



SLES15-SP3 Driver User Manual

Document History

Version	Date	Description of Change
SLES15-SP3	December 2021	Initial release of this document

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Chapter 1. Firmware Burning

1. Check the device's PCI address.

```
lspci | grep Mellanox
04:00.0 Ethernet controller: Mellanox Technologies MT27700 Family [ConnectX-4]
04:00.1 InfiniBand controller: Mellanox Technologies MT27700 Family [ConnectX-4]
07:00.0 Ethernet controller: Mellanox Technologies MT27710 Family [ConnectX-4 Lx]
07:00.1 Ethernet controller: Mellanox Technologies MT27710 Family [ConnectX-4 Lx]
0a:00.0 Network controller: Mellanox Technologies MT27520 Family [ConnectX-3 Pro]
21:00.0 InfiniBand controller: Mellanox Technologies MT27600 [Connect-IB]
24:00.0 Ethernet controller: Mellanox Technologies MT28800 Family [ConnectX-5 Ex]
```

2. Identify the adapter card's PSID.

```
# mstflint -d 81:00.0 q
Image type:          FS4
FW Version:          16.26.4012
FW Release Date:     10.12.2019
Product Version:     16.26.4012
Rom Info:            type=UEFI version=14.19.17 cpu=AMD64
                    type=PXE version=3.5.805 cpu=AMD64
Description:         UID                               GuidNumber
Base GUID:           ec0d9a0300d42de4                8
Base MAC:            ec0d9ad42de4                    8
Image VSD:           N/A
Device VSD:          N/A
PSID:                MT_0000000009
Security Attributes: N/A
```

3. Download the firmware BIN file from the Mellanox website that matches your card's PSID:

<https://www.nvidia.com/en-us/networking/> → Support → Support → Firmware Download

4. Burn the firmware.

```
# mstflint -d <lspci-device-id> -i <image-file> b
```

5. Reboot your machine after the firmware burning is completed.

6. Validate new firmware burned successfully:

```
# ethtool -i ens3
driver: mlx5_core
version: 5.0-0
firmware-version: 16.32.1010 (MT_0000000009)
expansion-rom-version:
```

```
bus-info: 0000:24:00.0
supports-statistics: yes
supports-test: yes
supports-eeprom-access: no
supports-register-dump: no
supports-priv-flags: yes
```

Chapter 2. Port Type Management

2.1 Port Type Management/VPI Cards Configuration

ConnectX-3 onwards adapter cards' ports can be individually configured to work as InfiniBand or Ethernet ports. By default, ConnectX family adapter cards VPI ports are initialized as InfiniBand ports. If you wish to change the port type use the `mstconfig` after the driver is loaded.

1. Install `mstflint` tools.

```
zypper install mstflint
```

2. Check the PCI address.

```
spci | grep Mellanox
```

Example:

```
24:00.0 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex]
```

3. Use `mstconfig` to change the link type as desired IB -- for InfiniBand, ETH -- for Ethernet.

```
mstconfig -d <device pci> s LINK_TYPE_P1/2=<ETH|IB|VPI>
```

Example:

```
# mstconfig -d 00:06.0 s LINK_TYPE_P1=ETH
```

```
Device #1
```

```
-----
```

```
Device type:    ConnectX5
```

```
Name:          MCX556A-EDA_Ax
```

```
Description:   ConnectX-5 Ex VPI adapter card; EDR IB (100Gb/s) and 100GbE; dual-port QSFP28; PCIe4.0 x16; tall bracket; ROHS R6
```

```
Device:        24:00.0
```

```
Configurations:
```

```
Next Boot
```

```
New
```

LINK_TYPE_P1

IB (1)

ETH (2)

Apply new Configuration? (y/n) [n] : y

Applying... Done!

-I- Please reboot machine to load new configurations.

4. Reboot the machine.

5. Query the device's parameters to validate the new configuration.

```
# mstconfig -d 00:06.0 q
```

```
Device #1:
```

```
-----
```

```
Device type:      ConnectX5
```

```
Name:            MCX556A-EDA_Ax
```

```
Description: ConnectX-5 Ex VPI adapter card; EDR IB (100Gb/s) and 100GbE; dual-port QSFP28; PCIe4.0 x16; tall bracket; ROHS R6
```

```
Device: 24:00.0
```

```
Configurations:                                     Next Boot
```

MEMIC_BAR_SIZE	0
MEMIC_SIZE_LIMIT	_256KB(1)
HOST_CHAINING_MODE	DISABLED(0)
HOST_CHAINING_DESCRIPTOR	Array[0..7]
HOST_CHAINING_TOTAL_BUFFER_SIZE	Array[0..7]
FLEX_PARSER_PROFILE_ENABLE	0
FLEX_IPV4_OVER_VXLAN_PORT	0
ROCE_NEXT_PROTOCOL	254
ESWITCH_HAIRPIN_DESCRIPTOR	Array[0..7]
ESWITCH_HAIRPIN_TOT_BUFFER_SIZE	Array[0..7]
NON_PREFETCHABLE_PF_BAR	False(0)
NUM_OF_VFS	4
SRIOV_EN	True(1)
PF_LOG_BAR_SIZE	5
VF_LOG_BAR_SIZE	1
NUM_PF_MSIX	63
NUM_VF_MSIX	11
INT_LOG_MAX_PAYLOAD_SIZE	AUTOMATIC(0)
SW_RECOVERY_ON_ERRORS	False(0)
RESET_WITH_HOST_ON_ERRORS	False(0)
ADVANCED_POWER_SETTINGS	False(0)
CQE_COMPRESSION	BALANCED(0)
IP_OVER_VXLAN_EN	False(0)
PCI_ATOMIC_MODE	
PCI_ATOMIC_DISABLED_EXT_ATOMIC	ENABLED(0)

LRO_LOG_TIMEOUT0	6
LRO_LOG_TIMEOUT1	7
LRO_LOG_TIMEOUT2	8
LRO_LOG_TIMEOUT3	13
LOG_DCR_HASH_TABLE_SIZE	11
DCR_LIFO_SIZE	16384
LINK_TYPE_P1	ETH(2)
LINK_TYPE_P2	IB(1)
ROCE_CC_PRIO_MASK_P1	255
ROCE_CC_ALGORITHM_P1	ECN(0)
ROCE_CC_PRIO_MASK_P2	255
ROCE_CC_ALGORITHM_P2	ECN(0)
CLAMP_TGT_RATE_AFTER_TIME_INC_P1	True(1)
CLAMP_TGT_RATE_P1	False(0)
RPG_TIME_RESET_P1	300
RPG_BYTE_RESET_P1	32767
RPG_THRESHOLD_P1	1
RPG_MAX_RATE_P1	0
RPG_AI_RATE_P1	5
RPG_HAI_RATE_P1	50
RPG_GD_P1	11
RPG_MIN_DEC_FAC_P1	50
RPG_MIN_RATE_P1	1
RATE_TO_SET_ON_FIRST_CNP_P1	0
DCE_TCP_G_P1	1019
DCE_TCP_RTT_P1	1
RATE_REDUCE_MONITOR_PERIOD_P1	4
INITIAL_ALPHA_VALUE_P1	1023
MIN_TIME_BETWEEN_CNPS_P1	2
CNP_802P_PRIO_P1	6
CNP_DSCP_P1	48
CLAMP_TGT_RATE_AFTER_TIME_INC_P2	True(1)
CLAMP_TGT_RATE_P2	False(0)
RPG_TIME_RESET_P2	300
RPG_BYTE_RESET_P2	32767
RPG_THRESHOLD_P2	1
RPG_MAX_RATE_P2	0
RPG_AI_RATE_P2	5
RPG_HAI_RATE_P2	50
RPG_GD_P2	11
RPG_MIN_DEC_FAC_P2	50
RPG_MIN_RATE_P2	1
RATE_TO_SET_ON_FIRST_CNP_P2	0
DCE_TCP_G_P2	1019
DCE_TCP_RTT_P2	1
RATE_REDUCE_MONITOR_PERIOD_P2	4
INITIAL_ALPHA_VALUE_P2	1023
MIN_TIME_BETWEEN_CNPS_P2	2

CNP_802P_PRIO_P2	6
CNP_DSCP_P2	48
LLDP_NB_DCBX_P1	False(0)
LLDP_NB_RX_MODE_P1	OFF(0)
LLDP_NB_TX_MODE_P1	OFF(0)
LLDP_NB_DCBX_P2	False(0)
LLDP_NB_RX_MODE_P2	OFF(0)
LLDP_NB_TX_MODE_P2	OFF(0)
DCBX_IEEE_P1	True(1)
DCBX_CEE_P1	True(1)
DCBX_WILLING_P1	True(1)
DCBX_IEEE_P2	True(1)
DCBX_CEE_P2	True(1)
DCBX_WILLING_P2	True(1)
KEEP_ETH_LINK_UP_P1	True(1)
KEEP_IB_LINK_UP_P1	False(0)
KEEP_LINK_UP_ON_BOOT_P1	False(0)
KEEP_LINK_UP_ON_STANDBY_P1	False(0)
KEEP_ETH_LINK_UP_P2	True(1)
KEEP_IB_LINK_UP_P2	False(0)
KEEP_LINK_UP_ON_BOOT_P2	False(0)
KEEP_LINK_UP_ON_STANDBY_P2	False(0)
NUM_OF_VL_P1	4_VLs(3)
NUM_OF_TC_P1	_8_TCs(0)
NUM_OF_PFC_P1	8
NUM_OF_VL_P2	_4_VLs(3)
NUM_OF_TC_P2	_8_TCs(0)
NUM_OF_PFC_P2	8
DUP_MAC_ACTION_P1	LAST_CFG(0)
SRIOV_IB_ROUTING_MODE_P1	LID(1)
IB_ROUTING_MODE_P1	LID(1)
DUP_MAC_ACTION_P2	LAST_CFG(0)
SRIOV_IB_ROUTING_MODE_P2	LID(1)
IB_ROUTING_MODE_P2	LID(1)
PCI_WR_ORDERING	per_mkey(0)
MULTI_PORT_VHCA_EN	False(0)
PORT_OWNER	True(1)
ALLOW_RD_COUNTERS	True(1)
RENEG_ON_CHANGE	True(1)
TRACER_ENABLE	IPv4(0)
IP_VER	0
BOOT_UNDI_NETWORK_WAIT	False(0)
UEFI_HII_EN	False(0)
BOOT_DBG_LOG	DISABLED(0)
UEFI_LOGS	1
BOOT_VLAN	PXE(1)
LEGACY_BOOT_PROTOCOL	NONE(0)
BOOT_RETRY_CNT1	True(1)

```
BOOT_LACP_DIS           False(0)
BOOT_VLAN_EN           0
BOOT_PKEY               False(0)
EXP_ROM_PXE_ENABLE     True(1)
IBM_TUNNELED_ATOMIC_EN False(0)
IBM_AS_NOTIFY_EN       False(0)
ADVANCED_PCI_SETTINGS  False(0)
SAFE_MODE_THRESHOLD    10
SAFE_MODE_ENABLE       True(1)
```

```
*****
```

Chapter 3. Modules Loading and Unloading

NVIDIA modules for ConnectX-3/ConnectX-3 Pro are:

- ▶ `mlx4_en`, `mlx4_core`, `mlx4_ib`

NVIDIA modules for ConnectX-4/ConnectX-4 Lx/ConnectX-5 are:

- ▶ `mlx5_core`, `mlx5_ib`

To unload the driver, you need to first unload `mlx*_en/ mlx*_ib` and then the `mlx*_core` module.

- ▶ To load and unload the modules, use the commands below:

- Loading the driver: `modprobe <module name>`

```
modprobe mlx5_ib
```

- Unloading the driver: `modprobe -r <module name>`

```
modprobe -r mlx5_ib
```

Chapter 4. Important Packages and Their Installation

Table 4-1. Packages

Package Name	Description
rdma-core	RDMA core userspace libraries and daemon
libibmad5	OpenFabrics Alliance InfiniBand MAD library (Low layer InfiniBand diagnostic and management programs)
opensm	OpenIB InfiniBand Subnet Manager and management utilities
ibutils	OpenIB NVIDIA InfiniBand Diagnostic Tools
infiniband-diags	OpenFabrics Alliance InfiniBand Diagnostic Tools
perftest	IB Performance Tests
mstflint	NVIDIA firmware burning and diagnostics tool

To install the packages above run:

```
# zypper install <packages names>
```

Chapter 5. SR-IOV Configuration

5.1 Setting up SR-IOV

1. Download mstflint tools.

```
# zypper install mstflint
```

2. Check the device's PCI

```
lspci | grep Mellanox
```

Example:

```
24:00.0 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex]
```

3. Check if SR-IOV is enabled in the firmware.

```
mstconfig -d <device pci> q
```

Example:

```
# mstconfig -d 00:06.0 q
```

Device #1:

Device type: ConnectX3Pro

PCI device: 00:06.0

Configurations:	Current
SRIOV_EN	True(1)
NUM_OF_VFS	8
LINK_TYPE_P1	ETH(2)
LINK_TYPE_P2	IB(1)
LOG_BAR_SIZE	3
BOOT_PKEY_P1	0
BOOT_PKEY_P2	0
BOOT_OPTION_ROM_EN_P1	True(1)
BOOT_VLAN_EN_P1	False(0)
BOOT_RETRY_CNT_P1	0
LEGACY_BOOT_PROTOCOL_P1	PXE(1)
BOOT_VLAN_P1	1
BOOT_OPTION_ROM_EN_P2	True(1)
BOOT_VLAN_EN_P2	False(0)
BOOT_RETRY_CNT_P2	0
LEGACY_BOOT_PROTOCOL_P2	PXE(1)

```
BOOT_VLAN_P2          1
IP_VER_P1             IPv4 (0)
IP_VER_P2             IPv4 (0)
```

4. Enable SR-IOV:

```
mstconfig -d <device pci> s SRIOV_EN=<False|True>
```

5. Configure the needed number of VFs.

```
mstconfig -d <device pci> s NUM_OF_VFS=<NUM>
```



Note: This file will be generated only if IOMMU is set in grub configuration. (by adding "intel_iommu=on" to /etc/default/grub).

6. [mlx4 devices only] Edit the file /etc/modprobe.d/mlx4.conf:

```
options mlx4_core num_vfs=[needed num of VFs] port_type_array=[1/2
```

Example:

```
options mlx4_core num_vfs=8 port_type_array=1,1
```

7. [mlx5 devices only] Write to the sysfs file the number of needed VFs.

```
echo [num_vfs] > /sys/class/infiniband/mlx5_0/device/sriov_numvfs
```

8. Reboot the driver.

9. Load the driver and verify that the VFs were created.

```
lspci | grep mellanox
```

Example:

```
24:00.0 Ethernet controller: Mellanox Technologies MT28800 Family
[ConnectX-5 Ex]
24:00.1 Infiniband controller: Mellanox Technologies MT28800Family [ConnectX-5 Ex]
24:00.2 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex Virtual
Function]
24:00.3 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex Virtual
Function]
24:00.4 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex Virtual
Function]
24:00.5 Ethernet controller: Mellanox Technologies MT28800 Family[ConnectX-5 Ex Virtual
Function]
```

For further information, refer to section Setting Up SR-IOV MLNX_OFED User Manual.

Chapter 6. Default RoCE Mode Setting for RDMA_CMAApplication

1. Create a directory for the mlx4/mlx5 device.

```
mkdir -p /sys/kernel/config/rdma_cm/mlx4_0/
```

2. Validate what is the used RoCE mode in the default_roce_mode configs file.

```
# cat /sys/kernel/config/rdma_cm/mlx4_0/ports/1/default_roce_mode IB/RoCE v1
```

3. Change the default RoCE mode,

- ▶ For RoCE v1: IB/RoCE v1

```
# echo "IB/RoCE v1" >
/sys/kernel/config/rdma_cm/mlx4_0/ports/1/default_roce_mode
# cat /sys/kernel/config/rdma_cm/mlx4_0/ports/1/default_roce_mode IB/RoCE v1
```

- ▶ For RoCE v2: RoCE v2

```
# echo "RoCE v2" >
/sys/kernel/config/rdma_cm/mlx4_0/ports/1/default_roce_mode
# cat /sys/kernel/config/rdma_cm/mlx4_0/ports/1/default_roce_mode
RoCE v2
```

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