Using Oracle Linux 7.6 with NetApp ONTAP

ONTAP SAN Host

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NetApp®

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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 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)/            device     host               lun
vserver(cDOT/FlashRay)   lun-pathname  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 Oracle Linux 7.6 the /etc/multipath.conf file must exist, but you do not need to make specific changes to the file. Oracle Linux 7.6 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.
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

The Oracle Linux 7.6 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
1202736	LUNs might not be available during host discovery due to "Not Present" state of remote ports on a OL7U6 host with QLogic QLE2742 adapter	During host discovery, the status of Fibre Channel (FC) remote ports on a OL7U6 host with a QLogic QLE2742 adapter might enter into "Not Present" state. Remote ports with a "Not Present" state might cause paths to LUNs to become unavailable. During storage failover, the path redundancy might be reduced and result in an I/O outage. You can check the remote port status by entering the following command: # cat /sys/class/fc_remote_ports/rport-*/port_state The following is an example of the output that is displayed: Online Online Not Present Online Online	16613

NetApp Bug ID	Title	Description	Bugzilla ID
1204078	Kernel disruption occurs on Oracle Linux 7.6 running with Qlogic(QLE2672) 16GB FC HBA during storage failover operations	During storage failover operations on the Oracle Linux 7.6 with a Qlogic QLE2672 Fibre Channel (FC) host bus adapter (HBA), a kernel disruption occurs due to a panic in the kernel. The kernel panic causes Oracle Linux 7.6 to reboot, which leads to an application disruption. If the kdump mechanism is enabled, the kernel panic generates a vmcore file located in the /var/crash/ directory. You can analyze the vmcore file to determine the cause of the panic. After the kernel disruption, you can reboot the host OS and recover the operating system, and then you can restart any applications as required.	16606

NetApp Bug ID	Title	Description	Bugzilla ID
1204351	Kernel disruption might occur on Oracle Linux 7.6 running with Qlogic(QLE2742) 32GB FC HBA during storage failover operations	During storage failover operations on the Oracle Linux 7.6 with a Qlogic QLE2742 Fibre Channel (FC) host bus adapter (HBA), a kernel disruption might occur due to a panic in the kernel. The kernel panic causes Oracle Linux 7.6 to reboot, which leads to an application disruption. If the kdump mechanism is enabled, the kernel panic generates a vmcore file located in the /var/crash/ directory. You can analyze the vmcore file to determine the cause of the panic. After the kernel disruption, you can reboot the host OS and recover the operating system, and then you can restart any applications as required.	16605

NetApp Bug ID	Title	Description	Bugzilla ID
1204352	Kernel disruption might occur on Oracle Linux 7.6 running with Emulex (LPe32002-M2)32GB FC HBA during storage failover operations	During storage failover operations on the Oracle Linux 7.6 with an Emulex LPe32002-M2 Fibre Channel (FC) host bus adapter (HBA), a kernel disruption might occur due to a panic in the kernel. The kernel panic causes Oracle Linux 7.6 to reboot, which leads to an application disruption. If the kdump mechanism is enabled, the kernel panic generates a vmcore file located in the /var/crash/ directory. You can analyze the vmcore file to determine the cause of the panic. After the kernel disruption, you can reboot the host OS and recover the operating system, and then you can restart any applications as required.	16607

NetApp Bug ID	Title	Description	Bugzilla ID
11246134	No I/O progress on Oracle Linux 7.6 with UEK5U2 kernel, running with an Emulex LPe16002B-M6 16G FC HBA during storage failover operations	During storage failover operations on the Oracle Linux 7.6 with the UEK5U2 kernel running with an Emulex LPe16002B-M6 16G Fibre Channel (FC) host bus adapter (HBA), I/O progress might stop due to reports getting blocked. The storage failover operation reports change from an "online" state to a "blocked" state, causing a delay in read and write operations. After the operation has completed successfully, the reports fail to move back to an "online" state and continue to remain in a "blocked" state.	16852

NetApp Bug ID	Title	Description	Bugzilla ID
1246327	Remote port status on QLogic QLE2672 16G host blocked during storage failover operations	Fibre Channel (FC) remote ports might be blocked on Red Hat Enterprise Linux (RHEL) 7.6 with the QLogic QLE2672 16G host during storage failover operations. Because the logical interfaces go down when a storage node is down, the remote ports set the storage node status to blocked. IO progress might stop due to the blocked ports if you are running both a QLogic QLE2672 16G host and a QLE2742 32GB Fibre Channel (FC) host bus adapter (HBA). When the storage node returns to its optimal state, the logical interfaces also come up and the remote ports should be online. However, the remote ports might still be blocked. This blocked state registers as failed faulty to LUNS at the multipath layer. You can verify the state of the remote ports with the following command: # cat /sys/class/fc_remote_ports/rport-*/port_stat You should see the following output: Blocked Blocked Blocked	16853

Note

For Oracle Linux (Red Hat compatible kernel) known issues, see the Known Issues section in the corresponding Red Hat Enterprise Linux release documentation.

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.