



# Measuring Interface Latencies for SAS, Fibre Channel and iSCSI

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# Demartek Company Overview

- Industry analysis with on-site test lab
- Lab includes servers, networking and storage infrastructure
  - Fibre Channel: 4 & 8 Gbps (16Gb soon)
  - Ethernet: 1 & 10 Gbps (including NFS, CIFS, iSCSI & FCoE)
  - Servers: 8+ cores, very large RAM
  - Virtualization: ESX, Hyper-V, Xen
- We prefer to run real-world applications to test servers and storage solutions
  - Currently testing various SSD and FCoE implementations
- Web: [www.demartek.com](http://www.demartek.com)

- Demartek Deployment Guides
  - Completed: iSCSI – May 31, 2011
  - In-progress: SAS, SSD & 16Gb Fibre Channel
  
- Free Monthly Newsletter
  - [http://www.demartek.com/Newsletter/Newsletter\\_main.html](http://www.demartek.com/Newsletter/Newsletter_main.html)
  - Text “DemartekLabNotes” to 22828
  
- Storage Interface Comparison
  - [http://www.demartek.com/Demartek\\_Interface\\_Comparison.html](http://www.demartek.com/Demartek_Interface_Comparison.html)
  - Internet search for “Storage Interface Comparison”

# Latency is Important

- OLTP applications require short response times (small latencies)
  - Some transactions require several successive queries in order to provide complete response
- HDDs have same maximum RPM (15000) as a decade ago, limiting latency improvements
- RAID5 striping and latency
  - Latencies can actually increase with large disk groups!
  - [http://en.wikipedia.org/wiki/Standard\\_RAID\\_levels#RAID\\_5\\_latency](http://en.wikipedia.org/wiki/Standard_RAID_levels#RAID_5_latency)

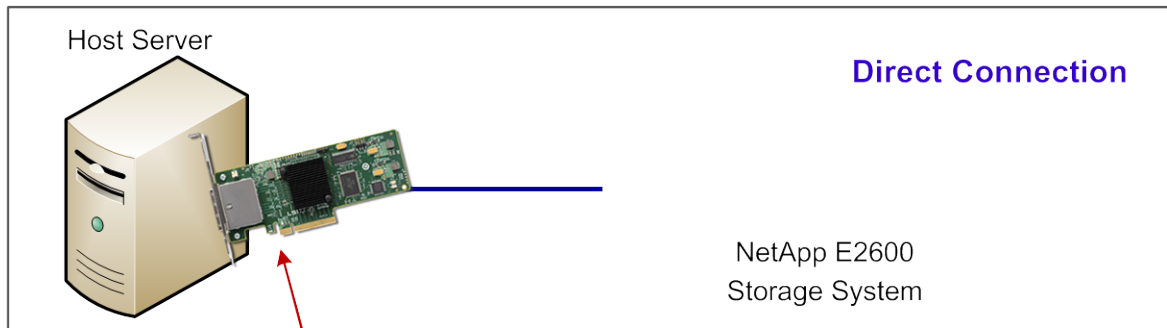
# Host Storage Interfaces

- The host storage system interface matters
- We compared the performance and latency of the same storage system with multiple host interfaces
- What kinds of performance and latency would you expect from these four host interfaces?
  - 1Gb iSCSI, 10Gb iSCSI, 6Gb SAS, 8Gb FC

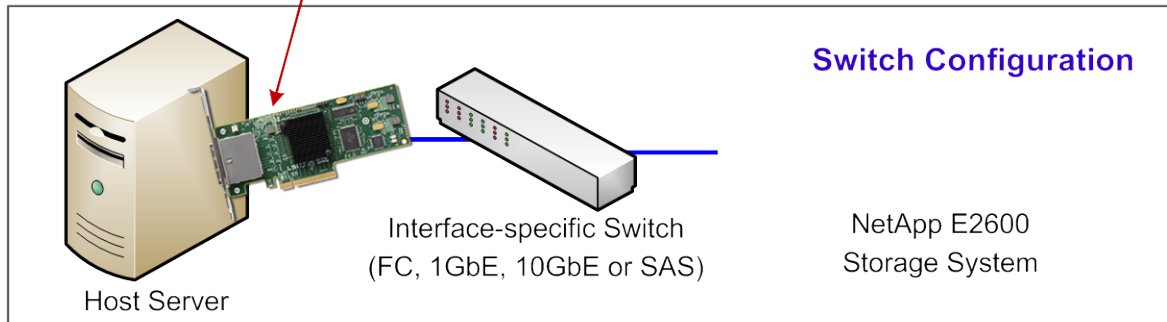
# Evaluation Environment



## NetApp E2600 Fibre Channel, iSCSI & SAS Host Interface Latency Evaluation

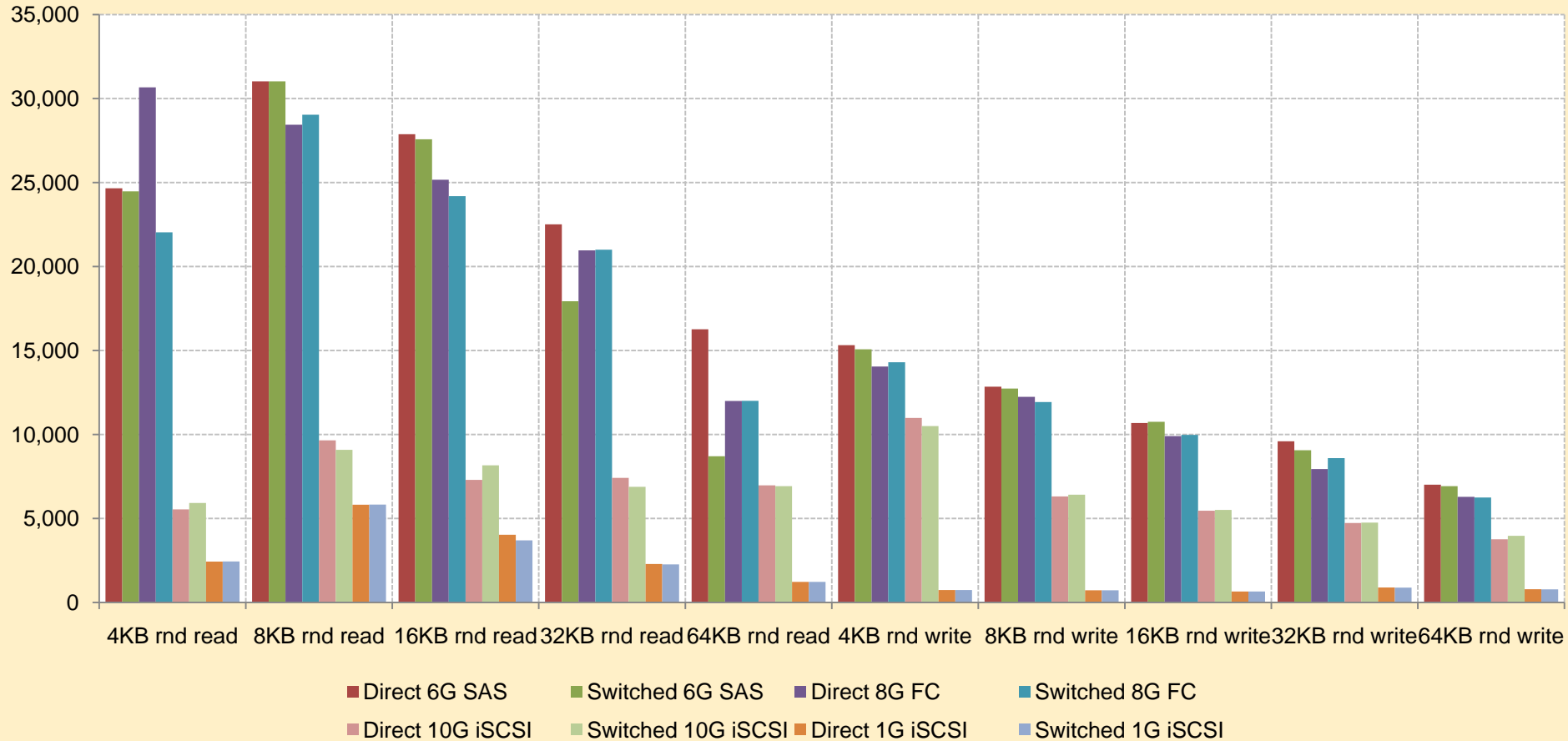


Specific adapters for  
FC, iSCSI & SAS



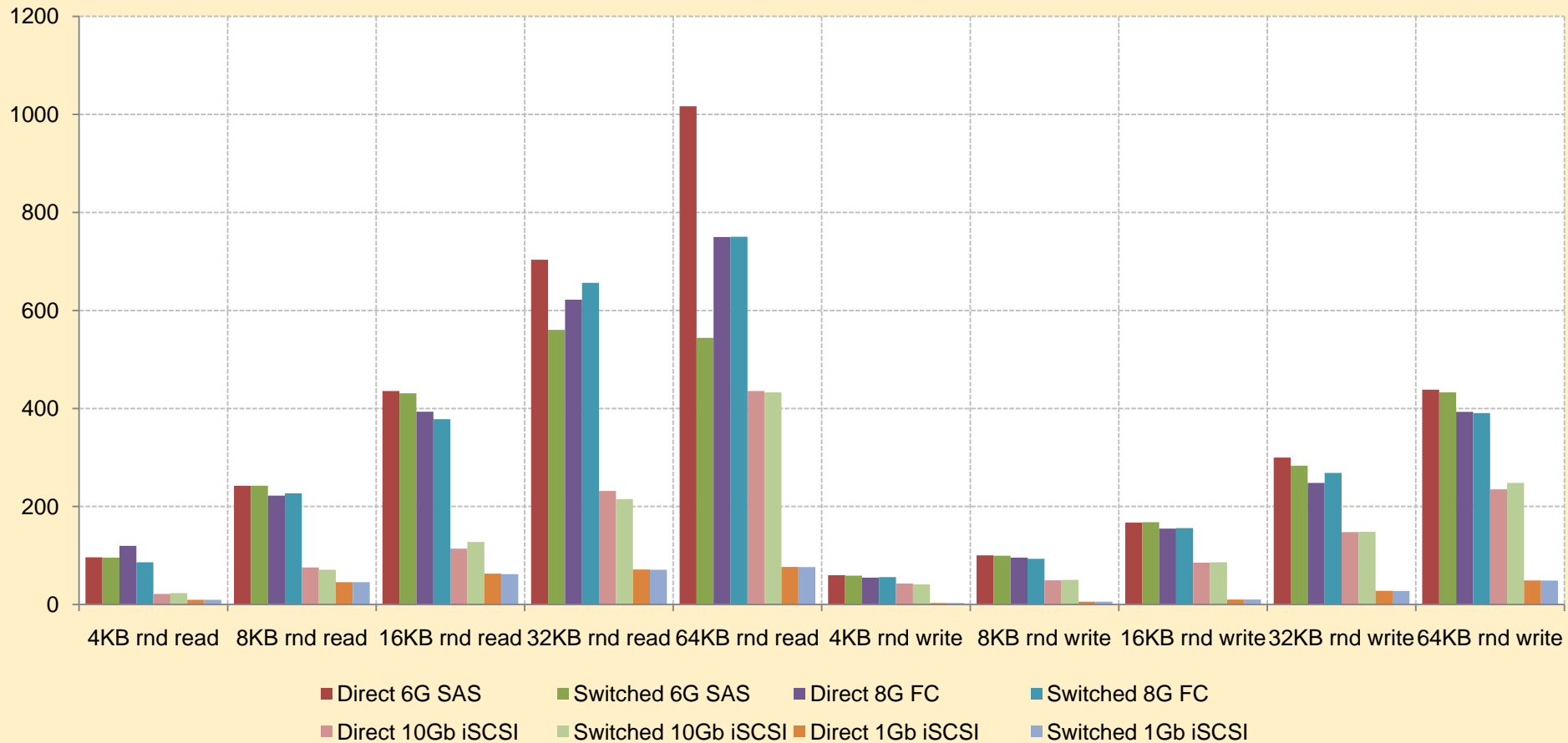
# Performance – Random IOPS

## SQLIO - IOPS (Random)



# Performance – Random MBPS

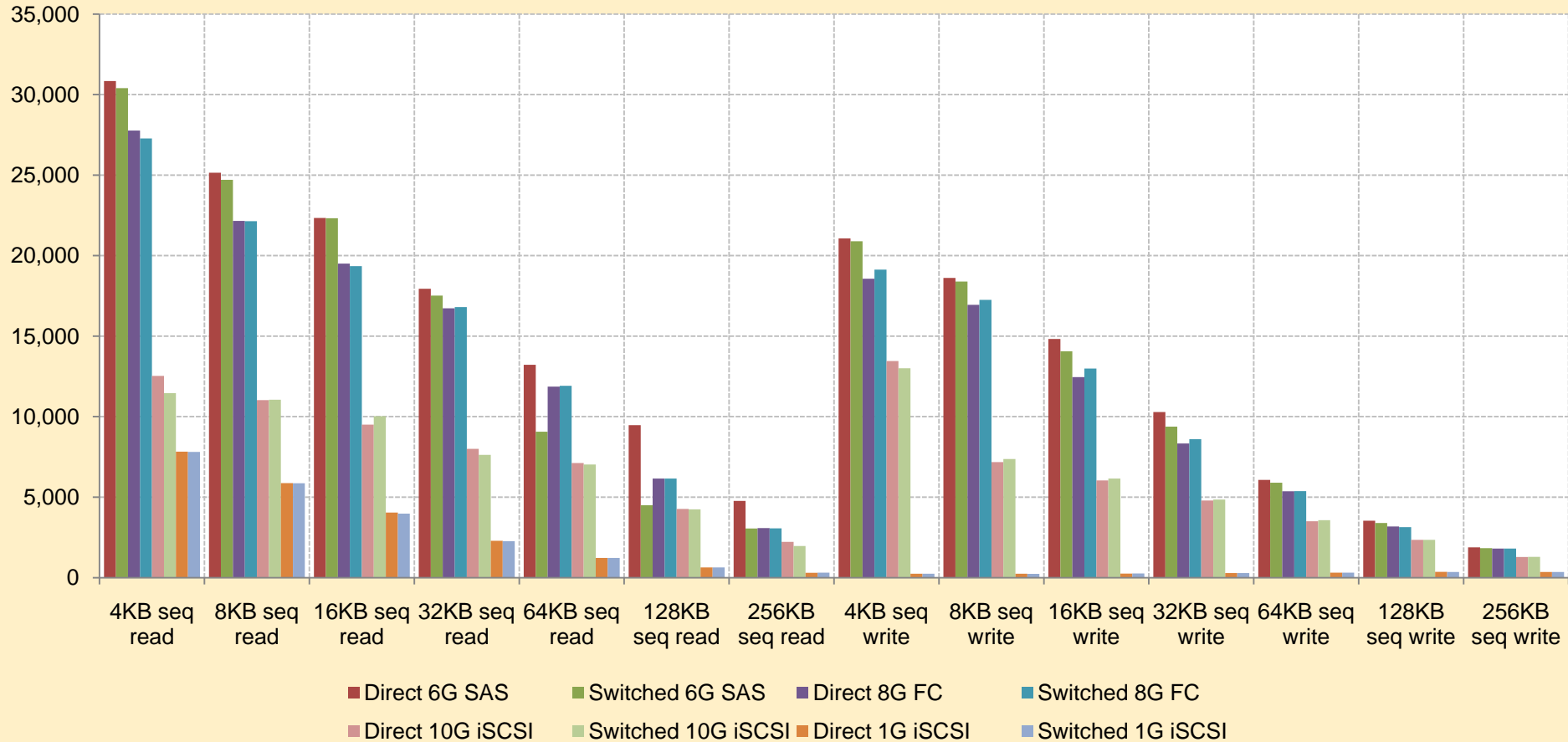
## SQLIO - MBPS (Random)





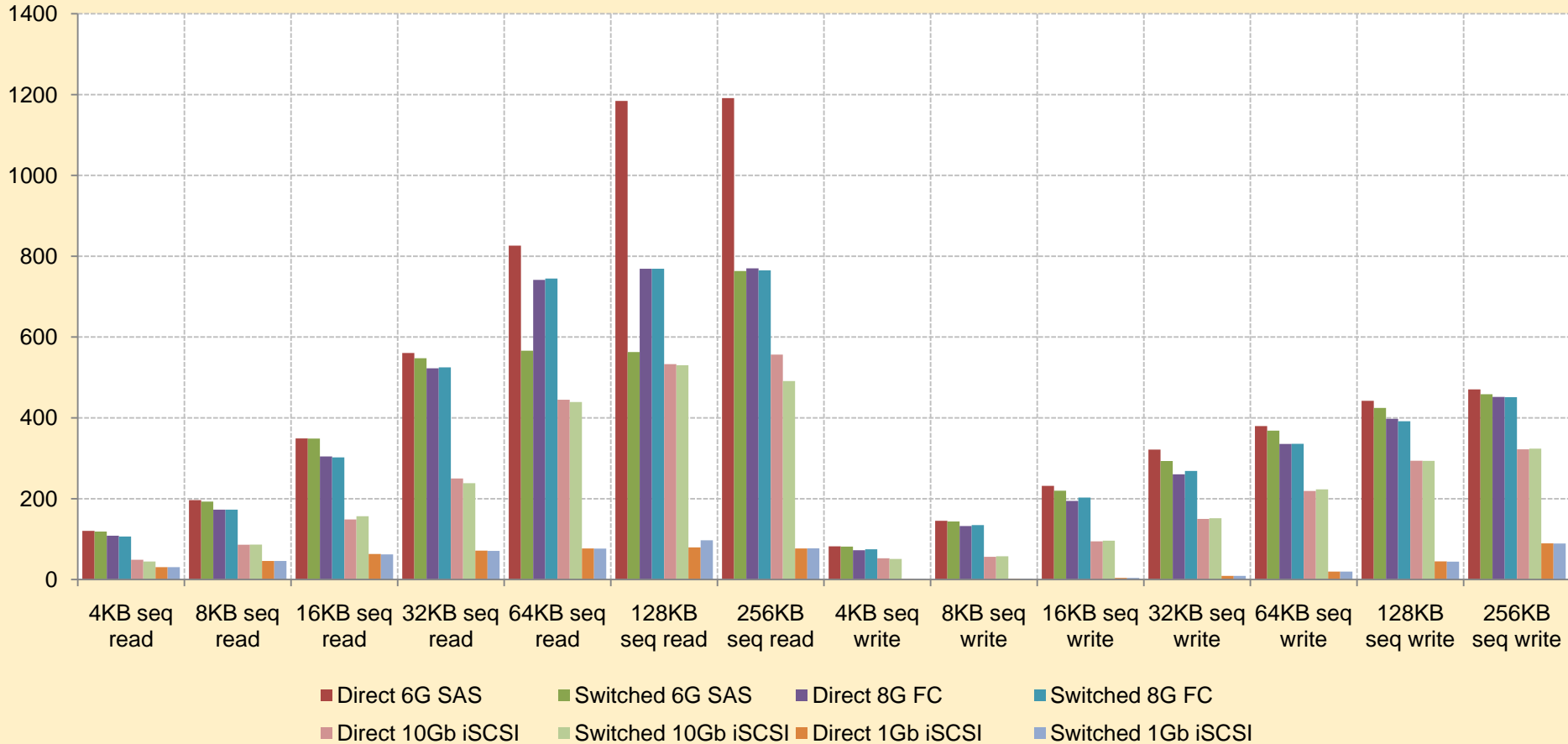
# Performance – Sequential IOPS

## SQLIO - IOPS (Sequential)



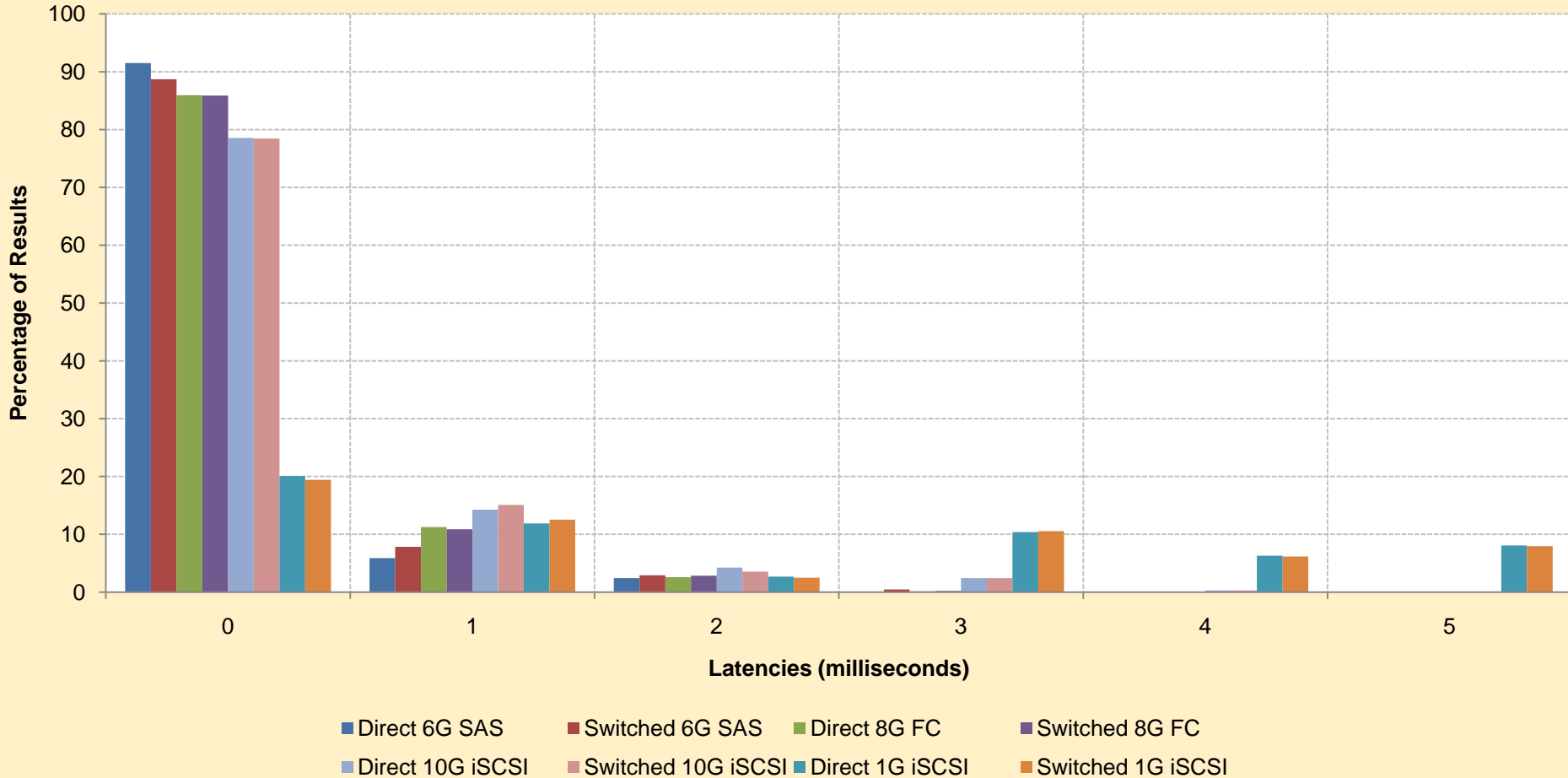
# Performance – Sequential MBPS

## SQLIO - MBPS (Sequential)



# Performance – Latencies up to 5ms

## Latencies - Up to 5 ms



# Performance Summary

- Performance rankings for this test:
  1. 6Gb SAS
  2. 8Gb FC (close second)
  3. 10Gb iSCSI
  4. 1Gb iSCSI
  
- iSCSI imposes additional overhead, and even at 10Gb, has higher latency than 6Gb SAS and 8Gb FC

- Some real-world applications are moving towards larger I/O block sizes and more importance on bandwidth
- Virtualized servers result in higher percentage of random I/O for storage systems
- Deployment of SSDs can increase CPU utilization and network bandwidth needs
- I believe that at the current rate of price decreases and capacity increases, SSDs (probably NAND flash) will become the new standard for tier-1 storage by 2012

# Demartek SSD Resources

- Demartek SSD Zone
  - [www.demartek.com/SSD.html](http://www.demartek.com/SSD.html)
  
- Demartek involved in ongoing real-world testing of SSDs
  
- Contact me regarding our upcoming Deployment Guides (SAS, SSD, 16Gb FC)



## Contact Information

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