

2013 *Creative* STORAGESM CONFERENCE

SATA Express PCIe Client Storage

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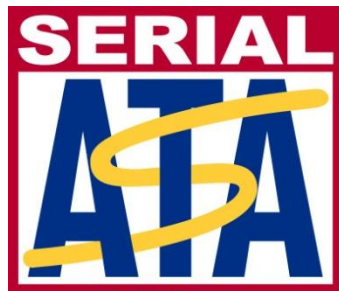
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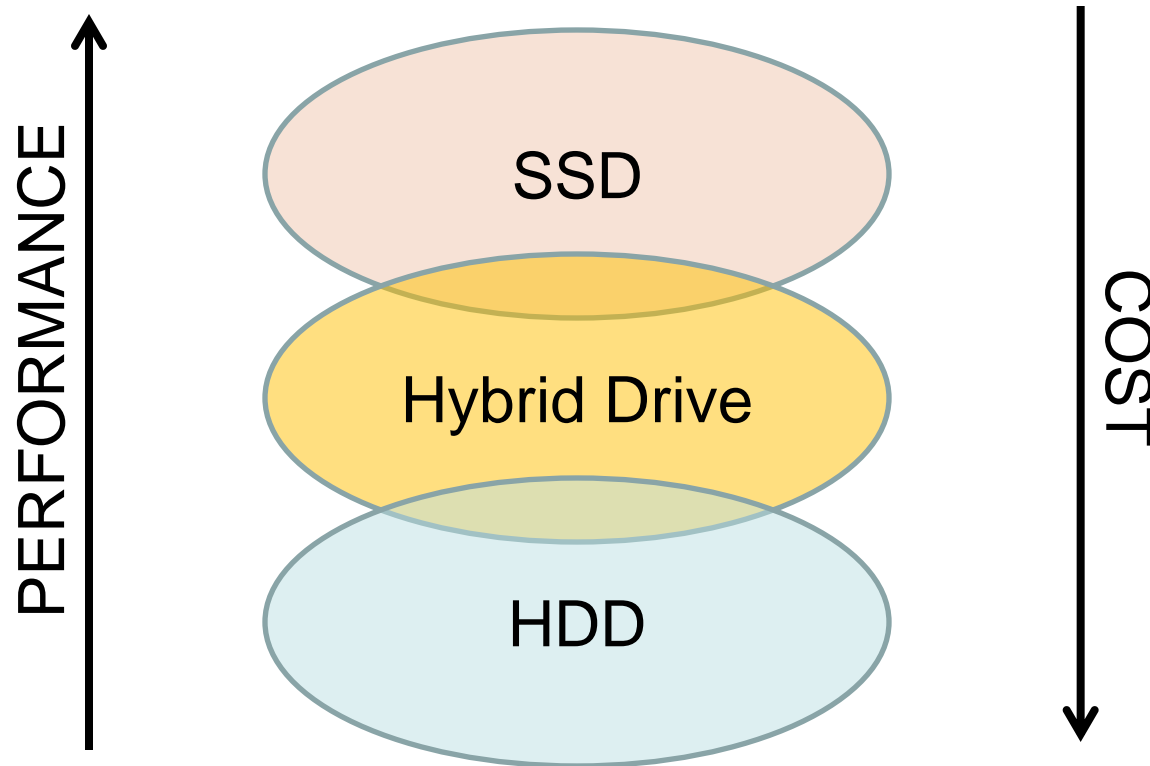
Client Storage

- Client market includes desktop & laptop systems
- Today SATA is the dominant storage interface for client storage



A Need for More Speed

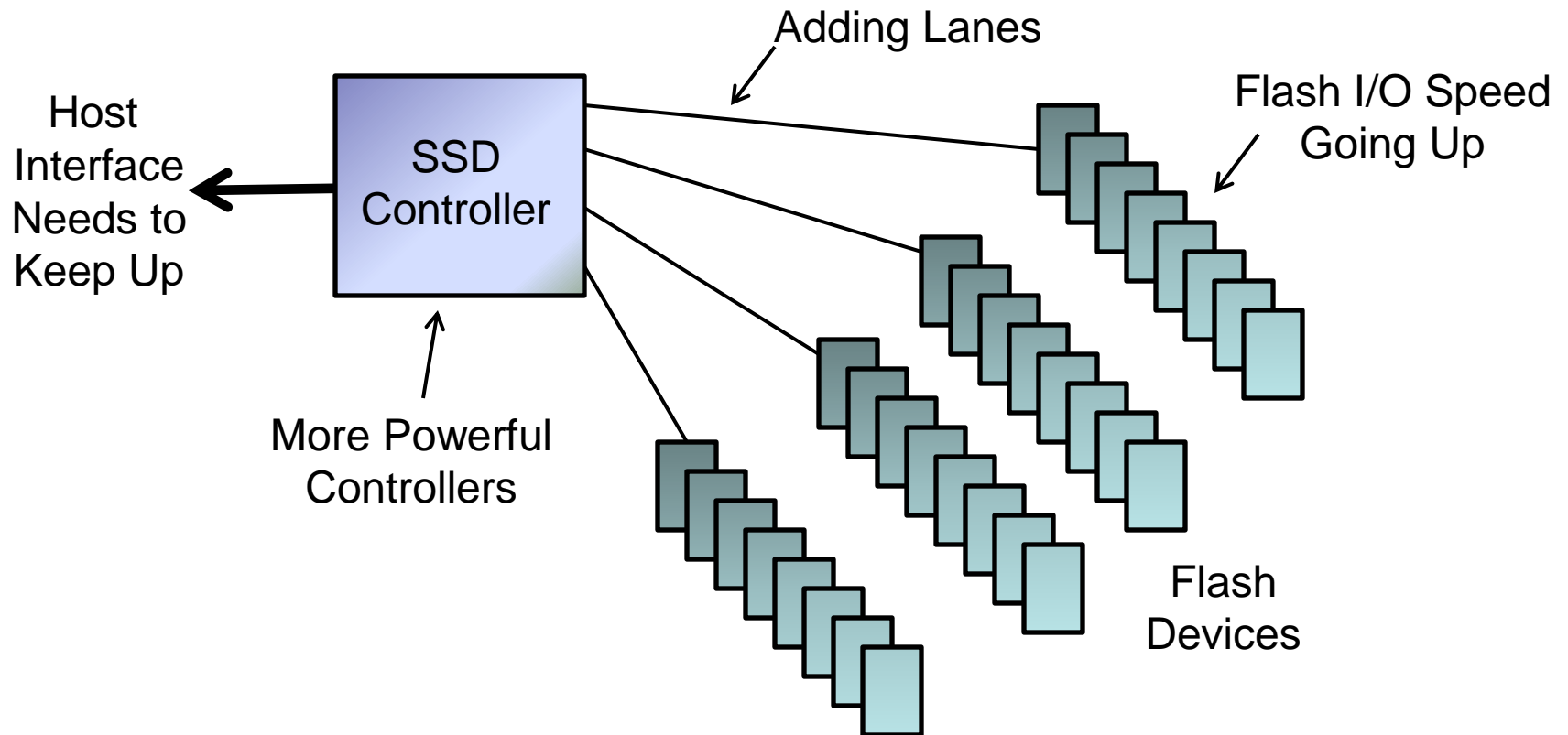
- SSDs and Hybrid Drives are driving performance



Hybrid Drive = HDD with Flash Cache

Getting Faster

- SSD speeds are increasing



How Do We Get There?

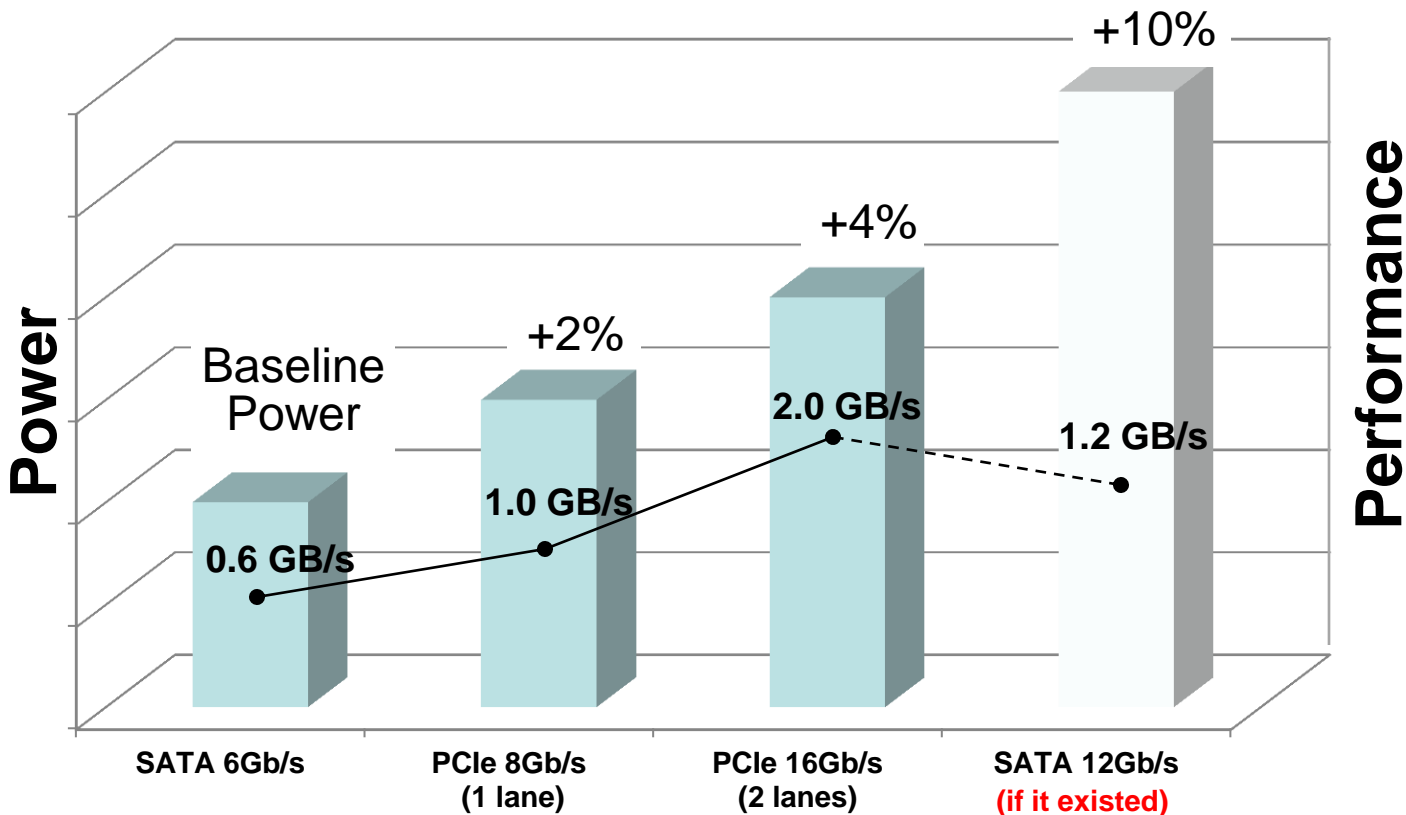
- SSDs and Hybrid Drives will soon need an interface faster than today's SATA 6Gb/s
- The traditional approach would be to double the SATA speed to 12Gb/s
 - Analysis determined that finalizing a 12Gb/s SATA standard would require 2+ years
 - 12Gb/s SATA would require many changes, be more costly and have higher power consumption than desirable

A Better Choice

- PCI Express (PCIe) is an established standard already present in client systems
 - Maximum speed of 1GBytes/s per lane
 - SATA 6Gbits/s equates to 0.6GBytes/s
 - PCIe enables use of multiple lanes to scale up performance
 - Two PCIe lanes = 2GB/s

Power & Performance

- 2 lanes of PCIe 3.0 offers 3.3x the performance of SATA 6Gb/s with only 4% increase in power
- 2 lanes of PCIe 3.0 would be 1.6x higher performance and would consume less power than a hypothetical SATA 12Gb/s



The Decision

- Considering all the factors...
 - Performance
 - Time-to-market
 - Power
- SATA-IO decided to create SATA Express

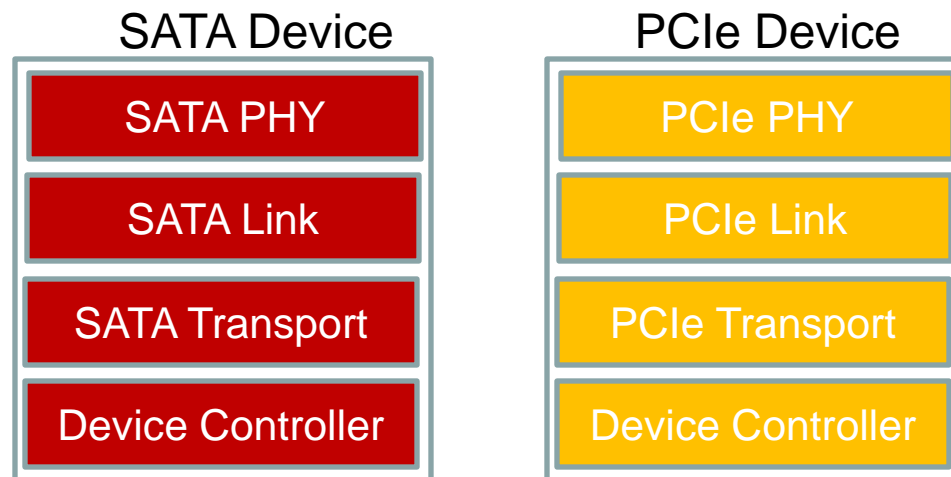
What is SATA Express?

- Standardization of PCIe as an interface for client storage
- Provides an ecosystem for client storage in which SATA and PCIe solutions can coexist
 - A SATA Express host utilizes a SATA Express host connector and will connect to and function with a SATA or PCIe storage device



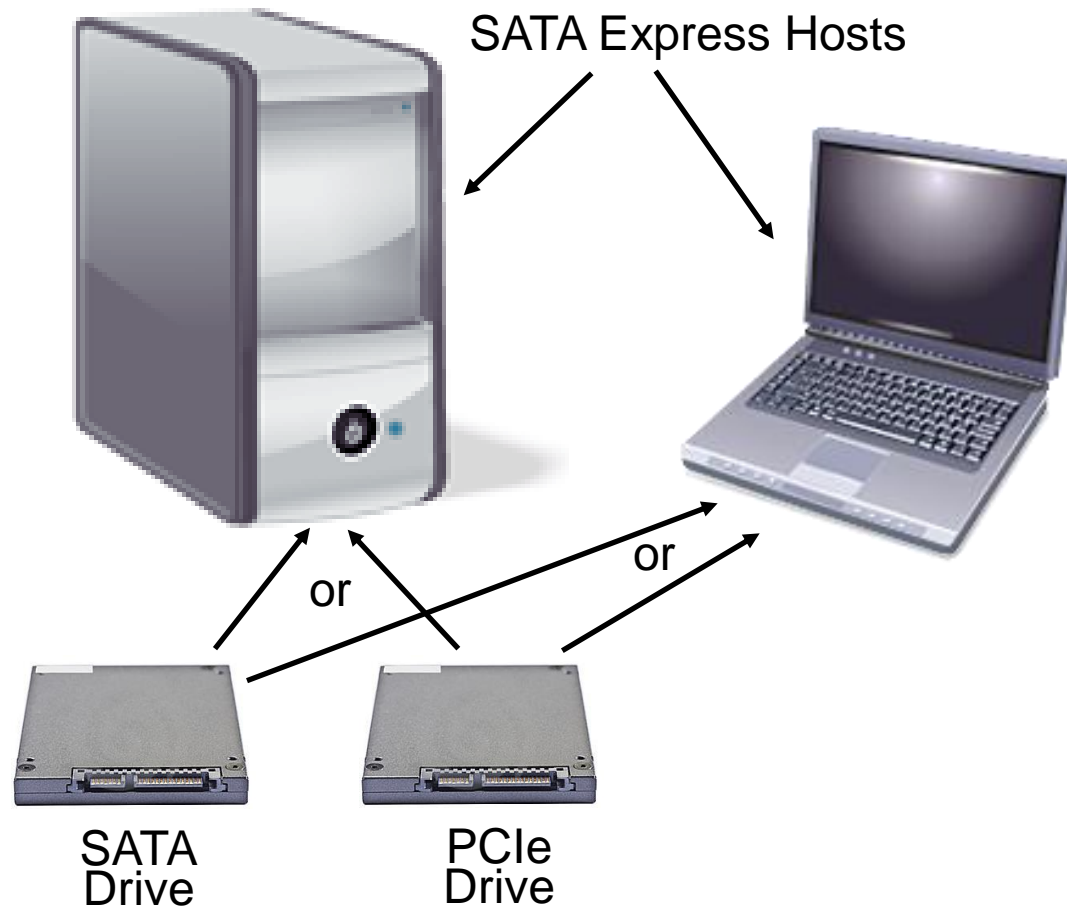
SATA Express is PCIe

- The SATA Express environment is pure PCIe
- There is no SATA link or transport layer, so there's no translation overhead
- Users will see the full performance of PCIe



SATA Express Connectivity

- A SATA Express host accepts either a SATA or PCIe storage device



SATA Express Software Architecture

- Although not defined by the specification, there are two choices for a PCIe storage device register interface/command set:
 1. AHCI, which is used for SATA, would enable a PCIe device to be compatible with SATA software environments
 - AHCI is supported in most major operating systems
 - But AHCI is not optimized for SSD performance
 2. NVMe Express is architected for high performance PCIe SSDs
 - But NVMe does not provide SATA software compatibility
 - Drivers for Windows, Linux, and other operating systems are available at www.nvmexpress.org

Summary

- SATA Express enables a migration path to PCIe
 - A SATA Express host supports PCIe or SATA storage devices
- SATA 6Gb/s is adequate for most storage devices for the foreseeable future
- Currently no plan to define SATA 12Gb/s
 - Two lanes of PCIe provides higher performance with lower power
- SATA Express specification is currently in SATA-IO member review and is expected to become publically available in August

For More Information...

- Go to the SATA Express page on the SATA-IO site www.sata-io.org/technology/sataexpress.asp
- Check out the NVM Express site at www.nvmexpress.org
- Download the SFF-8639 connector specification at <ftp://ftp.seagate.com/sff/SFF-8639.PDF>