SATA Express
PCIe Client Storage
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What is SATA Express?

- Standardization of PCIe as an interface for client storage
- Enables PCIe 1GB/s per lane performance for the client space
  - Today’s SATA = 0.6GB/s
- 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
Introducing M.2 from PCI-SIG (FKA NGFF)

- Creating SATA Express infrastructure required cooperation between two industry organizations

**SATA-IO:**
- SATA Express device connector supports up to 2 PCIe lanes
- SATA Express host connector supports up to 2 PCIe lanes or 1 SATA port

**PCI-SIG:**
- M.2 device connector supports up to 4 lanes of PCIe or 1 SATA port
- M.2 host connector supports up to 4 lanes of PCIe or 1 SATA port
SATA Express Connectivity

- A SATA Express (or M.2) host accepts either a SATA or PCIe storage device
  - A signal driven by the device tells the host whether the device is SATA or PCIe
  - Works the same for SATA & PCIe drives on SATA Express host and for M.2 SATA/PCIe cards/host
SATA Express Client Applications

- A SATA Express (or M.2) host accepts either a SATA or PCIe storage device

M.2 is targeted at thin notebooks & tablets
- 22 x 42, 60, 80, 110mm for storage
SATA Express Enterprise Connection

- A PCIe drive mates with the SFF-8639 connector for enterprise applications
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 O/Ses
   • But AHCI is not optimized for SSD performance

2. NVM Express is architected for high performance PCIe SSDs
   • But NVMe does not provide SATA software compatibility
   • Drivers for Windows, Linux, and VMWare are available at www.nvmexpress.org
SATA Express versus SATA

- SATA Express (2 lanes PCIe 3.0) offers 3.3x the performance of SATA 6Gb/s with only 4% increase in power.
- SATA Express (2 lanes PCIe 3.0) is 1.6x higher performance and consumes less power than SATA 12Gb/s.

*Relative power for the on-drive controller; does not include Flash memory.
Final Thoughts

- SATA Express enables a migration path to PCIe
  - A SATA Express or M.2 host supports PCIe or SATA storage devices
- With the inclusion of M.2, SATA Express covers the entire range of client storage, from desktop to mobile
  - Connectivity with the enterprise via the SFF-8639 connector
- Choice of register interface/command sets
  - AHCI for software compatibility or NVMe for higher performance
- Currently no plan to define SATA 12Gb/s
  - Two lanes of PCIe provides higher performance with lower power
For More Information…

- Check out the NVM Express site at [www.nvmexpress.org](http://www.nvmexpress.org)
Announcing
Marvell Dragonfly NVDRIVE

- Combines Flash-backed DRAM and SanDisk mSATA SSDs to deliver performance of DRAM

- DragonFly NVDRIVE eliminates SSD write cliff
  - 10-30X the performance of other solutions
  - 50X lower latency than traditional SSD

- See the Dragonfly NVDRIVE in the Marvell booth