

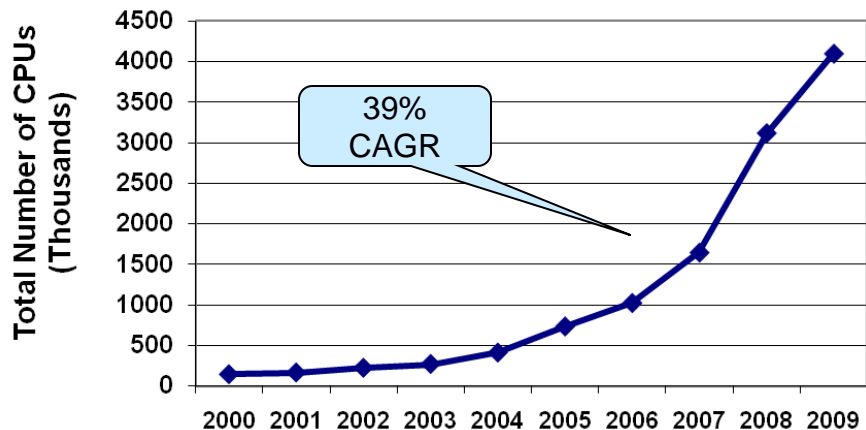
# **InfiniBand Strengthens Leadership as The High-Speed Interconnect Of Choice**

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

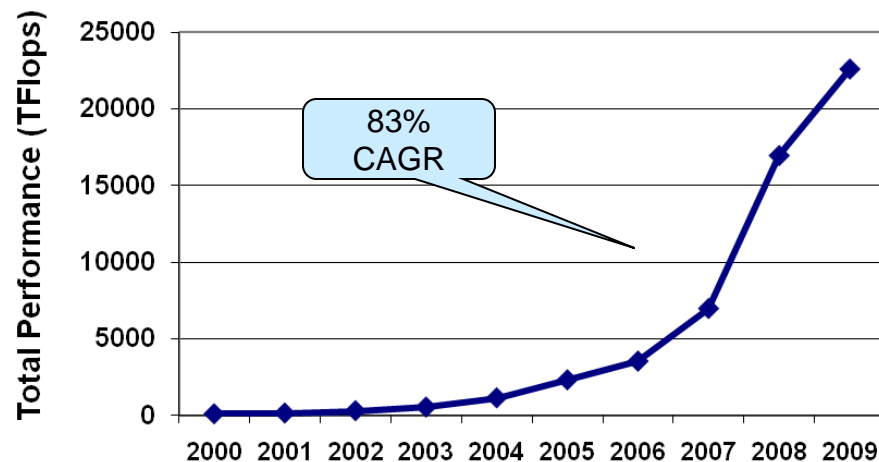
**Top500 Supercomputers  
June 2009**



## Total # of CPUs on the Top500



## Total Performance of the Top500



- Explosive high-performance computing market growth
- Clusters continue to dominate with 82% of the Top500 list
- Mellanox 40Gb/s end-to-end solutions provide the HIGHEST system utilization in the Top10
  - In average, 15% higher utilization compared to rest of the Top10 systems



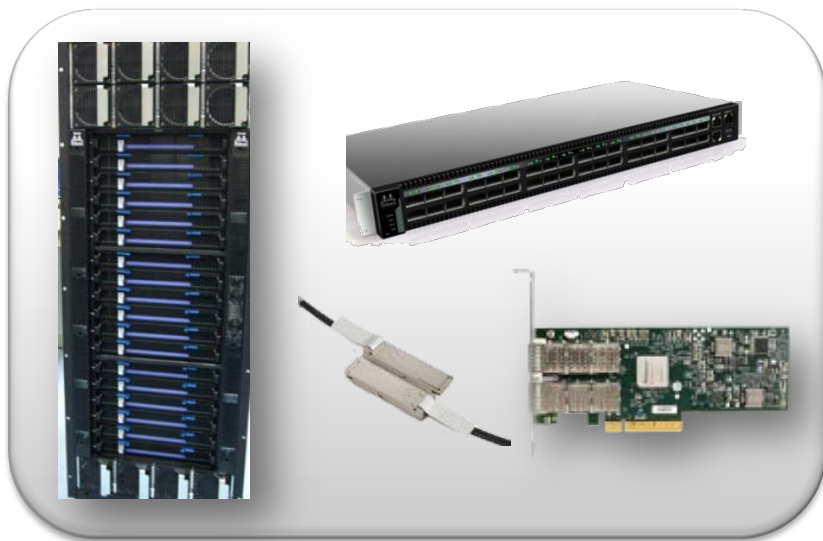
- **InfiniBand is the only growing standard interconnect technology**
  - 152 clusters, 30.4 % of the list, 25% increase versus June 2008 list
  - GigE and proprietary interconnects shows no growth
  - No 10GigE clusters on the list
- **Mellanox 40Gb/s InfiniBand end-to-end the only proven technology on the list**
  - Enable the highest system utilization in the Top10 systems, 15% higher than the top 10 average
  - Enables the most power efficient clusters
- **InfiniBand connects the most powerful system in the world - #1 on the list**
  - The First systems to achieve sustained Petaflop performance
  - ConnectX InfiniBand world leading scalable interconnect, Mellanox based switches
- **InfiniBand makes the most powerful clusters - Top10, Top20**
  - 4 of the top 10 (#1, #4, #8, #10) , 9 of the top 20 (#15, #17, #18, #19, #20)
- **The most used interconnect in the Top200**
  - 59% of the Top100, 45% of the Top200
- **Mellanox InfiniBand enables the highest utilization on the top500**
  - Up to 94% system utilization, 50% higher than the best Ethernet based system
- **Diverse set of applications**
  - High end HPC, commercial HPC and enterprise data center

- **The most powerful supercomputer in the world**
  - Los Alamos Nation Lab, #1 on June 2009 Top500 list
  - Usage - national nuclear weapons, astronomy, human genome science and climate change
- **Breaking through the “Petaflop barrier”**
  - 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**

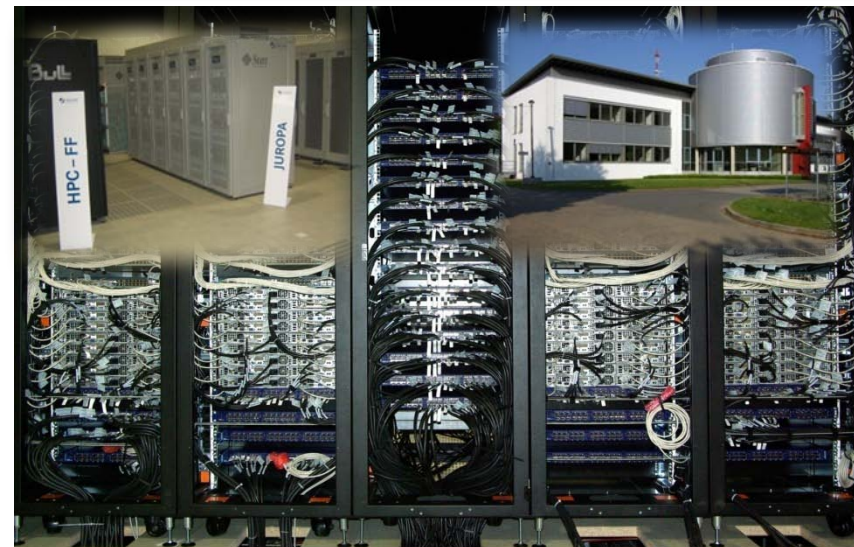


## Mellanox End-to-End 40Gb/s Connectivity

- 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

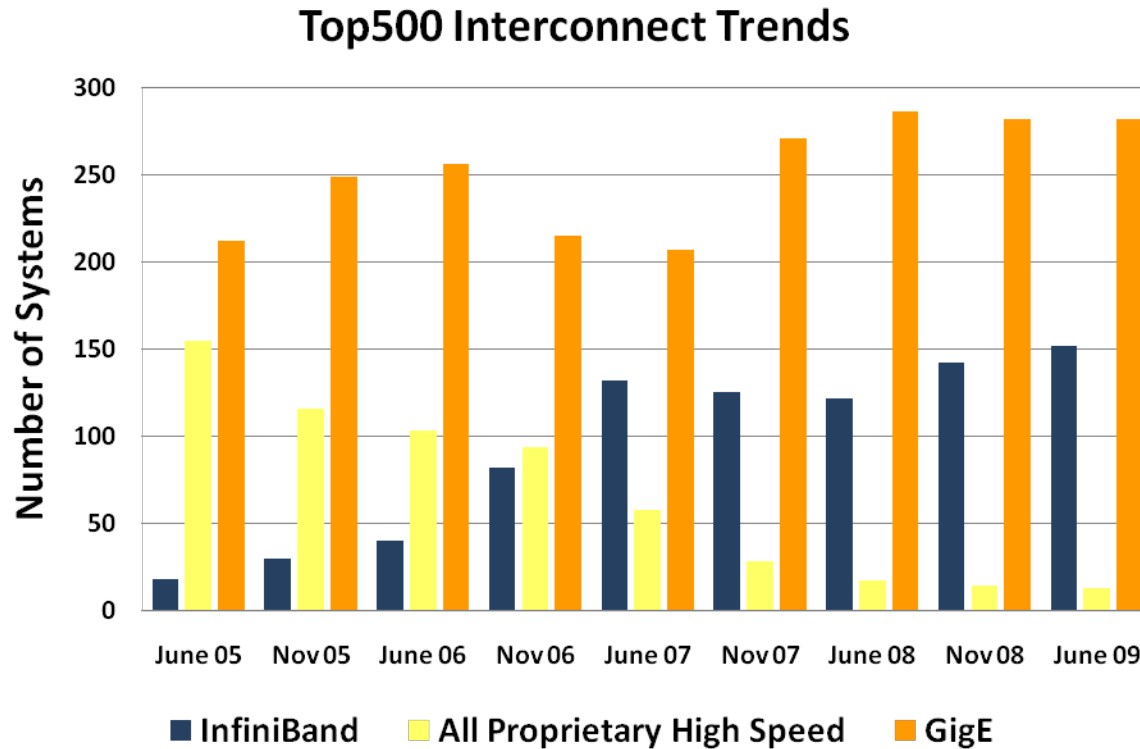
- #10 on the Top500
- 3288 compute nodes
- 79 TB main memory
- 26304 CPU cores



## Highest system Efficiency and utilization in the Top10

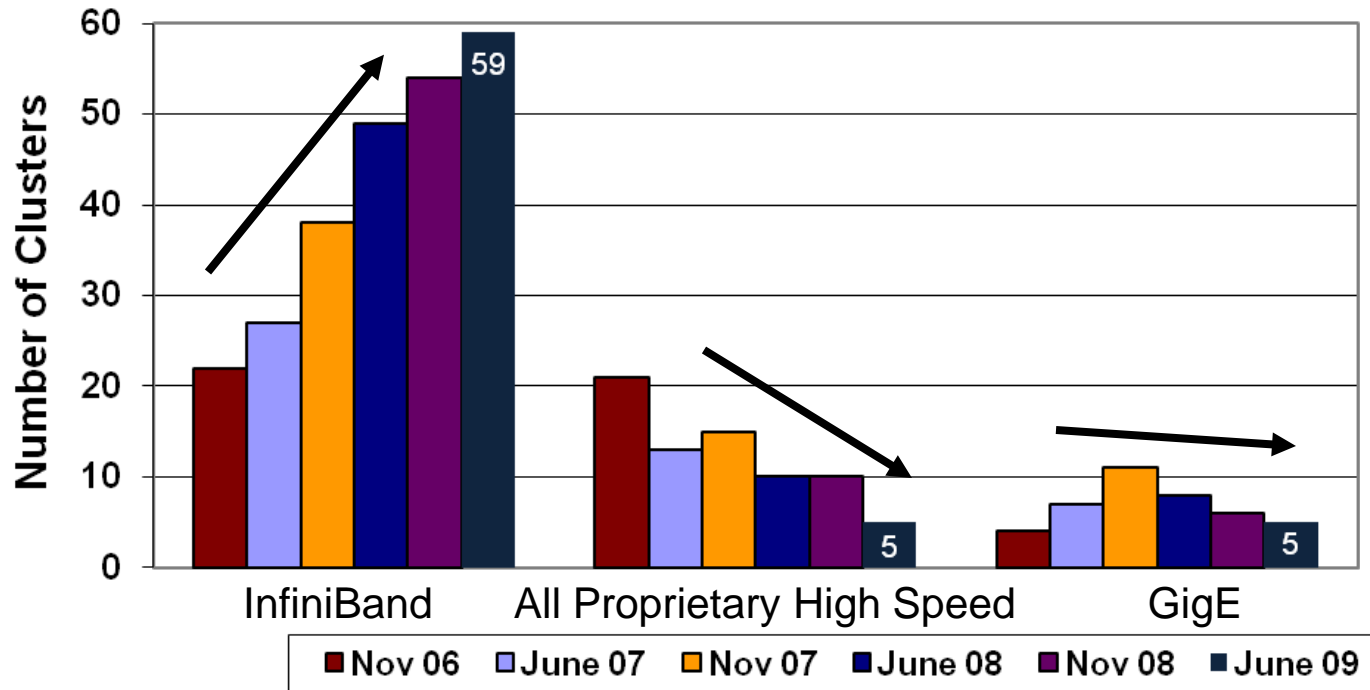
- **China 863 Grid program**
  - Biggest government project in China IT industry
- **Dawning5000A supercomputer**
  - 1920 nodes Dawning blade system
  - 180.6TFlop, almost 80% efficiency
- **Highest ranked Windows HPC Server 2008 based system**
- **Mellanox ConnectX and switch based systems**
  - Delivering highest scalability for Windows based clusters





- InfiniBand and Ethernet are the dominant connectivity solutions
- InfiniBand is the only growing high speed clustering interconnect
  - 152 systems on the June 09 list, 25% increase since June 2008

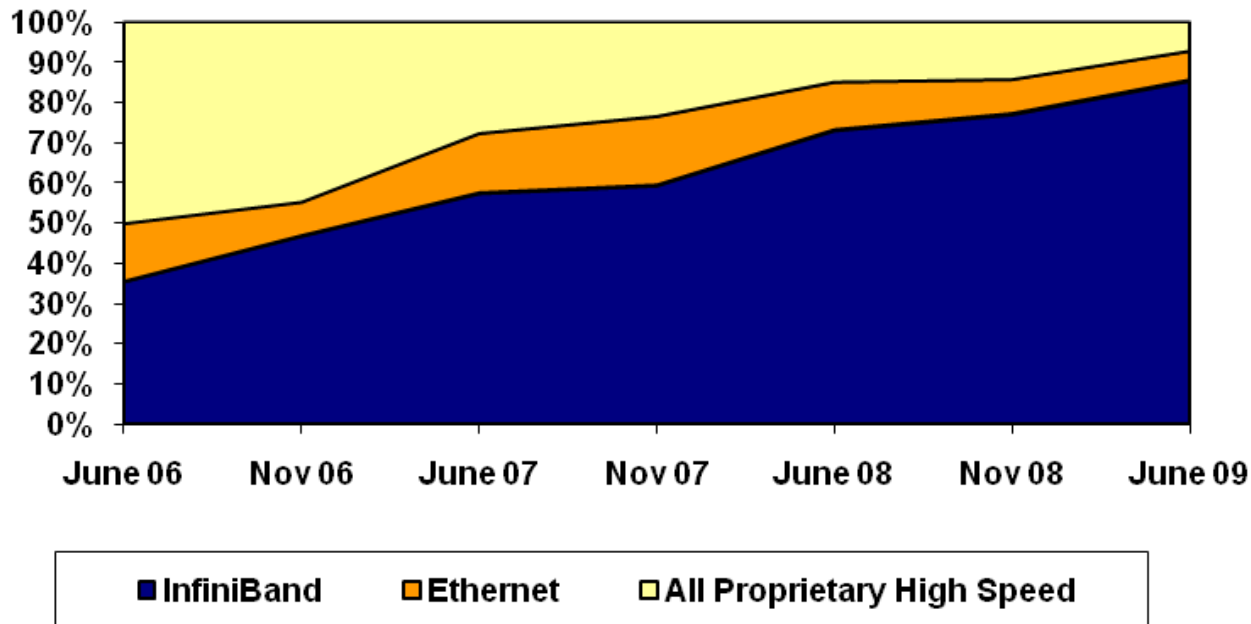
## Top100 Interconnect Trends



- **InfiniBand is the leading interconnect in the Top100**
  - 59 clusters, 20% higher than June 2008 list
  - Almost 12X the number of GigE based systems
  - Almost 12x the number of all the proprietary high speed interconnects based systems
- **InfiniBand is the only growing high-speed interconnect**



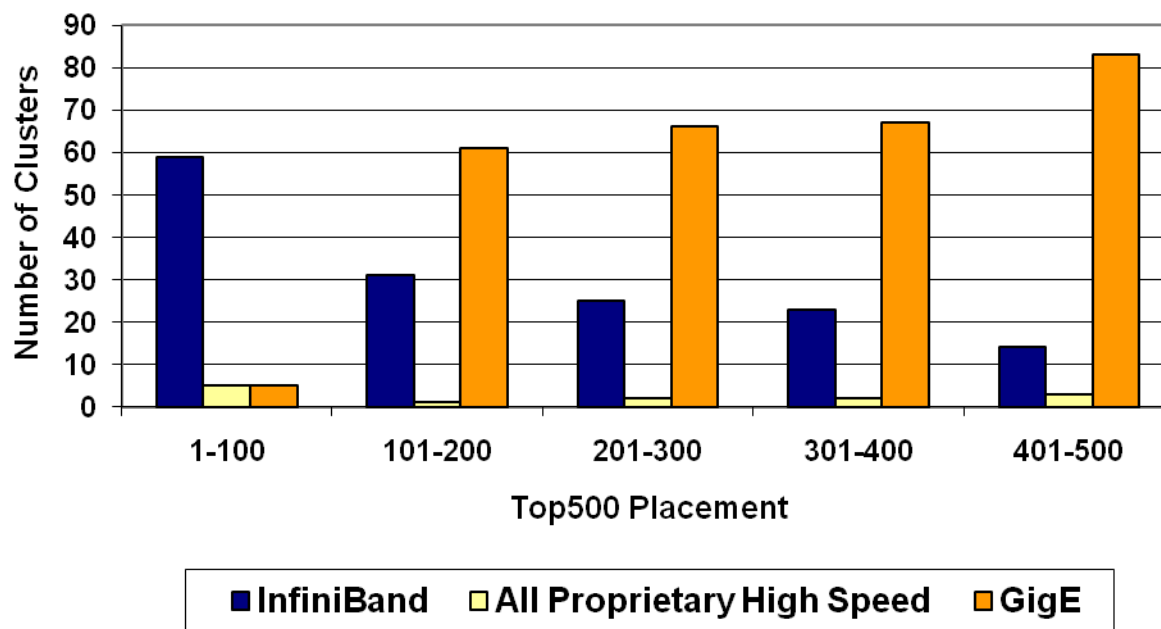
## TOP100 Clustering Interconnect Share Over Time



- **InfiniBand the natural choice for large scale computing**
  - All based on Mellanox InfiniBand technology



## Top500 Interconnect Placement

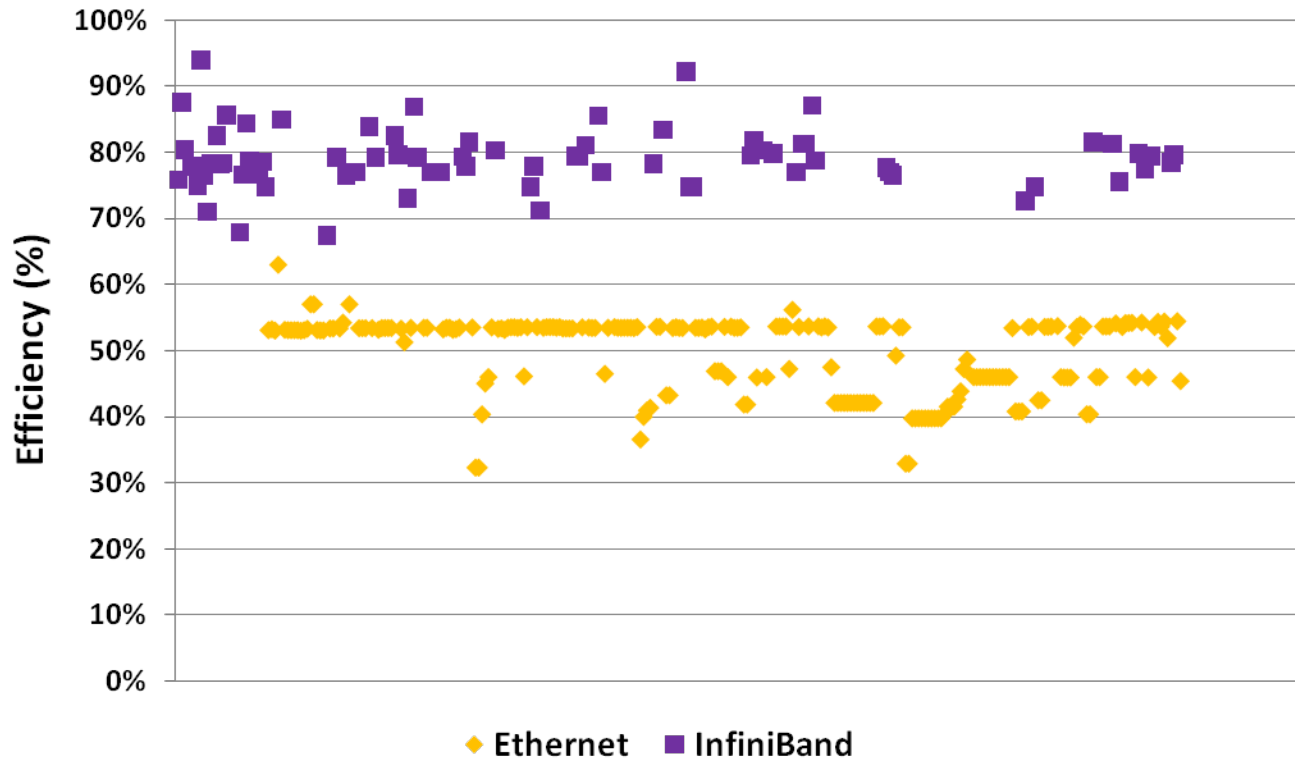


- **InfiniBand is the high performance interconnect of choice**
  - Connecting the most powerful clusters, providing the highest system utilization
- **InfiniBand is the best price/performance connectivity for clusters**
  - For all cluster sizes, for all applications
- **All InfiniBand clusters use Mellanox switch solutions**
  - 149 out of the 152 clusters use Mellanox InfiniBand HCA adapters



- **Mellanox InfiniBand connects 8 of the 10 most efficient systems**
  - Up to 94% efficiency/utilization, only 6% less than the theoretical limit
    - The other 2 systems are proprietary based
  - All top 3 efficient systems are based on Mellanox InfiniBand solutions
  - 50% higher utilization versus the best Ethernet system on the list
  
- **InfiniBand enables the highest utilization in the Top10 systems**
  - In average, 15% higher efficiency compared to Top10 systems average
  
- **Mellanox InfiniBand solutions enable HPC users with return on investment**
  - Best performance
  - Highest efficiency and utilization
  - Lowest power/performance

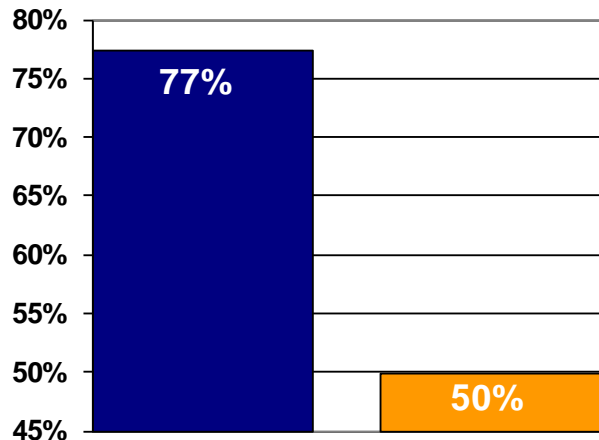
## Top500 Efficiency Comparison



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

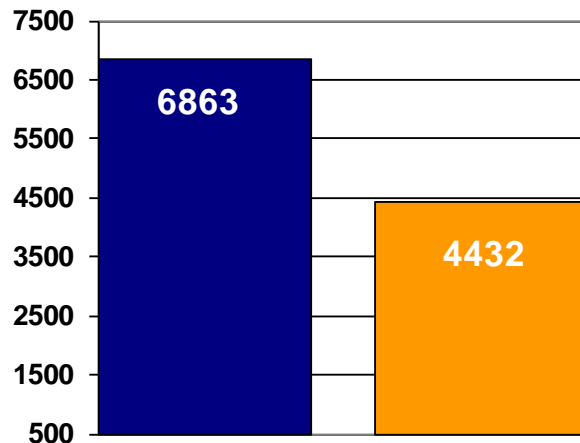
# Top500 Interconnect Comparison

## Efficiency



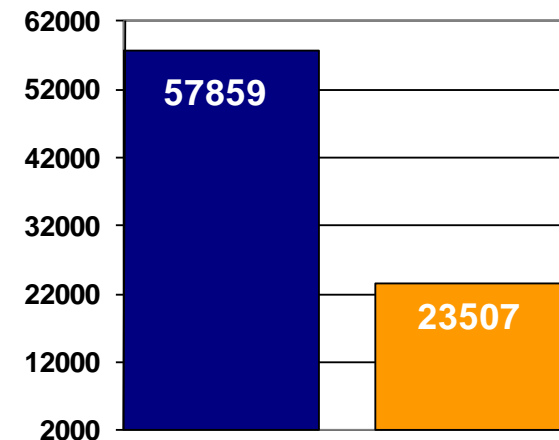
Average Cluster Efficiency

## Scalability



Average # of CPU per Cluster

## Performance



Average Cluster Performance in GFlops

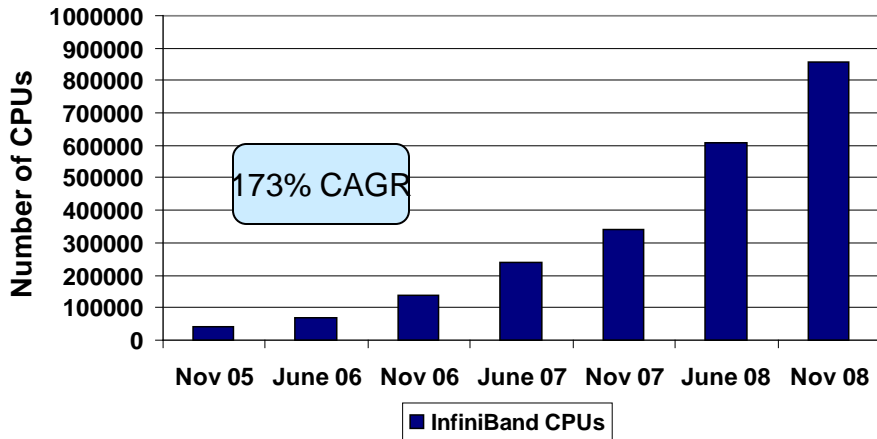
■ InfiniBand ■ GigE

InfiniBand maximizes the cluster's compute power

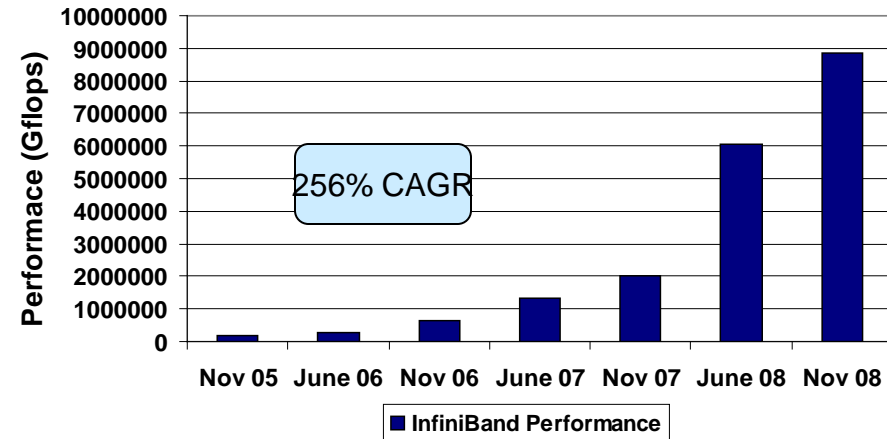
# InfiniBand Performance Trends



### InfiniBand Clusters - CPU Count



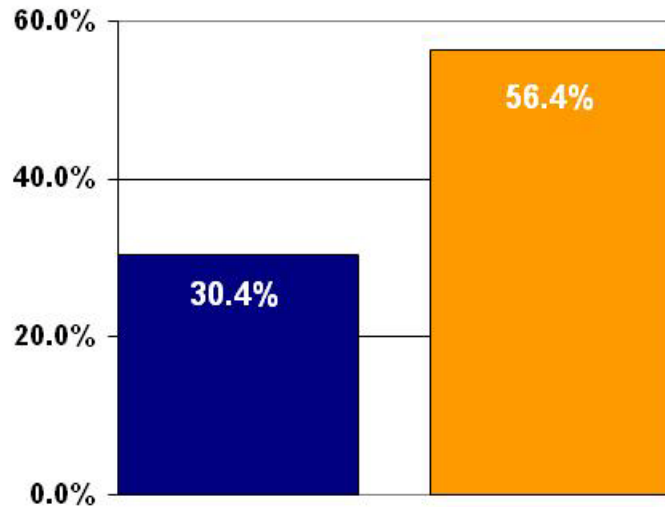
### InfiniBand Clusters - Performance



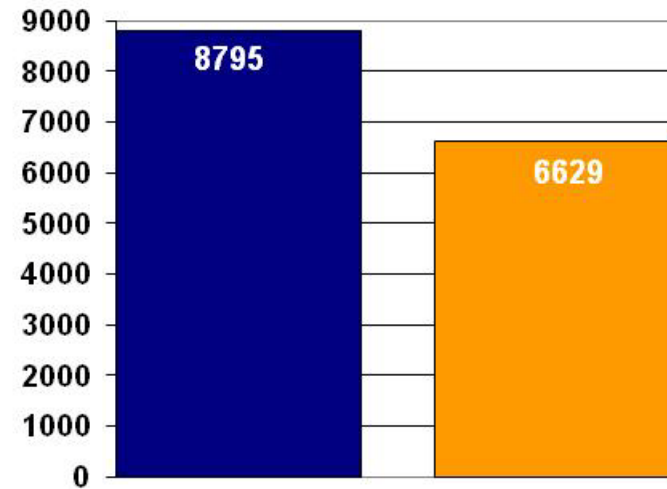
- Mellanox InfiniBand is the most efficient and scalable Interconnect
- Driving factors: performance, multi-core, productivity, consolidation



Top500 Interconnect Share



Top500 Interconnect Aggregate Performance (TFlop)



■ InfiniBand ■ GigE

- **InfiniBand provides 33% higher aggregate performance**
  - While connecting less number of systems

**For more information  
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