Veritas

ONTAP SAN Host Utilities

NetApp
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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     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=infoscal1_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

```
# 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. 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

```
# vxdmpadm getsubpaths dmpnodename=infoscal1_21
NAME   STATE[A]    PATH-TYPE[M] CTLR-NAME  ENCLR-TYPE  ENCLR-
NAME   ATTRS  PRIORITY
=============================================================
==================
sdby   ENABLED(A)  Active/Optimized  c1    Infoscal    infoscal1
-      -
sddx   ENABLED(A)  Active/Optimized  c2    Infoscal    infoscal1
-      -
sdfe   ENABLED(A)  Active/Optimized  c1    Infoscal    infoscal1
-      -
sdfo   ENABLED(A)  Active/Optimized  c2    Infoscal    infoscal1
-      -
```

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

```
# vxdmpadm 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.

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 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:

```
vxdmpadm
```

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

```
# vxdmpadm 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

```
# vxdmpadm 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 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:

```
vxdmpadm
```

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.

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# 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",
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/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

```
# vxdmpadm 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

```
# vxdmpadm 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 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:

```
vxdmpadm
```

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

```
# vxdmpadm 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

```
# vxdmpadm 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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