Ubuntu 18.04 Linux Inbox Driver User Manual
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# Table of Contents

Document Revision History ........................................................................................................... 5  
1 Firmware Burning ....................................................................................................................... 6  
2 Port Type Management ................................................................................................................ 7  
3 Modules Loading and Unloading .................................................................................................. 9  
4 Important Packages and Their Installation ................................................................................. 10  
5 SR-IOV Configuration ................................................................................................................. 11  
   5.1 Setting up SR-IOV .................................................................................................................... 11  
6 Default RoCE Mode Setting ......................................................................................................... 13
List of Tables

Table 1: Document Revision History ................................................................. 5
## Document Revision History

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<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubuntu 18.04</td>
<td>April 30, 2018</td>
<td>Initial version of this document.</td>
</tr>
</tbody>
</table>
1 Firmware Burning

1. Check the device’s PCI address.

   `lspci | grep Mellanox`

   Example:

   ```bash
   00:06.0 Infiniband controller: Mellanox Technologies MT27520 Family [ConnectX-3 Pro]
   ```

2. Identify the adapter card’s PSID.

   ```bash
   # mstflint -d 81:00.0 q
   Image type: FS2
   FW Version: 2.36.5000
   FW Release Date: 26.4.2016
   Rom Info: type=PXE version=3.4.718 devid=4103
   Device ID: 4103
   Description: Node Port1 Port2
   Sys image GUIDs: e41d2d0300b3f590 e41d2d0300b3f591 e41d2d0300b3f592
   e41d2d0300b3f593
   MACs: e41d2db3f591 e41d2db3f592
   VSD: PSID: MT_1090111019
   ```

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

   ```text
   www.mellanox.com ➔ Support/Education ➔ Support Downloader
   ```

4. Burn the firmware.

   ```bash
   # 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:

   ```bash
   # ethtool -i ens3
   driver: mlx4_en
   version: 2.2-1 (Feb 2014)
   firmware-version: 2.40.5000
   expansion-rom-version: 
   bus-info: 0000:0a:00.0
   supports-statistics: yes
   supports-test: yes
   supports-eeprom-access: no
   supports-register-dump: no
   supports-priv-flags: yes
   ```
Port Type Management

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

   `yum install mstflint`

2. Check the device’s PCI address.

   `lspci | grep Mellanox`

   Example:
   
   00:06.0 Infiniband controller: Mellanox Technologies MT27520 Family [ConnectX-3 Pro]

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: ConnectX3Pro
   PCI device: 00:06.0
   
   Configurations: LINK_TYPE_P1 Current New
   ------ ------- -------
   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: ConnectX3Pro
   PCI device: 0a:00.0
   
   Configurations: 
   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)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOT_VLAN_EN_P2</td>
<td>False(0)</td>
</tr>
<tr>
<td>BOOT_RETRY_CNT_P2</td>
<td>0</td>
</tr>
<tr>
<td>LEGACY_BOOT_PROTOCOL_P2</td>
<td>PXE(1)</td>
</tr>
<tr>
<td>BOOT_VLAN_P2</td>
<td>1</td>
</tr>
<tr>
<td>IP_VER_P1</td>
<td>IPv4(0)</td>
</tr>
<tr>
<td>IP_VER_P2</td>
<td>IPv4(0)</td>
</tr>
</tbody>
</table>
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 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
- **libibmad**: Low layer InfiniBand diagnostic and management programs
- **libibmad**: OpenFabrics Alliance InfiniBand MAD library

- **opensm**: InfiniBand Subnet Manager
- **opensm**: OpenIB InfiniBand Subnet Manager and management utilities
- ** opensm**: Libraries used by OpenSM and included utilities

**Ibutils**: OpenIB Mellanox InfiniBand Diagnostic Tools

- **ibutils**: OpenIB Mellanox InfiniBand Diagnostic Tools
- **ibutils**: Shared libraries used by ibutils binaries
- **infiniband-diags**: OpenFabrics Alliance InfiniBand Diagnostic Tools

**perftest**: IB Performance tests

- **perf**: IB Performance Tests
- **perf**: IB Performance Tests

**mstflint**: Mellanox Firmware Burning and Diagnostics Tools

- **mstflint**: Mellanox firmware burning tool

➢ To install the packages above run:

```bash
# apt-get install <packages names>
```
5 SR-IOV Configuration

5.1 Setting up SR-IOV

1. Install the mstflint tools.
   ```
   # yum install mstflint
   ```

2. Check the device’s PCI.
   ```
   # lspci | grep Mellanox
   ```
   Example:
   ```
   00:06.0 Infiniband controller: Mellanox Technologies MT27520 Family [ConnectX-3 Pro]
   ```

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
   SROV_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 False(0)
   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] Create/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.

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

Example:
```
# echo 8 > /sys/class/infiniband/mlx5_0/device/sriov_numvfs
```

8. Reboot the driver.

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

```bash
# lspci | grep mellanox
```

Example:
```
00:06.0 Network controller: Mellanox Technologies MT27520 Family [ConnectX-3 Pro]
00:06.1 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.2 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.3 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.4 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.5 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.6 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.7 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
00:06.0 Network controller: Mellanox Technologies MT27500/MT27520 Family [ConnectX-3/ConnectX-3 Pro Virtual Function]
```

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

1. Mount the configfs file.
   
   ```bash
   # mount -t configfs none /sys/kernel/config
   ```

2. Create a directory for the mlx4/mlx5 device.
   
   ```bash
   # mkdir -p /sys/kernel/config/rdma_cm/mlx4_0/
   ```

3. Validate what is the used RoCE mode in the default_roce_mode configfs file.
   
   ```bash
   # 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

   ```bash
   # 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
   ```

   ```bash
   # 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
   ```