



NVIDIA DOCA Installation Guide for Linux

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This guide details the necessary steps to set up NVIDIA DOCA in your Linux environment.

1. Introduction

Installation of the NVIDIA® BlueField® networking platform (DPU or SuperNIC) software requires following the following step-by-step [procedure](#).

1.1 Supported Platforms

1.1.1 Supported BlueField Platforms

The following NVIDIA® BlueField® platforms are supported with DOCA:

NVIDIA SKU	Legacy OPN	PSID	Description
900-9D3B6-00CV-AA0	N/A	MT_0000000884	BlueField-3 B3220 P-Series FHHL DPU; 200GbE (default mode) / NDR200 IB; Dual-port QSFP112; PCIe Gen5.0 x16 with x16 PCIe extension option; 16 Arm cores; 32GB on-board DDR; integrated BMC; Crypto Enabled
900-9D3B6-00SV-AA0	N/A	MT_0000000965	BlueField-3 B3220 P-Series FHHL DPU; 200GbE (default mode) / NDR200 IB; Dual-port QSFP112; PCIe Gen5.0 x16 with x16 PCIe extension option; 16 Arm cores; 32GB on-board DDR; integrated BMC; Crypto Disabled
900-9D3B6-00CC-AA0	N/A	MT_0000001024	BlueField-3 B3210 P-Series FHHL DPU; 100GbE (default mode) / HDR100 IB; Dual-port QSFP112; PCIe Gen5.0 x16 with x16 PCIe extension option; 16 Arm cores; 32GB on-board DDR; integrated BMC; Crypto Enabled
900-9D3B6-00SC-AA0	N/A	MT_0000001025	BlueField-3 B3210 P-Series FHHL DPU; 100GbE (default mode) / HDR100 IB; Dual-

NVIDIA SKU	Legacy OPN	PSID	Description
			port QSFP112; PCIe Gen5.0 x16 with x16 PCIe extension option; 16 Arm cores; 32GB on-board DDR; integrated BMC; Crypto Disabled
900-9D219-0086-ST1	MBF2M516A-CECOT	MT_0000000375	BlueField-2 E-Series DPU 100GbE Dual-Port QSFP56; PCIe Gen4 x16; Crypto and Secure Boot Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0086-ST0	MBF2M516A-EECOT	MT_0000000376	BlueField-2 E-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto and Secure Boot Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0056-ST1	MBF2M516A-EENOT	MT_0000000377	BlueField-2 E-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D206-0053-SQ0	MBF2H332A-AENOT	MT_0000000539	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; PCIe Gen4 x8; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; HHHL
900-9D206-0063-ST2	MBF2H332A-AEEOT	MT_0000000540	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; PCIe Gen4 x8; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; HHHL
900-9D206-0083-ST3	MBF2H332A-AECOT	MT_0000000541	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; PCIe Gen4 x8; Crypto and Secure Boot Enabled; 16GB

NVIDIA SKU	Legacy OPN	PSID	Description
			on-board DDR; 1GbE OOB management; HHHL
900-9D206-0083-ST1	MBF2H322A-AECOT	MT_0000000542	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; PCIe Gen4 x8; Crypto and Secure Boot Enabled; 8GB on-board DDR; 1GbE OOB management; HHHL
900-9D206-0063-ST1	MBF2H322A-AEEOT	MT_0000000543	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; PCIe Gen4 x8; Crypto Enabled; 8GB on-board DDR; 1GbE OOB management; HHHL
900-9D219-0066-ST0	MBF2M516A-EEEOT	MT_0000000559	BlueField-2 E-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0056-SN1	MBF2M516A-CENOT	MT_0000000560	BlueField-2 E-Series DPU 100GbE Dual-Port QSFP56; PCIe Gen4 x16; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0066-ST2	MBF2M516A-CEEOT	MT_0000000561	BlueField-2 E-Series DPU 100GbE Dual-Port QSFP56; PCIe Gen4 x16; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0006-ST0	MBF2H516A-CEEOT	MT_0000000702	BlueField-2 DPU 100GbE Dual-Port QSFP56; PCIe Gen4 x16; Crypto; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0056-ST2	MBF2H516A-CENOT	MT_0000000703	BlueField-2 DPU 100GbE Dual-Port QSFP56; PCIe

NVIDIA SKU	Legacy OPN	PSID	Description
			Gen4 x16; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0066-ST3	MBF2H516A-EEEOT	MT_0000000704	BlueField-2 DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D219-0056-SQ0	MBF2H516A-EENOT	MT_0000000705	BlueField-2 DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; PCIe Gen4 x16; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D250-0038-ST1	MBF2M345A-HESOT	MT_0000000715	BlueField-2 E-Series DPU; 200GbE/HDR single-port QSFP56; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; HHHL
900-9D250-0048-ST1	MBF2M345A-HECOT	MT_0000000716	BlueField-2 E-Series DPU; 200GbE/HDR single-port QSFP56; PCIe Gen4 x16; Secure Boot Enabled; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; HHHL
900-9D218-0073-ST1	MBF2H512C-AESOT	MT_0000000723	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; integrated BMC; PCIe Gen4 x8; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D218-0083-ST2	MBF2H512C-AECOT	MT_0000000724	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; integrated BMC; PCIe Gen4 x8; Secure Boot Enabled;

NVIDIA SKU	Legacy OPN	PSID	Description
			Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; FHHL
900-9D208-0086-ST4	MBF2M516C-EECOT	MT_0000000728	BlueField-2 E-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0086-SQ0	MBF2H516C-CECOT	MT_0000000729	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0076-ST5	MBF2M516C-CESOT	MT_0000000731	BlueField-2 E-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0076-ST6	MBF2M516C-EESOT	MT_0000000732	BlueField-2 E-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0086-ST3	MBF2M516C-CECOT	MT_0000000733	BlueField-2 E-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled;

NVIDIA SKU	Legacy OPN	PSID	Description
			Crypto Enabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0076-ST2	MBF2H516C-EESOT	MT_0000000737	BlueField-2 P-Series DPU 100GbE/EDR/HDR100 VPI Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D208-0076-ST1	MBF2H516C-CESOT	MT_0000000738	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management; Tall Bracket; FHHL
900-9D218-0083-ST4	MBF2H532C-AECOT	MT_0000000765	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; integrated BMC; PCIe Gen4 x8; Secure Boot Enabled; Crypto Enabled; 32GB on-board DDR; 1GbE OOB management; FHHL
900-9D218-0073-ST0	MBF2H532C-AESOT	MT_0000000766	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; integrated BMC; PCIe Gen4 x8; Secure Boot Enabled; Crypto Disabled; 32GB on-board DDR; 1GbE OOB management; FHHL
900-9D208-0076-ST3	MBF2H536C-CESOT	MT_0000000767	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Disabled; 32GB on-

NVIDIA SKU	Legacy OPN	PSID	Description
			board DDR; 1GbE OOB management; FHHL
900-9D208-0086-ST2	MBF2H536C-CECOT	MT_0000000768	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled; Crypto Enabled; 32GB on-board DDR; 1GbE OOB management; FHHL
900-9D218-0073-ST4	MBF2H512C-AEUOT	MT_0000000972	BlueField-2 P-Series DPU 25GbE Dual-Port SFP56; integrated BMC; PCIe Gen4 x8; Secure Boot Enabled with UEFI disabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management
900-9D208-0076-STA	MBF2H516C-CEUOT	MT_0000000973	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56; integrated BMC; PCIe Gen4 x16; Secure Boot Enabled with UEFI disabled; Crypto Disabled; 16GB on-board DDR; 1GbE OOB management
900-9D208-0076-STB	MBF2H536C-CEUOT	MT_0000001008	BlueField-2 P-Series DPU 100GbE Dual-Port QSFP56, integrated BMC, PCIe Gen4 x16, Secure Boot Enabled with UEFI Disabled, Crypto Disabled, 32GB on-board DDR, 1GbE OOB management, Tall Bracket, FHHL
P1004/699210040230	N/A	NVD0000000015	BlueField-2 A30X, P1004 SKU 205, Generic, GA100, 24GB HBM2e, PCIe passive Dual Slot 230W GEN4, DPU Crypto ON W/ Bkt, 1 Dongle, Black, HF, VCPD

NVIDIA SKU	Legacy OPN	PSID	Description
P4028/699140280000	N/A	NVD0000000020	ZAM / NAS

1.1.2 Supported ConnectX NICs

The NVIDIA® ConnectX® NICs supported with DOCA-Host can be found in: [NVIDIA DOCA Profiles](#)

1.2 Hardware Prerequisites

For BlueField Platform users, this guide assumes that a BlueField device has been installed in a server according to the instructions detailed in your [DPU's hardware user guide](#).

1.3 DOCA Packages

See information in the [NVIDIA DOCA Release Notes](#) page.

1.4 Supported Host OS per DOCA-Host Installation Profile

See information in the [NVIDIA DOCA Profiles](#) page.

2. BlueField Networking Platform Image Installation

This guide provides the minimal instructions for setting up DOCA on a standard system.

Note

Make sure to follow the instructions in this section sequentially. Make sure to update DOCA on the host side first before installing the BFB Bundle on the BlueField.

2.1 Installation Files

To download the DOCA for host packages from the links in this table, please register to the [NVIDIA Developer Program](#). Otherwise, please use the public repo from [DOCA Downloader](#).

Device	Component	OS	Arch	Link
Host	These files contain the following components suitable for their respective OS version.  Note Please take a look on the NVIDIA DOCA Profiles to know which from the below profiles are supported on your desired OS. - DOCA-All v2.8.0 - DOCA-Networking v2.8.0 - DOCA-OFED v2.8.0	Alinux 3.2	x86	doca-host-2.8.0-204000_24.07_alinux
		Anolis	aarch64	doca-host-2.8.0-204000_24.07_anolis
			x86	doca-host-2.8.0-204000_24.07_anolis
		BCLinux 21.10	aarch64	doca-host-2.8.0-204000_24.07_bclinu
			x86	doca-host-2.8.0-204000_24.07_bclinu
		BCLinux 21.10 SP2	aarch64	doca-host-2.8.0-204000_24.07_bclinu
			x86	doca-host-2.8.0-204000_24.07_bclinu
		CTyunOS 2.0	aarch64	doca-host-2.8.0-204000_24.07_ctyunc
			x86	doca-host-2.8.0-204000_24.07_ctyunc
		CTyunOS 23.01	aarch64	doca-host-2.8.0-204000_24.07_ctyunc
			x86	doca-host-2.8.0-204000_24.07_ctyunc
		Debian 10.13	aarch64	doca-host_2.8.0-204000_debian1013_arm64.d

Device	Component	OS	Arch	Link
	DOCA-Extra v2.8.0 (included in all)		x86	doca-host_2.8.0-204C_debian1013_amd64.d
		Debian 10.8	aarch64	doca-host_2.8.0-204C_debian108_arm64.d
			x86	doca-host_2.8.0-204C_debian108_amd64.d
		Debian 10.9	x86	doca-host_2.8.0-204C_debian109_amd64.d
		Debian 11.3	aarch64	doca-host_2.8.0-204C_debian113_arm64.d
			x86	doca-host_2.8.0-204C_debian113_amd64.d
		Debian 12.1	aarch64	doca-host_2.8.0-204C_debian121_arm64.d
			x86	doca-host_2.8.0-204C_debian121_amd64.d
		Debian 12.5	aarch64	doca-host_2.8.0-204C_debian125_arm64.d
			x86	doca-host_2.8.0-204C_debian125_amd64.d
		EulerOS 20 SP11	aarch64	doca-host-2.8.0-204000_24.07_eulero
			x86	doca-host-2.8.0-204000_24.07_eulero
		EulerOS 20 SP12	aarch64	doca-host-2.8.0-204000_24.07_eulero
			x86	doca-host-2.8.0-204000_24.07_eulero
		Fedora32	x86	doca-host-2.8.0-204000_24.07_fc32.x
		Kylin 1.0 SP2	aarch64	doca-host-2.8.0-204000_24.07_kylin10
			x86	doca-host-2.8.0-204000_24.07_kylin10

Device	Component	OS	Arch	Link
		Kylin 1.0 SP3	aarch64	doca-host-2.8.0-204000_24.07_kylin10
			x86	doca-host-2.8.0-204000_24.07_kylin10
		Mariner 2.0	x86	doca-host-2.8.0-204000_24.07_marine
		Oracle Linux 7.9	x86	doca-host-2.8.0-204000_24.07_ol79.x
		Oracle Linux 8.4	x86	doca-host-2.8.0-204000_24.07_ol84.x
		Oracle Linux 8.6	x86	doca-host-2.8.0-204000_24.07_ol86.x
		Oracle Linux 8.7	x86	doca-host-2.8.0-204000_24.07_ol87.x
		Oracle Linux 8.8	x86	doca-host-2.8.0-204000_24.07_ol88.x
		Oracle Linux 9.1	x86	doca-host-2.8.0-204000_24.07_ol91.x
		Oracle Linux 9.2	x86	doca-host-2.8.0-204000_24.07_ol92.x
		openEuler 20.03 SP3	aarch64	doca-host-2.8.0-204000_24.07_opene
			x86	doca-host-2.8.0-204000_24.07_opene
		openEuler 22.03	aarch64	doca-host-2.8.0-204000_24.07_opene
			x86	doca-host-2.8.0-204000_24.07_opene
		openEuler 22.03 SP1	x86	doca-host-2.8.0-204000_24.07_opene
		RHEL/CentOS 8.0	aarch64	doca-host-2.8.0-204000_24.07_rhel8C
			x86	doca-host-2.8.0-204000_24.07_rhel8C

Device	Component	OS	Arch	Link
		RHEL/CentOS 8.1	aarch64	doca-host-2.8.0-204000_24.07_rhel81
			x86	doca-host-2.8.0-204000_24.07_rhel81
		RHEL/CentOS 8.2	aarch64	doca-host-2.8.0-204000_24.07_rhel82
			x86	doca-host-2.8.0-204000_24.07_rhel82
		RHEL/CentOS 8.3	aarch64	doca-host-2.8.0-204000_24.07_rhel83
			x86	doca-host-2.8.0-204000_24.07_rhel83
		RHEL/CentOS 8.4	aarch64	doca-host-2.8.0-204000_24.07_rhel84
			x86	doca-host-2.8.0-204000_24.07_rhel84
		RHEL/CentOS 8.5	aarch64	doca-host-2.8.0-204000_24.07_rhel85
			x86	doca-host-2.8.0-204000_24.07_rhel85
		RHEL/Rocky 8.6	aarch64	doca-host-2.8.0-204000_24.07_rhel86
			x86	doca-host-2.8.0-204000_24.07_rhel86
		RHEL/Rocky 8.7	aarch64	doca-host-2.8.0-204000_24.07_rhel87
			x86	doca-host-2.8.0-204000_24.07_rhel87
		RHEL/Rocky 8.8	aarch64	doca-host-2.8.0-204000_24.07_rhel88
			x86	doca-host-2.8.0-204000_24.07_rhel88
		RHEL/Rocky 8.9	aarch64	doca-host-2.8.0-204000_24.07_rhel89

Device	Component	OS	Arch	Link
		RHEL/Rocky 8.10	x86	doca-host-2.8.0-204000_24.07_rhel8C
			aarch64	doca-host-2.8.0-204000_24.07_rhel81
		RHEL/Rocky 9.0	x86	doca-host-2.8.0-204000_24.07_rhel81
			aarch64	doca-host-2.8.0-204000_24.07_rhel9C
		RHEL/Rocky 9.1	x86	doca-host-2.8.0-204000_24.07_rhel9C
			aarch64	doca-host-2.8.0-204000_24.07_rhel91
		RHEL/Rocky 9.2	x86	doca-host-2.8.0-204000_24.07_rhel91
			aarch64	doca-host-2.8.0-204000_24.07_rhel92
		RHEL/Rocky 9.3	x86	doca-host-2.8.0-204000_24.07_rhel92
			aarch64	doca-host-2.8.0-204000_24.07_rhel93
		RHEL/Rocky 9.4	x86	doca-host-2.8.0-204000_24.07_rhel93
			aarch64	doca-host-2.8.0-204000_24.07_rhel94
		SLES 15 SP2	x86	doca-host-2.8.0-204000_24.07_rhel94
			aarch64	doca-host-2.8.0-204000_24.07_sles15
		SLES 15 SP3	x86	doca-host-2.8.0-204000_24.07_sles15
			aarch64	doca-host-2.8.0-204000_24.07_sles15

Device	Component	OS	Arch	Link
		SLES 15 SP4	aarch64	doca-host-2.8.0-204000_24.07_sles15
			x86	doca-host-2.8.0-204000_24.07_sles15
		SLES 15 SP5	aarch64	doca-host-2.8.0-204000_24.07_sles15
			x86	doca-host-2.8.0-204000_24.07_sles15
		SLES 15 SP6	x86	doca-host-2.8.0-204000_24.07_sles15
		TencentOS 3.3	aarch64	doca-host-2.8.0-204000_24.07_tencer
			x86	doca-host-2.8.0-204000_24.07_tencer
		Ubuntu 20.04	aarch64	doca-host_2.8.0-204C_ubuntu2004_arm64.d
			x86	doca-host_2.8.0-204C_ubuntu2004_amd64.c
		Ubuntu 22.04	aarch64	doca-host_2.8.0-204C_ubuntu2204_arm64.d
			x86	doca-host_2.8.0-204C_ubuntu2204_amd64.c
		Ubuntu 24.04	aarch64	doca-host_2.8.0-204C_ubuntu2404_arm64.d
			x86	doca-host_2.8.0-204C_ubuntu2404_amd64.c
		UOS20.1060	aarch64	doca-host-2.8.0-204000_24.07_uos20
			x86	doca-host-2.8.0-204000_24.07_uos20
		UOS20.1060A	aarch64	doca-host-2.8.0-204000_24.07_uos20
			x86	doca-host-2.8.0-204000_24.07_uos20

Device	Component	OS	Arch	Link
		XenServer 8.2	x86	doca-host-2.8.0-204000_24.07_xensei
Target BlueField Platform (Arm)	BlueField Software v 4.8.0	Ubuntu 22.04	aarch64	bf-bundle-2.8.0-98_24.07.06.1.prod.bfb
	DOCA SDK v2.8.0	Ubuntu 22.04	aarch64	doca-dpu-repo-ubuntu22.04.06.1.bf.4.8.0.1
	DOCA Runtime v2.8.0			

2.2 Uninstalling Software from Host

If an older DOCA (or MLNX_OFED) software version is installed on your host, make sure to uninstall it before proceeding with the installation of the new version:

Deb-based	<pre>\$ for f in \$(dpkg --get-selections grep doca awk '{print \$2}'); do echo \$f ; apt remove --purge \$f -y ; done \$ /usr/sbin/ofed_uninstall.sh --force \$ sudo apt-get autoremove</pre>
RPM-based	<pre>host# for f in \$(rpm -qa grep -i doca) ; do yum -y remove \$f; done host# /usr/sbin/ofed_uninstall.sh --force host# yum autoremove host# yum makecache</pre>

Then perform the following steps:

Note

The following procedure is valid for RPM-based OS only.

1. Download NVIDIA's RPM-GPG-KEY-Mellanox-SHA256 key:

```
# wget http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-
Mellanox-SHA256
--2018-01-25 13:52:30--
http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-Mellanox-
SHA256
Resolving www.mellanox.com... 72.3.194.0
Connecting to www.mellanox.com|72.3.194.0|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1354 (1.3K) [text/plain]
Saving to: ?RPM-GPG-KEY-Mellanox-SHA256?

100%[=====>]
1,354      --.-K/s   in 0s

2018-01-25 13:52:30 (247 MB/s) - ?RPM-GPG-KEY-Mellanox-
SHA256? saved [1354/1354]
```

2. Install the key:

```
# sudo rpm --import RPM-GPG-KEY-Mellanox-SHA256
warning: rpmts_HdrFromFdno: Header V3 DSA/SHA1 Signature, key
ID 6224c050: NOKEY
Retrieving key from file:///repos/MLNX_OFED//RPM-GPG-KEY-
Mellanox
Importing GPG key 0x6224C050:
  Userid: "Mellanox Technologies (Mellanox Technologies -
  Signing Key v2) "
  From   : /repos/MLNX_OFED//RPM-GPG-KEY-Mellanox-SHA256
Is this ok [y/N]:
```

3. Verify that the key was successfully imported:

```
# rpm -q gpg-pubkey --qf '%{NAME}-%{VERSION}-%{RELEASE}\t%
{SUMMARY}\n' | grep Mellanox
gpg-pubkey-a9e4b643-520791ba      gpg(Mellanox Technologies )
```

2.3 Installing Prerequisites on Host for Target BlueField

Install RShim to manage and flash the BlueField Platform.

OS	Procedure
Deb-based	1. Download the DOCA host repo package from the "Installation Files" section. 2. Unpack the deb repo. Run: <pre>host# sudo dpkg -i <repo_file></pre> 3. Perform apt update. Run: <pre>host# sudo apt-get update</pre> 4. Run <code>apt install</code> for RShim: <pre>host# sudo apt install rshim</pre>
RPM-based	1. Download the DOCA host repo package from the "Installation Files" section. 2. Unpack the RPM repo. Run: <pre>host# sudo rpm -Uvh <repo_file></pre> 3. Enable new dnf repos. Run:

OS	Procedure
	<pre>host# sudo dnf makecache</pre> 4. Run <code>dnf install</code> to install RShim: <pre>host# sudo dnf install rshim</pre>

Note

Skip section "[Installing Software on Host](#)" to proceed without the DOCA local repo package for host.

2.4 Installing Software on Host

Note

Skip this section if you intend to update only the BlueField software (`*.bfb`). The RShim driver is sufficient for that purpose.

Note

Make sure to have followed the instructions under "[Installing Prerequisites on Host for Target BlueField](#)".

1. Install DOCA local repo package for host:

Info

The following table provides instructions for installing the DOCA host repo on your device depending on your OS and desired profile.

OS	Profile	Instructions
Deb-based	doca-all	1. Download the DOCA host repo from section "Installation Files" for the host. 2. Unpack the deb repo. Run: <pre>host# dpkg -i <repo_file></pre> 3. Perform apt update. Run: <pre>host# apt-get update</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Ensure that the kernel headers installed match the version of the currently running kernel.  Info If the build directory exists in under <pre>/lib/modules/\$(uname -r)/build</pre> , then the kernel headers are installed. 6. Run apt install for DOCA SDK and DOCA runtime:

OS	Profile	Instructions
		<pre>host# sudo apt install -y doca-all mlnx-fw-updater</pre>
	doca-networking	1. Download the DOCA host repo from section "Installation Files" for the host. 2. Unpack the deb repo. Run: <pre>host# dpkg -i <repo_file></pre> 3. Perform apt update. Run: <pre>host# apt-get update</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Ensure that the kernel headers installed match the version of the currently running kernel. i Info If the build directory exists in under <pre>/lib/modules/\$(uname -r)/build</pre> , then the kernel headers are installed. 6. Run apt install for DOCA SDK and DOCA runtime: <pre>host# sudo apt install -y doca-networking mlnx-fw-updater</pre>
	doca-ofed	1. Download the DOCA host repo from section "Installation Files" for the host.

OS	Profile	Instructions
		2. Unpack the deb repo. Run: <pre>host# sudo dpkg -i <repo_file></pre> 3. Perform apt update. Run: <pre>host# sudo apt-get update</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Ensure that the kernel headers installed match the version of the currently running kernel. i Info If the build directory exists in under <pre>/lib/modules/\$(uname -r)/build</pre> , then the kernel headers are installed. 6. Install <code>doca-ufed</code>. Run: <pre>host# sudo apt install -y doca-ufed mlnx-fw-updater</pre>
RPM-based	doca-all	1. Download the DOCA host repo from section "Installation Files" for the host . 2. Unpack the rpm repo. Run: <pre>host# rpm -Uvh <repo_file>.rpm</pre> 3. Perform yum update. Run:

OS	Profile	Instructions
		<pre>host# sudo yum makecache</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Run yum install for DOCA SDK and DOCA runtime: <pre>host# sudo yum install -y doca-all mlnx-fw-updater</pre>
	doca-networking	1. Download the DOCA host repo from section "Installation Files" for the host . 2. Unpack the rpm repo. Run: <pre>host# rpm -Uvh <repo_file>.rpm</pre> 3. Perform yum update. Run: <pre>host# sudo yum makecache</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Run yum install for DOCA SDK and DOCA runtime: <pre>host# sudo yum install -y doca-networking mlnx-fw-updater</pre>
	doca-ofed	1. Download the DOCA host repo from section "Installation Files" for the host. 2. Unpack the RPM repo. Run: <pre>host# sudo rpm -Uvh <repo_file>.rpm</pre> 3. Perform yum update. Run:

OS	Profile	Instructions
		<pre>host# sudo yum makecache</pre> 4. If the kernel version on your host is not supported (not shown under "Supported Operating System Distributions"), refer to section "DOCA Extra Package". 5. Install <code>doca-ufed</code>. Run: <pre>host# sudo yum install -y doca-ufed m1nx-fw-updater</pre>

2. Load the drivers:

```
host# sudo /etc/init.d/openibd restart
```

3. Initialize MST. Run:

```
host# sudo mst restart
```

2.4.1 DOCA Extra Package

If the kernel version on your host is not supported (not shown under "[Supported Operating System Distributions](#)"), two options are available:

- Switch to a compatible kernel.
- Install `doca-extra` package:

1. Run:

```
host# sudo apt/yum install -y doca-extra
```

2. Execute the `doca-kernel-support` script which rebuilds and installs the DOCA-Host kernel modules with the running kernel:

```
host# sudo /opt/mellanox/doca/tools/doca-kernel-support
```

3. Install user-space packages:

```
host# sudo apt/yum install -y doca-ofed-userspace
```

i Note

`doca-kernel-support` does not support customized or unofficial kernels.

4. (Optional) Retrieve installed packages and their versions as part of DOCA Host installation:

```
host# doca-info

Versions:
- DOCA Base MLNX_OFED_LINUX-24.07-0.5.5.0
- MFT 4.29.0-127

UEFI\ATF versions:
- mst_device: mt41692_pciconf0
```

UEFI Version: 4.7.0-42-g13081ae

ATF Version: 4.7.0-25-g5569834

Firmware (Current):

- BlueField-3 32.41.1000

DOCA:

- doca-all 2.8.0-0.0.4
- doca-apsh-config 2.8.0079-1
- doca-bench 2.8.0079-1

...

DOCA Dependencies:

...

- flexio 24.07.2300
- mlnx-dpdk 22.11.0-2407.0.10

OFED:

...

- rdma-core 2407mlnx52-1.2407055

...

- ucx 1.17.0-1.2407055

...

Note

If BlueField has a BlueField Bundle version older than 2.7.0 installed on it, UEFI\ATF versions appear as N\A. If your version is 2.7.0 or higher and still see N\A, then perform driver restart on the host:

```
/etc/init.d/openibd restart
```

2.5 Installing Software on BlueField

Users have two options for installing DOCA on BlueField DPU or SuperNIC:

- Upgrading the full DOCA image on BlueField (recommended) – this option overwrites the entire boot partition with an Ubuntu 22.04 installation and updates BlueField and NIC firmware.
- Upgrading DOCA **local** repo package on BlueField – this option upgrades DOCA components without overwriting the boot partition. Use this option to preserve configurations or files on BlueField itself.
- Upgrading DOCA **online** repo package on BlueField – this option upgrades DOCA components without overwriting the boot partition. Use this option to preserve configurations or files on BlueField itself.

2.5.1 Installing Full DOCA Image on DPU via Host

Warning

This step overwrites the entire boot partition.

Note

This installation sets up the OVS bridge.

Note

If you are installing DOCA on multiple BlueField platforms, skip to section [Installing Full DOCA Image on Multiple BlueField Platforms](#).

Option 1 – No Pre-defined Password

Note

To change the default Ubuntu password during the BFB bundle installation, proceed to Option 2.

BFB installation is executed as follows:

```
host# sudo bfb-install --rshim rshim<N> --bfb <image_path.bfb>
```

Where `rshim<N>` is `rshim0` if you only have one Bluefield. You may run the following command to verify:

```
host# ls -la /dev/ | grep rshim
```

Option 2 – Set Pre-defined Password

Ubuntu users can provide a unique password that will be applied at the end of the BlueField BFB bundle installation. This password needs to be defined in a `bf.cfg` configuration file.

To set the password for the "ubuntu" user:

1. Create password hash. Run:

```
host# openssl passwd -1  
Password:  
Verifying - Password:  
$1$3B0RlrfX$TlHry93NFUJzg3Nya00rE1
```

2. Add the password hash in quotes to the `bf.cfg` file:

```
host# echo ubuntu_PASSWORD='$1$3B0RlrfX$TlHry93NFUJzg3Nya00rE1' > bf.cfg
```

When running the installation command, use the `--config` flag to provide the file containing the password:

```
host# sudo bfb-install --rshim rshim<N> --bfb  
<image_path.bfb> --config bf.cfg
```

Note

Optionally, to upgrade the BlueField integrated BMC firmware using BFB bundle, please provide the current BMC root credentials in a `bf.cfg` file, as shown in the following:

```
BMC_PASSWORD="<root password>"  
BMC_USER="root"  
BMC_REBOOT="yes"
```

Unless previously changed, the default BMC root password is `OpenBmc`.

Note

If `--config` is not used, then upon first login to the BlueField device, users will be prompted to update the default 'ubuntu' password.

The following is an example of Ubuntu-22.04 BFB bundle installation (Release version may vary in the future).

```
host# sudo bfb-install --rshim rshim0 --bfb bf-bundle-
2.7.0_24.04_ubuntu-22.04_prod.bfb --config bf.cfg
Pushing bfb 1.41GiB 0:02:02 [11.7MiB/s] [          <=>
]
Collecting BlueField booting status. Press Ctrl+C to stop
INFO[PSC]: PSC BL1 START
INFO[BL2]: start
INFO[BL2]: boot mode (rshim)
INFO[BL2]: VDDQ: 1120 mV
INFO[BL2]: DDR POST passed
INFO[BL2]: UEFI loaded
INFO[BL31]: start
INFO[BL31]: lifecycle GA Secured
INFO[BL31]: VDD: 850 mV
INFO[BL31]: runtime
INFO[BL31]: MB ping success
INFO[UEFI]: eMMC init
INFO[UEFI]: eMMC probed
INFO[UEFI]: UPVS valid
INFO[UEFI]: PMI: updates started
```

```
INFO[UEFI]: PMI: total updates: 1
INFO[UEFI]: PMI: updates completed, status 0
INFO[UEFI]: PCIe enum start
INFO[UEFI]: PCIe enum end
INFO[UEFI]: UEFI Secure Boot
INFO[UEFI]: PK configured
INFO[UEFI]: Redfish enabled
INFO[UEFI]: exit Boot Service
INFO[MISC]: Found bf.cfg
INFO[MISC]: Ubuntu installation started
INFO[MISC]: Installing OS image
INFO[MISC]: Changing the default password for user ubuntu
INFO[MISC]: Ubuntu installation completed
INFO[MISC]: Updating NIC firmware...
INFO[MISC]: NIC firmware update done
INFO[MISC]: Installation finished
```

To verify the BlueField has completed booting up, allow additional 90 seconds then perform the following:

```
host# sudo cat /dev/rshim<N>/misc
...
INFO[MISC]: Linux up
INFO[MISC]: DPU is ready
```

2.5.2 Installing Full DOCA Image on Multiple BlueField Platforms

On a host with multiple BlueField devices, the BFB image can be installed on all of them using the `multi-bfb-install` [script](#).


```
host# ./multi-bfb-install --bfb <image_path.bfb> --password  
<password>
```

This script detects the number of RShim devices and configures them statically.

- For Ubuntu – the script creates a configuration file `/etc/netplan/20-tmfifo.yaml`
- For CentOS/RH 8.0 and 8.2 – the script installs the `bridge-utils` package to use the `brctl` command, creates the `tm-br` bridge, and connects all RShim interfaces to it

After the installation is complete, the configuration of the bridge and each RShim interface can be observed using `ifconfig`. The expected result is to see the IP on the `tm-br` bridge configured to `192.168.100.1` with subnet `255.255.255.0`.

Note

To log into BlueField with `rshim0`, run:

```
ssh ubuntu@192.168.100.2
```

For each RShim after that, add 1 to the fourth octet of the IP address (e.g., `ubuntu@192.168.100.3` for `rshim1`, `ubuntu@192.168.100.4` for `rshim2`, etc).

The script burns a new MAC address to each BlueField and configures a new IP, 192.168.100.x, as described earlier.

2.5.3 Installing DOCA Local Repo Package on BlueField

Note

If you have already [installed BlueField image](#), be aware that the DOCA SDK, Runtime, and Tools are already contained in the BFB, and this installation is not mandatory. If you have not installed the BlueField image and wish to update DOCA Local Repo package, proceed with the following procedure.

Note

Before installing DOCA on the target BlueField, make sure the out-of-band interface (`mgmt`) is connected to the internet.

1. Download the DOCA SDK and DOCA Runtime package from section [Installation Files](#).
2. Copy deb repo package into BlueField. Run:

```
host# sudo scp -r doca-repo-aarch64-ubuntu2204-  
local_<version>_arm64.deb ubuntu@192.168.100.2:/tmp/
```

3. Unpack the deb repo. Run:

```
dpu# sudo dpkg -i doca-dpu-repo-ubuntu2204-  
local_<version>_arm64.deb
```

4. Run apt update.

```
dpu# sudo apt-get update
```

5. Run `apt install` for DOCA Runtime and DOCA SDK:

```
dpu# sudo apt install doca-runtime doca-sdk
```

2.6 Upgrading Firmware

Note

This operation is only required if the user skipped NIC firmware update during BFB bundle installation using the parameter `WITH_NIC_FW_UPDATE=no` in the `bf.cfg` file.

This section explains how to update the NIC firmware on a DOCA installed BlueField OS.

Note

If multiple BlueFields are installed, the following steps must be performed on all of them after [BFB installation](#).

An up-to-date NIC firmware image is provided in BlueField BFB bundle and copied to the BlueField filesystem during BFB installation.

To upgrade firmware in the BlueField Arm OS:

1. SSH to your BlueField Arm OS by any means available.

The following instructions enable to login to the BlueField Arm OS from the host OS over the RShim virtual interface, `tmfifo_net<N>` and do not require LAN connectivity with the BlueField OOB network port.

Note

This operation can be performed over the host's `tmfifo_net0` IPv4, 192.168.100.1 (preconfigured) with BlueField Arm OS at 192.168.100.2 (default).

If multiple BlueField DPUs were updated using the `multi-bfb-install` script, as explained above, then each target BlueField OS IPv4 address changes in its last octate according to the underlying RShim interface number: 192.168.100.3 for rshim1, 192.168.100.4 for rshim2, etc.

The default credentials for Ubuntu are as follows:

Username	Password
ubuntu	ubuntu

For example, to log into BlueField Arm OS over IPv6:

```
host]# systemctl restart rshim
// Wait 10 seconds

host]# ssh -6 fe80::21a:caff:feff:ff01%tmfifo_net<N>
Password: <configured-password>
```

2. Upgrade firmware in BlueField. Run:

```
dpu# sudo /opt/mellanox/mlnx-fw-updater/mlnx_fw_updater.pl --
force-fw-update
```

Example output:

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

Device Type:      BlueField-2
[...]
Versions:         Current          Available
FW                <Old_FW>         <New_FW>
```

3. For the firmware upgrade to take effect perform a [BlueField system reboot](#).

2.7 Post-installation Procedure

1. Restart the driver. Run:

```
host# sudo /etc/init.d/openibd restart
Unloading HCA driver:                [
OK ]
Loading HCA driver and Access Layer: [
OK ]
```

2. Configure the physical function (PF) interfaces.

```
host# sudo ifconfig <interface-1> <network-1/mask> up
```

```
host# sudo ifconfig <interface-2> <network-2/mask> up
```

For example:

```
host# sudo ifconfig p2p1 192.168.200.32/24 up  
host# sudo ifconfig p2p2 192.168.201.32/24 up
```

Pings between the source and destination should now be operational.

3. Upgrading BlueField Using Standard Linux Tools

This upgrade procedure enables upgrading DOCA components using standard Linux tools (e.g., `apt update` and `yum update`). This process utilizes native package manager repositories to upgrade BlueField networking platforms (DPUs or SuperNICs) without the need for a full installation.

This process has the following benefits :

- Only updates components that include modifications
 - Configurable – user can select specific components (e.g., UEFI-ATF, NIC-FW)
- Includes upgrade of:
 - DOCA drivers and libraries
 - DOCA reference applications
 - BSP (UEFI/ATF) upgrade while maintaining the configuration
 - NIC firmware upgrade while maintaining the configuration
- Does not:
 - Impact user binaries
 - Upgrade non-Ubuntu OS kernels

- Upgrade BlueField BMC firmware
- After completion of BlueField upgrade:
 - If NIC firmware was not updated, perform BlueField Arm reset (software reset/reboot BlueField)
 - If NIC firmware was updated, perform firmware reset (`mlxfwreset`) or perform a graceful shutdown and power cycle

OS	Action	Instructions
Ubuntu/ Debian	Remove <code>mlxbf-bootimages</code> package	<pre><bf> \$ apt remove --purge mlxbf-bootimage</pre>
	Install the the GPG key	<pre><bf> \$ apt update <bf> \$ apt install gnupg2</pre>
	Export the desired distribution	Export <code>DOCA_REPO</code> with the relevant URL. The following <pre><bf> \$ export DOCA_REPO="https://linux.mellanox.com/pub/arm64"</pre> • Ubuntu 22.04 – https://linux.mellanox.com/public/repo/c • Ubuntu 20.04 – https://linux.mellanox.com/public/repo/c • Debian 12 – https://linux.mellanox.com/public/repo/c
	Add GPG key to APT trusted keyring	<pre><bf> \$ curl \$DOCA_REPO/GPG-KEY-Mellanox.p /etc/apt/trusted.gpg.d/GPG-KEY-Mellanox.p</pre>
	Add DOCA online repository	<pre><bf> \$ echo "deb [signed-by=/etc/apt/trus</pre>

OS	Action	Instructions
		<pre>\$DOCA_REPO ./" > /etc/apt/sources.list.d/</pre>
	Update index	<pre><bf> \$ apt update</pre>
	Upgrade UEFI/ATF firmware	Run: <pre><bf> \$ apt install mlxbf-bootimages-sign</pre> Then initiate upgrade for UEFI/ATF firmware: <pre><bf> \$ apt install mlxbf-scripts <bf> \$ bfrec</pre>
	Upgrade BlueField NIC firmware	The following commands update the firmware package ar <pre><bf> \$ apt install mlnx-fw-updater-signed <bf> \$ sudo /opt/mellanox/mlnx-fw-updater update</pre>
	Remove old metapackages	<pre><bf> \$ apt-get remove doca* mlnx-ofed* ke</pre>
	Install new metapackages	<pre><bf> \$ apt-get install doca-runtime doca-</pre>
	Upgrade system	<pre><bf> \$ apt upgrade</pre>
	Apply the new changes,	For the upgrade to take effect, perform BlueField system

OS	Action	Instructions
	NIC firmware, and UEFI/ATF	Note This step triggers immediate reboot of the BlueField
CentOS/RHEL/ Anolis/Rocky	Remove mlxbf- bootimages package	<pre><bf> \$ yum -y remove mlxbf-bootimages* <bf> \$ yum makecache</pre>
	Export the desired distribution	Export <code>DOCA_REPO</code> with the relevant URL. The following <pre><bf> \$ export DOCA_REPO="https://linux.mellanox.com/pub arm64/"</pre> • AnolisOS 8.6 – https://linux.mellanox.com/public/repo/anolis86-arm64/ • OpenEuler 20.03 sp1 – https://linux.mellanox.com/public/repo/oe2003sp1-arm64/ • CentOS 7.6 with 4.19 kernel – https://linux.mellanox.com/public/repo/centos76-kernel419-arm64/ • CentOS 7.6 with 5.10 kernel – https://linux.mellanox.com/public/repo/centos76-kernel510-arm64/ • CentOS 7.6 with 5.4 kernel – https://linux.mellanox.com/public/repo/centos76-kernel54-arm64/ • Rocky Linux 8.6 – https://linux.mellanox.com/public/repo/rocky86-arm64/
	Add DOCA online repository	<pre>echo "[doca] name=DOCA Online Repo baseurl=\$DOCA_REPO enabled=1 gpgcheck=0 priority=10 cost=10" > /etc/yum.repos.d/doca.repo</pre>

OS	Action	Instructions
		A file is created under <code>/etc/yum.repos.d/doca.repo</code>
	Update index	<pre><bf> \$ yum makecache</pre>
	Upgrade UEFI/ATF firmware	Run: <pre><bf> \$ yum install mlxbf-bootimages-signed</pre> Then initiate the upgrade for UEFI/ATF firmware: <pre><bf> \$ bfrec</pre>
	Upgrade BlueField NIC firmware	The following commands update the firmware package and install the update: <pre><bf> \$ yum install mlnx-fw-updater-signed</pre> <pre><bf> \$ sudo /opt/mellanox/mlnx-fw-updater update</pre>
	Remove old metapackages	<pre><bf> \$ yum remove doca* mlnx-ofed* kernel*</pre>
	Install new metapackages	i Note Before installing the metapackages, please remove the old metapackages to avoid any conflicts: <pre><bf> \$ yum remove strongswan-bf strongswan-bf</pre> <pre><bf> \$ yum remove strongswan-bf strongswan-bf</pre>

OS	Action	Instructions
		<pre><bf> \$ yum -y install doca-runtime doca-d</pre>
	Upgrade system	<pre><bf> \$ yum upgrade --nobest</pre>
	Apply the new changes, NIC firmware, and UEFI/ATF	For the upgrade to take effect, perform BlueField system  Note This step triggers immediate reboot of the BlueFie

4. Post-Installation Procedure

1. Restart the driver. Run:

```
host# sudo /etc/init.d/openibd restart
Unloading HCA driver: [
OK ]
Loading HCA driver and Access Layer: [
OK ]
```

2. Configure the physical function (PF) interfaces.

```
host# sudo ifconfig <interface-1> <network-1/mask> up
host# sudo ifconfig <interface-2> <network-2/mask> up
```

For example:

```
host# sudo ifconfig p2p1 192.168.200.32/24 up
host# sudo ifconfig p2p2 192.168.201.32/24 up
```

Pings between the source and destination should now be operational.

5. Building Your Own BFB Installation Image

Users wishing to build their own customized BlueField OS image can use the BFB build environment. Please refer to the bfb-build project in [this GitHub webpage](#) for more information.

Note

For a customized BlueField OS image to boot on the UEFI secure-boot-enabled BlueField (default BlueField secure boot setting), the OS must be either signed with an existing key in the UEFI DB (e.g., the Microsoft key), or UEFI secure boot must be disabled. Please refer to the "Secure Boot" page under [NVIDIA BlueField DPU Platform Operating System Documentation](#) for more details.

6. Setting Up Build Environment for Developers

For full instructions about setting up a development environment, refer to the [NVIDIA DOCA Developer Guide](#).

7. Additional SDKs for DOCA

7.1 Installing CUDA on NVIDIA Converged Accelerator

NVIDIA® CUDA® is a parallel computing platform and programming model developed by NVIDIA for general computing GPUs.

This section details the necessary steps to set up CUDA on your environment. This section assumes that a BFB image has already been installed on your environment.

To install CUDA on your converged accelerator:

1. Download and install the latest NVIDIA Data Center GPU driver.
2. Download and install CUDA

Note

The CUDA version tested to work with DOCA SDK is 11.8.0.

Note

Downloading CUDA includes the latest NVIDIA Data Center GPU driver and CUDA toolkit. For more information about CUDA and driver compatibility, refer to the [NVIDIA CUDA Toolkit Release Notes](#).

7.1.1 Configuring Operation Mode

There are two modes that the NVIDIA Converged Accelerator may operate in:

- Standard mode (default) – the BlueField and the GPU operate separately
- BlueField-X mode – the GPU is exposed to BlueField and is no longer visible on the host

To verify which mode the system is operating in, run:

```
host# sudo mst start
host# sudo mlxconfig -d <device-id> q
PCI_DOWNSTREAM_PORT_OWNER[4]
```

Note

To learn your BlueField Platform's device ID, refer to section ["Determining BlueField Device ID"](#).

- Standard mode output:

```
Device #1:  
[...]  
Configurations:                                Next Boot  
          PCI_DOWNSTREAM_PORT_OWNER[4]  
DEVICE_DEFAULT(0)
```

- BlueField-X mode output:

```
Device #1:  
[...]  
Configurations:                                Next Boot  
          PCI_DOWNSTREAM_PORT_OWNER[4]          EMBEDDED_CPU(15)
```

To configure BlueField-X mode, run:

```
host# mlxconfig -d <device-id> s PCI_DOWNSTREAM_PORT_OWNER[4]=0xF
```

To configure standard mode, run:

```
host# mlxconfig -d <device-id> s PCI_DOWNSTREAM_PORT_OWNER[4]=0x0
```

Note

To learn your BlueField Platform's device ID, refer to section "[Determining BlueField Device ID](#)".

Power cycle is required for configuration to take effect. For power cycle the host run:

```
host# ipmitool power cycle
```

7.1.2 Downloading and Installing CUDA Toolkit and Driver

This section details the necessary steps to set up CUDA on your environment. It assumes that a BFB image has already been installed on your environment.

1. Install CUDA by visiting the [CUDA Toolkit Downloads](#) webpage.

Note

Select the Linux distribution and version relevant for your environment.

Note

This section shows the native compilation option either on x86 or aarch64 hosts.

2. Test that the driver installation completed successfully. Run:

```
dpu# nvidia-smi
```

```
Tue Apr  5 13:37:59 2022
```

```
+-----+
+-----+
| NVIDIA-SMI 510.47.03      Driver Version: 510.47.03      CUDA
Version: 11.8              |
+-----+-----+-----+
+-----+
| GPU   Name           Persistence-M| Bus-Id        Disp.A |
Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|      Memory-Usage | GPU-
Util  Compute M. |
|                               |                    |
MIG M. |
+=====+=====+=====+
|    0   NVIDIA BF A10          Off  | 00000000:06:00.0 Off  |
0 |
|  0%    43C    P0     N/A / 225W |      0MiB / 23028MiB |
0%      Default |
|                               |                    |
N/A |
+-----+-----+-----+
+-----+
+-----+
+-----+
| Processes:
|
| GPU   GI    CI          PID    Type    Process name
GPU Memory |
|       ID    ID
Usage      |
+=====+
| No running processes found
|
```



```
+-----+
|       |
+-----+
```

3. Verify that the installation completed successfully.

1. Download CUDA samples repo. Run:

```
dpu# git clone https://github.com/NVIDIA/cuda-samples.git
```

2. Build and run vectorAdd CUDA sample. Run:

```
dpu# cd cuda-samples/Samples/0_Introduction/vectorAdd
dpu# make
dpu# ./vectorAdd
```

Note

If the `vectorAdd` sample works as expected, it should output "`Test Passed`".

Note

If it seems that the GPU is slow or stuck, stop execution and run:

```
dpu# sudo setpci -v -d ::0302 800.L=201 #
CPL_VC0 = 32
```

7.1.3 GPUDirect RDMA

For information on GPUDirect RDMA and more, refer to [DOCA GPUNetIO](#) documentation.

7.2 Installing Rivermax on BlueField

NVIDIA Rivermax offers a unique IP-based solution for any media and data streaming use case.

This section provides the steps to install Rivermax assuming that a BFB image has already been installed on your environment.

7.2.1 Downloading Rivermax Driver

1. Navigate to the [NVIDIA Rivermax SDK](#) product page.
2. Register to be able to download the driver package using the JOIN button at the top of the page.
3. Download the appropriate driver package according to your BFB under the "Linux" subsection. For example, for Ubuntu 22.04 BFB, download `rivermax_ubuntu2204_<version>.tar.gz`.

7.2.2 Installing Rivermax Driver

1. Copy the `.tgz` file to BlueField:

```
host# sudo scp -r rivermax_ubuntu2204_<version>.tar.gz  
ubuntu@192.168.100.2:/tmp/
```

2. Extract the Rivermax file:

```
dpu# sudo tar xzf rivermax_ubuntu2204_<version>.tar.gz
```

3. Install the Rivermax driver package:

```
dpu# cd <rivermax-version>/Ubuntu.22.04/deb-dist/aarch64/  
dpu# sudo dpkg -i rivermax_<version>.deb
```

7.2.3 Installing Rivermax Libraries from DOCA

Rivermax libraries are compatibles with DOCA components and can be found inside the `doca-dpu-repo`.

1. Unpack the doca-dpu-repo:

```
dpu# sudo dpkg -i doca-dpu-repo-ubuntu2204-  
local_<version>_arm64.deb
```

2. Run apt update:

```
dpu# sudo apt-get update
```

3. Install the Rivermax libraries:

```
dpu# sudo apt install doca-rmax-libs  
dpu# sudo apt install libdoca-rmax-libs-dev
```

For additional details and guidelines, please visit the [NVIDIA Rivermax SDK](#) product page.

Info

For questions, comments, and feedback, please contact us at DOCA-Feedback@exchange.nvidia.com.

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