



# NVMe/FC Host Configuration for SUSE Linux Enterprise Server 15 SP2 with ONTAP

ONTAP SAN Host

NetApp  
September 10, 2020

This PDF was generated from [https://docs.netapp.com/us-en/ontap-sanhost/nvme\\_sles15\\_sp2.html](https://docs.netapp.com/us-en/ontap-sanhost/nvme_sles15_sp2.html) on October 09, 2020. Always check docs.netapp.com for the latest.

# Table of Contents

- NVMe/FC Host Configuration for SUSE Linux Enterprise Server 15 SP2 with ONTAP . . . . . 1
  - Supportability . . . . . 1
  - Known limitations . . . . . 1
  - Enabling NVMe/FC on SLES15 SP2 . . . . . 1
  - Configuring the Broadcom FC Adapter for NVMe/FC . . . . . 2
  - Validating NVMe/FC . . . . . 3
  - Enabling 1MB I/O Size for Broadcom NVMe/FC . . . . . 5
  - LPFC Verbose Logging . . . . . 6

# NVMe/FC Host Configuration for SUSE Linux Enterprise Server 15 SP2 with ONTAP

## Supportability

NVMe/FC is supported on ONTAP 9.6 or later for the following versions of SLES:

- SLES15 SP2

SLES15 SP2 host can run both NVMe/FC, & FCP (FC-SCSI) traffic through the same fibre channel initiator adapter ports. See the [Hardware Universe](#) for a list of supported FC adapters and controllers.

For the most current list of supported configurations & versions, see the [NetApp Interoperability Matrix](#).

## Known limitations

None. Native NVMe/FC auto-connect scripts are included in the nvme-cli package. You can use the native inbox lpfc driver on SLES15 SP2.

## Enabling NVMe/FC on SLES15 SP2

1. Upgrade to SLES15 SP2 MU kernel-default-4.12.14-197.40.1. See the [NetApp Interoperability Matrix](#) for the most current list of supported versions.

```
# uname -r
5.3.18-24.9-default
```

2. Upgrade to nvme-cli-1.8.1-6.9.1 MU package.

This nvme-cli package contains the native NVMe/FC auto-connect scripts, so you do not need to install the external NVMe/FC auto-connect scripts provided by Broadcom on the SLES15 SP2 host. This package also includes the ONTAP udev rule which enables round-robin load balancing for NVMe multipath, and the NetApp plug-in for ONTAP devices.

```
# rpm -qa|grep nvme-cli
nvme-cli-1.10-2.38.x86_64
```

3. On the SLES15 SP2 host, check the host NQN string at `/etc/nvme/hostnqn` and verify that it matches the host NQN string for the corresponding subsystem on the ONTAP array.

```
# cat /etc/nvme/hostnqn
nqn.2014-08.org.nvmexpress:uuid:3ca559e1-5588-4fc4-b7d6-5ccfb0b9f054
```

```
*> vserver nvme subsystem host show -vserver vs_fcnvme_145
Vserver Subsystem Host NQN
-----
vs_fcnvme_145
nvme_145_1
nqn.2014-08.org.nvmexpress:uuid:c7b07b16-a22e-41a6-a1fd-cf8262c8713f
nvme_145_2
nqn.2014-08.org.nvmexpress:uuid:c7b07b16-a22e-41a6-a1fd-cf8262c8713f
nvme_145_3
nqn.2014-08.org.nvmexpress:uuid:c7b07b16-a22e-41a6-a1fd-cf8262c8713f
nvme_145_4
nqn.2014-08.org.nvmexpress:uuid:c7b07b16-a22e-41a6-a1fd-cf8262c8713f
nvme_145_5
nqn.2014-08.org.nvmexpress:uuid:c7b07b16-a22e-41a6-a1fd-cf8262c8713f
5 entries were displayed.
```

4. Reboot the host.

## Configuring the Broadcom FC Adapter for NVMe/FC

1. Verify that you are using the supported adapter. For the most current list of supported adapters see the [NetApp Interoperability Matrix](#).

```
# cat /sys/class/scsi_host/host*/modelname
LPe32002-M2
LPe32002-M2
```

```
# cat /sys/class/scsi_host/host*/modeldesc
Emulex LightPulse LPe32002-M2 2-Port 32Gb Fibre Channel Adapter
Emulex LightPulse LPe32002-M2 2-Port 32Gb Fibre Channel Adapter
```

2. Verify that you are using the recommended Broadcom lpfc firmware and native inbox driver versions.

```
# cat /sys/class/scsi_host/host*/fwrev
12.6.182.8, sli-4:2:c
12.6.182.8, sli-4:2:c
```

```
# cat /sys/module/lpfc/version
0:12.8.0.2
```

3. Verify that lpfc\_enable\_fc4\_type is set to 3.

```
# cat /sys/module/lpfc/parameters/lpfc_enable_fc4_type
3
```

4. Verify that the initiator ports are up and running.

```
# cat /sys/class/fc_host/host*/port_name
0x100000109b579d5e
0x100000109b579d5f
```

```
# cat /sys/class/fc_host/host*/port_state
Online
Online
```

5. Verify that the NVMe/FC initiator ports are enabled, running and able to see the target LIFs.

```
# cat /sys/class/scsi_host/host*/nvme_info
NVME Initiator Enabled
XRI Dist lpfc0 Total 6144 IO 5894 ELS 250
NVME LPORT lpfc0 WWPN x100000109b579d5e WWNN x200000109b579d5e DID x011c00 ONLINE
NVME RPORT WWPN x208400a098dfdd91 WWNN x208100a098dfdd91 DID x011503 TARGET DISCSRV
ONLINE
NVME RPORT WWPN x208500a098dfdd91 WWNN x208100a098dfdd91 DID x010003 TARGET DISCSRV
ONLINE
NVME Statistics
LS: Xmt 0000000e49 Cmpl 0000000e49 Abort 00000000
LS XMIT: Err 00000000 CMPL: xb 00000000 Err 00000000
Total FCP Cmpl 000000003ceb594f Issue 000000003ce65dbe OutIO ffffffffbb046f
abort 00000bd2 noxri 00000000 nondlp 00000000 qdepth 00000000 wqerr 00000000 err
00000000
FCP CMPL: xb 000014f4 Err 00012abd
```

## Validating NVMe/FC

1. Verify the following NVMe/FC settings.

```
# cat /sys/module/nvme_core/parameters/multipath
Y
```

```
# cat /sys/class/nvme-subsystem/nvme-subsys*/model
NetApp ONTAP Controller
```

```
# cat /sys/class/nvme-subsystem/nvme-subsys*/iopolicy
round-robin
```

2. Verify that the namespaces are created.

```
# nvme list
Node SN Model Namespace Usage Format FW Rev
-----
/dev/nvme1n1 814vWBNRwfBGAAAAAAB NetApp ONTAP Controller 1 85.90 GB / 85.90 GB 4 KiB
+ 0 B FFFFFFFF
```

3. Verify the status of the ANA paths.

```
# nvme list-subsys /dev/nvme1n1
nvme-subsys1 - NQN=nqn.1992-
08.com.netapp:sn.04ba0732530911ea8e8300a098dfdd91:subsystem.nvme_145_1
\
+- nvme2 fc traddr=nn-0x208100a098dfdd91:pn-0x208200a098dfdd91 host_traddr=nn-
0x200000109b579d5f:pn-0x100000109b579d5f live inaccessible
+- nvme3 fc traddr=nn-0x208100a098dfdd91:pn-0x208500a098dfdd91 host_traddr=nn-
0x200000109b579d5e:pn-0x100000109b579d5e live inaccessible
+- nvme4 fc traddr=nn-0x208100a098dfdd91:pn-0x208400a098dfdd91 host_traddr=nn-
0x200000109b579d5e:pn-0x100000109b579d5e live optimized
+- nvme6 fc traddr=nn-0x208100a098dfdd91:pn-0x208300a098dfdd91 host_traddr=nn-
0x200000109b579d5f:pn-0x100000109b579d5f live optimized
```

4. Verify the NetApp plug-in for ONTAP devices.

```
# nvme netapp ontapdevices -o column
Device Vserver Namespace Path NSID UUID Size
-----
-----
-----
/dev/nvme1n1 vserver_fcnvme_145 /vol/fcnvme_145_vol_1_0_0/fcnvme_145_ns 1 23766b68-
e261-444e-b378-2e84dbe0e5e1 85.90GB

# nvme netapp ontapdevices -o json
{
  "ONTAPdevices" : [
    {
      "Device" : "/dev/nvme1n1",
      "Vserver" : "vserver_fcnvme_145",
      "Namespace_Path" : "/vol/fcnvme_145_vol_1_0_0/fcnvme_145_ns",
      "NSID" : 1,
      "UUID" : "23766b68-e261-444e-b378-2e84dbe0e5e1",
      "Size" : "85.90GB",
      "LBA_Data_Size" : 4096,
      "Namespace_Size" : 20971520
    },
  ]
}
```

## Enabling 1MB I/O Size for Broadcom NVMe/FC

The `lpfc_sg_seg_cnt` parameter must be set to 256 in order for the host to issue 1MB size I/O.

1. Set the `lpfc_sg_seg_cnt` parameter to 256.

```
# cat /etc/modprobe.d/lpfc.conf
options lpfc lpfc_sg_seg_cnt=256
```

2. Run a `dracut -f` command, and reboot the host.
3. Verify that `lpfc_sg_seg_cnt` is 256.

```
# cat /sys/module/lpfc/parameters/lpfc_sg_seg_cnt
256
```

# LPFC Verbose Logging

1. You can set the `lpfc_log_verbose` driver setting to any of the following values to log NVMe/FC events.

```
#define LOG_NVME 0x00100000 /* NVME general events. */  
#define LOG_NVME_DISC 0x00200000 /* NVME Discovery/Connect events. */  
#define LOG_NVME_ABTS 0x00400000 /* NVME ABTS events. */  
#define LOG_NVME_IOERR 0x00800000 /* NVME IO Error events. */
```

2. After setting any of these values, run `dracut-f` and reboot host.
3. After rebooting, verify the settings.

```
# cat /etc/modprobe.d/lpfc.conf  
lpfc_enable_fc4_type=3 lpfc_log_verbose=0xf00083  
  
# cat /sys/module/lpfc/parameters/lpfc_log_verbose  
15728771
```



## Copyright Information

Copyright © 2020 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

## Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.