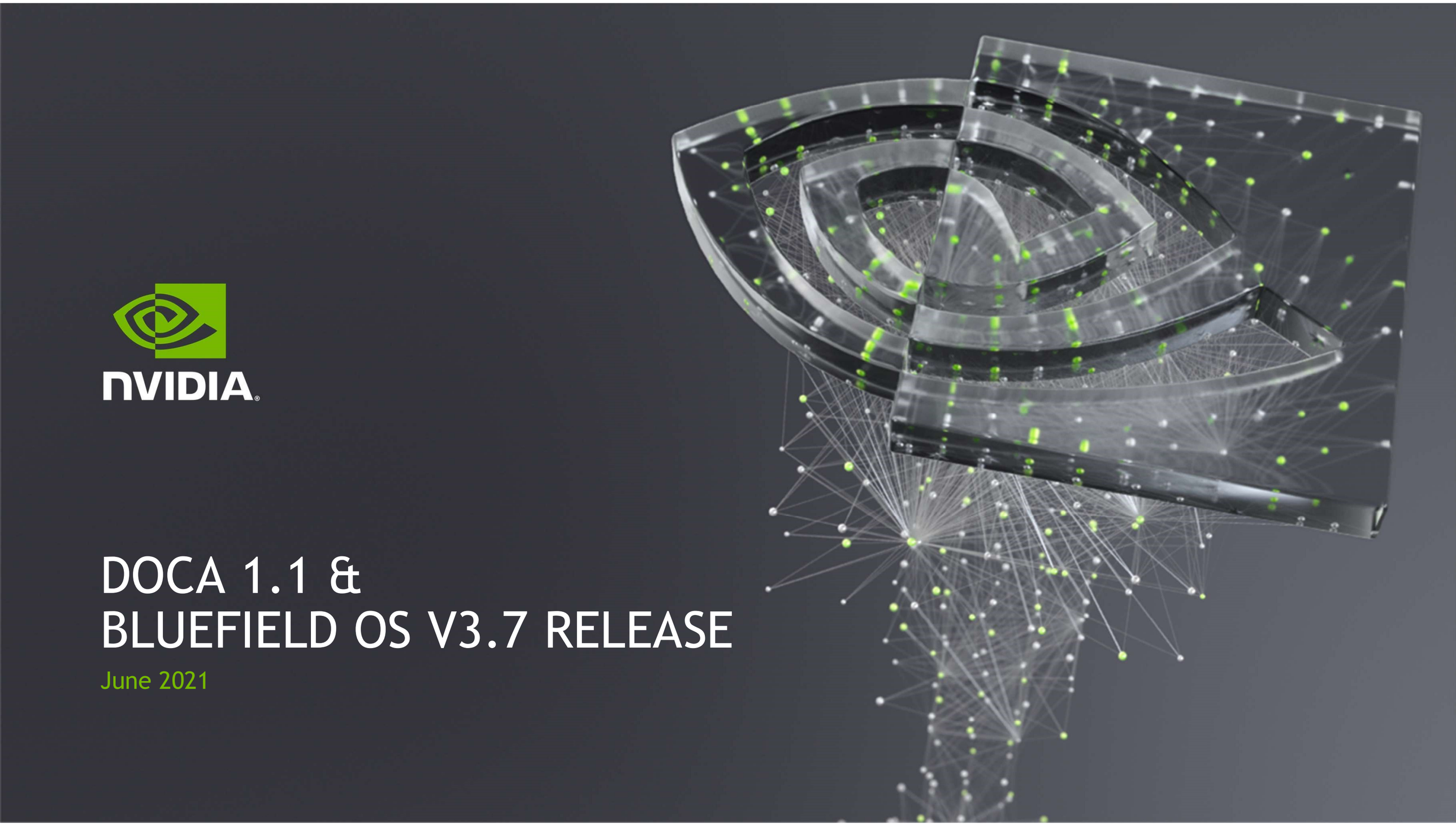


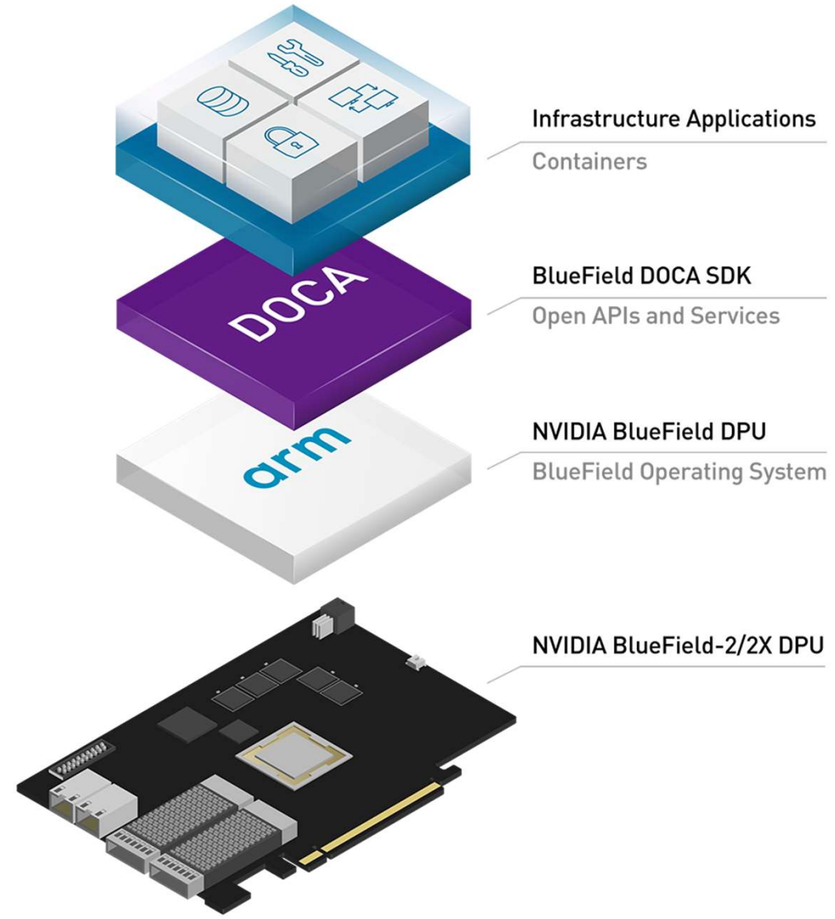
DOCA 1.1 & BLUEFIELD OS V3.7 RELEASE

June 2021

DOCA 1.1 BLUEFIELD OS V3.7 GA

Enabling the Transition to DPU based Data Center architecture

Products	DOCA v1.1 BlueField OS v3.7 GA DOCA SDK v0.2
Platforms	BlueField-2 DPU 25G & 100G GA BlueField-2 DPU Controller 100G ES
Key Features	DOCA FLOW Lib - Gateway DNS & URL Filter example applications Acceleration of Stateful Flow Table (SFT) DOCA DPI Lib with SFT & RegEx acceleration DOCA Packages for x86 BlueField SNAP virtio-blk Resilience BlueField SNAP Direct for virtio-blk
Availability	Software download
Actions	Encourage customers to sign up for DOCA early access



Features Highlight

DOCA

Flow Library – Gateway

DPI Library

Reference Applications

DOCA Developer Experience

Security

Secured NIC

TLS Inline Offload

Storage

SNAP virtio-blk Resilience

SNAP Accelerated flow

SNAP Process Upgrade / crash recovery

SPDK NVMe-oF RDMA DC

Supported OS & Cards

BlueField-2 3.7 Portfolio

Supported OS

Enhancements

DOCA SDK
HIGHLIGHTED FEATURES

DOCA FLOW LIBRARY - GATEWAY

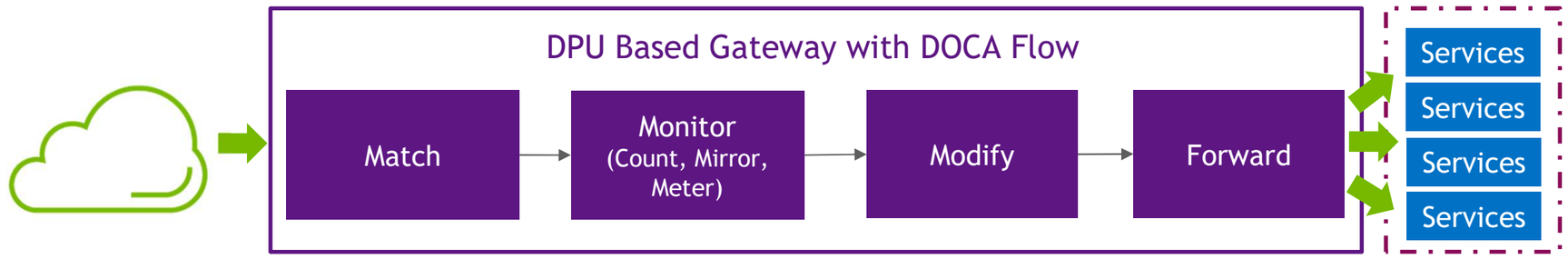
Creating Optimized and Accelerated Gateways

Developer's Benefits

- Simplicity and scale through dedicated use case APIs and logic
- Tuned for best performance
- VNF and Appliance
- High insertion rate
- Supporting remote API calls and multi threading

Use Cases

- Data network gateway
- Service Load balancer
- Carrier Grade NAT



DOCA FLOW GATEWAY – DNS FILTERING

Example Application

- Reduce CPU overhead by offloading DNS requests handling to the DPU Arm control plane
- DNS filter example application is levering DOCA Flow Gateway APIs to steer DNS requests and non-DNS traffic
- Further processing can be done on the DPU Arm such as whitelisting, logging, filtering, etc
- Non-DNS traffic is forwarded to the host or forwarded by the hardware using hair-pinning
- DNS filter example application is designed to run as a "bump-on-the-wire"

DOCA DPI LIBRARY

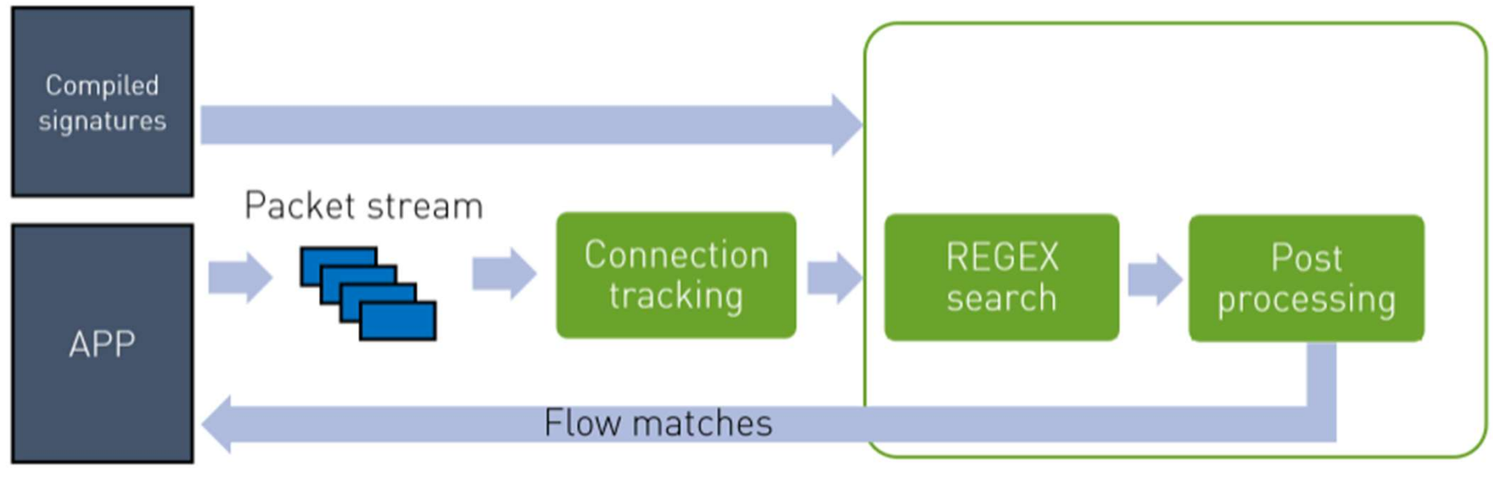
Enable accelerated & distributed Deep Packet Inspection

Developer's Benefits

- Simplicity and scale through dedicated use case APIs and logic
- Tuned for best performance using SFT (Connection Tracking) and RegEx (Regular Expression) acceleration in hardware
- VNF and Appliance ready
- 100Ks of signatures are supported
- Total inspection bandwidth of 50Gbps

Use Cases

- Next Generation Firewall acceleration
- Intrusion detection
- Stateful L7 load balancers
- Content policy violations

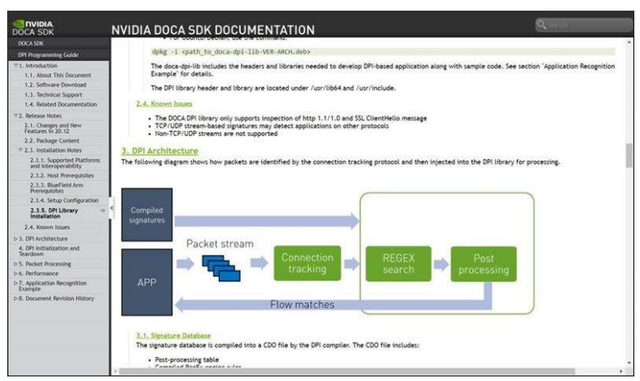


REFERENCE APP—DPI FOR APPLICATION RECOGNITION

Step-by-Step Developer Journey

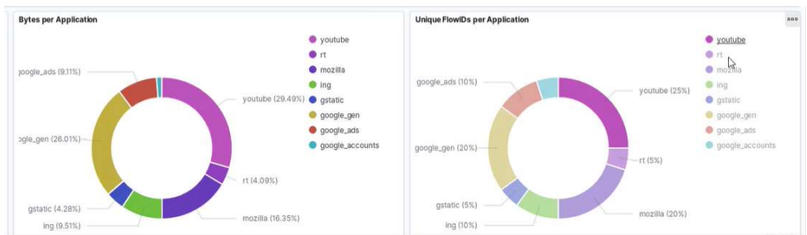
1

Review the DOCA Dev Zone "Programming Guide" for Deep-Packet-Inspection (DPI) Library



2

Review the DOCA "Reference Applications" section for Application Recognition (AR)



Approach NVIDIA support for more information on precompiled signature databases

3

Implement changes on top of the reference application or use the DPI APIs from your application

DPI compiler is needed if you're using your own signatures

REFERENCE APP—DPI FOR APPLICATION RECOGNITION

Step-by-Step Developer Journey

4

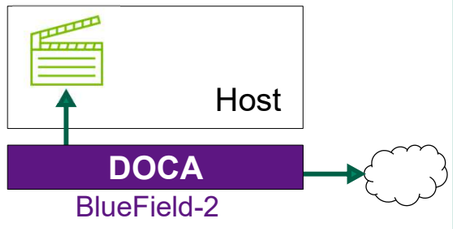
Compile your application on the emulated Arm developer container or natively on the Arm

Load your application to the BlueField OS that has DOCA Runtime installed

5

Browse "Video App" from the host and make sure there's connectivity

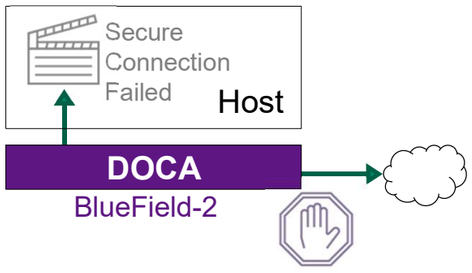
Review the Application Recognition terminal output with App name



Use the NetFlow exporter to export the traffic statistics

6

Block "Video App" on the host by issuing block command per "Video App" ID on the DPU



Verify that Video App is now blocked

DOCA DEVELOPER EXPERIENCE

SDK Manager

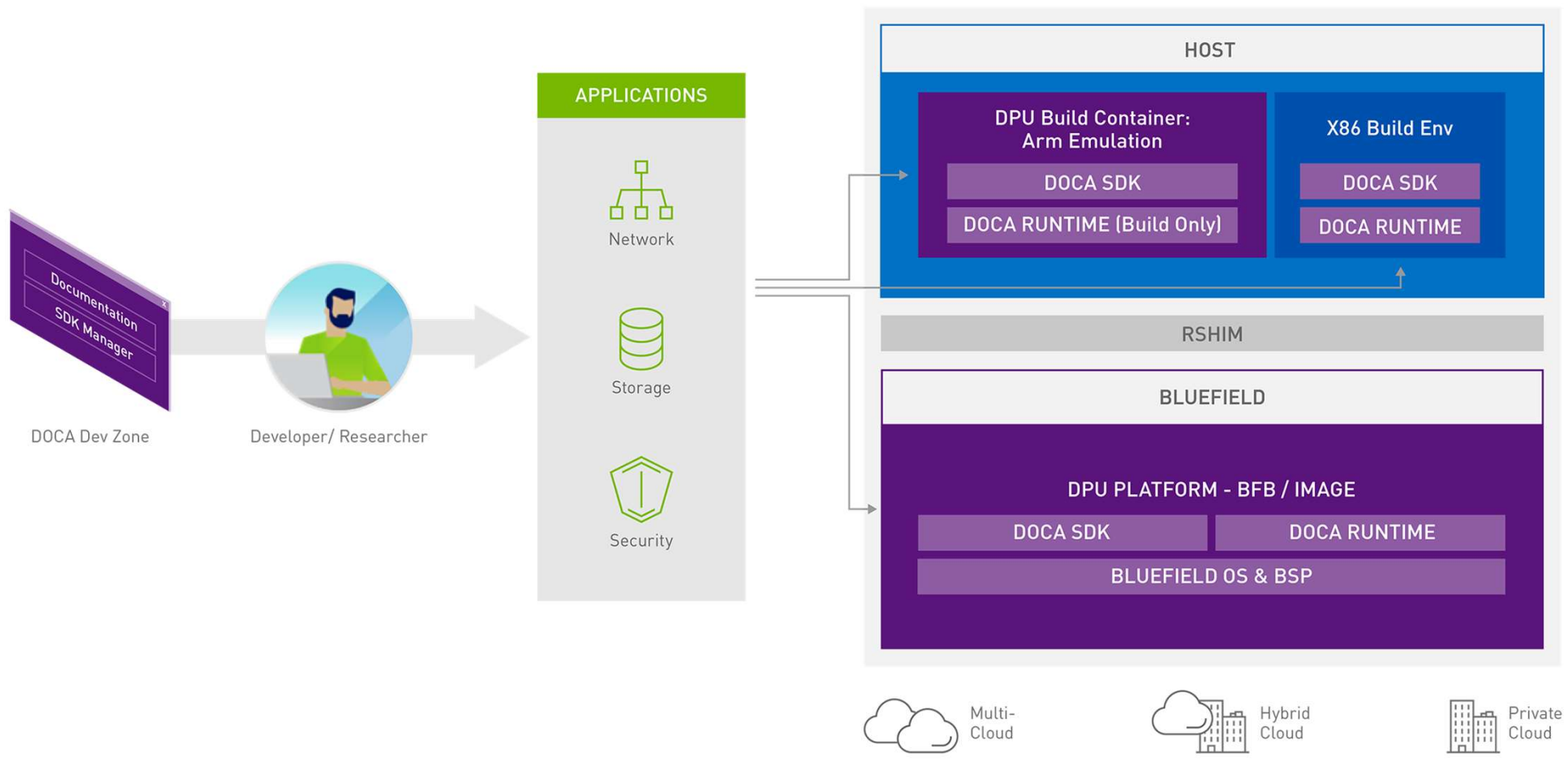
Easily install the DOCA packages
Flash or Update DPU Software

Developer Container

Develop DOCA anywhere
Build services & images on host

DOCA Package for x86

Develop host-based applications
Leverage the DPU acceleration



SECURITY
HIGHLIGHTED FEATURES

NIC FIRMWARE ROLLBACK PROTECTION

BlueField-2 includes 2 subsystems – NIC (ConnectX-6DX) & ARM

NIC subsystem now includes protection to enforce inability to downgrade FW version

Value – added protection (based on security version numbers in HW eFuses) from malicious actor rolling back to a FW with known vulnerabilities

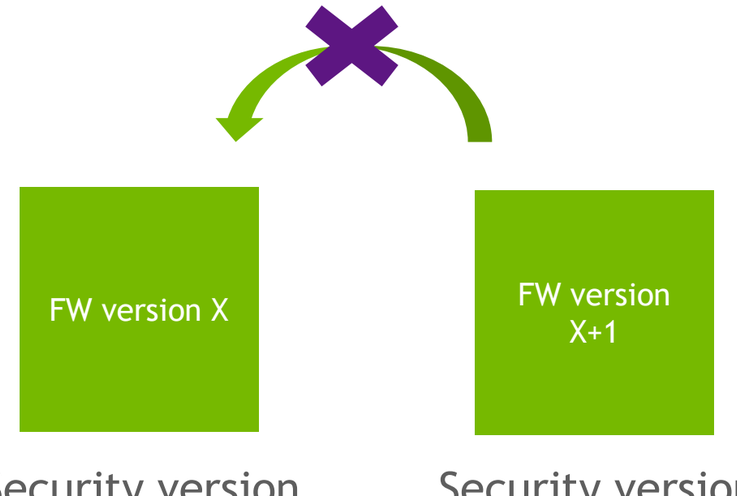
ARM subsystem already supports similar ability

Can be enabled on cards in field (with 32 security level increments) by updating to latest FW

"Fresh“\New cards can have their "minimal version" fuses burned in factory

New field in flint query to provide visibility

Support for NIC side in BlueField-2 onwards




```
Secure boot:            Enabled
EFUSE Security Ver:     0
Image Security Ver:     0
Security Ver Program:   Manually ; Disabled
```

TLS INLINE OFFLOAD LAG SUPPORT

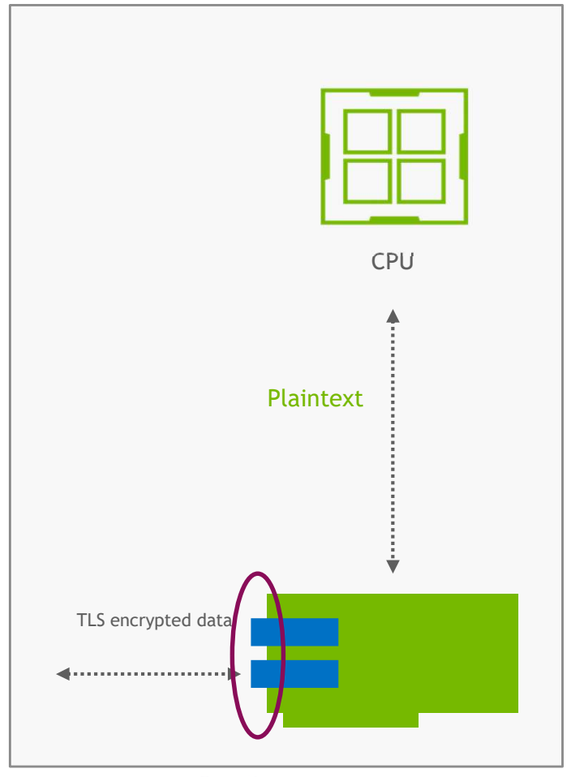
Support link aggregation groups (LAG) with kTLS crypto HW offload

Aggregating multiple network interfaces into a single logical bonded interface

Value -

Allows maximizing aggregated bandwidth in relevant system set ups with multiple network interfaces

Enables redundancy in case one of the links should fail



STORAGE
HIGHLIGHTED FEATURES

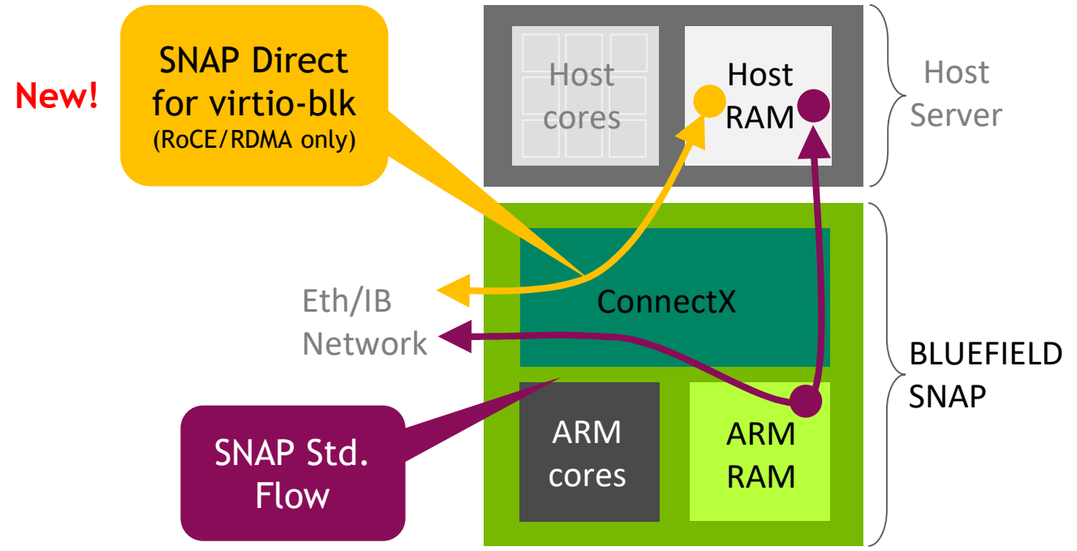
virtio-blk SNAP-DIRECT

Lowers latency; frees Arm memory BW; increased efficiency

- SNAP-Direct introduced in previous release for NVMe only
- New in this release – SNAP-Direct for virtio-blk

Capabilities

- Direct Host RAM buffer to Network tx/rx (zero-copy)
- Control remains on Arm cores
- Currently supported for RoCE/RDMA only – NVMe-oF is main use case



SNAP ACCELERATED FLOW

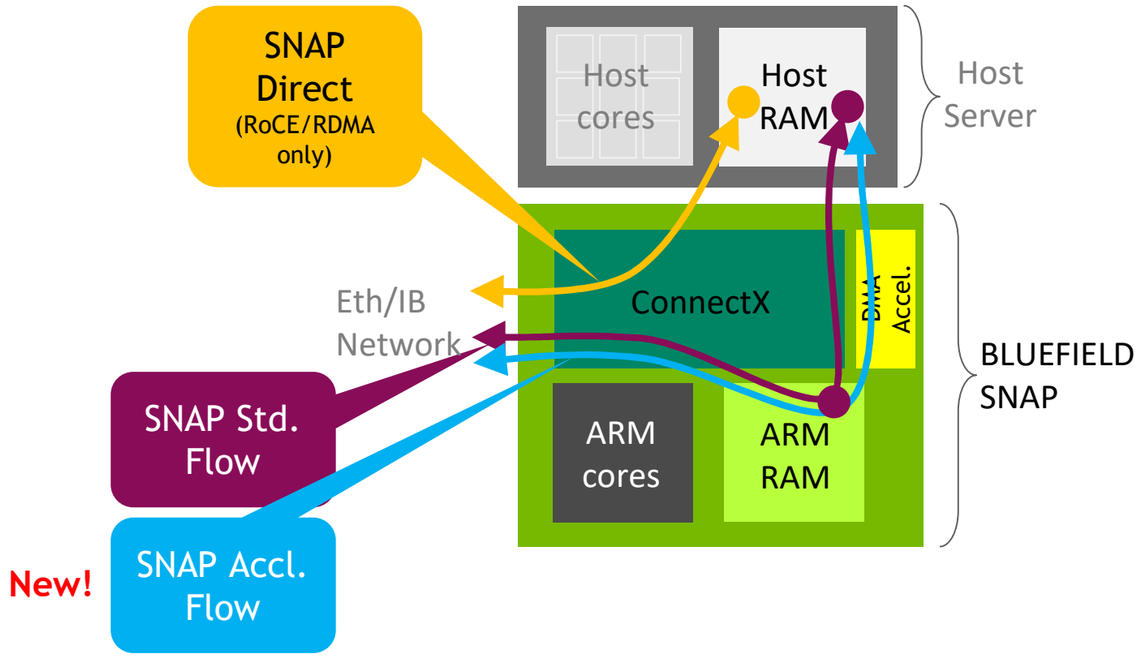
Accelerated ARM-DATA-PATH

Improving ‘SNAP Std. Flow’ using new-BlueField-2-DMA engine

Data-path Host-ARM is accelerated, hopping PCIe only once

DMA-engine is a 400Gbps device (200Gbps full-duplex)

Performance with data copy to ARM RAM is expected to be ~4MIOPS @4K blocks



SNAP PROCESS UPGRADE / CRASH RECOVERY

Software Upgrade

- Allow SNAP/SPDK process upgrade during traffic
- Run next-ver and recover traffic from same point
- Quick to recovery
- External Orchestration dependent
- virtio-blk only

Crash Recovery

- In the event of SNAP/SPDK process-crash
- Restart to recover traffic from same point
- Quick to recovery
- External Orchestration dependent
- virtio-blk only

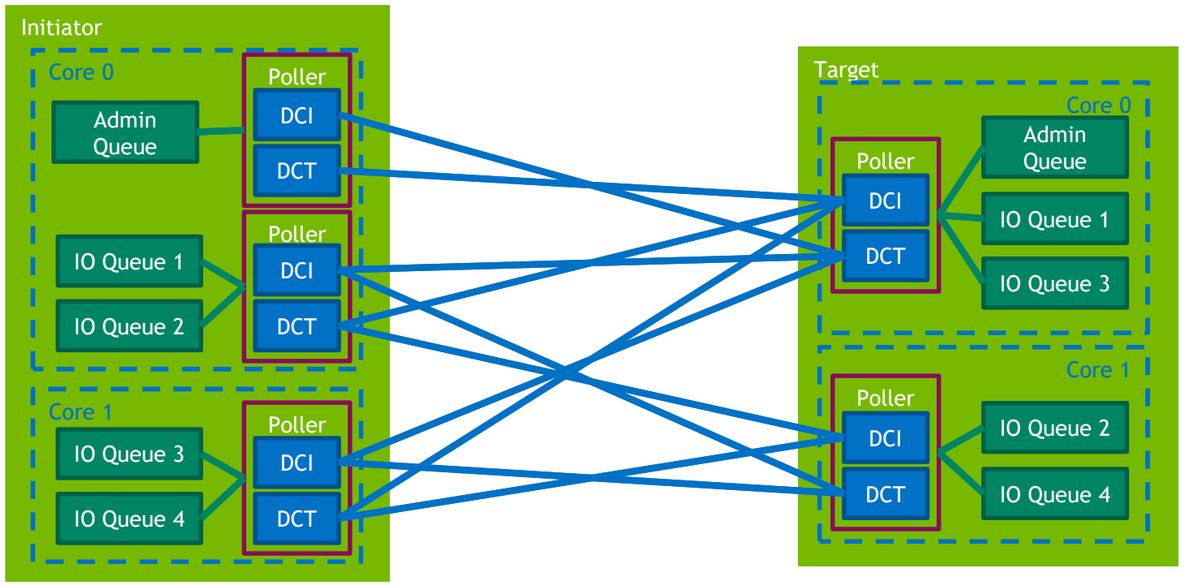
SPDK NVME-OF ADDS RDMA DC SUPPORT

Today, most widely RDMA Transports used are -

- UD (Unreliable Datagram)
  - ✓ Unreliable
  - ✓ Scalable: One QP services multiple destinations
- RC (Reliable Connection)
  - ✓ Reliable
  - ✓ Scalability limitations: One connection per destination

RDMA DC Transport provides best of both worlds -

- ✓ Reliable
- ✓ Scalable: One QP services multiple destinations



- SPDK adds RDMA DC support
- Initiator and Target (DCI/DCT)
- Integrated into NVMe-oF for both RoCE (Eth) and RDMA (IB)
- Beta Available now (private ver); Upstreaming is on-going

SUPPORTED OS & CARDS

BLUEFIELD-2 3.7 PORTFOLIO

FOR ALIBABA ONLY

	BLUEFIELD-2 DPU	BLUEFIELD-2 DPU	BLUEFIELD-2 DPU CONTROLLER
	25G End Point	100G End Point	100G Root Complex
	GA	GA	Sample
Flavors	2x25G P-series (2.5 GHz)	2x100G E-series (2.0 GHz) P-series (2.75 GHz)	2x100G P-series (2.75 GHz)

FOR ALIBABA ONLY

SUPPORTED OS

FOR ALIBABA ONLY

DPU ARM OS

- Ubuntu Server 20.04 Kernel 5.4 [default]
- CentOS 7.6 (drivers only for LK 5.4) *
  CentOS 8.2 (drivers only native LK and LK 5.4) *
- Debian 10 (drivers only) *

HOST OS

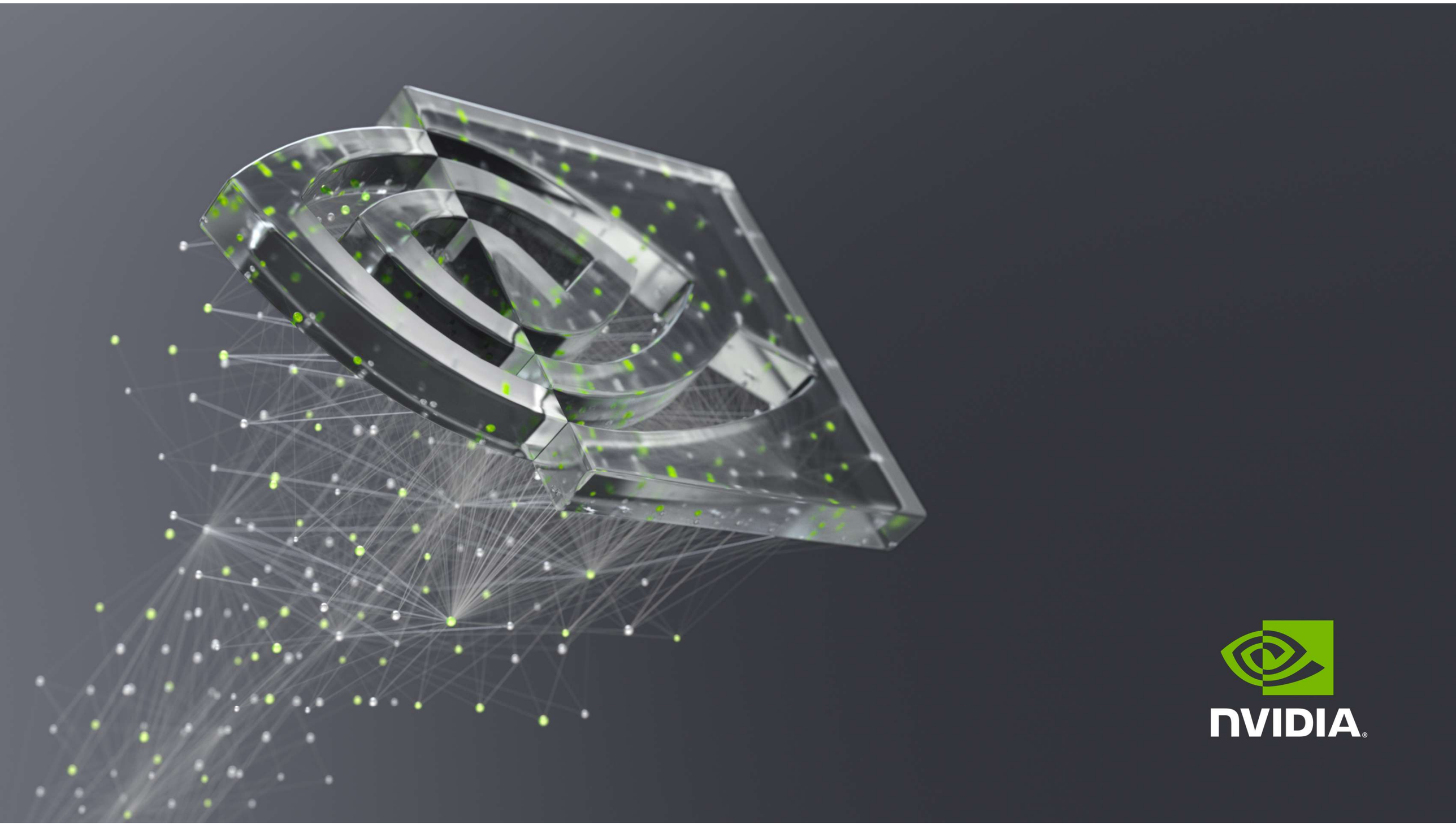
- Ubuntu 16.04 */ 18.04 / 20.04
- RHEL/CentOS 7.4 */ 7.5* / 7.6 / 8.0 / 8.2
- Debian 9.11*
- Windows Server 2016*, 2019*

* Not supported in DOCA, please approach the support team

Enhancements

DOCA 1.1 BLUEFIELD OS V3.7 ENHANCEMENTS

DOCA SDK v0.2	x86 DOCA Packages - Runtime and SDK packages for x86
Platform	NVSM Integration
	Reduce Boot time
	DOCA Telemetry Service Early Access
Storage	Signature Offload API


NVIDIA