



## **OL 9**

### **SAN hosts and cloud clients**

NetApp  
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# Table of Contents

- OL 9 ..... 1
  - Use Oracle Linux 9.2 with ONTAP ..... 1
  - Use Oracle Linux 9.1 with ONTAP ..... 7
  - Use Oracle Linux 9.0 with ONTAP ..... 13

# OL 9

## Use Oracle Linux 9.2 with ONTAP

You can use the ONTAP SAN host configuration settings to configure Oracle Linux 9.2 with ONTAP as the target.

### 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 host bus adapters (HBAs). The `sanlun` command returns information about the LUNs mapped to your host, multipathing, and information necessary to create initiator groups.

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

```
# sanlun lun show all
```

Example output:

controller (7mode/E-Series) / vserver (cDOT/FlashRay) Product	lun-pathname	device filename	host adapter	protocol	lun size
data_vserver cDOT	/vol/vol1/lun1	/dev/sdb	host16	FCP	80.0g
data_vserver cDOT	/vol/vol1/lun1	/dev/sdc	host15	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sdd	host16	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sde	host15	FCP	80.0g

## 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.

### 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

For OL 9.2 the `/etc/multipath.conf` file must exist, but you do not need to make specific changes to the file. OL 9.2 is compiled with all the 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 configurations.

### All SAN Array configurations

In All SAN Array (ASA) configurations, all paths to a given LUN are active and optimized. This improves performance by serving I/O operations through all paths at the same time.

### Example

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

```
# multipath -ll
3600a098038303634722b4d59646c4436 dm-28 NETAPP,LUN C-Mode
size=10G features='3 queue_if_no_path pg_init_retries 50' hwhandler='1
alua' wp=rw
|+- policy='service-time 0' prio=50 status=active
| - 11:0:7:6    sdbz 68:208  active ready running
| - 11:0:11:6   sddn 71:80   active ready running
| - 11:0:15:6   sdfb 129:208 active ready running
| - 12:0:1:6    sdgp 132:80  active ready running
```



Do not use an excessive number of paths to a single LUN. No more than four paths should be required. More than eight 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

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

```
# multipath -ll
3600a0980383036347ffb4d59646c4436 dm-28 NETAPP,LUN C-Mode
size=10G features='3 queue_if_no_path pg_init_retries 50' hwhandler='1
alua' wp=rw
|+- policy='service-time 0' prio=50 status=active
| - 16:0:6:35   sdwb 69:624  active ready running
| - 16:0:5:35   sdun 66:752  active ready running
`-+- policy='service-time 0' prio=10 status=enabled
| - 15:0:0:35   sdaj 66:48   active ready running
| - 15:0:1:35   sdbx 68:176  active ready running
```



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

### Recommended settings

The Oracle Linux 9.2 OS is compiled to recognize ONTAP LUNs and automatically set all configuration parameters correctly for both ASA and non-ASA configurations. You can further optimize performance for your host configuration with the following recommended settings.

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

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

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

```
# systemctl enable multipathd
# systemctl start multipathd
```

- There is no requirement to add anything directly to the `multipath.conf` file, unless you have devices that you do not want to be managed by multipath or you have existing settings that override defaults.
- To exclude unwanted devices, add the following syntax to the `multipath.conf` file .

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

Replace the `<DevId>` with the WWID string of the device you want to exclude.

### Example

In this example, we are going to determine the WWID of a device and add to the `multipath.conf` file.

### Steps

1. Run the following command to determine the WWID:

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

`sda` is the local SCSI disk that we need to add it to the blacklist.

2. Add the WWID to the blacklist stanza in `/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 might be overriding the default settings.

The following table demonstrates 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 the `multipath.conf` file that apply specifically to ONTAP LUNs. If this is not done, the ONTAP LUNs might not work as expected. These defaults should only be overridden in consultation with NetApp and/or an OS vendor and only when the impact is fully understood.

Parameter	Setting
<code>detect_prio</code>	<code>yes</code>
<code>dev_loss_tmo</code>	<code>infinity</code>
<code>failback</code>	<code>immediate</code>
<code>fast_io_fail_tmo</code>	<code>5</code>
<code>features</code>	<code>2 pg_init_retries 50</code>
<code>flush_on_last_del</code>	<code>yes</code>
<code>hardware_handler</code>	<code>0</code>
<code>no_path_retry</code>	<code>queue</code>
<code>path_checker</code>	<code>tur</code>
<code>path_grouping_policy</code>	<code>group_by_prio</code>
<code>path_selector</code>	<code>service-time 0</code>
<code>polling_interval</code>	<code>5</code>
<code>prio</code>	<code>ontap</code>
<code>product</code>	<code>LUN.*</code>
<code>retain_attached_hw_handler</code>	<code>yes</code>
<code>rr_weight</code>	<code>uniform</code>
<code>user_friendly_names</code>	<code>no</code>
<code>vendor</code>	<code>NETAPP</code>

### Example

The following example demonstrates how to correct an overridden default. In this case, the `multipath.conf` file defines values for `path_checker` and `no_path_retry` that are not compatible with ONTAP LUNs. If they cannot be removed because other SAN arrays are still attached to the host, these parameters can be corrected specifically for ONTAP LUNs with a device stanza.

```

defaults {
  path_checker readsector0
  no_path_retry fail
}
devices {
  device {
    vendor "NETAPP "
    product "LUN.*"
    no_path_retry queue
    path_checker tur
  }
}

```



To configure Oracle Linux 9.2 RedHat Enterprise Kernel (RHCK), use the [recommended settings](#) for Red Hat Enterprise Linux (RHEL) 9.2.

## KVM settings

You can also use the recommended settings to configure Kernel-based Virtual Machine (KVM). There are no changes required to configure KVM as the LUN is mapped to the hypervisor.

## Known issues

The Oracle Linux 9.2 with ONTAP release has the following known issues:

NetApp Bug ID	Title	Description	Bugzilla ID
<a href="#">1508554</a>	SAN LUN utility with Emulex HBA needs symbolic links from library packages	<p>When you execute the Linux Unified Host Utilities CLI command - "sanlun fcp show adapter -v" on a SAN host, the command fails with an error message displaying that the library dependencies required for an host bus adapter (HBA) discovery cannot be located:</p> <pre>[root@hostname ~]# sanlun fcp show adapter -v Unable to locate /usr/lib64/libHBAAPI.so library Make sure the package installing the library is installed &amp; loaded</pre>	Not Applicable

# Use Oracle Linux 9.1 with ONTAP

You can use the ONTAP SAN host configuration settings to configure Oracle Linux 9.1 with ONTAP as the target.

## 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 host bus adapters (HBAs). The `sanlun` command returns information about the LUNs mapped to your host, multipathing, and information necessary to create initiator groups.

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

```
# sanlun lun show all
```

Example output:

controller (7mode/E-Series) / vserver (cDOT/FlashRay) Product	lun-pathname	device filename	host adapter	protocol	lun size
data_vserver cDOT	/vol/vol1/lun1	/dev/sdb	host16	FCP	80.0g
data_vserver cDOT	/vol/vol1/lun1	/dev/sdc	host15	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sdd	host16	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sde	host15	FCP	80.0g

## 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.

### 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

For OL 9.1 the `/etc/multipath.conf` file must exist, but you do not need to make specific changes to the file. OL 9.1 is compiled with all the 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 configurations.

### All SAN Array configurations

In All SAN Array (ASA) configurations, all paths to a given LUN are active and optimized. This improves performance by serving I/O operations through all paths at the same time.

### Example

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

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alua' wp=rw
|+- policy='service-time 0' prio=50 status=active
| - 11:0:7:6   sdbz 68:208   active ready running
| - 11:0:11:6  sddn 71:80    active ready running
| - 11:0:15:6  sdfb 129:208  active ready running
| - 12:0:1:6   sdgp 132:80   active ready running
```



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

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

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# multipath -ll
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| - 16:0:6:35 sdwb 69:624   active ready running
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   - 15:0:0:35 sdaj 66:48    active ready running
   - 15:0:1:35 sdbx 68:176   active ready running
```



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

## Recommended settings

The Oracle Linux 9.1 OS is compiled to recognize ONTAP LUNs and automatically set all configuration parameters correctly for both ASA and non-ASA configurations. You can further optimize performance for your host configuration with the following recommended settings.

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

```
touch /etc/multipath.conf
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The first time you create this file, you might need to enable and start the multipath services:

```
# systemctl enable multipathd
# systemctl start multipathd
```

- There is no requirement to add anything directly to the `multipath.conf` file, unless you have devices that you do not want to be managed by multipath or you have existing settings that override defaults.
- To exclude unwanted devices, add the following syntax to the `multipath.conf` file .

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

Replace the `<DevId>` with the WWID string of the device you want to exclude.

### Example

In this example, we are going to determine the WWID of a device and add to the `multipath.conf` file.

### Steps

1. Run the following command to determine the WWID:

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

`sda` is the local SCSI disk that we need to add it to the blacklist.

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

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

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

The following table demonstrates 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 the `multipath.conf` file that apply specifically to ONTAP LUNs. If this is not done, the ONTAP LUNs might not work as expected. These defaults should only be overridden in consultation with NetApp and/or an OS vendor and only when the impact is fully understood.

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<code>flush_on_last_del</code>	<code>yes</code>
<code>hardware_handler</code>	<code>0</code>
<code>no_path_retry</code>	<code>queue</code>
<code>path_checker</code>	<code>tur</code>
<code>path_grouping_policy</code>	<code>group_by_prio</code>
<code>path_selector</code>	<code>service-time 0</code>
<code>polling_interval</code>	<code>5</code>
<code>prio</code>	<code>ontap</code>
<code>product</code>	<code>LUN.*</code>
<code>retain_attached_hw_handler</code>	<code>yes</code>
<code>rr_weight</code>	<code>uniform</code>
<code>user_friendly_names</code>	<code>no</code>
<code>vendor</code>	<code>NETAPP</code>

### Example

The following example demonstrates how to correct an overridden default. In this case, the `multipath.conf` file defines values for `path_checker` and `no_path_retry` that are not compatible with ONTAP LUNs. If they cannot be removed because other SAN arrays are still attached to the host, these parameters can be corrected specifically for ONTAP LUNs with a device stanza.

```

defaults {
  path_checker readsector0
  no_path_retry fail
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devices {
  device {
    vendor "NETAPP "
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    no_path_retry queue
    path_checker tur
  }
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```



To configure Oracle Linux 9.1 RedHat Enterprise Kernel (RHCK), use the [recommended settings](#) for Red Hat Enterprise Linux (RHEL) 9.1.

## KVM settings

You can also use the recommended settings to configure Kernel-based Virtual Machine (KVM). There are no changes required to configure KVM as the LUN is mapped to the hypervisor.

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<a href="#">1508554</a>	SAN LUN utility with Emulex HBA needs symbolic links from library packages	<p>When you execute the Linux Unified Host Utilities CLI command - "sanlun fcp show adapter -v" on a SAN host, the command fails with an error message displaying that the library dependencies required for a host bus adapter (HBA) discovery cannot be located:</p> <pre>[root@hostname ~]# sanlun fcp show adapter -v Unable to locate /usr/lib64/libHBAAPI.so library Make sure the package installing the library is installed &amp; loaded</pre>	Not Applicable

# Use Oracle Linux 9.0 with ONTAP

You can use the ONTAP SAN host configuration settings to configure Oracle Linux 9.0 with ONTAP as the target.

## 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.

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### What you'll need

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### Steps

1. Download the 64-bit Linux Unified Host Utilities software package from the [NetApp Support Site](#) to your host.
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```
rpm -ivh netapp_linux_unified_host_utilities-7-1.x86_64
```

## SAN toolkit

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Example output:

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data_vserver cDOT	/vol/vol1/lun1	/dev/sdc	host15	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sdd	host16	FCP	80.0g
data_vserver cDOT	/vol/vol2/lun2	/dev/sde	host15	FCP	80.0g

## 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.

### 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

For Oracle Linux (OL) 9.0 the `/etc/multipath.conf` file must exist, but you do not need to make specific changes to the file. OL 9.0 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 configurations

In All SAN Array (ASA) configurations, all paths to a given LUN are active and optimized. This improves performance by serving I/O operations through all paths at the same time.

### Example

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

```
# multipath -ll
3600a098038303634722b4d59646c4436 dm-28 NETAPP,LUN C-Mode
size=80G features='3 queue_if_no_path pg_init_retries 50' hwhandler='1
alua' wp=rw
|+- policy='service-time 0' prio=50 status=active
| - 11:0:7:6   sdbz 68:208   active ready running
| - 11:0:11:6  sddn 71:80    active ready running
| - 11:0:15:6  sdfb 129:208  active ready running
| - 12:0:1:6   sdgp 132:80   active ready running
```



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

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

```
# multipath -ll
3600a0980383036347ffb4d59646c4436 dm-28 NETAPP,LUN C-Mode
size=80G features='3 queue_if_no_path pg_init_retries 50' hwhandler='1
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|+- policy='service-time 0' prio=50 status=active
| - 16:0:6:35  sdwb 69:624   active ready running
| - 16:0:5:35  sdun 66:752   active ready running
`+- policy='service-time 0' prio=10 status=enabled
| - 15:0:0:35  sda j 66:48    active ready running
| - 15:0:1:35  sdbx 68:176   active ready running
```



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

## Recommended settings

The Oracle Linux 9.0 OS is compiled to recognize ONTAP LUNs and automatically set all configuration parameters correctly for both ASA and non-ASA configuration.

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

byte file by using the following command:

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

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

```
# systemctl enable multipathd
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```

- There is no requirement to add anything directly to the `multipath.conf` file, unless you have devices that you do not want to be managed by multipath or you have existing settings that override defaults.
- To exclude unwanted devices, add the following syntax to the `multipath.conf` file .

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

Replace the `<DevId>` with the WWID string of the device you want to exclude.

### Example

In this example, we are going to determine the WWID of a device and add to the `multipath.conf` file.

### Steps

1. Run the following command to determine the WWID:

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

`sda` is the local SCSI disk that we need to add it to the blacklist.

2. Add the WWID to the blacklist stanza in `/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 might be overriding the default settings.

The following table demonstrates 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 the `multipath.conf` file that apply specifically to ONTAP LUNs. If this is not done, the ONTAP LUNs might not work as expected. These defaults should only be overridden in consultation with NetApp and/or an OS vendor and only when the impact is fully understood.

Parameter	Setting
<code>detect_prio</code>	<code>yes</code>
<code>dev_loss_tmo</code>	<code>infinity</code>
<code>failback</code>	<code>immediate</code>
<code>fast_io_fail_tmo</code>	<code>5</code>
<code>features</code>	<code>2 pg_init_retries 50</code>
<code>flush_on_last_del</code>	<code>yes</code>
<code>hardware_handler</code>	<code>0</code>
<code>no_path_retry</code>	<code>queue</code>
<code>path_checker</code>	<code>tur</code>
<code>path_grouping_policy</code>	<code>group_by_prio</code>
<code>path_selector</code>	<code>service-time 0</code>
<code>polling_interval</code>	<code>5</code>
<code>prio</code>	<code>ontap</code>
<code>product</code>	<code>LUN.*</code>
<code>retain_attached_hw_handler</code>	<code>yes</code>
<code>rr_weight</code>	<code>uniform</code>
<code>user_friendly_names</code>	<code>no</code>
<code>vendor</code>	<code>NETAPP</code>

### Example

The following example shows how to correct an overridden default. In this case, the `multipath.conf` file defines values for `path_checker` and `no_path_retry` 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
  no_path_retry fail
}
devices {
  device {
    vendor "NETAPP "
    product "LUN.*"
    no_path_retry queue
    path_checker tur
  }
}

```



To configure Oracle Linux 9.0 RedHat Enterprise Kernel (RHCK), use the [recommended settings](#) for Red Hat Enterprise Linux (RHEL) 9.0.

## KVM settings

You can also use the recommended settings to configure Kernel-based Virtual Machine (KVM). There are no changes required to configure KVM as the LUN is mapped to the hypervisor.

## Known issues

The Oracle Linux 9.0 with NetApp ONTAP release has the following known issues:

NetApp Bug ID	Title	Description	Bugzilla ID
<a href="#">1508554</a>	SAN LUN utility with Emulex HBA needs symbolic links from library packages	<p>When you execute the Linux Unified Host Utilities CLI command - "sanlun fcp show adapter -v" on a SAN host, the command fails with an error message displaying that the library dependencies required for a host bus adapter (HBA) discovery cannot be located:</p> <pre>[root@hostname ~]# sanlun fcp show adapter -v Unable to locate /usr/lib64/libHBAAPI.so library Make sure the package installing the library is installed &amp; loaded</pre>	Not Applicable

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