



# SUSE Linux Enterprise Server 12 with ONTAP

## ONTAP SAN Host

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# SUSE Linux Enterprise Server 12 with ONTAP

## Installing the Linux Unified Host Utilities

The NetApp Linux Unified Host Utilities software package is available on the [NetApp Support Site](#) in a 32-bit and 64-bit .rpm file. If you do not know which file is right for your configuration, use the [NetApp Interoperability Matrix Tool](#) to verify which one you need.

Installing the Linux Unified Host Utilities is strongly recommended, but 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.

### *Before you begin*

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

1. Download the 32-bit or 64-bit Linux Unified Host Utilities software package from the NetApp Support Site to your host.
2. Use the following command to install the software package:

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

## SAN Toolkit

The toolkit 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 example, the **sanlun lun show command** returns LUN information.

```
# sanlun lun show all
controller(7mode/E-Series)/
vserver(cDOT/FlashRay)  lun-pathname  device      host      lun
                        filename      adapter    protocol  size      Product
-----
data_vserver            /vol/vol1/lun1  /dev/sdb    host16    FCP        120.0g    cDOT
data_vserver            /vol/vol1/lun1  /dev/sdc    host15    FCP        120.0g    cDOT
data_vserver            /vol/vol2/lun2  /dev/sdd    host16    FCP        120.0g    cDOT
data_vserver            /vol/vol2/lun2  /dev/sde    host15    FCP        120.0g    cDOT
```

# SAN Booting

## *Before you begin*

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.

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

Remember, multiple paths will only be 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 the boot is successful.

## Multipathing

For SUSE Linux Enterprise Server 12 the `/etc/multipath.conf` file must exist, but you do not need to make specific changes to the file. SUSE Linux Enterprise Server 12 is compiled with all settings required to recognize and correctly manage ONTAP LUNs.

You can use the `multipath -ll` command to verify the settings for your ONTAP LUNs.

The following sections provide sample multipath output for a LUN mapped to ASA and non-ASA personas.

### All SAN Array Configuration

For All SAN Array (ASA) configuration there should be one group of paths with single priorities. All the paths are Active/Optimized, meaning they are serviced by the controller and I/O is sent on all the active paths.

#### *Example*

The following example displays the correct output for an ONTAP LUN with four Active/Optimized paths:

```
# multipath -ll
3600a0980383034466b2b4a3775474859 dm-3 NETAPP,LUN C-Mode
size=20G features='4 queue_if_no_path pg_init_retries 50 retain_attached_hw_handle'
hwhandler='1 alua' wp=rw
|+- policy='round-robin 0' prio=50 status=active
| |- 1:0:8:1 sdb 8:16 active ready running
| `-- 2:0:8:1 sdd 8:48 active ready running
`+- policy='round-robin 0' prio=10 status=enabled
  |- 1:0:9:1 sdc 8:32 active ready running
  `-- 2:0:9:1 sde 8:64 active ready running
```

#### *Note*

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:

```
# multipath -ll
3600a09803831347657244e527766394e dm-5 NETAPP,LUN C-Mode
size=80G features='4 queue_if_no_path pg_init_retries 50 retain_attached_hw_handle'
hwhandler='1 alua' wp=rw
|+- policy='service-time 0' prio=50 status=active
| |- 11:0:1:0 sdj 8:144 active ready running
| |- 11:0:2:0 sdr 65:16 active ready running
`+- policy='service-time 0' prio=10 status=enabled
  |- 11:0:0:0 sdb 8:i6 active ready running
  |- 12:0:0:0 sdz 65:144 active ready running
```

#### *Note*

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

SUSE Linux Enterprise Server 12 OS is compiled to recognize ONTAP LUNs and automatically set all configuration parameters correctly.

The `multipath.conf` file must exist for the multipath daemon to start, but you can create an empty, zero-byte file using the command:

```
touch /etc/multipath.conf
```

The first time you create this file, you might need to enable and start the multipath services.

```
[root@jfs0 ~]#systemctl enable multipathd
[root@jfs0 ~]# systemctl start multipathd
```

There is no requirement to add anything directly to `multipath.conf`, unless you have devices that you do not want to be managed by multipath or you have existing settings that override defaults.

You can add the following syntax to the `multipath.conf` file to exclude the unwanted devices.

## Note

Replace the `<DevId>` with the WWID string of the device you want to exclude. Use the following command to determine the WWID:

```
blacklist {
    wwid <DevId>
    devnode "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
    devnode "^hd[a-z]"
    devnode "^cciss.*"
}
```

## Example

In this example, `sda` is the local SCSI disk that we need to blacklist.

1. Run the following command to determine the WWID:

```
# /lib/udev/scsi_id -gud /dev/sda
360030057024d0730239134810c0cb833
```

2. Add this WWID to the blacklist stanza in the `/etc/multipath.conf`:

```
blacklist {
    wwid 360030057024d0730239134810c0cb833
    devnode "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
    devnode "^hd[a-z]"
    devnode "^cciss.*"
}
```

You should always check your `/etc/multipath.conf` file for legacy settings, especially in the defaults section, that may be overriding default settings.

The table below shows the critical `multipathd` parameters for ONTAP LUNs and the required values. If a host is connected to LUNs from other vendors and any of these parameters are overridden, they will need to be corrected by later stanzas in `multipath.conf` that apply specifically to ONTAP LUNs. If this is not done, the ONTAP LUNs may not work as expected. These defaults should only be overridden in consultation with NetApp and/or OS vendor and only when the impact is fully understood.

Parameter	Setting
detect_prio	yes
dev_loss_tmo	"infinity"
failback	immediate
fast_io_fail_tmo	5
features	"3 queue_if_no_path pg_init_retries 50"
flush_on_last_del	"yes"
hardware_handler	"0"
path_checker	"tur"
path_grouping_policy	"group_by_prio"
path_selector	"service-time 0"
polling_interval	5
prio	"ontap"
product	LUN.*
retain_attached_hw_handler	yes
rr_weight	"uniform"
user_friendly_names	no
vendor	NETAPP

### Example

The following example shows how to correct an overridden default. In this case, the `multipath.conf` file defines values for `path_checker` and `detect_prio` that are not compatible with ONTAP LUNs. If they

cannot be removed because of other SAN arrays still attached to the host, these parameters can be corrected specifically for ONTAP LUNs with a device stanza.

```
defaults {
  path_checker readsector0
  detect_prio no
}
devices {
  device {
    vendor "NETAPP "
    product "LUN.*"
    path_checker tur
    detect_prio yes
  }
}
```

## Known Problems and Limitations

NetApp Bug ID	Title	Description	Bugzilla ID
<a href="#">873555</a>	scsi_dh_alua module is not loaded during multipathd startup on local boot	scsi_dh_alua is a Linux ALUA device handler module. This is not loaded during multipathd startup on local boot. Due to this device handler will not be loaded though ALUA is enabled on target side.	<a href="#">908529</a>
<a href="#">863584</a>	The message "conflicting device node '/dev/mapper/360xx' found" appears on the screen when you create a DM device on SLES12	You might observe a failure in creating a link to DM devices under /dev/mapper dir in SLES 12 and see the messages "conflicting device node '/dev/mapper/360xx' found".	<a href="#">903001</a>
<a href="#">847490</a>	Multipath daemon shows path failures on SLES 12	You might observe path failures on the SLES12 multipath daemon during I/O with storage or fabric faults.	<a href="#">890854</a>



# Release Notes

## ASM Mirroring

ASM mirroring might require changes to the Linux multipath settings to allow ASM to recognize a problem and switch over to an alternate fail group. Most ASM configurations on ONTAP use external redundancy, which means that data protection is provided by the external array and ASM does not mirror data. Some sites use ASM with normal redundancy to provide two-way mirroring, normally across different sites. See [Oracle Databases on ONTAP](#) for further information.

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