

CORAIID
EtherDrive® SAN Integration
for
VMware® Virtual Infrastructure™

ESX™ Server 3.5, ESX Server 3i 3.5
Virtual Center™ 2.5

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. EtherDrive HBA ESX Driver Installation.....	5
6. EtherDrive HBA ESXi Driver Installation.....	6
7. Using Virtual Infrastructure with an EtherDrive HBA.....	7
7.1 EtherDrive SAN Identifier.....	7
7.2 Recognizing the EtherDrive HBA as a Storage Adapter.....	7
7.3 Setting up a Volume on the EtherDrive SAN Storage.....	9
7.4 Extending a Volume on the EtherDrive SAN Storage.....	14
7.5 Renaming a Datastore	18
8. Frequently Asked Questions.....	19

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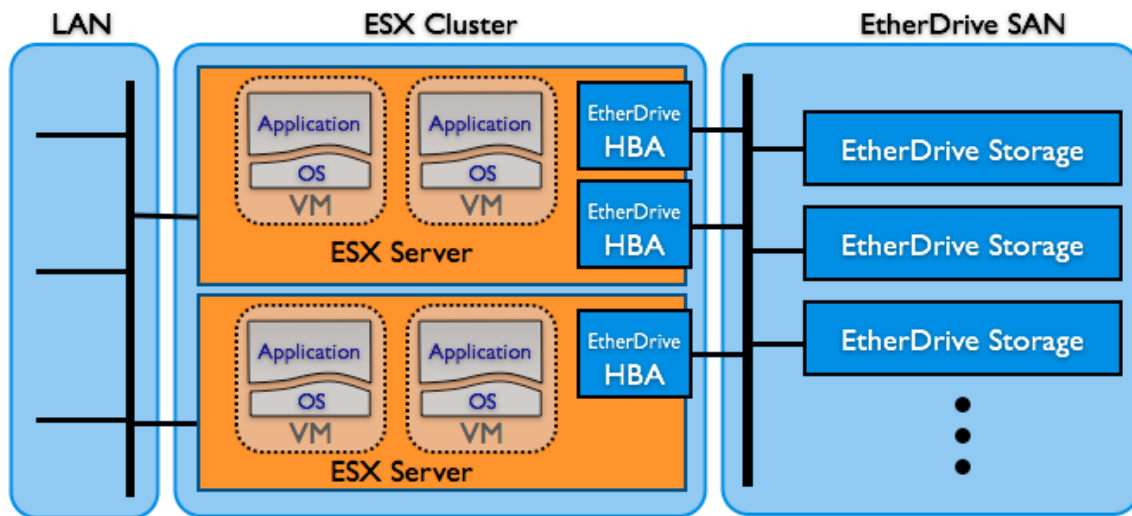
1. Introduction

The CORAID 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 an highly effective way to take full advantage of VMware Infrastructure features including VMotion and VMFS.

CORAID 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, each block containing 512 bytes of data. LUNs are also referred to as Volumes, 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.

HBA (Host Bus Adapter): An HBA is used to connect a host server to network storage. The following EtherDrive HBAs are available from CORAID:

- 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 CORAID 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 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 2 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, the EtherDrive LUNs appear as a locally attached SCSI disk. 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 subnet.
- 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 network 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 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 2
2. Install and verify disks:
SR shelf 2> show -l
3. Create a 14-disk LUN:
SR shelf 2> make 1 raid5 2.0-13
4. Allocate a system wide spare disk:
SR shelf 2> spare 2.14
5. Enable the LUN:

SR shelf 2> online 1

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 does not utilize a LUN greater than 2TB. 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 Virtual Infrastructure 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:

1. Power off the ESX server and then disconnect the power cable.
2. Remove the server's cover and identify an empty PCI slot.
3. Pull out the slot cover (if any) by removing the screw or releasing the lever.
4. Seat the EtherDrive HBA firmly into the PCI slot.
5. Refasten the EtherDrive HBA's retaining bracket using the existing screw or lever.
6. Close the ESX server cover, plug in the power cable(s), and turn on the ESX server.
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 per ESX server which 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. 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 following instructions assume driver release 1.0.1. Change the file name below as appropriate for other release versions.

1. Copy the install script to the ESXi server:

<http://www.coraid.com>

```
scp /path/to/VMware-esx-drivers-scsi-ethdrv-1.0.1-00000.i386.rpm  
root@esxi_ip_address:/tmp/
```

2. ssh to the ESXi server:
ssh root@esxi_ip_address
3. Install the EtherDrive HBA Driver
rpm -U VMware-esx-drivers-scsi-ethdrv-1.0.1-00000.i386.rpm
4. Reboot the ESX Server by typing reboot at the Console OS command prompt.

6. EtherDrive HBA ESXi Driver Installation

Installation of the AoE HBA driver into ESXi is accomplished using an interface ESXi supports for third party drivers. Third party drivers can be installed into a file, /bootbank/oem.tgz, which is unpacked each time ESXi boots. The software driver may be downloaded from: <http://support.coraid.com/support/esx> . Perform the following steps to install the driver onto the ESXi server:

NOTE: ssh must be enabled on the ESXI server (proceed to step 5 if ssh is already enabled on the ESXi server)

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

4. Reboot the ESXi server to enable ssh.

ASSUMPTION: The following instructions assume driver release 1.0.1. Change the file/directory names below as appropriate for other release versions.

5. Copy the install script to the ESXi server:
scp /path/to/esxi-ethdrv-1.0.1-00000.tgz root@esxi_ip_address:/tmp/
6. ssh to the ESXi server:
ssh root@esxi_ip_address
7. Change directory to /tmp and unpack the driver tarball:
cd /tmp
tar -zxvf esxi-ethdrv-1.0.1-00000.tgz
8. A directory named by the driver version is created during step 7. Change directory into this directory and run the driver install script:

```
cd esxi-ethdrv-1.0.1-00000
./coraid_hba_install
```

9. After update of oem.tgz is complete, reboot the ESXi server.

NOTE: The coraid_hba_install script unpacks the /bootbank/oem.tgz file, upgrades/installs the files necessary for the HBA driver and repacks it back into /bootbank/oem.tgz. As a precaution a copy of oem.tgz is stored in /bootbank/oem_bak.tgz prior to driver install.

7. Using Virtual Infrastructure with an EtherDrive HBA

This section provides detailed instructions on how to get the VMware Virtual Infrastructure (VI) client to recognize and use the EtherDrive HBA and associated EtherDrive LUNs. Once the VI client recognizes an EtherDrive HBA, the storage associated with the EtherDrive HBA is presented to Virtual Infrastructure in the same manner as standard SCSI storage; at which point all of the available features of Virtual Infrastructure may be utilized with the EtherDrive storage. This section is not intended to provide details on how to configure and install Virtual Machines or to perform any of the many features provided by Virtual Infrastructure.

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 was installed, 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 VI client has already been configured to manage the ESX server

7.1 EtherDrive SAN Identifier

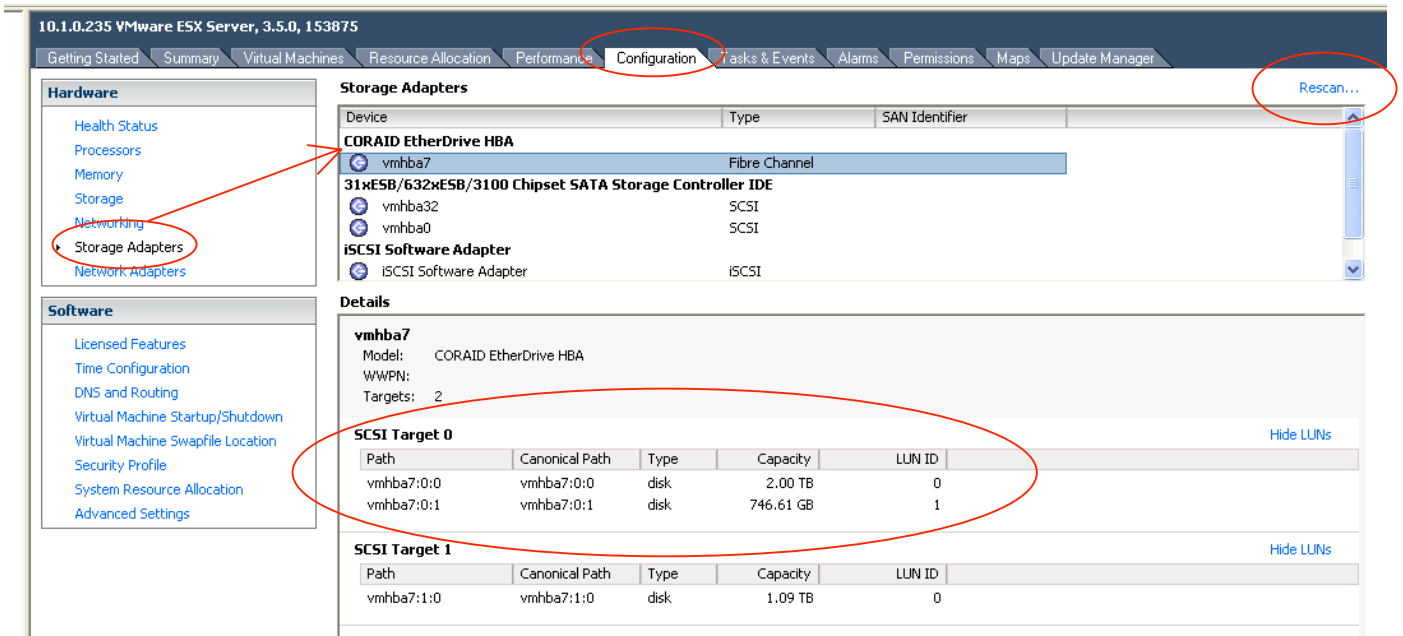
The EtherDrive HBA presents a SAN Identifier to Virtual Infrastructure for every available EtherDrive LUN. This identifier is useful when deciding which LUN to use during the process of adding storage. The identifier depicts the EtherDrive shelf and LUN number in the following manner:

SAN Identifier template: ex:xx:xx:yy:yy

e indicates that the LUN is an EtherDrive LUN
 x:xx:xx defines the shelf number of the EtherDrive LUN
 yy:yy defines the LUN number of the EtherDrive LUN

7.2 Recognizing the EtherDrive HBA as a Storage Adapter

The first step is to open the VI 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 VI 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 2.746TB LUN, shown as SCSI Target 0 here, is presented to Virtual Infrastructure as a 2TB LUN and 746.61B LUN.

7.3 Setting up a Volume on the EtherDrive SAN Storage

Once the EtherDrive HBA has been recognized by Virtual Infrastructure, 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'.

10.1.0.235 VMware ESX Server, 3.5.0, 153875

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Tasks & Events Alarms Permissions Maps Update Manager

Hardware

- Health Status
- Processors
- Memory
- Storage**
- Networking
- Storage Adapters
- Network Adapters

Software

- Licensed Features
- Time Configuration
- DNS and Routing
- Virtual Machine Startup/Shutdown
- Virtual Machine Swapfile Location
- Security Profile
- System Resource Allocation
- Advanced Settings

Storage Refresh Remove Add Storage...

Identification	Device	Capacity	Free	Type
remo:storage1	vmhba0:0:0:3	1.18 TB	457.26 GB	vmfs3

Details Properties...

remo:storage1 1.18 TB Capacity

Location: /vmfs/volumes/481f8c93-83... 747.24 GB Used 457.26 GB Free

Path Selection

Fixed	Properties	Extents
	Volume Label: remo:storag...	vmhba0:0:0:3 458.20 ...
	Datstore Name: remo:storag...	Total Formatted Capacity 1.18 TB

Paths

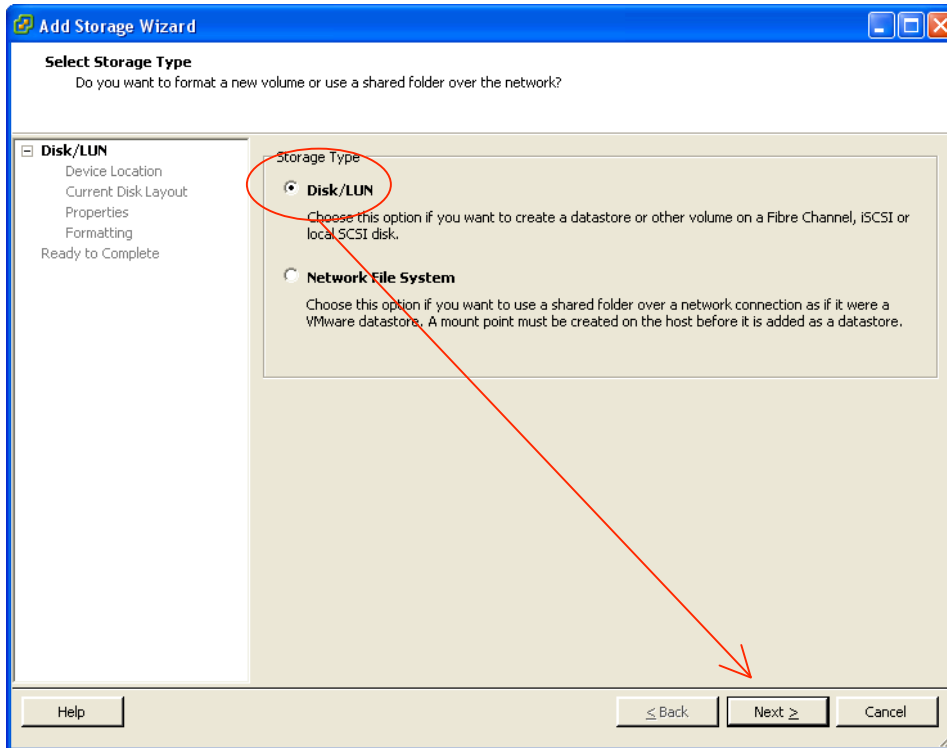
Total:	1
Broken:	0
Disabled:	0

Formatting

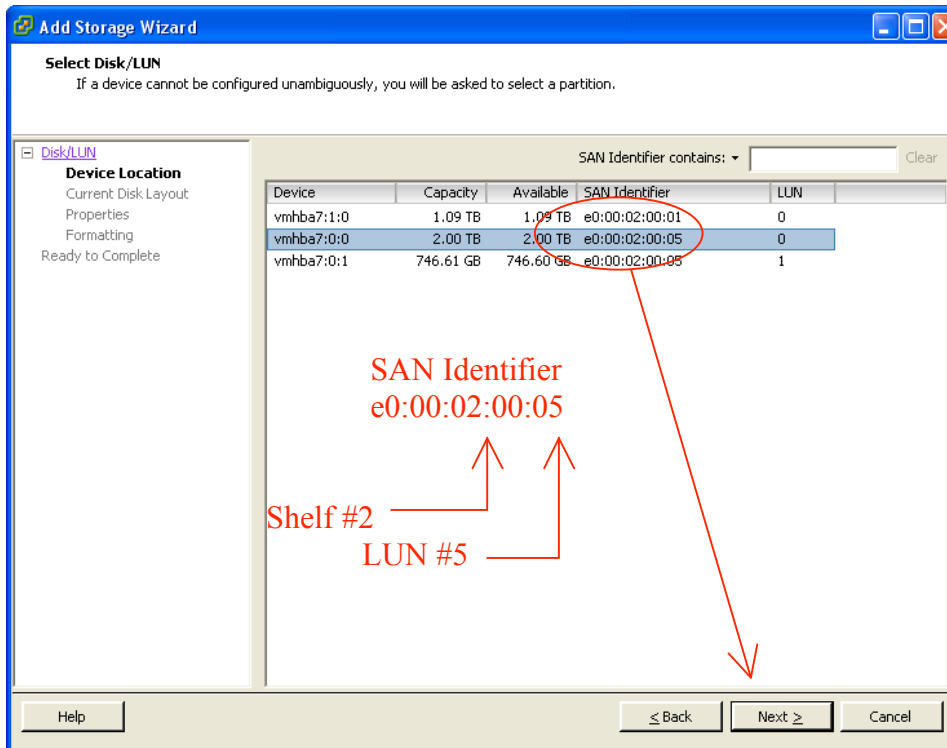
File System:	VMFS 3.31
Block Size:	1 MB

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'.



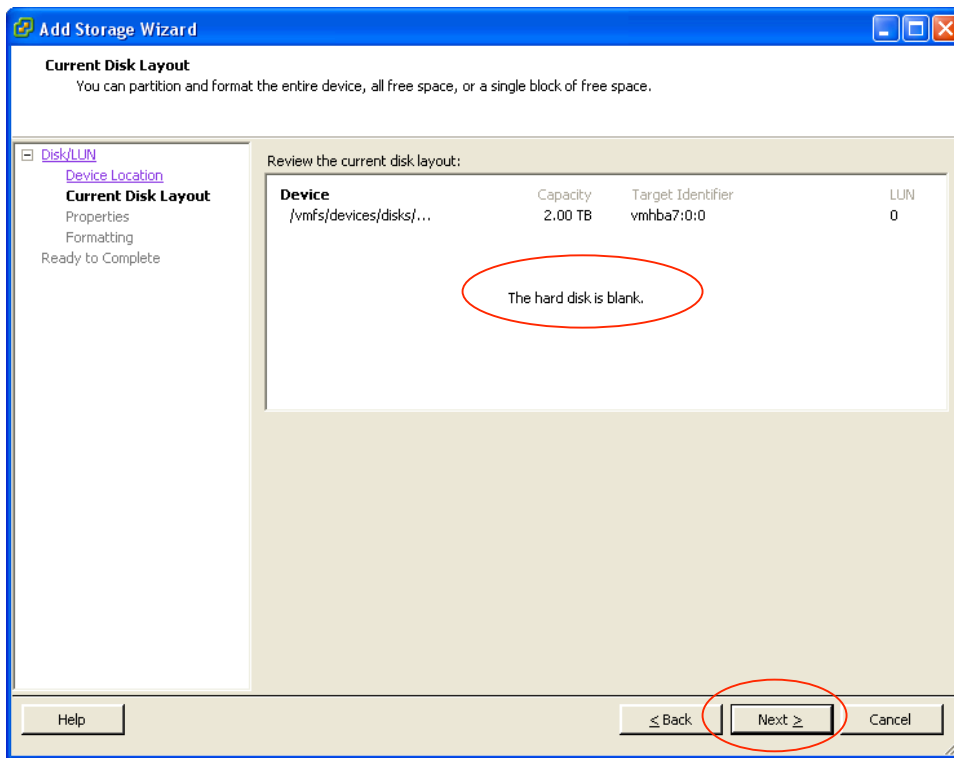
From the second page of the 'Add Storage Wizard', select the desired EtherDrive LUN (use the 'SAN Identifier' to assist in this selection). Once the desired EtherDrive LUN has been selected, click 'Next'.



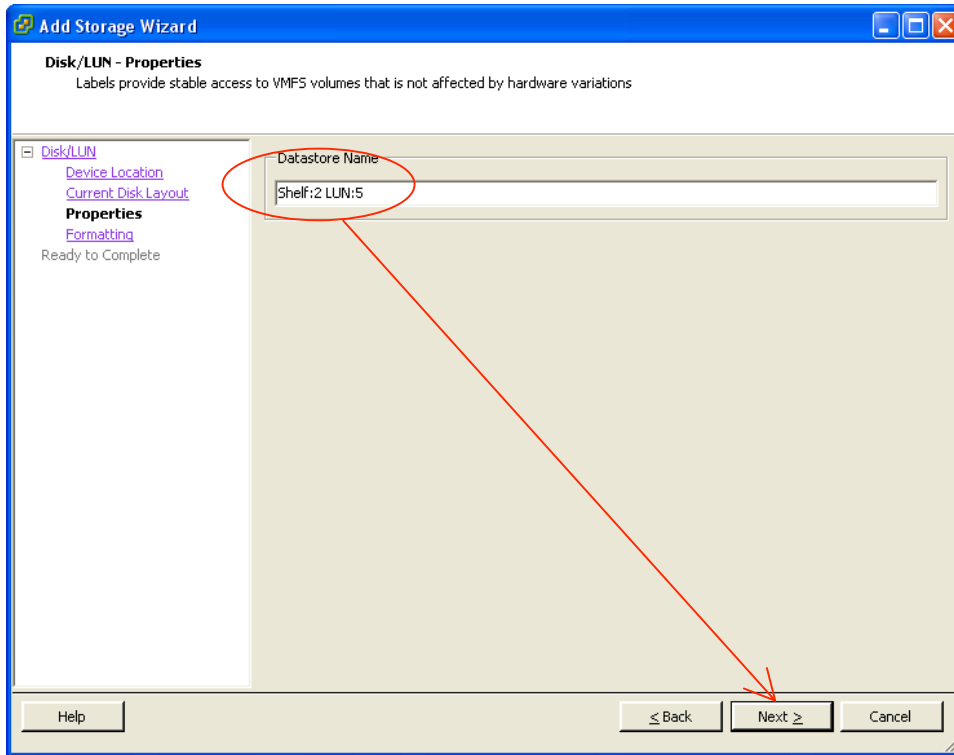
NOTE: In this example, the SAN Identifier e0:00:02:00:05 identifies that the selected LUN resides on the EtherDrive storage appliance with the shelf number 2. Furthermore, it identifies that the LUN is number 5. This LUN was configured on the EtherDrive SAN storage appliance to be 2.746TB. The EtherDrive HBA automatically segmented the LUN at the 2TB boundary and presents the 2.746TB LUN as one 2TB LUN and one 746.61GB LUN.

NOTE: It is important to make note of the Shelf and LUN number from the San Identifier. This will allow for proper naming of the Datatstore in a later step.

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'.

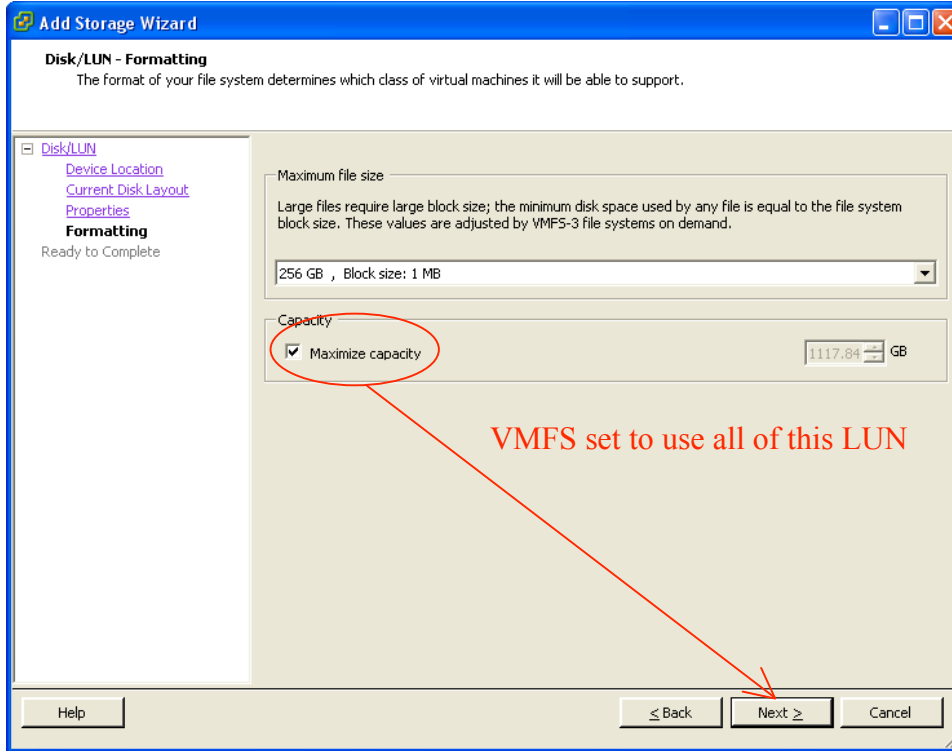


Use the fourth page of the 'Add Storage Wizard' to name the Datastore (Volume). Once the EtherDrive LUN has been named, click 'Next'.

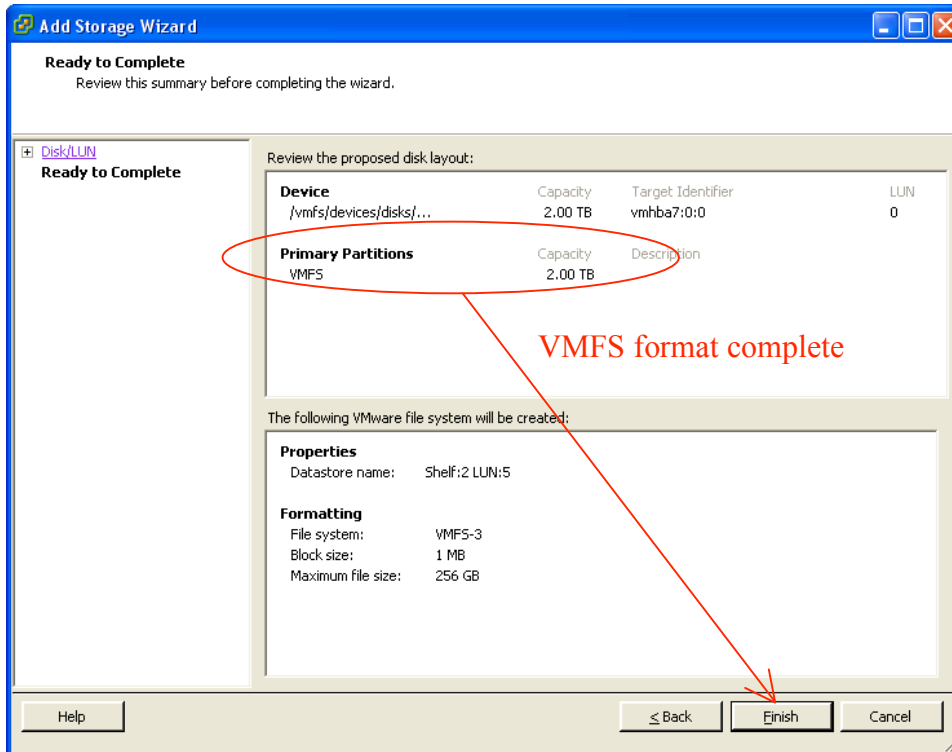


NOTE: It is very important to name the Datastore with the EtherDrive Shelf and LUN number supplied in the SAN Identifier from two steps earlier. The Datastore name may consist of additional characters, but the Shelf and LUN number should be a part of the name. Example: 'Accounting Dept DB: Shelf:2 LUN:5' may be used instead.

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 Virtual Infrastructure 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.

The screenshot shows the VMware vSphere configuration interface for a storage device. The 'Storage' tab is active, displaying a table of storage devices. A red circle highlights the entry 'Shelf:2 LUN:5' with device 'vmhba7:0:0:1', a capacity of 2.00 TB, and 2.00 TB of free space. Below the table, the 'Details' section for 'Shelf:2 LUN:5' is visible, showing its location, capacity, and formatting details (VMFS 3.31, 1 MB block size).

Identification	Device	Capacity	Free	Type
remo:storage1	vmhba0:0:0:3	1.18 TB	457.26 GB	vmfs3
Shelf:2 LUN:5	vmhba7:0:0:1	2.00 TB	2.00 TB	vmfs3

Details for Shelf:2 LUN:5

Location: /vmfs/volumes/4a202d48-3...
 Capacity: 2.00 TB
 Used: 571.00 MB
 Free: 2.00 TB

Path Selection
 Fixed

Properties
 Volume Label: Shelf:2 LUN...
 Datastore Name: Shelf:2 LUN...

Extents
 vmhba7:0:0:1 2.00 TB
 Total Formatted Capacity 2.00 TB

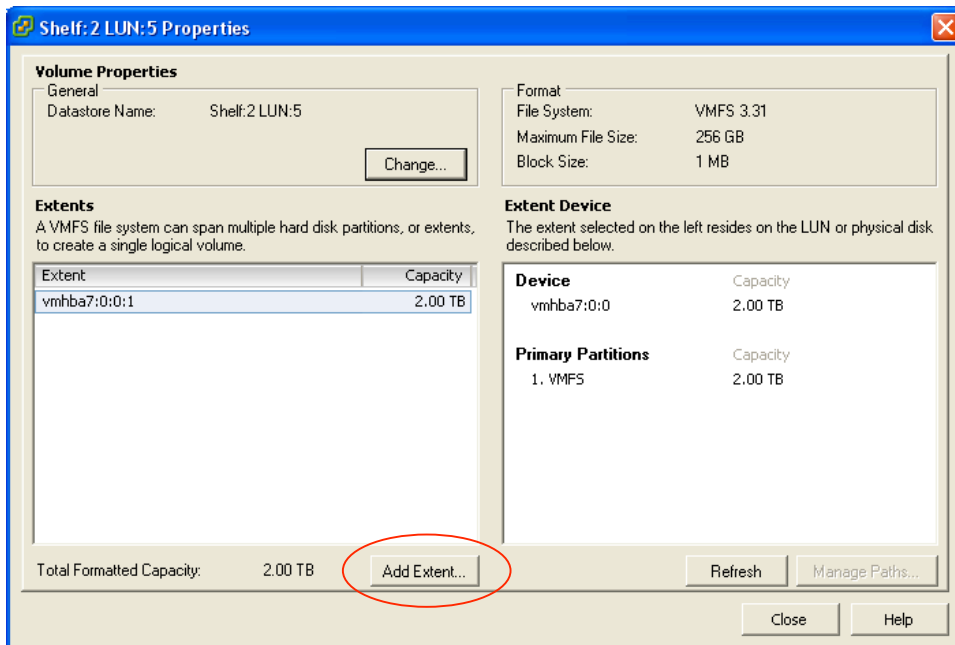
Formatting
 File System: VMFS 3.31
 Block Size: 1 MB

7.4 Extending a Volume on the EtherDrive SAN Storage

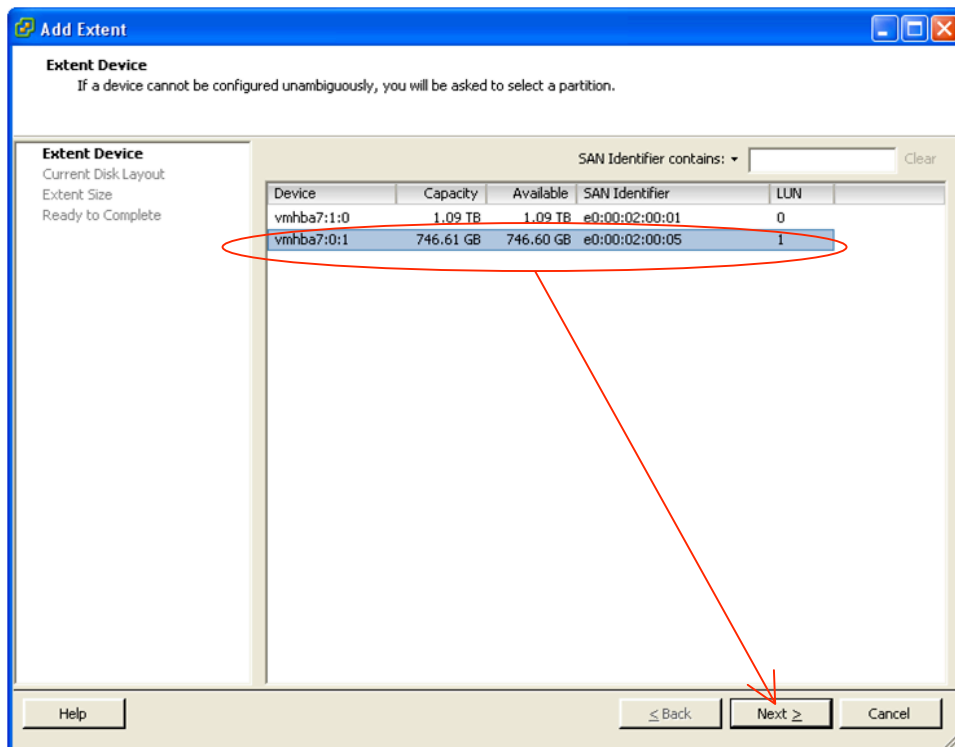
Once the EtherDrive LUN has been formatted, the LUN may be extended using Virtual Infrastructure. To do this, select the EtherDrive Volume to be extended and then click 'Properties'.

This screenshot is identical to the one above, showing the 'Storage' configuration page. A red circle highlights the 'Shelf:2 LUN:5' entry in the storage table. A red arrow points from this entry to the 'Properties...' link located at the bottom right of the 'Details' section for that specific datastore.

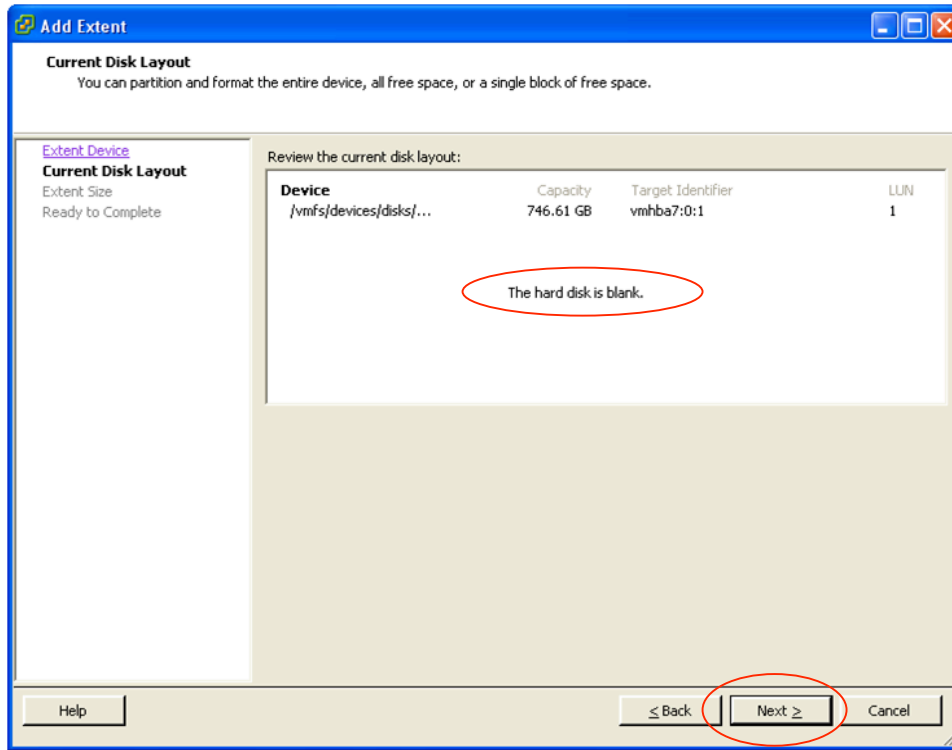
Next, click the 'Add Extent' button.



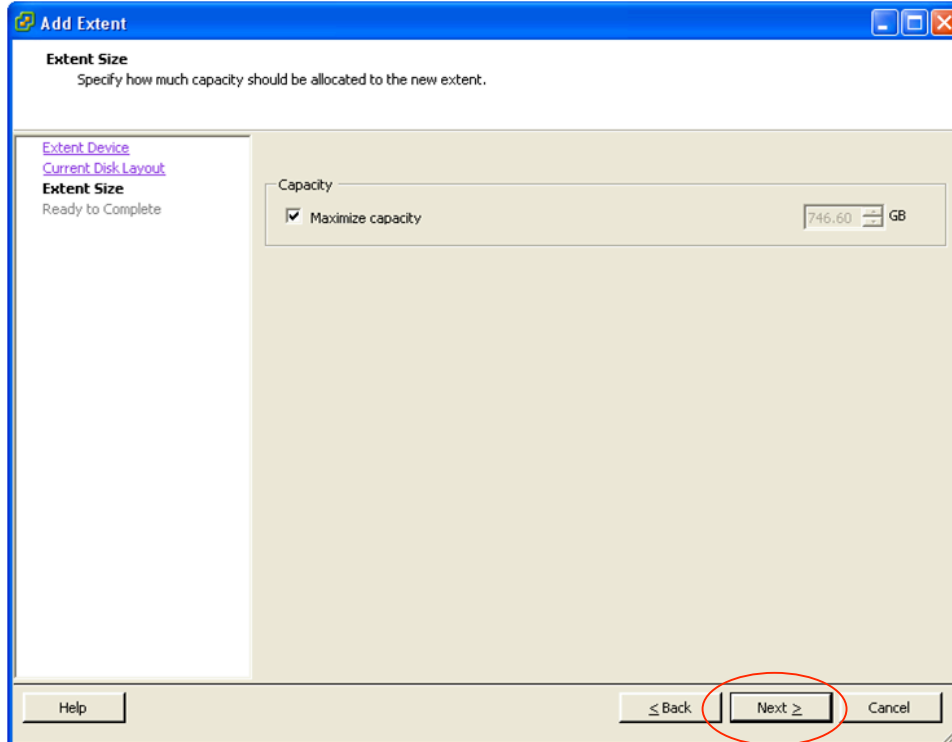
Next, select the extent that is to be added onto the current Volume and then click 'Next'.



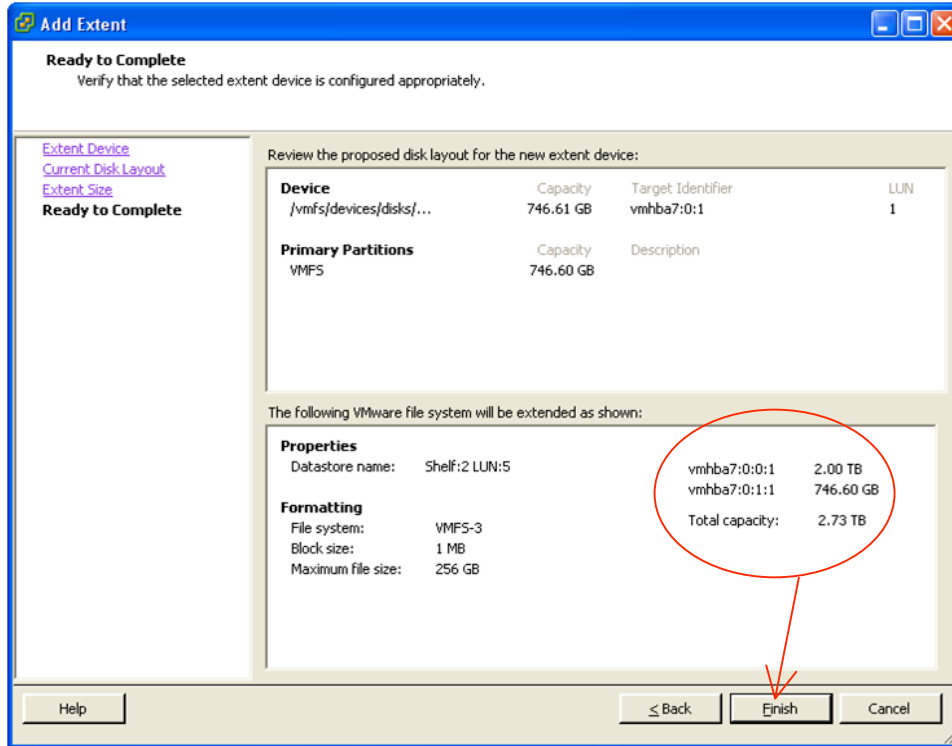
Next, verify that the information presented is correct and then click 'Next'. This page also displays the current disk layout of the selected LUN. In this example, the disks are blank. If the correct EtherDrive LUN has been selected, click 'Next'.



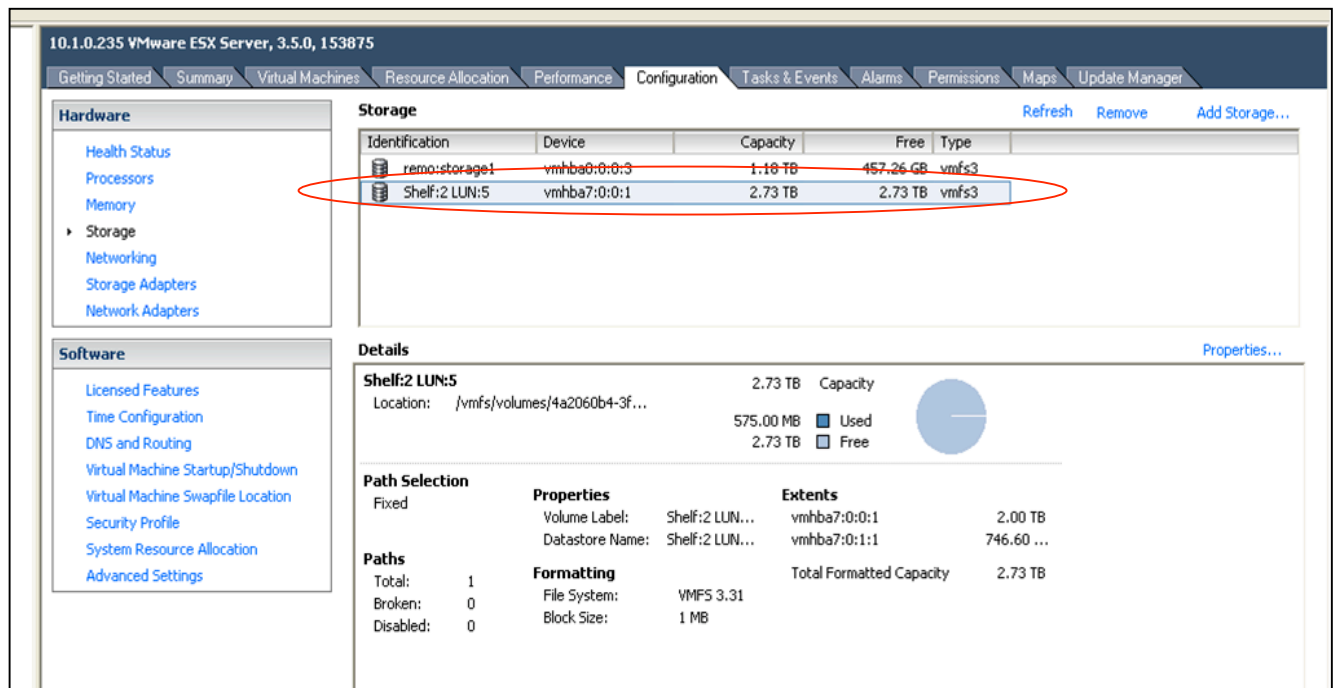
Next, select how much of the LUN to add on to the Volume and then click 'Next'.



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

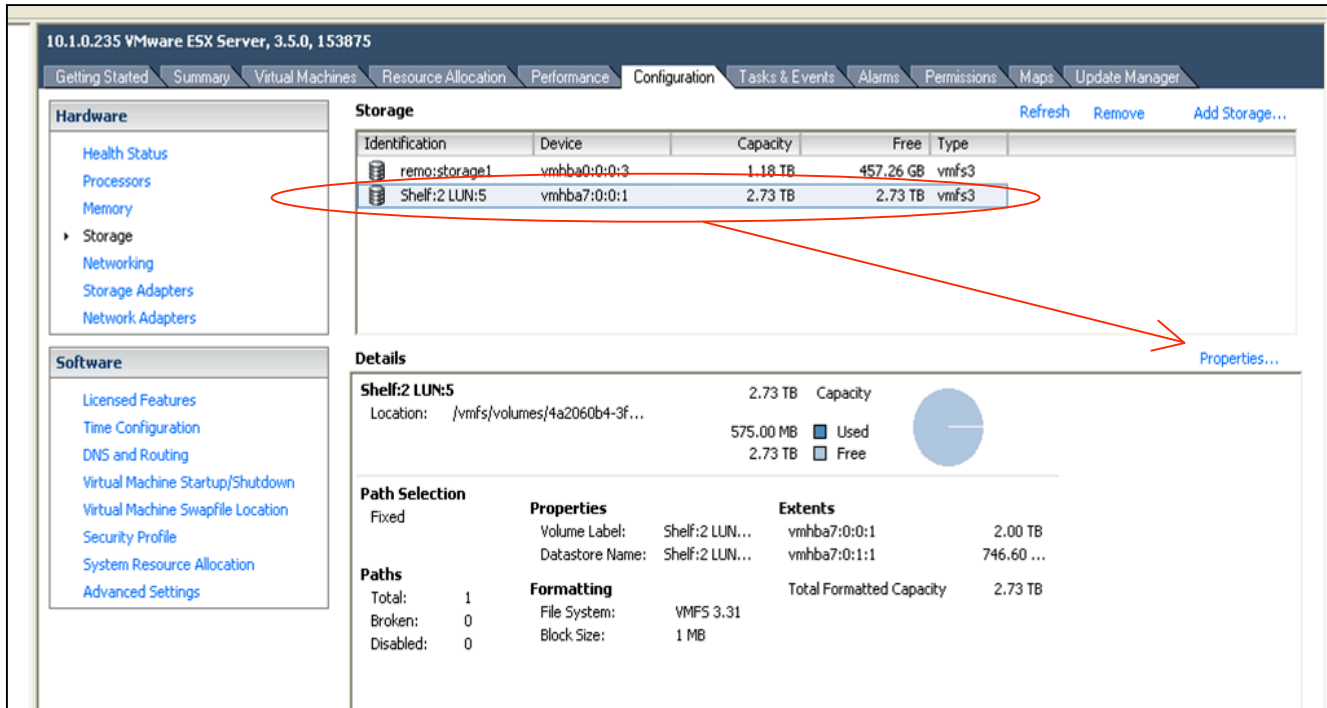


The VMFS Volume has been extended to 2.73TB located on Shelf 2 LUN 5.

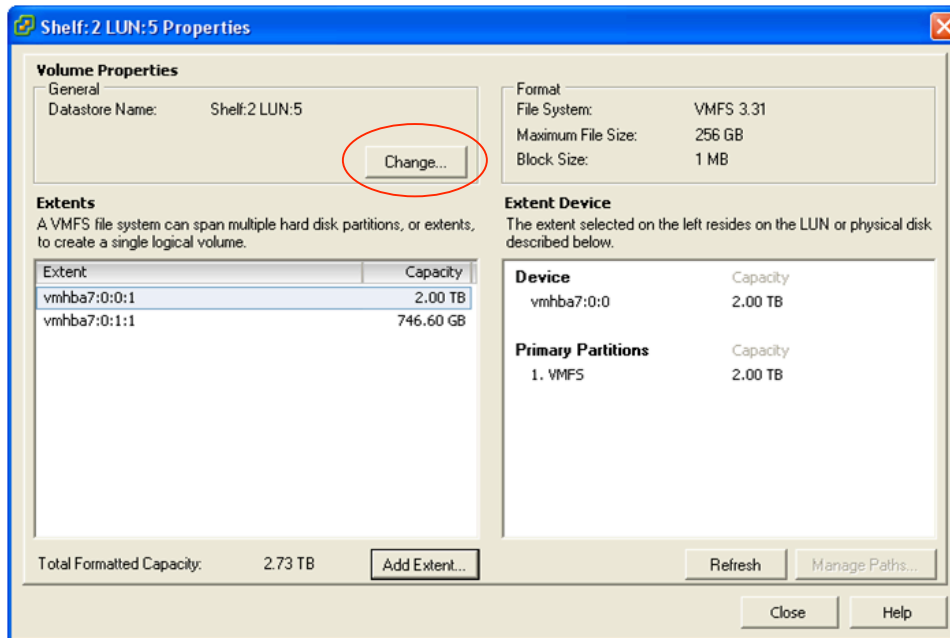


7.5 Renaming a Datastore

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



Next, click the 'Change' button and provide an appropriate name. Example: 'Shelf:2 LUN: 5 + Shelf:3 LUN:6'



8. 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 Virtual Infrastructure?
You must perform a storage rescan from Virtual Infrastructure 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 CORAIID EtherDrive HBA looks like a standard Network Interface Card (NIC). Can I use the CORAIID 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 CORAIID 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 CORAIID EtherDrive SAN solution?
Yes. Once the EtherDrive LUN is configured using Virtual Infrastructure, 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. I keep reading that the CORAIID EtherDrive HBA presents the EtherDrive storage as a SCSI device. Why does the CORAIID EtherDrive HBA show up as a Fibre Channel device?
Virtual Infrastructure presents the EtherDrive HBA as a Fibre Channel device due to the fact that the EtherDrive HBA fills out the WWN Fibre Channel identifier with the shelf and LUN information from the EtherDrive SAN storage appliance.
6. 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.