Using Oracle Linux 7.0 with NetApp ONTAP

ONTAP SAN Host

Sean Daffy
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NetApp®

Table of Contents

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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 7.0 the /etc/multipath.conf file must exist, but you do not need to make specific changes to the file. Oracle Linux 7.0 is compiled with all settings required to recognize and correctly manage ONTAP LUNs. To Enable ALUA Handler, perform the following steps:

1. Create a backup of the initrd-image.
2. Append the following parameter value to the kernel for ALUA and non-ALUA to work: `rdloaddriver=scsi_dh_alua`

   Example

   ```
   kernel /vmlinuz-3.8.13-68.1.2.el6uek.x86_64 ro root=/dev/mapper/vg_ibmx3550m421096-
   lv_root rd_NO_LUKSrd_LVM_LV=vg_ibmx3550m421096/lv_root LANG=en_US.UTF-8
   rd_NO_MDSYSFONT=latarcyrheb-sun16 crashkernel=256M KEYBOARDTYPE=pc KEYTABLE=us
   rd_LVM_LV=vg_ibmx3550m421096/lv_swap rd_NO_DM rhgb quiet rdloaddriver=scsi_dh_alua
   ```

3. Recreate the initrd-image with the `dracut -f` command.
4. Reboot the host.
5. Verify the output of the `cat /proc/cmdline` command to ensure that the setting is complete.

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 7.0 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"

Parameter	Setting
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
901558	OL7.0 : Host loses all paths to the lun and hangs due to "RSCN timeout" error on OL 7.0 UEK r3U5 Beta on Emulex 8G(LPe12002) host	You might observe that the Emulex 8G(LPe12002) host hangs and there is a high I/O outage during storage failover operations with I/O. You might observe paths not recovering, which is a result of the RSCN timeout, due to which the host loses all the paths and hangs. Probability of hitting this issue is high.	14898
901557	OL 7.0: High IO outage observed on QLogic 8G FC (QLE2562) SAN host during storage failover operations with IO	You might observe high IO outage on QLogic 8G FC (QLE2562) host during storage failover operations with IO. Aborts and Device resets manifests as IO outage on the host. Probability of hitting this IO outage is high.	14894
894766	OL7.0: Dracut fails to include scsi_dh_alua.ko module in initramfs on UEKR3U5 alpha	The scsi_dh_alua module might not load even after adding the parameter "rdloaddriver=scsi_dh_alua" in the kernel command line and creating Dracut. As a result, ALUA is not enabled for NetApp LUNs as recommended.	14860

NetApp Bug ID	Title	Description	Bugzilla ID
894796	Anaconda displays an iSCSI login failure message although logins are successful during OL 7.0 OS installation	When you are installing OL 7.0, the anaconda installation screen displays that iSCSI login to multiple target IPs have failed though the iSCSI logins are successful. Anaconda displays following error message: "Node Login Failed" You will observe this error only when you select multiple target IPs for iSCSI login. You can continue the OS installation by clicking the "ok" button. This bug does not hamper either the iSCSI or the OL 7.0 OS installation.	14870
894771	OL7.0 : Anaconda does not add bootdev argument in kernel cmd line to set IP address for iSCSI SANboot OS install	Anaconda does not add a bootdev argument in the kernel command line where you set the IPv4 address during the OL 7.0 OS installation on an iSCSI multipath'd LUN. Owing to this, you cannot assign IP addresses to any of the Ethernet interfaces that were configured to establish iSCSI sessions with the storage subsystem during the OL 7.0 boot. Since iSCSI sessions are not established, the root LUN is not discovered when the OS boots and hence the OS boot fails.	14871

NetApp Bug ID	Title	Description	Bugzilla ID
916501	Qlogic 10G FCoE (QLE8152) host kernel crash observed during storage failover operations with IO	You may observe a kernel crash in Qlogic driver module on 10G FCoE Qlogic (QLE8152) host. The crash occurs during storage failover operations with IO. Probability of hitting this crash is high which leads to longer IO outage on the host.	15019

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.