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Step-by-Step Guide

Open-E JovianDSS Fibre Channel High-Availability Cluster

The aim of this document is to demonstrate how to set up a High-Availability Cluster with Fibre Channel.

Open-E JovianDSS includes failover functionality for SMB, NFS and iSCSI, FC enabling you to set up High Availability Load-Balanced Storage Clusters.

By using the Open-E JovianDSS High Availability Cluster Feature Pack you can ensure reliability and redundancy through failover in case of a server crash.

The HA cluster management software enables you to quickly access all features related to your cluster setup.

Whether for initial configuration or re-configuration after a failover – everything is in one place and guarantees ease of use for the storage administrator.

Data can be simultaneously accessed via SMB, NFS or iSCSI and via one more Virtual IP addresses. Standalone VIP feature creates a connection to the data which is independent of the physical network path.

Fibre Channel HA Cluster uses Asymmetric Logical Unit Access (ALUA) to configure the paired targets. LUNs are visible on both configured targets by the initiator that has access to those LUNs by paths. Depending on the path status, the initiator knows which path should be used to access LUNs. The initiator accesses LUNs by using an active path, while standby path is used for a target that does not have access to LUNs. An active path is set for a target when the pool is present on the same node where the target is. A standby path is used for a target when a pool is present on the other node.

High availability is achieved by detecting hardware failures and automatically moving the VIP and for Fibre Channel the active path from the primary to the secondary node without the client servers noticing a timeout.

Software version up26 supports Single node Fibre Channel Target with all Fibre Channel clients.

Fibre Channel HA Cluster was tested and supported with RH Linux cluster and with VMware cluster only !

FC Cluster for VMware
(ALUA failover with VMware ESXi 6.5. or newer)

It is required to register SCST devices with VMW_SATP_DEFAULT_AP plugin in ESX root console.

Login to ESX console and add new rules for SCST file I/O and block I/O devices:

esxcli storage nmp satp rule add -s VMW_SATP_DEFAULT_AP -V "SCST_FIO" -M "Storage" -c tpgs_on -P VMW_PSP_MRU -e "SCST_FIO Storage Device" -o disable_action_OnRetryErrors

esxcli storage nmp satp rule add -s VMW_SATP_DEFAULT_AP -V "SCST_BIO" -M "Storage" -c tpgs_on -P VMW_PSP_MRU -e "SCST_BIO Storage Device" -o disable_action_OnRetryErrors

execute:
esxcli storage core claimrule load

check if new rule is listed in:
esxcli storage nmp satp rule list

reboot the VMware server

check if correct plugin is used for SCST devices:
esxcli storage nmp satp rule list | grep SCST
The Storage Array Type should be set to VMW_SATP_DEFAULT_AP

FC Cluster for RH Linux
(ALUA failover with RH Linux)

--- multipath install on RH: yum -install multipath-tools

/etc/multipath.conf

```
defaults {
    Uid_attribute      "ID_SERIAL"
    Getuid_callout     "/lib/udev/scsi_id --whitelisted --export --page=0x80 --device=/dev/%n"
}

blacklist_exceptions {
    Property        "ID_SERIAL"
}

devices {
device {
        Vendor              "SCST_[BF]IO"
        Product             "Storage"
        hardware_handler             "1 alua"
        path_selector         "service-time 0"
        path_grouping_policy    "failover"
        Failback             "manual"
        prio            "alua"
        prio_args           ""
        Path_checker          "tur"
        Rr_weight          "priorities"
        Fast_io_fail_tmo           300
        No_path_retry        500
}
}
```

--- restart multipath: multipath -r
--- check multipath: multipath -l -v2

-- list WWN: cat /sys/class/fc_host/host*/port_name
        this command list WWN in hex format : 0x2100000e1e28c7c0 (this is just example WWN)
        but the GUI accept following format :   21:00:00:0e:1e:28:c7:c0
   so this need to be typed manually (no copy & paste)

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To set up a High-Availability Cluster, perform the following steps:

1. Hardware configuration
2. ESX Storage adapter
3. Storage settings
4. Cluster Binding
5. Ping Nodes
6. Start cluster
7. Pool
8. Add Initiator
9. Add group wizard

10. Add remote target
11. Rescan adapters
12. Check adapters after rescan
13. Edit multipath
14. Path check
15. Move cluster
16. Cluster check after test move

1. Hardware configuration
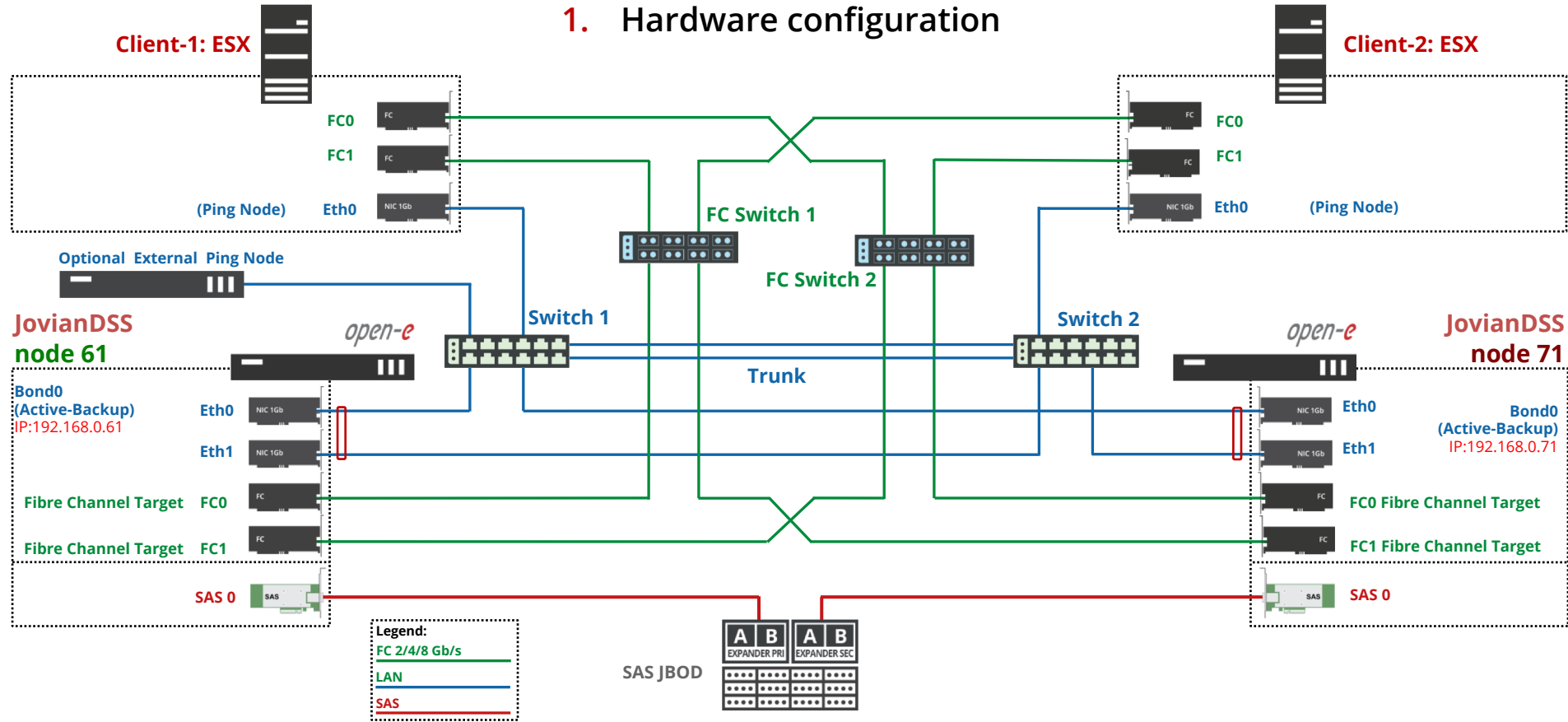
2. ESX Storage adapter

ESX host
IP Address: 192.168.0.51

In **Storage Adapters**, check the settings of both Fibre Channel adapters.

3. Storage settings

JovianDSS: **node 61**
IP Address: 192.168.0.61

Go to menu **Storage Settings**. In the
Options drop-down menu select
Properties.

3. Storage settings

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In the **Properties** menu, enter the **Alias** name and click the **Apply** button.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Storage Settings

Access protocols

Fibre Channel ports

WWN

21:00:00:0e:1e:2c:dd:40

21:00:00:0e:1e:2c:dd:41

Options

Options

Options

Properties

Properties

Target WWN: 21:00:00:0e:1e:2c:dd:40

Alias: dd-40

Port mode: ● Target
                               ○ Initiator

✖ Cancel   ✔ Apply

3. Storage settings

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JovianDSS: **node 61**
IP Address: 192.168.0.61

Storage Settings

	Storage
	User Management
	Failover Settings
	Storage Settings
	Backup & Recovery
	System Settings
	Diagnostics

| Access protocols | Discovery CHAP user access | Fibre Channel |

Fibre Channel ports

WWN	Alias	Mode	Type	Status	Options
21:00:00:0e:1e:2c:dd:40	dd-40	Target	Physical	OK	Options ˅
21:00:00:0e:1e:2c:dd:41	dd-41	Target	Physical	OK	Options ˅

For another **WWN**, go to the **Options** drop-down menu for this WWN, select **Properties** and enter the **Alias** name accordingly. In this example second alias is **dd-41.**

3. Storage settings

JovianDSS: **node 71**
IP Address: 192.168.0.71

Targets on the second node are also active.

Storage Settings

| Storage |
| User Management |
| Failover Settings |
| Storage Settings |
| Backup & Recovery |
| System Settings |
| Diagnostics |

Storage Settings

| Access protocols | Discovery CHAP user access | Fibre Channel |

∧ Fibre Channel ports

WWN	Alias	Mode	Type	Status	Options
21:00:00:0e:1e:28:c4:e0	c4-e0	Target	Physical	OK	Options ∨
21:00:00:0e:1e:28:c4:e1	c4-e1	Target	Physical	OK	Options ∨

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4. Cluster Binding

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JovianDSS: node 61
IP Address: 192.168.0.61

In the main menu select the **Failover settings** and enter IP address of the Bond interface of the second node and enter the current administrator password (default: admin) and click on the **Connect** button.

The Bond interface will function as a ring path (heartbeat) and as the persistent reservation synchronization path.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Failover Settings

Failover status

⚠ **Nodes are not bound**
In order to configure and run Failover service both nodes must be connected.
Note:
• Network interfaces used to bind the nodes must be Active-Backup bonding interfaces.
• Physical and Virtual IP addresses on each node must have a unique subnetwork class.

Node binding

Remote node IP: 192.168.0.71

Password: •••••

✓ Connect

5. Ping nodes

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Failover settings** click the **Edit** button in the **Ping nodes** section and enter at least two ping nodes.

Ping node IP addresses must be reachable from Ring interfaces, so the ping node must use the same network subnet as the ring interfaces.

Ping nodes

Search   + Add ping node

	IP	Local status	Remote status	Options
1	192.168.0.51	Reachable	Reachable	✕ Delete
2	192.168.0.52	Reachable	Reachable	✕ Delete

✕ Close

Storage
User Management
Failover Settings
Storage Settings
Backup & Recovery
System Settings
Diagnostics

Failov...

Failov...

Nod...
node
node

Dis

Failove...

Zpo...

Inf...

Rings   1 configured

Details

6. Start cluster

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JovianDSS: **node 61**
IP Address: 192.168.0.61

Now, all required settings are completed.

Click **the Start Failover** button in order to start the HA-cluster service.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Failover Settings

Failover status

ⓘ **Windows Failover Clustering**
To ensure proper functioning of Windows Failover Clustering feature (including Hyper-V in cluster environment) it is required to enable SCSI-3 Persistant Reservation Synchronization.

Failover status   **Ready to start**

✔ Start Failover

Failover nodes

Node	Connection status	Failover status
node-61 (IP: 192.168.0.61, node ID: cfce4829)	Reachable	N/A
node-71 (IP: 192.168.0.71, node ID: 22566a06)	Reachable	N/A

Disconnect nodes

Failover resources

Zpool name	Active on node	Status
Information about failover resources is not available until failover is started.		

Rings   **1 configured**

Details

Ping nodes   **2 of 2 reachable**

Edit

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7. Pool

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In the main menu, select **Storage**. In order to access the pool setup menu click the down arrow button in the middle bottom of the pool status section.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Storage   ↻ Rescan   + Add zpool

● Pool-0   ☑ Options ⌄

State:	ONLINE
Zpool ID:	12199181236699342582
Total storage:	544.00 GiB
Disks:	10

ⓘ Status: Zpool is functioning correctly.
   Action: None required.

⌄

Zpools available for import

ⓘ **Rescan required**
   Click **Rescan** button above to scan disks for new zpools

Unassigned disks

Local disks

Search

	Name	Serial number	Size	Model	Blink
1	sdb	15P0A0EPT2LA	186.31 GiB	X446_PHM2200MCTO	●
2	sdf	43G0A05MTVL6	186.31 GiB	PX02SMF020	●

8. Add Initiator

JovianDSS: **node 61**
IP Address: 192.168.0.61

In the pool menu select **Fibre Channel**.

8. Add Initiator

ESX host
IP Address: 192.168.0.51

From **Storage Adapters** in VMware please select the text, then use the pop-up menu to copy the selected text to the clipboard.

Summary	Monitor	Configure	Permissions	VMs	Resource Pools	Datastores	Networks	Updates

▼ Storage
    Storage Adapters
    Storage Devices
    Host Cache Configur.
    Protocol Endpoints
    I/O Filters
▼ Networking
    Virtual switches
    VMkernel adapters
    Physical adapters
    TCP/IP configuration
▼ Virtual Machines

Storage Adapters

+ Add Software Adapter   Refresh   Rescan Storage...   Rescan Adapter

Adapter	Type	Status	Identifier	Targets	Devic...	Paths
▲ Model: 2600 Series 16Gb Fibre Channel to PCI Express HBA						
vmhba3	Fibre Channel	Online	20:00:00:0e:1e:2a:8... 21:00:00:0e:1e:2a:81:e0	0	0	0
vmhba4	Fibre Channel	Online	20:00:00:0e:1e:2a:81:e1 21:00:00:0			
▲ Model: Fusion-MPT 12GSAS SAS3008 PCI-Express						
vmhba2	SAS	Unknown	--			
▲ Model: Patsburg 6 Port SATA AHCI Controller						

Copy	Ctrl+C
Search Google for "21:00:00:0e:1e:2a:81:e0"	
Print...	Ctrl+P
Inspect	Ctrl+Shift+I

8. Add Initiator

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Add Initiator** please paste the previously saved text from the clipboard into the **Initiator WWN** field, and enter the **Alias** initiator. Next, click the **Apply** button. Repeat these steps for the second adapter.

8. Add Initiator

JovianDSS: **node 61**
IP Address: 192.168.0.61

Initiators have been added.

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9. Add group wizard

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Add Fibre Channel group** wizard, in Properties step, please enter the name of **Group alias**. To confirm this name click the **Next** button.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Add Fibre Channel group

1. Properties
2. Targets
3. Initiators WWN
4. Zvols
5. Summary

Group alias: Group1

✕ Cancel   Next ›

Alias   WWN   Options
                         21:00:00:0e:1e:2a:81:e0   Options
vmhba4   21:00:00:0e:1e:2a:81:e1   Options

9. Add group wizard

JovianDSS: **node 61**
IP Address: 192.168.0.61

In the **Targets** step please Select proper WWNs and click the **Next** button.

9. Add group wizard

open-e

JovianDSS: **node 61**
IP Address: 192.168.0.61

In the **Initiators WWN** step please select proper **Alias**es and click the **Next** button.

Add Fibre Channel group

1. Properties
2. Targets
3. Initiators WWN
5. Summary

Select WWN initiators

Alias	WWN	Options
vmhba3	21:00:00:0e:1e:2a:81:e0	Options
vmhba4	21:00:00:0e:1e:2a:81:e1	Options

Cancel Back Next

Alias	WWN	Options
vmhba3	21:00:00:0e:1e:2a:81:e0	Options
vmhba4	21:00:00:0e:1e:2a:81:e1	Options

9. Add group wizard

JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Zvols** step please click the **Add zvol** button.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Add Fibre Channel group

1. Properties

2. Targets

3. Initiators WWN

4. Zvols

5. Summary

Select Zvols

Search

+ Add zvol

Name	Type	Logical size	SCSI ID	LUN	Access mode

No zvols found.

Cancel   Back   Next

Alias	WWN	Options
vmhba3	21:00:00:0e:1e:2a:81:e0	Options
vmhba4	21:00:00:0e:1e:2a:81:e1	Options

9. Add group wizard

open-e
JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Add new zvol**, enter the name of a new Zvol and the appropriate size and click **Add** button.

Add new zvol

Zvol properties

Name:	zvol00
Size:	1024	GiB

522.87 GiB physical available

Provisioning:
○ Thick provisioned
● Thin provisioned (default)

Deduplication:	Disabled (default)
Number of the data copies:	1 (default)
Compression:	lz4 (default)
Volume block size:	128 KiB (default)
Write cache logging (Sync):	Always (default)
Write cache logging (Log bias):	Write log device (Latency)
Primary cache:	All (default)
Secondary cache:	All (default)

✕ Cancel   ✓ Add

9. Add group wizard

JovianDSS: **node 61**
IP Address: 192.168.0.61

After creating new **Zvols** click the **Next** button.

9. Add group wizard

JovianDSS: **node 61**
IP Address: 192.168.0.61

In **Summary** you are able to see an overview of the configuration of the **Fibre Channel Group**. If the settings need to be modified, click the **Back** button and make the required changes. If it is correct, click **Add**.

Go to the second node and create **Fibre Channel Group** accordingly.

Add Fibre Channel group

1. Properties
2. Targets
3. Initiators WWN
4. Zvols
5. Summary

WWN	Alias	Mode	Type	Status
21:00:00:0e:1e:2c:dd:40	dd-40	Target	Physical	OK
21:00:00:0e:1e:2c:dd:41	dd-41	Target	Physical	OK

WWN Initiators

WWN	Alias
21:00:00:0e:1e:2a:81:e0	vmhba3
21:00:00:0e:1e:2a:81:e1	vmhba4

Zvols

Name	Type	Logical size	SCSI ID	LUN	Access mode
zvol00	zvol	1.00 TiB	Auto	Auto	Write-through (default)

Cancel   Back   Add

10. Add remote target

JovianDSS: **node 61**
IP Address: 192.168.0.61

After completion of the **Fibre Channel Group** wizard return to the **Storage**. Beside you will see the **Fibre channel targets** you are able to view and an overview of the configuration targets.

In the **Options** drop-down menu select **Properties**.

10. Add remote target

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JovianDSS: **node 61**
IP Address: 192.168.0.61

In the target properties select
Remote port for alias **dd-40** and click
the **Apply** button.

10. Add remote target

JovianDSS: **node 61**
IP Address: 192.168.0.61

Next, in this step select **Remote port** for the second target for the alias **dd-41**. Next, click the **Apply** button.

Edit target properties

Target dd-41 properties

Target WWN:	21:00:00:0e:1e:2c:dd:41
Alias:	dd-41
Remote port (mapping):	Select remote port

21:00:00:0e:1e:28:c4:e0 (c4-e0)
1:00:00:0e:1e:28:c4:e1 (c4-e1)

✕ Cancel   ✓ Apply

Storage
User Management
Failover Settings
Storage Settings
Backup & Recovery
System Settings
Diagnostics

Storage

Rescan   + Add zpool

Inititator alias

vmhba3

vmhba4

Search

Zvol

zvol00

Public gro...

Zvols available to be assigned to Fibre Channel groups

Search

+ Add new zvol

Zvol	Type	Logical size	Physical size	Compression	Provisioning	Options
⚠ zvol00	zvol	1.00 TiB	56.00 KiB	1.00	thin	Options

11. Rescan adapters

ESX host
IP Address: 192.168.0.51

In **Storage Adapters**, you can check the connection of both remote ports for rescan.

Storage Adapters

Summary	Monitor	Configure	Permissions	VMs	Resource Pools	Datastores	Networks	Updates

- Storage
  - Storage Adapters
  - Storage Devices
  - Host Cache Configur.
  - Protocol Endpoints
  - I/O Filters
- Networking
  - Virtual switches
  - VMkernel adapters
  - Physical adapters
  - TCP/IP configuration

+ Add Software Adapter Refresh Rescan Storage... | Rescan Adapter

Rescans all storage adapters on the host to discover newly added storage devices and/or VMFS volumes.

Adapter	Type	Status				
◢ Model: 2600 Series 16Gb Fibre Channel to PCI Express HBA						
vmhba3	Fibre Channel	Online	20:00:00:0e:1e:2a:81:e0 21:00:00:0e:1e:2a:81:e0	4	1	4
vmhba4	Fibre Channel	Online	20:00:00:0e:1e:2a:81:e1 21:00:00:0e:1e:2a:81:e1	4	1	4
◢ Model: Fusion-MPT 12GSAS SAS3008 PCI-Express						
vmhba2	SAS	Unknown	--	1	1	1
◢ Model: Patsburg 6 Port SATA AHCI Controller						

12. Check adapters after rescan

ESX host
IP Address: 192.168.0.51

After the rescan, the new device (SCST_FIO) is listed below.

13. Edit multipath

ESX host
IP Address: 192.168.0.51

Next, go to **Storage Devices** and please click **Edit Multipath**.

13. Edit multipath

ESX host
IP Address: 192.168.0.51

In **Edit Multipathing Policies** select **Round Robin (VMware)** and click the **OK** button.

14. Path check

ESX host
IP Address: 192.168.0.51

Then, in **Storage Devices**, there should be 4 active and 4 passive paths listed.

The first initiator port "sees" 2 active target ports and the second initiator "sees" also the same 2 active targets. Similarly with standby paths.
The first initiator port "sees" 2 passive target ports and the second initiator "sees" also the same 2 passive targets.

15. Move cluster

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JovianDSS: **node 61**
IP Address: 192.168.0.61

Go to the main menu **Storage**. Now, in order to test failover, in the **Options** drop-down menu select **Move**.

The pool will be exported on the current node and will be imported on the second node.

Storage	
User Management	
Failover Settings	
Storage Settings	
Backup & Recovery	
System Settings	
Diagnostics	

Storage   Rescan   + Add zpool

● Pool-0   Options ▾

Delete Zpool
Export Zpool
Clear error counters
Move

State:	ONLINE		Status:	Zpool is functioning correctly.
Zpool ID:	12199181236699342582		Action:	None required.
Total storage:	544.00 GiB			
Disks:	10			

Status   Disk groups   iSCSI targets   **Fibre Channel**   Shares   Snapshots   Virtual IPs

◯ **Fibre Channel groups**   + Add group

⌄ Group1 —— Targets: **2** —— Initiators: **2** —— Zvols: **1** —— Status: **Active** ——

✎ Edit group properties   🔌 Deactivate group   ✕ Delete group

Search   + Add target

Target alias	WWN	Type	Status	Options
dd-40	21:00:00:0e:1e:2c:dd:40	Physical	OK	Options ▾
dd-41	21:00:00:0e:1e:2c:dd:41	Physical	OK	Options ▾

Search   + Add initiator

Inititator alias	WWN	Options
vmhba3	21:00:00:0e:1e:2a:81:e0	Options ▾
vmhba4	21:00:00:0e:1e:2a:81:e1	Options ▾

15. Move cluster

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JovianDSS: **node 61**
IP Address: 192.168.0.61

After moving, the pool is active on the node-7.

Storage

User Management

Failover Settings

Storage Settings

Backup & Recovery

System Settings

Diagnostics

Storage

Rescan   + Add zpool

ⓘ No local zpools have been found on the system. To create a zpool on this node please select an "Add zpool" button.

Pool ⚠ Active on node node-71   •→ Move to this node

| Status: | ONLINE |
| Zpool ID: | 12199181236699342582 |

ⓘ Status: Zpool is ready to import.
Action: None required.

Zpools available for import

ⓘ No external zpools available for the import have been found.

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16. Cluster check after test move

ESX host
IP Address: 192.168.0.51

Now, In **Paths** we see the active-standby paths swapped.
(rescan or refresh on vCenter GUI may be required)

| Summary | Monitor | Configure | Permissions | VMs | Resource Pools | Datastores | Networks | Updates |

Storage
- Storage Adapters
- Storage Devices
- Host Cache Configur...
- Protocol Endpoints
- I/O Filters

Networking
- Virtual switches
- VMkernel adapters
- Physical adapters
- TCP/IP configuration

Virtual Machines
- VM Startup/Shutdo...
- Agent VM Settings
- Default VM Compati...
- Swap File Location

System
- Licensing
- Host Profile
- Time Configuration
- Authentication Servi...
- Certificate
- Power Management
- Advanced System S...
- System Resource Re...
- Firewall
- Services

Storage Devices

🔄 Refresh | 🔗 Attach | Detach | Rename... | Turn On LED | Turn Off LED | Erase Partitions... | Mark as Flash Disk | Mark as Local

Name	L...	Type	Capacity	Datastore	Operational S...	Hardware Accele
Local Intel Enclosure Svc Dev (naa.5001e6734f...	0	enclos...		Not Consumed	Attached	Not supported
SCST_FIO Fibre Channel Disk (eui.323539326...	0	disk	1.00 TB	Not Consumed	Attached	Supported
Local ATA Disk (t10.ATA_____INTEL_SSDSC2B...	0	disk	93.16 GB	📀 datastore1	Attached	Unknown

Copy All   3 Items

Propertie... | **Paths** | Partition Details

Enable Disable

Runtime Name	Status	Target ↓	Name
vmhba4:C0:T2:L0	◇ Standby	20:00:00:0e:1e:2c:dd:41 21:00:00:0e:1e:2c:dd:41	vmhba4:C0:T2:L0
vmhba3:C0:T2:L0	◇ Standby	20:00:00:0e:1e:2c:dd:41 21:00:00:0e:1e:2c:dd:41	vmhba3:C0:T2:L0
vmhba3:C0:T1:L0	◇ Standby	20:00:00:0e:1e:2c:dd:40 21:00:00:0e:1e:2c:dd:40	vmhba3:C0:T1:L0
vmhba4:C0:T1:L0	◇ Standby	20:00:00:0e:1e:2c:dd:40 21:00:00:0e:1e:2c:dd:40	vmhba4:C0:T1:L0
vmhba4:C0:T3:L0	◆ Active (I/O)	20:00:00:0e:1e:28:c4:e1 21:00:00:0e:1e:28:c4:e1	vmhba4:C0:T3:L0
vmhba3:C0:T3:L0	◆ Active (I/O)	20:00:00:0e:1e:28:c4:e1 21:00:00:0e:1e:28:c4:e1	vmhba3:C0:T3:L0
vmhba4:C0:T0:L0	◆ Active (I/O)	20:00:00:0e:1e:28:c4:e0 21:00:00:0e:1e:28:c4:e0	vmhba4:C0:T0:L0
vmhba3:C0:T0:L0	◆ Active (I/O)	20:00:00:0e:1e:28:c4:e0 21:00:00:0e:1e:28:c4:e0	vmhba3:C0:T0:L0

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