NVIDIA BlueField DPU Time and Scheduling Deployment Guide for Rivermax (Windows)

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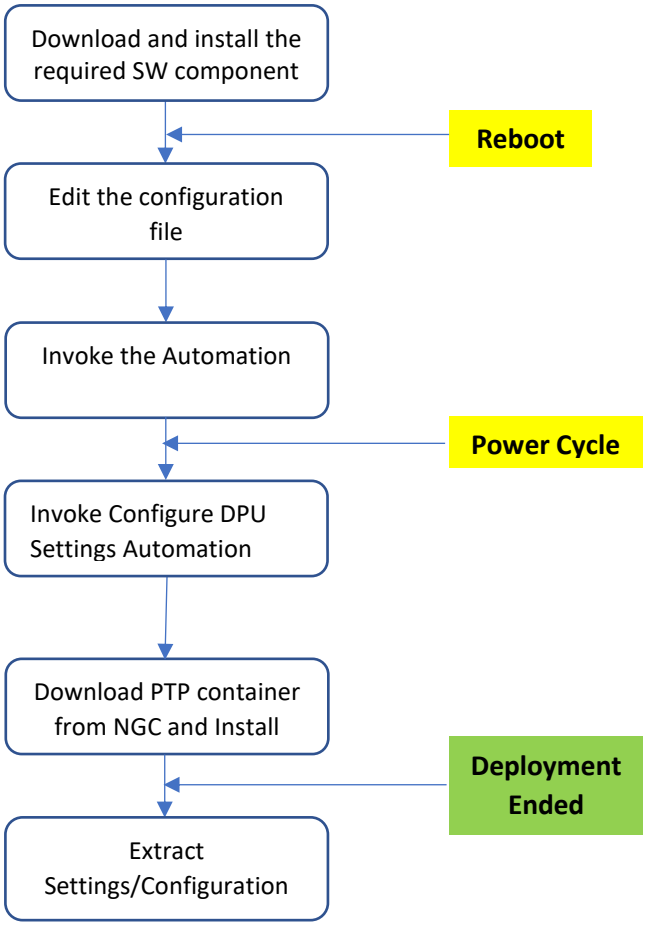
1 DPU Deployment Steps and Flow Diagram

1. Download and install a few SW component on the Windows server (WinOF-2, Python, PuTTy and the BFB image)
2. Editing a configuration file with information like BlueField-2 IP, password, and gateway
3. Run Automation from windows server command line – [Power Cycle is required]
4. Configure DPU settings
5. PTP Container deployment from NGX using putty (opens automatically)
6. Extract settings – this is done automatically for future debug



2 Physical Setup

3 Software Components

The following table presents the software components used to deploy NVIDIA® BlueField® DPU:

Component	Download Link	Version
BlueField BFB (BlueField-2 Ubuntu Server **20.04 - BlueField OS image)**	Direct Link Page Link	**Note: due to an issue with the latest BFB on the web (1.2.1) – BFB 1.2.0 is located in the BFB directory as part of the provided ZIP file**
PuTTY	Link	0.76 or later
Python	Link	3.10.1 or later
MLNX_WinOF2	Link	2.80 or later
BlueField Firmware		24.32.1010 [Part of the BFB image and set by WinOF-2]

For latest software versions -
https://docs.nvidia.com/networking/display/BlueFieldDPUOSv380/Supported+Platforms+and+Interoperability

4 NVIDIA BlueField-2 Cables connection

Connect 2 types of cables:

- miniUSB Cable is not needed – can be connected for terminal usage
- Ethernet cable - used for **DPU management**, connected to the **OOB port**. DPU is configured by default to acquire IP via DHCP - make sure to configure your DHCP server with the DPU OOB MAC
- **Port 0** - 100GbE cable connected to the high-speed switch

5 Prerequisites

1. Unzip the ZIP file to this path on the Windows server: **C:\DPU**

   Note: the path is used hardcoded in the scripts

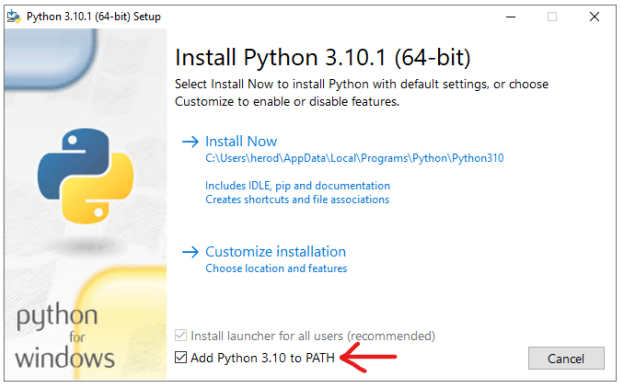
   The ZIP file contains automated scripts to install and configure the DPU.

   The Zip file contains:

   - DPU_install.batch – main script that start the process.
   - automation.batch – contains the commands for the BFB and FW installations.
   - configure_dpu_setting – contains the commands and scripts for the DPU configurations.
   - configuration_file.txt – file for the user to insert his info.
   - create_container.sh – script that run on the DPU and create the container.
   - remote_commands.txt – using this file running commands remotely on the DPU.
   - reset_password.py – script that change the password of the system to the user password.
   - set_ip_and_container.sh – set IP for the PTP interface, install needed package to run the container.
   - set_real_time_clock.sh – enable real time clock.
   - setting_status.sh - print the current DPU status.
   - Read_DPU_Configuration.batch - main script to get the current DPU status.
   - set_persistent_ip_to_p0.sh – set persistent IP and gateway to the PTP interface.
   - FW_Update.batch – force update the DPU FW to the latest FW version.
   - remote_commands_dns_fix.txt – using this file to run commands on the DPU to fix the DNS.
   - get_fw_info.batch – get the current device FW version and status.
   - config_after_reboot.sh – set the PTP interface Tx Timestamp to on after each reboot.
   - rc.local – will copied to the Bluefield /etc/ and run the "config_after_reboot" script after each reboot.

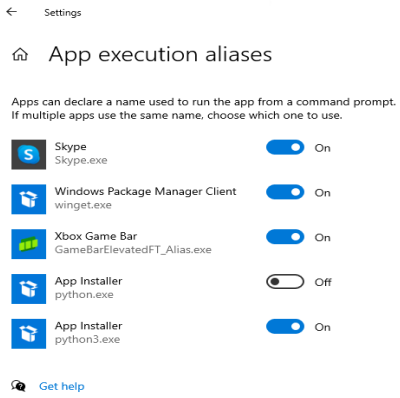
2. Download the software components from section 3
   1. Download the BFB image and place it in this folder **C:\DPU\BFB**
   2. **Note: due to an issue with the latest BFB on the web (1.2.1) – BFB 1.2.0 is located in the BFB directory as part of the provided ZIP file**
   3. Install PuTTY
   4. Install MLNX_WinOF2
      - For Rivermax installation please refer to the Rivermax installation guide
      - Rivermax version 1.9.x installation requiring a registry key - **command line must be used: MLNX_WinOF2-2_80_50000_All_x64.exe /v"MT_RIVERMAX=1 /l*vx C:\Users\\log.txt "**
   5. Install app ex

      Enable "add Python 3.10 to PATH"



After the Python 3 installation, type at the search bar "App execution aliases"

Make sure that only python3.exe is on (as the image below).



***Note: A Reboot is required after installation**

3. Edit the configuration_file at **C:\DPU\configuration_file.txt**
   - **BlueField-2_Managment_IP**: BlueField-2 DPU OOB Management IP
   - **BlueField-2_Managment_Gateway**: BlueField-2 DPU OOB Management Gateway
   - **BlueField-2_PTP_IP_Interface_0**: DPU arm PTP interface IP address and Subnet Mask
   - **BlueField-2_PTP_IP_Interface_0_Gateway**: DPU arm PTP interface Gateway
   - **BlueField-2_Username**: BlueField-2 current username (can be "root")
   - **BlueField-2_Password**: BlueField-2 current password
   - **BlueField-2_Root_Password**: BlueField-2 root current password
   - **Force_BFB_image_update(y/n):** y – force install BFB image (default), n – the BFB image will install only if the current BFB version is different from the BFB image version at C:\DPU\BFB\

***NOTES:**

- It is mandatory to fill in all the fields
- If you do not know the root password, BFB burn required!
- After the installation of the BFB the system requires a password change.

BlueField-2_Password requirements:

- Minimum password length of **8 characters**
- Use at least one digit
- Use at least one Special character
- Don't use the Special character: **!** (Exclamation mark)

6 PTP Pre-Requisite

Configure PTP on the switch side, while ensuring that the Bluefield IP and PTP are using the same subnet.

More information is available as part of the PTP best practice document.

*Make sure you have access permissions to container on NVIDIA NGC

7 DPU Setup – Start automation scripts

Open a Command line as an administrator and run the script file **C:\DPU\DPU_Install.bat**

The installation will take ~15 minutes, at the end the automation will perform a FW upgrade.

After FW upgrade a power cycle to the server is needed – Manually

8 DPU Settings

After the BFB installation and FW upgrade it's required to configure a few settings.

Open a Command line as an administrator and run the script file **C:\DPU\configure_dpu_setting.bat**

Once completed a PuTTY window will be opened to set the PTP container [next section]

Another window will open and all the DPU settings will be printed for debug/tracking.

9 DPU PTP Service Container

1. Open a new command line window: putty -ssh root@BlueFied_2_Managment_IP 22 -pw BlueField-2_Password
2. In the PuTTY window Run the following command to start the PTP Container setup:

   # ./create_container.sh

3. Insert the interface name for PTP usage (i.e. p0):

   # p0
4. Insert Username and Password, see below:

   Note: The script will download a container from the NVIDIA NGC catalog and require providing an API key to log into the NGC registry:

   Username: $oauthtoken
   Password: <Your_NGC_API_Key>

   For private container (early access program) see NGC Private Registry User Guide -> section "Generating Your NGC API Key"

   *Make sure you have access permissions to container on NVIDIA Rivermax NGC

5. Verify the container is up and running:

   # docker ps

```
CONTAINER ID    IMAGE
a8df01c70d6e    nvcr.io/ea-rivermax/dpu-ptp-service/dpu-ptp-serice:21.03-
v1
COMMAND         CREATED        STATUS       PORTS     NAMES
"./start.sh"    45 hours ago    Up 45 hours           ptp-service-container
```

6. Check /var/log/ptp4l.log file for PTP lock:

   # tail -f /var/log/ptp4l.log

```
ptp4l[326.286]: rms    5 max    9 freq   +945 +/-   4 delay   109 +/-   1
ptp4l[327.286]: rms    4 max   10 freq   +944 +/-   5 delay   109 +/-   0
ptp4l[328.286]: rms    4 max    8 freq   +946 +/-   5 delay   109 +/-   1
ptp4l[329.286]: rms    5 max    8 freq   +942 +/-   6 delay   108 +/-   0
ptp4l[330.286]: rms    5 max   10 freq   +944 +/-   7 delay   108 +/-   1
ptp4l[331.286]: rms    3 max    6 freq   +945 +/-   5 delay   110 +/-   0
```

10 Basic Troubleshooting

BFB installation Timeout

Issue - Timeout occurs when trying to install BFB-write error: Connection timed out

The timeout may be due to a USB connection issue; Try these steps to resolve the problem:

- On the server: remove MLNX_WinOF2, reboot and reinstall (make sure latest version is used)
- Use a different USB port
- If you have another USB cable, replace it
- Try to software reset the DPU using the following command on the Windows server:

  RshimCmd -RestartSmartNic 1 -BusNum 3

  Note: The BusNum should be taken from ***rshimcmd -enumdevices***

  - Guidelines for RSHIM support https://docs.nvidia.com/networking/display/winof2v280/RShim+Drivers+and+Usage
- Try to power cycle the server hosting the DPU
- **Error:** 'RshimCmd' is not recognized as an internal or external command
  - Make sure to restart the server after WinOF-2 installation
- Ensure that the FW version is correct – a force update might be required – use mlxup software - https://www.mellanox.com/support/firmware/mlxup-mft
- In extreme use cases it might be recommended to restore the DPU to default
  - mlxfwreset -d XX:XX.X -y reset
  - XX:XX.X = pci address

Extract Settings and Configurations

- At the end of the deployment the setting and configuration will be printed -
- Verify that you get the same “Setting Status” as below or extract is it using the Read_DPU_Configuration.bat
- Note: tx_port_ts need to be set on every reset – it will be part of the container in the next releases

```
DPU Automation Version:0.99
PCI Bus:3
-------- Setting Status --------------
Starting MST (Mellanox Software Tools) driver set
Loading MST PCI module - Success
[warn] mst_pciconf is already loaded, skipping
Create devices
Unloading MST PCI module (unused) - Success
Real Time:
        REAL_TIME_CLOCK_ENABLE              True(1)
Loopback:
        MPFS_MC_LOOPBACK_DISABLE_P1         True(1)
        MPFS_MC_LOOPBACK_DISABLE_P2         True(1)
Tx Timestamp:
tx_port_ts         : on
tx_port_ts         : on
OVS:
256b5be9-0765-4a2c-95b9-31f40ee7de49
    ovs_version: "2.15.1"
device mode:
        INTERNAL_CPU_MODEL                  SEPARATED_HOST(0)
privilege:
Host configurations
-------------------
level                          : PRIVILEGED

Port functions status:
----------------------
disable_rshim                  : FALSE
disable_tracer                 : FALSE
disable_port_owner             : FALSE
disable_counter_rd             : FALSE

interface IP:
p0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 1.1.2.3  netmask 255.255.255.0  broadcast 1.1.2.255
        inet6 fe80::bace:f6ff:fed1:3fb4  prefixlen 64  scopeid 0x20<link>
        ether b8:ce:f6:d1:3f:b4  txqueuelen 1000  (Ethernet)
        RX packets 59  bytes 3885 (3.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 28  bytes 2349 (2.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
BFB version:
DOCA_v1.2.1_BlueField_OS_Ubuntu_20.04-5.4.0-1023-bluefield-5.5-2.1.7.0-3.8.5.12027-1.signed-aarch64
FW version:
Querying Mellanox devices firmware ...

Device #1:
----------

  Device Type:      BlueField2
  Part Number:      MBF2H516A-EENO_Ax_Bx
  Description:      BlueField-2 DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto Disabled; 16GB on-boar
d DDR; 1GbE OOB management; FHHL
  PSID:             MT_0000000705
  PCI Device Name:  /dev/mst/mt41686_pciconf0
  Base MAC:         b8cef6d13fb0
  Versions:         Current        Available
     FW             24.32.1010     N/A
     PXE            3.6.0502       N/A
     UEFI           14.25.0017     N/A
     UEFI Virtio blk   22.2.0010       N/A
     UEFI Virtio net   21.2.0010       N/A

  Status:           No matching image found
```

- ## No PTP after reboot
  - Make sure that P0 interface has a valid IP address (netplan has been applied during automation)

- ## Server of DPU is getting rebooted
  - If the BlueField-2 is installed on a server without proper cooling it might reach high temperature – it's advised to place an active fan on it to ensure constant air flow
- ## COM3 console can be used to monitor the deployment process
  - Launch PuTTY on port COM3 to view progress of the Ubuntu install on the DPU
- ## Program FW manually

  Open a Command line as administrator and run the script file **C:\DPU\FW_Update.bat**

  After FW upgrade a power cycle to the server is needed
- ## Not using latest Python
  - Make sure that during the Python installation you set the add Python to path
  - Make sure that no other Python version is in Windows Path environment variable

11 Recommendations

1. Tune the server that is hosting the DPU by Rivermax Windows tunning guide: https://community.mellanox.com/s/article/Rivermax-Windows-Performance-Tuning-Guide

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