



# **AIX and PowerVM/VIOS**

## ONTAP SAN Host Utilities

NetApp  
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# AIX and PowerVM/VIOS

## Configure AIX 7.3/VIOS 4.x for FCP and iSCSI with ONTAP storage

The AIX Host Utilities software provides management and diagnostic tools for AIX hosts that are connected to ONTAP storage. When you install the AIX Host Utilities on an AIX 7.3/VIOS 4.x host, you can use the Host Utilities to help you manage FCP and iSCSI protocol operations with ONTAP LUNs.

### Step 1: Optionally, enable SAN booting

You can configure your host to use SAN booting to simplify deployment and improve scalability. If your configuration doesn't support SAN booting, you can use a local boot.

#### SAN boot

SAN booting is the process of setting up a SAN-attached disk (a LUN) as a boot device for an AIX/PowerVM host host. You can set up a SAN boot LUN to work in a AIX Multipath I/O (MPIO) environment that is using the FC protocol and running AIX Host Utilities with either the FC or FCoE protocol. The method you use to create a SAN boot LUN and install a new OS image in an AIX MPIO environment depends on the protocol that you are using.

#### Steps

1. Use the [Interoperability Matrix Tool](#) to verify that your AIX OS, protocol, and ONTAP version support SAN booting.
2. Follow the best practices for setting up a SAN boot in the vendor documentation.

#### Local boot

Perform a local boot by installing the AIX OS on the local hard disk, for example, on an SSD, SATA, or RAID.

### Step 2: Install the AIX Host Utilities

NetApp strongly recommends installing the AIX Host Utilities to support ONTAP LUN management and assist technical support with gathering configuration data. The MPIO package from the Host Utilities provides MPIO support for AIX and VIOS.



Installing the AIX Host Utilities provides additional timeout settings on your AIX host.

[Install AIX Host Utilities 8.0](#).

### Step 3: Confirm the multipath configuration for your host

You can use multipathing with AIX and PowerVM to manage ONTAP LUNs.

Multipathing allows you to configure multiple network paths between the host and storage system. If one path fails, traffic continues with the remaining paths. The AIX and PowerVM environments of the Host Utilities use

the AIXs native multipathing solution (MPIO).

The Path Control Module (PCM) is responsible for controlling multiple paths for an AIX host. The PCM is a storage vendor supplied code that handles path management and is installed and enabled during the Host Utilities installation.

To ensure that multipathing is configured correctly for your host, verify that you have the NetApp recommended settings configured for your ONTAP LUNs.

## Steps

1. Verify that "MPIO NetApp" is available. "MPIO NetApp" is loaded during the AIX Host Utilities installation and becomes available after you reboot the host.

```
lsdev -Cc disk
```

### Example output

```
hdisk1 Available 00-00-02 MPIO NetApp FCP Default PCM Disk
```

2. The AIX Host Utilities load the following parameter settings for ONTAP LUNs.

### Show parameter settings

Parameter	Environment	Value for AIX	Note
algorithm	MPIO	round_robin	Set by Host Utilities
hcheck_cmd	MPIO	inquiry	Set by Host Utilities
hcheck_interval	MPIO	30	Set by Host Utilities
hcheck_mode	MPIO	nonactive	Set by Host Utilities
lun_reset_spt	MPIO / non-MPIO	yes	Set by Host Utilities
max_transfer	MPIO / non-MPIO	FC LUNs: 0x100000 bytes	Set by Host Utilities
qfull_dly	MPIO / non-MPIO	2-second delay	Set by Host Utilities
queue_depth	MPIO / non-MPIO	64	Set by Host Utilities
reserve_policy	MPIO / non-MPIO	no_reserve	Set by Host Utilities
re_timeout (disk)	MPIO / non-MPIO	30 seconds	Uses OS Default values
dyntrk	MPIO / non-MPIO	Yes	Uses OS Default values
fc_err_recov	MPIO / non-MPIO	Fast_fail	Uses OS Default values
q_type	MPIO / non-MPIO	simple	Uses OS Default values
num_cmd_elems	MPIO / non-MPIO	1024 for AIX 3072 for VIOS	FC EN1B, FC EN1C
num_cmd_elems	MPIO / non-MPIO	1024 for AIX	FC EN0G

3. Configure the following settings to optimize I/O operations for FC.

Parameter	AIX versions	AIX OS default value	NetApp recommended value
rw_timeout (disk)	AIX 7.3TL3	NPIV:30 seconds, vSCSI:45 seconds	NPIV:30 seconds, vSCSI:120 seconds
	AIX 7.2TL5	NPIV:30 seconds, vSCSI:45 seconds	NPIV:30 seconds, vSCSI:120 seconds
	VIOS 3.1	30 seconds	30 seconds
	VIOS 4.1	30 seconds	30 seconds

4. Configure the following settings to optimize I/O operations for iSCSI.

Parameter	AIX versions	AIX OS default value	NetApp recommended value
rw_timeout (disk)	AIX 7.3TL3	vSCSI:45 seconds	vSCSI:120 seconds
	AIX 7.2TL5	vSCSI:45 seconds	vSCSI:120 seconds
	VIOS 3.1	120 seconds	30 seconds
	VIOS 4.1	120 seconds	30 seconds
	All AIX7.2 and AIX 7.3 standalone	120 seconds	30 seconds
isw_err_recov (iscsi0)	All AIX7.2 and AIX 7.3 standalone	delayed_fail	fast_fail

5. If your storage configuration includes MetroCluster or SnapMirror active sync, change the default settings:

#### MetroCluster

By default, the AIX OS enforces a shorter I/O timeout when there are no available paths to a LUN. This might occur in configurations that include single-switch SAN fabric and in MetroCluster configurations that experience unplanned failovers. For additional information and recommended changes to default settings, see the Knowledge Base article [What are AIX Host support considerations in a MetroCluster configuration?](#).

#### SnapMirror active sync

Beginning with ONTAP 9.11.1, SnapMirror active sync is supported for an AIX host. The primary cluster in an AIX configuration is the "active" cluster.

In an AIX configuration, failovers are disruptive. With each failover, you need to perform a re-scan on the host for I/O operations to resume.

Refer to the Knowledge Base article [How to configure an AIX host for SnapMirror active sync](#).

6. Verify the parameter settings and that multiple paths are listed for an ONTAP LUN:

```
lsmpio
```

In the following example for an AFF or FAS system, the PCM is listed for NetApp.

## Show example

```
# lsmpio -l hdisk1
name      path_id  status    path_status  parent  connection
hdisk1    0        Enabled   Non          fscsi6
203200a098ba7afe,5b00000000000000
hdisk1    1        Enabled   Non          fscsi8
203100a098ba7afe,5b00000000000000
hdisk1    2        Enabled   Sel,Opt     fscsi6
203000a098ba7afe,5b00000000000000
hdisk1    3        Enabled   Sel,Opt     fscsi8
203800a098ba7afe,5b00000000000000
#
lsattr -El hdisk1
PCM          PCM/friend/NetAppDefaultPCM Path Control Module
False
PR_key_value 0x6d0000000002          Persistant Reserve Key
Value        True
algorithm    round_robin           Algorithm
True
clr_q        no                  Device CLEARS its Queue
on_error     True
dist_err_pcnt 0                  Distributed Error Sample
Time        True
dist_tw_width 50                Distributed Error Sample
Time        True
hcheck_cmd   inquiry            Health Check Command
True
hcheck_interval 30              Health Check Interval
True
hcheck_mode   nonactive          Health Check Mode
True
location
True
lun_id       0x5b00000000000000  Logical Unit Number ID
False
lun_reset_spt yes                LUN Level Reset
True
max_transfer 0x100000           Maximum TRANSFER Size
True
node_name    0x204800a098ba7afe FC Node Name
False
pvid        none                Physical volume
identifier
q_err       yes                Use QERR bit
```

```

True
q_type           simple           Queueing TYPE
True
qfull_dly       2                Delay in seconds for
SCSI TASK SET FULL True
queue_depth     64               Queue DEPTH
True
reassign_to     120              REASSIGN time out value
True
reserve_policy PR_shared       Reserve Policy
True
rw_timeout      30               READ/WRITE time out
value           True
scsi_id         0xec409        SCSI ID
False
start_timeout   60               START unit time out
value           True
timeout_policy  fail_path      Active/Passive Disk Path
Control Module True
ww_name         0x203200a098ba7afe FC World Wide Name
False

```

## 7. Verify the path status for ONTAP LUNs:

```
sanlun lun show
```

The following example outputs show the correct path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

## ASA configurations

An ASA configuration optimizes all paths to a given LUN, keeping them active ("primary"). This improves performance by serving I/O operations through all paths at the same time.

### Show example

```
# sanlun lun show -p |grep -p hdisk78
        ONTAP Path:
vs_aix_clus:/vol/chataix_205p2_vol_en_1_7/jfs_205p2_lun_en
        LUN: 37
        LUN Size: 15g
        Host Device: hdisk78
        Mode: C
        Multipath Provider: AIX Native
        Multipathing Algorithm: round_robin
-----
host  vserver  AIX                                AIX MPIO
path   path     MPIO    host      vserver      path
state  type     path    adapter   LIF          priority
-----
up     primary   path0   fcs0     fc_aix_1     1
up     primary   path1   fcs0     fc_aix_2     1
up     primary   path2   fcs1     fc_aix_3     1
up     primary   path3   fcs1     fc_aix_4     1
```

## AFF or FAS configuration

An AFF or FAS configuration should have two groups of paths with higher and lower priorities. Higher priority Active/Optimized paths are served by the controller where the aggregate is located. Lower priority paths are active but non-optimized because they are served by a different controller. Non-optimized paths are only used when optimized paths aren't available.

The following example displays the correct output for an ONTAP LUN with two Active/Optimized ("primary") paths and two Active/Non-Optimized ("secondary") paths:

## Show example

```
# sanlun lun show -p |grep -p hdisk78
          ONTAP Path:
vs_aix_clus:/vol/chataix_205p2_vol_en_1_7/jfs_205p2_lun_en
          LUN: 37
          LUN Size: 15g
          Host Device: hdisk78
          Mode: C
          Multipath Provider: AIX Native
          Multipathing Algorithm: round_robin
-----
host      vserver      AIX
path      path        MPIO
state     type        path
          host      vserver      AIX MPIO
          adapter   LIF
          priority
-----
up        secondary   path0  fcs0   fc_aix_1    1
up        primary     path1  fcs0   fc_aix_2    1
up        primary     path2  fcs1   fc_aix_3    1
up        secondary   path3  fcs1   fc_aix_4    1
```

## Step 4: Review the known issues

There are no known issues.

## What's next?

[Learn about using the AIX Host Utilities tool.](#)

# Configure AIX 7.2/VIOS 3.1 for FCP and iSCSI with ONTAP storage

The AIX Host Utilities software provides management and diagnostic tools for AIX hosts that are connected to ONTAP storage. When you install the AIX Host Utilities on an AIX 7.2 and/or PowerVM (VIOS 3.1) host, you can use the Host Utilities to help you manage FCP and iSCSI protocol operations with ONTAP LUNs.

## Step 1: Optionally, enable SAN booting

You can configure your host to use SAN booting to simplify deployment and improve scalability. If your configuration doesn't support SAN booting, you can use a local boot.

## SAN boot

SAN booting is the process of setting up a SAN-attached disk (a LUN) as a boot device for an AIX/PowerVM host host. You can set up a SAN boot LUN to work in a AIX Multipath I/O (MPIO) environment that is using the FC protocol and running AIX Host Utilities with either the FC or FCoE protocol. The method you use to create a SAN boot LUN and install a new OS image in an AIX MPIO environment depends on the protocol that you are using.

### Steps

1. Use the [Interoperability Matrix Tool](#) to verify that your AIX OS, protocol, and ONTAP version support SAN booting.
2. Follow the best practices for setting up a SAN boot in the vendor documentation.

### Local boot

Perform a local boot by installing the AIX OS on the local hard disk, for example, on an SSD, SATA, or RAID.

## Step 2: Install the AIX Host Utilities

NetApp strongly recommends installing the AIX Host Utilities to support ONTAP LUN management and assist technical support with gathering configuration data. The MPIO package from the Host Utilities provides MPIO support for AIX and VIOS.



Installing the AIX Host Utilities provides additional timeout settings on your AIX host.

[Install AIX Host Utilities 6.1.](#)

## Step 3: Confirm the multipath configuration for your host

You can use multipathing with AIX 7.2 and PowerVM to manage ONTAP LUNs.

Multipathing allows you to configure multiple network paths between the host and storage system. If one path fails, traffic continues with the remaining paths. The AIX and PowerVM environments of the Host Utilities use the AIXs native multipathing solution (MPIO).

The Path Control Module (PCM) is responsible for controlling multiple paths for an AIX host. The PCM is a storage vendor supplied code that handles path management and is installed and enabled during the Host Utilities installation.

To ensure that multipathing is configured correctly for your host, verify that you have the NetApp recommended settings configured for your ONTAP LUNs.

1. The AIX Host Utilities load the following parameter settings for ONTAP LUNs.

## Show parameter settings

Parameter	Environment	Value for AIX	Note
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lun_reset_spt	MPIO / non-MPIO	yes	Set by Host Utilities
max_transfer	MPIO / non-MPIO	FC LUNs: 0x100000 bytes	Set by Host Utilities
qfull_dly	MPIO / non-MPIO	2-second delay	Set by Host Utilities
queue_depth	MPIO / non-MPIO	64	Set by Host Utilities
reserve_policy	MPIO / non-MPIO	no_reserve	Set by Host Utilities
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num_cmd_elems	MPIO / non-MPIO	1024 for AIX 3072 for VIOS	FC EN1B, FC EN1C
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2. If your storage configuration includes MetroCluster or SnapMirror active sync, change the default settings:

### MetroCluster

By default, the AIX OS enforces a shorter I/O timeout when there are no available paths to a LUN. This might occur in configurations that include single-switch SAN fabric and in MetroCluster configurations that experience unplanned failovers. For additional information and recommended changes to default settings, see the Knowledge Base article [What are AIX Host support considerations in a MetroCluster configuration?](#).

### SnapMirror active sync

Beginning with ONTAP 9.11.1, SnapMirror active sync is supported for an AIX host. The primary cluster in an AIX configuration is the "active" cluster.

In an AIX configuration, failovers are disruptive. With each failover, you need to perform a re-scan on the host for I/O operations to resume.

Refer to the Knowledge Base article [How to configure an AIX host for SnapMirror active sync](#).

3. Verify the path status for ONTAP LUNs:

```
sanlun lun show
```

The following example outputs show the correct path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

## ASA configurations

An ASA configuration optimizes all paths to a given LUN, keeping them active ("primary"). This improves performance by serving I/O operations through all paths at the same time.

### Show example

```
# sanlun lun show -p |grep -p hdisk78
        ONTAP Path:
vs_aix_clus:/vol/chataix_205p2_vol_en_1_7/jfs_205p2_lun_en
        LUN: 37
        LUN Size: 15g
        Host Device: hdisk78
        Mode: C
        Multipath Provider: AIX Native
        Multipathing Algorithm: round_robin
-----
host  vserver  AIX                                AIX MPIO
path   path     MPIO    host      vserver      path
state  type     path    adapter   LIF          priority
-----
up     primary   path0   fcs0     fc_aix_1     1
up     primary   path1   fcs0     fc_aix_2     1
up     primary   path2   fcs1     fc_aix_3     1
up     primary   path3   fcs1     fc_aix_4     1
```

## AFF or FAS configuration

An AFF or FAS configuration should have two groups of paths with higher and lower priorities. Higher priority Active/Optimized paths are served by the controller where the aggregate is located. Lower priority paths are active but non-optimized because they are served by a different controller. Non-optimized paths are only used when optimized paths aren't available.

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-----
host      vserver      AIX
path      path        MPIO
state     type        path
          host      vserver
          adapter   LIF
          priority
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up        secondary   path0  fcs0   fc_aix_1      1
up        primary     path1  fcs0   fc_aix_2      1
up        primary     path2  fcs1   fc_aix_3      1
up        secondary   path3  fcs1   fc_aix_4      1
```

## Step 4: Review the known issues

### Known issues

The IBM AIX 7.2 and/or PowerVM (VIOS 3.1) with ONTAP storage release has the following known issues:

NetApp Bug ID	Title	Description	Partner ID
1416221	AIX 7200-05-01 encountered I/O disruption on virtual iSCSI disks(VIOS 3.1.1.x) during storage failover	I/O disruption can happen during storage failover operations on AIX 7.2 TL5 hosts on the virtual iSCSI disks mapped through the VIOS 3.1.1.x. By default, the <code>rw_timeout</code> value of the virtual iSCSI disks (hdisk) on VIOC will be 45 seconds. If an I/O delay greater than 45 seconds happens during storage failover, an I/O failure might occur. To avoid this situation, refer to the workaround mentioned in the BURT. As per IBM, after applying APAR - IJ34739 (upcoming release) we can dynamically change the <code>rw_timeout</code> value using the <code>chdev</code> command.	NA
1414700	AIX 7.2 TL04 encountered I/O disruption on virtual iSCSI disks(VIOS 3.1.1.x) during storage failover	I/O disruption can happen during storage failover operations on AIX 7.2 TL4 hosts on the virtual iSCSI disks mapped through the VIOS 3.1.1.x. By default, the <code>rw_timeout</code> value of vSCSI adapter on VIOC is 45 seconds. If an I/O delay of more than 45 seconds happens during a storage failover, I/O failure might occur. To avoid this situation, refer to the workaround mentioned in the BURT.	NA
1307653	I/O issues occur on VIOS 3.1.1.10 during SFO faults and straight I/O	On VIOS 3.1.1, I/O failures might occur on NPIV client disks that are backed by 16 GB or 32 GB FC adapters. Additionally, the <code>vfchost</code> driver might stop processing I/O requests from the client. Applying IBM APAR IJ22290 IBM APAR IJ23222 fixes the issue.	NA

## What's next?

[Learn about using the AIX Host Utilities tool.](#)

# Configure AIX 7.1 for FCP and iSCSI with ONTAP storage

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## Step 2: Install the AIX Host Utilities

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Installing the AIX Host Utilities provides additional timeout settings on your AIX host.

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## Step 3: Confirm the multipath configuration for your host

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## Steps

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queue_depth	MPIO / non-MPIO	64	Set by Host Utilities
reserve_policy	MPIO / non-MPIO	no_reserve	Set by Host Utilities
re_timeout (disk)	MPIO / non-MPIO	30 seconds	Uses OS Default values
dyntrk	MPIO / non-MPIO	Yes	Uses OS Default values
fc_err_recov	MPIO / non-MPIO	Fast_fail	Uses OS Default values
q_type	MPIO / non-MPIO	simple	Uses OS Default values
num_cmd_elems	MPIO / non-MPIO	1024 for AIX	FC EN1B, FC EN1C
num_cmd_elems	MPIO / non-MPIO	500 for AIX (standalone/physical) 200 for VIOC	FC EN0G

2. If your storage configuration includes MetroCluster or SnapMirror active sync, change the default settings:

## **MetroCluster**

By default, the AIX OS enforces a shorter I/O timeout when there are no available paths to a LUN. This might occur in configurations that include single-switch SAN fabric and in MetroCluster configurations that experience unplanned failovers. For additional information and recommended changes to default settings, see the Knowledge Base article [What are AIX Host support considerations in a MetroCluster configuration?](#).

## **SnapMirror active sync**

Beginning with ONTAP 9.11.1, SnapMirror active sync is supported for an AIX host. The primary cluster in an AIX configuration is the "active" cluster.

In an AIX configuration, failovers are disruptive. With each failover, you need to perform a re-scan on the host for I/O operations to resume.

Refer to the Knowledge Base article [How to configure an AIX host for SnapMirror active sync](#).

3. Verify the path status for ONTAP LUNs:

```
sanlun lun show
```

The following example outputs show the correct path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

## ASA configurations

An ASA configuration optimizes all paths to a given LUN, keeping them active ("primary"). This improves performance by serving I/O operations through all paths at the same time.

### Show example

```
# sanlun lun show -p |grep -p hdisk78
        ONTAP Path:
vs_aix_clus:/vol/chataix_205p2_vol_en_1_7/jfs_205p2_lun_en
        LUN: 37
        LUN Size: 15g
        Host Device: hdisk78
        Mode: C
        Multipath Provider: AIX Native
        Multipathing Algorithm: round_robin
-----
host  vserver  AIX                                AIX MPIO
path  path     MPIO    host    vserver    path
state type     path   adapter  LIF      priority
-----
up    primary   path0   fcs0    fc_aix_1    1
up    primary   path1   fcs0    fc_aix_2    1
up    primary   path2   fcs1    fc_aix_3    1
up    primary   path3   fcs1    fc_aix_4    1
```

## AFF or FAS configuration

An AFF or FAS configuration should have two groups of paths with higher and lower priorities. Higher priority Active/Optimized paths are served by the controller where the aggregate is located. Lower priority paths are active but non-optimized because they are served by a different controller. Non-optimized paths are only used when optimized paths aren't available.

The following example displays the correct output for an ONTAP LUN with two Active/Optimized ("primary") paths and two Active/Non-Optimized ("secondary") paths:

## Show example

```
# sanlun lun show -p |grep -p hdisk78
          ONTAP Path:
vs_aix_clus:/vol/chataix_205p2_vol_en_1_7/jfs_205p2_lun_en
          LUN: 37
          LUN Size: 15g
          Host Device: hdisk78
          Mode: C
          Multipath Provider: AIX Native
          Multipathing Algorithm: round_robin
-----
host      vserver      AIX
path      path        MPIO
state     type        path
          host      vserver      AIX MPIO
          adapter   LIF
          priority
-----
up        secondary   path0  fcs0   fc_aix_1      1
up        primary     path1  fcs0   fc_aix_2      1
up        primary     path2  fcs1   fc_aix_3      1
up        secondary   path3  fcs1   fc_aix_4      1
```

## Step 4: Review the known issues

The AIX 7.1 with ONTAP storage release has no known issues.

## What's next?

[Learn about using the AIX Host Utilities tool.](#)

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