



SSD Form Factor Working Group

Driving industry standardization, innovation, and performance for the benefit of our customers.

Gary Kotzur, Technology Strategist - Dell

Jim Pappas, Director of Technology Initiatives - Intel



Customer Benefit Goals

Increased Performance of PCIe

High Availability and Serviceability

Compatibility: SAS/SATA/PCIe

Improved Power Efficiency

Reduced TCO

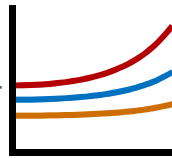
*other brands and names may be claimed as the property of others

Why PCIe Storage Standards?

Areas to Address

Performance Trends

Processor vs. Storage
Gap Increasing



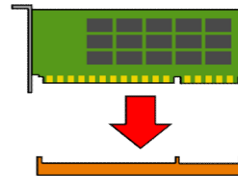
Serviceability

Internal Access
Cold-Plug



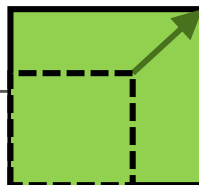
Interoperability

Card Form Factor
Varying Card Sizes



Scalability

Performance
& Capacity



PCIe SSD Benefits

Minimize Gap

Improved Latency
Improved IOPs

Remove Constraints

External Access
Hot-Pluggable

Common Form Factor

Drive Form Factor
Multi-protocol

Increased Slots

External Slots
“Live” Scaling

*other brands and names may be claimed as the property of others

Broad Industry Collaboration



Promoters

Contributors



Working Group Charter

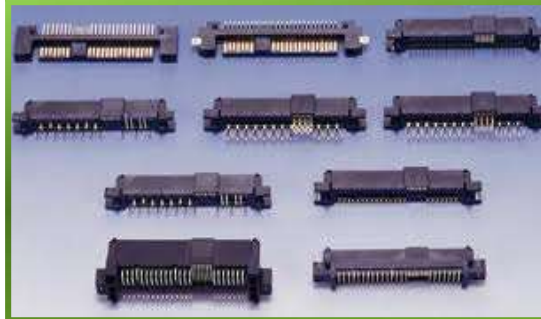
Promote enterprise storage usage of PCIe SSDs, by enabling serviceability, high-availability, ease of integration, interoperability and scalability of Solid-State Storage.

Key Focus Areas:

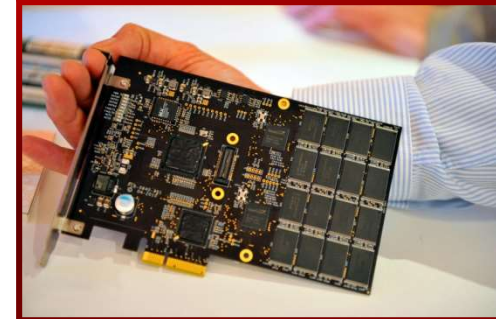
Form Factor



Connector



Hot-Plug



*other brands and names may be claimed as the property of others

Working Group Key Elements

Form Factor



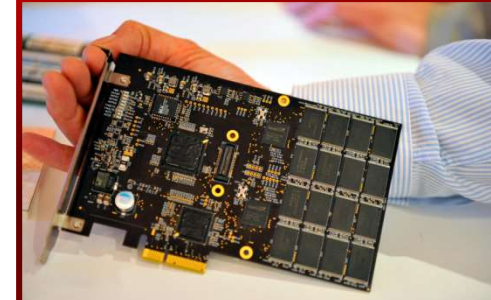
**Benefit from current 2.5”
HDD form factor**
Expand power envelope

Connector



Multiple protocols:
PCIe 3.0, SAS 3.0, SATA 3.0
Management Bus
Dual port (PCIe)
Multi-lane capability (PCIe/SAS)
Power pins
**SAS Drive Backward
Compatibility**

Hot-Plug



Hot-Plug Connector
**Identify desired drive
behavior**
**Define required system
behavior**

*other brands and names may be claimed as the property of others

PCIe Storage Strengths

Current PCIe SSD cards:

Well received by customers, have attained highest performance to date.

Complement existing storage protocols:

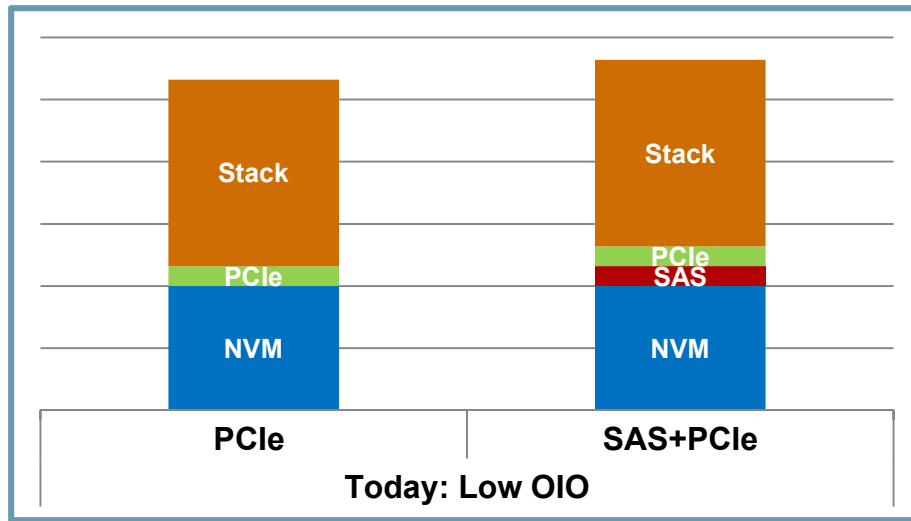
Providing highest IOPs and lowest latency for demanding applications

Obvious advantages: Reduced path components

- Lower costs
- Less real estate
- Less power
- Higher reliability
- Lower latency

*other brands and names may be claimed as the property of others

More on Latency ...



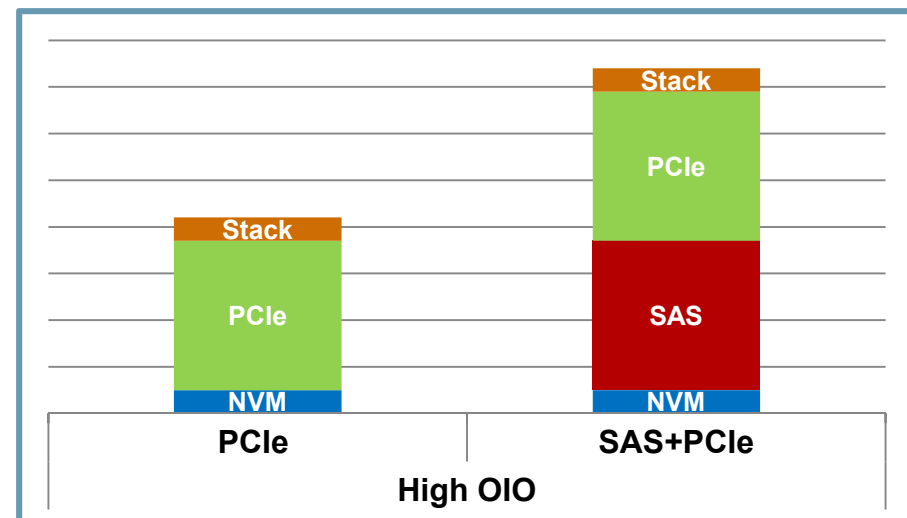
Today: Low OIO (Outstanding IO)

- High latency NVM and legacy stack can diminish interface latency benefits

Today: High OIO

Future: Upcoming advances

- Parallelism reduces NVM and stack aggregate latency, seen today in database work loads
- Future NVM can achieve low latency even at low OIO
- Path latency of a PCIe solution can be much lower than SAS solution, providing significant performance improvement



*other brands and names may be claimed as the property of others

Customer Benefits Summary

Increased Performance of PCIe

- High Throughput
- Low latency

High Availability and Serviceability

- Extended RAS capability in a common form factor
- Known drive replacement behavior

Compatibility

- Standardization reduces issues
- Single connector for SAS/SATA/PCIe

Improved Power Efficiency

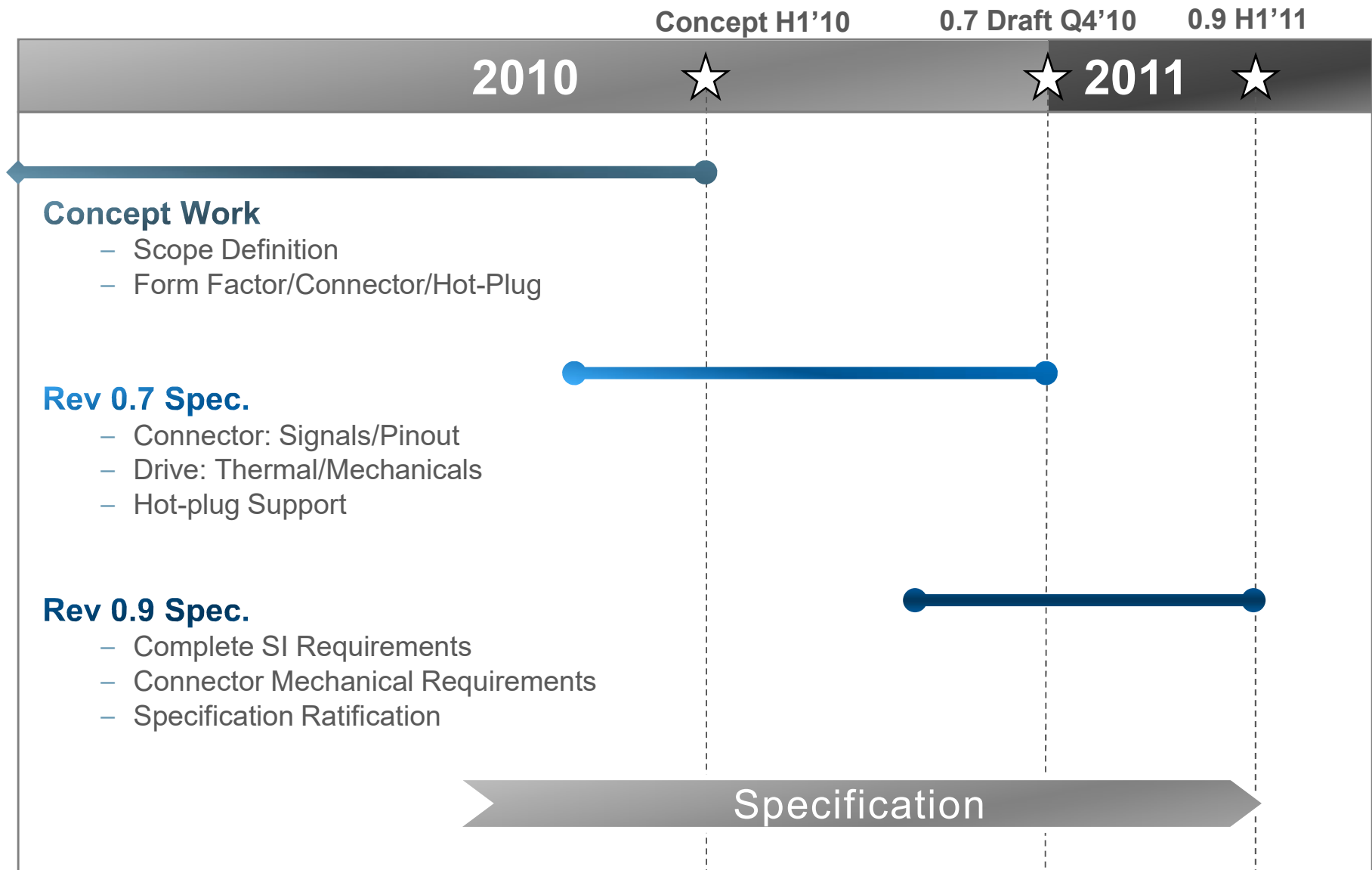
- Higher performance from same media
- Improved IOPs/Watt

Reduced TCO

- Reduce component complexity
- Improved \$/IOPs

*other brands and names may be claimed as the property of others

Timeline



For More Information

Website: <http://www.ssdformfactor.org>

Email: info@ssdformfactor.org

Dell

Andre_Fuochi@dell.com

EMC

Katryn.mcgaughey@emc.com

Fujitsu

Sigrun.Harsch@ts.fujitsu.com

Intel

Nick.knupffer@intel.com