



Interconnect Your Future

Enabling the Best Datacenter Return on Investment

TOP500 Supercomputers, June 2019



Mellanox InfiniBand and Ethernet Accelerate World-Leading Supercomputers on the June'19 TOP500 List

- InfiniBand Accelerates Six of the Top Ten Supercomputers in the World, Including the Top Three, and Four of the Top Five on June's TOP500
- Mellanox InfiniBand and Ethernet Solutions Connect 296 Systems or 59% of Overall TOP500 Platforms, Demonstrating 37% Growth in 12 Months (June'18-June'19)
- HDR 200G InfiniBand Makes Its Debut on the List, Accelerating Four Systems Including the Fifth Highest Ranking Supercomputer
- Mellanox 25 Gigabit and Faster Ethernet Solutions Connect 63% of Total Ethernet Systems, Representing 124% Growth in 12 Months

Key Takeaways From the June TOP500 2019 List

- Mellanox connects 59% of overall TOP500 platforms (296 systems, InfiniBand and Ethernet), demonstrating 37% growth in 12 months (June'18-June'19)
- HDR 200G InfiniBand accelerates 4 supercomputers – #5 (TACC - USA), #62 (MSU - USA), #166 (CSC - Finland), and #264 (Tsukuba - Japan)
- InfiniBand accelerates the world's fastest HPC/AI supercomputer – Oak Ridge National Laboratory 'Summit' supercomputer
- InfiniBand accelerates the top 3 supercomputers in the world – #1 (ORNL - USA), #2 (LLNL - USA), and #3 (Wuxi - China), and 6 of the top 10 – #5 (TACC - USA), #8 (AIST - Japan), and #10 (LLNL - USA)
- InfiniBand accelerates the fastest industrial supercomputer at Total Oil and Gas, #11 on the list
- InfiniBand connects 126 supercomputers, or nearly 55% of overall HPC systems on the TOP500 list
- Mellanox connects 170 Ethernet systems (25 Gigabit and faster), or 63% of the total Ethernet systems – 124% increase in 12 months (June'18-June'19)
- The TOP500 list has evolved to include both HPC and cloud/hyperscale (non-HPC) platforms, where more than half of the platforms on the TOP500 list can be categorized as non-HPC application platforms

InfiniBand is the Interconnect of Choice for HPC and AI Infrastructures
Mellanox Ethernet is the Interconnect of Choice for Cloud and Hyperscale Platforms

SUPERCONNECTING the #1 Supercomputers



OAK RIDGE
National Laboratory

Lawrence Livermore
National Laboratory

国家超级计算无锡中心
National Supercomputing Center in Wuxi

TACC
TEXAS ADVANCED COMPUTING CENTER

AIST
ADVANCED INDUSTRIAL SCIENCE
AND TECHNOLOGY (AIST)

Lawrence Livermore
National Laboratory



1

TOP 500
The List.

2

TOP 500
The List.

3

TOP 500
The List.

5

TOP 500
The List.

8

TOP 500
The List.

10

TOP 500
The List.

InfiniBand Accelerates 6 of Top 10 Supercomputers

SUPERCONNECTING the #1 Supercomputers



TACC
TEXAS ADVANCED COMPUTING CENTER



FRONTERA

5 TOP 500
The List.

MISSISSIPPI STATE UNIVERSITY



62 TOP 500
The List.



166 TOP 500
The List.

筑波大学
University of Tsukuba



264 TOP 500
The List.



World's First
HDR InfiniBand
Supercomputer

सी डैक
CDAC

India's National
Supercomputing
Program

HDR 200G InfiniBand Accelerated Supercomputers



SUPERCONNECTING the #1 Supercomputers



148.6 Petaflops



Mellanox InfiniBand Connects the World's Fastest
HPC and AI Supercomputer

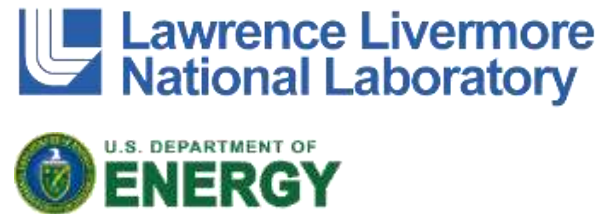
Mellanox Accelerates Leading HPC and AI Systems

World's Top 3 Supercomputers



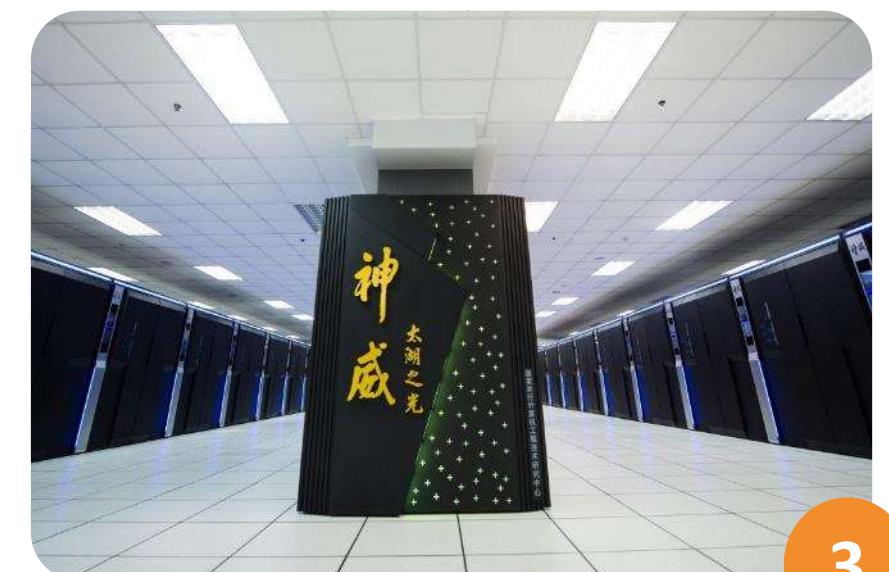
1

Summit CORAL System
World's Fastest HPC / AI System
9.2K InfiniBand Nodes



2

Sierra CORAL System
#2 USA Supercomputer
8.6K InfiniBand Nodes



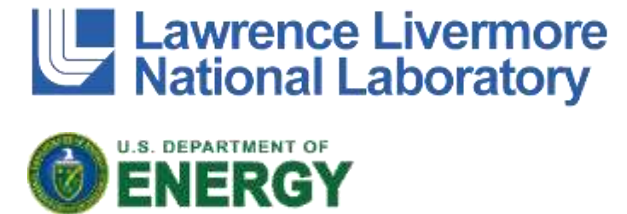
3

Wuxi Supercomputing Center
Fastest Supercomputer in China
41K InfiniBand Nodes



Mellanox Accelerates Leading HPC and AI Systems

World's Top 10 Supercomputers



23.5 Petaflops
8K HDR InfiniBand Nodes



Fastest HPC / AI System in Japan
1.1K InfiniBand Nodes



1.5K EDR InfiniBand Nodes



Mellanox Accelerates Leading HPC and AI Systems

World's Top Supercomputers



11

The World's Fastest Industry Supercomputer
Dual-Rail EDR InfiniBand



18

The world's Second Fastest Industry Supercomputer
1.6K InfiniBand Nodes



22

NVIDIA DGX SuperPOD Supercomputer
10 EDR InfiniBand Adapters per Node
1 Terabit/second throughput per node



HDR 200G InfiniBand Wins Next Generation Supercomputers



5

23.5 Petaflops
8K HDR InfiniBand Nodes
Fat-Tree Topology



62

3.1 Petaflops
1.8K HDR InfiniBand Nodes
Fat-Tree Topology



166

1.7 Petaflops
2K HDR InfiniBand Nodes
Dragonfly+ Topology

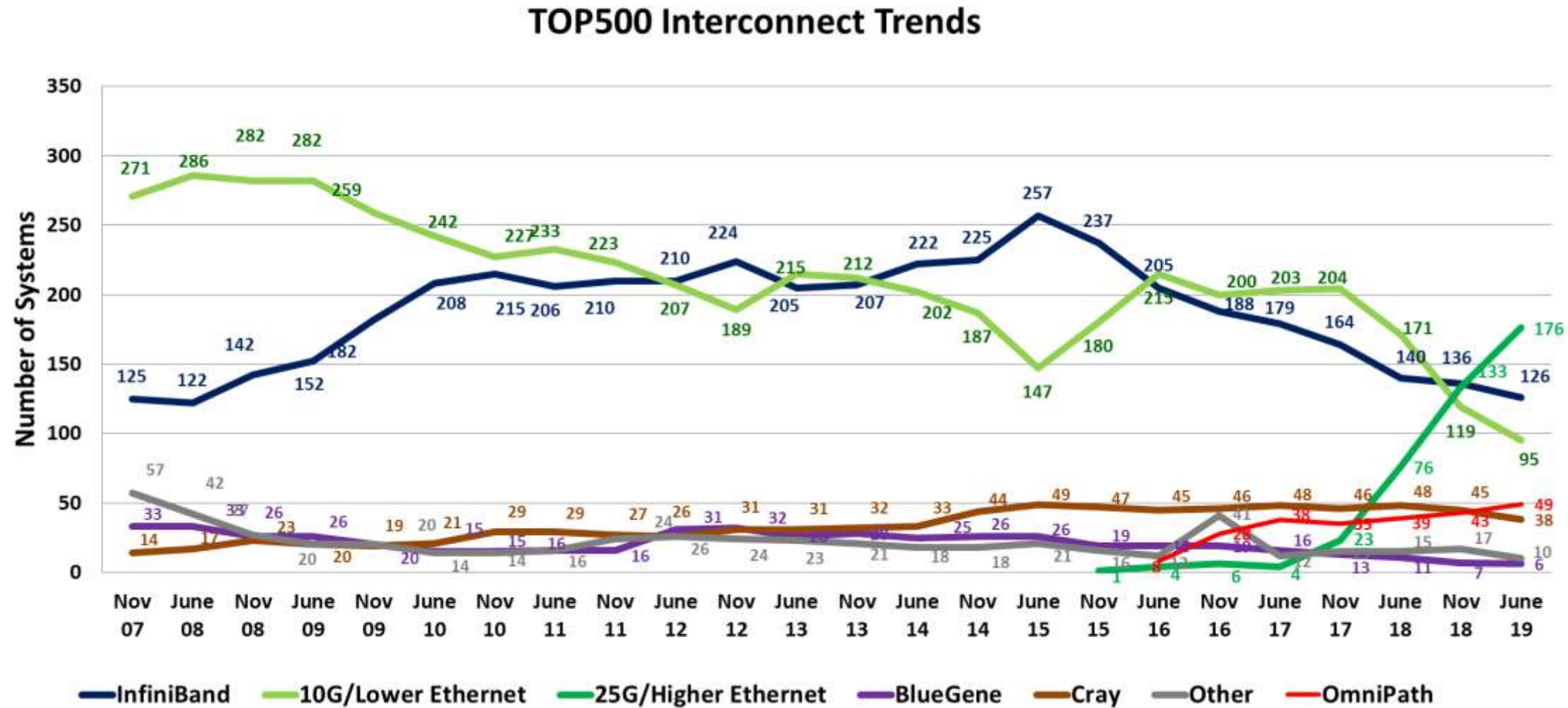


264

1.6 Petaflops
HDR InfiniBand,
Hybrid CPU-GPU-FPGA
Fat-Tree Topology



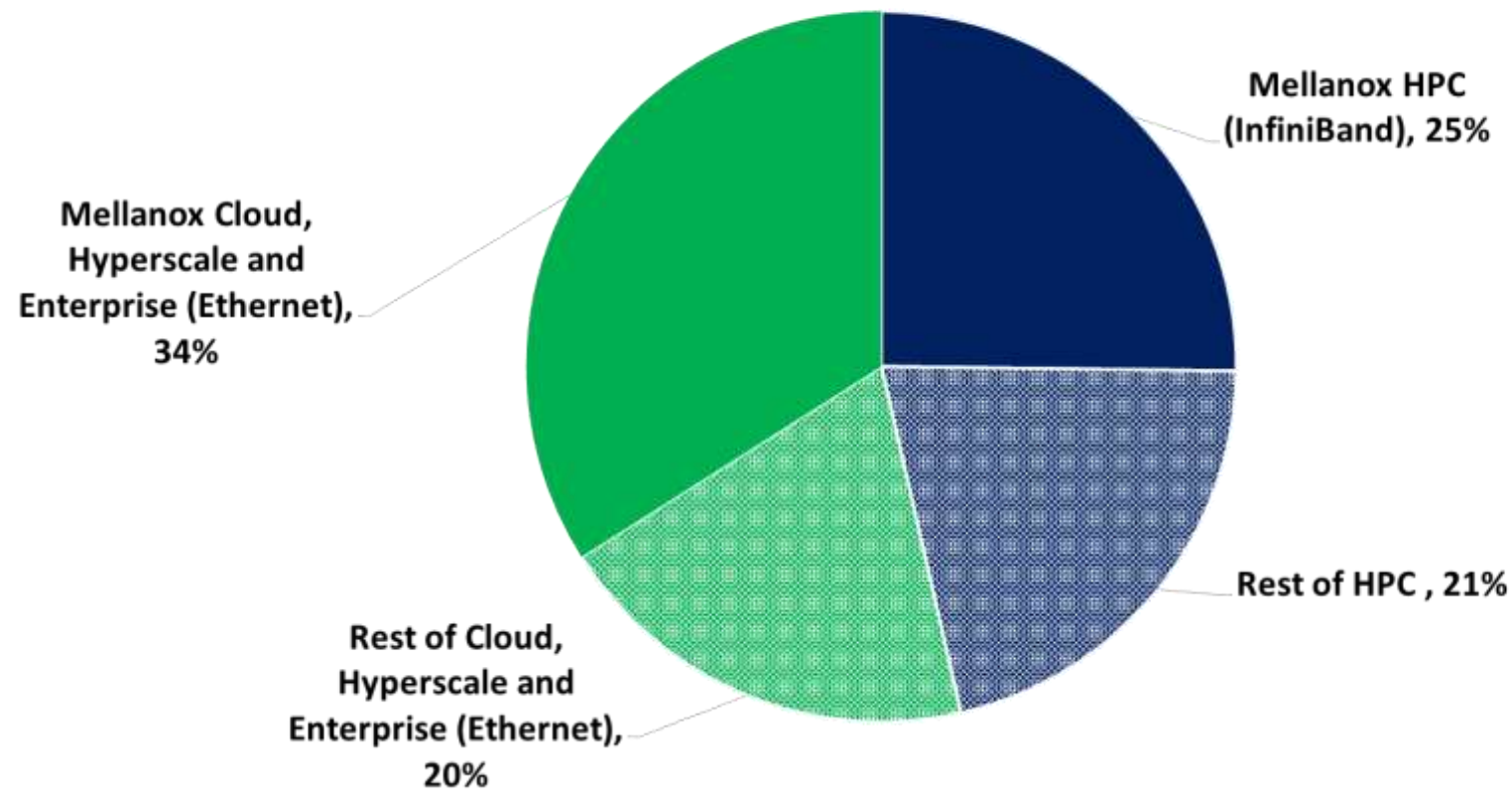
TOP500 Interconnect Trends



The TOP500 List has Evolved to Include Both HPC and Cloud / Web2.0 Hyperscale Platforms
 InfiniBand Continues its Leadership as the Most Used Interconnect Solution for HPC Platforms
 Mellanox Connects most of 25G and faster Cloud and Hyperscale Ethernet Systems

Mellanox Accelerates 59% of Total TOP500 Systems

TOP500 June'19 - Complete View



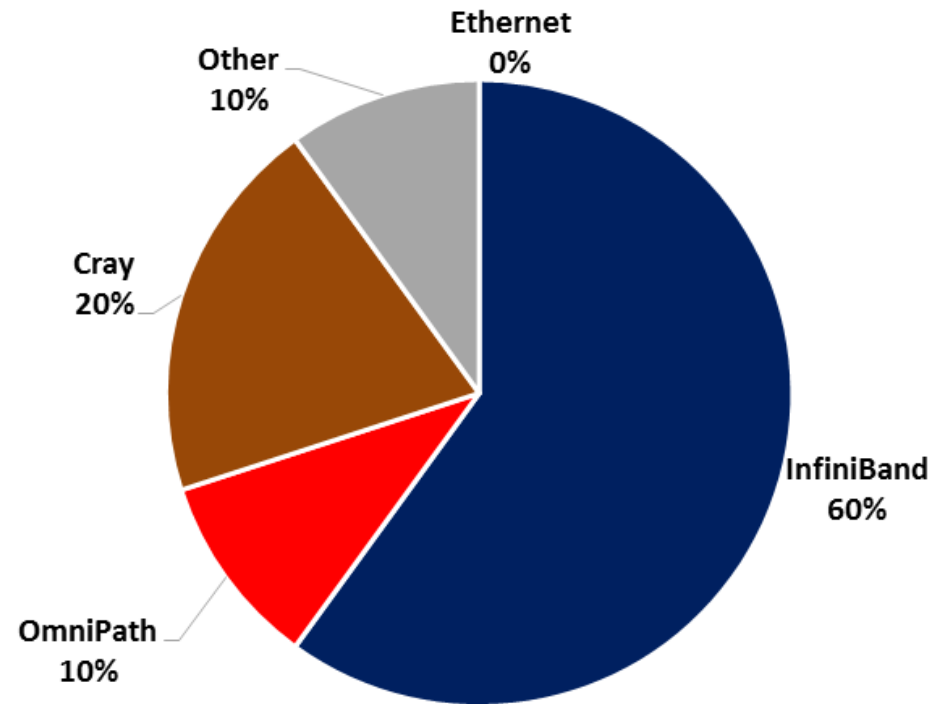
InfiniBand Accelerates 55% of HPC Systems on the TOP500 list

Mellanox Connects 63% of Total Ethernet Systems

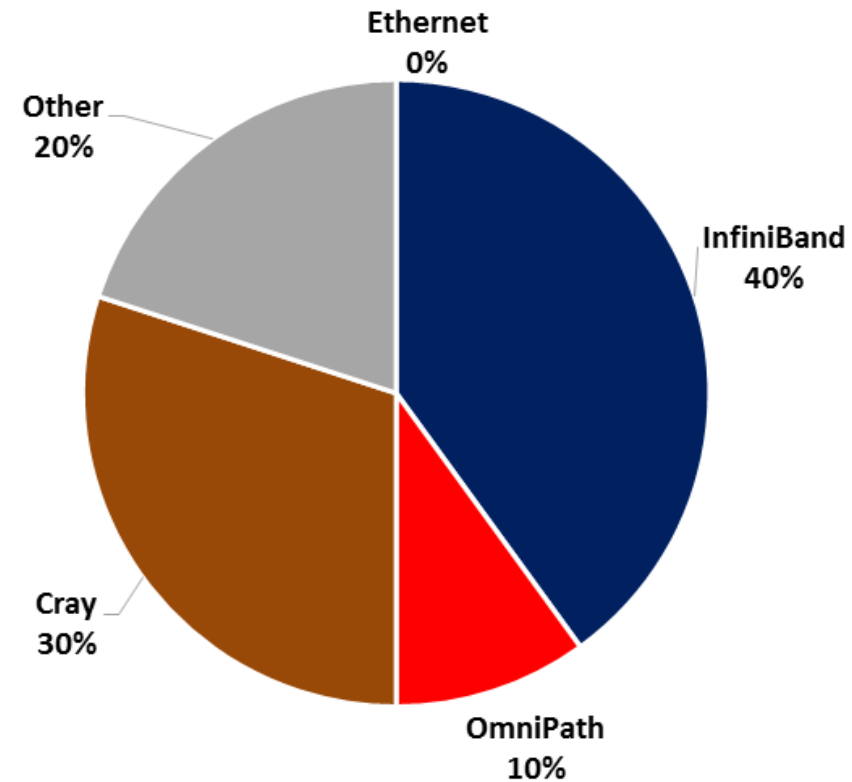
Mellanox Connects Overall 296 Systems (59%), 37% Increase in 12 Months (June'18-June'19)

Interconnects - TOP10 Supercomputers

TOP10 Systems June '19



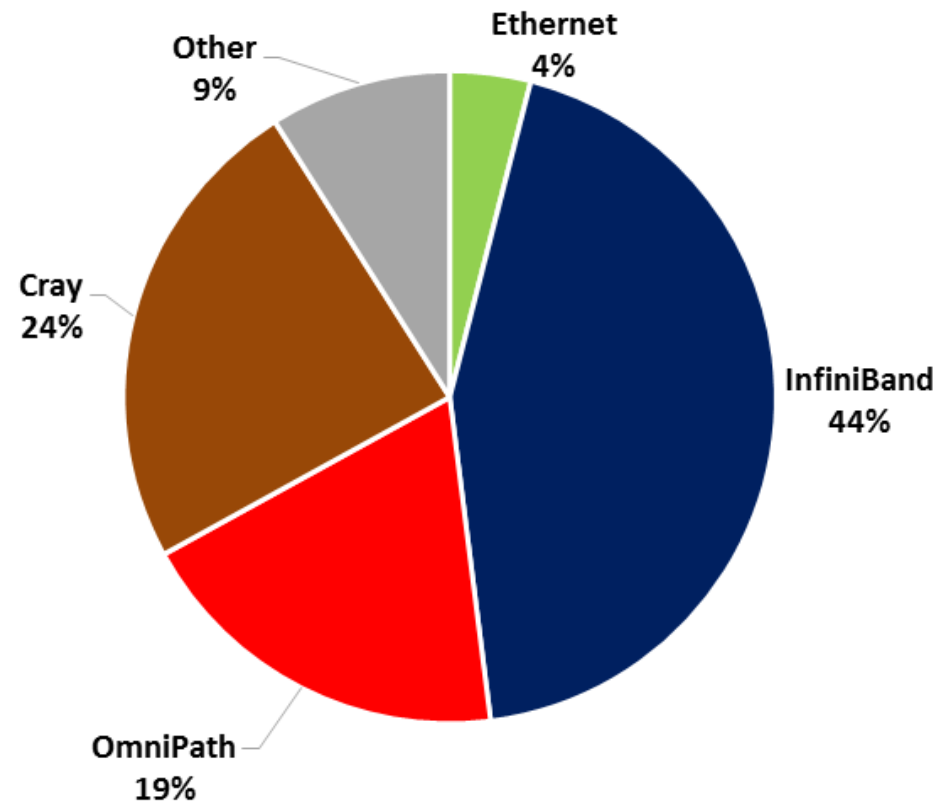
TOP10 Systems Nov '18



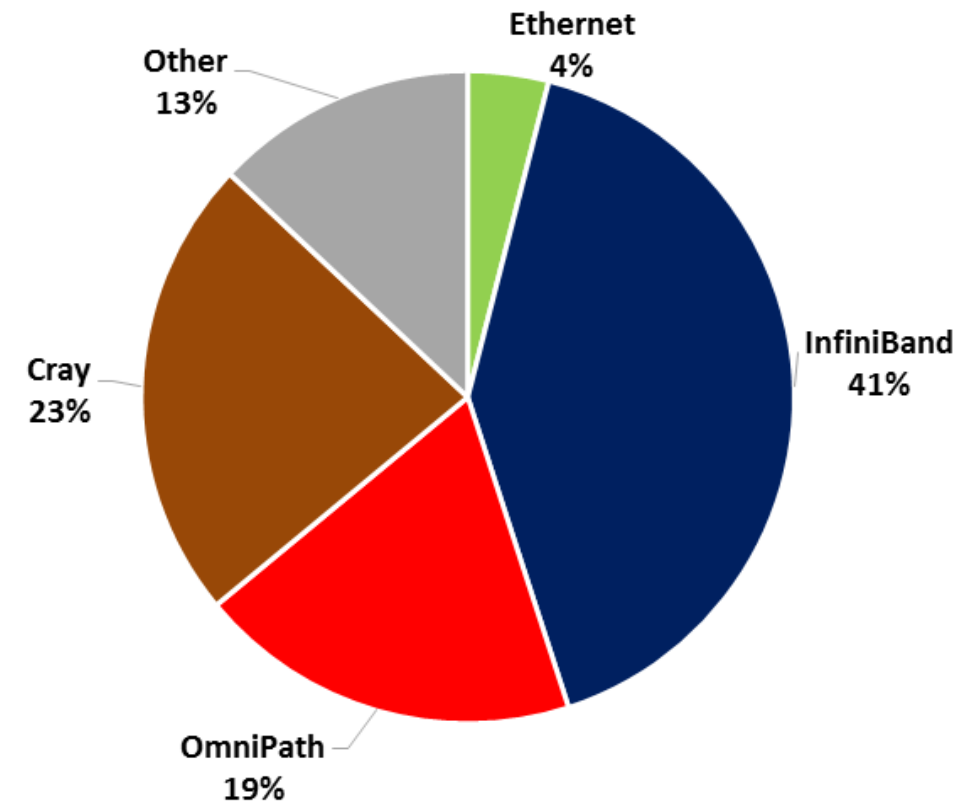
InfiniBand Accelerates 6 of Top 10 Supercomputers (Compare to 4 Systems in Nov'18)
Including First TOP5 HDR InfiniBand Supercomputer

Interconnects - TOP100 Supercomputers

TOP100 Systems June '19

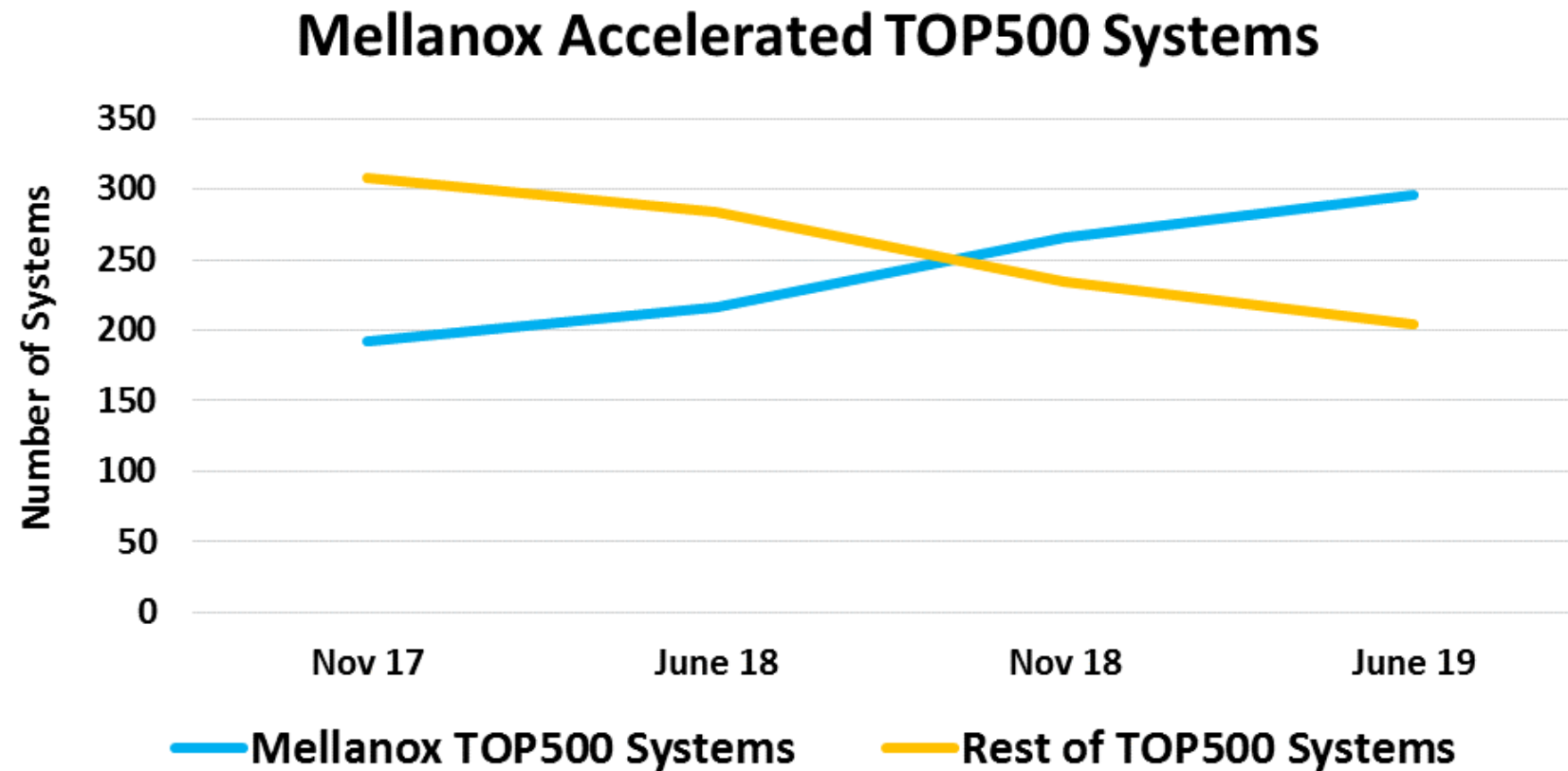


TOP100 Systems Nov '18



InfiniBand Accelerates 44 of Top 100 Supercomputers
7% Increase Compared to 6 Months Ago (June '19 to Nov '18)

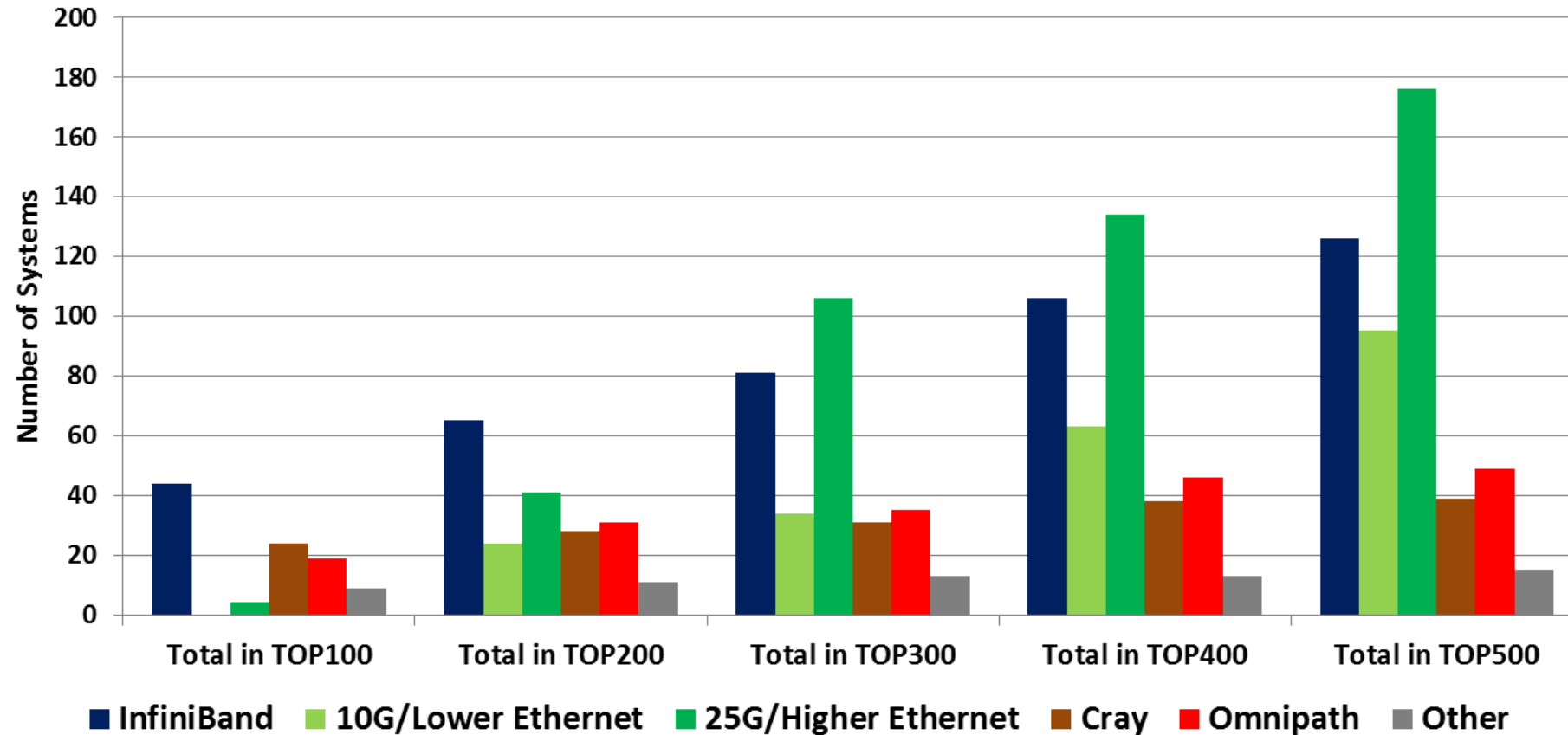
Mellanox Accelerated Systems Grew (InfiniBand and Ethernet) 37% in 12 Months (June'18 – June'19)



Mellanox InfiniBand and Ethernet Solutions Accelerate Majority of TOP500 Platforms on the November TOP500 Supercomputers List

Interconnects – TOP100, 200, 300, 400, 500

TOP500 - TOP 100, 200, 300, 400, 500 Systems Distribution

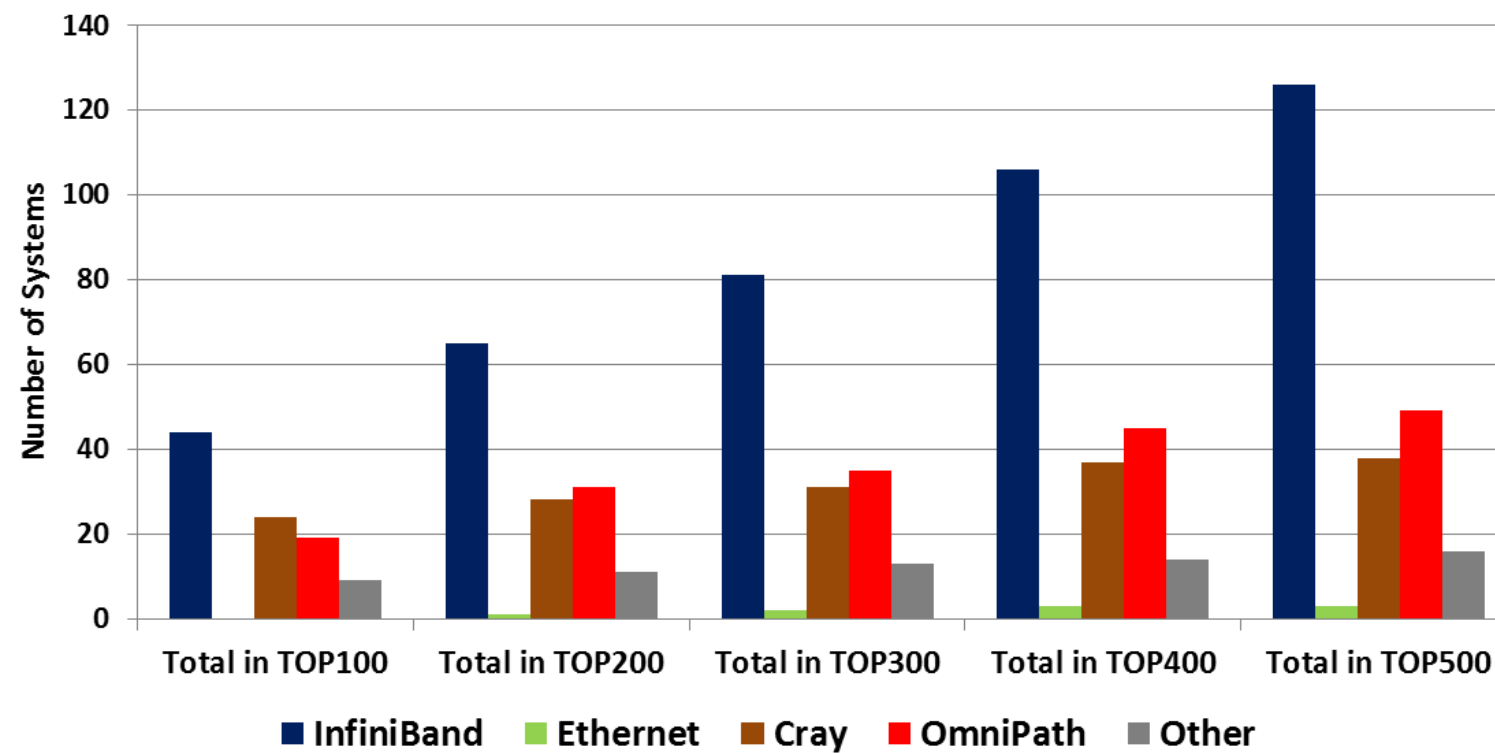


InfiniBand is The Most Used High-Speed Interconnect of Top Supercomputers
Superior Performance, Scalability, Efficiency and Return-On-Investment

InfiniBand Solutions – TOP100, 200, 300, 400, 500

HPC Systems Only (Excluding Cloud, Hyperscale etc. Systems)

TOP500 - TOP 100, 200, 300, 400, 500 Systems Distribution
HPC Systems Only



InfiniBand is The Most Used Interconnect For HPC Systems
Superior Performance, Scalability, Efficiency and Return-On-Investment

Unleashing the Power of Data

Exponential Growth of Data & Real Time Analytics

Requires Mellanox High Throughput, Low Latency, Smart Interconnect Solutions



Enabling World-Leading Artificial Intelligence Solutions

Mellanox Unleashes the Power of Artificial Intelligence

More Data



Better Models

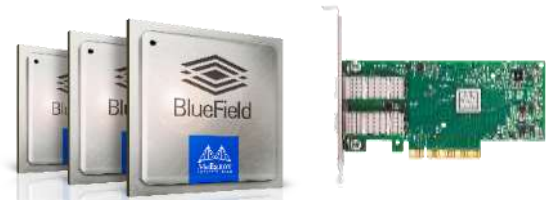


Faster Interconnect



GPUs
CPUs
FPGAs
Storage

High Performance Computing and Artificial Intelligence Need the Most Intelligent Interconnect



SmartNIC



System on a Chip

Higher

Data Speeds

Faster

Data Processing

Better

Data Security



Adapters



Switches



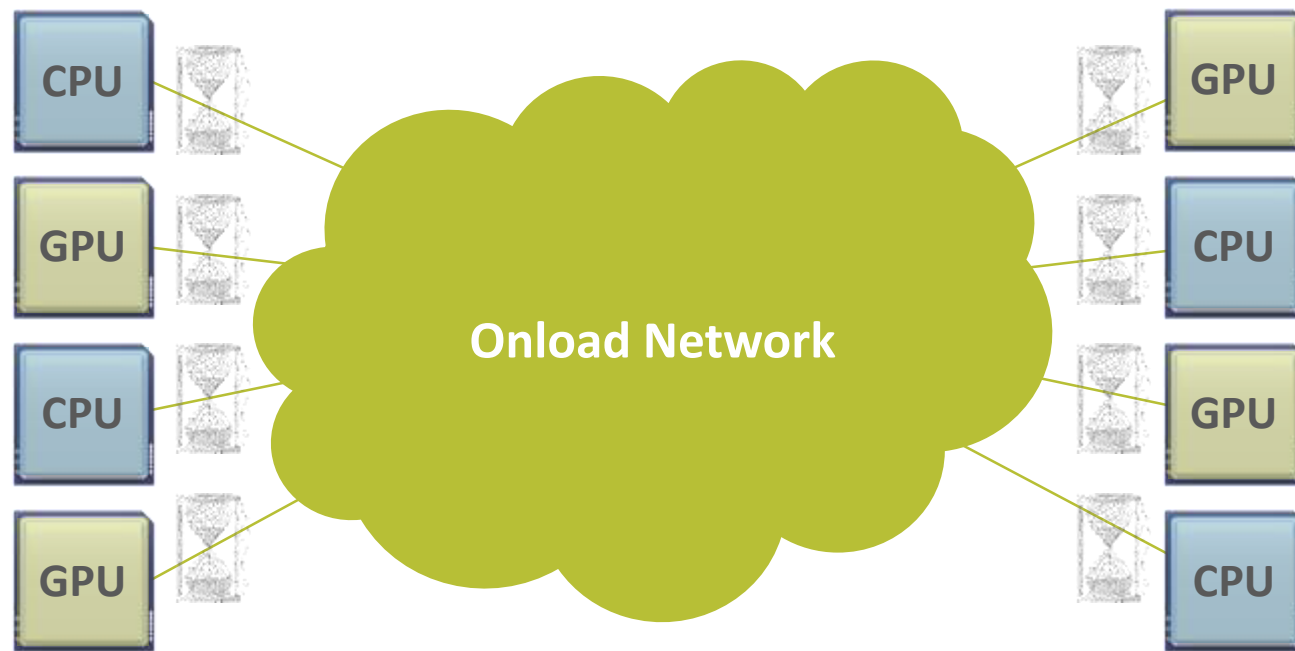
Cables & Transceivers



The Need for Intelligent and Faster Interconnect

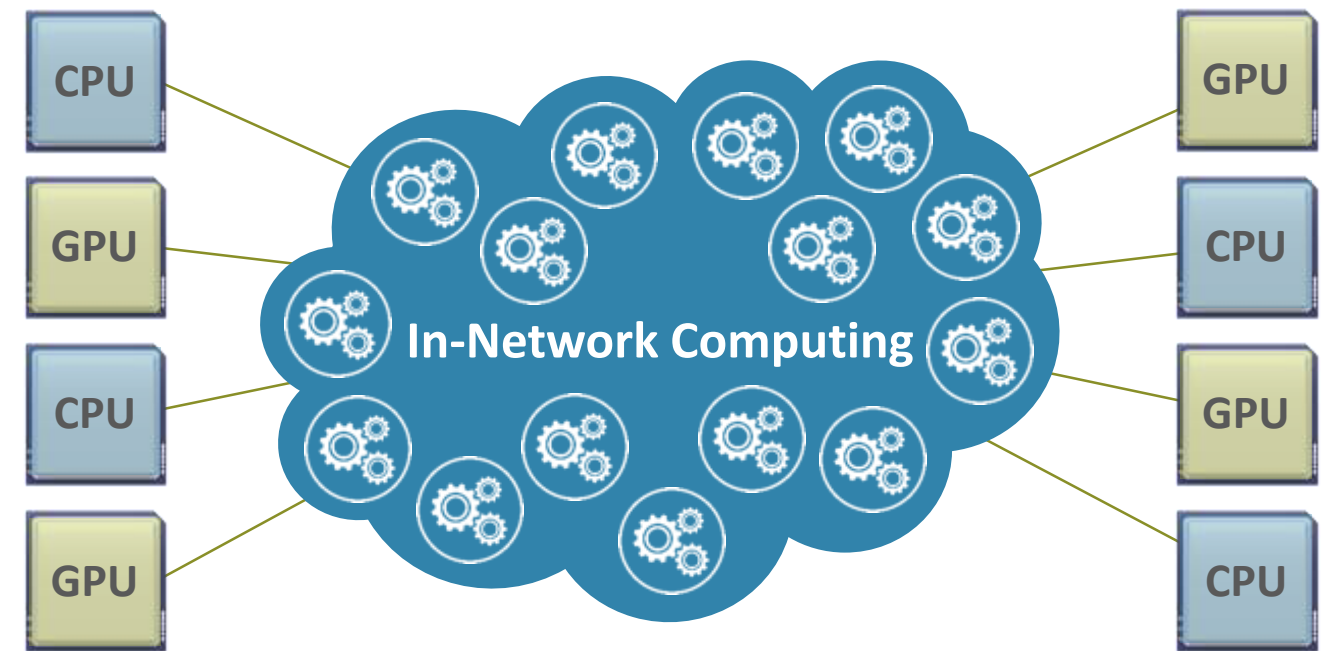
Faster Data Speeds and In-Network Computing
Enable Higher Performance and Scale

CPU-Centric (Onload)



Must Wait for the Data
Creates Performance Bottlenecks

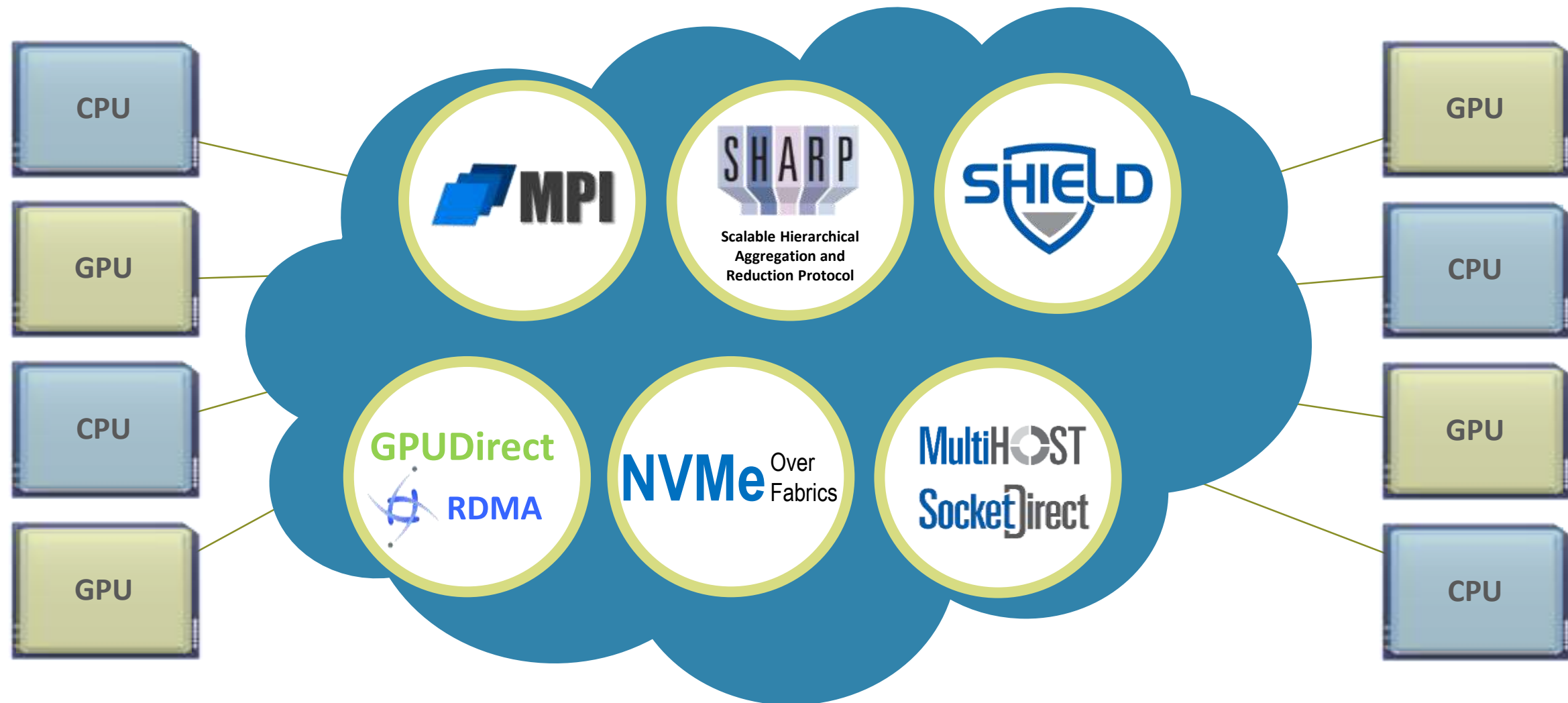
Data-Centric (Offload)



Analyze Data as it Moves!
Higher Performance and Scale

In-Network Computing to Enable Data-Centric Data Centers

Faster Data Speeds and In-Network Computing Enable Higher Performance and Scale



Mellanox In-Network Computing and Acceleration Engines

Mellanox In-Network Computing Delivers Highest Performance



In-Network Computing



10X

Performance Acceleration
Critical for HPC and Machine Learning Applications



In-Network Computing



35X

Performance Acceleration
Delivers Highest Application Performance



Self-Healing Technology



5000X

Faster Network Recovery
Unbreakable Data Centers

GPU Direct™ RDMA
GPU Acceleration Technology



10X

Performance Acceleration
Critical for HPC and Machine Learning Applications

Unlocking the Power of Artificial Intelligence

RDMA Supercharges Leading AI Frameworks



Mellanox Supercharges Leading AI Companies



60%
Higher ROI

50%
Lower CapEx
& OpEx

InfiniBand Delivers Best Return on Investment

- 30%-250% Higher Return on Investment
- Up to 50% Saving on Capital and Operation Expenses
- Highest Applications Performance, Scalability and Productivity

Weather

1.9X
Better



Automotive

2X
Better



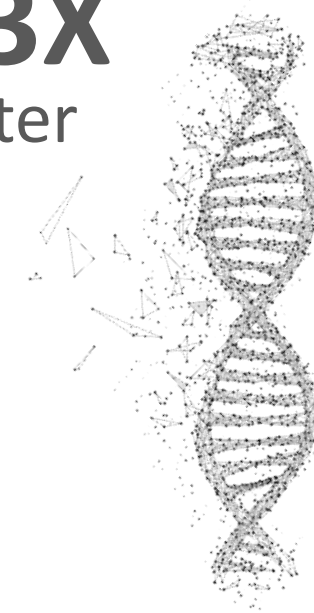
Chemistry

1.4X
Better



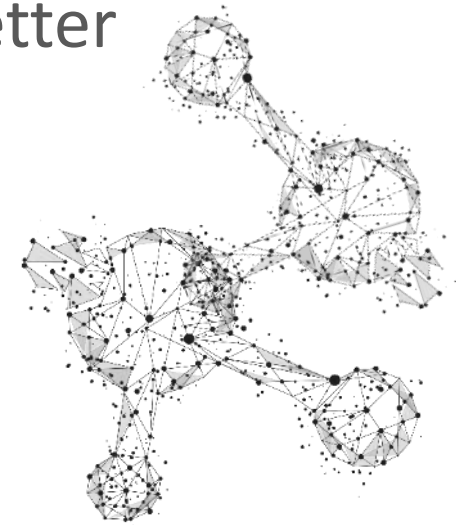
Genomics

1.3X
Better















Molecular Dynamics

2.5X
Better

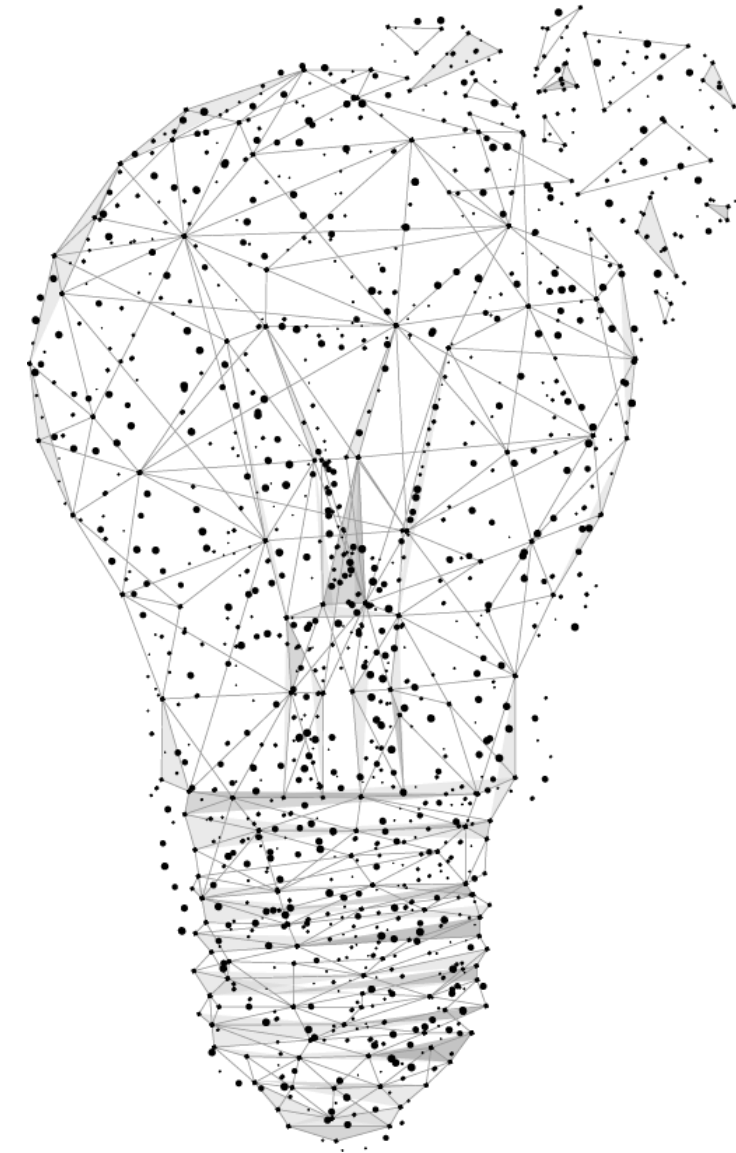
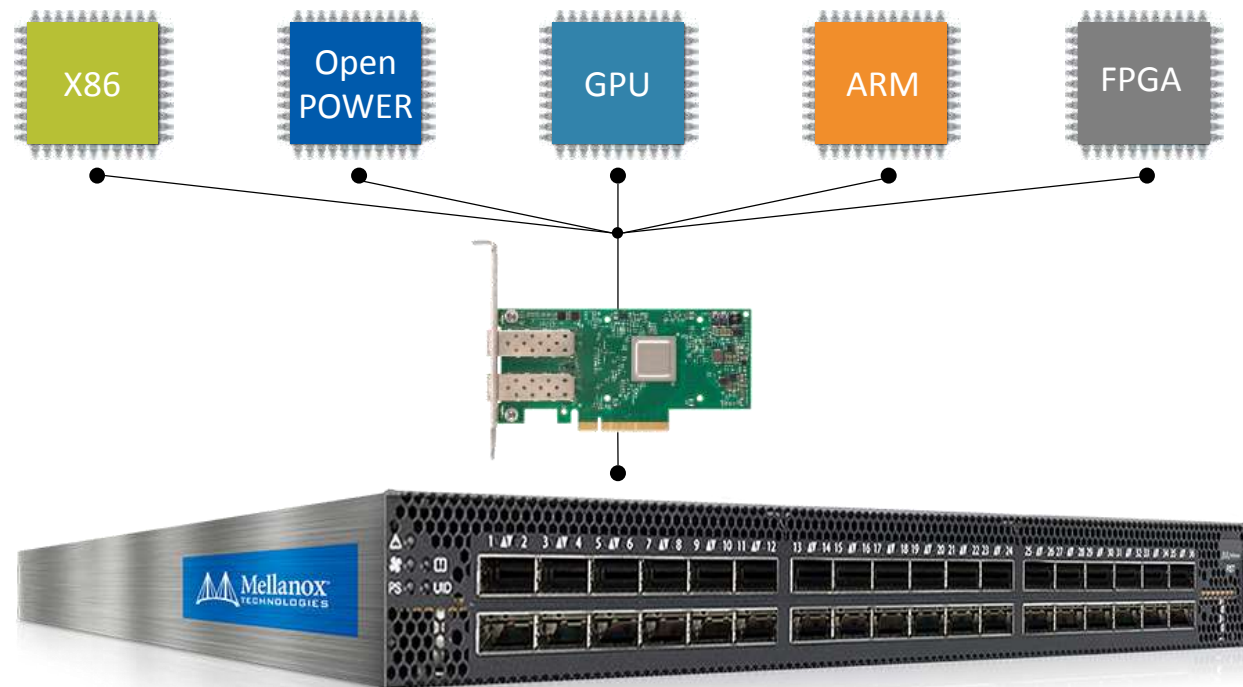


Highest-Performance 200Gb/s Interconnect Solutions

Adapters		<p>200Gb/s Adapter, 0.6us latency 215 million messages per second (10 / 25 / 40 / 50 / 56 / 100 / 200Gb/s)</p>	
Switch	 <p>The smartest switch, became smarter</p>	<p>40 HDR (200Gb/s) InfiniBand Ports 80 HDR100 InfiniBand Ports Throughput of 16Tb/s, <90ns Latency</p>	
Switch		<p>16 400GbE, 32 200GbE, 128 25/50GbE Ports (10 / 25 / 40 / 50 / 100 / 200 GbE) Throughput of 6.4Tb/s</p>	
SoC		<p>System on Chip and SmartNIC Programmable adapter Smart Offloads</p>	
Interconnect		<p>Transceivers Active Optical and Copper Cables (10 / 25 / 40 / 50 / 56 / 100 / 200Gb/s)</p>	
Software		<p>MPI, SHMEM/PGAS, UPC For Commercial and Open Source Applications Leverages Hardware Accelerations</p>	

End-to-End Solutions for All Platforms

Unleashing the Power of all Compute Architectures



Highest Performance and Scalability for Intel, AMD, IBM Power, NVIDIA, Qualcomm, ARM and FPGA-based Compute and Storage Platforms at 10, 20, 25, 40, 50, 100, 200 and 400Gb/s Speeds

InfiniBand The Smart Choice for HPC and AI Platforms and Applications

“We chose a co-design approach supporting in the best possible manner our key applications. The only interconnect that really could deliver that was Mellanox’s InfiniBand.”



[Watch Video](#)

“InfiniBand gives us the very high bandwidth we need to address some of our most important applications. The Switch based collective operations dramatically improve the performance for our applications.”



[Watch Video](#)

“One of the big reasons we use InfiniBand and not an alternative is that we’ve got backwards compatibility with our existing solutions.”



[Watch Video](#)

“InfiniBand is the most advanced interconnect technology in the world, with dramatic communication overhead reduction that fully unleashes cluster performance.”



[Watch Video](#)

“In HPC, the processor should be going 100% of the time on a science question, not on a communications question. This is why the offload capability of Mellanox’s network is critical.”



[Watch Video](#)

“InfiniBand is the best that is required for our applications. It enhances and unlocks the potential of the system.”



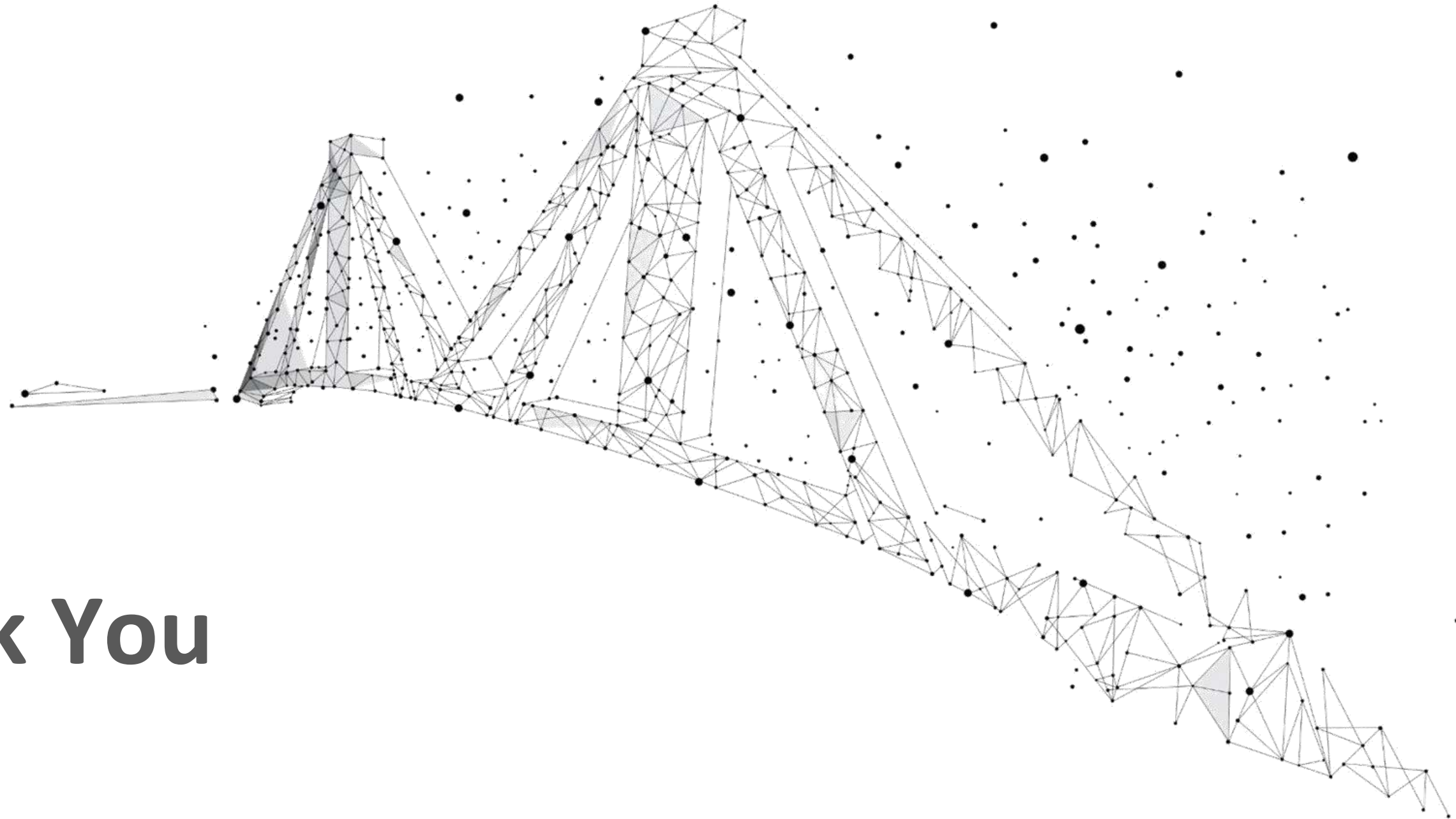
[Watch Video](#)

Proven Advantages

- Deliver best return on investment
- Scalable, intelligent, flexible, high performance, end-to-end connectivity solutions
- Standards-based (InfiniBand, Ethernet), supported by large eco-system
- Supports all compute architectures: x86, Power, ARM, GPU, FPGA etc.
- Offloading and In-Network Computing architecture
- Flexible topologies: Fat Tree, Mesh, 3D Torus, Dragonfly+, etc.
- Converged I/O: compute, storage, management on single fabric
- Backward and future compatible



The Future Depends On Smart Interconnect



Thank You

