Next Generation Performance & Scalability with Mellanox
“Smart” Interconnect
Mellanox Technologies

Revolutionizing the Datacenter
The Future is Here
Enter the World of Scalable Performance
At the Speed of 100Gb/s!
The Ever Growing Demand for Higher Performance

Performance Development

Terascale

2000

2005

2010

2015

2020

Petascale

1st

“Roadrunner”

Exascale

2015

2020

The Interconnect is the Enabling Technology

SMP to clusters

Single-core to many-core

Co-design

Application

Software

Hardware
Performance enabled via co-design architecture

- Software – Hardware
- Hardware – Hardware
- Software – Software
- Industry – Users – Academia

Standard, open source, eco-system programmable, configurable, innovation
Why OpenPOWER

- Mellanox solutions are based on open standards
- Open ecosystem of industry experts
- Promotes industry growth and innovation

- Collaborative environment that shares expertise to address customer needs
- Open development is key to rapid and continuous technology innovation
OpenPOWER is driving industry innovation with co-design

**Open development**
OpenPOWER enables greater innovation through both open software and open hardware

**Collaboration across multiple thought leaders**
Collaborative development model drives collective thought leadership, simultaneously across multiple disciplines

**Performance of POWER architecture**
Broadens the capabilities of the POWER platform

The OpenPOWER Foundation creates an open ecosystem to serve the evolving needs of customers.
Breaking the Application Latency Wall

- **Today:** Network device latencies are on the order of 100 nanoseconds
- **Challenge:** Enabling the next order of magnitude improvement in application performance
- **Solution:** Creating synergies between software and hardware – intelligent interconnect

Intelligent Interconnect Paves the Road to Exascale Performance
Intelligence is Moving to the Interconnect

Past

Future

CPU

Interconnect
Mellanox ConnectX-5 With CAPI Support

- CAPI provides an optimized platform for moving enormous volumes of data. With much tighter integration between the Mellanox high-performance interconnect and the processor, POWER-based systems can rip through high volumes of data and bring compute and data closer together.

- CAPI also simplifies the memory management between interconnect and CPU – which results in reduced overhead, higher performance and increased scalability.

- CAPI provides a level of integration that removes additional latency compared to platforms featuring traditional PCI-Express bus semantics.

- ConnectX-5 can be leveraged for 100Gb CAPI-attached InfiniBand, Ethernet, or storage solutions.
Introducing Switch-IB 2 World’s First “Smart Switch”
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World’s first “Smart Switch”
Built for scalable compute and storage infrastructures

10X higher performance with “SHArP” Technology

- The world fastest switch with <90 nanosecond latency
- 36-ports, 100Gb/s per port, 7.2Tb/s throughput, 7.02 billion messages/sec
- Adaptive routing, congestion control, support for multiple topologies
“SHArP” (Scalable Hierarchical Aggregation Protocol) Technology

“SHArP” enables Switch-IB 2 to manage and execute MPI operations in the network

Switch-IB 2 enables the switch network to operate as a co-processor

Delivering 10X performance improvement for MPI and SHMEM/PAGS communications
“SHArP” Performance Advantage

MiniFE is a Finite Element mini-application
Implements kernels that represent implicit finite-element applications

CPU-based versus Switch Collectives Offloads MiniFE Application - Latency Ratio (8 Bytes)

10X to 25X Performance Improvement
SHArP delivers 2.2X higher performance

OpenFOAM

OpenFoam : Lid Driven Cavity Flow
icoFoam solver, 2D 1 million cells

Performance Rating (Jobs per Day)

Number of Nodes

4  8  16  32  64

Intel MPI  Open MPI  HPC-X (SHArP)
World Leading 10, 25, 40, 50, 100 Gigabit Ethernet Switching

One Switch. A World of Options.
Spectrum Open Ethernet Switch

- Performance leadership
  - Non-blocking 6.4Tb/s switching
  - Sub-300ns port-to-port latency
  - RDMA over Converged Ethernet

- Cloud-scale
  - Virtual network at scale
  - Bandwidth optimization
  - Flexible SDN pipeline

- Features
  - 32 ports of 100 / 56 / 40GbE
  - 64 ports of 50 / 25 / 10GbE
  - L2, L3 and ACL-based forwarding
  - QoS and Congestion control
  - Dynamically shared buffer

World’s Only Non-Blocking 10 to 100GbE Switch
Same Infrastructure, World of Options

Network
- 40GbE
- 10GbE
- Same Connectors
- Same Infrastructure
- 2.5X higher Throughput
- Similar Cost / Power

Compute Nodes

Storage Nodes

Network
- 100GbE
- 25GbE
- 50GbE
- Same Connectors
- Same Infrastructure
- 2.5X higher Throughput
- Similar Cost / Power

Compute Nodes

Storage Nodes

Gain a Competitive Advantage with Spectrum 10, 25, 40, 50, 100 GbE Switching
Summary

- The OpenPOWER Foundation creates an open ecosystem to serve the evolving needs of customers.

- To overcome the performance limitations of today’s HPC and enterprise systems, we need an intelligent interconnect paired with a powerful POWER-based processor.

- The interconnect becomes a co-processor, offloading the CPU, increasing data center efficiency.

- Mellanox 100Gb/s, both InfiniBand and Ethernet solutions are robust and deliver unprecedented scalable performance for OpenPOWER-based platforms.

Protect Your Future with Mellanox and OpenPOWER!