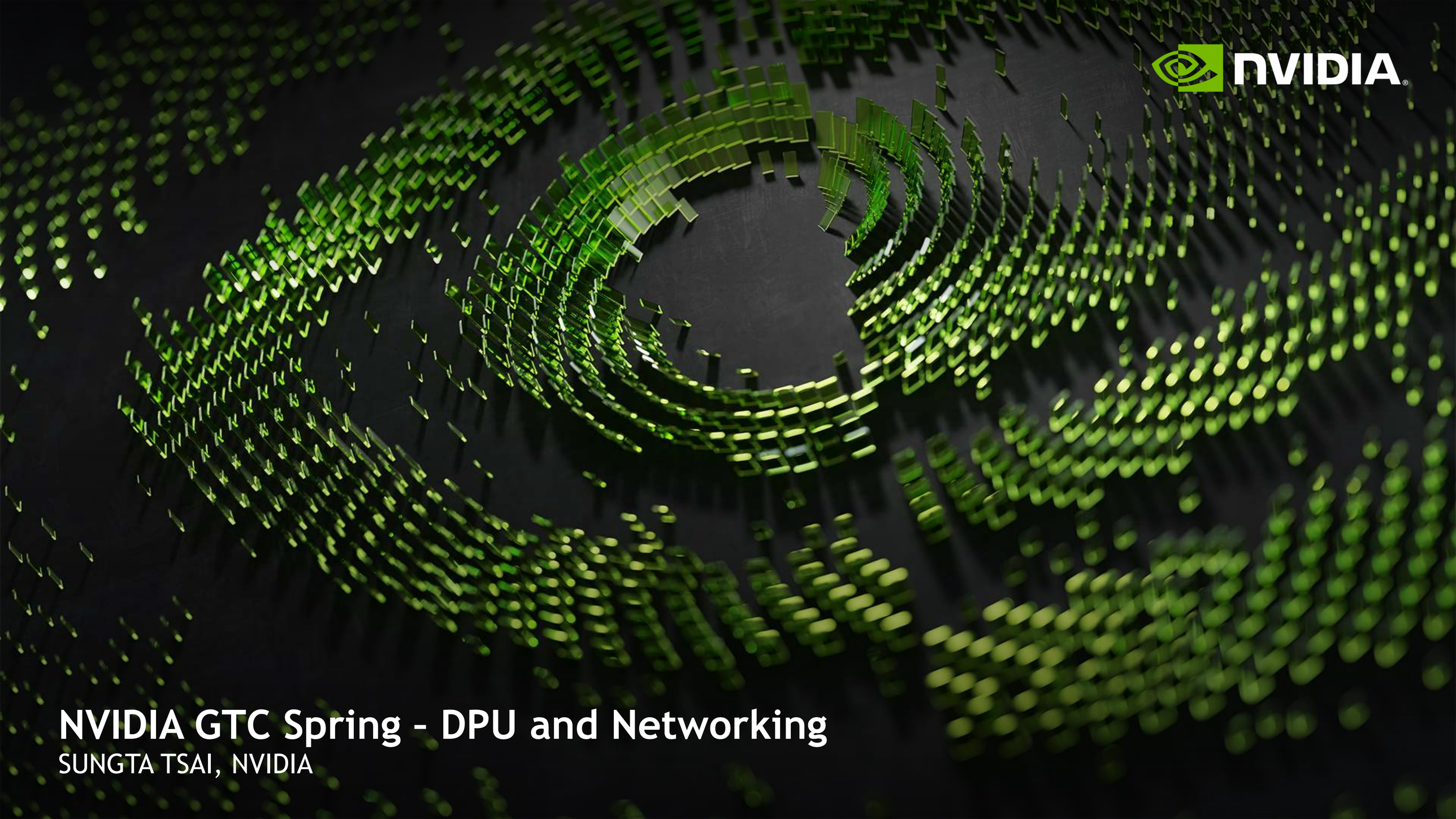
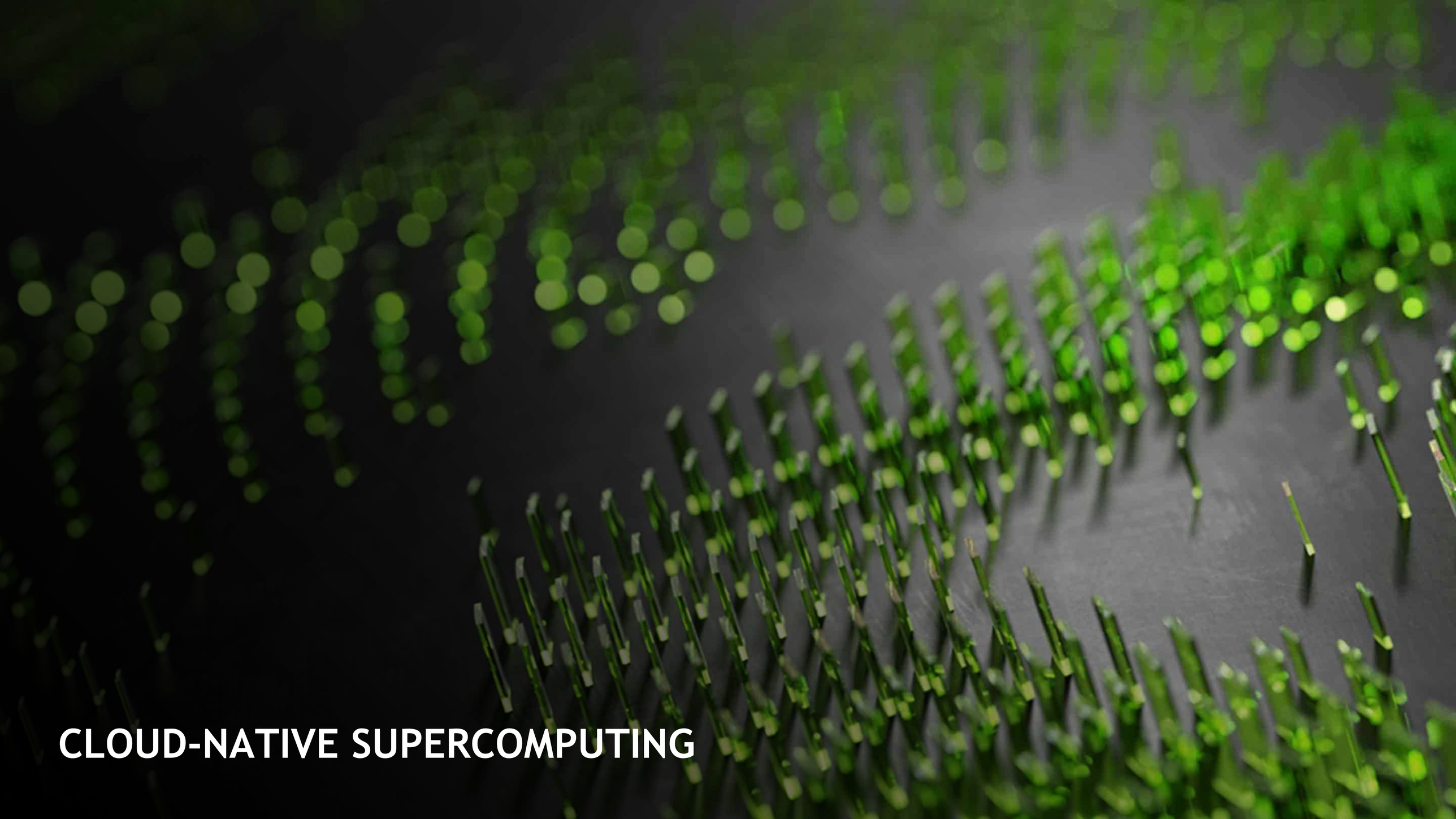


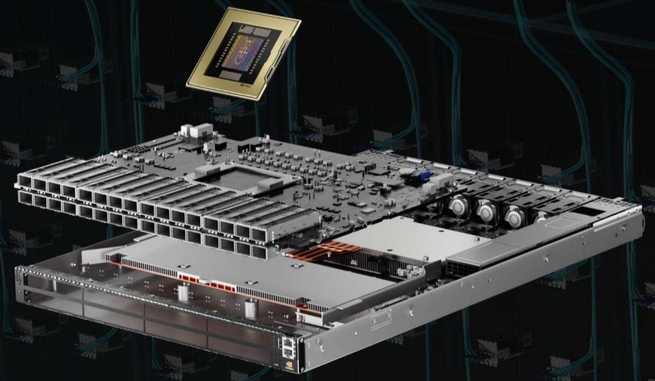
NVIDIA GTC Spring – DPU and Networking

SUNGTA TSAI, NVIDIA

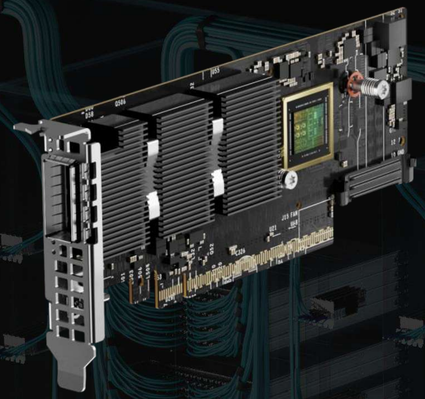

CLOUD-NATIVE SUPERCOMPUTING

NVIDIA QUANTUM-2

400G NDR InfiniBand Cloud-Native Supercomputing

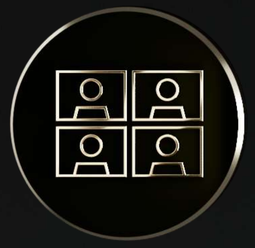


QUANTUM-2 SWITCH



CONNECTX-7 INFINIBAND

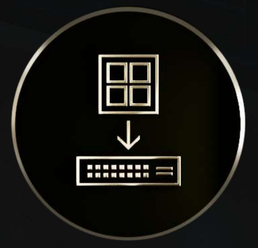
BLUEFIELD-3 INFINIBAND



Multi-Tenant
Bare-Metal Secure

Performance
Isolation

Congestion
Control

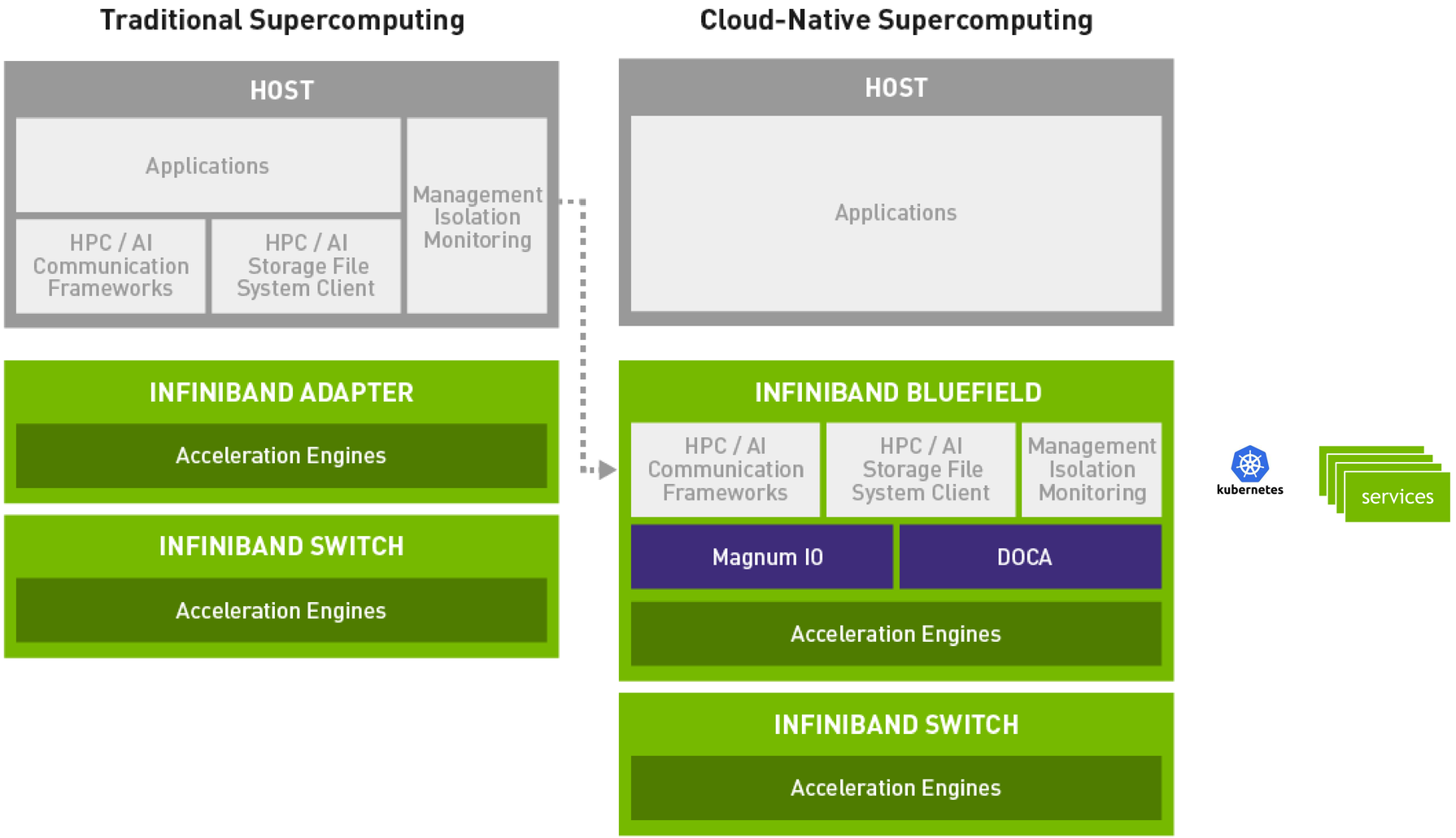


SHARP Gen 3
In-Network Computing

Precision
Timing

CLOUD NATIVE SUPERCOMPUTING INFRASTRUCTURE

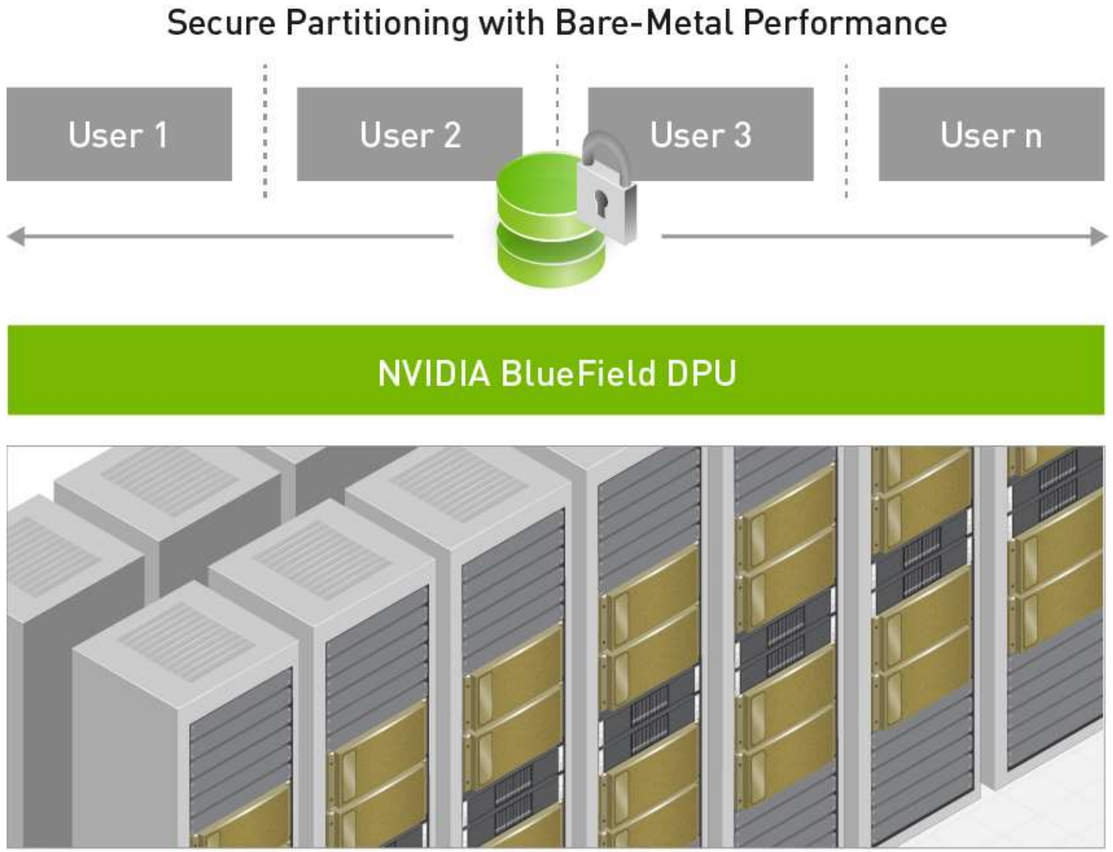
Based on NVIDIA DPU



HIGHER APPLICATION PERFORMANCE

Collective offload with UCC accelerator

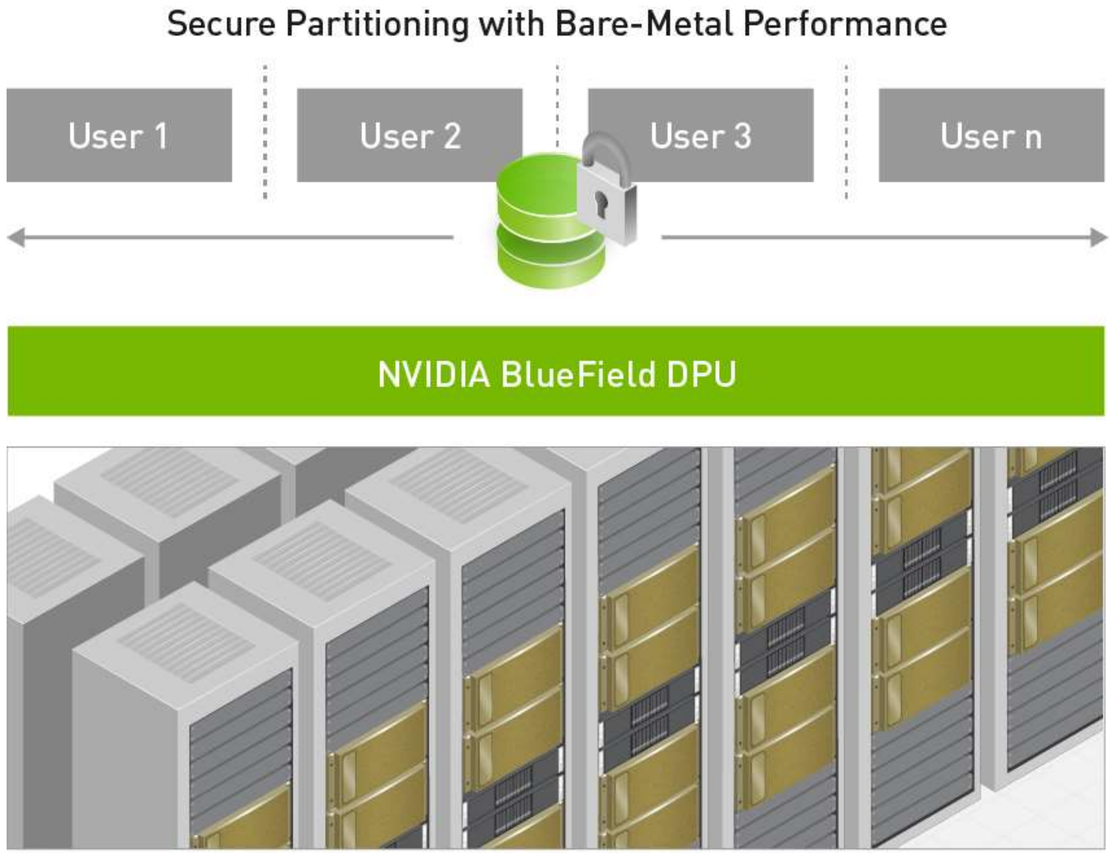
- DPU Accelerated HPC Communications
- Active messages
- Smart MPI progression
- Data Compression
- User-defined Algorithm



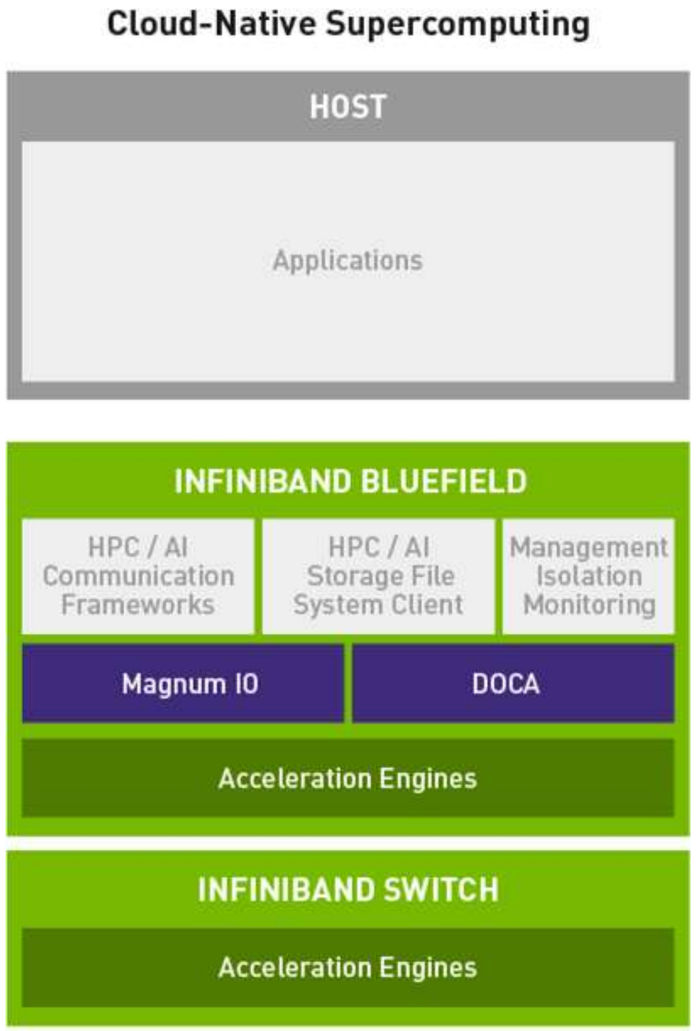
MULTI TENANT ISOLATION

Secured Network infrastructure and configuration

- Zero trust architecture
- Storage virtualization
- Tenant Service Level Agreement (SLA)
- 32K concurrent isolated users on single subnet
- DPU and Host Telemetry
- Host Introspection and security alerts



CLOUD NATIVE SUPERCOMPUTING INFRASTRUCTURE



kubernetes

Tenant services

- Accelerations
- Offloading
- UCC Offloading
- UCX Acceleration

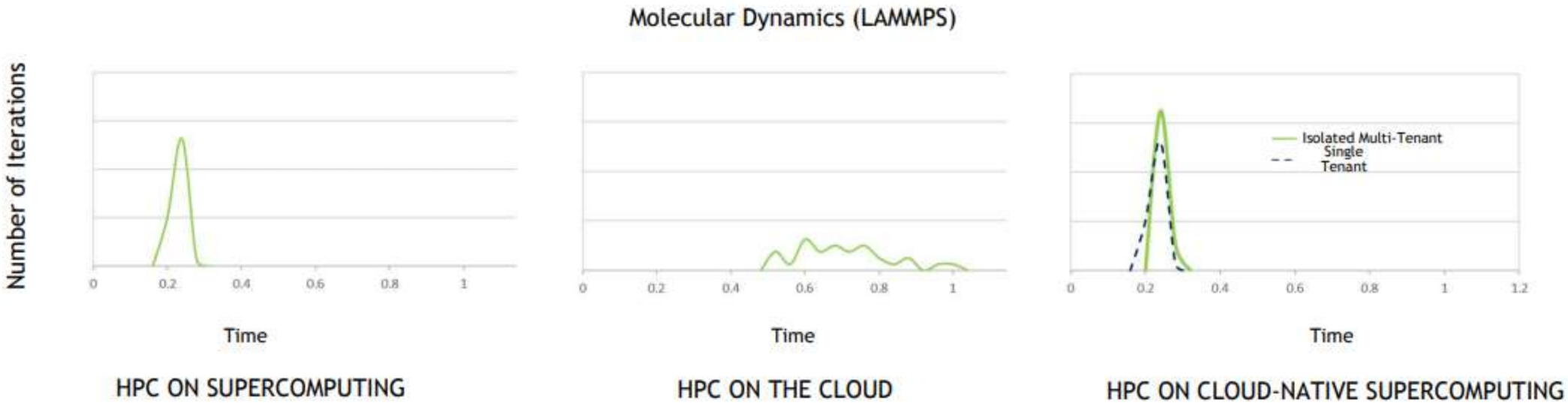
Infrastructure services

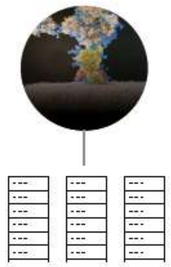
- Telemetry
- Security
- Remote resources
- Isolation

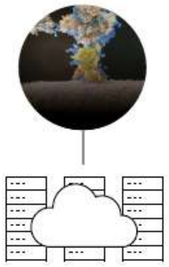
NVIDIA

MULTI-TENANT SUPERCOMPUTING CLOUD – THE CHALLENGE, THE SOLUTION

Molecular Dynamics (LAMMPS) Example: Tenant Service Level Agreement (SLA)

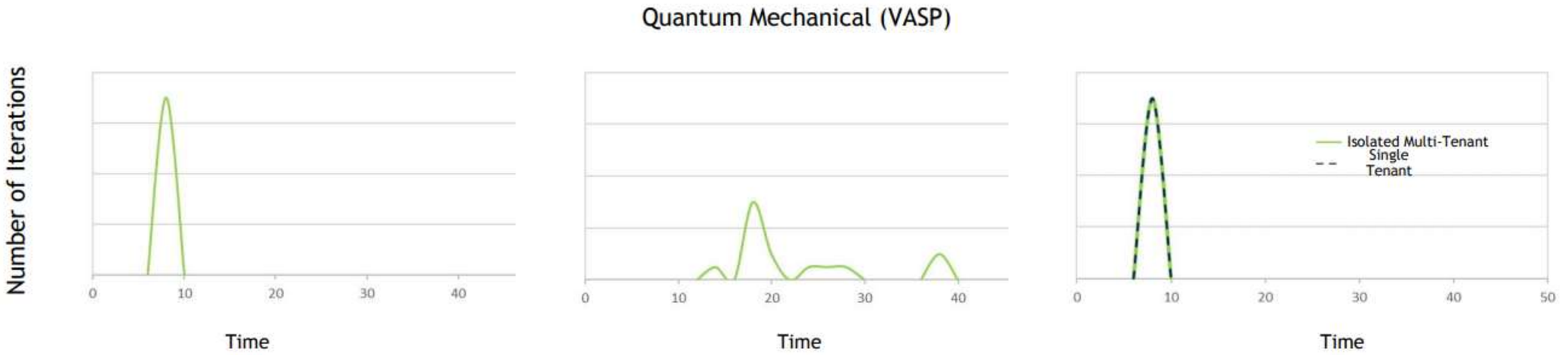




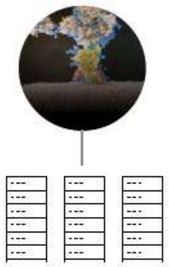


MULTI-TENANT SUPERCOMPUTING CLOUD – THE CHALLENGE, THE SOLUTION

Quantum Mechanical (VASP) Example: Tenant Service Level Agreement (SLA)

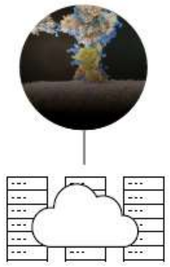


HPC ON SUPERCOMPUTING



HPC ON THE CLOUD

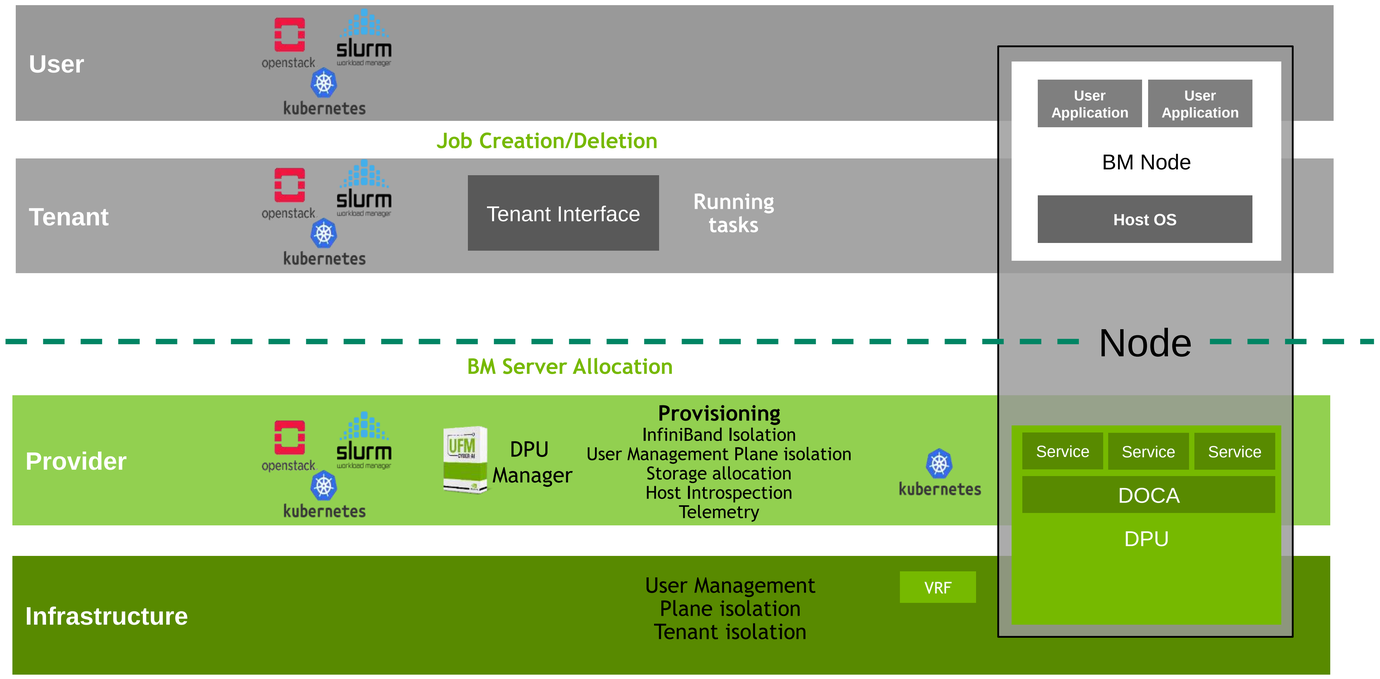
HPC ON CLOUD-NATIVE SUPERCOMPUTING

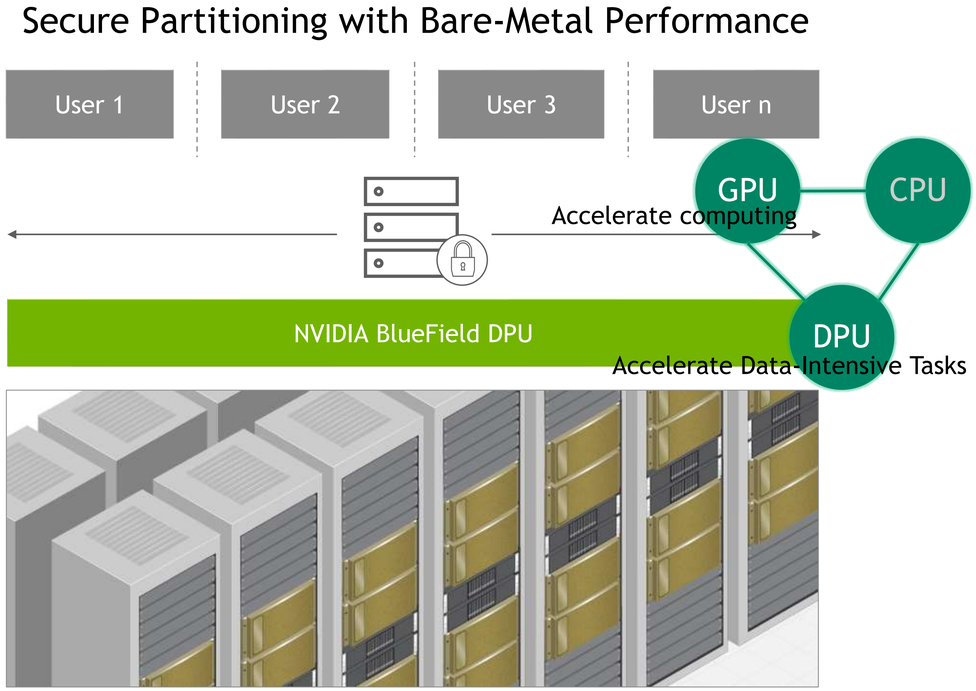


CLOUD NATIVE SUPERCOMPUTING ARCHITECTURE

The Data Center Becomes The New Unit of Computing

- Cloud Native Supercomputing
  - Cloud native orientated - with scaled, decoupled, dynamic systems managed from the cloud ways that enables ease of use, resilience, and transparency
  - BareMetal Performance - with performance isolation, and performance acceleration
  - Multi tenant - with security isolation

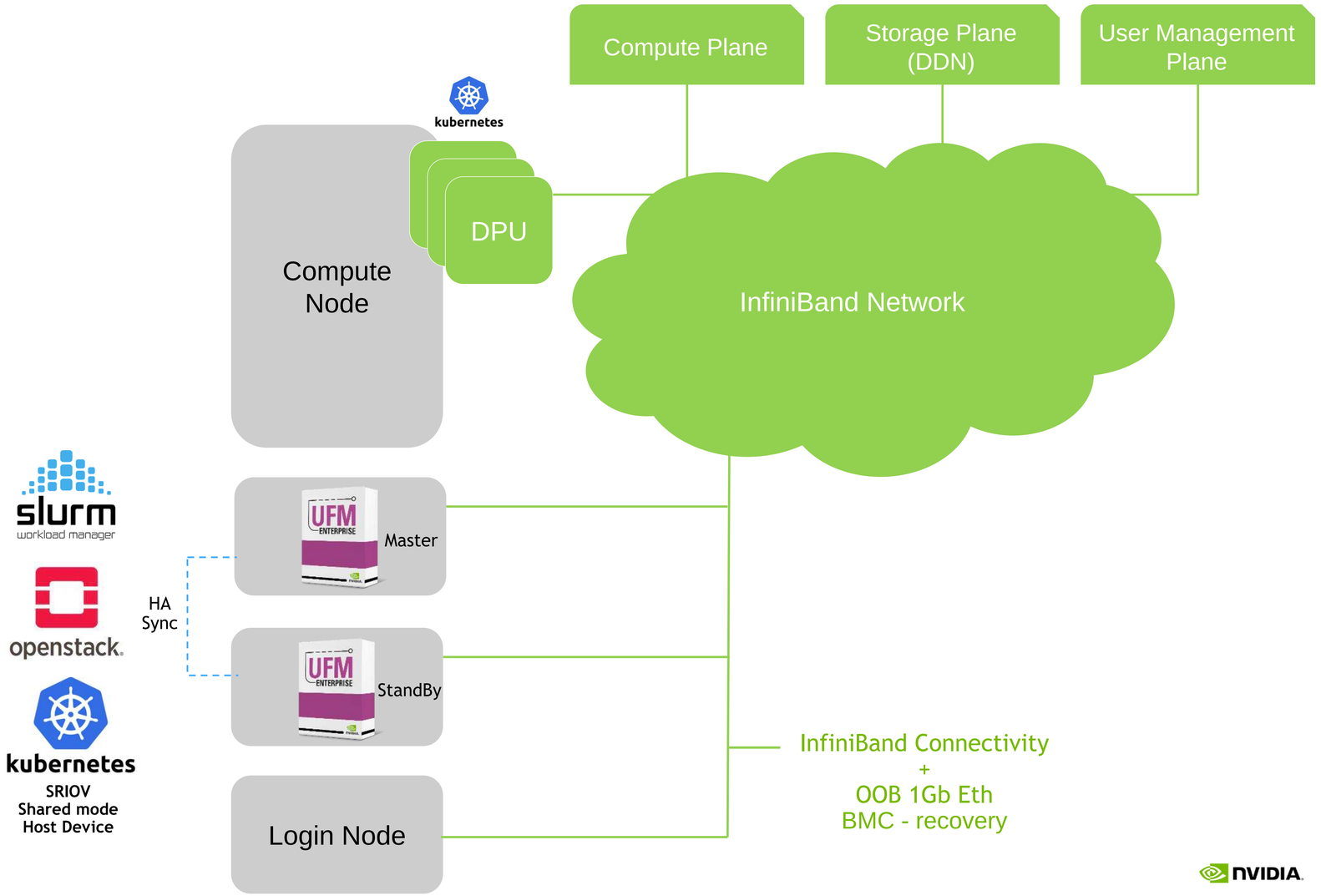




NVIDIA CLOUD NATIVE SUPERCOMPUTING ARCHITECTURE

Build Components Hardware and Software

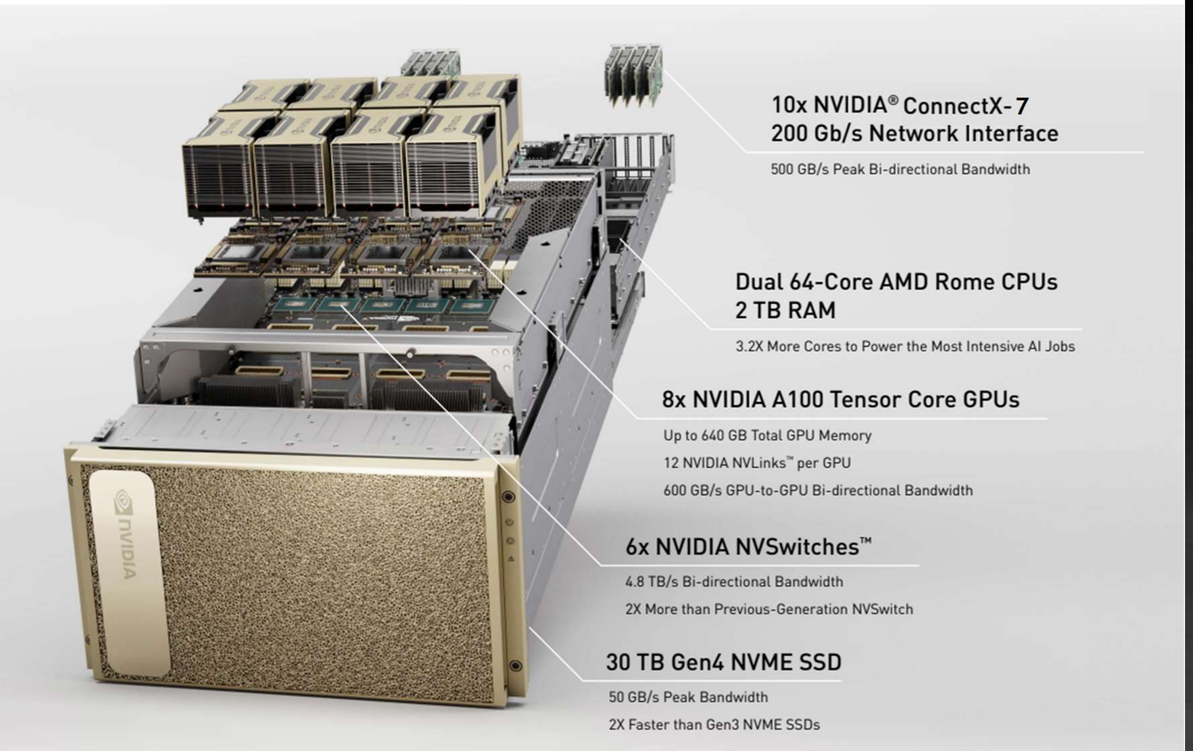
- Hardware
  - NVIDIA BlueField DPU's
  - NVIDIA Quantum-2 InfiniBand Fabric
  - NVIDIA UFM Appliance (optional)
- Software
  - NVIDIA UFM (Unified Fabric Manager)
    - OpenStack
    - Kubernetes
    - Slurm (Work Scheduler)
  - NVIDIA DPU Operations (DPU Manager)



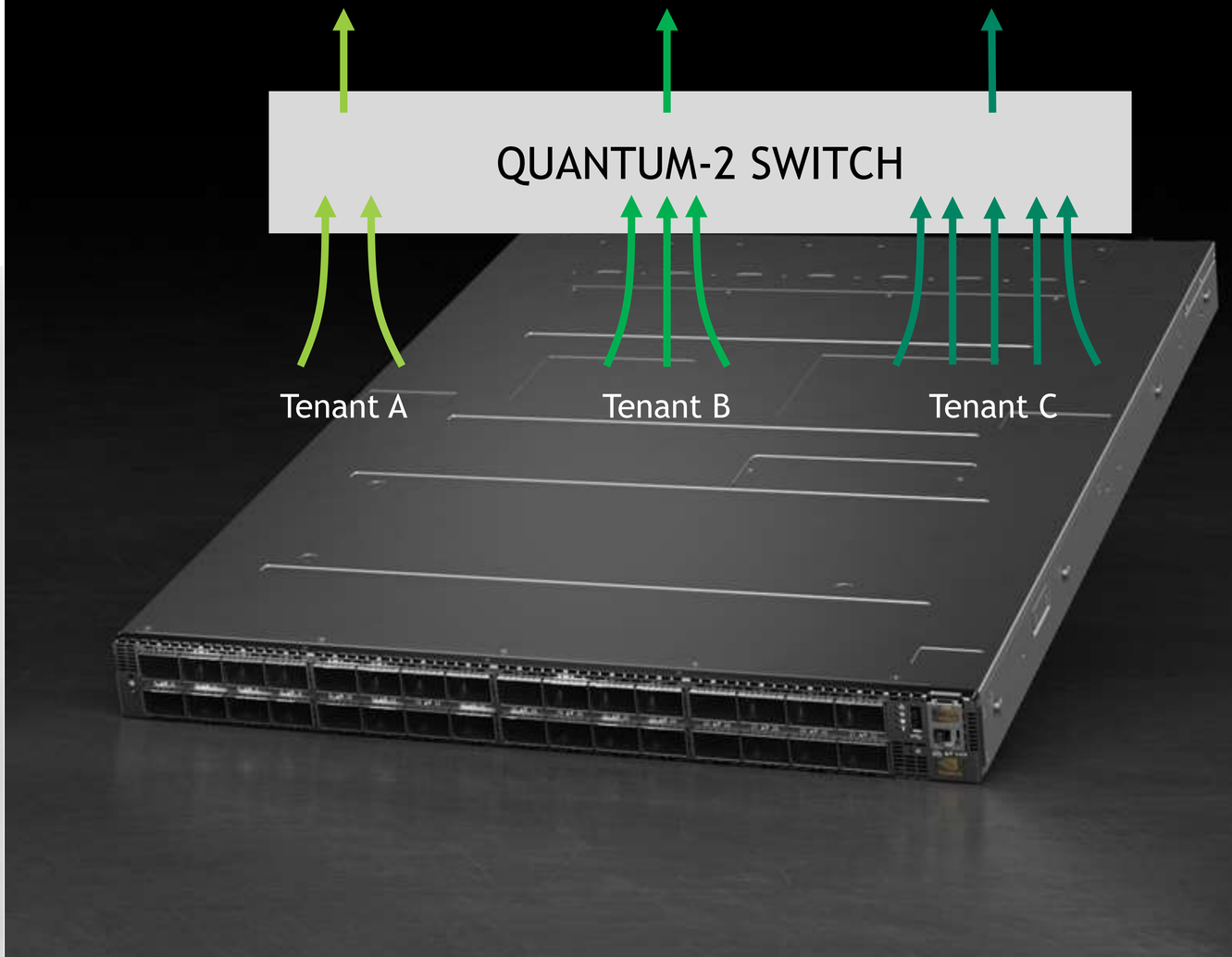
DGX A100 WITH QUANTUM-2

SHARPv3 Multi-Tenant In-Network Computing

200G Node to Switch, 400G Switch to Switch



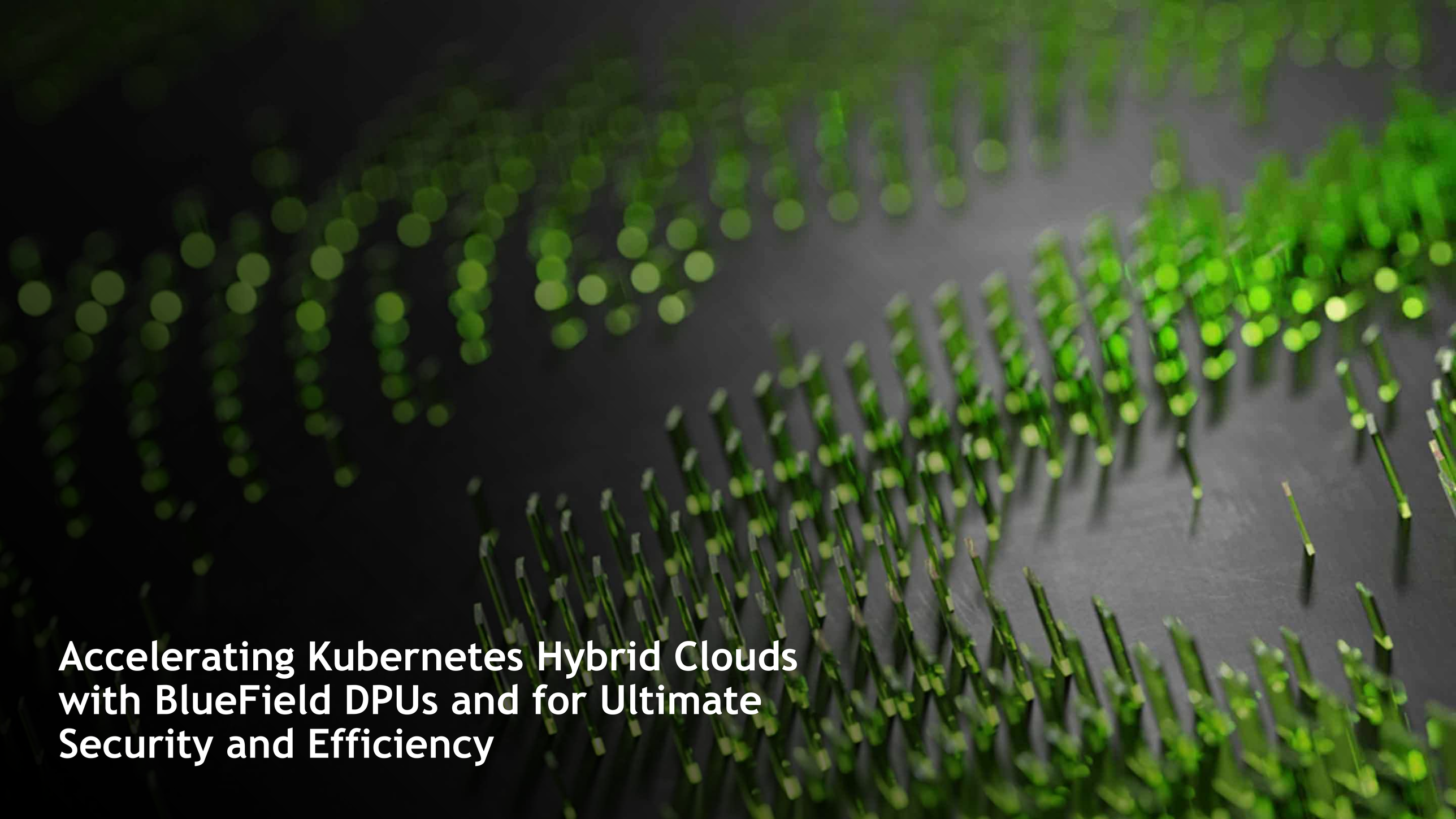
SHARPv3 Multi-Tenant In-Network Computing



NVIDIA QUANTUM-2 IN-NETWORK COMPUTING

Optimized Multi-Tenant Applications Performance

RECOMMENDERS	NLP	FFT	MOLECULAR DYNAMICS
1.4X	1.2X	1.3X	1.2X


Accelerating Kubernetes Hybrid Clouds
with BlueField DPUs and for Ultimate
Security and Efficiency

NVIDIA BLUEFIELD-3 DPU

Offload, Accelerate and Isolate Infrastructure Processing

400Gb/s Connectivity

2X Network Bandwidth
2X Network Pipeline
4X Host Bandwidth

Programmable Compute

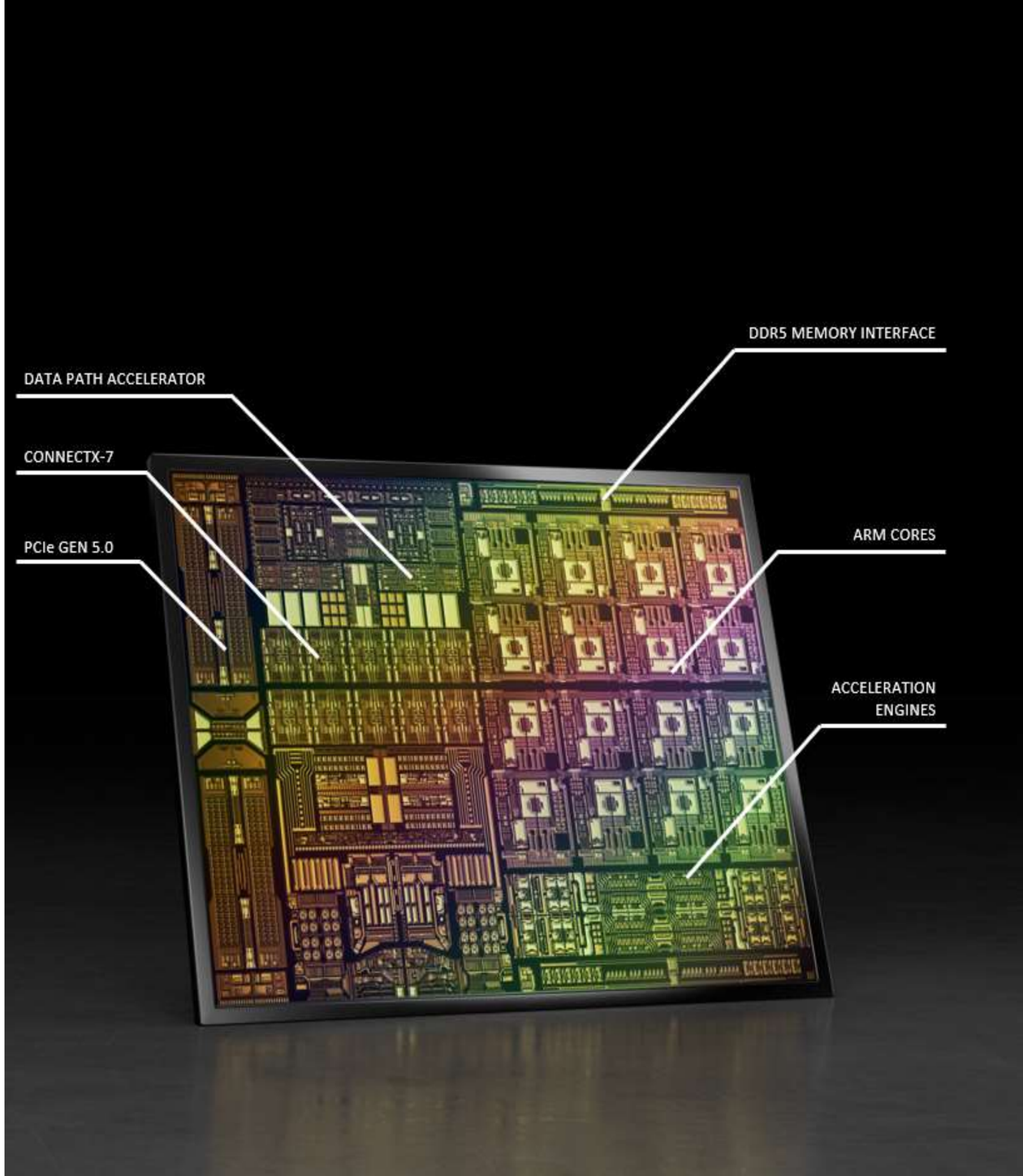
4X Arm Compute
5X Memory
New Datapath Accelerator

Zero-Trust Security

4X IPsec Acceleration
2X TLS Acceleration
New MACsec Acceleration
Platform Attestation

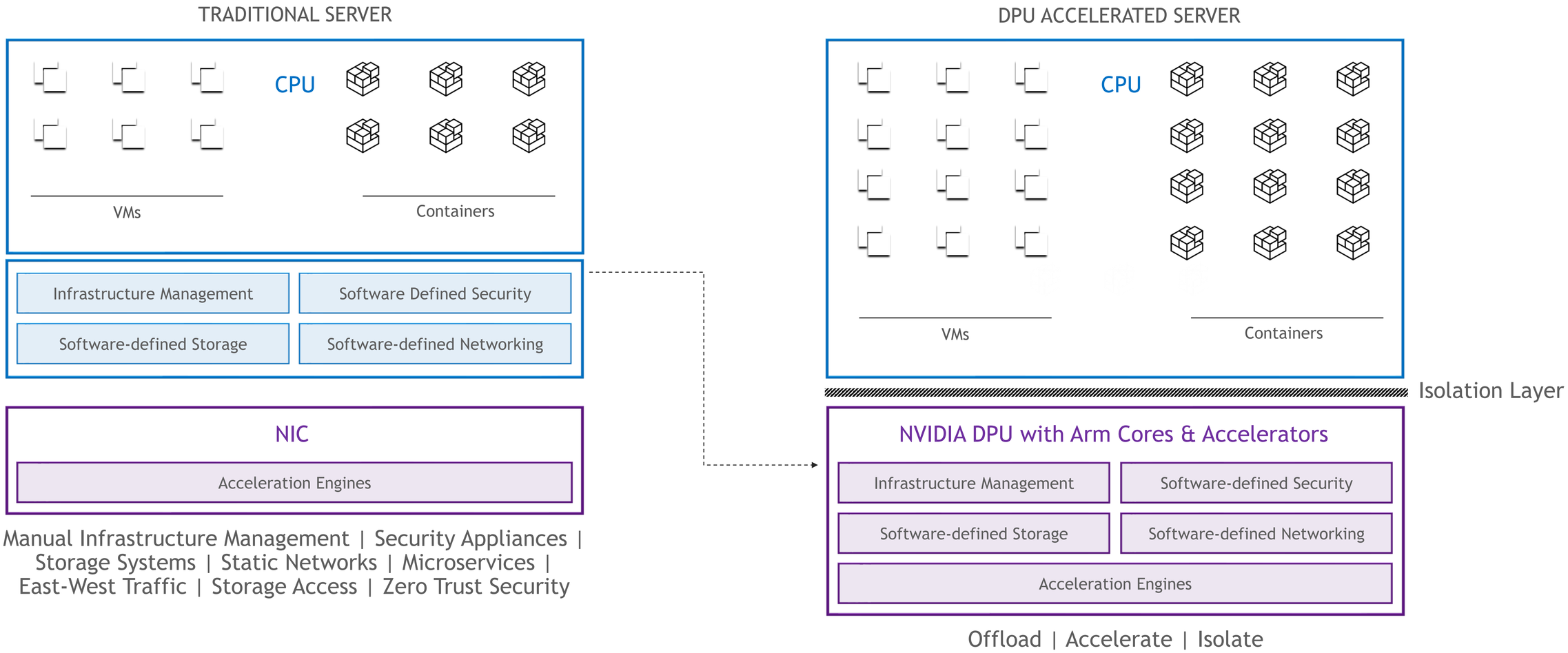
Composable Storage

2X Storage IOPs
2X Storage Encryption
New NVMe/TCP Acceleration



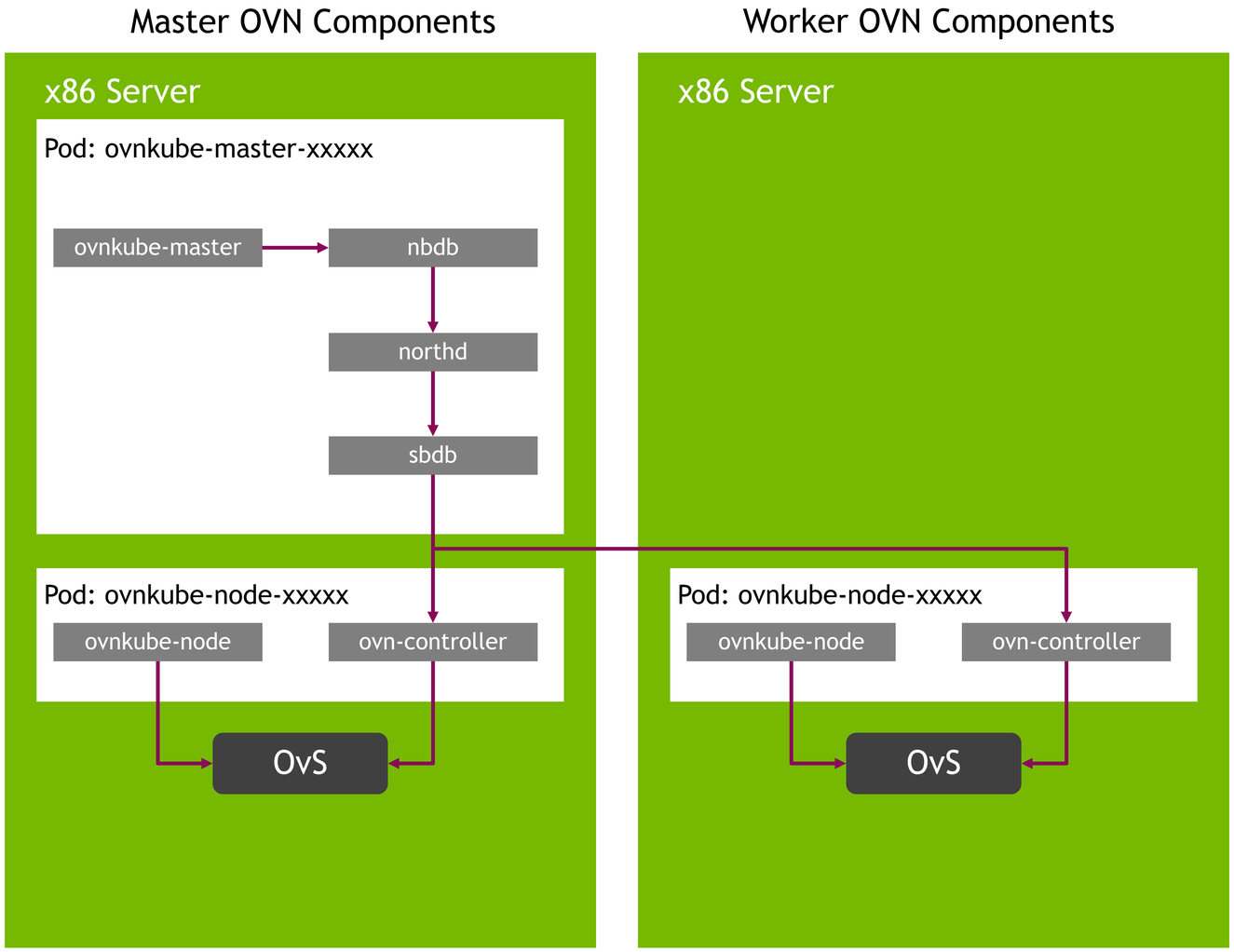
INTRODUCING THE DATA PROCESSING UNIT

Software-Defined, Hardware-Accelerated Data Center Infrastructure-on-a-Chip



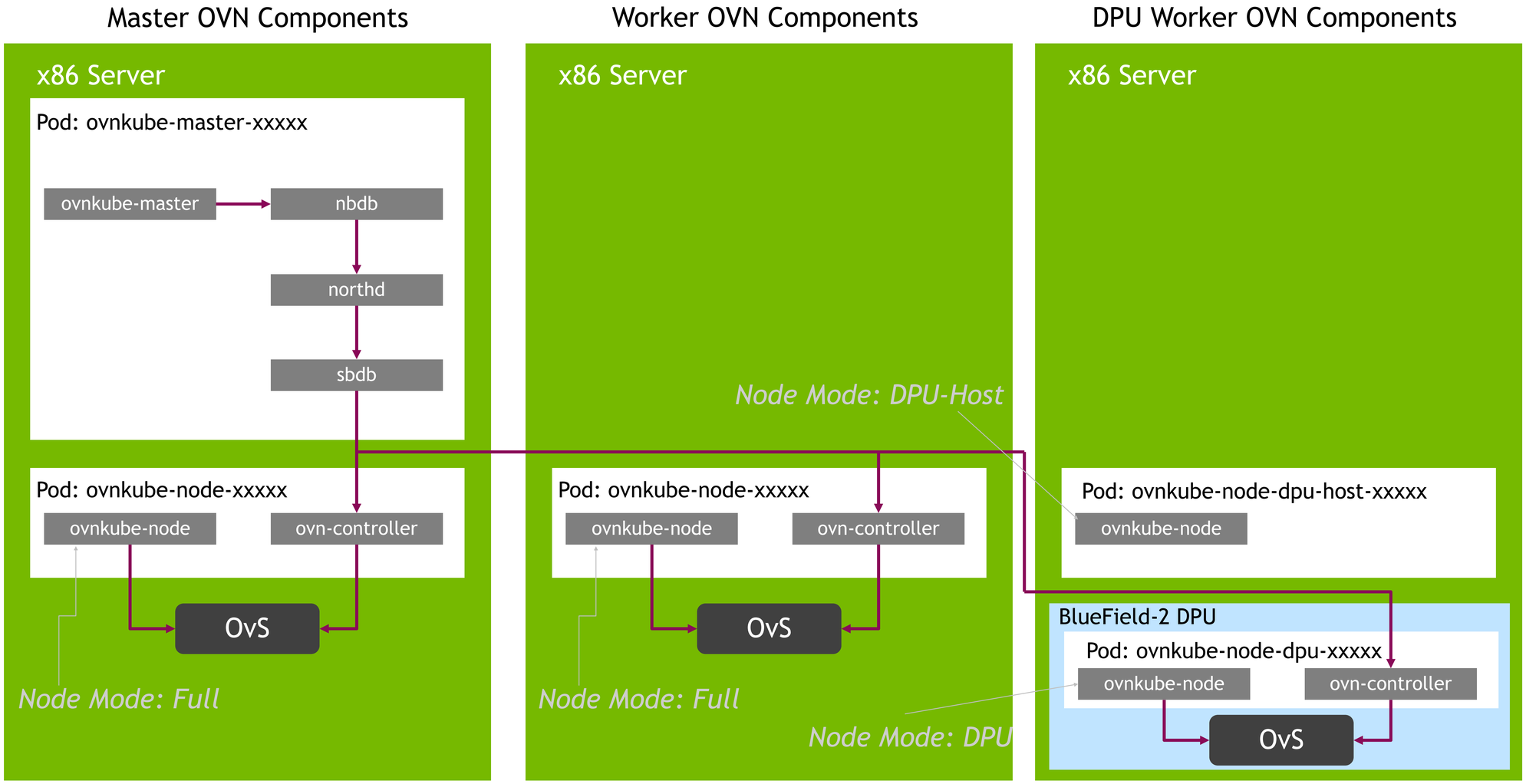
KUBERNETES OVN COMPONENTS ON DPU

DPU Benefits



KUBERNETES OVN COMPONENTS ON DPU

DPU Benefits



ANNOUNCING MONTEREY BETA LAUNCHPAD

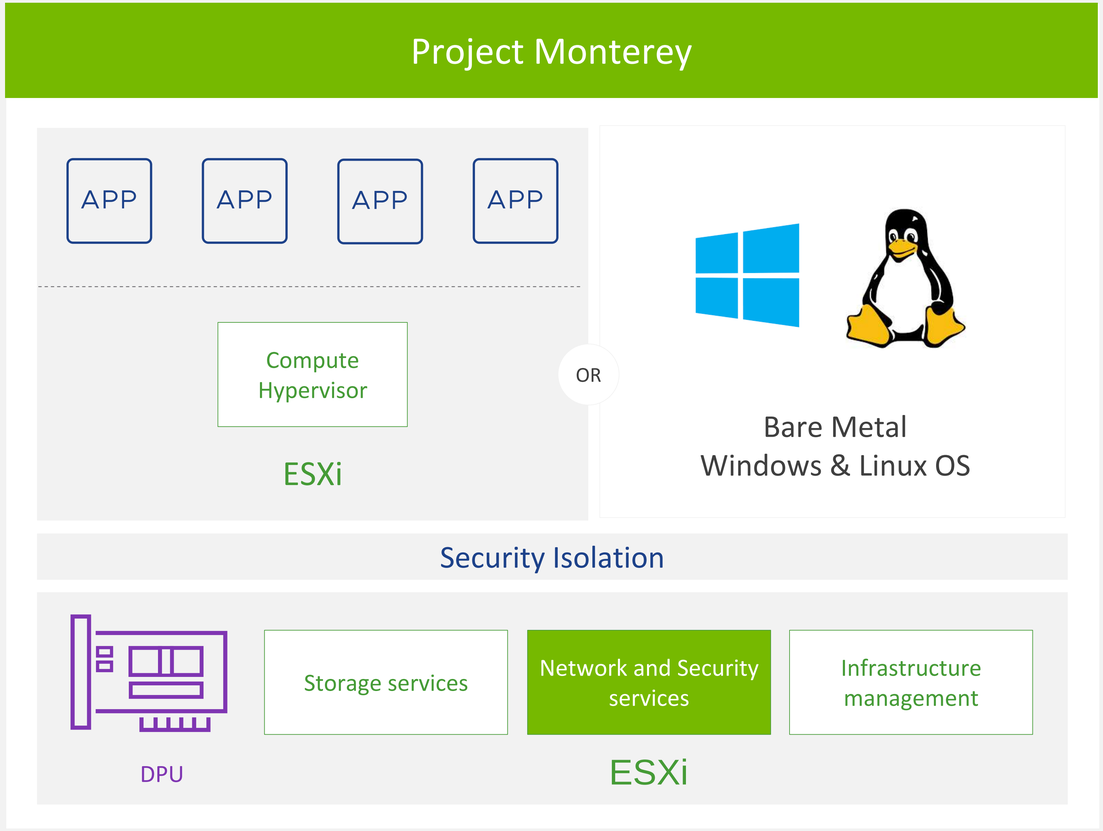
Availability: US, EMEA, APAC

Networking & Security Labs

CPU load reduction – network traffic passed to DPU

Security isolation - distributed firewall (NSX) on Bluefield-2

4 X86 CPU cores saved – offload, accelerate, isolate on DPU



ANNOUNCING RED HAT OPENSHIFT WITH BLUEFIELD

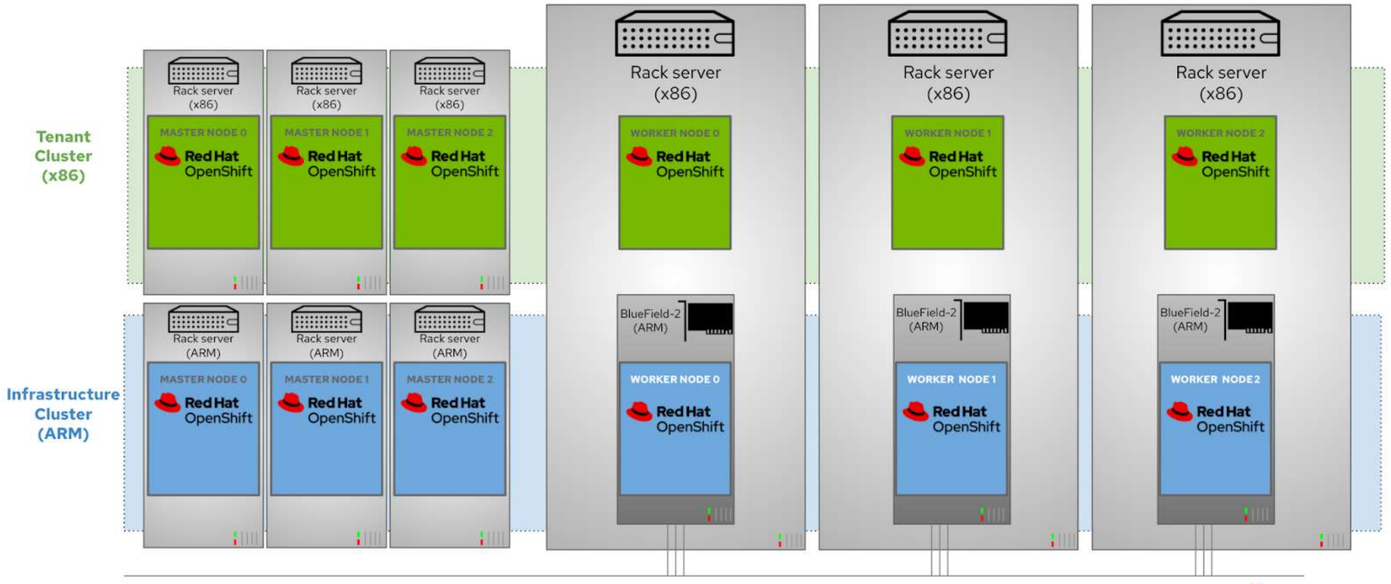
ACCELERATED AND SECURE KUBERNETES ORCHESTRATION

OpenShift Container Platform (OCP) offloaded and accelerated on BlueField DPU

Kubernetes OpenShift networking control path and data path running on the DPU

6 node minimum requirement

Available as Dev Preview; GA Q4 2022



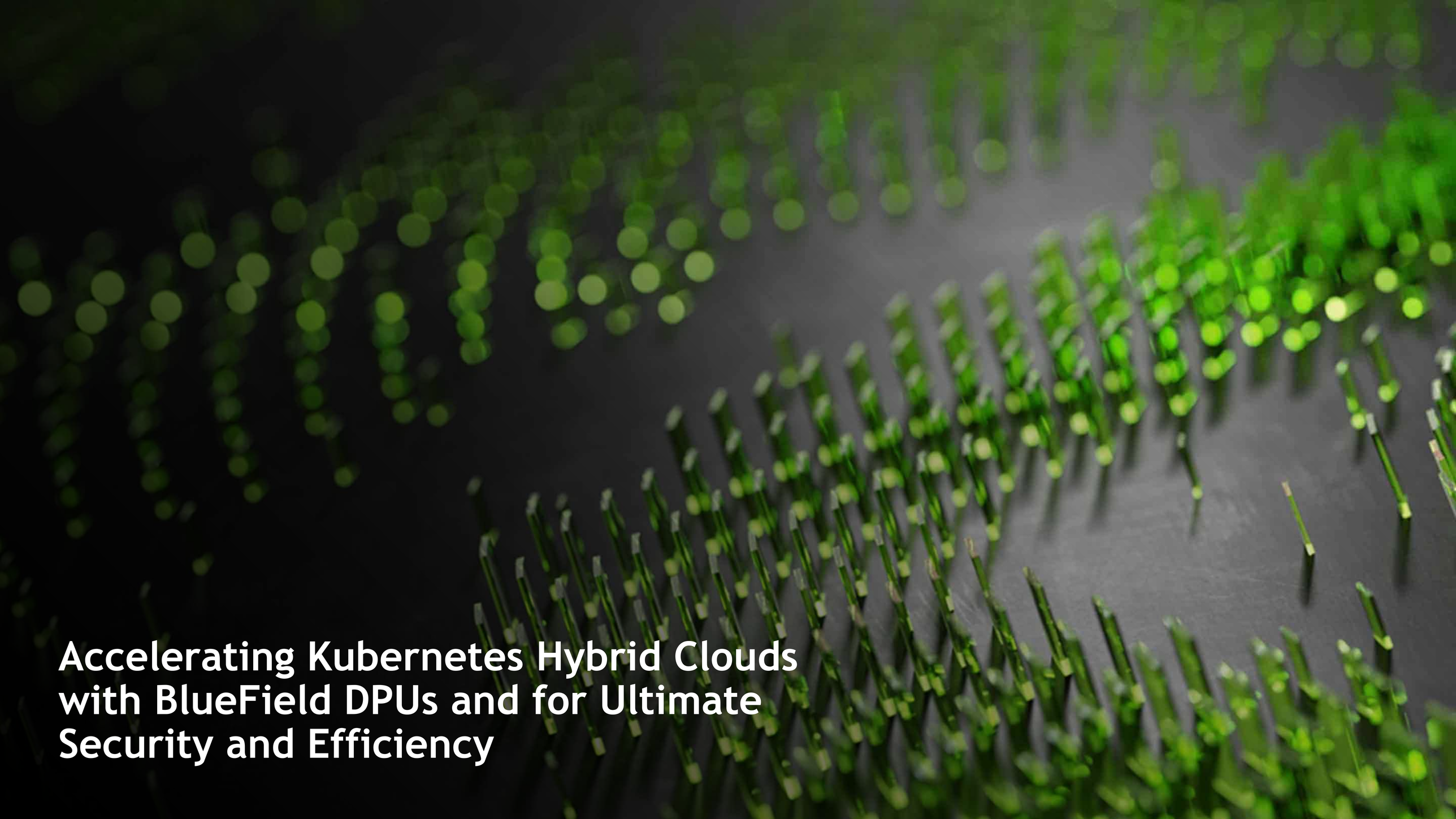
BENEFITS OF OPENSHIFT WITH DPU

Leveraging BlueField Capabilities

70% reduction of CPU utilization for the same throughput

Simpler, more secure container management

Cloud-ready solution to manage containers and deployment for both applications (on X86) and infrastructure (on DPU)


Accelerating Kubernetes Hybrid Clouds
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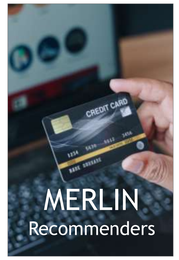
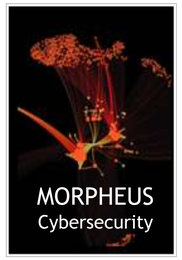
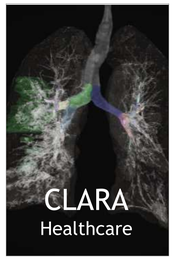
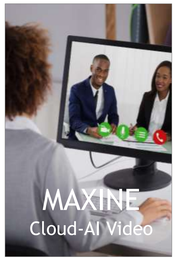
ANNOUNCING NVIDIA SPECTRUM ETHERNET PLATFORM

Connecting NVIDIA Platforms with Accelerated Ethernet Solutions





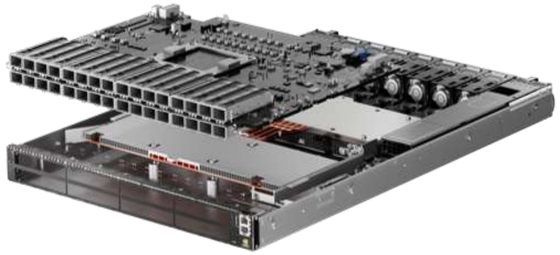




END-TO-END 400G HYPERSCALE NETWORKING PLATFORM

Performance Optimized for Cloud, Enterprise AI & Simulation at Scale

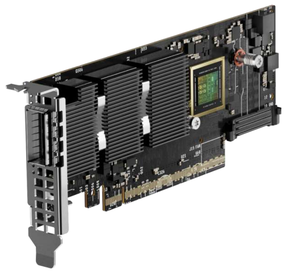
SPECTRUM-4 SWITCH



The Accelerated Cloud Fabric
RoCE · High Speed Encryption · Adaptive Routing

Up to 800Gbs

CONNECTX-7 SMARTNIC



The Worlds Leading Network Adapter
Intelligent Offloads · Precision Timing

Up to 400Gbs

BLUEFIELD-3 DPU

Programmable Data Center Infrastructure
Networking, Storage, Security

Up to 400Gbs

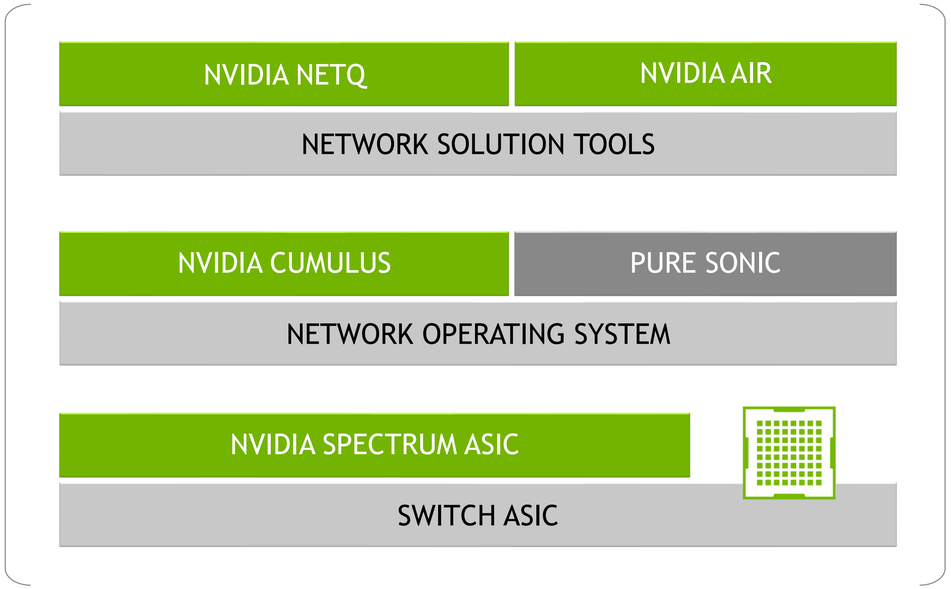
NVIDIA

NVIDIA SPECTRUM PLATFORM

CONNECTING NVIDIA SOLUTIONS WITH ACCELERATED ETHERNET SWITCH TECHNOLOGIES

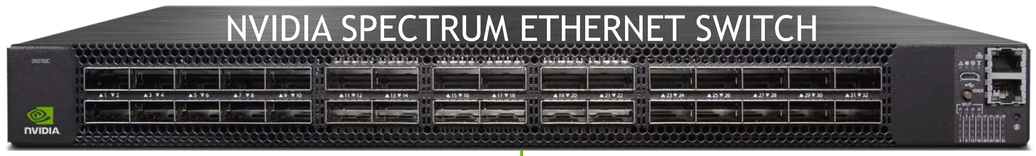
ACCELERATED
Best-in-class hardware performance with cloud-scale software efficiency

INNOVATIVE
5th generation in-house ASIC design optimizes Cloud, AI, & storage workloads

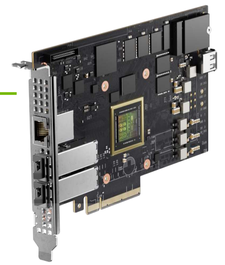


OPTIMIZED
Faster network deployments with lowest TCO and highest ROI

RELIABLE
Exclusive features enabling fairness, predictability and actionable visibility



NVIDIA DPU



DGX | EGX | HGX | OVX

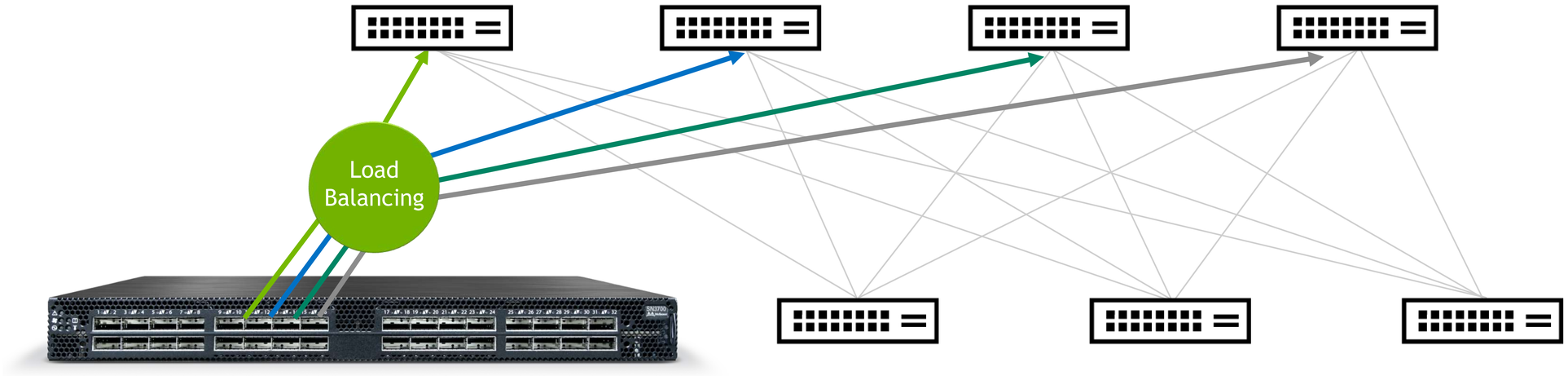
END-TO-END 400G HYPERSCALE NETWORKING PLATFORM

Performance Optimized for Cloud, Enterprise AI & Simulation at Scale

NVIDIA

ADAPTIVE ROUTING

Supercomputing Network Innovation



Ethernet

Static hashing

- Independent of traffic conditions
- Bigger flows = higher chance for congestion
- High tail latency

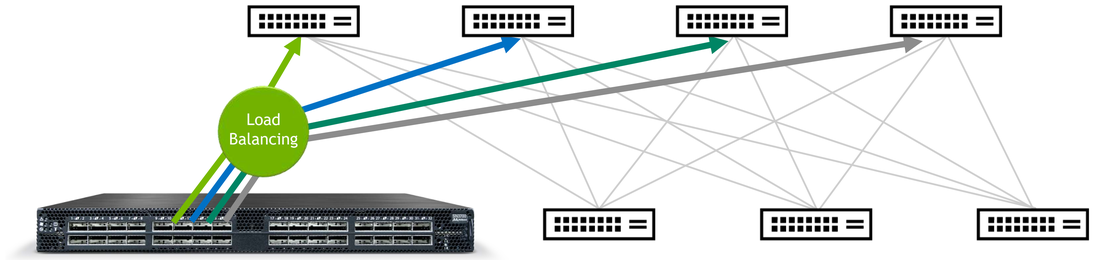
Accelerated Ethernet with Adaptive Routing

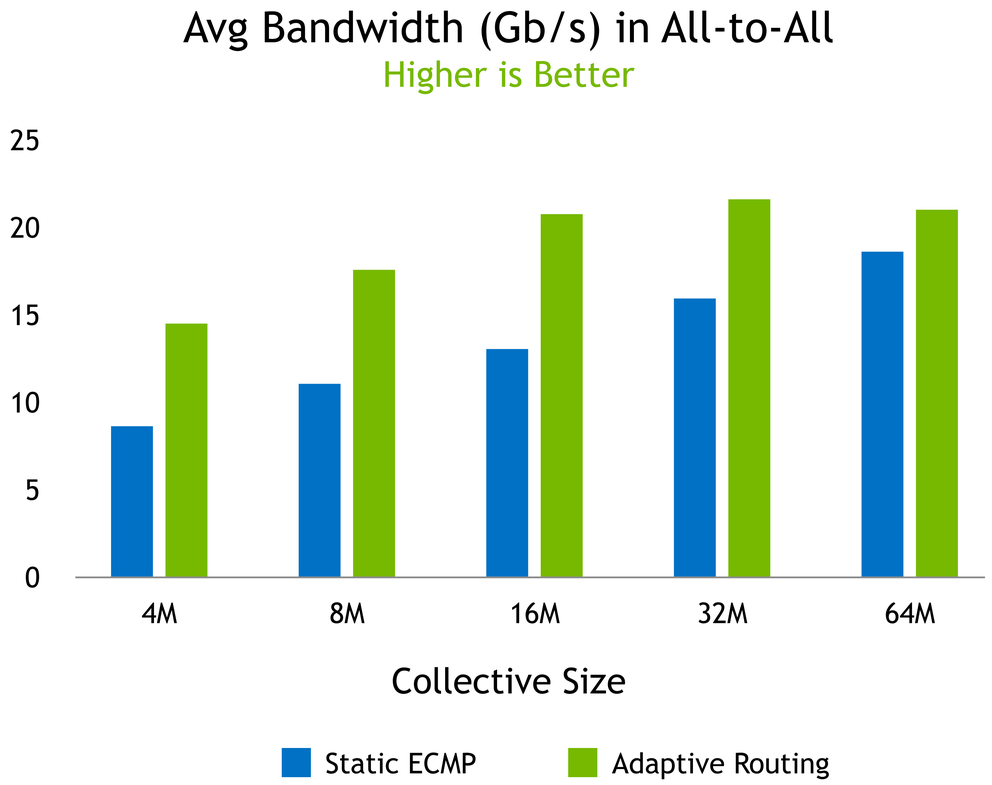
Congestion based port selection

- Flowlet-aware: eliminates out-of-order Packets
- Reduce tail latency
- Multi-vendor friendly
- RoCE OOO placement for highest efficiency

INCREASING AI PERFORMANCE WITH ADAPTIVE ROUTING

Real World AI Traffic Test

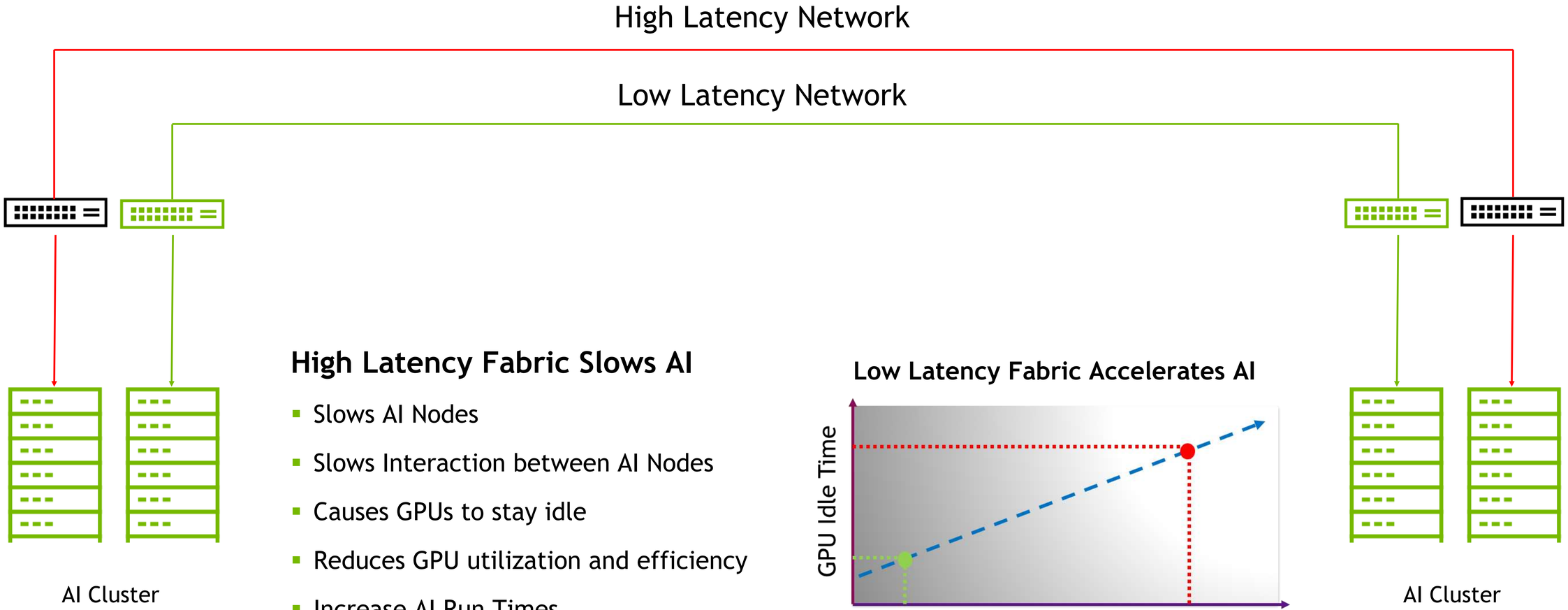




Setup: Spectrum + ConnextX-6Dx +CPU + UCX *PARAM communications micro-benchmark*

SPECTRUM CLASS-LEADING LATENCY

Lower Latency = Higher AI Performance



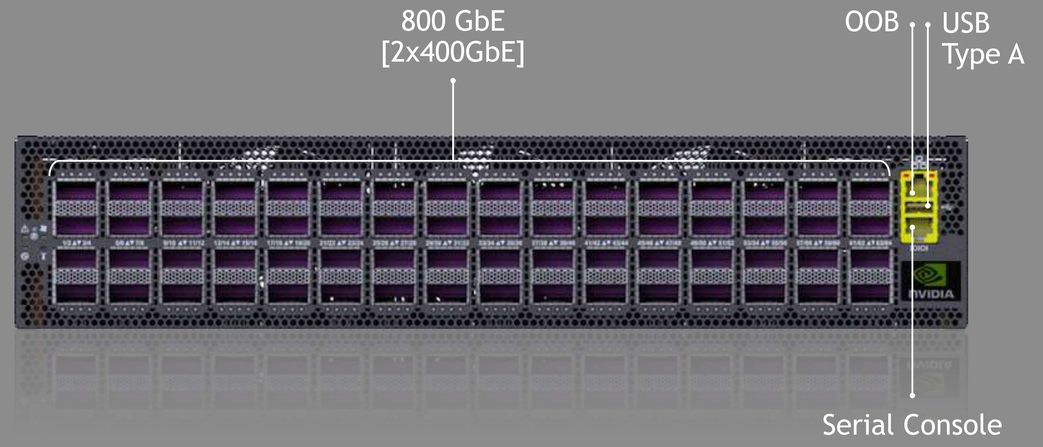
High Latency Fabric Slows AI

- Slows AI Nodes
- Slows Interaction between AI Nodes
- Causes GPUs to stay idle
- Reduces GPU utilization and efficiency
- Increase AI Run Times

SN5600

64x 800GbE / 128x 400GbE

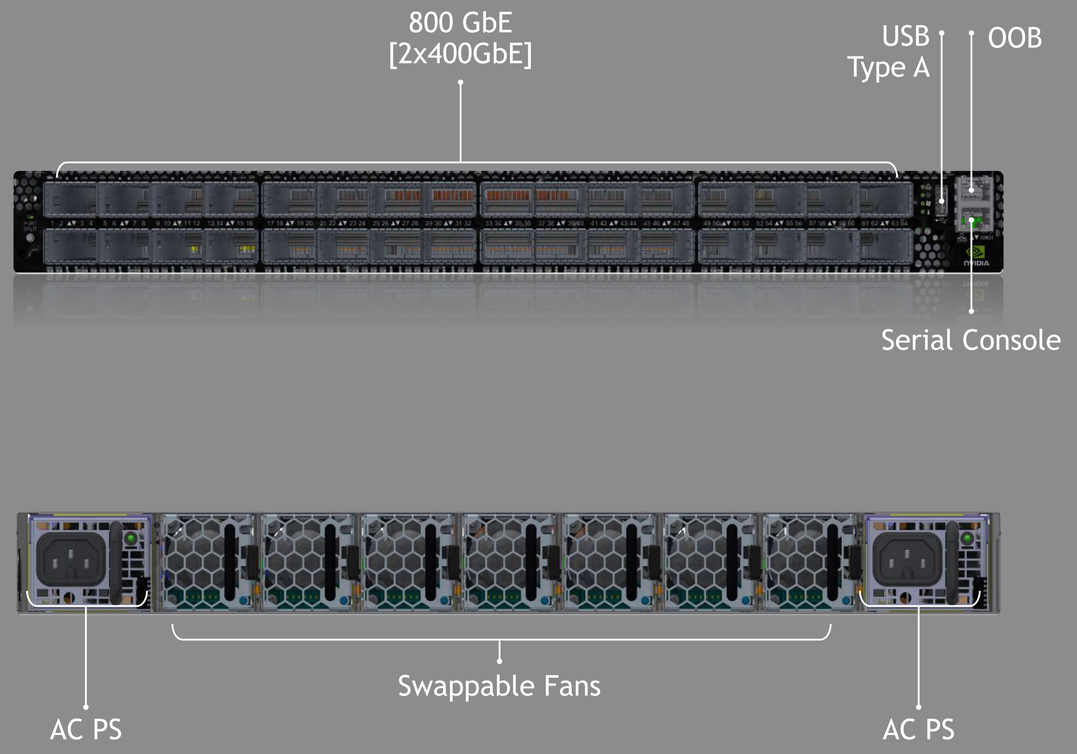
Switch ASIC	▪ NVIDIA Spectrum-4
Switching Capacity	▪ 51.2Tbps
Ports	▪ 64 Cages: 800G or 2x 400G
System CPU	▪ x86, Six-Core Xeon ▪ RAM: DDR4 SDRAM 32GB ▪ Image storage: SATA SSD 256GB
System Power	▪ PS: AC, 1+1 redundancy, hot swap
Mounting Options	▪ Fixed ▪ Tool-less, Rack mobility
Dimensions	▪ H: 2U, 3.43’’ (87mm) ▪ W: 16.8’’ (428mm) ▪ D: 26’’ (660mm)
Airflow	▪ N+1 fans, hot swap, forward and reverse



SN5700

32x 800GbE / 64x 400GbE / 256x 100G

Switch ASIC	▪ NVIDIA Spectrum-4
Switching Capacity	▪ 25.6Tbps
Ports	▪ 32 Cages: 800GbE or 2x400G ▪ 18W Max, 15W Typical
System CPU	▪ x86, Six-Core Xeon 2.2GHz ▪ RAM: DDR4 SDRAM 32GB ▪ Image storage: SATA SSD 256GB
System Power	▪ PS: AC, 1+1 redundancy, hot swap
Mounting Options	▪ Fixed ▪ Tool-less, Rack mobility
Dimensions	▪ H: 1U, 1.71’’ (43.6mm) ▪ W: 17’’ (438mm) ▪ D: 26’’ (660mm)
Airflow	▪ N+1 fans, hot swap, forward and reverse




NVIDIA