

Delivering World-Class I/O Solutions

InfiniBand Low Latency Technical Forum
September 17, 2007



CONFIDENTIAL

About Mellanox Technologies



- **Fabless semiconductor supplier founded in 1999**
 - Business HQ in California
 - Research & Development and Operations HQ in Israel
 - Global sales offices and support
 - 200 employees worldwide
- **Leading server and storage interconnect products**
- **Shipped over 2M 10 & 20Gb/s ports as of May 2007**
- **\$106M raised in an IPO Feb 2007 (NASDAQ: MLNX)**
 - Dual Listed on Tel Aviv Stock Exchange as of Jul 9, 2007 (TASE: MLNX)
 - Profitable since 2005
- **Revenues: FY'06=\$48.5M, 1Q'07=\$16.9M, 2Q'07 Rev=\$19.8M**

10Gb/s+ Connectivity Market Drivers



**Multi Core
CPUs**

More demanding
applications per server
and I/O



**Data Center
Consolidation**

Fewer servers
handling the growing
workload



**Networked
Storage**

More traffic per I/O
with server I/O
consolidation



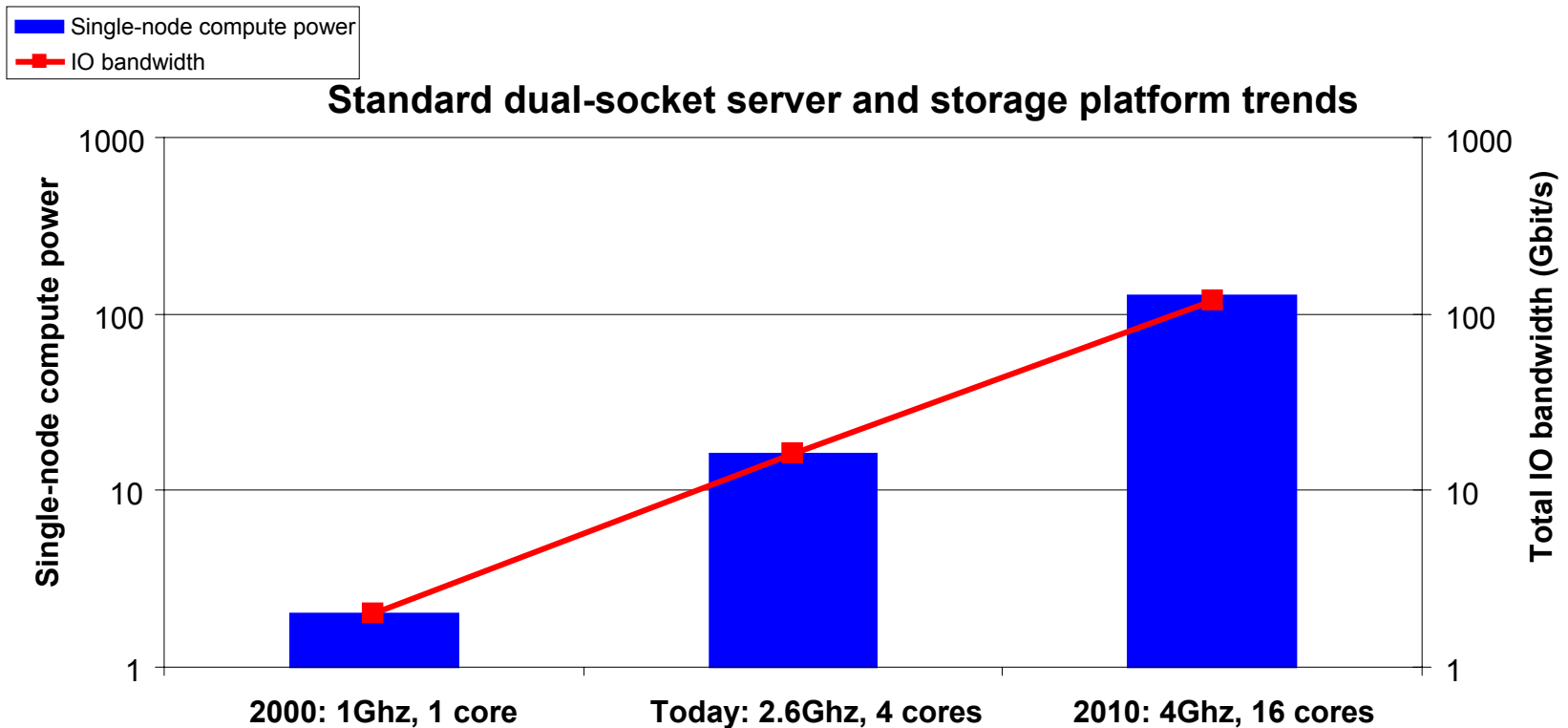
**Virtualized/
Shared
Resources**

I/O capacity per server
dictated by the most
demanding apps



**10Gb/s+
connectivity
for each
server**

I/O Performance Growth Trends



- **Amdahl's Law: Total server and storage system performance limited by the performance of the CPU, Memory or I/O**

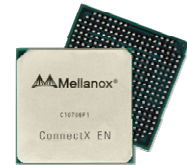
Multi-core CPUs demands 10Gb/s+ today

Mellanox InfiniBand Products



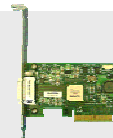
4th Generation

ConnectX™
Two 10/20/40 Gb/s InfiniBand



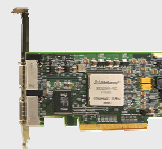
PCI EXPRESS™
2.0
Adapter

3rd Generation



One 10/20Gb/s

PCI EXPRESS™
Adapter



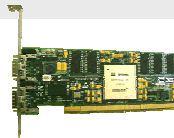
Two 10/20Gb/s IB

PCI EXPRESS™
Adapter



480, 960Gb/s Total
Switch

2nd Generation



Two 10Gb/s



160Gb/s Total
Switch

1st Gen.



40Gb/s Total



Adapter + Switch

2000

2001

2002

2003

2004

2005

2006

2007

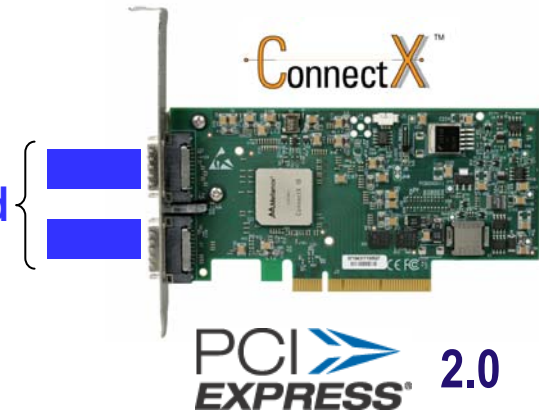
*Adapter Card Products Based on Adapter Silicon Not Shown

PCI Express 2.0 Adapters Available!

■ ConnectX IB Dual-Port 20Gb/s InfiniBand

- Delivers line rate on a single port
- 30% throughput increase (single-port)
- 100% throughput increase (dual-port)
- IB Copper and Active Fiber cables
- Up to a 25% latency improvement

InfiniBand



■ Double the bandwidth to host processors

- Backward compatible to PCI Express 1.1
- Servers and storage to ship in 4Q07

Excellent Out-of-the-Box Experience for InfiniBand HCAs



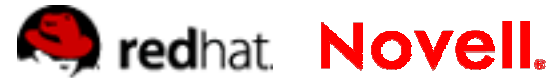
■ OpenFabrics Software

- OpenFabrics Enterprise Distribution (OFED) for Linux
- WinOF for Windows
- OFED 1.2.5 supports ConnectX IB HCAs



■ Linux OS Vendor In-the-box Support of OFED

- Red Hat Enterprise Linux (versions 4 and 5)
- Novell SUSE Linux Enterprise Server (version 10)
- Front-line support by Red Hat and Novell



■ Microsoft WHQL Certified

- Drivers from Mellanox
- Front-line support by Microsoft



■ VMware – Coming soon!



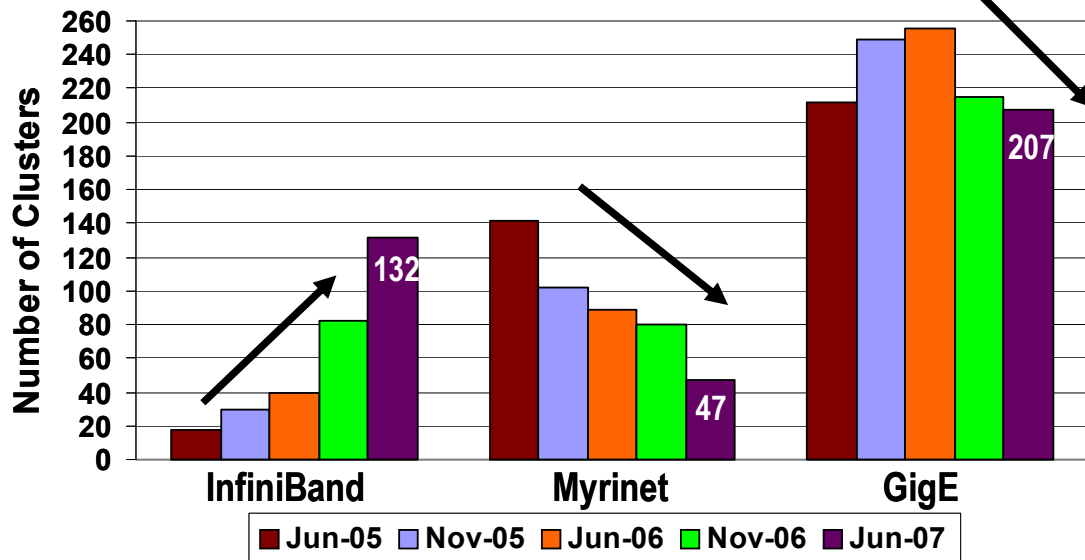
■ Sun Solaris, IBM AIX, HPUX operating systems

- Support by server OEMs



Interconnect Trends In The TOP500

Top500 Interconnect Trends

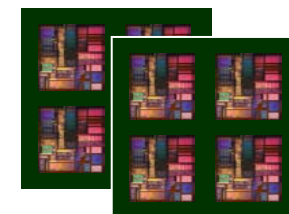
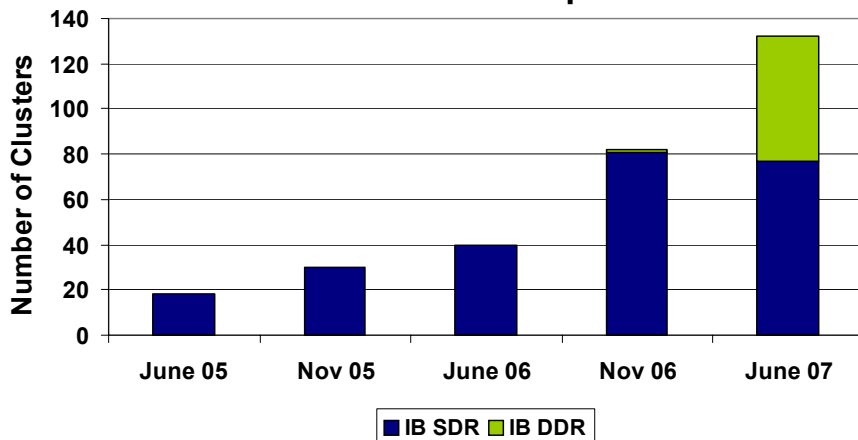


Growth rate from June 06 to June 07

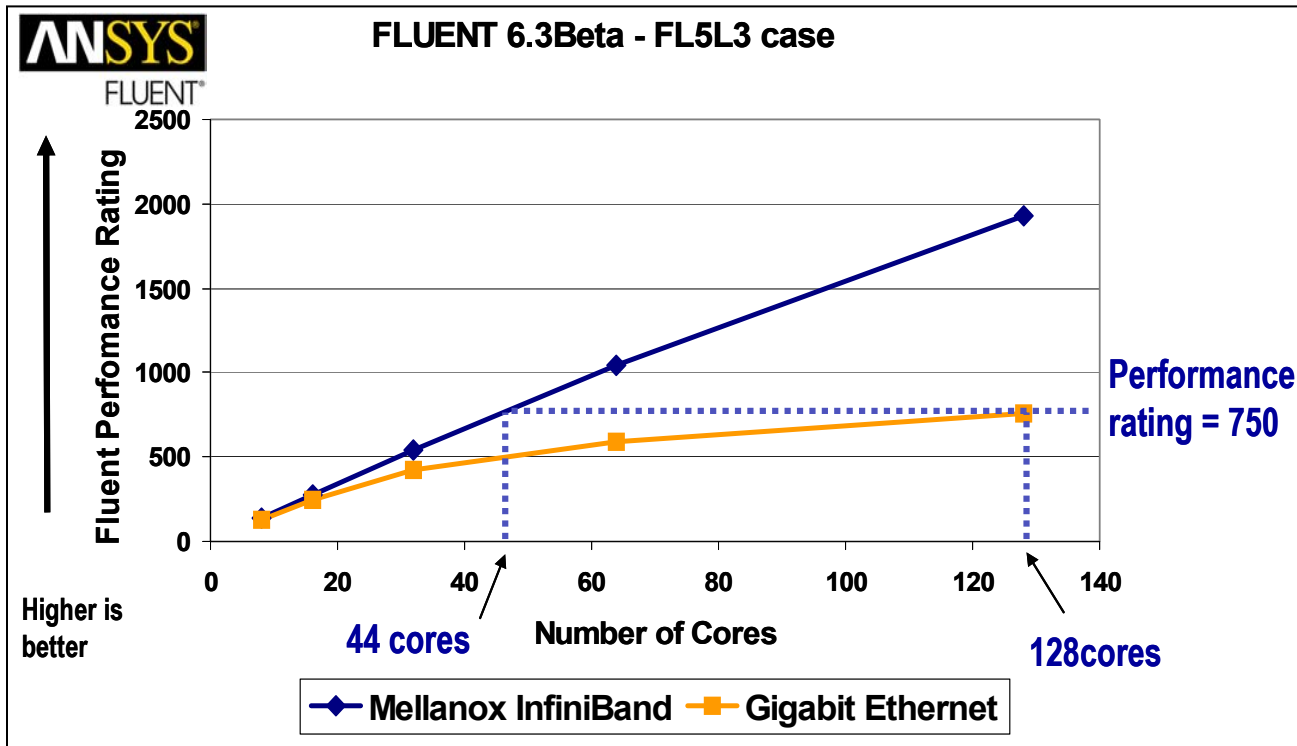
- InfiniBand: +230%
- Myrinet: -47%
- GigE: -19%

- Explosive growth of InfiniBand 20Gb/s
 - 55 clusters = 42% of the InfiniBand clusters
- 64% of the Top500 Uses Multi-Core CPUs

InfiniBand In The Top500



Proven Efficiency

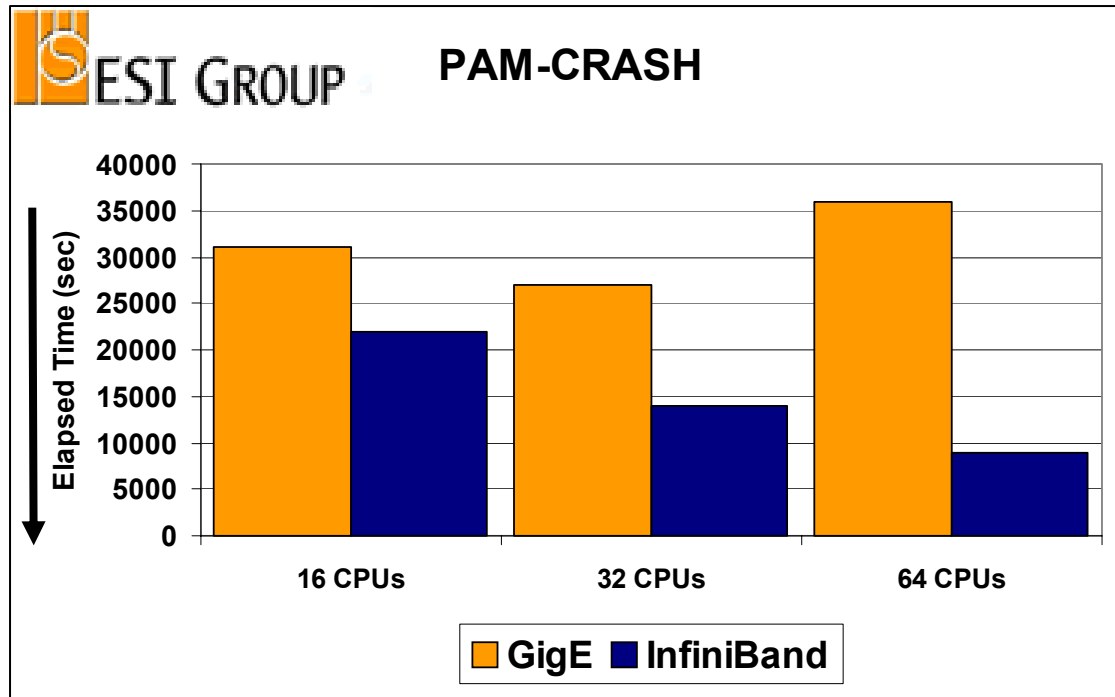


Fluid dynamics
simulation
benchmark

44 cores with
IB=128 cores
with GigE

- The efficiency of IB enables end-users to do more with less
- Reduces power, cost, floor space and TCO

Proven Scalability

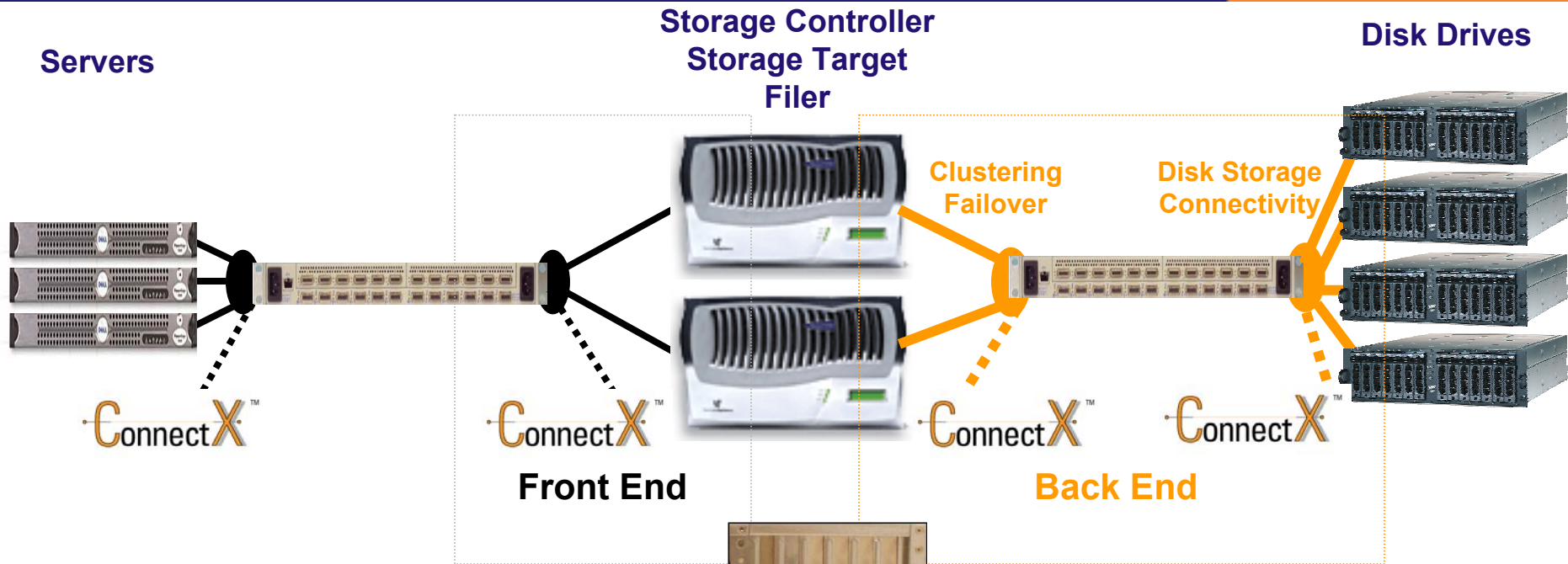


Car crash
simulation
benchmark

Scale # of CPUs
to get
increasingly
better
performance

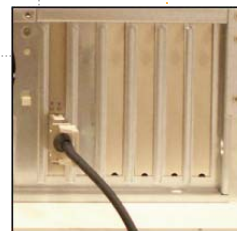
- The scalability of IB enables the addition of computing to deliver increased performance efficiently
- Scale server nodes to many cores & clusters to 10K+ nodes

Storage Front End and Back End



■ InfiniBand

- SRP/iSCSI/iSER
- NFS/CIFS/NFS-RDMA
- Clustered File Systems
- FCoIB (future)

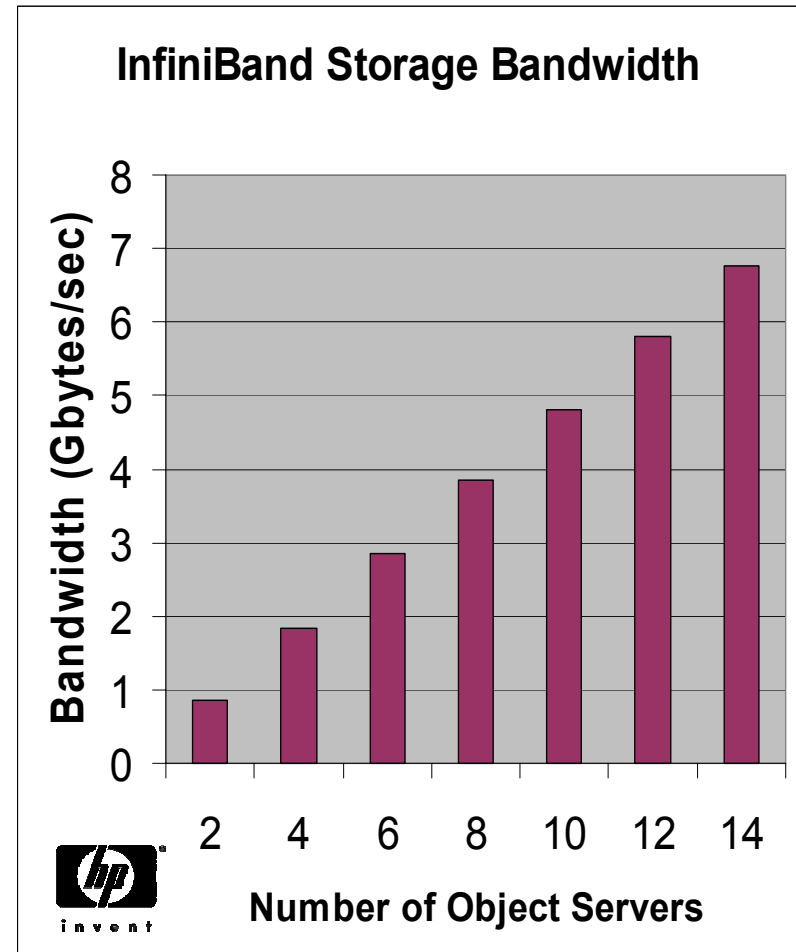


Clustering
Communications
Storage
Management

“One Wire”

Scalability for Storage Clusters

- **Additional bandwidth with each additional Storage Server**
- **GB/s, 10s of GB/s, and even 100s of GB/s possible**
- **~7 GB/s striped across 14 servers shown here**
 - HP StorageWorks Scalable File Share 2.1 on Voltaire InfiniBand with Lustre™ protocols



#1 Price/Performance TPC-H Benchmark

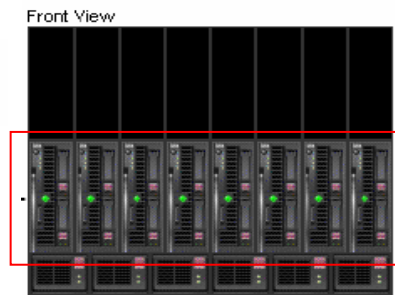


- 20Gb/s InfiniBand unified fabric
- First “all-blade” server and storage benchmark
 - 8 compute servers for DB
 - 16 storage servers
- 30% power/cooling
- 20% floor space
- 40% 3 year TCO of storage subsystem

ORACLE DATABASE 10^g

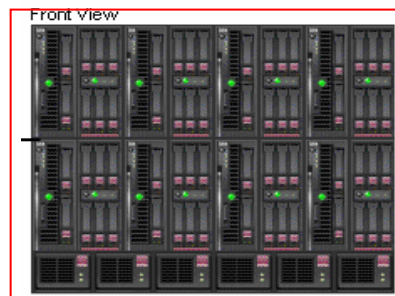
HP comparison vs. rack servers and economical SAN

Enclosure: IBAppliance1



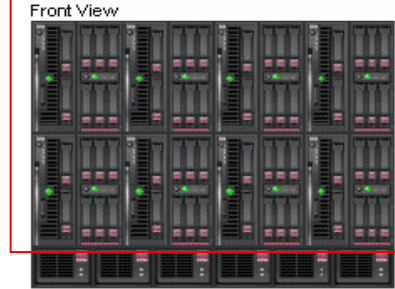
Database Servers w/ IB

Enclosure: IBAppliance2



Storage Servers w/ IB and SAS disks

Enclosure: IBAppliance3



InfiniBand Interconnect

300 GB Results		www.tpc.org			
Rank	Company	System	QphH	Price/QphH	System Availability
1		HP BladeSystem ProLiant BL460c IB Cluster 16P DC	39,613	12.57 US \$	09/15/07



Mellanox Cluster Center To Test Drive Apps



- <http://www.mellanox.com/applications/clustercenter.php>

- **Helios cluster**

- 32 nodes
- Quad core Intel Clovertown CPUs

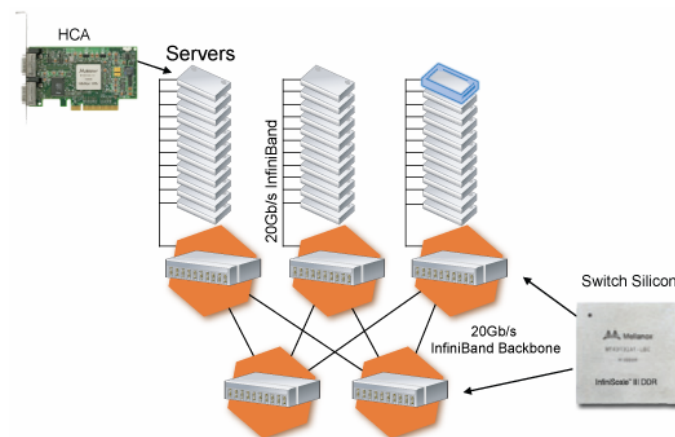
- **Utilizing “Fat Tree” network architecture (CBB)**

- Non-blocking switch topology
- Non-blocking bandwidth

- **ConnectX InfiniBand 20Gb/s**

- **InfiniBand based storage**

- InfiniBand storage
- NFS over RDMA, SRP



- **Mellanox InfiniBand addresses top data center issues**
 - Power & Cooling
 - Scaling Performance & Capacity
 - Footprint Space
 - Management & Operational Cost
- **InfiniBand is well established in HPC – fast expanding to commercial and enterprise applications**
- **InfiniBand scales BOTH computing and storage**
- **PCI Express 2.0 InfiniBand adapters available extending performance leadership**