



Session 201-B: Accelerating Enterprise Applications with Flash Memory

Rob Larsen

Director, Enterprise SSD

Micron Technology relarsen@micron.com

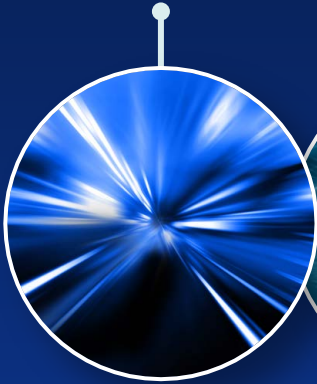
The logo for the Flash Memory Summit features a stylized yellow sunburst with multiple rays. The word "Flash" is in red, "Memory" is in blue, and "SUMMIT" is in white on a blue rectangular background.

Flash Memory Summit Agenda

- Target applications
- Addressing needs and challenges with PCIe
- Database example
- Virtualization example
- Conclusion

Typical Enterprise Applications

Analytic
Acceleration



VDI
Infrastructure



Big
Data



In-Server
Caching



Database
Applications



Data-Intensive
Virtual Machines



All improved by PCIe SSDs

800K PCIe SSD
300 HDD
Random Read IOPS

Customer Needs & Challenges



Database Applications



Virtualization Appliances

Challenges

High latency
Low performance
High I/O traffic
Unacceptable query times

Boot storms
Equipment allocation
Low performance

Needs

Low latency
High performance
Reduced footprint
Low cost
Caching capabilities

Scalable to meet burst traffic needs
Reduced footprint
Low cost
High performance

PCIe SSDs to the Rescue



Database
Applications



Virtualization
Appliances

Product Value

Increased IOPS
Low CPU utilization
High endurance/capacity

Increased apps performance
Caching capabilities
Low latency
High IOPS/bandwidth/reliability

Scaleable
High performance
Small footprint

TCO Value

Increased IOPS &
improved bandwidth
reduce the amount of
equipment needed

Can be virtualized across
multiple servers allowing
decreased equipment footprint

Supporting multiple
simultaneous users
reduces cost/IOP
Manage boot storms
Low latency for instant response
and improved productivity

Example: Oracle Database



Pain Points

- Typically I/O bound
- Applications can be sluggish
- Centralize storage may lead to latency issues
- Scaling challenges



Needs

- High IOPS
- Low latency
- Reduced cost & footprint
- Increased application performance

OLTP Oracle Database Example



Four Configurations:

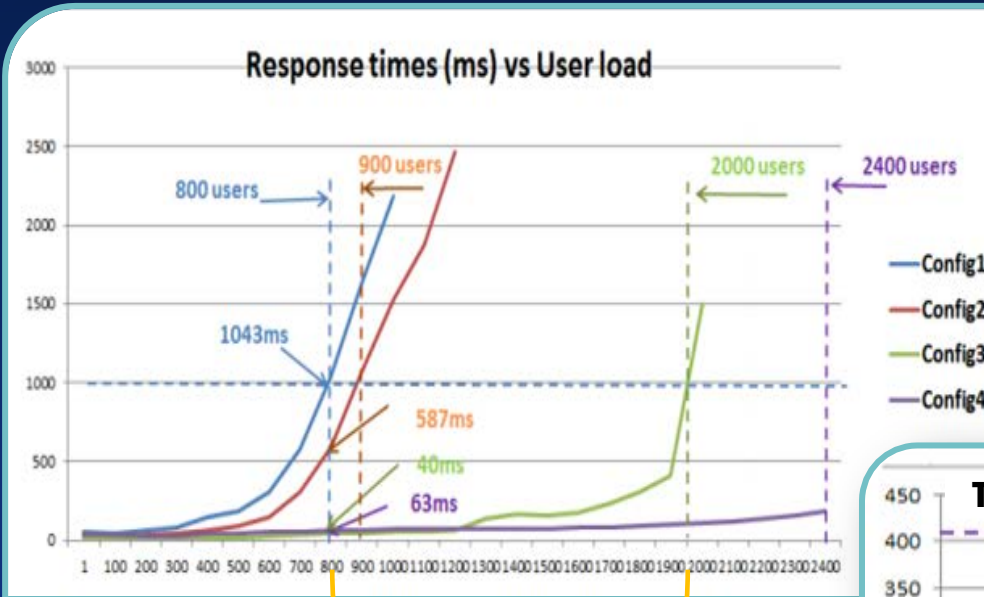
- 1 All Database objects in HDD (baseline)
- 2 Indexes stored in PCIe SSD, rest in HDD
- 3 All index +1 active table in SSD
- 4 All index +4 active tables in SSD



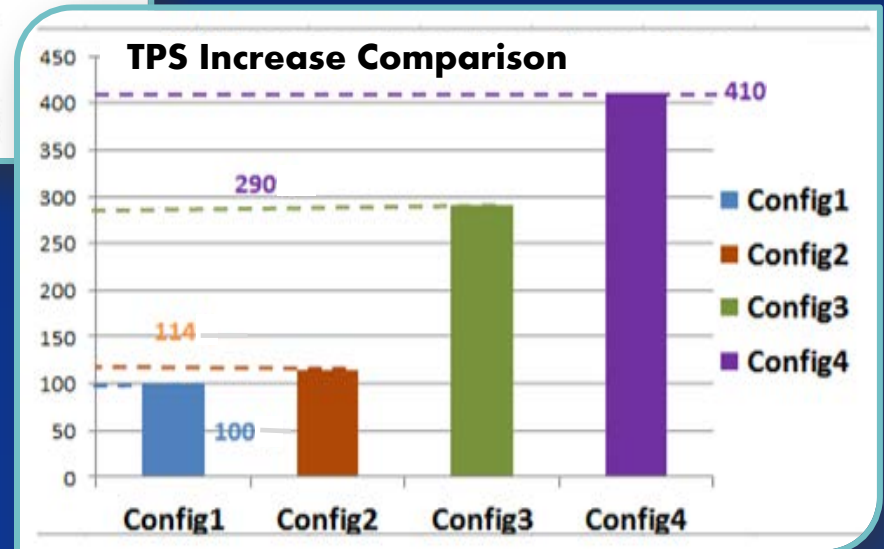
White Paper: PCIe SSD for oracle database performance

http://en.community.dell.com/techcenter/enterprise-solutions/m/oracle_db_gallery/20154176/download.aspx

OLTP Oracle Database Example



TCO:
2.5X More Users
@ equivalent response time (1000ms)



Example: Virtualization



Server Virtualization

Sensitive to IO and CPU latency, needs scalability



Desktop Virtualization

Requires more RAM and HDD capacity

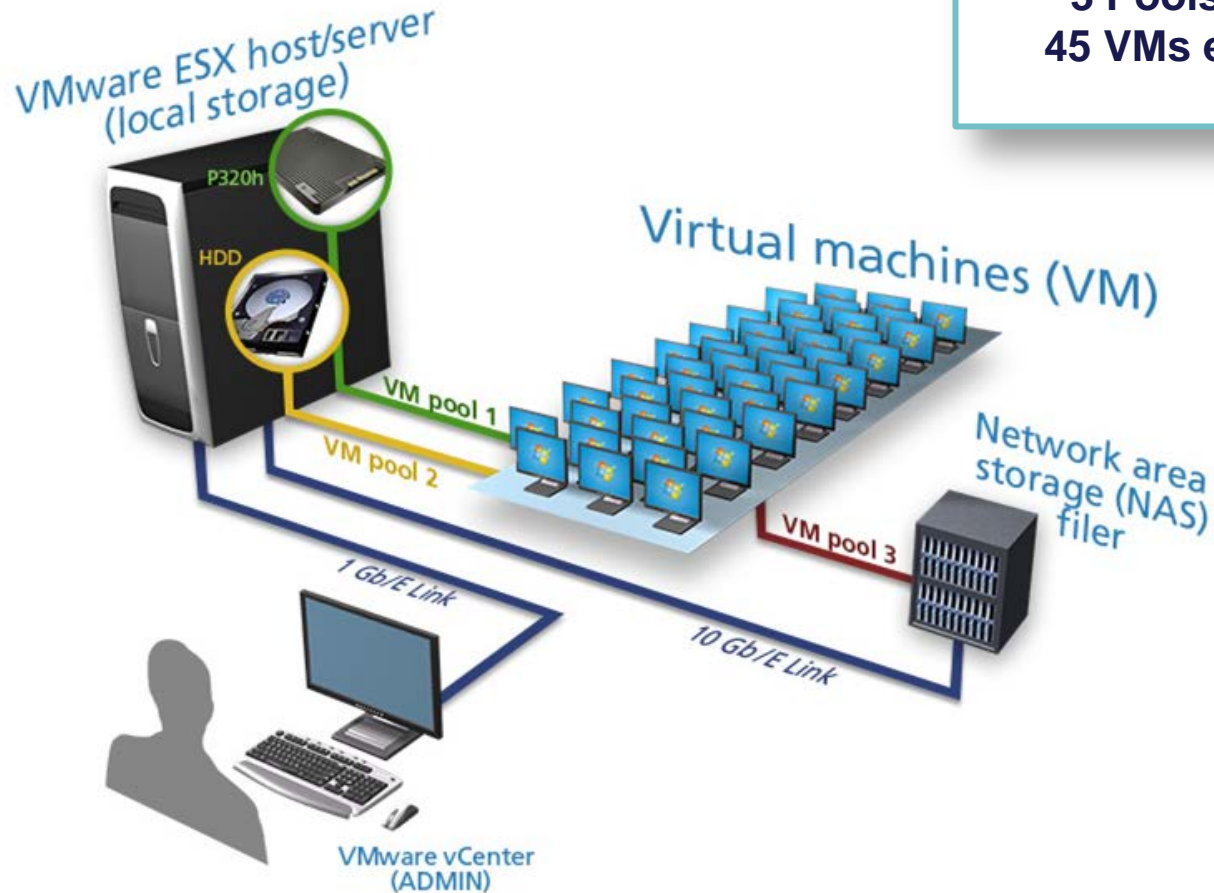


Virtual Desktop Integration (VDI)

IO storms are key technology issues

A Look at the VDI View

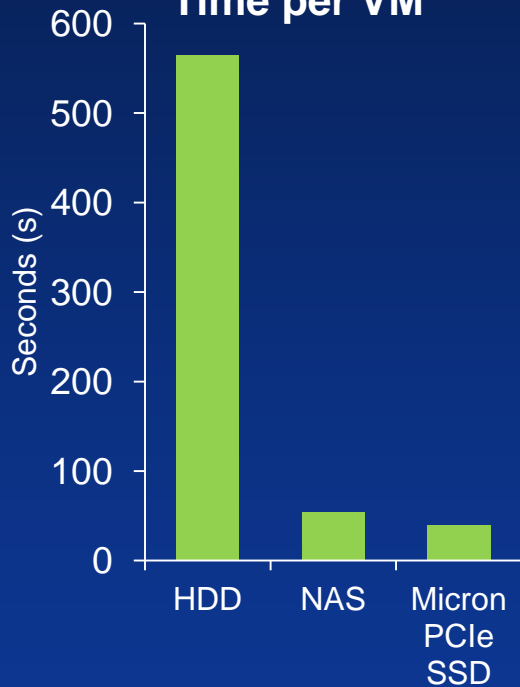
3 Pools of
45 VMs each



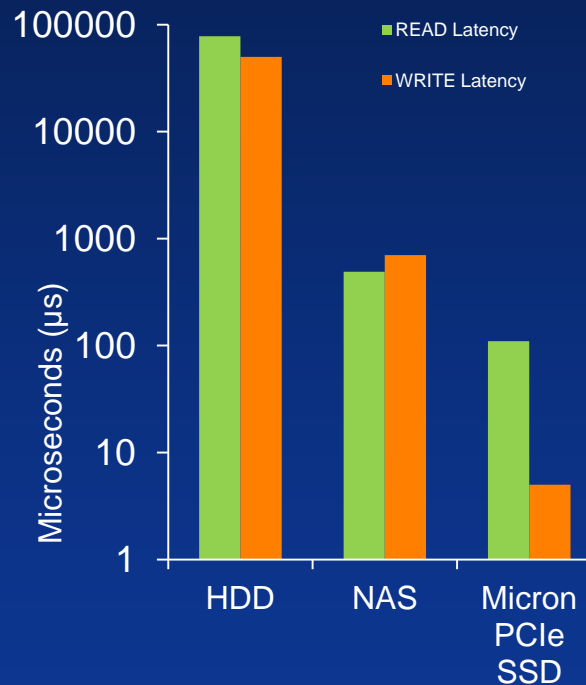
ESX Server	HP DL380 w/ 145GB local DRAM 2 Intel Xeon X5675 (3.06 Ghz/6 core/6 logical) Vmware ESX kernel ESX 5.1 build 5.1.0.914609, host cache enabled 128GB HDD, 700GB Micron P320H SSD
NAS Filer	NetApp 6240 filer w/ virtual machines on 650GB Raid Volume w/ 512GB Flash Cache
Network Connection	10Gb/E fibre link, 1ESX host server, 1Gb/E copper ports
Admin Tool	Vmware vCenter Operations Mgr, Vware View Manager

VDI Boot Storm Comparison

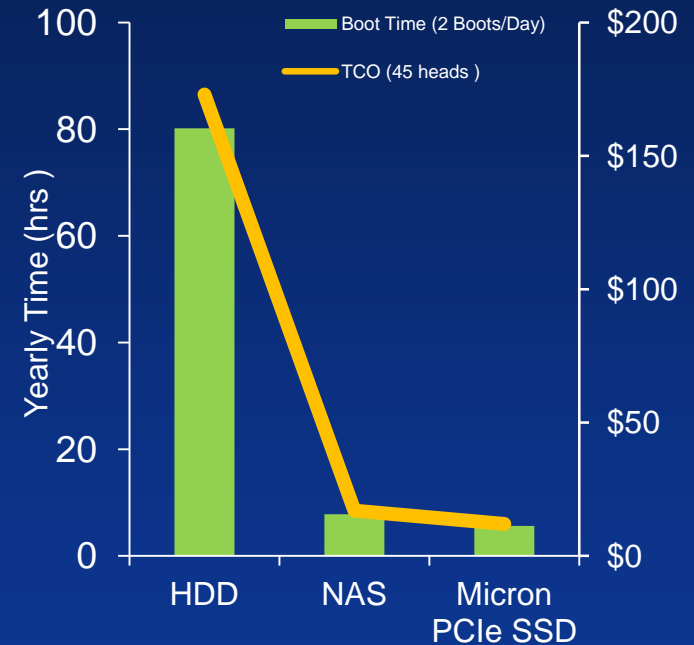
Average Initial Boot Time per VM



Latency Times



Total Cost of Ownership



[White Paper: P320h PCIe SSD Boot Storm Testing in Virtualized Environments](#)

Flash Memory Summit Conclusion

- Several classical enterprise applications benefit from PCIe
- PCIe's low latency and high IOPs enable improved system level responsiveness, scalability & reduced TCO



For more information: www.micron.com/enterprise-storage

