Red Hat Enterprise Linux (RHEL) 8.0 Driver User Manual

RHEL 8.0
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Document Revision History

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<td>RHEL 8.0</td>
<td>November 13, 2019</td>
<td>Initial version of this document.</td>
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1 **Firmware Burning**

1. Check the device’s PCI address.

   ```bash
   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
   ```

<table>
<thead>
<tr>
<th>Image type</th>
<th>FW Version</th>
<th>FW Release Date</th>
<th>Rom Info</th>
<th>Device ID</th>
<th>Description</th>
<th>Sys image</th>
<th>GUIDs</th>
<th>MACs</th>
<th>VSD</th>
<th>PSID</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2</td>
<td>2.42.5000</td>
<td>26.7.2017</td>
<td>type=PXE version=3.4.752 devid=4103</td>
<td>4103</td>
<td>Node Port1 Port2</td>
<td></td>
<td>e41d2d0300b3f590</td>
<td>e41d2d0300b3f591</td>
<td>e41d2d0300b3f592</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>e41d2d0300b3f593</td>
<td></td>
<td></td>
<td>MT_1090111019</td>
</tr>
</tbody>
</table>

3. Download the firmware BIN file from the Mellanox website that matches your card’s PSID. To download the firmware, go to www.mellanox.com ([Firmware Downloads](#)).

4. Burn the firmware.

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

5. Reboot your machine after the firmware burning is completed.
2 Port Type Management

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.

   ```
   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:  Current New
   LINK_TYPE_P1     IB(1)   ETH(2)
   Apply new Configuration? ? (y/n) [n]: y
   Applying... Done!

   `-1= Please reboot machine to load new configurations.

4. Reboot your machine.
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 onwards 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

libibmad: Low layer InfiniBand diagnostic and management programs
libibmad

opensm: InfiniBand Subnet Manager
opensm
opensm

Ibutils: OpenIB Mellanox InfiniBand Diagnostic Tools
ibutils
ibutils

infiniband-diags: OpenFabrics Alliance InfiniBand Diagnostic Tools
infiniband-diags

perftest: IB Performance tests
perftest

mstflint: Mellanox Firmware Burning and Diagnostics Tools
mstflint

➢ To install the packages above run:

```
# yum install libibverbs librdmacm libibcm libibmad libibumad libmlx4
libmlx5 opensm ibutils infiniband-diags srptools perftest mstflint rdmacm-utils ibverbs-utils librdmacm-utils -y
```
5 SR-IOV Configuration

5.1 Setting up SR-IOV

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

2. Check the device’s PCI.
   
   ```sh
   # 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.
   
   ```sh
   # mstconfig -d <device pci> q
   ```

   **Example:**
   
   ```
   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:
   
   ```sh
   # mstconfig -d <device pci> s SRIOV_EN=<False|True>
   ```

5. Configure the needed number of VFs
   
   ```sh
   # 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.
   echo [num_vfs] > sys/class/net/ib2/device/sriov_numvfs

Example:
   # echo 8 > /sys/class/net/ib2/device/sriov_numvfs

8. Reboot the driver.

9. Load the driver and verify that the VFs were created.
   
   Example:
   
   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
  ```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
  ```
- 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
  ```
7  PXE over InfiniBand Installation

PXE over InfiniBand infrastructure has additional parameter in the Boot Loader file for
loading the necessary modules and interfaces and for allowing sufficient time to get the link.

To install RHEL from PXE using the IPoIB interfaces, add the following parameters to the
Boot Loader file, located in the var/lib/tftpboot/pxelinux.cfg directory, at the
PXE server:

```plaintext
bootdev=ib0 ksdevice=ib0 net.ifnames=0 biosdevname=0 rd.neednet=1
rd.bootif=0 rd.driver.pre=mlx5_ib,mlx4_ib,ib_ipoib ip=ib0:dhcp
rd.net.dhcp.retry=10 rd.net.timeout.iflink=60 rd.net.timeout.ifup=80
rd.net.timeout.carrier=80
```

Example:

```plaintext
default RH7.5
prompt 1
timeout 600
label RH7.5
kernel
append bootdev=ib0 ksdevice=ib0 net.ifnames=0 biosdevname=0 rd.neednet=1
rd.bootif=0 rd.driver.pre=mlx5_ib,mlx4_ib,ib_ipoib ip=ib0:dhcp
rd.net.dhcp.retry=10 rd.net.timeout.iflink=60 rd.net.timeout.ifup=80
rd.net.timeout.carrier=80
```