# 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.
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> **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,5b000000000000
hdisk1  1        Enabled  Non          fscsi8
203100a098ba7afe,5b000000000000
hdisk1  2        Enabled  Sel,Opt      fscsi6
203000a098ba7afe,5b000000000000
hdisk1  3        Enabled  Sel,Opt      fscsi8
203800a098ba7afe,5b000000000000
#
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                                    Location Label
True
lun_id          0x5b000000000000            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               False
q_err           yes                         Use QERR bit
```

```
True
q_type          simple                          Queuing 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:

```
# 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      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 |
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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 |
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| 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<br>3072 for VIOS | FC EN1B, FC EN1C |
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The following example outputs show the correct path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

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                   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
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```

## 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 `rw_timeout` 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 rw_timeout value using the `chdev` 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 `rw_timeout` 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 `vfchost` driver might stop processing I/O requests from the client. Applying IBM APAR IJ22290 IBM APAR IJ23222 fixes the issue. | NA |

## What's next?

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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 7.1 host, you can use the Host Utilities to help you manage FCP and iSCSI protocol operations with ONTAP LUNs.

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   | 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 | 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?.

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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**

```
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                    ONTAP Path:
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                        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
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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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**Show example**

```
# sanlun lun show -p |grep -p hdisk78
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                          LUN: 37
                     LUN Size: 15g
                  Host Device: hdisk78
                         Mode: C
           Multipath Provider: AIX Native
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------- ---------- ------ ------- ---------- ----------
host    vserver    AIX                       AIX MPIO
path    path       MPIO   host    vserver        path
state   type       path   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.