Veritas

SAN hosts and cloud clients

NetApp
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Veritas

Use Veritas Infoscale 8 for Linux with ONTAP

You can use ONTAP SAN host configuration settings for the Veritas Infoscale storage foundation 8 series release for Red Hat Enterprise Linux and Oracle Linux (RHCK based) platforms with FC, FCoE, and iSCSI protocols.

Install the Linux Unified Host Utilities

The NetApp Linux Unified Host Utilities software package is available on the NetApp Support Site in a 64-bit .rpm file.

NetApp strongly recommends installing the Linux Unified Host Utilities, but it is not mandatory. The utilities do not change any settings on your Linux host. The utilities improve management and assist NetApp customer support in gathering information about your configuration.

What you'll need

If you have a version of Linux Unified Host Utilities currently installed, you should upgrade or remove it, and then use the following steps to install the latest version.

Steps

1. Download the 64-bit Linux Unified Host Utilities software package from the NetApp Support Site to your host.
2. Install the software package:

   ```
   rpm -ivh netapp_linux_unified_host_utilities-7-1.x86_64
   ```

SAN Toolkit

The tool kit is installed automatically when you install the NetApp Host Utilities package. This kit provides the `sanlun` utility, which helps you manage LUNs and HBAs. The `sanlun` command returns information about the LUNs mapped to your host, multipathing, and information necessary to create initiator groups.

Example

In the following illustration, the `sanlun show` command returns LUN information.

```
# sanlun show -p -v SFRAC:/vol/fen1/lun1

              ONTAP Path: SFRAC:/vol/fen1/lun1
                     LUN: 0
                LUN Size: 10g
                 Product: cDOT
                DMP NODE: sfrac0_47
      Multipath Provider: Veritas
----------  ------  ---------  ------
-------------------------------------
Veritas     host    vserver    host:
path        path    path     /dev/   chan:     vserver           major:
state       state   type     node    id:lun    LIF                   minor
----------  ------  ---------  ------
-------------------------------------
enabled     up      active/non-optimized sdea   14:0:1:0   lif_10
128:32
enabled (a) up      active/optimized     sdcj   14:0:0:0   lif_2
69:112
enabled (a) up      active/optimized     sdb    13:0:0:0   lif_1
8:16
enabled     up      active/non-optimized sdas   13:0:1:0   lif_9
66:192
```

SAN Booting

What you'll need

If you decide to use SAN booting, it must be supported by your configuration. You can use the NetApp Interoperability Matrix Tool to verify that your OS, HBA, HBA firmware and the HBA boot BIOS, and ONTAP version are supported.

Refer to Veritas Support Portal (Product Matrix, Platform Lookup, HCL Matrix) to verify SAN Boot configuration supportability and known caveats.

Steps

1. Map the SAN boot LUN to the host.
2. Verify that multiple paths are available.

   Multiple paths become available after the host OS is up and running on the paths.

3. 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.

4. Reboot the host to verify that the boot is successful.

Multipathing

You must verify that your configuration meets the system requirements. For more information, see the NetApp Interoperability Matrix Tool and the Veritas HCL Matrix.

Example

In this example, the `vxdmpadm` command is used to verify that the VxDMP Multipath has the ONTAP target array attached.

```
# 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
```

With Veritas Dynamic Multipathing (VxDMP), you must perform configuration tasks to claim NetApp LUNs as Veritas Multipath Devices. You must have the Array Support Library (ASL) and the Array Policy Module (APM) packages installed that Veritas provides for NetApp storage systems. While the Veritas Software Installation loads the default ASL APM packages along with the product, it is recommended to use the latest supported packages listed on Veritas support portal.

Example

The following example displays the Veritas Support Library (ASL) and the Array Policy Module (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
```

All SAN Array Configuration

In All SAN Array (ASA) configurations, all paths to a given Logical Unit (LUN) are active and optimized. This means I/O can be served through all paths at the same time, thereby enabling better performance.

Example

The following example displays the correct output for an ONTAP LUN:

```
# 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     -
```

Do not use an excessive number of paths to a single LUN. No more than 4 paths should be required. More than 8 paths might cause path issues during storage failures.

Non-ASA Configuration

For non-ASA configuration there should be two groups of paths with different priorities. The paths with the higher priorities are Active/Optimized, meaning they are serviced by the controller where the aggregate is located. The paths with the lower priorities are active but are non-optimized because they are served from a different controller. The non-optimized paths are only used when no optimized paths are available.

Example

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

```
# 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     -
-
```

Do not use an excessive number of paths to a single LUN. No more than 4 paths should be required. More than 8 paths might cause path issues during storage failures.

Recommended Settings

Settings for Veritas Multipath

The following Veritas VxDMP tunables are recommended by NetApp for optimum system configuration in storage failover operations.

Parameter	Setting
dmp_lun_retry_timeout	60
dmp_path_age	120
dmp_restore_interval	60

DMP tunables are set online by using the `vxdmpadm` command as follows:

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

The values of these tunable can be verified dynamically by using `#vxdmpadm gettune`.

Example

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

```
# 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
```

Settings by protocol

- For FC/FCoE only: Use the default timeout values.
- For iSCSI only: 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. Setting the value of `replacement_timeout` to 120 in the iSCSI configuration file is recommended.

Example

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

Settings by OS platforms

For Red Hat Enterprise Linux 7 and 8 series, you must configure `udev rport` values to support the Veritas Infoscale environment in storage failover scenarios. Create 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'"
```

> For all other settings specific to Veritas, refer to the standard Veritas Infoscale product documentation.

Multipath Coexistence

If you have a heterogenous multipath environment including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, please refer to the Veritas Product Administration guide for configuration settings.

Known issues

There are no known issues for the Veritas Infoscale 8 for Linux with ONTAP release.

Use Veritas Infoscale 7 for Linux with ONTAP

You can use ONTAP SAN host configuration settings for the Veritas Infoscale storage foundation 7 series release for Red Hat Enterprise Linux & Oracle Linux (RHCK based) platforms with FC, FCoE and iSCSI protocols.

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The NetApp Linux Unified Host Utilities software package is available on the NetApp Support Site in a 64-bit .rpm file.

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1. Download the 64-bit Linux Unified Host Utilities software package from the NetApp Support Site to your host.
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              ONTAP Path: SFRAC:/vol/fen1/lun1
                     LUN: 0
                LUN Size: 10g
                 Product: cDOT
                DMP NODE: sfrac0_47
      Multipath Provider: Veritas
----------  ------  ---------  ------
-------------------------------------
Veritas     host    vserver    host:
path        path    path     /dev/   chan:     vserver           major:
state       state   type     node    id:lun    LIF                   minor
----------  ------  ---------  ------
-------------------------------------
enabled     up      active/non-optimized sdea   14:0:1:0   lif_10
128:32
enabled (a) up      active/optimized     sdcj   14:0:0:0   lif_2
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enabled (a) up      active/optimized     sdb    13:0:0:0   lif_1
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sdcj  ENABLED(A)  Active/Optimized     c14   SFRAC       sfrac0     -
-
sdea  ENABLED (A)    Active/Optimized c14   SFRAC       sfrac0     -
```

> Do not use an excessive number of paths to a single LUN. No more than 4 paths should be required. More than 8 paths might cause path issues during storage failures.

Non-ASA configurations

For non-ASA configurations, there should be two groups of paths with different priorities. The paths with the higher priorities are Active/Optimized, meaning they are serviced by the controller where the aggregate is located. The paths with the lower priorities are active but are non-optimized because they are served from a different controller. The non-optimized paths are only used when no optimized paths are available.

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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     -
-
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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
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Settings by protocol

- For FC/FCoE only: Use the default timeout values.
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  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. Setting the value of `replacement_timeout` to 120 in the iSCSI configuration file is recommended.

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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'"
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For all other settings specific to Veritas, refer to the standard Veritas Infoscale product documentation.

Multipath Coexistence

If you have a heterogenous multipath environment including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, please refer to the Veritas Product Administration guide for configuration settings.

Known issues

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Use Veritas Storage Foundation 6 for Linux with ONTAP

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                LUN Size: 10g
                 Product: cDOT
                DMP NODE: sfrac0_47
      Multipath Provider: Veritas
----------  ------  ---------  ------
-------------------------------------
Veritas     host    vserver    host:
path        path    path     /dev/   chan:     vserver           major:
state       state   type     node    id:lun    LIF                   minor
----------  ------  ---------  ------
-------------------------------------
enabled     up      active/non-optimized sdea   14:0:1:0   lif_10
128:32
enabled (a) up      active/optimized     sdcj   14:0:0:0   lif_2
69:112
enabled (a) up      active/optimized     sdb    13:0:0:0   lif_1
8:16
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Steps

1. Map the SAN boot LUN to the host.
2. Verify that multiple paths are available.

Multiple paths become available after the host OS is up and running on the paths.

3. 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.

4. Reboot the host to verify that the boot is successful.

Multipathing

You must verify that your configuration meets the system requirements. For more information, see the NetApp Interoperability Matrix Tool and the Veritas HCL Matrix.

Example

In this example, the `vxdmpadm` command is used to verify that the VxDMP Multipath has the ONTAP target array attached.

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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
```

With Veritas Dynamic Multipathing (VxDMP), you must perform configuration tasks to claim NetApp LUNs as Veritas Multipath Devices. You must have the Array Support Library (ASL) and the Array Policy Module (APM) packages installed that Veritas provides for NetApp storage systems. While the Veritas Software Installation loads the default ASL APM packages along with the product, it is recommended to use the latest supported packages listed on Veritas support portal.

Example

The following example displays the Veritas Support Library (ASL) and the Array Policy Module (APM) configuration.

```
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asl        = libvxnetapp.so
```

```
# vxddladm listversion |grep libvxnetapp.so
libvxnetapp.so              vm-7.4-rev-1    6.1

# 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
```

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For non-ASA configurations, there should be two groups of paths with different priorities. The paths with the higher priorities are Active/Optimized, meaning they are serviced by the controller where the aggregate is located. The paths with the lower priorities are active but are non-optimized because they are served from a different controller. The non-optimized paths are only used when no optimized paths are available.

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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     Active/Non-Optimized c14   SFRAC       sfrac0     -
-
```

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The values of these tunable can be verified dynamically by using `#vxdmpadm gettune`.

Example

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

```
# 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
```

Settings by protocol

- For FC/FCoE only: Use the default timeout values.
- For iSCSI only: 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. Setting the value of `replacement_timeout` to 120 in the iSCSI configuration file is recommended.

Example

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

Settings by OS platforms

For Red Hat Enterprise Linux 7 and 8 series, you must configure `udev rport` values to support the Veritas Infoscale environment in storage failover scenarios. Create 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'"
```

For all other settings specific to Veritas, refer to the standard Veritas Infoscale product documentation.

Multipath Coexistence

If you have a heterogenous multipath environment including Veritas Infoscale, Linux Native Device Mapper, and LVM volume manager, please refer to the Veritas Product Administration guide for configuration settings.

Known issues

There are no known issues for the Veritas Storage Foundation 6 for Linux with ONTAP release.