



Ubuntu 20.10 Linux Inbox Driver User Manual

20.10

Document History

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1 Firmware Burning

1. Check the device's PCI address.

```
lspci | grep Mellanox
```

Example:

```
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]
24:00.1 InfiniBand 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: www.mellanox.com → 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: 16.26.4012 (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
```

2 Port Type Management

2.1 Port Type Management/VPI Cards Configuration

ConnectX®-3/ConnectX®-3 Pro/ConnectX®-4 ports can be individually configured to work as InfiniBand or Ethernet ports. By default, both ConnectX®-5 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.

```
apt install mstflint
```

2. Check the PCI address.

```
lspci | 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 your 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                               0
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	True(1)
IP_VER	IPv4(0)
BOOT_UNDI_NETWORK_WAIT	0
UEFI_HII_EN	False(0)
BOOT_DBG_LOG	False(0)
UEFI_LOGS	DISABLED(0)
BOOT_VLAN	1
LEGACY_BOOT_PROTOCOL	PXE(1)
BOOT_RETRY_CNT1	NONE(0)
BOOT_LACP_DIS	True(1)
BOOT_VLAN_EN	False(0)
BOOT_PKEY	0
EXP_ROM_UEFI_x86_ENABLE	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)
```

```
*****
*****
```

3 Modules Loading and Unloading

Mellanox modules for ConnectX®-2/ConnectX®-3/ConnectX®-3 Pro are:

- ▶ mlx4_en, mlx4_core, mlx4_ib

Mellanox modules for ConnectX®-4/ConnectX®-4 Lx/ConnectX®-5 are:

- ▶ mlx5_core, mlx5_ib

In order 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
```

4 Important Packages and Their Installation

rdma-core

rdma-core RDMA core userspace libraries and daemons

libibmad5: Low layer InfiniBand diagnostic and management programs

libibmad5 OpenFabrics Alliance InfiniBand MAD library

opensm: InfiniBand Subnet Manager

opensm OpenIB InfiniBand Subnet Manager and management utilities

ibutils: OpenIB Mellanox InfiniBand Diagnostic Tools

ibutils OpenIB Mellanox InfiniBand Diagnostic Tools

infiniband-diags: OpenFabrics Alliance InfiniBand Diagnostic Tools

infiniband-diags OpenFabrics Alliance InfiniBand Diagnostic Tools

perftest: IB Performance tests

perftest IB Performance Tests

mstflint: Mellanox Firmware Burning and Diagnostics Tools

mstflint Mellanox firmware burning tool

- ▶ To install the packages above, run:

```
# apt-get install <packages names>
```

5 SR-IOV Configuration

5.1 Setting up SR-IOV

1. Download mstflint tools.

```
# apt 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 the grub.conf file (by adding "intel_iommu=on" to /boot/grub/grub.conf file).

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  
for IB/ETH],[ 1/2 for IB/ETH]
```

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 MT28800  
Family [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.

Default RoCE Mode Setting for RDMA_CM Application

1. Mount the configs file.

```
# mount -t configfs none /sys/kernel/config
```

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

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

3. 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
```

4. Change the default RoCE mode,

- For RoCE v1: 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
```

```
# 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
```

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