



## Mellanox HPC Presentation

Mellanox Confidential

April 2013



# Leading Supplier of End-to-End Interconnect Solutions



## Comprehensive End-to-End InfiniBand and Ethernet Portfolio

ICs	Adapter Cards	Switches/Gateways	Host/Fabric Software	Cables

- **InfiniBand has become the de-facto interconnect solution for HPC**
  - The most used interconnect on the TOP500 list – 224 systems
- **InfiniBand connects 10 out of 23 of the world's sustained Petaflop systems**
- **The most used interconnect solution in the TOP100, TOP200, TOP300, TOP400**
  - Connects 52% (52 systems) of the TOP100 while Ethernet only 4% (4 system)
  - Connects 54% (108 systems) of the TOP200 while Ethernet only 12.5% (25 systems)
  - Connects 49.7% (149 systems) of the TOP300 while Ethernet only 25% (75 systems)
  - Connects 46% (184 systems) of the TOP400 while Ethernet only 34% (136 systems)
- **Mellanox FDR InfiniBand is the fastest interconnect solution on the TOP500**
  - Used in 45 systems on the TOP500 list – more than double since the June 2012 list
  - Connects the fastest InfiniBand-based supercomputers – 2.9 Petaflops (LRZ), 2.6 Petaflops (TACC)



# Mellanox InfiniBand Paves the Road to Exascale



**PetaFlop**  
Mellanox Connected



# Mellanox 56Gb/s FDR Technology

# FDR INFINIBAND TECHNOLOGY

THE NEXT GENERATION OF  
HIGH-PERFORMANCE SCALABLE CONNECTIVITY

## FDR InfiniBand Features and Capabilities

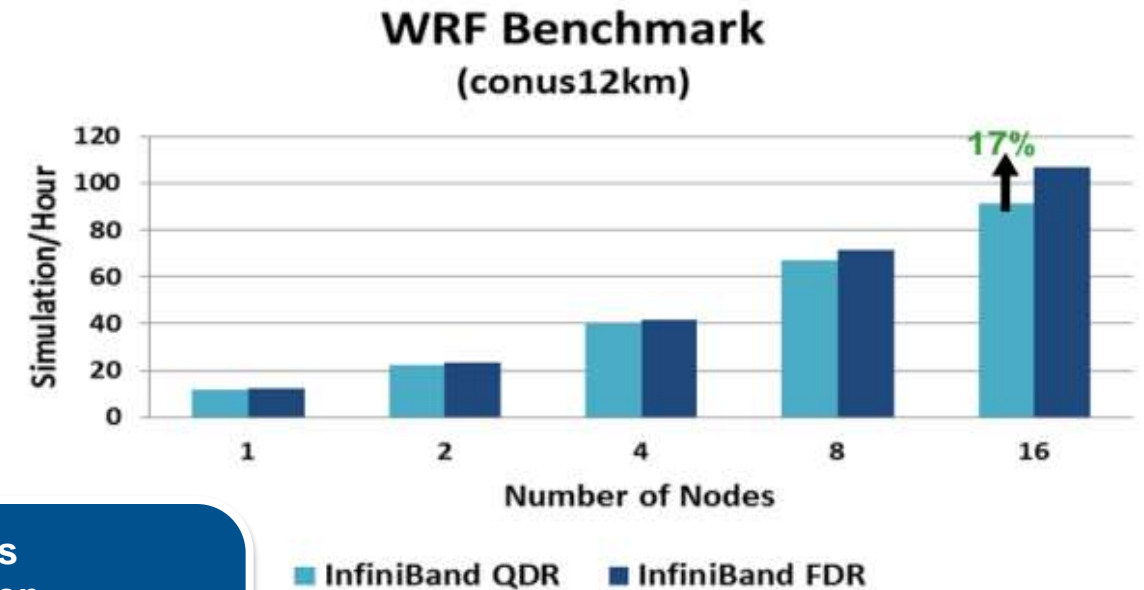
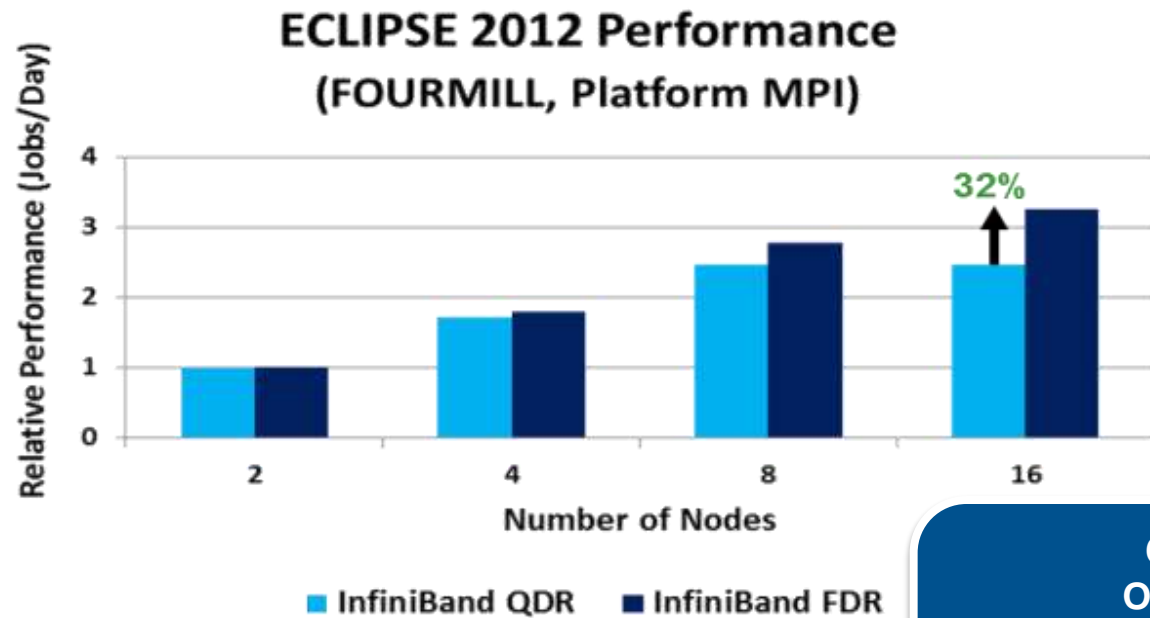
### Performance / Scalability

- 56Gb/s bandwidth
- <0.7usec latency
- PCI Express 3.0
- InfiniBand Routing and IB-Ethernet Bridging

### Reliability / Efficiency

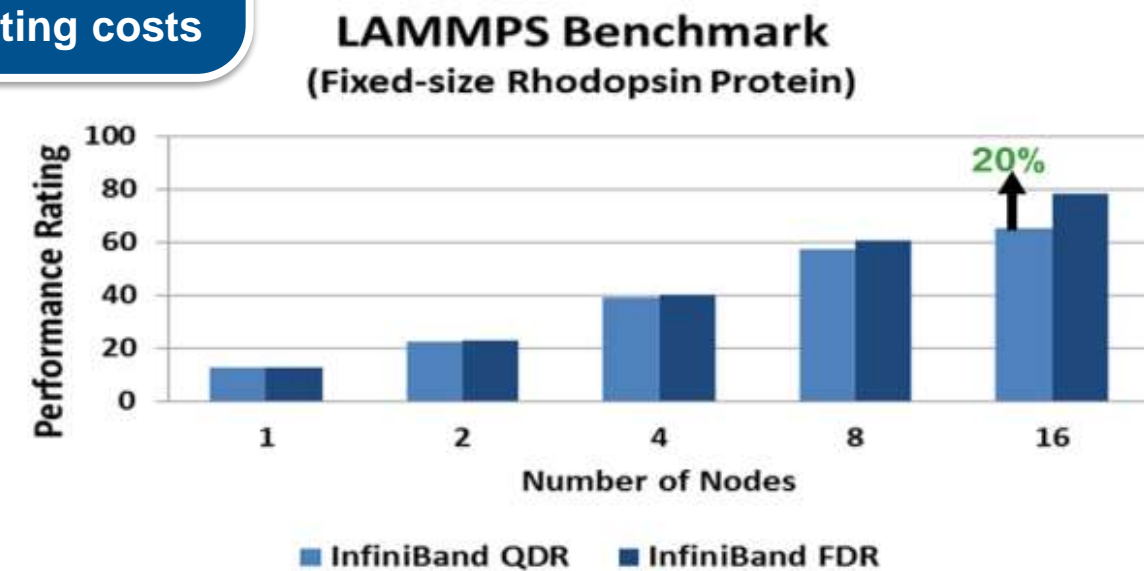
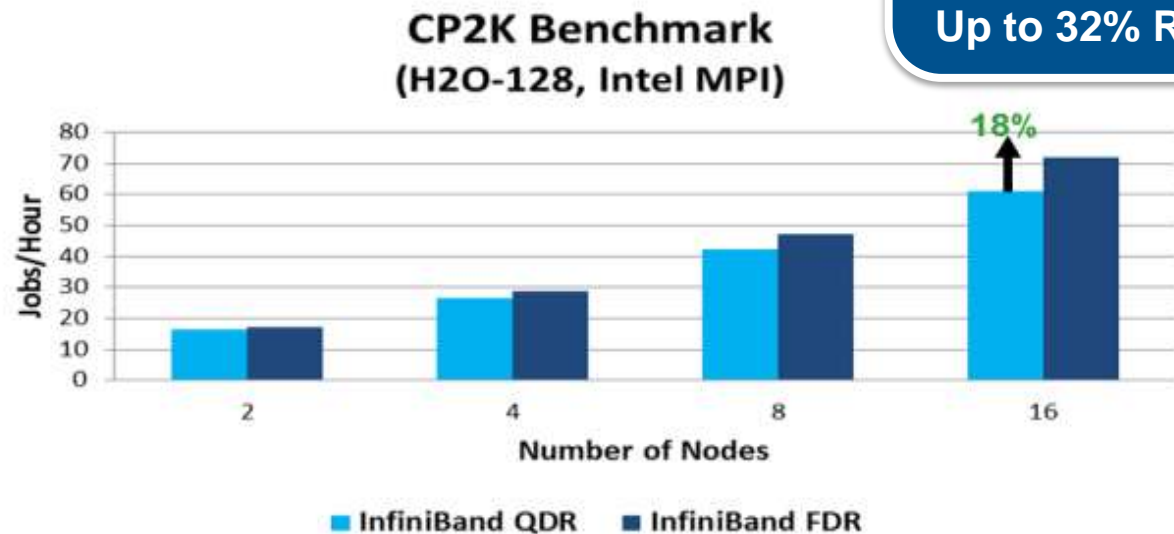
- Unbreakable Link Technology
  - Forward Error Correction
  - Link quality auto-sensing
  - Link Level Retransmission
- Link bit encoding – 64/66
- Lower power consumption

# FDR Application Benchmarks Highlight ROI



Computational Fluid Dynamics  
Oil and Gas Reservoir Simulation  
Molecular Dynamics  
Weather and Earth Sciences

**Up to 32% ROI on equipment/operating costs**



# Connect-IB

Architectural Foundation for Exascale Computing



- A new interconnect architecture for compute intensive applications
- World's fastest server and storage interconnect solution
- Enables unlimited clustering (compute and storage) scalability
- Accelerates compute-intensive and parallel-intensive applications
- Optimized for multi-tenant environments of 100s of Virtual Machines per server

## Enter the World of Scalable Performance

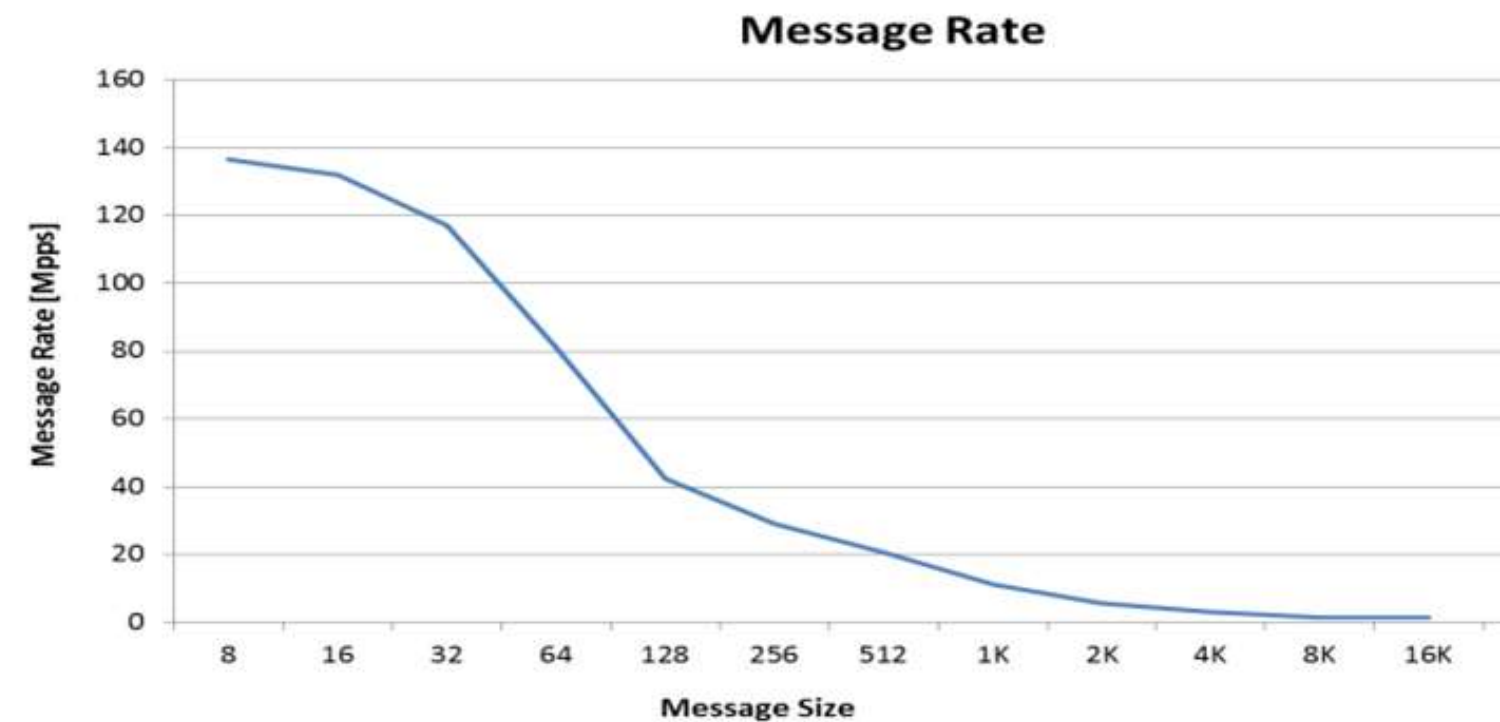
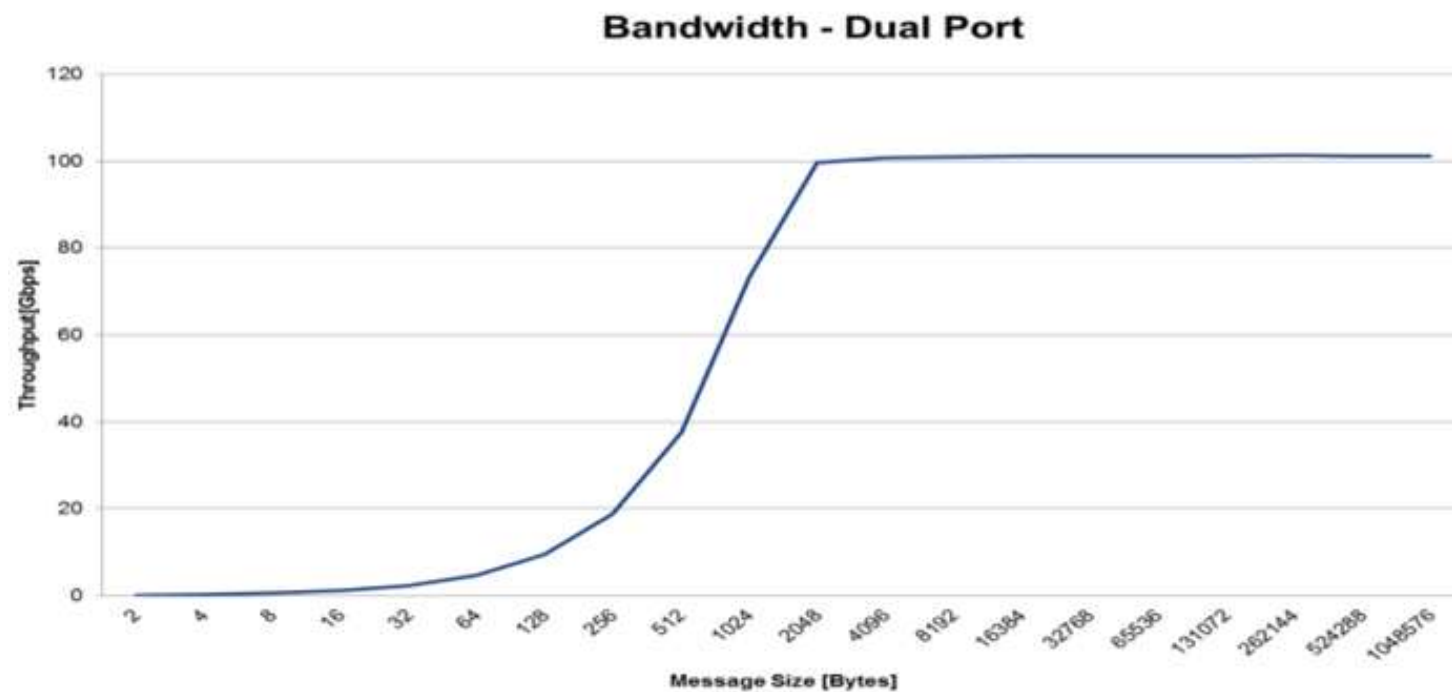
Connect **IB**<sup>™</sup>



# Connect-IB Performance Highlights



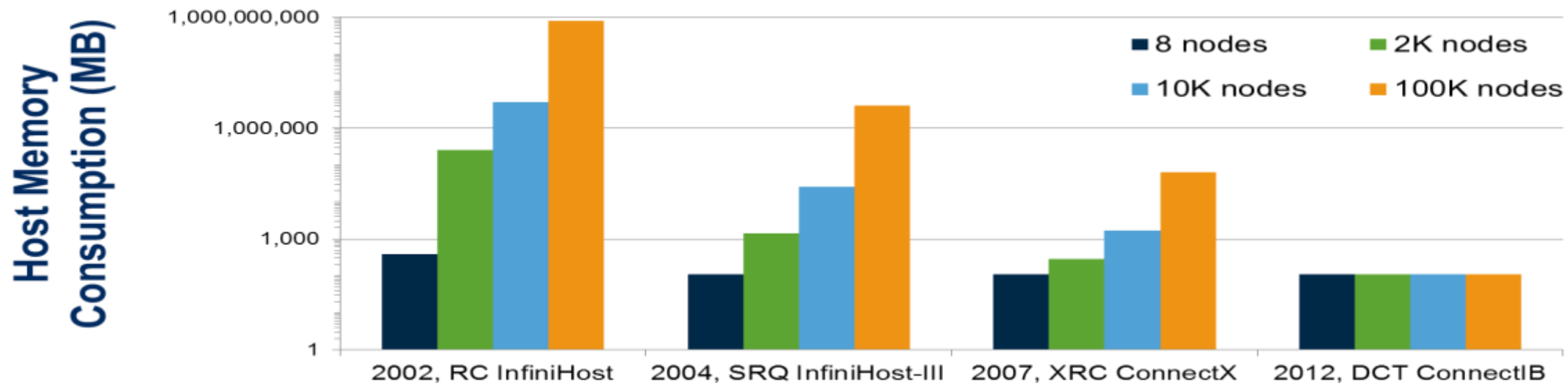
- World's first 100Gb/s InfiniBand interconnect adapter
  - PCIe 3.0 x16, dual FDR 56Gb/s InfiniBand ports to provide >100Gb/s
- Highest InfiniBand message rate: 137 million messages per second
  - 4X higher than other InfiniBand solutions



**Unparalleled Throughput and Message Injection Rates**

## ■ New innovative transport – Dynamically Connected Transport service

- The new transport service combines the best of:
  - Unreliable Datagram (UD) – no resources reservation
  - Reliable Connected Service – transport reliability
- Scale out for unlimited clustering size of compute and storage
- Eliminates overhead and reduces memory footprint
- Interconnect resources requirement is constant, not influenced by number of nodes

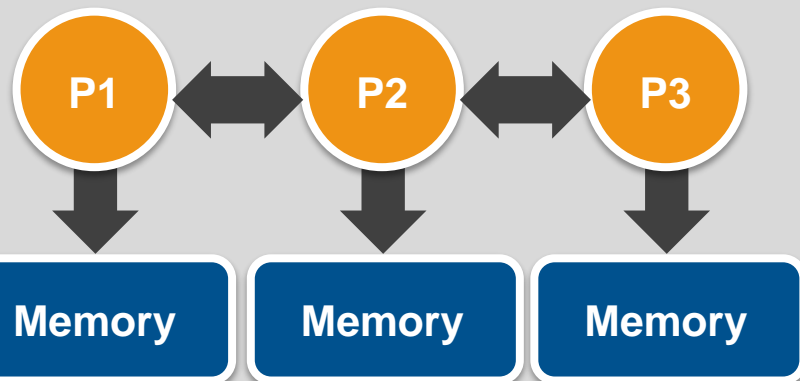


## Scalable Transport Mechanisms

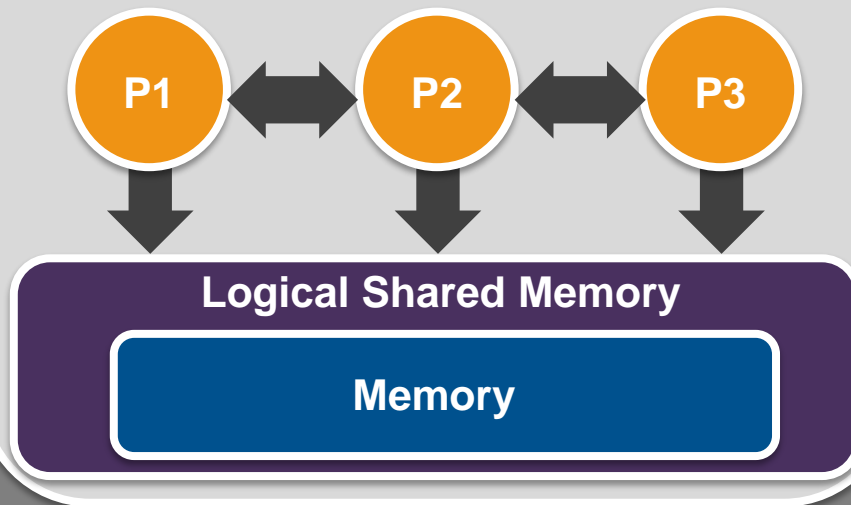
# Mellanox ScalableHPC

Accelerations for Parallel Programs

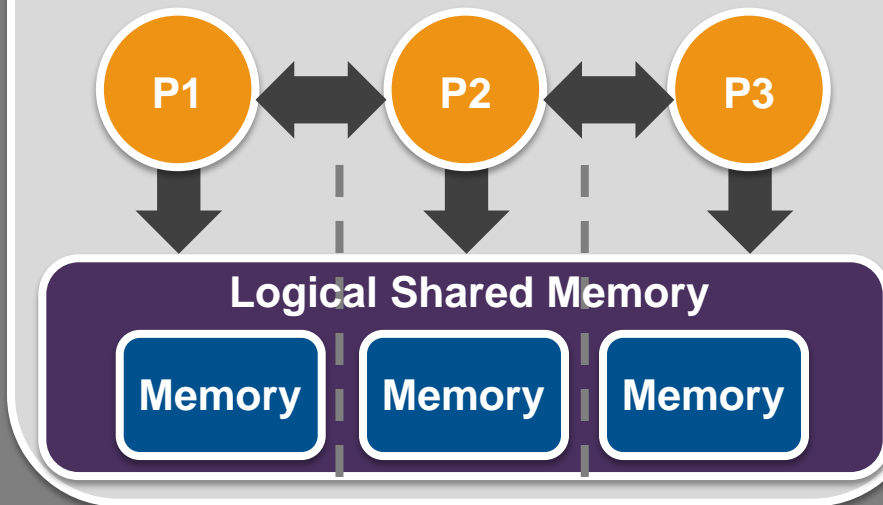
## MPI



## SHMEM



## PGAS



## MXM

- Reliable Messaging Optimized for Mellanox HCA
- Hybrid Transport Mechanism
- Efficient Memory Registration
- Receive Side Tag Matching

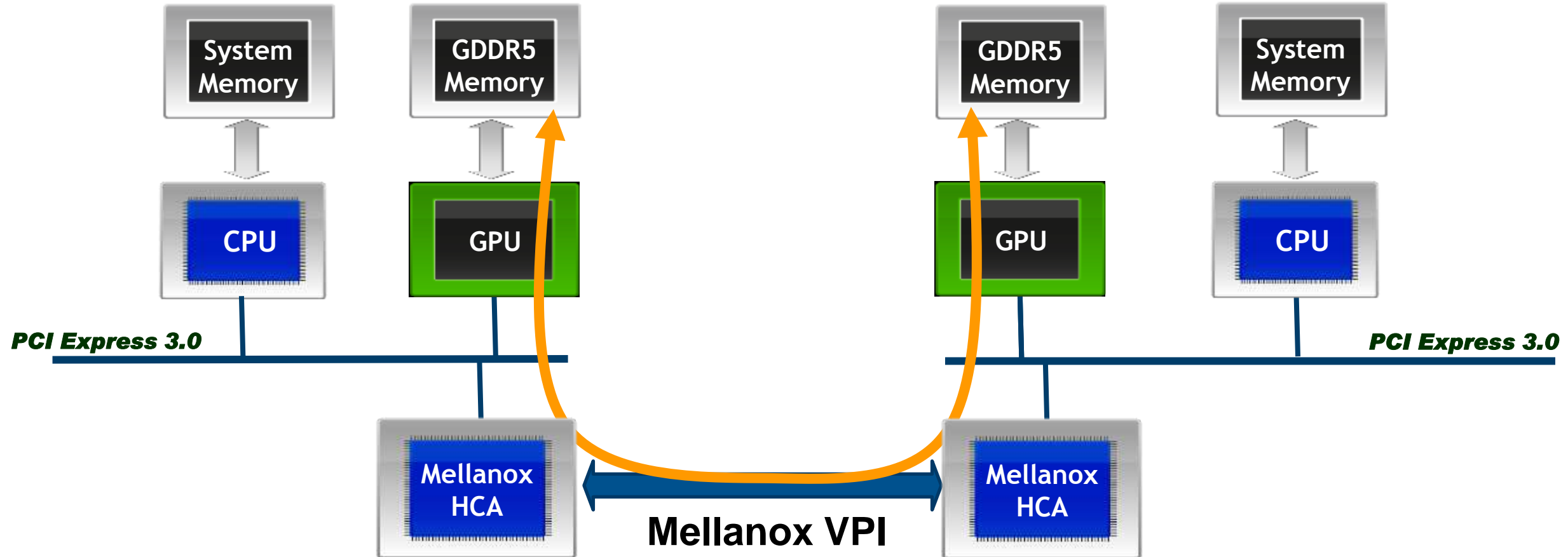
## FCA

- Topology Aware Collective Optimization
- Hardware Multicast
- Separate Virtual Fabric for Collectives
- CORE-Direct Hardware Offload

InfiniBand Verbs API

# Accelerator and GPU Offloads

- GPU Direct RDMA (previously known as GPU Direct 3.0)
- Enables peer to peer communication directly between HCA and GPU
- Dramatically reduces overall latency for GPU to GPU communications



Thank You

