InfiniBand Strengthens Leadership as The High-Speed Interconnect Of Choice

Providing the Best Return on Investment by Delivering the Highest System Efficiency and Utilization

Top500 Supercomputers
June 2010
Top500 Performance Trends

- Explosive high-performance computing market growth
- Clusters continue to dominate with 84.8% of the Top500 list
- Mellanox 40Gb/s solutions provide the highest systems utilization in the Top500

* 2010 reflects only 6 months
InfiniBand in The Top500

- **InfiniBand is the only growing standard interconnect technology**
  - 208 clusters, 41.6% of the list, 37% increase since June 2009 (YoY)
  - Ethernet shows decline in number of systems: -14% YoY
  - Clustered proprietary interconnects show decline in number of systems: -54% YoY

- **Mellanox 40Gb/s InfiniBand the only scalable 40Gb/s technology on the list**
  - Enable the highest system utilization in the Top500 – 96% system efficiency
  - Enables the most power efficient clusters – all of the Top5 power efficient systems
  - Account for twice the performance compared to Ethernet systems

- **Mellanox InfiniBand the only standard interconnect solution for Petascale systems**
  - Connecting two out of the three sustained Petascale performance systems on the list
  - Connects nearly 4x the number of Cray based system in the Top100
  - Connects nearly more than 6x the number of Blue Gene based systems in the Top100

- **Mellanox end-to-end 40G scalable HPC solution accelerates NVIDIA GPU based systems**
  - GPUDirect technology enables faster communications and performance increase for systems on the list

- **InfiniBand makes the most powerful clusters - Top10, Top20**
  - 5 of the top 10 (#2, #3, #6, #7, #10), 11 of the top 20 (#11, #13, #14, #15, #18, #19)

- **The most used interconnect in the Top100, Top200, Top300**
  - 64% of the Top100, 56% of the Top200, 47% of the Top300

- **Diverse set of applications**
  - High end HPC, commercial HPC and enterprise data center
- **InfiniBand is the only growing high speed clustering interconnect**
  - 208 systems on the June 10 list, 37% increase since June 2009

- **InfiniBand is the HPC interconnect of choice**
  - Connecting 41.6% of the Top500 systems
InfiniBand is the only growing high speed clustering interconnect
- 208 systems on the June 10 list, 37% increase since June 2009

InfiniBand is the HPC interconnect of choice
- Connecting 41.6% of the Top500 systems

### Top500 Interconnect Trends

<table>
<thead>
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<th>InfiniBand</th>
<th>Ethernet</th>
<th>Clustered Proprietary Interconnects</th>
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Interconnect Trends – Top100

- **InfiniBand** is the leading interconnect in the Top100
- **The natural choice for world leading supercomputers**
  - Performance, Efficiency, Scalability
Top500 Interconnect Placement

- **InfiniBand is the high performance interconnect of choice**
  - Connecting the most powerful clusters, providing the highest system utilization
- **InfiniBand is the best price/performance connectivity for HPC systems**
  - For all system sizes, for all applications
Enabling the Best Return on Investment

- **Mellanox InfiniBand connects all of the Top5 most efficient systems**
  - Up to 96% efficiency/utilization, only 4% less than the theoretical limit

- **Mellanox InfiniBand end-to-end solutions enable HPC users with the best return on their investment**
  - Best performance and scalability
  - Highest efficiency and utilization
  - Lowest power/performance
InfiniBand Unsurpassed System Efficiency

- Top500 systems listed according to their efficiency
- InfiniBand is the key element responsible for the highest systems efficiency
**Top500 Interconnect Comparison**

- InfiniBand systems account for twice the performance than Ethernet systems.
- The only scalable HPC interconnect solutions.
Mellanox InfiniBand is the most efficient and scalable Interconnect

Driving factors: performance, efficiency, scalability, many-many cores
Dawning TC3600 Blade Supercomputer
5200 nodes, 120640 cores
NVIDIA GPUs
Mellanox end-to-end 40Gb/s InfiniBand solutions
  • ConnectX-2 and IS5000 switches
1.27 sustained PetaFlop performance
The highest ranked system from China in the Top500 history
LANL Roadrunner – #3, World First Petaflop System

- **World first machine to break the Petaflop barrier**
  - Los Alamos Nation Lab, #2 on Nov 2009 Top500 list
  - Usage - national nuclear weapons, astronomy, human genome science and climate change

- **CPU-GPU-InfiniBand combination for balanced computing**
  - More than 1,000 trillion operations per second
  - 12,960 IBM PowerXCell CPUs, 3,456 tri-blade units
  - Mellanox ConnectX 20Gb/s InfiniBand adapters
  - Mellanox based InfiniScale III 20Gb/s switches

- **Mellanox Interconnect is the only scalable high-performance solution for Petascale computing**
NASA Ames Research Center (NAS) - #6

- 9.2K nodes
- 81,920 cores
- 773 Teraflops sustained performance
- Mellanox InfiniBand adapters and switch based systems
- Supports variety of scientific and engineering projects
  - Coupled atmosphere-ocean models
  - Future space vehicle design
  - Large-scale dark matter halos and galaxy evolution
The Second fastest supercomputer in Asia

- National University of Defense Technology (NUDT)
- #1 on Nov 2009 China Top100 list
- 3072 nodes, 6144 Intel Nehalem CPUs, 24576 cores
- 2560 ATI Radeon 4870X2 GPUs
- Mellanox InfiniBand 40Gb/s ConnectX HCAs and Mellanox based switches

Mellanox Interconnect is the only scalable high-performance solution for Petascale computing
Mellanox End-to-End 40Gb/s Connectivity
- Network Adaptation: ensures highest efficiency
- Self Recovery: ensures highest reliability
- Scalability: the solution for Peta/Exa flops systems
- On-demand resources: allocation per demand
- Green HPC: lowering system power consumption

JuRoPA and HPC –FF Supercomputer

274.8 TFlops at 91.6% Efficiency
- #13 on the Top500
- 3288 compute nodes
- 79 TB main memory
- 26304 CPU cores
Sandia “Red Sky” - #11

- 5.4K nodes, 43K cores, 87% efficiency
- Intel Xeon X55xx 2.93Ghz CPUs
- Mellanox ConnectX and switch based systems
- Network Topology – 3D Torus
For more information
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