# Linux Unified Host Utilities

## SAN hosts and cloud clients

NetApp
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# Linux Unified Host Utilities

## Linux Unified Host Utilities 7.1 Release Notes

The release notes describe new features and enhancements, known problems and limitations, and important cautions for configuring and managing your specific host with your ONTAP storage system.

For specific information about the operating system versions and updates that the Host Utilities support, see the NetApp Interoperability Matrix Tool.

### What's New

The Linux Host Utilities 7.1 release contains the following new features and enhancements:

- Linux Host Utilities is now called *Linux Unified Host Utilities* because it supports NetApp E-Series storage systems running SANtricity as well as AFF, FAS, and ASA systems running ONTAP.

  Any mention of Host Utilities or Linux Host Utilities in this document refers to Linux Unified Host Utilities.

- The following operating systems are now supported:
  - SUSE Linux Enterprise Server 15 series
  - Oracle VM 3.2 series
  - Oracle Linux 6 and 7 series
  - Red Hat Enterprise Linux 6 and 7 series
  - SUSE Linux Enterprise Server 11 SP4
  - KVM and XEN, RHEV 6.4 and 6.5
  - Citrix XenServer
- On Red Hat Enterprise Linux (RHEL) 6 and RHEL 7 hosts, a tuned package for setting server profiles is now supported. You can use the `tuned-adm` command to set different profiles, depending on the environment. For example, you can also use the virtual guest profile as a guest virtual machine and you can use the enterprise storage profile for configurations where LUNs from enterprise storage arrays are used. Using these tuned packages can result in improvement in throughput and latency in ONTAP.
- Adds support for 32GB FC adapters from Broadcom Emulex and Marvell Qlogic.

NetApp continues to work with the Host Utilities to add support for features after the initial release. For latest information about the features that are supported and the new features that have been added, see the NetApp Interoperability Matrix Tool.

### Fixed in this release

The intermittent host OS failure issue that occurs when running the `sanlun lun show -p` command in SUSE Linux Enterprise Server 12 SP1, OL 7.2, RHEL 7.2, and RHEL 6.8 is fixed in this release.

### Known problems and limitations

The Linux Host Utilities 7.1 release has the following known problems and limitations.

| NetApp Bug ID | Title | Description |
|---|---|---|
| 1457017 | `sanlun` installation issues warning messages related to `libdevmapper.so` and `libnl.so` libraries. These warnings do not affect the functionality of `sanlun` kit. | 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:<br><br>[root@hostname ~]# sanlun fcp show adapter -v<br>Unable to locate /usr/lib64/libHBAAPI.so library<br>Make sure the package installing the library is installed & loaded<br>Refer to NetApp Bugs Online - 1508554. |

NetApp Bugs Online provides complete information for most known issues, including suggested workarounds where possible.

# Install Linux Unified Host Utilities 7.1

The Linux Unified Host Utilities (LUHU) assists you to manage NetApp ONTAP storage attached to a Linux host. 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.

The following Linux distributions are supported:

- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- Oracle Linux
- Oracle VM
- Citrix XenServer

#### What you'll need

The NetApp Linux Unified Host Utilities software package is available on the NetApp Support Site in a 32-bit or 64-bit .rpm file.

- For reliable operation, you must verify that your entire iSCSI, FC, or FCoE configuration is supported.

  You can use the NetApp Interoperability Matrix Tool to verify your configuration.

- You must install the host bus adapter (HBA) management packages available on the vendor support site.

The management software enables the SAN toolkit commands to gather information about the FC HBAs, such as their WWPNs. For the `sanlun fcp show adapter` command to work, verify that the following packages are correctly installed:

  - Marvell QLogic HBA – QConvergeConsole CLI
  - Broadcom Emulex HBA - OneCommand Manager core application CLI
  - Marvell Brocade HBA – Brocade Command Utility CLI

- RPM Packages "libhbaapi" and "libhbalinux" available for each Linux distribution should be installed on the host OS.

> Linux Unified Host Utilities software does not support NVMe over Fibre Channel (NVMe/FC) and NVMe over TCP (NVMe/TCP) host protocols.

**Steps**

1. If you have a version of Linux Unified Host Utilities currently installed, use the following command to remove it:

   ```
   rpm -e netapp_linux_unified_host_utilities-7-1
   ```

   For older versions of Linux Host Utilities, go to the directory where the host utility software is installed and enter the uninstall command to remove the installed package.

2. Download the 32-bit or 64-bit Linux Unified Host Utilities software package from the NetApp Support Site to your host.
3. Go to the directory to which you downloaded the software package and use the following command to install it:

   ```
   rpm -ivh netapp_linux_unified_host_utilities-7-1.x86_xx.rpm
   ```

   **Example output**

   ```
   Verifying...                          ##################################
   [100%]
   Preparing...                          ##################################
   [100%]
   Updating / installing...
      1:netapp_linux_unified_host_utiliti##################################
   [100%]
   ```

4. Verify the installation:

   ```
   sanlun version
   ```

   **Example output**

```
sanlun version 7.1.386.1644
```

## Recommended driver settings with Linux kernel

When you configure an FC environment that uses native inbox drivers that are bundled with the Linux kernel, you can use the default values for the drivers.

## SAN Toolkit

Linux Unified Host Utilities is a NetApp host software that provides a command line tool kit on your Linux host.

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
```

Example output:

```
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
```

- This toolkit is common across all configurations and protocols of the Host Utilities. As a result, some of its contents apply to one configuration, but not another. Having unused components does not affect your system performance.
- The SAN toolkit is not supported on Citrix XenServer, Oracle VM, and Red Hat Enterprise Virtualization Hypervisor.

# Linux Unified Host Utilities 7.1 command reference

You can use the Linux Unified Host Utilities 7.1 sample command reference for an end-to-end validation of the NetApp storage configuration using the host utilities tool.

## List all host initiators mapped to host

You can retrieve a list of all host initiators mapped to a host.

```
# sanlun fcp show adapter -v
```

**Example output**

```
adapter name:      host15
WWPN:              10000090fa022736
WWNN:              20000090fa022736
driver name:       lpfc
model:             LPe16002B-M6
model description: Emulex LPe16002B-M6 PCIe 2-port 16Gb Fibre Channel
Adapter
serial number:     FC24637890
hardware version:  0000000b 00000010 00000000
driver version:    12.8.0.5; HBAAPI(I) v2.3.d, 07-12-10
firmware version:  12.8.340.8
Number of ports:   1
port type:         Fabric
port state:        Operational
supported speed:   4 GBit/sec, 8 GBit/sec, 16 GBit/sec
negotiated speed:  16 GBit/sec
OS device name:    /sys/class/scsi_host/host15

adapter name:      host16
WWPN:              10000090fa022737
WWNN:              20000090fa022737
driver name:       lpfc
model:             LPe16002B-M6
model description: Emulex LPe16002B-M6 PCIe 2-port 16Gb Fibre Channel
Adapter
serial number:     FC24637890
hardware version:  0000000b 00000010 00000000
driver version:    12.8.0.5; HBAAPI(I) v2.3.d, 07-12-10
firmware version:  12.8.340.8
Number of ports:   1
port type:         Fabric
port state:        Operational
supported speed:   4 GBit/sec, 8 GBit/sec, 16 GBit/sec
negotiated speed:  16 GBit/sec
OS device name:    /sys/class/scsi_host/host16
```

## List all LUNs mapped to host

You can retrieve a list of all LUNs mapped to a host.

```
# sanlun lun show -p -v all
```

**Example output**

```
                    ONTAP Path: vs_sanboot:/vol/sanboot_169/lun
                           LUN: 0
                      LUN Size: 150g
                       Product: cDOT
                   Host Device: 3600a0980383143393124515873683561
              Multipath Policy: service-time 0
                DM-MP Features: 3 queue_if_no_path pg_init_retries 50
              Hardware Handler: 1 alua
            Multipath Provider: Native
----------- --------- ---------- ------- ------------ ----------
----------
            host      vserver            host:
dm-mp       path      path       /dev/   chan:        vserver    major:
state       state     type       node    id:lun       LIF        minor
----------- --------- ---------- ------- ------------ ----------
----------
active      up        primary    sdq    15:0:5:0     lif_18      65:0
active      up        primary    sds    16:0:5:0     lif_17      65:32
active      up        primary    sdac   16:0:7:0     lif_25      65:192
active      up        primary    sdad   15:0:7:0     lif_26      65:208
active      up        secondary  sdt    15:0:4:0     lif_20      65:48
active      up        secondary  sdr    15:0:6:0     lif_19      65:16
active      up        secondary  sdad   16:0:4:0     lif_27      66:96
active      up        secondary  sdan   16:0:6:0     lif_28      66:112
```

## List all LUNs mapped to host from a given SVM

You can retrieve a list of all LUNs mapped to a host from a specific storage VM (SVM).

```
# sanlun lun show -p -v vs_sanboot
```

**Example output**

```
                    ONTAP Path: vs_sanboot:/vol/sanboot_169/lun
                           LUN: 0
                      LUN Size: 160g
                       Product: cDOT
                   Host Device: 3600a0980383143393124515873683561
              Multipath Policy: service-time 0
                DM-MP Features: 3 queue_if_no_path pg_init_retries 50
              Hardware Handler: 1 alua
            Multipath Provider: Native
----------- --------- ---------- ------- ------------ ---------------
----------
            host      vserver            host:
dm-mp       path      path       /dev/   chan:        vserver
major:
state       state     type       node    id:lun       LIF
minor
----------- --------- ---------- ------- ------------ ---------------
----------
active      up        primary    sdce    15:0:5:0     lif_16g_5
69:32
active      up        primary    sdfk    16:0:5:0     lif_16g_7
130:96
active      up        primary    sdfm    16:0:7:0     lif_16g_8
130:128
active      up        primary    sdcg    15:0:7:0     lif_16g_6
69:64
active      up        secondary  sdcd    15:0:4:0     lif_16g_1
69:16
active      up        secondary  sdcf    15:0:6:0     lif_16g_2
69:48
active      up        secondary  sdfj    16:0:4:0     lif_16g_3
130:80
active      up        secondary  sdfl    16:0:6:0     lif_16g_4
130:112
```

## List all attributes of a given LUN mapped to host

You can retrieve a list of all attributes of a specified LUN mapped to a host.

```
# sanlun lun show -p -v vs_sanboot:/vol/sanboot_169/lun
```

**Example output**

```
                    ONTAP Path: vs_sanboot:/vol/sanboot_169/lun
                           LUN: 0
                      LUN Size: 160g
                       Product: cDOT
                   Host Device: 3600a0980383143393124515873683561
              Multipath Policy: service-time 0
                DM-MP Features: 3 queue_if_no_path pg_init_retries 50
              Hardware Handler: 1 alua
            Multipath Provider: Native
----------- --------- ---------- ------- ------------ -----------------
----------
            host      vserver            host:
dm-mp       path      path       /dev/   chan:        vserver
major:
state       state     type       node    id:lun       LIF
minor
----------- --------- ---------- ------- ------------ -----------------
----------
active      up        primary    sdce    15:0:5:0     lif_16g_5
69:32
active      up        primary    sdfk    16:0:5:0     lif_16g_7
130:96
active      up        primary    sdfm    16:0:7:0     lif_16g_8
130:128
active      up        primary    sdcg    15:0:7:0     lif_16g_6
69:64
active      up        secondary  sdcd    15:0:4:0     lif_16g_1
69:16
active      up        secondary  sdcf    15:0:6:0     lif_16g_2
69:48
active      up        secondary  sdfj    16:0:4:0     lif_16g_3
130:80
active      up        secondary  sdfl    16:0:6:0     lif_16g_4
130:112
```

## List the ONTAP SVM identity from which a given LUN is mapped to host

You can retrieve a list of ONTAP SVM identity from which a specific LUN is mapped to a hist.

```
# sanlun lun show -m -v vs_sanboot:/vol/sanboot_169/lun
```

**Example output**

```
                                                                    device
host                  lun
vserver                       lun-pathname                      filename
adapter    protocol   size    product
-------------------------------------------------------------------------
-------------------------------------
vs_sanboot                    /vol/sanboot_169/lun           /dev/sdfm
host16     FCP        160g    cDOT
             LUN Serial number: 81C91$QXsh5a
         Controller Model Name: AFF-A400
          Vserver FCP nodename: 2008d039ea1308e5
          Vserver FCP portname: 2010d039ea1308e5
              Vserver LIF name: lif_16g_8
            Vserver IP address: 10.141.12.165
                                10.141.12.161
                                10.141.12.163
           Vserver volume name: sanboot_169
MSID::0x00000000000000000000000809E7CC3
         Vserver snapshot name:
```

## List ONTAP LUN attributes by host device filename

You can retrieve a list of ONTAP LUN attributes by a host device filename.

```
# sanlun lun show -d /dev/sdce
```

**Example output**

```
controller(7mode/E-Series)/                          device        host
lun
vserver(cDOT/FlashRay)      lun-pathname           filename      adapter
protocol   size    product
-------------------------------------------------------------------------
--------------------------
vs_sanboot                 /vol/sanboot_169/lun    /dev/sdce     host15
FCP        160g    cDOT
[root@sr630-13-169 ~]#
```

## List all SVM target LIF WWPNs attached to host

You can retrieve a list of all SVM target LIF WWPNs attached to a host.

```
# sanlun lun show -wwpn
```

**Example output**

```
controller(7mode/E-Series)/   target
device          host       lun
vserver(cDOT/FlashRay)        wwpn               lun-pathname
filename        adapter    size    product
------------------------------------------------------------------------
-----------------------------------------
vs_169_16gEmu                 202cd039ea1308e5   /vol/VOL_8g_169_2_8/lun
/dev/sdlo       host18     10g     cDOT
vs_169_16gEmu                 202cd039ea1308e5   /vol/VOL_8g_169_2_9/lun
/dev/sdlp       host18     10g     cDOT
vs_169_16gEmu                 202cd039ea1308e5   /vol/VOL_8g_169_2_7/lun
/dev/sdln       host18     10g     cDOT
vs_169_16gEmu                 202cd039ea1308e5   /vol/VOL_8g_169_2_5/lun
/dev/sdll       host18     10g     cDOT
```

## List ONTAP LUNs seen on host by a given SVM target LIF WWPN

You can retrieve a list of ONTAP LUNs noticed on a host by a specified SVM target LIF WWPN.

```
# sanlun lun show -wwpn 2010d039ea1308e5
```

**Example output**

```
controller(7mode/E-Series)/   target
device         host       lun
vserver(cDOT/FlashRay)        wwpn               lun-pathname
filename       adapter    size    product
------------------------------------------------------------------------
-------------------------------------
vs_sanboot                    2010d039ea1308e5   /vol/sanboot_169/lun
/dev/sdfm      host16     160g    cDOT
```

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