



Veritas

ONTAP SAN Host Utilities

NetApp
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Table of Contents

- Veritas 1
 - Configure Veritas Infoscale 9 for FC, FCoE, and iSCSI with ONTAP storage 1
 - Step 1: Optionally, enable SAN booting 1
 - Step 2: Install the Linux Host Utilities 1
 - Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host 1
 - Step 4: Known issues 7
 - What's next? 7
 - Configure Veritas Infoscale 8 for FC, FCoE, and iSCSI with ONTAP storage 7
 - Step 1: Optionally, enable SAN booting 7
 - Step 2: Install the Linux Host Utilities 8
 - Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host 8
 - Step 4: Known issues 13
 - What's next? 13
 - Configure Veritas Infoscale 7 for FC, FCoE, and iSCSI with ONTAP storage 13
 - Step 1: Optionally, enable SAN booting 13
 - Step 2: Install the Linux Host Utilities 14
 - Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host 14
 - Step 4: Known issues 19
 - What's next? 19
 - Configure Veritas Infoscale 6 for FC, FCoE, and iSCSI with ONTAP storage 19
 - Step 1: Optionally, enable SAN booting 19
 - Step 2: Install the Linux Host Utilities 20
 - Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host 20
 - Step 4: Known issues 25
 - What's next? 25

Veritas

Configure Veritas Infoscale 9 for FC, FCoE, and iSCSI with ONTAP storage

The Linux Host Utilities software provides management and diagnostic tools for Linux hosts that are connected to ONTAP storage. Use the Linux Host Utilities with Veritas Infoscale 9 for Oracle Linux (Red Hat Compatible Kernel based), Red Hat Enterprise Linux (RHEL), and SUSE Linux Enterprise Server hosts to support managing FC, FCoE, 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.

Before you begin

- Use the [Interoperability Matrix Tool](#) to verify that your Linux OS, host bus adapter (HBA), HBA firmware, HBA boot BIOS, and ONTAP version support SAN booting.
- Refer to the Veritas Support Portal (Product Matrix, Platform Lookup, and HCL Matrix) to verify the SAN boot configuration support and known issues.

Steps

1. [Create a SAN boot LUN and map it to the host.](#)
2. Enable SAN booting in the server BIOS for the ports to which the SAN boot LUN is mapped.

For information on how to enable the HBA BIOS, see your vendor-specific documentation.

3. Verify that the configuration was successful by rebooting the host and verifying that the OS is up and running.

Step 2: Install the Linux Host Utilities

NetApp strongly recommends [installing the Linux Host Utilities](#) to support ONTAP LUN management and assist technical support with gathering configuration data.



Installing the Linux Host Utilities doesn't change any host timeout settings on your Linux host.

Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host

Use Veritas Dynamic Multipathing (VxDMP) with Veritas Infoscale 9 to manage ONTAP LUNs.

To ensure that VxDMP is set up correctly for your host, you need to verify the VxDMP configuration and check the Array Support Library (ASL) and the Array Policy Module (APM) configuration. The ASL and APM packages for NetApp storage systems are installed during the Veritas software installation.



For heterogenous multipath environments, including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, refer to the Veritas Product Administration documentation for the configuration settings.

Before you begin

Ensure your configuration meets the system requirements. See the [Interoperability Matrix Tool](#) and the Veritas HCL Matrix.

Steps

1. Verify the ONTAP target array is attached to the VxDMP multipath:

```
vxdmpadm
```

Show example

```
#vxdmpadm listenclosure
ENCLR_NAME      ENCLR_TYPE      ENCLR_SNO      STATUS
ARRAY_TYPE      LUN_COUNT      FIRMWARE
=====
=====
info_asa0        Info_ASA        81KDT+YTg35P    CONNECTED
ALUA            20              9161
infoscal1        Infoscal        81Ocq?Z7hPzC    CONNECTED
ALUA            23              9181
# vxdmpadm getdmpnode
NAME            STATE            ENCLR-TYPE      PATHS    ENBL    DSBL    ENCLR-NAME
=====
infoscal1_22    ENABLED          Infoscal        4        4        4        0
infoscal1
```

2. Check the configuration of the ASL and APM packages. NetApp recommends that you use the latest supported packages listed on the Veritas support portal.

Show example ASL and APM configuration

```
# vxdmpadm list dmpnode dmpnodename=infoscail_22 | grep asl
asl                               = libvxnetapp.so

# vxddladm listversion |grep libvxnetapp.so
libvxnetapp.so                   vm-8.0.0-rev-1    8.0

# rpm -qa |grep VRTSaslapm
VRTSaslapm-9.0.3-RHEL9.x86_64
#vxddladm listsupport libname=libvxnetapp.so
ATTR_NAME    ATTR_VALUE
=====
LIBNAME       libvxnetapp.so
VID           NETAPP
PID           All
ARRAY_TYPE    ALUA, A/A
```

3. For optimum system configuration in storage failover operations, verify that you have the following Veritas VxDMP tunables:

Parameter	Setting
dmp_lun_retry_timeout	60
dmp_path_age	120
dmp_restore_interval	60

4. Set the DMP tunables to online:

```
# vxdmpadm settune dmp_tunable=value
```

5. Verify that the tunables settings are correct:

```
# vxdmpadm gettune
```

The following example shows the effective VxDMP tunables on a SAN host.

Show example

```
# vxddm adm gettune
```

Tunable	Current Value	Default Value
dmp_cache_open	on	on
dmp_daemon_count	10	10
dmp_delayq_interval	15	15
dmp_display_alua_states	on	on
dmp_fast_recovery	on	on
dmp_health_time	60	60
dmp_iostats_state	enabled	enabled
dmp_log_level	1	1
dmp_low_impact_probe	on	on
dmp_lun_retry_timeout	60	30
dmp_path_age	120	300
dmp_pathswitch_blks_shift	9	9
dmp_probe_idle_lun	on	on
dmp_probe_threshold	5	5
dmp_restore_cycles	10	10
dmp_restore_interval	60	300
dmp_restore_policy	check_disabled	check_disabled
dmp_restore_state	enabled	enabled
dmp_retry_count	5	5
dmp_scsi_timeout	20	20
dmp_sfg_threshold	1	1
dmp_stat_interval	1	1
dmp_monitor_ownership	on	on
dmp_monitor_fabric	on	on
dmp_native_support	off	off

6. Configure the protocol timeout values:

FC/FCoE

Use the default timeout values for FC and FCoE.

iSCSI

Set the `replacement_timeout` parameter value to 120.

The iSCSI `replacement_timeout` parameter controls how long the iSCSI layer should wait for a timed-out path or session to reestablish itself before failing any commands on it. NetApp recommends setting the value of `replacement_timeout` to 120 in the iSCSI configuration file.

```
# grep replacement_timeout /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 120
```

7. Verify the parameter settings and path status for your ONTAP LUNs:

In AFF, FAS, or ASA configurations, a single ONTAP LUN should not require more than four paths. More than four paths can cause problems during a storage failure.

The following examples show the correct parameter settings and path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

ASA configuration

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

Show example

```
# vxddmpadm getsubpaths dmpnodename=infosc11_21
NAME      STATE[A]      PATH-TYPE[M] CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME      ATTRS    PRIORITY
=====
=====
sdby      ENABLED(A)    Active/Optimized  c1      Infosc1     infosc11
-         -
sddx      ENABLED(A)    Active/Optimized  c2      Infosc1     infosc11
-         -
sdfe      ENABLED(A)    Active/Optimized  c1      Infosc1     infosc11
-         -
sdfo      ENABLED(A)    Active/Optimized  c2      Infosc1     infosc11
-         -
```

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 output for an ONTAP LUN with two Active/Optimized paths and two Active/Non-Optimized paths:

Show example

```
# vxddmpadm getsubpaths dmpnodename-sfrac0_47
NAME    STATE[A]    PATH-TYPE[M]    CTLR-NAME    ENCLR-TYPE    ENCLR-
NAME    ATTRS    PRIORITY
=====
=====
sdas    ENABLED      Active/Non-Optimized c13    SFRAC        sfrac0
-        -
sdb     ENABLED(A)   Active/Optimized    c14    SFRAC        sfrac0
-        -
sdcj    ENABLED(A)   Active/Optimized    c14    SFRAC        sfrac0
-        -
sdea    ENABLED      Active/Non-Optimized c14    SFRAC        sfrac0
-        -
```

Step 4: Known issues

There are no known issues.

What's next?

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

Configure Veritas Infoscale 8 for FC, FCoE, and iSCSI with ONTAP storage

The Linux Host Utilities software provides management and diagnostic tools for Linux hosts that are connected to ONTAP storage. Use the Linux Host Utilities with Veritas Infoscale 8 for Oracle Linux (Red Hat Compatible Kernel based), Red Hat Enterprise Linux (RHEL), and SUSE Linux Enterprise Server hosts to support managing FC, FCoE, and iSCSI protocol operations with ONTAP LUNs.

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- Refer to the Veritas Support Portal (Product Matrix, Platform Lookup, and HCL Matrix) to verify the SAN boot configuration support and known issues.

Steps

1. [Create a SAN boot LUN and map it to the host.](#)
2. Enable SAN booting in the server BIOS for the ports to which the SAN boot LUN is mapped.

For information on how to enable the HBA BIOS, see your vendor-specific documentation.

3. Verify that the configuration was successful by rebooting the host and verifying that the OS is up and running.

Step 2: Install the Linux Host Utilities

NetApp strongly recommends [installing the Linux Host Utilities](#) to support ONTAP LUN management and assist technical support with gathering configuration data.



Installing the Linux Host Utilities doesn't change any host timeout settings on your Linux host.

Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host

Use Veritas Dynamic Multipathing (VxDMP) with Veritas Infoscale 8 to manage ONTAP LUNs.

To ensure that VxDMP is set up correctly for your host, you need to verify the VxDMP configuration and check the Array Support Library (ASL) and the Array Policy Module (APM) configuration. The ASL and APM packages for NetApp storage systems are installed during the Veritas software installation.



For heterogenous multipath environments, including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, refer to the Veritas Product Administration documentation for the configuration settings.

Before you begin

Ensure that your configuration meets the system requirements. See the [Interoperability Matrix Tool](#) and the Veritas HCL Matrix.

Steps

1. Verify the ONTAP target array is attached to the VxDMP multipath:

```
vxddmpadm
```

Show example

```
# vxdmpadm listenclosure
ENCLR_NAME    ENCLR_TYPE  ENCLR_SNO      STATUS      ARRAY_TYPE
LUN_COUNT     FIRMWARE
=====
=====
sfrac0        SFRAC        804Xw$PqE52h  CONNECTED   ALUA        43
9800
# vxdmpadm getdmpnode
NAME          STATE      ENCLR-TYPE    PATHS    ENBL    DSBL  ENCLR-NAME
=====
sfrac0_47    ENABLED   SFRAC         4        4        0    sfrac0
```

2. Check the configuration of the ASL and APM packages. NetApp recommends that you use the latest supported packages listed on the Veritas support portal.

Show example ASL and APM configuration

```
# vxdmpadm list dmpnode dmpnodename=sfrac0_47 | grep asl
asl          = libvxnetapp.so
# vxddladm listversion |grep libvxnetapp.so
libvxnetapp.so          vm-8.0.0-rev-1    8.0

# rpm -qa |grep VRTSaslapm
VRTSaslapm-x.x.x.0000-RHEL8.X86_64
vxddladm listsupport libname=libvxnetapp.so
ATTR_NAME    ATTR_VALUE
=====
LIBNAME       libvxnetapp.so
VID           NETAPP
PID           All
ARRAY_TYPE    ALUA, A/A
```

3. For optimum system configuration in storage failover operations, verify that you have the following Veritas VxDMP tunables:

Parameter	Setting
dmp_lun_retry_timeout	60
dmp_path_age	120
dmp_restore_interval	60

4. Set the DMP tunables to online:

```
# vxdmpadm settune dmp_tunable=value
```

5. Verify that the tunables settings are correct:

```
# vxdmpadm gettune
```

The following example shows the effective VxDMP tunables on a SAN host.

Show example

```
# vxdmpadm gettune
```

Tunable	Current Value	Default Value
dmp_cache_open	on	on
dmp_daemon_count	10	10
dmp_delayq_interval	15	15
dmp_display_alua_states	on	on
dmp_fast_recovery	on	on
dmp_health_time	60	60
dmp_iostats_state	enabled	enabled
dmp_log_level	1	1
dmp_low_impact_probe	on	on
dmp_lun_retry_timeout	60	30
dmp_path_age	120	300
dmp_pathswitch_blks_shift	9	9
dmp_probe_idle_lun	on	on
dmp_probe_threshold	5	5
dmp_restore_cycles	10	10
dmp_restore_interval	60	300
dmp_restore_policy	check_disabled	check_disabled
dmp_restore_state	enabled	enabled
dmp_retry_count	5	5
dmp_scsi_timeout	20	20
dmp_sfg_threshold	1	1
dmp_stat_interval	1	1
dmp_monitor_ownership	on	on
dmp_monitor_fabric	on	on
dmp_native_support	off	off

6. Configure the protocol timeout values:

FC/FCoE

Use the default timeout values for FC and FCoE.

iSCSI

Set the `replacement_timeout` parameter value to 120.

The iSCSI `replacement_timeout` parameter controls how long the iSCSI layer should wait for a timed-out path or session to reestablish itself before failing any commands on it. NetApp recommends setting the value of `replacement_timeout` to 120 in the iSCSI configuration file.

```
# grep replacement_timeout /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 120
```

7. Set the host "udev rport" values for RHEL 8 and 9 series hosts to support the Veritas Infoscale environment in storage failover scenarios.

Configure "udev rport" values by creating the file `/etc/udev/rules.d/40-rport.rules` with the following file content:

```
# cat /etc/udev/rules.d/40-rport.rules
KERNEL=="rport-*", SUBSYSTEM=="fc_remote_ports", ACTION=="add",
RUN+="/bin/sh -c 'echo 20 >
/sys/class/fc_remote_ports/%k/fast_io_fail_tmo;echo 864000
>/sys/class/fc_remote_ports/%k/dev_loss_tmo'"
```



Refer to the standard Veritas Infoscale product documentation for all other settings specific to Veritas.

8. Verify the parameter settings and path status for your ONTAP LUNs:

In AFF, FAS, or ASA configurations, a single ONTAP LUN should not require more than four paths. More than four paths can cause problems during a storage failure.

The following examples show the correct parameter settings and path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

ASA configuration

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

Show example

```
# vxddmpadm getsubpaths dmpnodename-sfrac0_47
NAME  STATE[A]  PATH-TYPE[M]  CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME  ATTRS    PRIORITY
=====
=====
sdas  ENABLED (A)  Active/Optimized c13  SFRAC      sfrac0
-      -
sdb   ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdcj  ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdea  ENABLED (A)  Active/Optimized c14  SFRAC      sfrac0
-      -
```

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 output for an ONTAP LUN with two Active/Optimized paths and two Active/Non-Optimized paths:

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NAME    STATE[A]    PATH-TYPE[M]    CTLR-NAME    ENCLR-TYPE    ENCLR-
NAME    ATTRS    PRIORITY
=====
=====
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-       -
sdb     ENABLED(A)   Active/Optimized    c14    SFRAC        sfrac0
-       -
sdcj    ENABLED(A)   Active/Optimized    c14    SFRAC        sfrac0
-       -
sdea    ENABLED      Active/Non-Optimized c14    SFRAC        sfrac0
-       -
```

Step 4: Known issues

There are no known issues.

What's next?

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

Configure Veritas Infoscale 7 for FC, FCoE, and iSCSI with ONTAP storage

The Linux Host Utilities software provides management and diagnostic tools for Linux hosts that are connected to ONTAP storage. Use the Linux Host Utilities with Veritas Infoscale 7 for Oracle Linux (Red Hat Compatible Kernel based), Red Hat Enterprise Linux (RHEL), and SUSE Linux Enterprise Server hosts to support managing FC, FCoE, 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.

Before you begin

- Use the [Interoperability Matrix Tool](#) to verify that your Linux OS, host bus adapter (HBA), HBA firmware, HBA boot BIOS, and ONTAP version support SAN booting.
- Refer to the Veritas Support Portal (Product Matrix, Platform Lookup, and HCL Matrix) to verify the SAN boot configuration support and known issues.

Steps

1. [Create a SAN boot LUN and map it to the host.](#)
2. Enable SAN booting in the server BIOS for the ports to which the SAN boot LUN is mapped.

For information on how to enable the HBA BIOS, see your vendor-specific documentation.

3. Verify that the configuration was successful by rebooting the host and verifying that the OS is up and running.

Step 2: Install the Linux Host Utilities

NetApp strongly recommends [installing the Linux Host Utilities](#) to support ONTAP LUN management and assist technical support with gathering configuration data.



Installing the Linux Host Utilities doesn't change any host timeout settings on your Linux host.

Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host

Use Veritas Dynamic Multipathing (VxDMP) with Veritas Infoscale 7 to manage ONTAP LUNs.

To ensure that VxDMP is set up correctly for your host, you need to verify the VxDMP configuration and check the Array Support Library (ASL) and the Array Policy Module (APM) configuration. The ASL and APM packages for NetApp storage systems are installed during the Veritas software installation.



For heterogenous multipath environments, including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, refer to the Veritas Product Administration documentation for the configuration settings.

Before you begin

Ensure that your configuration meets the system requirements. See the [Interoperability Matrix Tool](#) and the Veritas HCL Matrix.

Steps

1. Verify the ONTAP target array is attached to the VxDMP multipath:

```
vxddmpadm
```


Show example

```
# vxdmpadm listenclosure
ENCLR_NAME    ENCLR_TYPE  ENCLR_SNO      STATUS      ARRAY_TYPE
LUN_COUNT     FIRMWARE
=====
=====
sfrac0        SFRAC        804Xw$PqE52h  CONNECTED   ALUA        43
9800
# vxdmpadm getdmpnode
NAME          STATE      ENCLR-TYPE    PATHS    ENBL    DSBL  ENCLR-NAME
=====
sfrac0_47    ENABLED    SFRAC         4        4        0    sfrac0
```

2. Check the configuration of the ASL and APM packages. NetApp recommends that you use the latest supported packages listed on the Veritas support portal.

Show example ASL and APM configuration

```
# vxdmpadm list dmpnode dmpnodename=sfrac0_47 | grep asl
asl          = libvxnetapp.so
# vxddladm listversion |grep libvxnetapp.so
libvxnetapp.so          vm-8.0.0-rev-1    8.0

# rpm -qa |grep VRTSaslapm
VRTSaslapm-x.x.x.0000-RHEL8.X86_64
vxddladm listsupport libname=libvxnetapp.so
ATTR_NAME    ATTR_VALUE
=====
LIBNAME       libvxnetapp.so
VID           NETAPP
PID           All
ARRAY_TYPE    ALUA, A/A
```

3. For optimum system configuration in storage failover operations, verify that you have the following Veritas VxDMP tunables:

Parameter	Setting
dmp_lun_retry_timeout	60
dmp_path_age	120
dmp_restore_interval	60

4. Set the DMP tunables to online:

```
# vxdmpadm settune dmp_tunable=value
```

5. Verify that the tunables settings are correct:

```
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```

The following example shows the effective VxDMP tunables on a SAN host.

Show example

```
# vxdmpadm gettune
```

Tunable	Current Value	Default Value
dmp_cache_open	on	on
dmp_daemon_count	10	10
dmp_delayq_interval	15	15
dmp_display_alua_states	on	on
dmp_fast_recovery	on	on
dmp_health_time	60	60
dmp_iostats_state	enabled	enabled
dmp_log_level	1	1
dmp_low_impact_probe	on	on
dmp_lun_retry_timeout	60	30
dmp_path_age	120	300
dmp_pathswitch_blks_shift	9	9
dmp_probe_idle_lun	on	on
dmp_probe_threshold	5	5
dmp_restore_cycles	10	10
dmp_restore_interval	60	300
dmp_restore_policy	check_disabled	check_disabled
dmp_restore_state	enabled	enabled
dmp_retry_count	5	5
dmp_scsi_timeout	20	20
dmp_sfg_threshold	1	1
dmp_stat_interval	1	1
dmp_monitor_ownership	on	on
dmp_monitor_fabric	on	on
dmp_native_support	off	off

6. Configure the protocol timeout values:

FC/FCoE

Use the default timeout values for FC and FCoE.

iSCSI

Set the `replacement_timeout` parameter value to 120.

The iSCSI `replacement_timeout` parameter controls how long the iSCSI layer should wait for a timed-out path or session to reestablish itself before failing any commands on it. NetApp recommends setting the value of `replacement_timeout` to 120 in the iSCSI configuration file.

```
# grep replacement_timeout /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 120
```

7. Set the host "udev rport" values for RHEL 8 and 9 series hosts to support the Veritas Infoscale environment in storage failover scenarios.

Configure "udev rport" values by creating the file `/etc/udev/rules.d/40-rport.rules` with the following file content:

```
# cat /etc/udev/rules.d/40-rport.rules
KERNEL=="rport-*", SUBSYSTEM=="fc_remote_ports", ACTION=="add",
RUN+="/bin/sh -c 'echo 20 >
/sys/class/fc_remote_ports/%k/fast_io_fail_tmo;echo 864000
>/sys/class/fc_remote_ports/%k/dev_loss_tmo'"
```



Refer to the standard Veritas Infoscale product documentation for all other settings specific to Veritas.

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Show example

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=====
=====
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-      -
sdb   ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdcj  ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdea  ENABLED (A)  Active/Optimized c14  SFRAC      sfrac0
-      -
```

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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```
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NAME  STATE[A]  PATH-TYPE[M]  CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME  ATTRS    PRIORITY
=====
=====
sdas   ENABLED    Active/Non-Optimized c13   SFRAC      sfrac0
-      -
sdb    ENABLED(A) Active/Optimized    c14   SFRAC      sfrac0
-      -
sdcj   ENABLED(A) Active/Optimized    c14   SFRAC      sfrac0
-      -
sdea   ENABLED    Active/Non-Optimized c14   SFRAC      sfrac0
-      -
```

Step 4: Known issues

There are no known issues.

What's next?

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

Configure Veritas Infoscale 6 for FC, FCoE, and iSCSI with ONTAP storage

The Linux Host Utilities software provides management and diagnostic tools for Linux hosts that are connected to ONTAP storage. Use the Linux Host Utilities with Veritas Infoscale 6 for Oracle Linux (Red Hat Compatible Kernel based), Red Hat Enterprise Linux (RHEL), and SUSE Linux Enterprise Server hosts to support managing FC, FCoE, 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.

Before you begin

- Use the [Interoperability Matrix Tool](#) to verify that your Linux OS, host bus adapter (HBA), HBA firmware, HBA boot BIOS, and ONTAP version support SAN booting.
- Refer to the Veritas Support Portal (Product Matrix, Platform Lookup, and HCL Matrix) to verify the SAN boot configuration support and known issues.

Steps

1. [Create a SAN boot LUN and map it to the host.](#)
2. Enable SAN booting in the server BIOS for the ports to which the SAN boot LUN is mapped.

For information on how to enable the HBA BIOS, see your vendor-specific documentation.

3. Verify that the configuration was successful by rebooting the host and verifying that the OS is up and running.

Step 2: Install the Linux Host Utilities

NetApp strongly recommends [installing the Linux Host Utilities](#) to support ONTAP LUN management and assist technical support with gathering configuration data.



Installing the Linux Host Utilities doesn't change any host timeout settings on your Linux host.

Step 3: Confirm the Veritas Dynamic Multipathing configuration for your host

Use Veritas Dynamic Multipathing (VxDMP) with Veritas Infoscale 6 to manage ONTAP LUNs.

To ensure that VxDMP is set up correctly for your host, you need to verify the VxDMP configuration and check the Array Support Library (ASL) and the Array Policy Module (APM) configuration. The ASL and APM packages for NetApp storage systems are installed during the Veritas software installation.



For heterogenous multipath environments, including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, refer to the Veritas Product Administration documentation for the configuration settings.

Before you begin

Ensure that your configuration meets the system requirements. See the [Interoperability Matrix Tool](#) and the Veritas HCL Matrix.

Steps

1. Verify the ONTAP target array is attached to the VxDMP multipath:

```
vxddmpadm
```

Show example

```
# vxdmpadm listenclosure
ENCLR_NAME    ENCLR_TYPE  ENCLR_SNO      STATUS      ARRAY_TYPE
LUN_COUNT     FIRMWARE
=====
=====
sfrac0        SFRAC        804Xw$PqE52h  CONNECTED   ALUA        43
9800
# vxdmpadm getdmpnode
NAME          STATE      ENCLR-TYPE    PATHS    ENBL    DSBL  ENCLR-NAME
=====
sfrac0_47    ENABLED    SFRAC         4        4        0    sfrac0
```

2. Check the configuration of the ASL and APM packages. NetApp recommends that you use the latest supported packages listed on the Veritas support portal.

Show example ASL and APM configuration

```
# vxdmpadm list dmpnode dmpnodename=sfrac0_47 | grep asl
asl          = libvxnetapp.so
# vxddladm listversion |grep libvxnetapp.so
libvxnetapp.so          vm-8.0.0-rev-1    8.0

# rpm -qa |grep VRTSaslapm
VRTSaslapm-x.x.x.0000-RHEL8.X86_64
vxddladm listsupport libname=libvxnetapp.so
ATTR_NAME    ATTR_VALUE
=====
LIBNAME       libvxnetapp.so
VID           NETAPP
PID           All
ARRAY_TYPE    ALUA, A/A
```

3. For optimum system configuration in storage failover operations, verify that you have the following Veritas VxDMP tunables:

Parameter	Setting
dmp_lun_retry_timeout	60
dmp_path_age	120
dmp_restore_interval	60

4. Set the DMP tunables to online:

```
# vxdmpadm settune dmp_tunable=value
```

5. Verify that the tunables settings are correct:

```
# vxdmpadm gettune
```

The following example shows the effective VxDMP tunables on a SAN host.

Show example

```
# vxdmpadm gettune
```

Tunable	Current Value	Default Value
dmp_cache_open	on	on
dmp_daemon_count	10	10
dmp_delayq_interval	15	15
dmp_display_alua_states	on	on
dmp_fast_recovery	on	on
dmp_health_time	60	60
dmp_iostats_state	enabled	enabled
dmp_log_level	1	1
dmp_low_impact_probe	on	on
dmp_lun_retry_timeout	60	30
dmp_path_age	120	300
dmp_pathswitch_blks_shift	9	9
dmp_probe_idle_lun	on	on
dmp_probe_threshold	5	5
dmp_restore_cycles	10	10
dmp_restore_interval	60	300
dmp_restore_policy	check_disabled	check_disabled
dmp_restore_state	enabled	enabled
dmp_retry_count	5	5
dmp_scsi_timeout	20	20
dmp_sfg_threshold	1	1
dmp_stat_interval	1	1
dmp_monitor_ownership	on	on
dmp_monitor_fabric	on	on
dmp_native_support	off	off

6. Configure the protocol timeout values:

FC/FCoE

Use the default timeout values for FC and FCoE.

iSCSI

Set the `replacement_timeout` parameter value to 120.

The iSCSI `replacement_timeout` parameter controls how long the iSCSI layer should wait for a timed-out path or session to reestablish itself before failing any commands on it. NetApp recommends setting the value of `replacement_timeout` to 120 in the iSCSI configuration file.

```
# grep replacement_timeout /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 120
```

7. Set the host "udev rport" values for RHEL 8 and 9 series hosts to support the Veritas Infoscale environment in storage failover scenarios.

Configure "udev rport" values by creating the file `/etc/udev/rules.d/40-rport.rules` with the following file content:

```
# cat /etc/udev/rules.d/40-rport.rules
KERNEL=="rport-*", SUBSYSTEM=="fc_remote_ports", ACTION=="add",
RUN+="/bin/sh -c 'echo 20 >
/sys/class/fc_remote_ports/%k/fast_io_fail_tmo;echo 864000
>/sys/class/fc_remote_ports/%k/dev_loss_tmo'"
```



Refer to the standard Veritas Infoscale product documentation for all other settings specific to Veritas.

8. Verify the parameter settings and path status for your ONTAP LUNs:

In AFF, FAS, or ASA configurations, a single ONTAP LUN should not require more than four paths. More than four paths can cause problems during a storage failure.

The following examples show the correct parameter settings and path status for ONTAP LUNs in an ASA, AFF, or FAS configuration.

ASA configuration

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

Show example

```
# vxddmpadm getsubpaths dmpnodename-sfrac0_47
NAME  STATE[A]  PATH-TYPE[M]  CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME  ATTRS    PRIORITY
=====
=====
sdas  ENABLED (A)  Active/Optimized c13  SFRAC      sfrac0
-      -
sdb   ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdcj  ENABLED (A)  Active/Optimized  c14  SFRAC      sfrac0
-      -
sdea  ENABLED (A)  Active/Optimized c14  SFRAC      sfrac0
-      -
```

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 output for an ONTAP LUN with two Active/Optimized paths and two Active/Non-Optimized paths:

Show example

```
# vxddmpadm getsubpaths dmpnodename-sfrac0_47
NAME  STATE[A]  PATH-TYPE[M]  CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME  ATTRS    PRIORITY
=====
=====
sdas  ENABLED    Active/Non-Optimized c13  SFRAC      sfrac0
-      -
sdb   ENABLED(A) Active/Optimized    c14  SFRAC      sfrac0
-      -
sdcj  ENABLED(A) Active/Optimized    c14  SFRAC      sfrac0
-      -
sdea  ENABLED    Active/Non-Optimized c14  SFRAC      sfrac0
-      -
```

Step 4: Known issues

There are no known issues.

What's next?

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

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