



Recommended Host Settings for Linux Host Utilities 6.0

Recommendations for the host settings

NetApp recommends that you use certain values for host parameters when you run the Linux Host Utilities. These recommendations are based on research, working with Linux providers such as Red Hat and SUSE, and internal testing done at NetApp. The recommended values may differ depending on your system environment and the version of the operating system that you are using.

Before you set up the Linux Host Utilities, it is a good practice to check the following information:

- ◆ The *Linux Host Utilities Release Notes*, which are online on the NetApp Support Site, to see if there are any changes to these recommendations.
- ◆ The Interoperability Matrix, which is online at support.netapp.com/NOW/products/interoperability, to verify that the Host Utilities support your system setup.
- ◆ The *Linux Host Utilities Installation and Administration Guide* which is online on the NetApp Support Site, for information about setting up and using the Host Utilities.

For detailed information on the DM-Multipath parameters, see the Red Hat documentation on the multipath.conf file. At the time this document was prepared, that information was available at

http://docs.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/6/html/DM_Multipath/config_file_defaults.html

This information on the multipath.conf parameters applies to both Red Hat Enterprise Linux and SUSE Linux.

Examples of multipath.conf files are included in the *Linux Host Utilities Installation and Setup Guide* and the *Linux Host Utilities Quick Start Guide*.

Red Hat Enterprise Linux: Recommended default settings for DM-Multipath

The table that follows lists the recommended settings for the default section of the DM-Multipath multipath.conf file on hosts running Red Hat Enterprise Linux. In most cases, the Red Hat settings also apply to Oracle Linux.

Note

Keep in mind that the parameters and values you supply for the multipath.conf default parameters override the values that you supply for the device parameters.

Red Hat Enterprise Linux DM-Multipath recommended default parameters		
Parameter	Value	Recommendation
<code>flush_on_last_del</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 update 3 or later ◆ RHEL 4 update 7 and later	yes	Set this value to yes. The default value is no.
<code>max_fds</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5.2 and later ◆ RHEL 4 update 7 and later	max	Set this value to max.
<code>pg_prio_calc</code> Supported Red Hat versions: ◆ RHEL 5 update 6 or later	avg	Set this value to avg. Note _____ This parameter is not supported with Red Hat Enterprise Linux 6 series or 4 series.
<code>queue_without_daemon</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 update 3 or later	no	Set this value to no. The default value is yes. Note _____ This parameter is not supported with Red Hat Enterprise Linux 4 series.

Red Hat Enterprise Linux DM-Multipath recommended default parameters		
Parameter	Value	Recommendation
<code>user_friendly_names</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	no	Set this value to <code>no</code>. Entering <code>no</code> forces both the host and the target to use the WWID for naming the DM-Multipath devices, which ensures that the host and the target use a consistent attribute that persists across reboots and does not require a separate <code>mpath bindings</code> file for naming purposes. In addition, by setting this value to <code>no</code>, you avoid some of the problems that have been seen when <code>user_friendly_names</code> is set to <code>yes</code>. There have been several Red Hat bugzilla reports about these issues. Note Red Hat Enterprise Virtualization Hypervisor nodes require that you set this value to <code>no</code>.

**Red Hat Enterprise Linux:
Recommended device settings for DM-Multipath**

The table that follows lists the recommended settings for the devices section of the DM-Multipath `multipath.conf` file when you are running Red Hat Enterprise Linux. In most cases, the Red Hat settings also apply to Oracle Linux.

Red Hat Enterprise Linux DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
<code>failback</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	immediate	Set this value to <code>immediate</code>. Related parameters: <code>failback</code> also works with <code>path_grouping_policy</code>.

Red Hat Enterprise Linux DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
<code>features</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	<code>"1 queue_if_no_path"</code>	Set this value to <code>"1 queue_if_no_path"</code>. Related parameters: If you specify <code>path_no_retry</code> in the default section of the <code>multipath.conf</code> file, that value overrides the <code>features</code> value and could cause an operating system crash during a takeover/giveback procedure.
<code>getuid_callout</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	RHEL 6 series: <code>"/lib/udev/scsi_id -g -u -d /dev/%n"</code>	Red Hat Enterprise Linux 6 series: Set this value to <code>"/lib/udev/scsi_id -g -u -d /dev/%n"</code>. Red Hat Enterprise Linux 5 series and 4 series: Set this value to <code>"/sbin/scsi_id -g -u -s /block/%n"</code>.
<code>hardware_handler</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	ALUA environments (RHEL 6 series and 5 series): <code>"1 alua"</code>	Red Hat Enterprise Linux 6 series and 5 series: Set this value to <code>"1 alua"</code>. Red Hat Enterprise Linux 4 series: Set this value to <code>"0"</code>. Related parameters: This value works with the value for <code>prio</code> or <code>prio_callout</code>.
<code>path_checker</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5.1 and later ◆ RHEL 4.7 and later	<code>directio</code>	Set this value to <code>directio</code>, which is the default. Related parameters: If you are using Red Hat Enterprise Linux 5 or 4.6 and earlier, the value for this parameter is <code>readsector0</code>.

Red Hat Enterprise Linux DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
path_checker Supported Red Hat versions: ◆ RHEL 5 ◆ RHEL 4.6 and earlier	readsector0	Set this value to <code>readsector0</code> . Related parameters: If you are using Red Hat Enterprise Linux 6 series, 5.1 and later, or 4.7 and later, the value for this parameter is <code>directio</code> .
path_grouping_policy Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	group_by_prio	FC only: Set this value to <code>group_by_prio</code> . Related parameters: This value works with <code>failback</code> . If you are using the iSCSI protocol, see the next row for information on the value you should use.
path_grouping_policy Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5.4 and later ◆ RHEL 4.8 and later ◆ RHEL 5.3 and earlier ◆ RHEL 4.7 and earlier	RHEL 6 series, 5.4 and later, and 4.8 and later: <code>group_by_prio</code> RHEL 5.3 and earlier and 4.7 and earlier: <code>multibus</code>	iSCSI only with Red Hat Enterprise Linux 6 series, 5.4 and later, and 4.8 and later: Set this value to <code>group_by_prio</code> . iSCSI only with Red Hat Enterprise Linux 5.3 and earlier and 4.7 and earlier: Set this value to <code>multibus</code> . Related parameters: This value works with <code>failback</code> . If you are using the FC protocol, see the previous row for information on the value you should use.
path_selector Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	RHEL 6 series, 5 series, and 4 series: <code>"round-robin 0"</code> RHEL 6 series also supports: <code>"queue-length 0"</code> <code>"service-time 0"</code>	Set this value to <code>"round-robin 0"</code> . This is the recommended value for all versions of Red Hat Enterprise Linux that the Host Utilities support.

Red Hat Enterprise Linux DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
prio Supported Red Hat versions: ◆ RHEL 6 series	ALUA environments: "alua" Non-ALUA environments: "ontap"	The recommended value is "alua", which is the value required when you are using ALUA. Related parameters: This value works with <code>hardware_handler</code>. If you are using Red Hat Enterprise Linux 5 series or 4 series, see the next row.
prio_callout Supported Red Hat versions: ◆ RHEL 5.1 and later ◆ RHEL 5 series ◆ RHEL 4 series	ALUA environments: <code>"/sbin/mpath_prio_alua /dev/%n"</code> Non-ALUA environments: <code>"sbin/mpath_prio_ontap /dev/%n"</code>	Red Hat Enterprise Linux 5.1 and later: When ALUA is enabled, set this value to <code>"/sbin/mpath_prio_alua /dev/%n"</code>. Red Hat Enterprise Linux 5 series and 4 series: When ALUA is not enabled, set this value to <code>"sbin/mpath_prio_ontap /dev/%n"</code>. Related parameters: This value works with <code>hardware_handler</code>. If you are using Red Hat Enterprise Linux 6 series, see the previous row.
product Supported Red Hat versions: ◆ All	"LUN"	Set this value to "LUN".
rr_min_io Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	128	Set this value to 128. Note_____ If you are using Red Hat Enterprise Linux 4 update 7 or earlier, place <code>rr_min_io</code> in the default section of the <code>multipath.conf</code> file. _____

Red Hat Enterprise Linux DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
<code>rr_weight</code> Supported Red Hat versions: ◆ RHEL 6 series ◆ RHEL 5 series ◆ RHEL 4 series	uniform	Set this value to <code>uniform</code> .
<code>vendor</code> Supported Red Hat versions: ◆ All	"NETAPP"	This is required for the NetApp Host Utilities product.

SUSE Linux Enterprise Server: Recommended default settings for DM-Multipath

The table that follows lists the recommended settings for the default section of the DM-Multipath `multipath.conf` file on hosts running SUSE Linux Enterprise Server.

Note

Keep in mind that the parameters and values you supply for the `multipath.conf` default parameters override the values that you supply for the device parameters.

SUSE Linux Enterprise Server DM-Multipath recommended default parameters		
Parameter	Value	Recommendation
<code>flush_on_last_del</code> Supported SUSE versions: ◆ SLES 11 SP1 or later	yes	Set this value to <code>yes</code> . The default value is <code>no</code> .
<code>max_fds</code> Supported SUSE versions: ◆ SLES 11 SP1 ◆ SLES 10 SP4	max	SUSE Linux Enterprise Server 11 SP1 and 10 SP4: Set this value to <code>max</code> . Related parameters: If you are using SUSE Linux Enterprise Server 11 or 10 SP3 and earlier, see the next row.

SUSE Linux Enterprise Server DM-Multipath recommended default parameters		
Parameter	Value	Recommendation
<code>max_fds</code> Supported SUSE versions: ◆ SLES 11 ◆ SLES 10 SP3 and earlier	8192	SUSE Linux Enterprise Server 11 and 10 SP3 and earlier: Set this value to 8192. Related parameters: If you are using SUSE Linux Enterprise Server 11 SP1 or 10 SP4, see the previous row.
<code>user_friendly_names</code> Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	no	Setting this value to no. This is the default.

SUSE Linux Enterprise Server: Recommended device settings for DM-Multipath

The table that follows lists the recommended SUSE Linux Enterprise Server settings for the devices section of the DM-Multipath `multipath.conf` file.

SUSE Linux Enterprise Server DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
<code>failback</code> Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	immediate	Set this value to <code>immediate</code> . Related parameters: The value works with Path Group priorities.
<code>features</code> Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	"1 queue_if_no_path"	Set this value to "1 queue_if_no_path". Related parameters: If you specify <code>path_no_retry</code> in the default section of the <code>multipath.conf</code> file, that value overrides the <code>features</code> value and could cause an operating system crash during a takeover/giveback procedure.

SUSE Linux Enterprise Server DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
getuid_callout Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	SLES 11 series: "/lib/udev/scsi_id -g -u -d /dev/%n" SLES 10 series: "/sbin/scsi_id -g -u -s /block/%n"	SUSE Linux Enterprise Server 11 series: Set this value to "/lib/udev/scsi_id -g -u -d /dev/%n". SUSE Linux Enterprise Server 10 series: Set this value to "/sbin/scsi_id -g -u -s /block/%n".
hardware_handler Supported SUSE versions: ◆ SLES 11 SP1 ◆ SLES 10 with SP4 or later	ALUA environments: "1 alua" Non-ALUA environments: "0"	ALUA environments: If you use ALUA, set this value to "1 alua". Non-ALUA environments: If you are not using ALUA, set this value to "0" . Related parameters: This value works with prio or prio_callout.
path_checker Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 SP2 or later	tur	Set this value to tur.
path_grouping_policy Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	group_by_prio	FC only: Set this value to group_by_prio. Related parameters: This value works with failback. If you are using the iSCSI protocol, see the next row for information on the value you should use.

SUSE Linux Enterprise Server DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
<code>path_grouping_policy</code> Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 SP3 or later ◆ SLES 10 SP2 and earlier	SLES 11 series, 10 SP3 or later: <code>group_by_prio</code> SLES 10 SP2 and earlier: <code>multibus</code>	iSCSI only with SUSE Linux Enterprise Server 11 series and 10 SP3 or later: Set this value to <code>group_by_prio</code>. iSCSI only with SUSE Linux Enterprise Server 10 SP2 and earlier: Set this value to <code>multibus</code>. Related parameters: This value works with <code>failback</code>. If you are using the FC protocol, see the previous row for information on the value you should use.
<code>path_selector</code> Supported SUSE versions: ◆ SLES 11 SP1 or later	SUSE 11 and 10 series: <code>"round-robin 0"</code> SLES 11 SP1 series also supports: <code>"least-pending"</code> <code>"length-load-balancing"</code> <code>"service-time"</code>	Set this value to <code>"round-robin 0"</code>. This is the recommended value for all versions of SUSE Linux Enterprise Linux Server that the Host Utilities support.
<code>prio</code> Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 SP2 or later	ALUA environments: <code>"alua"</code> Non-ALUA environments: <code>"ontap"</code>	ALUA environments: If you use ALUA, set this value to <code>"alua"</code>. Non-ALUA environments: If you are not using ALUA, set this value to <code>"ontap"</code>. Related parameters: This value works with <code>hardware_handler</code>. If you are using SUSE Linux Enterprise Server 10 SP1 and earlier, see the next row.

SUSE Linux Enterprise Server DM-Multipath recommended device parameters		
Parameter	Value	Recommendation
prio_callout Supported SUSE versions: ◆ SLES 10 SP1 and earlier	Non-ALUA environments: "sbin/mpath_prio_ontap /dev/%n"	Non-ALUA environments: If you do not use ALUA, set this value to "sbin/mpath_prio_ontap /dev/%n". Related parameters: This value works with hardware_handler. If you are using SUSE Linux Enterprise Server 11 series or 10 SP2 or later, see the previous row.
product Supported SUSE versions: ◆ All	"LUN"	Set this value to "LUN".
rr_min_io Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	128	Set this value to 128.
rr_weight Supported SUSE versions: ◆ SLES 11 series ◆ SLES 10 series	uniform	Set this value to uniform.
vendor Supported SUSE versions: ◆ All	"NETAPP"	This is required for the NetApp Host Utilities product.

Time-out values when using DM-Multipath

FC only: If you are using the Fibre Channel protocol, use the default values.

iSCSI only: If you are using iSCSI, you must set the following time-out value in the iSCSI configuration file in order to use DM-Multipath.

```
node.session.timeo.replacement_timeout = 5
```

Red Hat Enterprise Linux 4: For systems running Red Hat Enterprise Linux 4, you must modify the `/etc/iscsi.conf` to uncomment `ConnFailTimeoutof` and give it a value of 5.

Recommendations for Veritas Storage Foundation settings

NetApp recommendations for Veritas values

When you run the Host Utilities with Veritas Volume Manager (VxVM) and Dynamic Multipathing (VxDMP), NetApp recommends that, in most cases, you use the values provided in the Veritas Release Notes. The exceptions listed below.

Note _____
Check the NetApp Interoperability Matrix, which is online at support.netapp.com/NOW/products/interoperability, to see which versions of Veritas Storage Foundation the Host Utilities support.

Based on testing done when the version of the Host Utilities was developed, NetApp recommends you set the following values when using Veritas Storage Foundation. Details on how to set these values are in the *Linux Host Utilities Installation and Administration Guide*.

Veritas Storage Foundation recommended settings	
Setting	Description
dmp_restore_interval=60	The Veritas DMP restore daemon interval is a tunable that specifies the number of seconds the restore daemon waits before checking the paths between the host and the storage system. The NetApp recommended value is 60 seconds. Testing has shown that you get a faster recovery by making the restore daemon poll more often. However, systems set to a longer polling interval take longer to detect path recoveries, which can impact storage system performance during a failover operation.
dmp_restore_policy=disabled	The restore daemon policy tunable specifies which paths the restore daemon checks when it polls the system. NetApp recommends that you set the value to <code>disabled</code>, which tells the daemon to check only the disabled paths.

Veritas Storage Foundation recommended settings	
Setting	Description
dmp_lun_retry_timeout=300	Set the VxDMP tunable dmp_lun_retry_timeout to 300. The tunable dmp_lun_retry_timeout tells VxDMP to continue retrying I/O requests to a LUN when all the paths to the disk have failed. When you set this tunable to 300, the VxDMP continues to retry paths to the LUN until either the I/O succeeds or 300 seconds have elapsed. Setting this value provides for faster recovery from temporary path failures.
Veritas Storage Foundation 5.1 SP1 and later: dmp_path_age=120	If you are using Veritas Storage Foundation 5.1 SP1, you must set the tunable dmp_path_age to 120. This setting helps minimize the path restoration window and maximize high availability of NetApp storage.
Timeout values for VxDMP	FC only: If you are using the Fibre Channel protocol, use the default timeout values. iSCSI only: If you are using iSCSI, you must set the following time-out value in the iSCSI configuration file in order to use VxDMP. <pre>node.session.timeo.replacement_timeout = 120</pre>
Red Hat Enterprise Linux 6 or later: Create the file /etc/udev/rules.d/40-rport.rules	If you are using Red Hat Enterprise Linux 6 or later, you must configure it to support Veritas Storage Foundation. At the time this document was prepared, you had to create the file /etc/udev/rules.d/40-rport.rules with the following content line: <pre>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'"</pre> For the latest information, check the Veritas Release Notes for SF5.1SP1PR2.

Veritas Storage Foundation recommended settings	
Setting	Description
SUSE Linux Enterprise Server 11 or later: Create the file <code>/etc/udev/rules.d/40-rport.rules</code>	If you are using SUSE Linux Enterprise Server 11 or later, you must configure it to support Veritas Storage Foundation. Before you do anything, you should check the Symantec TechNote 124725. It contains the latest information and is available at http://www.symantec.com/business/support/index?page=content&id=TECH124725. At the time this document was prepared, you had to create the file <code>/etc/udev/rules.d/40-rport.rules</code> with the following content line: <pre> 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'". </pre>

For all other settings, use the values recommended in the Veritas Storage Foundation Release Notes.