



# SATA Express PCIe Client Storage

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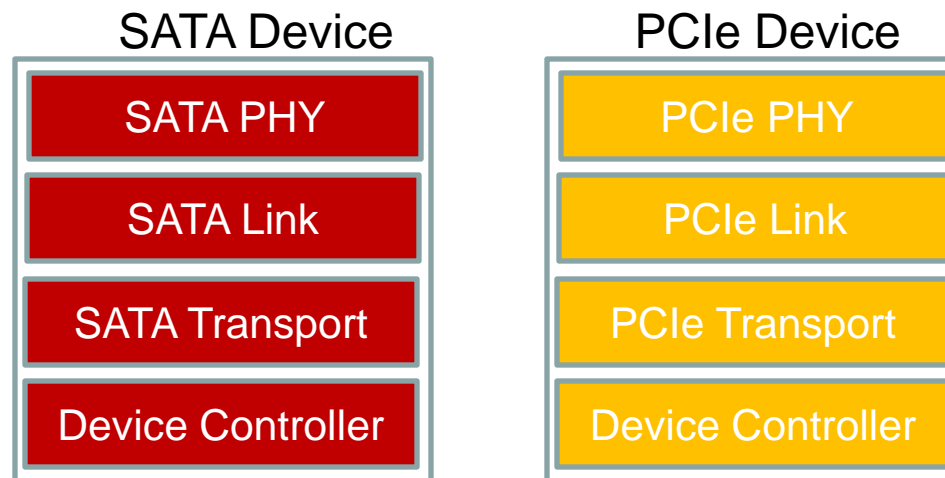
# What is SATA Express?

- 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 or PCIe  
Drive

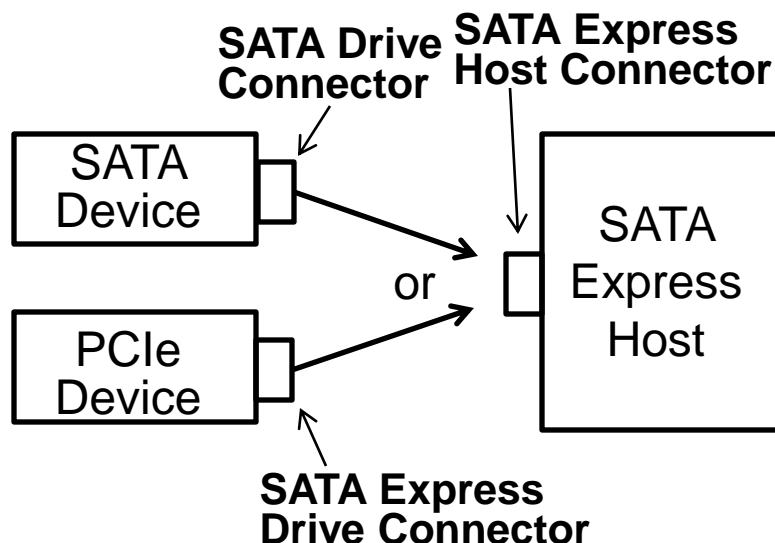


M.2 Card



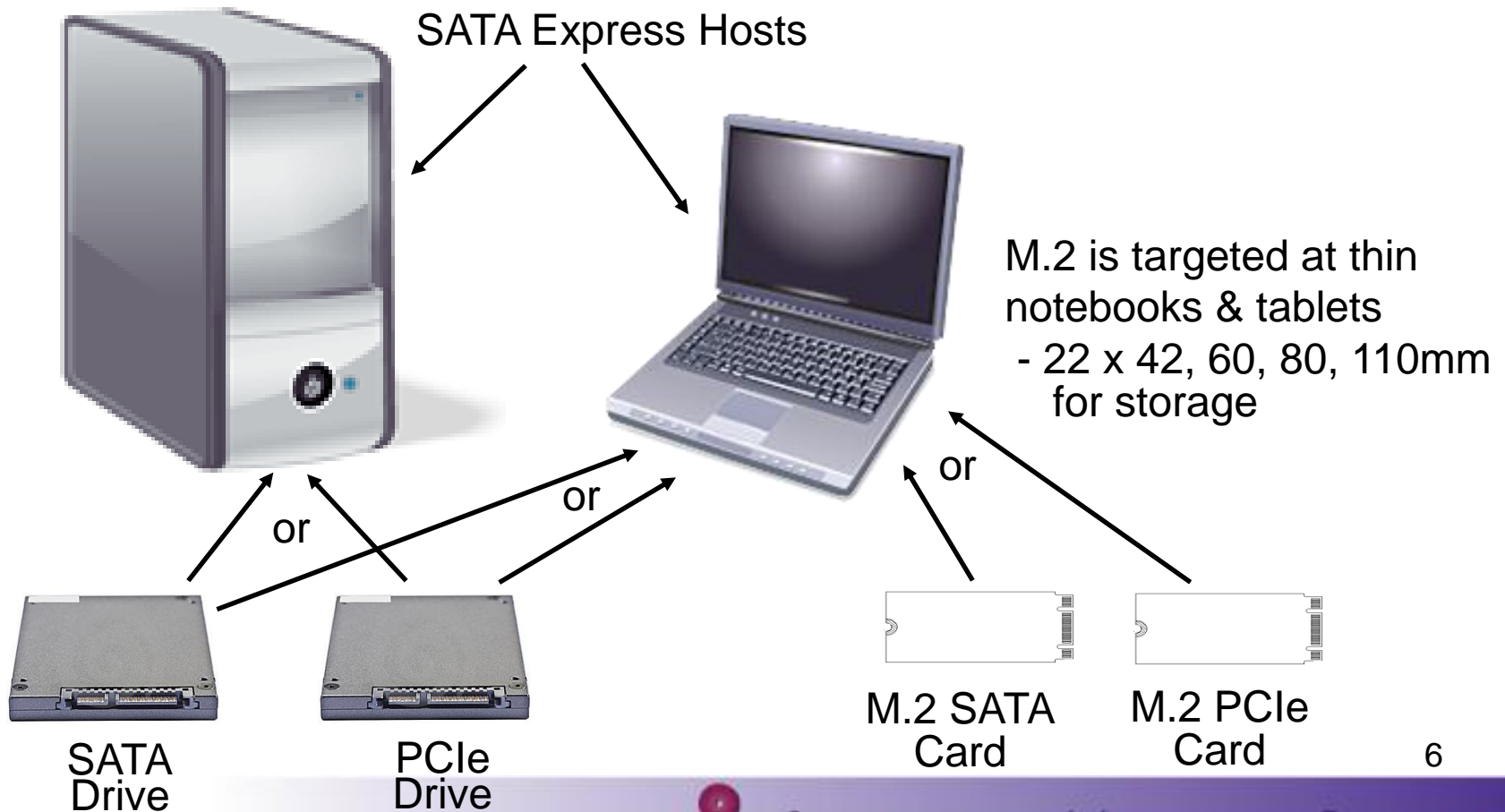
# SATA Express Connectivity

- 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



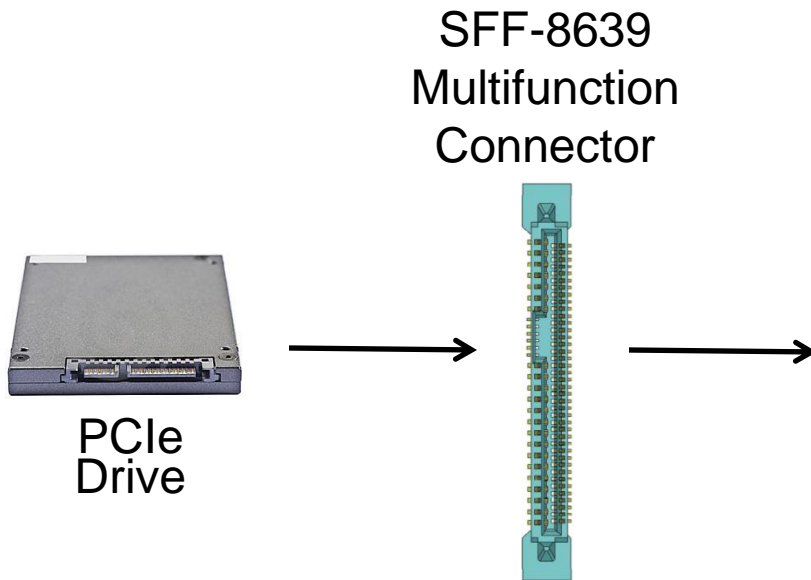
# SATA Express Client Applications

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



# SATA Express Enterprise Connection

- A PCIe drive mates with the SFF-8639 connector for enterprise applications



# SATA Express Software Architecture

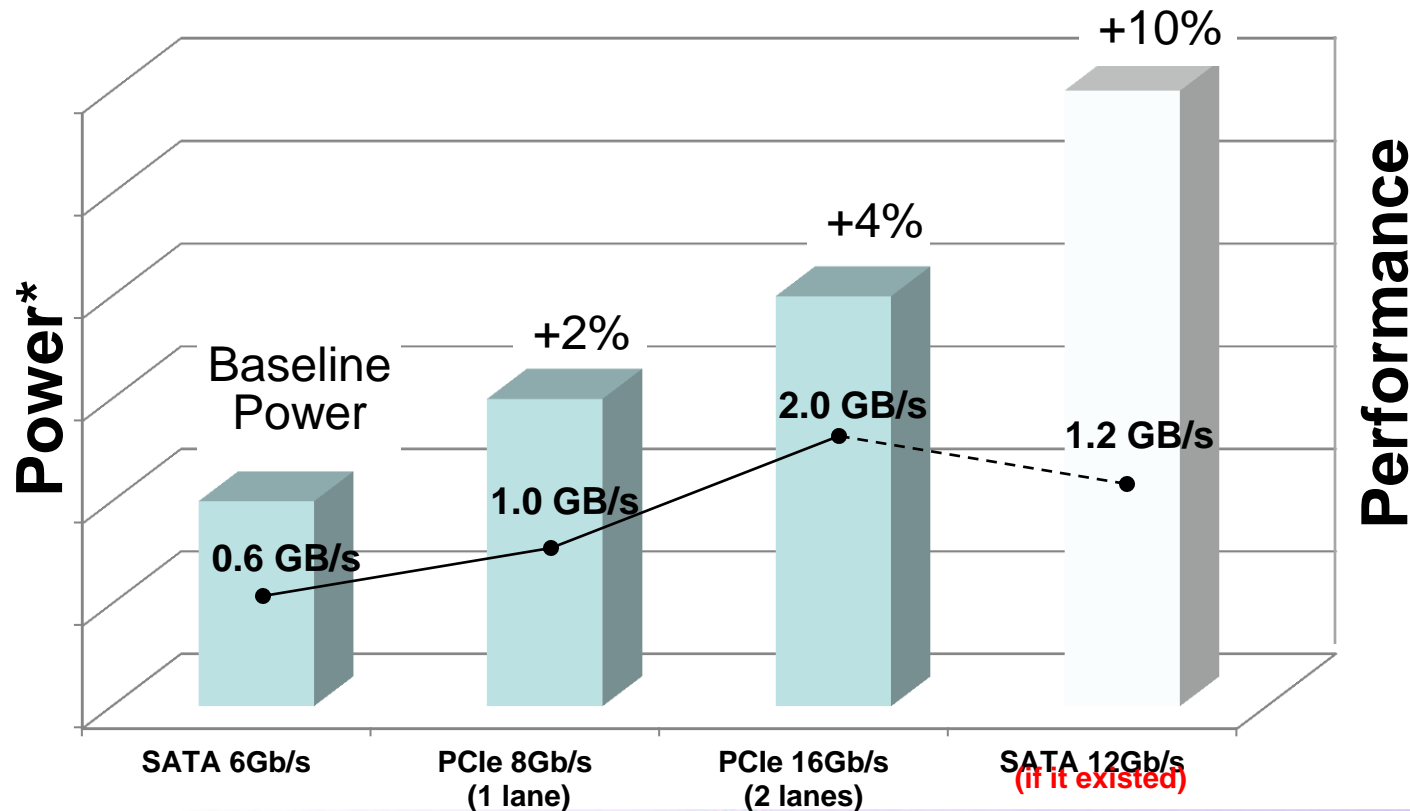
- Although not defined by the specification, there are two choices for a PCIe storage device register interface/command set:
  1. AHCI, which is used for SATA, would enable a PCIe device to be compatible with SATA software environments
    - AHCI is supported in most major O/Ses
    - But AHCI is not optimized for SSD performance
  2. NVMe 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](http://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...

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



# 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

