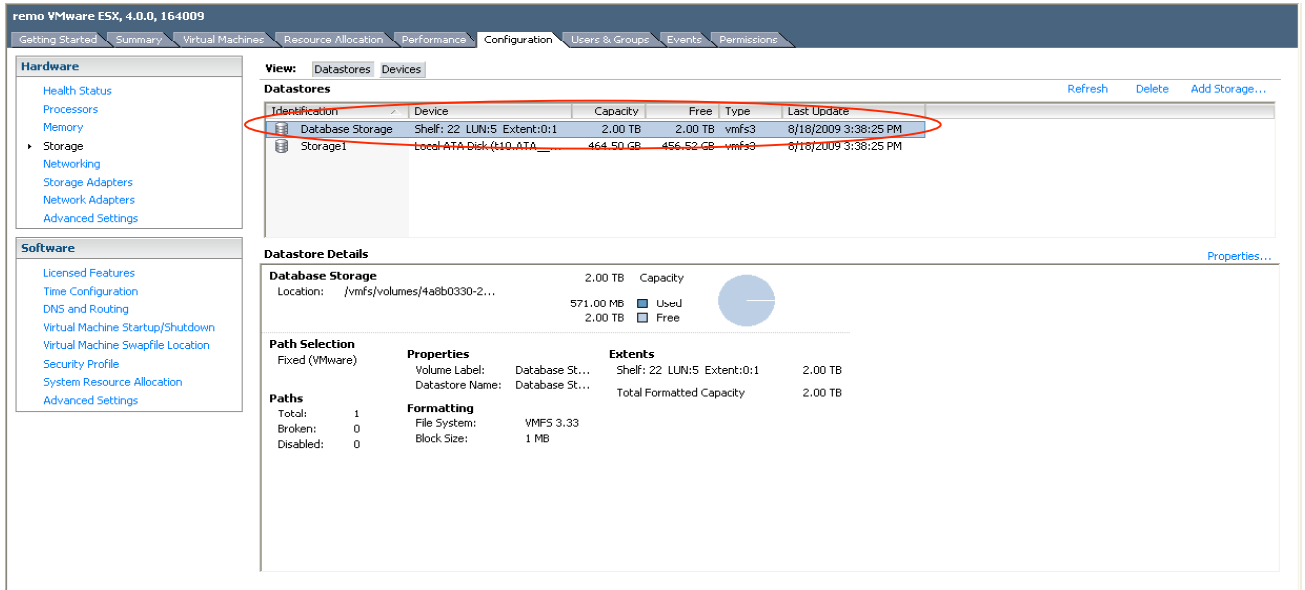
Use the fifth page of the 'Add Storage Wizard' to select the block size of the Datastore (Volume). Once the desired block size has been selected, click 'Next'.



Use the sixth page of the 'Add Storage Wizard' to verify that the configuration is correct. Once the configuration has been verified, click 'Finished'.

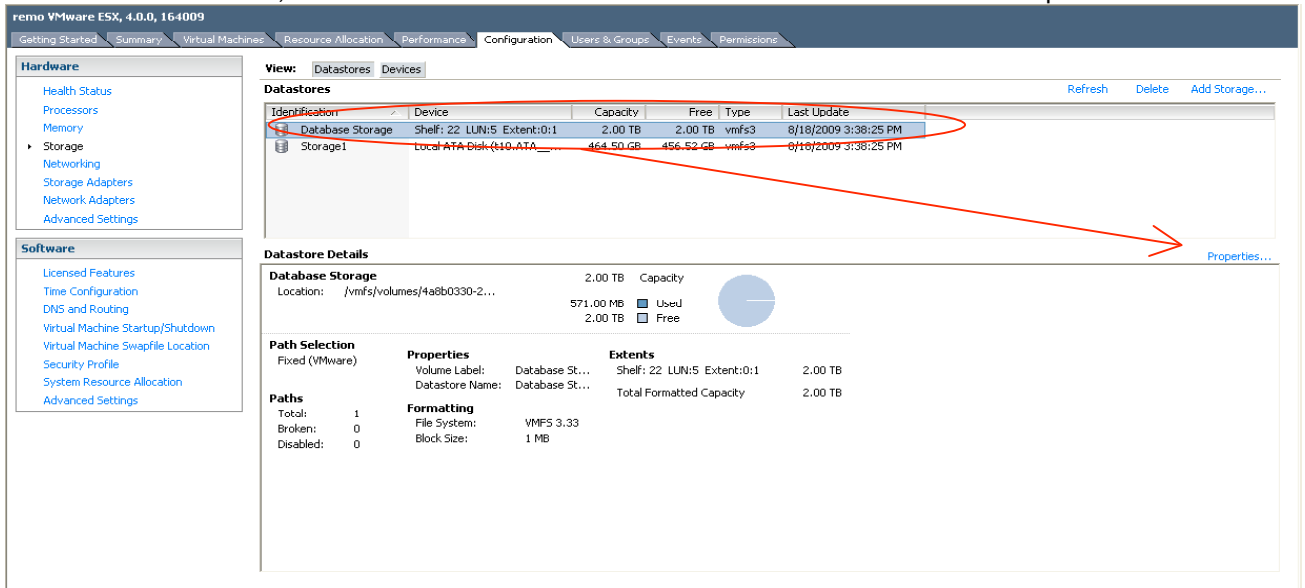


Once vSphere has completed adding the new Datastore (Volume), the new Datastore is listed under the available storage. At this point, the Datastore may be used by VMware just like any other Datastore would be.

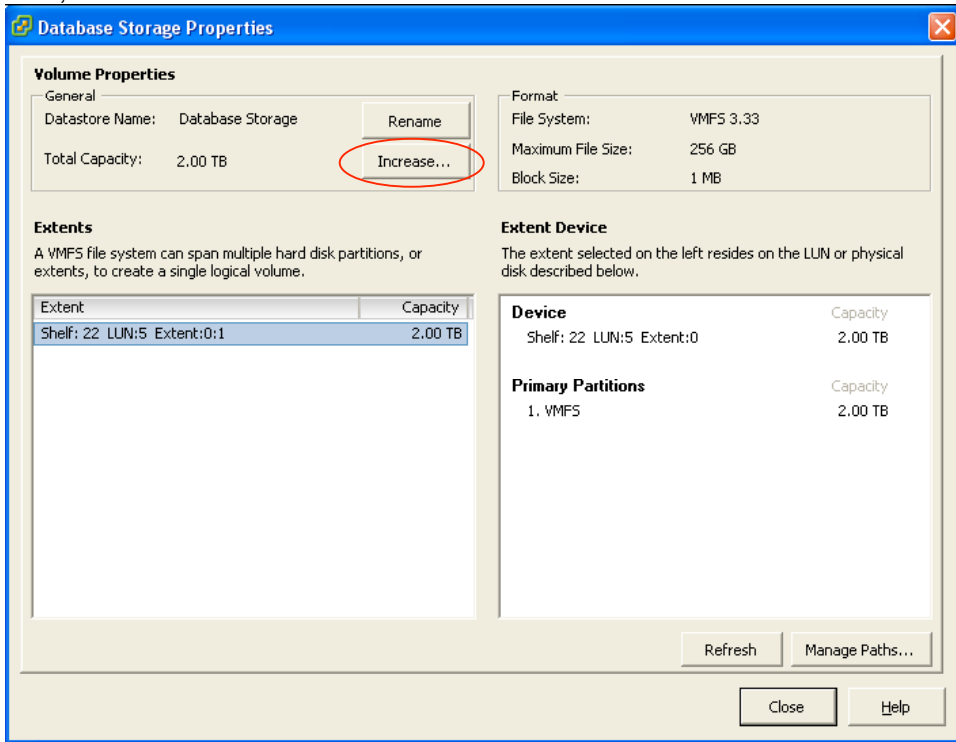


## 7.4 Extending a Volume on the EtherDrive SAN Storage

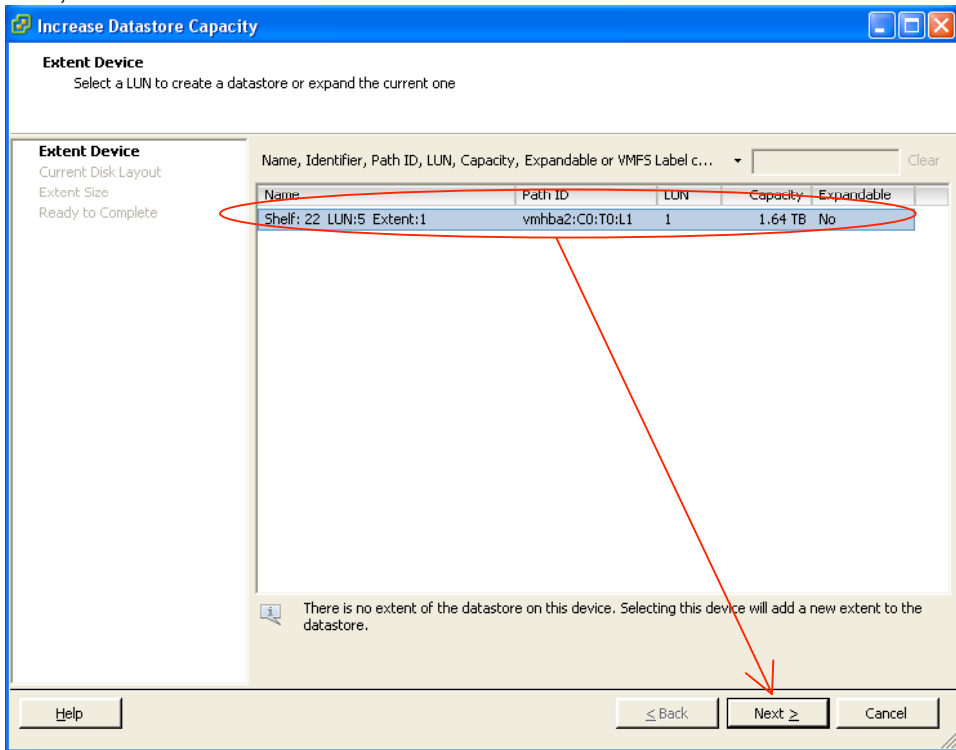
Once the EtherDrive LUN has been formatted, the LUN may be extended using the vSphere Client. To do this, select the EtherDrive Volume to be extended and then click 'Properties'.



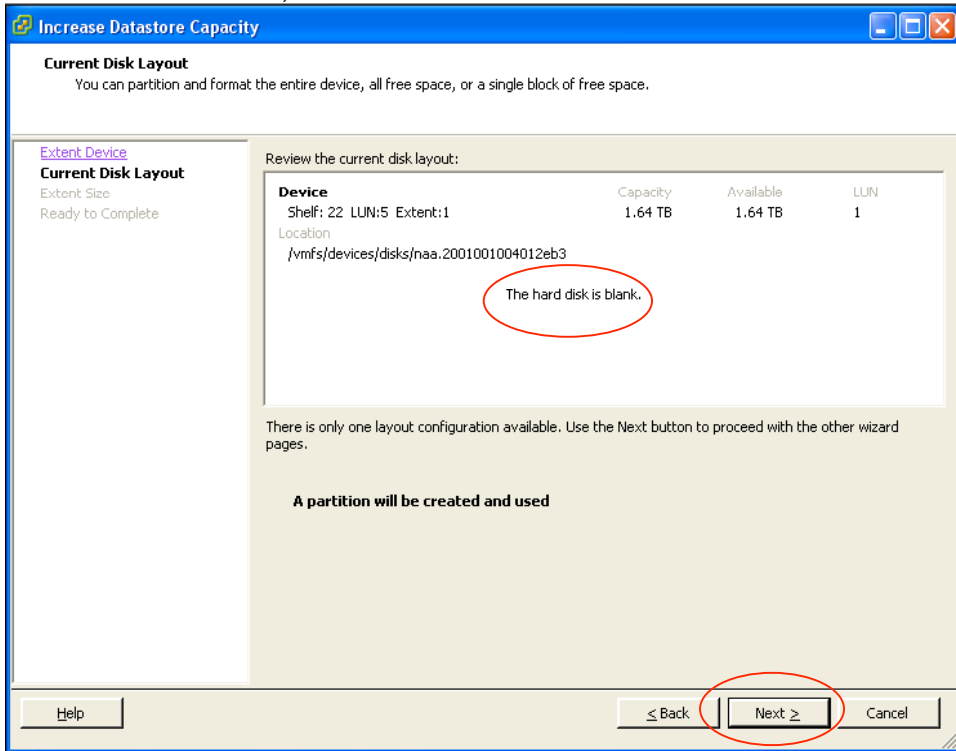
Next, click the 'Increase' button.



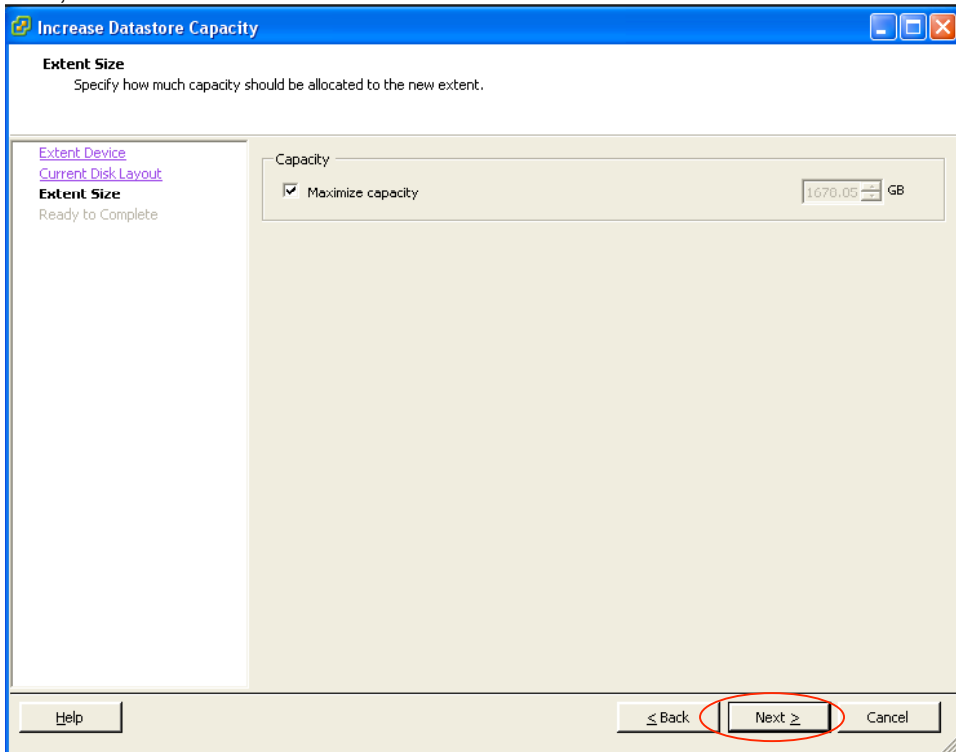
Next, select the extent that is to be added onto the current Volume and then click 'Next'.



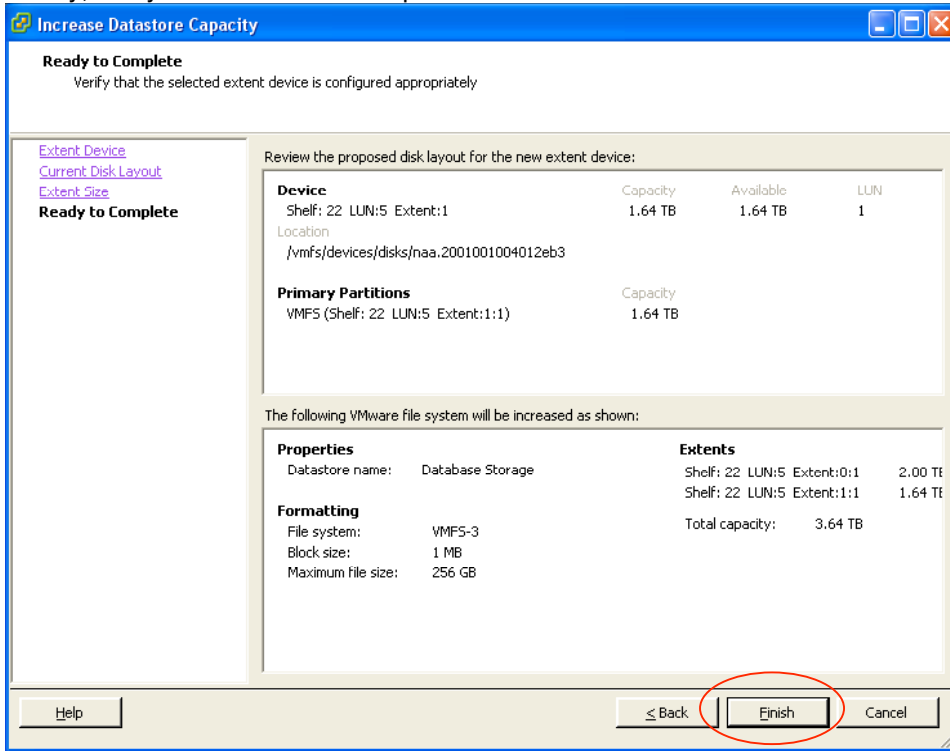
Next, verify that the information presented is correct. This page also displays the current disk layout of the selected LUN. In this example, the disks are blank. If the correct EtherDrive LUN has been selected, click 'Next'.



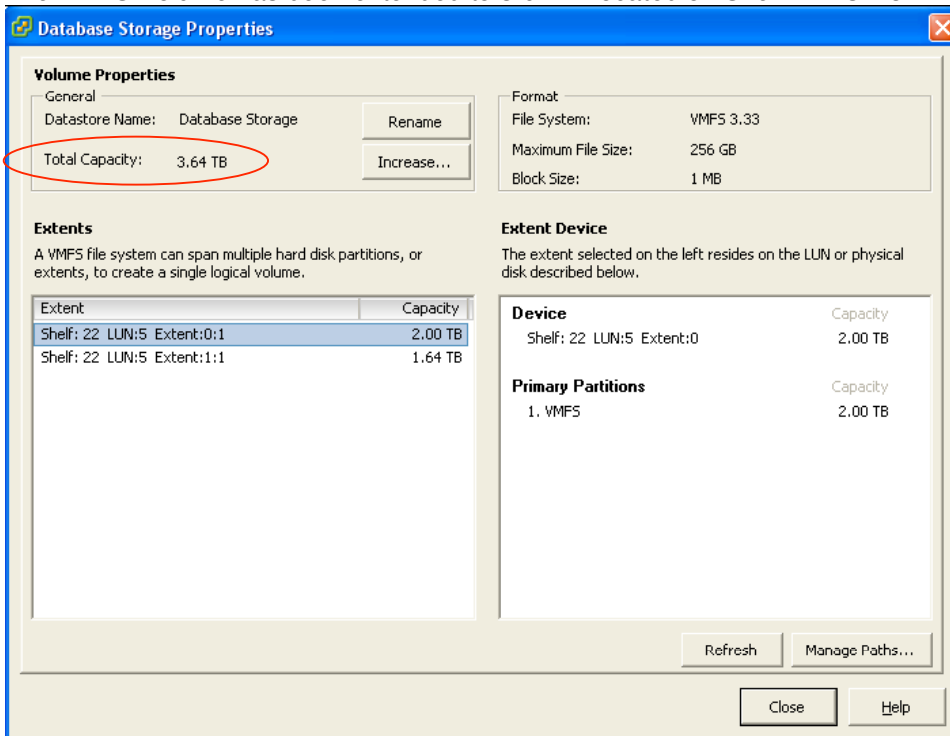
Next, select how much of the LUN to add on to the Volume and then click 'Next'.



Finally, verify that the information presented is correct and then click 'Finish'.

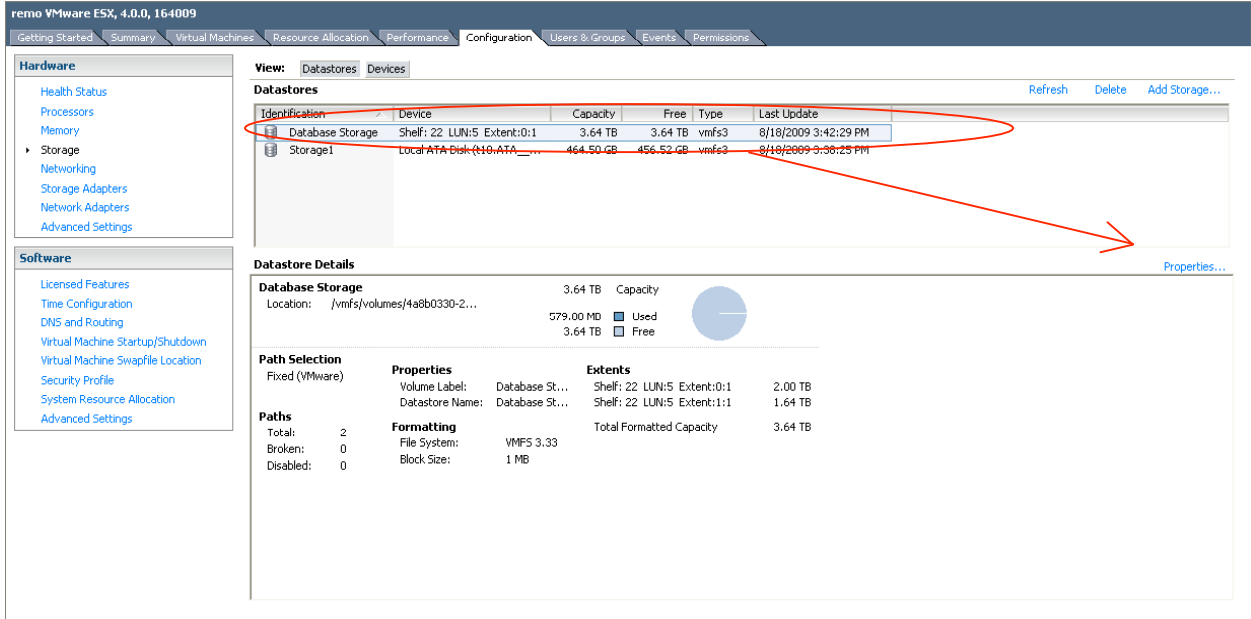


The VMFS Volume has been extended to 3.64TB located on Shelf 22 LUN 5.

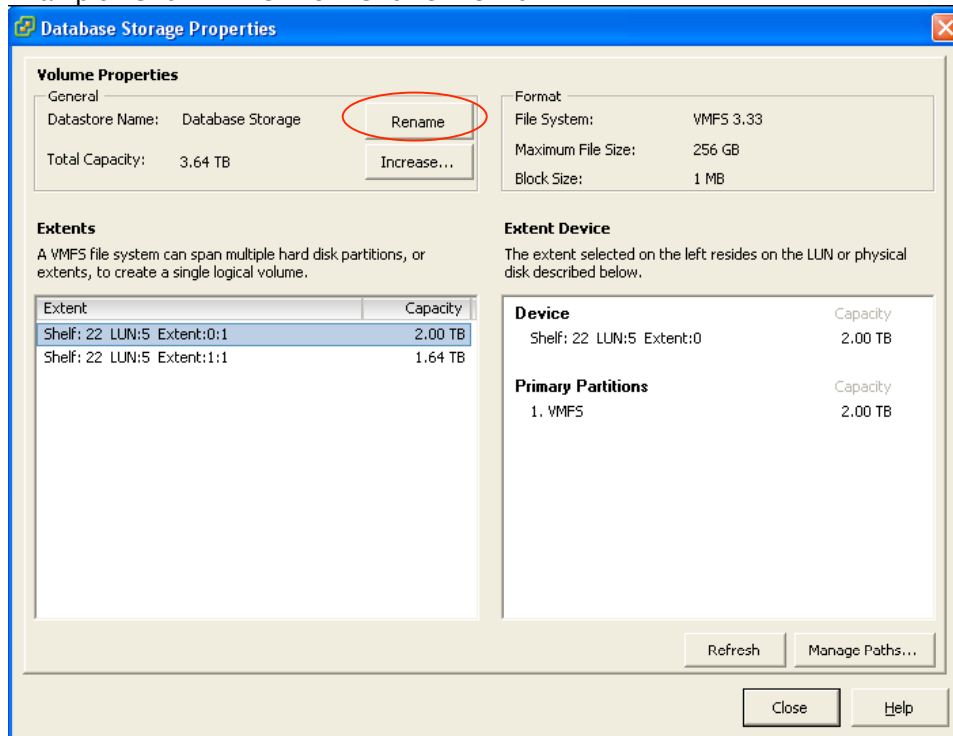


## 7.5 Renaming a Datastore

The name of the Datastore may be updated in order to represent LUN locations that have been extended onto a Datastore. To achieve this, select the Datastore to be updated and click 'Properties'.



Next, click the 'Rename' button and provide an appropriate name. Example: 'Shelf:22 LUN: 5 + Shelf:3 LUN:6'



## 8. Raw Device Mappings

With vSphere, Raw Device Mapping (RDM) is only available for non-local storage. Currently only iSCSI, Fibre Channel, and SAS storage types are considered non-local; thus, EtherDrive storage LUNs are seen as local storage by ESX. For this reason, the default behavior is such that the RDM storage type is not accessible when configuring a Virtual Machine or Virtual Disk. However, there is a workaround to enable RDM for local storage types, but it comes with the following caveats from VMWare:

RDM is a mechanism that VMware provides in order to support MSCS, as described in VMware's public manuals. Other uses of RDM are not tested by VMware. Using RDM to map any other volume that contains sensitive customer data (i.e., outside ESX Server's root file-system, and not MSCS, but still important to the customer) is strictly at the customer's own risk. If the customer loses data in a non-MSCS configuration (i.e., something that VMware has never tested), VMware will reject any service or support request.

The workaround makes it potentially possible to configure RDM on a volume that holds the ESX Server's root file-system. This is absolutely NOT supported or recommended by VMware. If a customer attempts this and accidentally destroys his system as a result and then files a Field Service request or Support Request with VMware, VMware will reject the request.

Given these constraints, if you still wish to enable RDM for EtherDrive storage, please contact CORAID Support for more information. For more information about RDM, please see VMware's document titled 'ESX Configuration Guide'.

## 9. Frequently Asked Questions

1. I have added a new LUN to my EtherDrive SAN storage appliance, how do I get it to show up in the vSphere Client?

You must perform a storage rescan from vSphere Client in order for newly available LUNs to be presented. This is accomplished by clicking 'Rescan' from the 'Storage Adapters' page under the 'Configuration' tab.

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

No. The EtherDrive HBA is a dedicated storage device which allows it to process storage commands at an exceptionally fast rate.

3. I understand that I need a CORAID EtherDrive HBA for my ESX server in order to utilize my EtherDrive SAN storage appliances. Do I also need an EtherDrive HBA for each of my EtherDrive SAN storage appliances?

No. An EtherDrive HBA is only required for each ESX server. The EtherDrive HBA can communicate with any EtherDrive SAN storage appliance running firmware version 20090303 or higher.

4. This manual does not define how to use other VMware features that I am used to using. Can I utilize all of the VMware features with the CORAID EtherDrive SAN solution?

Yes. Once the EtherDrive LUN is configured using the vSphere Client, the Datastore or Volume that is overlaid on the EtherDrive LUN may be used just like any other VMware

Volume. You should consult the appropriate VMware manual for VMware specific features.

5. What do I have to configure to use Multi-path?

Nothing! The EtherDrive HBA driver automatically handles Multi-path for all of the available EtherDrive HBA ports. So even if a single ESX server has two EtherDrive HBAs, the EtherDrive HBA driver will automatically Multi-path via the ports on both devices.

6. Why can vSphere see my EtherDrive storage but is not able to add a VMFS file system to it?

This is a good indication that the Ethernet switch used to connect the EtherDrive HBA to the EtherDrive storage does not support jumbo frames or that jumbos frames are not enabled on the switch. The HBA requires the use of jumbo frames with a MTU of 9000.

7. Why is the EtherDrive HBA's description listed as 'Unknown' on the Storage Adapters page in vSphere?

This is a known issue with the initial release of ESXi. Even though the EtherDrive HBA is described as 'Unknown', there are no functional issues with ESXi or the EtherDrive HBA as a result of this problem. This issue will be addressed by VMware in a future release of ESXi.

## Appendix

### A-1. Enable ssh for ESXi

Step 1. At the console of the ESXi server, press ALT-F1 to access the console window.

Step 2. Type 'unsupported' in the console and then press <Enter>. *Note: You will not see the text you type in.* If you typed in unsupported correctly, you will see the Tech Support Mode warning and a password prompt. Enter the password for the root login.

Step 3. You should then see the prompt of ~#. Edit the inetd.conf file with vi by typing:  
vi /etc/inetd.conf

Find the line that begins with #ssh and remove the #. Then save the file. If you're new to using vi, then move the cursor down to #ssh line and then press the Insert key. Move the cursor over one space and then hit backspace to delete the #. Then press ESC and type in :wq to save the file and exit vi. If you make a mistake, you can press the ESC key and then type in :q! to quit vi without saving the file.

Step 4. Reboot the ESXi server to enable ssh.

### A-2. Enable ssh for ESX

Step 1. At the console of the ESX server, press ALT-F1 to access the console window. Login using the root user.

Step 2. You should then see the prompt of ~]#. Edit the sshd.conf file with vi by typing:  
vi /etc/ssh/sshd\_config

Step 3. Find the line that begins with PermitRootLogin and change the 'no' to 'yes'. Then save the file. If you're new to using vi, then move the cursor down to PermitRootLogin line and then press the Insert key. Use the backspace key to delete the word 'no' and then type the word 'yes'. Then press ESC and type in :wq to save the file and exit vi. If you make a mistake, you can press the ESC key and then type in :q! to quit vi without saving the file.

Step 4. Restart sshd by typing:  
/etc/init.d/sshd restart