



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 `vxddmpadm` command is used to verify that the VxDMP Multipath has the ONTAP target array attached.

```
# vxddmpadm listenclosure
ENCLR_NAME    ENCLR_TYPE  ENCLR_SNO      STATUS      ARRAY_TYPE    LUN_COUNT
FIRMWARE
=====
=====
sfrac0        SFRAC       804Xw$PqE52h  CONNECTED   ALUA          43
9800
# vxddmpadm 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.

```
# vxddmpadm 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:

```
# 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        -
```



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:

```
# vxddpdm 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 `vxddpdm` command as follows:

```
# vxddpdm settune dmp_tunable=value
```

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

Install the Linux Unified Host Utilities

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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      vservers  host:
path         path      path      /dev/   chan:    vservers      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.

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1. Map the SAN boot LUN to the host.
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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.

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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
```

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

```
# vxddladm list dmpnode dmpnodename=sfrac0_47 | grep asl
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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Example

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

```
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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 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.

Example

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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        -
-
```



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

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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.

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```
# grep replacement_timeout /etc/iscsi/iscsid.conf
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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:

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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 7 for Linux with ONTAP release.

Use Veritas Storage Foundation 6 for Linux with ONTAP

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      LUN: 0
      LUN Size: 10g
      Product: cDOT
      DMP NODE: sfrac0_47
      Multipath Provider: Veritas
-----
Veritas      host      vservers      host:
path         path         path         /dev/      chan:      vservers      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

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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.

```
# 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-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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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        -
-
```



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dmp_path_age	120
dmp_restore_interval	60

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

```
# vxddmpadm settune dmp_tunable=value
```

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

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