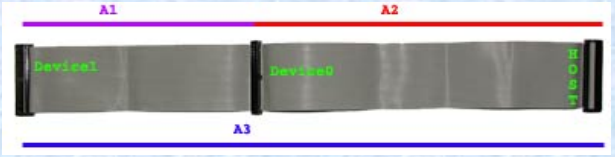
Rozhraní PC

Základní pojmy - souvislosti

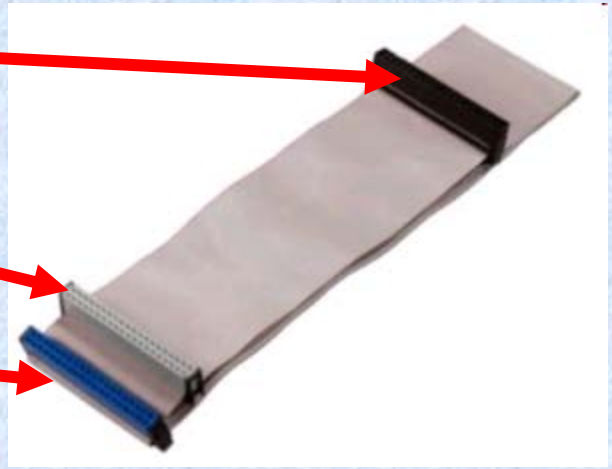
- **SCSI**
- **IDE**
- **ATA**
- **PATA** –
- **SATA**
- **USB**
- **SAS**
- **FireWire - IEEE1394**

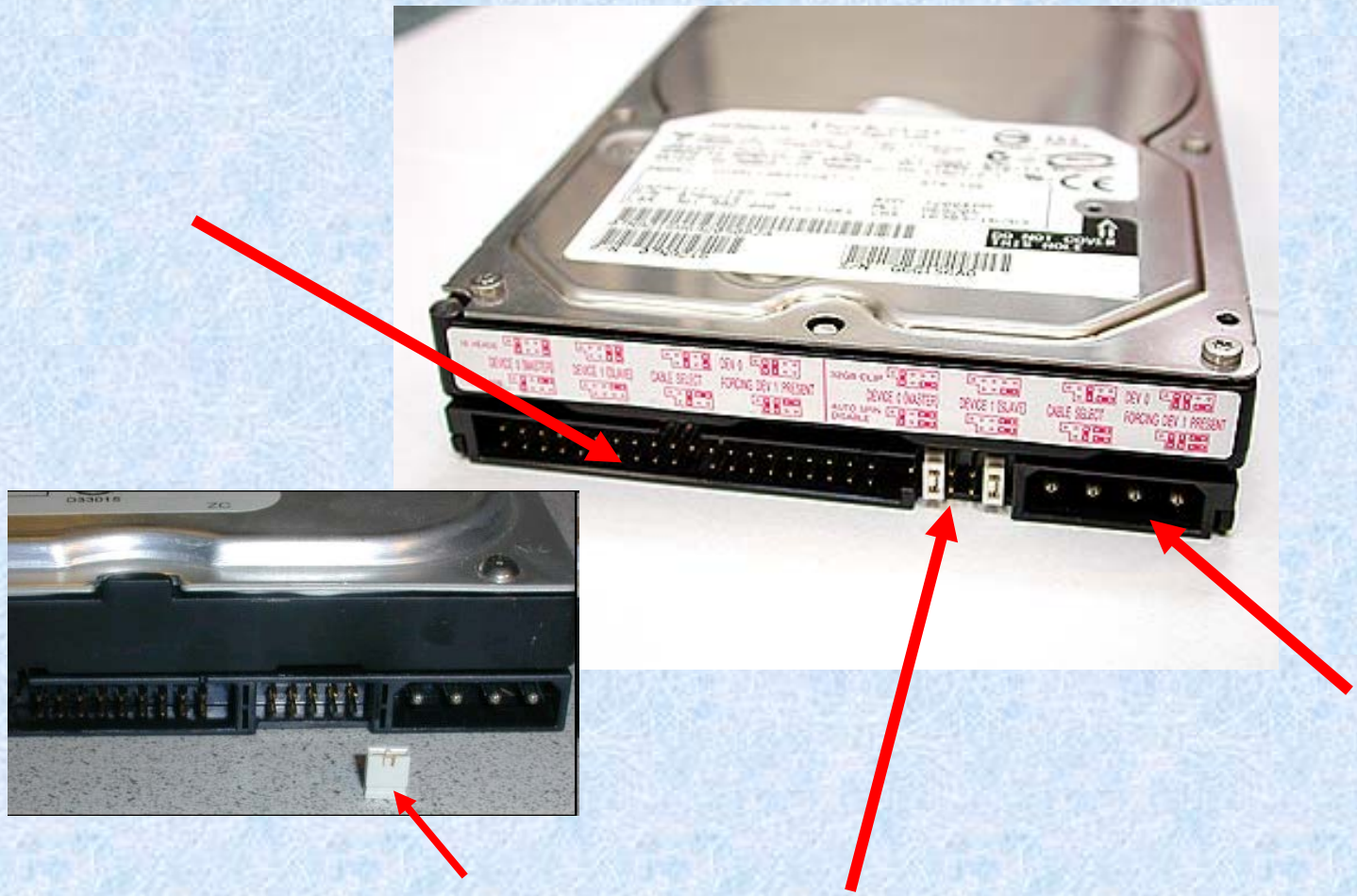
Srovnání šířky kabelů

SCSI SATA EIDE Rounded EIDE


A1
A2
Device1
Device0
HOST
A3

1
SECONDARY
39





Rozhraní IDE přenáší data dvěma způsoby:

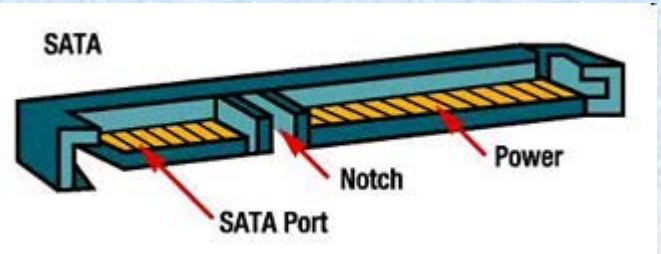
- **PIO - Programmed Input and Output .**
- **DMA (Direct Memory Acces)**

Přenosová rychlost PATA

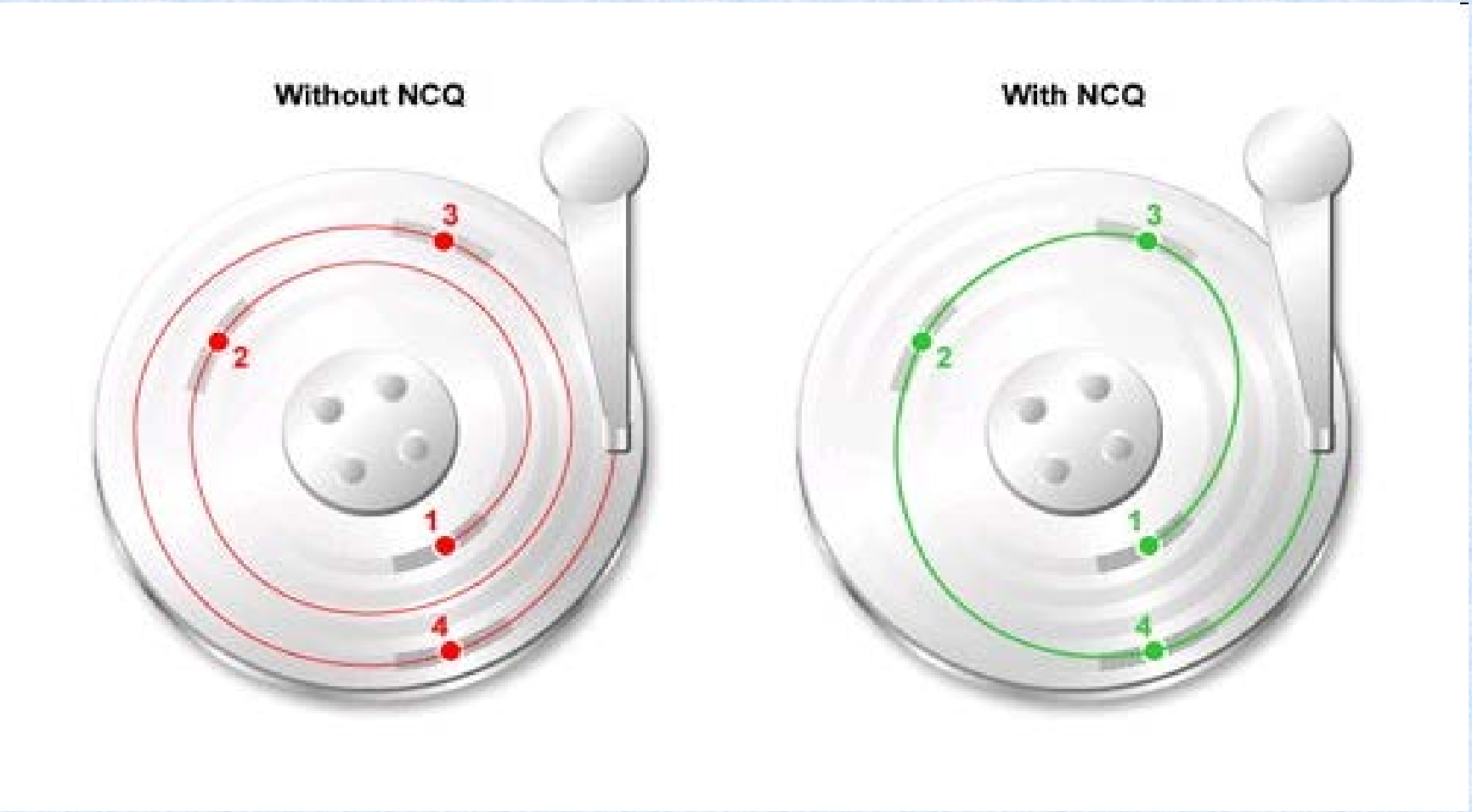
- Např. ATA 100

Konektory eSATA

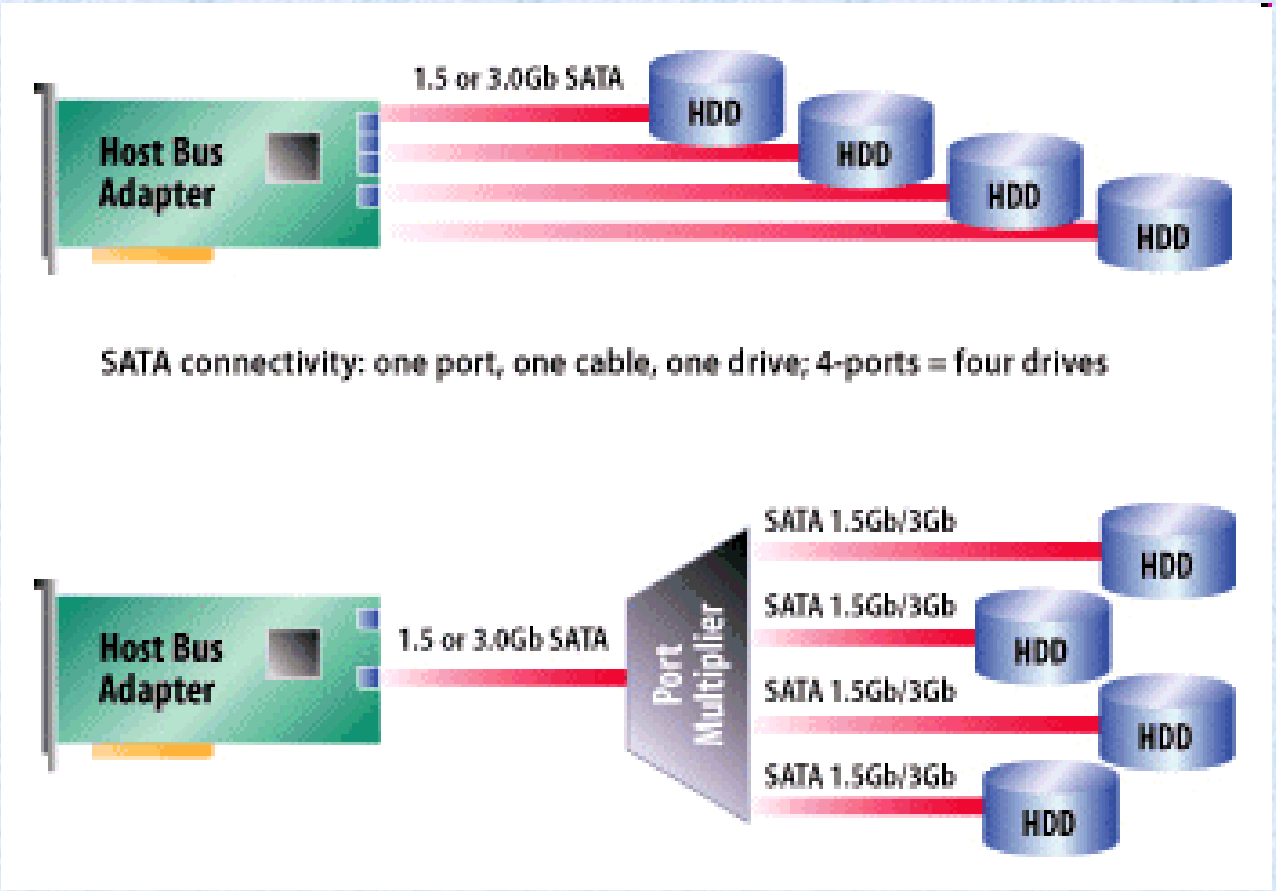
Konektory Serial ATA



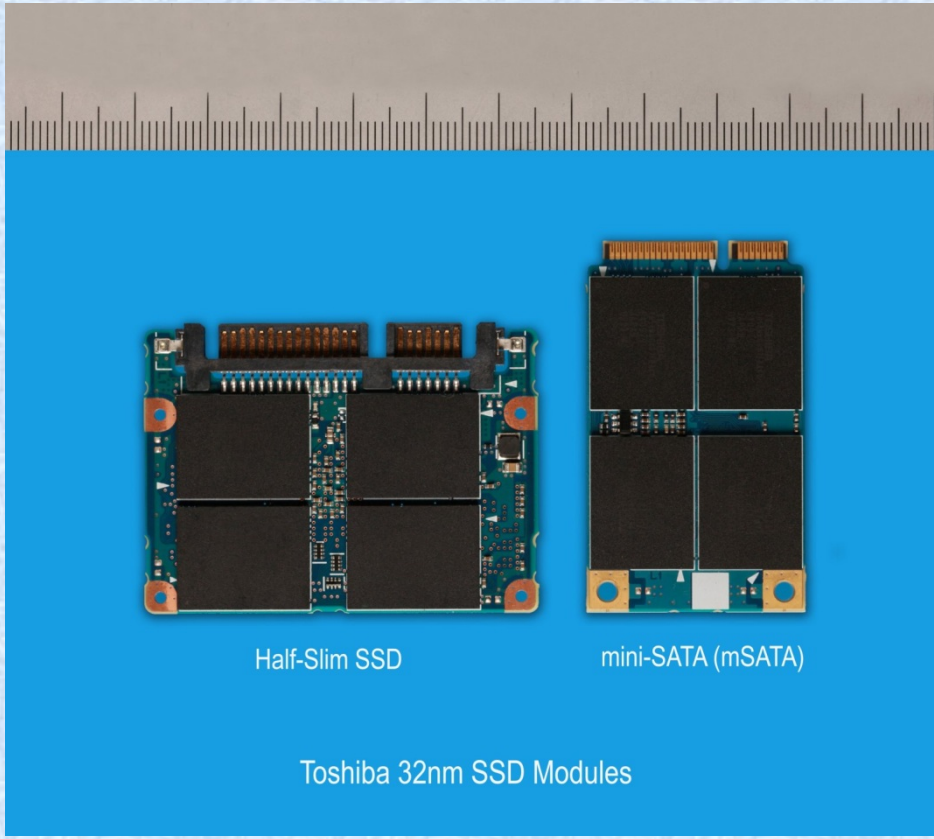
Technologie NCQ (Native Command Queuing)



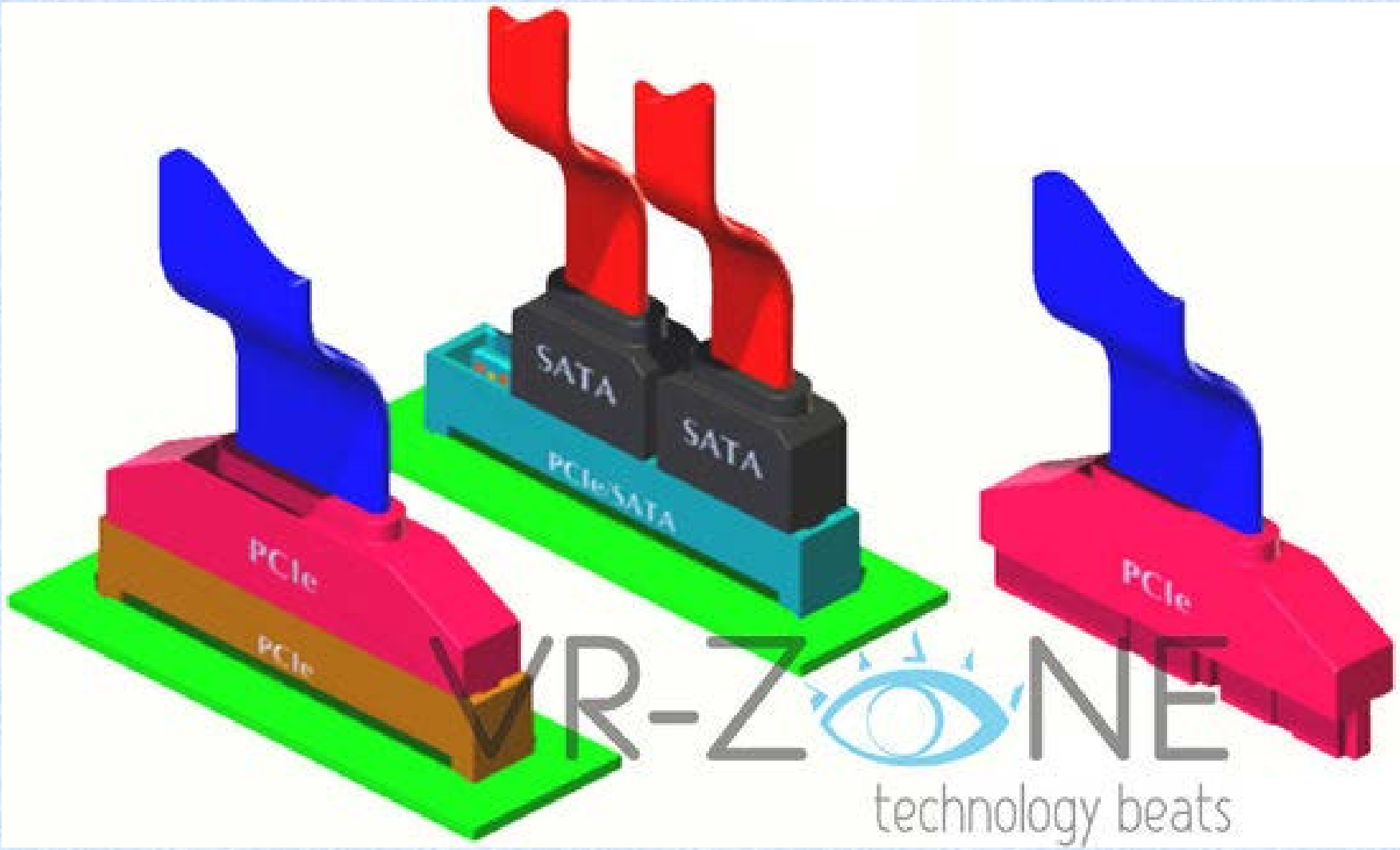
Další technologie SATA



mSATA (mini SATA)



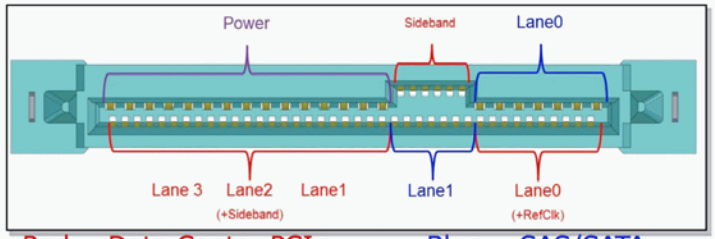
SATA dochází dech, je tu SATA Express (2013)



SATA Express specifikace

Trend: Two Connectors

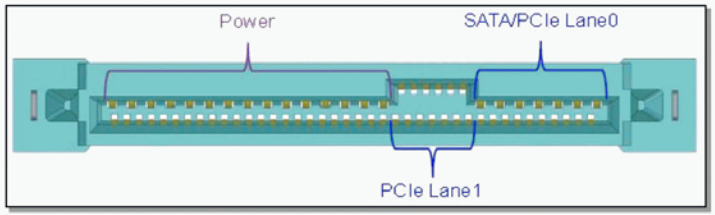
SFF-8639 **U.2**



Red = Data Center PCIe Blue = SAS/SATA

- 4x PCI Express* unleashes performance SSDs
- Cables require RefClk and six high speed signal lanes, shield?
- Increased device attach flexibility between SATA / SAS* / PCI Express
- Decreased system flexibility with directly wired SATA and PCI lanes

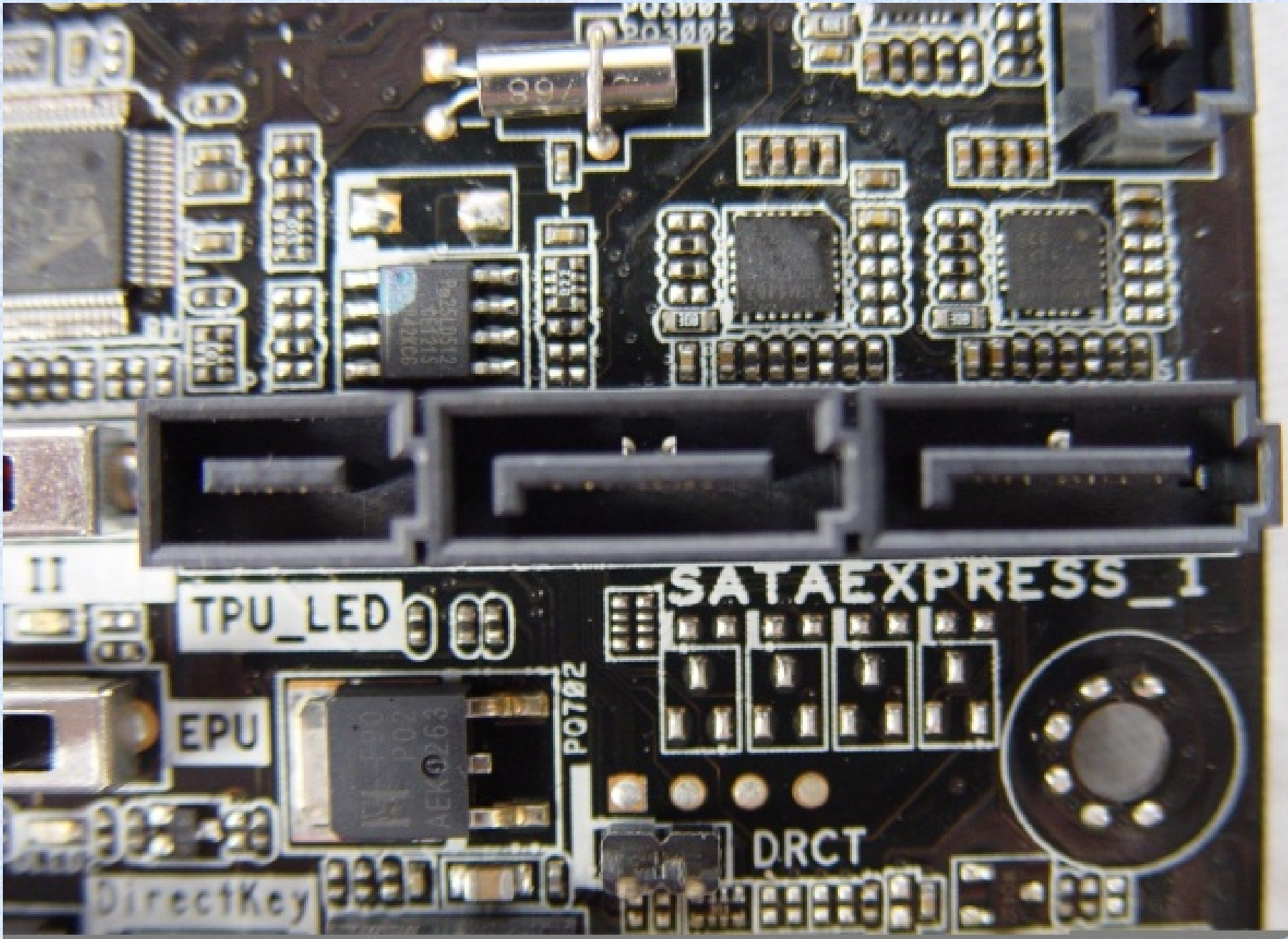
SATA* Express



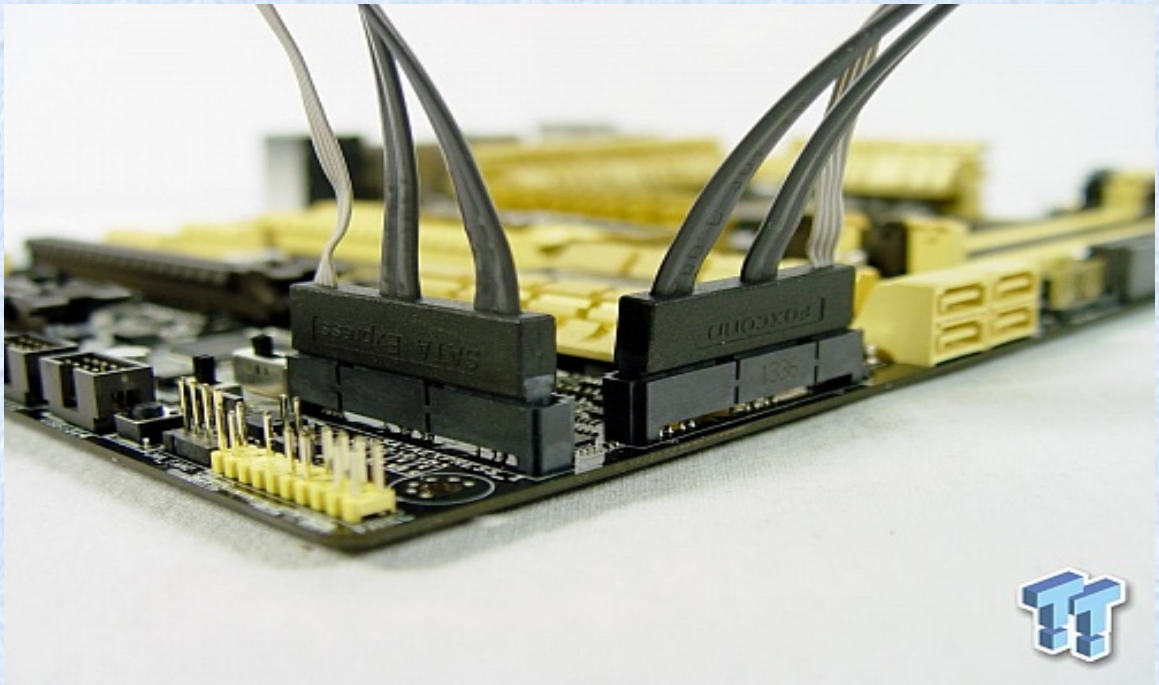
Blue = Muxed single SATA or 2x PCIe

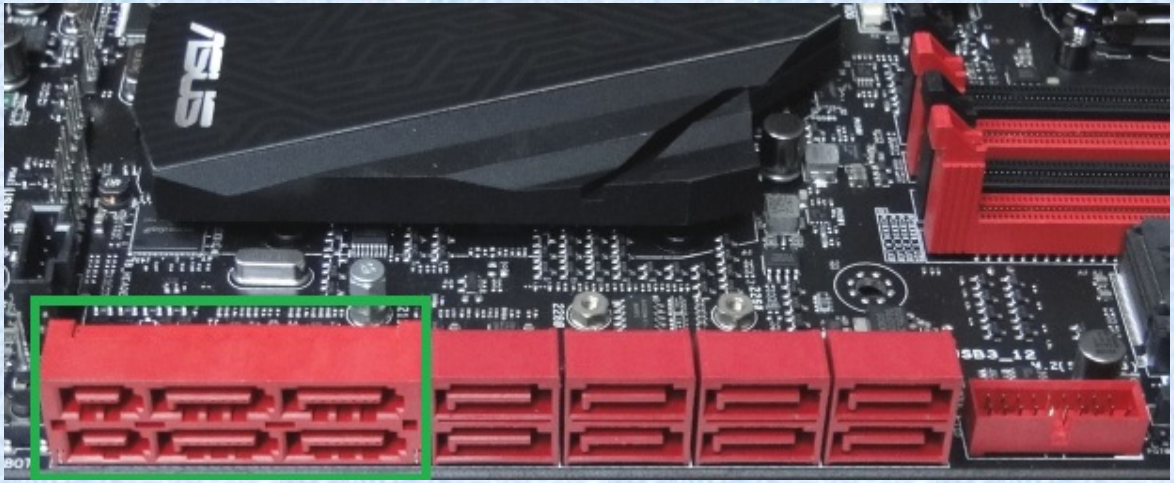
- 2x PCI Express limits SSD performance, still nearly 2x SATA
- Cost optimized w/ two high speed lanes, no RefClk, likely no shield
  - Requires clockless drive w/ SSC, in PCI SIG now
- Increased system flexibility supporting muxed SATA and PCI
- "It fits, but doesn't work!" risk

SFF-8639: Optimized for performance and device flexibility
SATA Express: Focus on rapid low cost platform transition


TPU_LED
SATAEXPRESS_1
EPU
DRCT
DirectKey

Kabely SATA Express



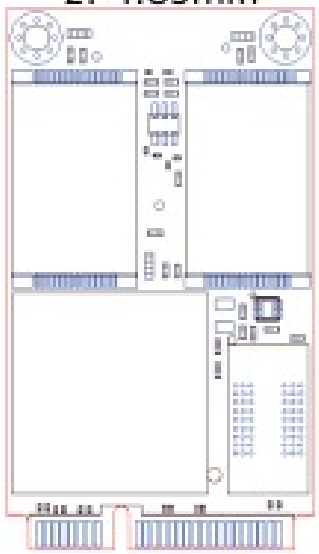


Dnešní (další) využitelnost SATA Express (v podání ASRocku)

mSATAa SATAe nahradilo nejdříve NGFF a z něj potom M.2

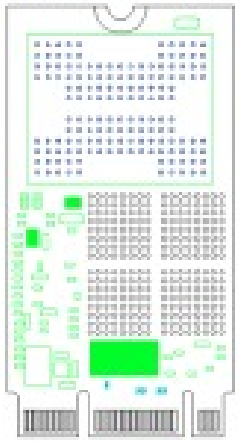
Trend: NGFF Card Format*

51mm x 30mm
z: 4.85mm



mSATA

42mm x 22mm
z: 2.75mm single side[1]
z: 3.85mm double side[1]



NGFF Card

Proposed Draft — **Serial ATA International Organization**

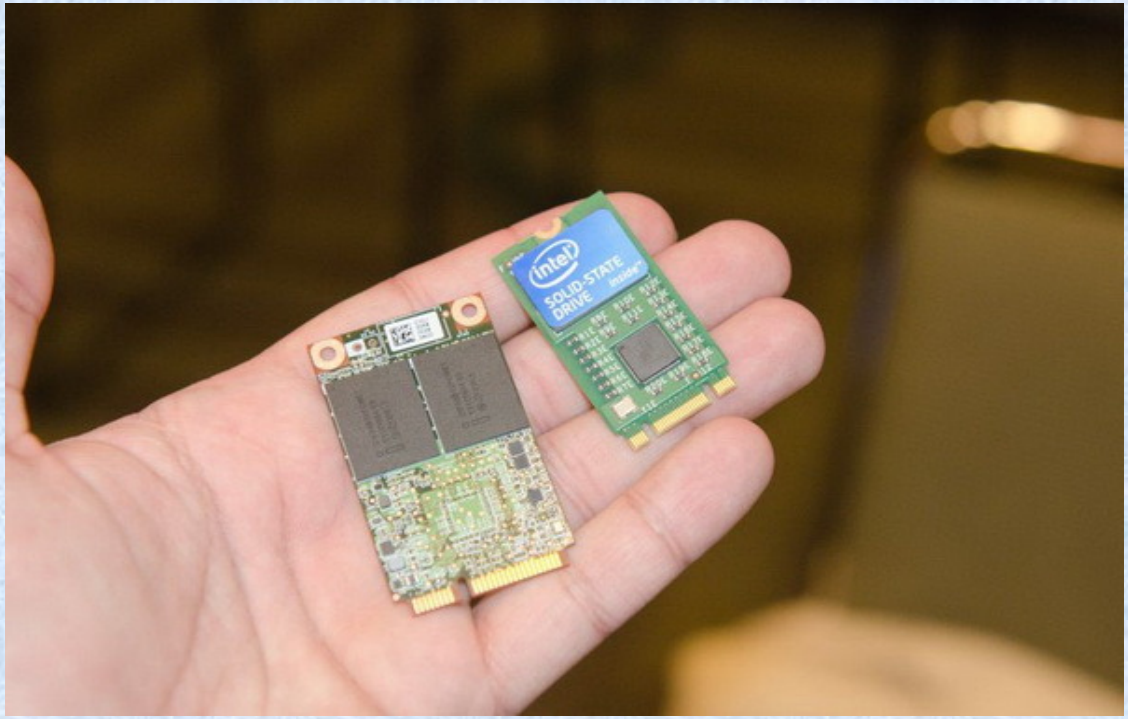
Version 04
August 14, 2012

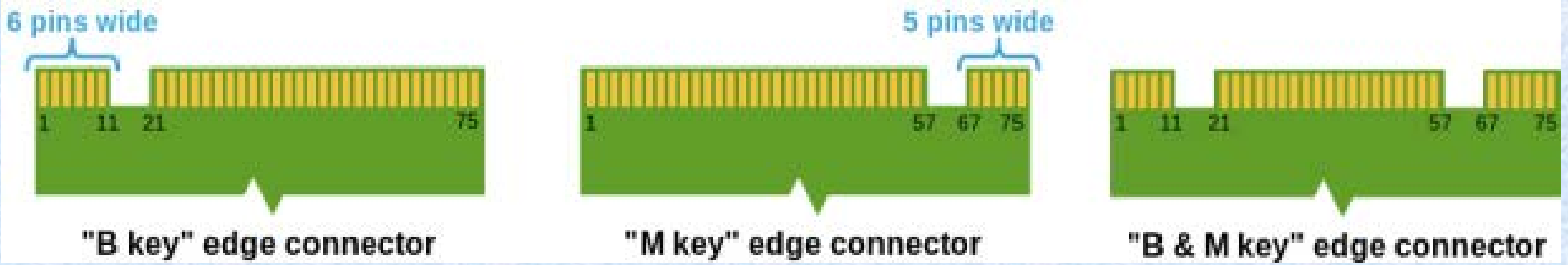
Serial ATA Technical Proposal #TPR_C112
Title: NGFF Card Format for SSDs

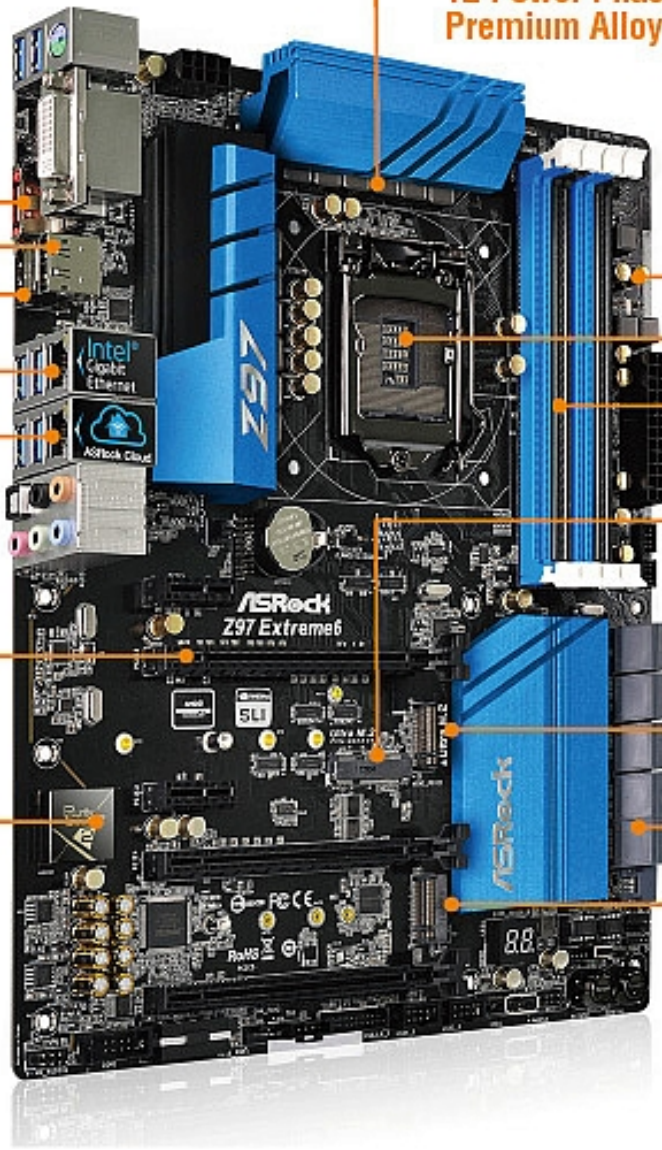
This is an internal working document of the Serial ATA International Organization. As such, this is not a completed standard and has not been approved. The Serial ATA International Organization may modify the contents at any time. This document is made available for review and comment only.

Specification optimized for caching devices or SSDs, includes a series of module lengths and connector keys enabling SATA*, 2x or 4x PCI Express*

Smaller, thinner, SSD optimized form factor


intel
SOLID-STATE
DRIVE


6 pins wide
1
11
21
75
"B key" edge connector
5 pins wide
1
57
67
75
"M key" edge connector
1
11
21
57
67
75
"B & M key" edge connector



Digi Power
12 Power Phase Design
Premium Alloy Choke

eSATA
DisplayPort
HDMI

Intel LAN

Realtek LAN

12K Platinum Capacitor

Intel LGA 1150 Socket

4 DDR3 3200+(OC)
15µ Gold Contact

Mini PCIe

PCIe 3.0 x16
Supports Quad CrossFireX
& Quad SLI

Ultra M.2 Socket 32Gb/s
(PCIe Gen3 x4)

Purity Sound™ 2

Nichicon Fine Gold Series Audio Caps
115dB SNR DAC with Differential Amplifier
TI® NE5532 Premium Headset Amplifier
Direct Drive Technology
EMI Shielding Cover
PCB Isolate Shielding

SATA Express

M.2 Socket 10Gb/s
(PCIe Gen2 x2/SATA)

SATA Express™ and SFF-8639 Comparison

Source: Seagate* (with permission)

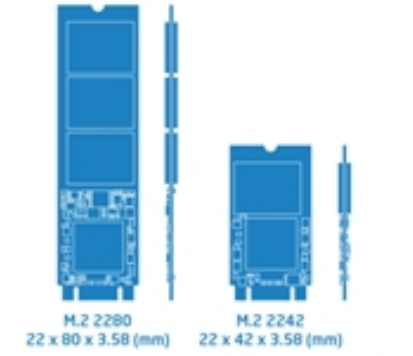
	SATAe	SFF-8639
SATA / SAS*	SATA	SATA / SAS
PCI Express*	x2	x4 or dual x2
Host Mux	Yes	No
Ref Clock	Optional	Required
EMI	SRIS	Shielding
Height	7mm	15mm
Max Performance	2 GB/s	4 GB/s
Bottom Line	Flexibility & Cost	Performance

SFF-8639 designed for data center, SATAe designed for Client

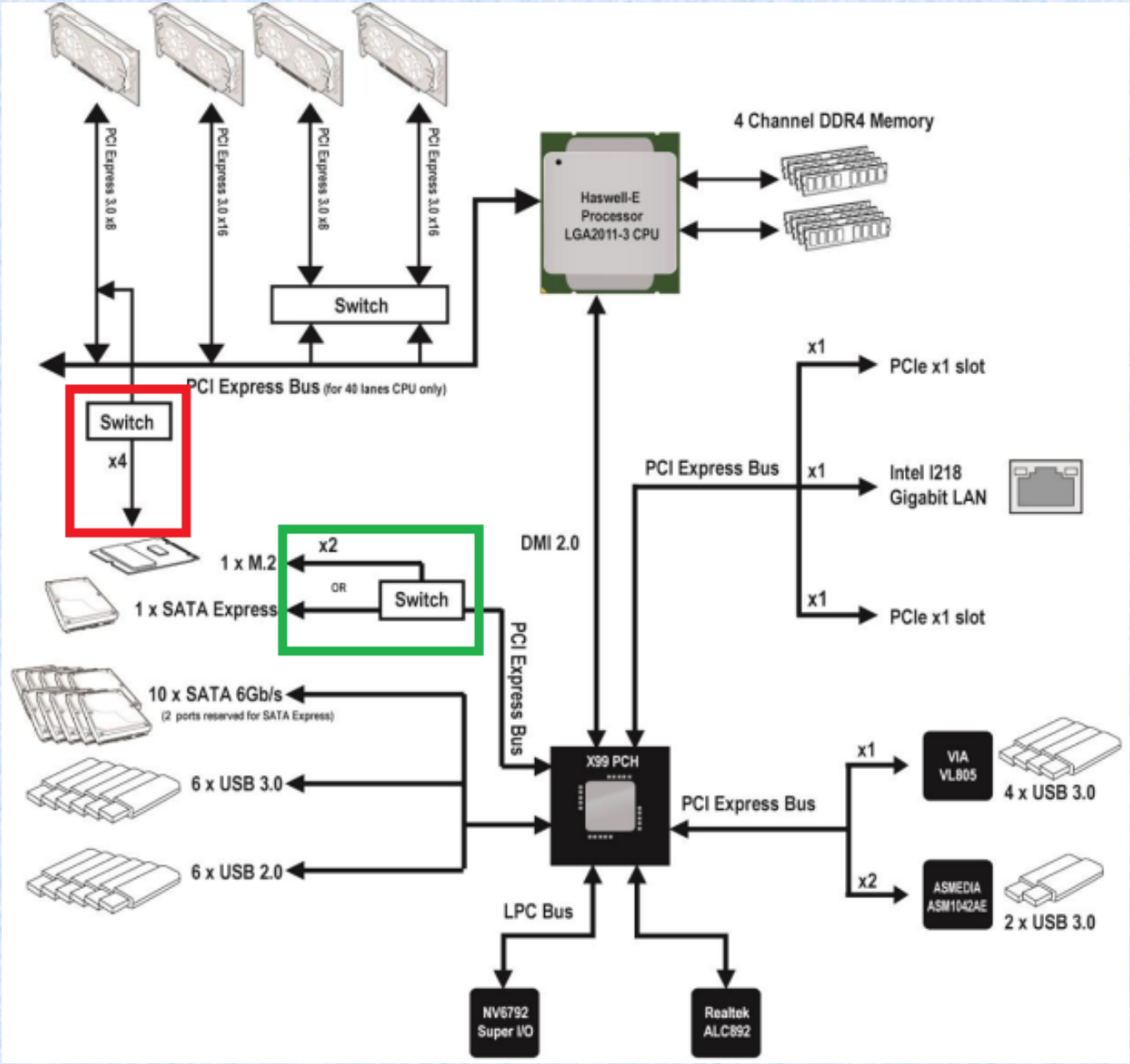
M.2 Form Factor Comparison

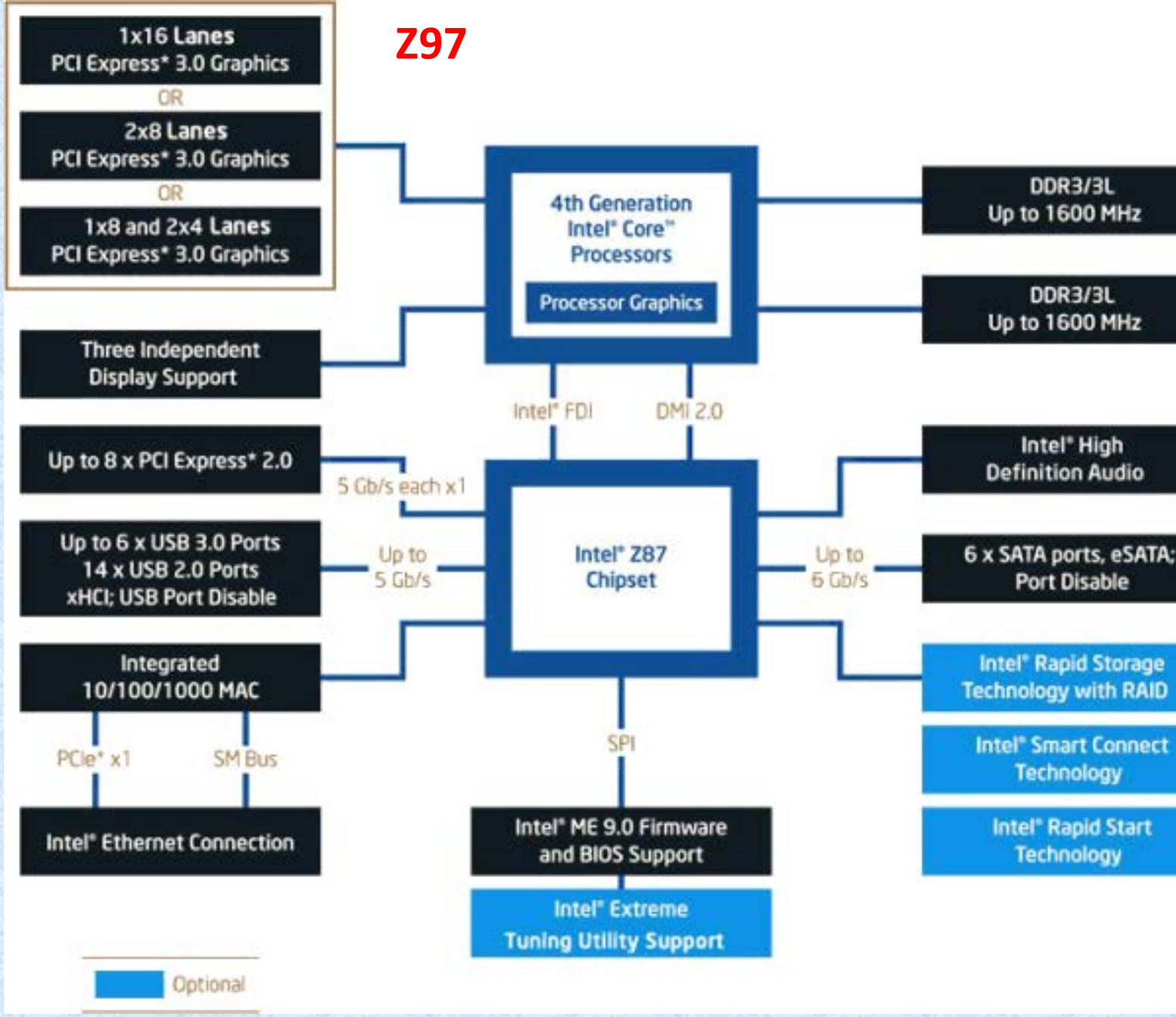
	M.2 Socket 2	M.2 Socket 3
SATA	Yes, Shared	Yes, Shared
PCIe® x2		
PCIe x4	No	Yes
Comms Support	Yes	No
Ref Clock	Required	Required
Max Performance	2 GB/s	4 GB/s
Bottom Line	Flexibility	Performance

M.2 Socket 3 is the best option for Data Center PCIe SSDs

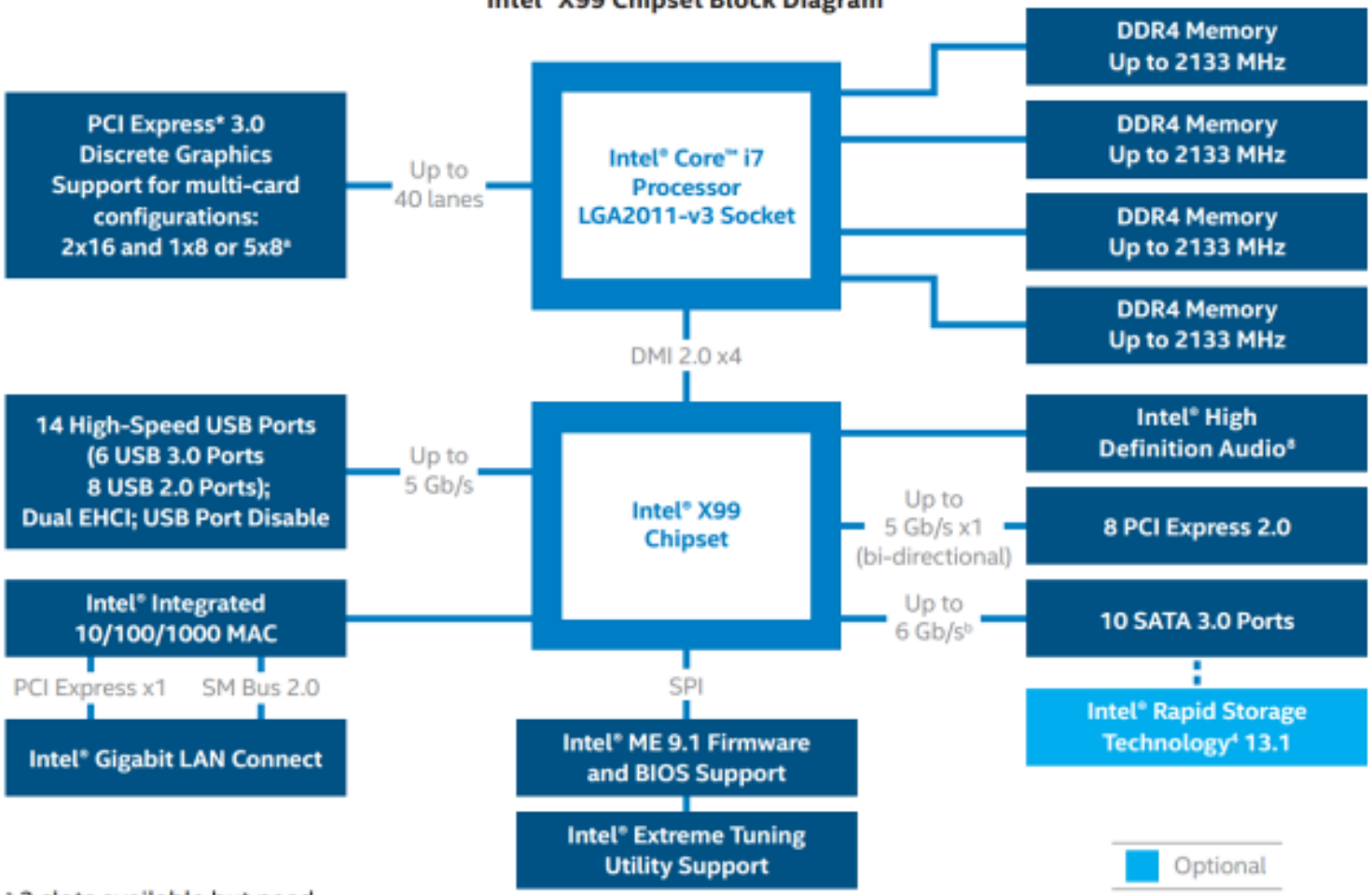


Dnes na verzi PCI- E i na počtu linek záleží




Z97
1x16 Lanes
PCI Express* 3.0 Graphics
OR
2x8 Lanes
PCI Express* 3.0 Graphics
OR
1x8 and 2x4 Lanes
PCI Express* 3.0 Graphics
4th Generation
Intel® Core™
Processors
Processor Graphics
DDR3/3L
Up to 1600 MHz
DDR3/3L
Up to 1600 MHz
Three Independent
Display Support
Intel® FDI
DMI 2.0
Up to 8 x PCI Express* 2.0
5 Gb/s each x1
Intel® High
Definition Audio
Up to 6 x USB 3.0 Ports
14 x USB 2.0 Ports
xHCI; USB Port Disable
Up to
5 Gb/s
Intel® Z87
Chipset
Up to
6 Gb/s
6 x SATA ports, eSATA;
Port Disable
Integrated
10/100/1000 MAC
Intel® Rapid Storage
Technology with RAID
Intel® Smart Connect
Technology
PCIe* x1
SM Bus
SPI
Intel® Ethernet Connection
Intel® ME 9.0 Firmware
and BIOS Support
Intel® Rapid Start
Technology
Intel® Extreme
Tuning Utility Support
Optional

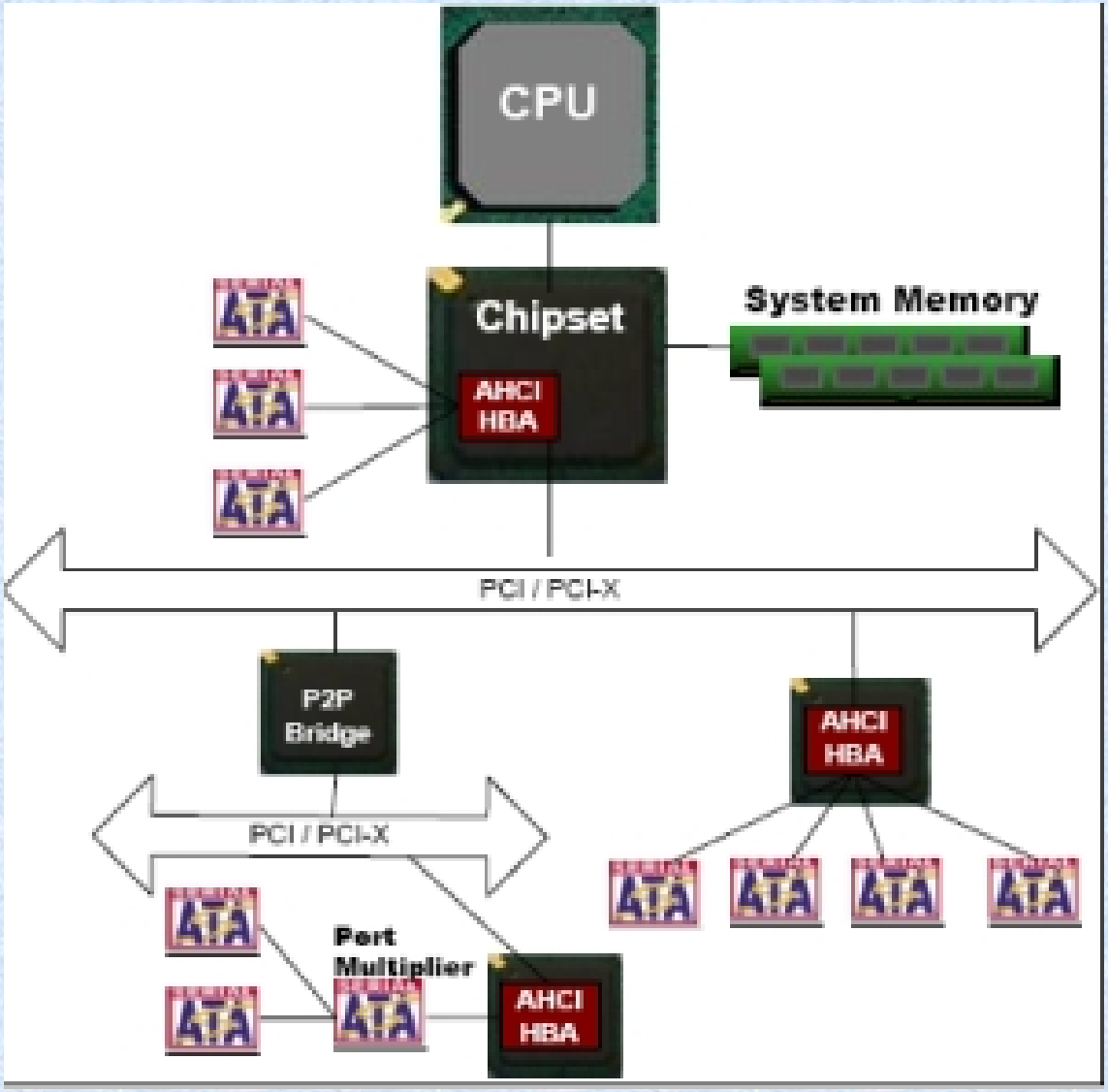
Intel® X99 Chipset Block Diagram



[a] 3 slots available but need additional logic onboard to support more slots. 5x8 configuration requires additional system clocks to be provided by third party components.

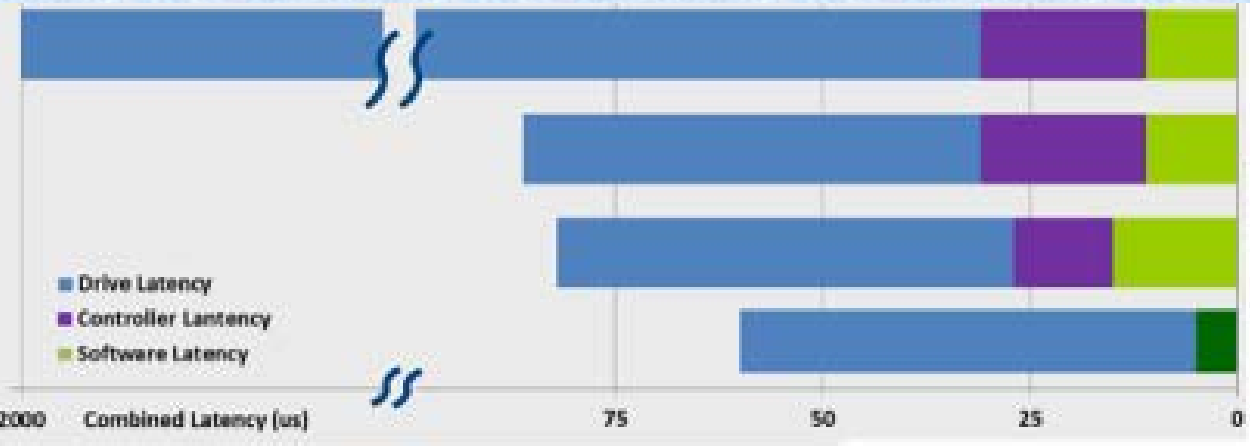
[b] All SATA ports capable of 6 Gb/s.

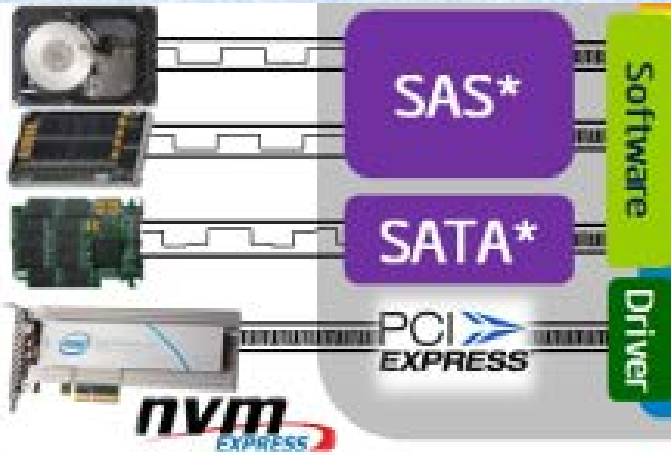
Umístění AHCI HBA (Host Bus Controler) v architekruře PCI /PCI-X

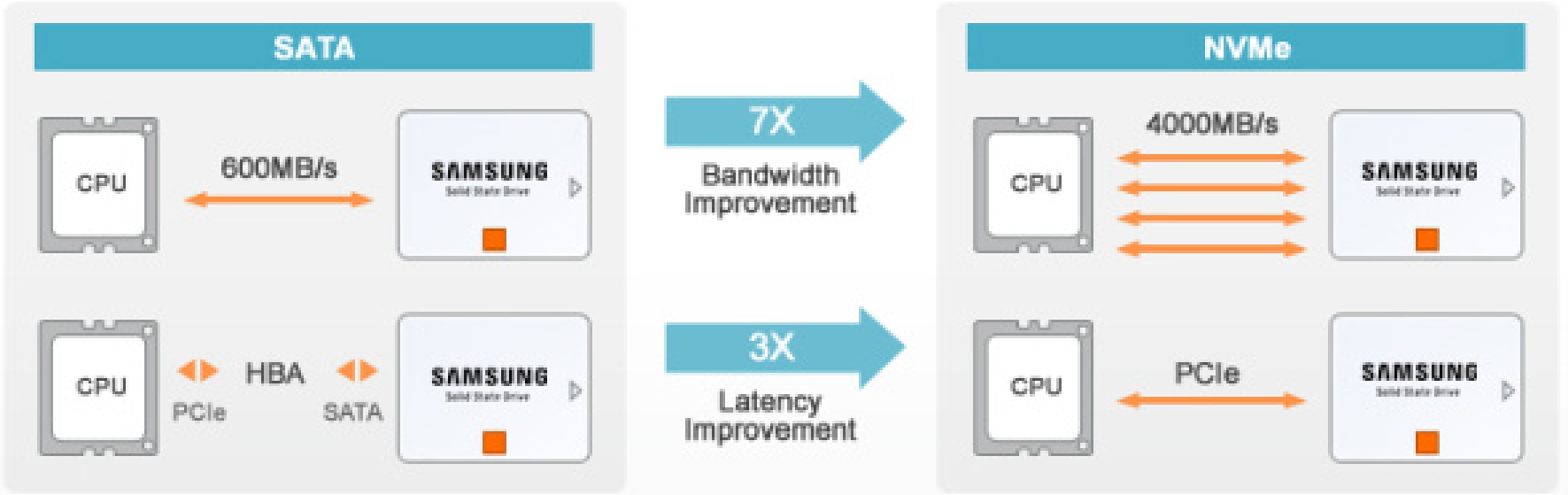


Co znamená NVMe

(Non-Volatile Memory Host Controller Interface)





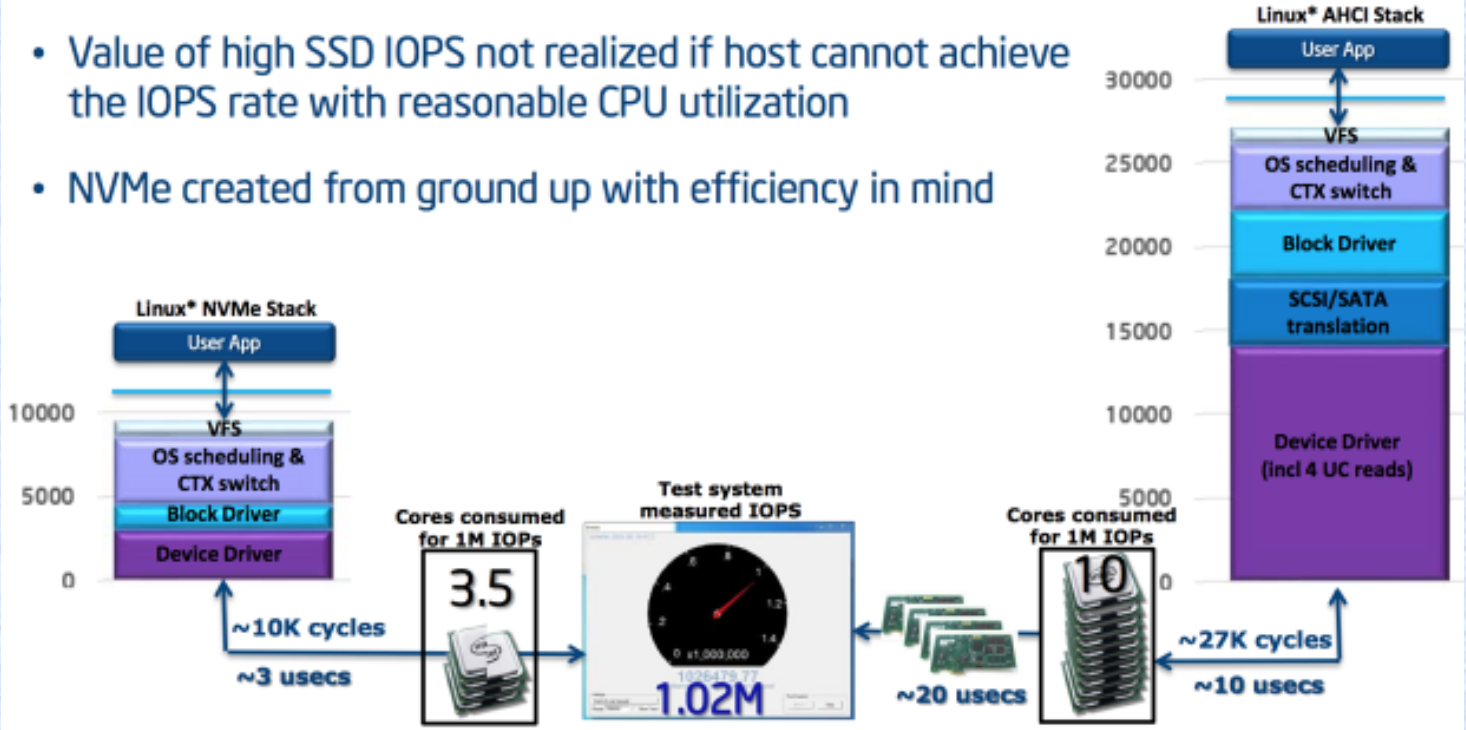


Srovnání konektoru NVMe M.2 SATA M.2

NVMe* Conducive to Efficient Stack

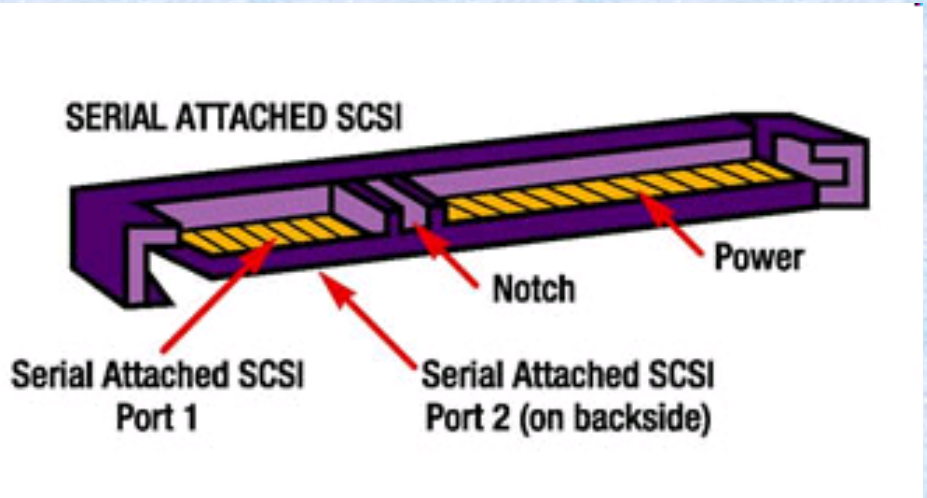
Intel investing in NVMe interface and driver stack

- Value of high SSD IOPS not realized if host cannot achieve the IOPS rate with reasonable CPU utilization
- NVMe created from ground up with efficiency in mind

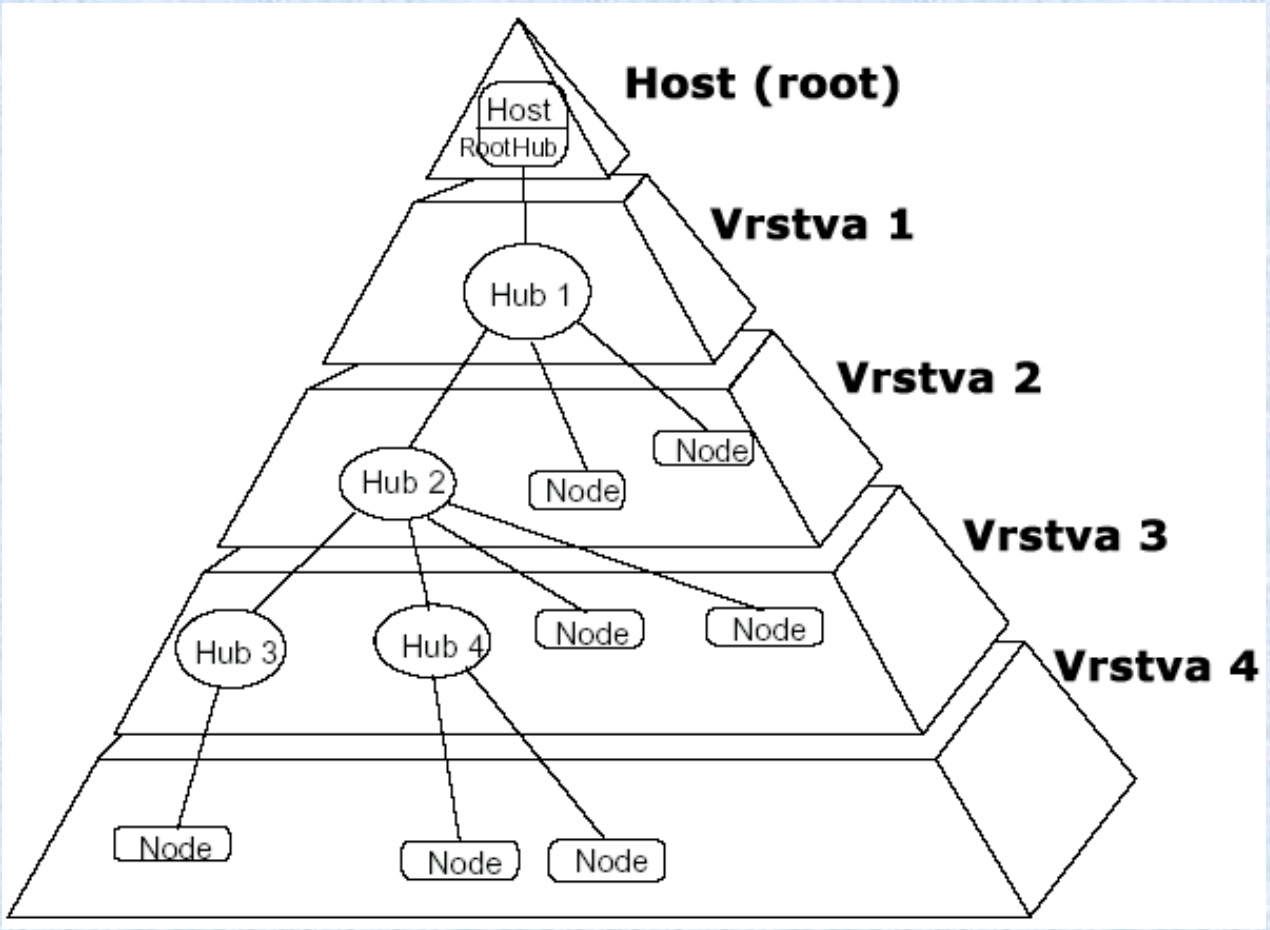


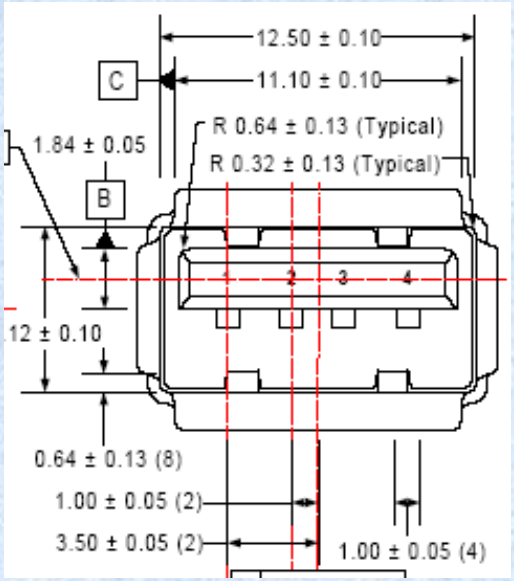
Measurement taken on Intel® Core™ i5-2500K 3.3GHz 6MB L3 Cache Quad-Core Desktop Processor using Linux* RedHat* EL6.0 2.6.32-71 Kernel using FIO with raw IO. Testing and measurement by Intel. * Other brands and names are the property of their respective owners

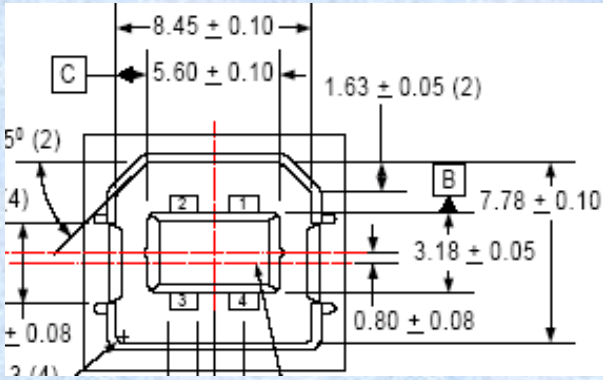
SAS (Serial Attached SCSI)

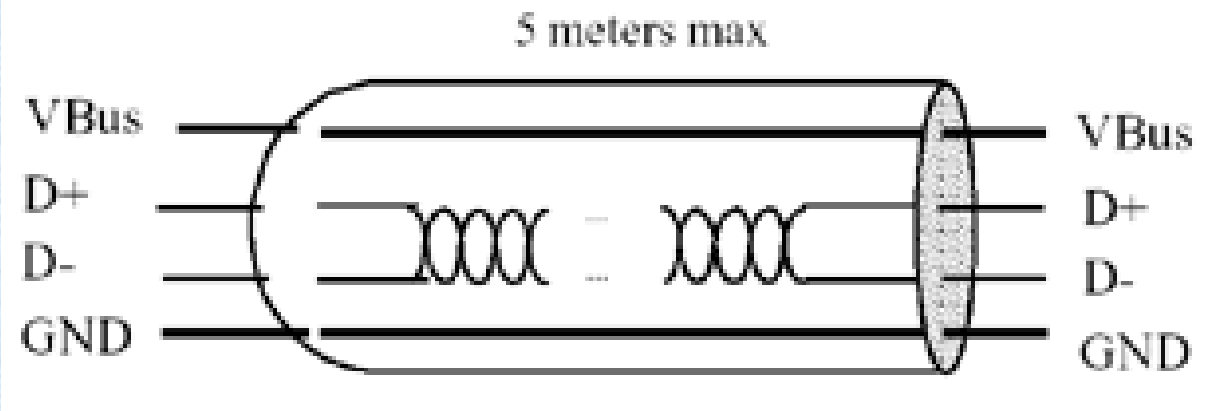


FireWire - IEEE1394


Host (root)
Host
RootHub
Vrstva 1
Hub 1
Vrstva 2
Node
Hub 2
Node
Vrstva 3
Hub 3
Hub 4
Node
Node
Vrstva 4
Node
Node
Node

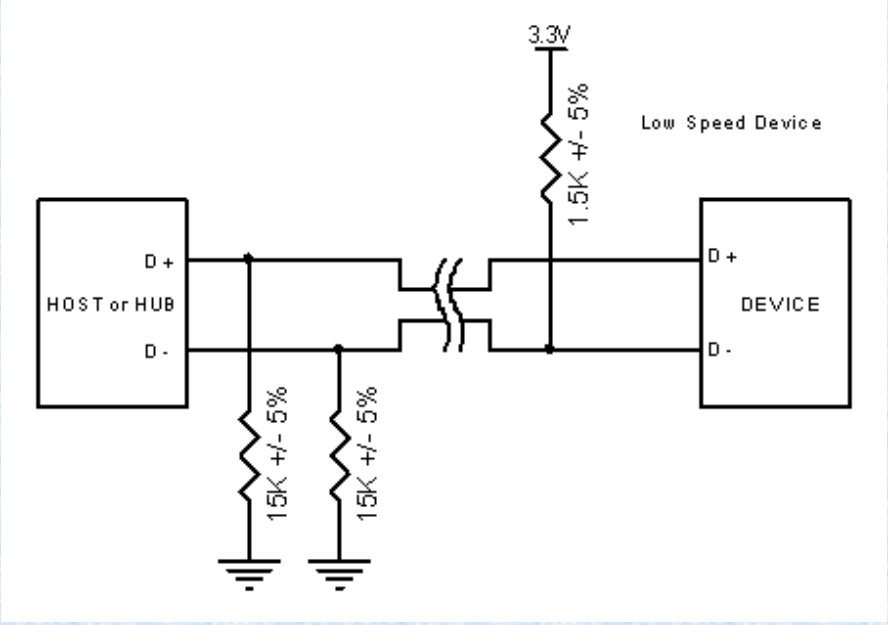

12.50 ± 0.10
C
11.10 ± 0.10
R 0.64 ± 0.13 (Typical)
1.84 ± 0.05
R 0.32 ± 0.13 (Typical)
B
1
2
3
4
12 ± 0.10
0.64 ± 0.13 (8)
1.00 ± 0.05 (2)
3.50 ± 0.05 (2)
1.00 ± 0.05 (4)


8.45 ± 0.10
C
5.60 ± 0.10
1.63 ± 0.05 (2)
B
7.78 ± 0.10
3.18 ± 0.05
0.80 ± 0.08
2
1
3
4

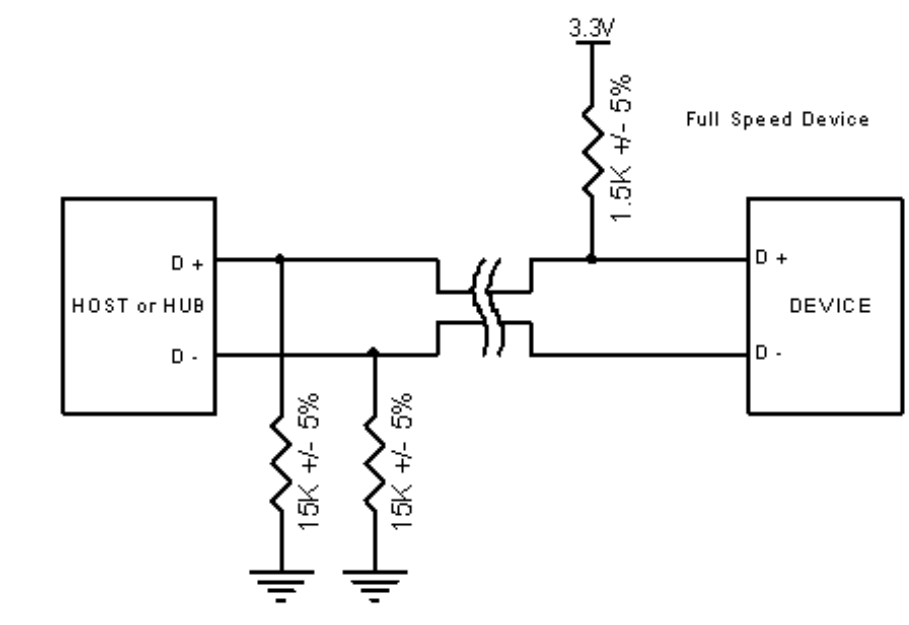

5 meters max
VBus
D+
D-
GND
VBus
D+
D-
GND

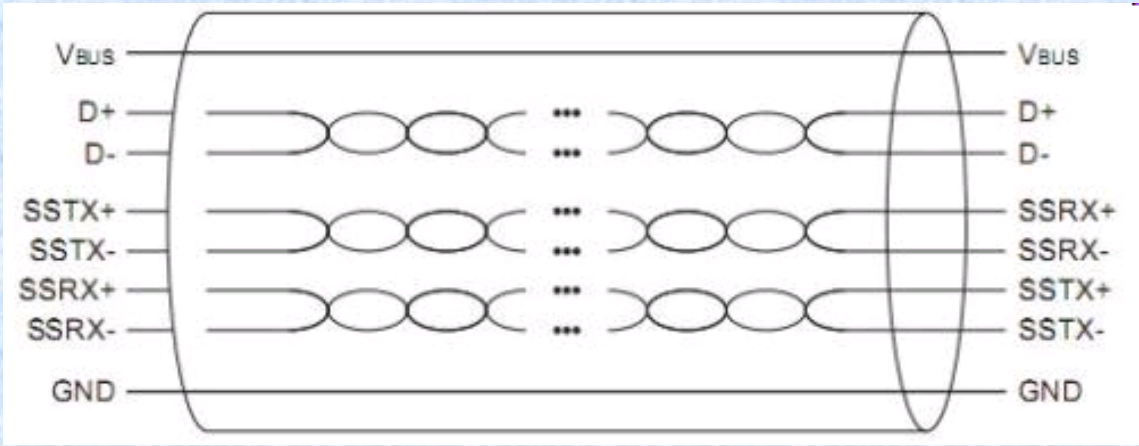
Definice rychlosti zařízení

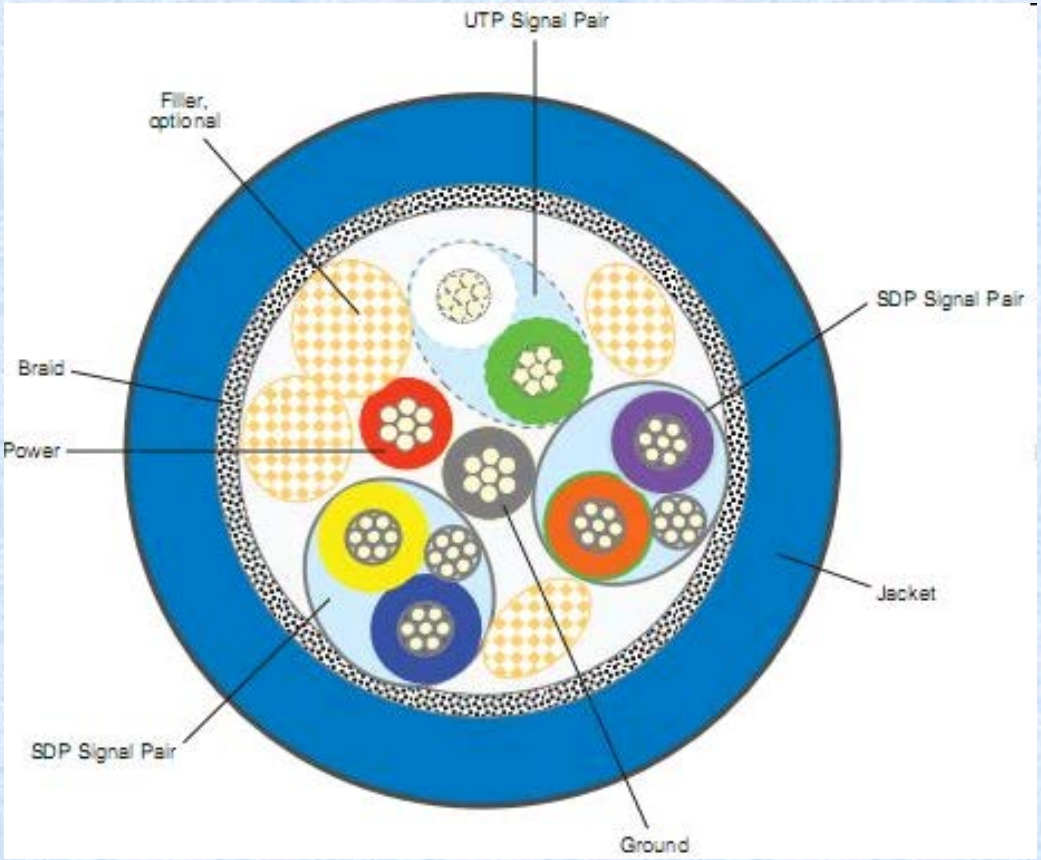
Low Speed



Full Speed




VBUS
D+
D-
SSTX+
SSTX-
SSRX+
SSRX-
GND
VBUS
D+
D-
SSRX+
SSRX-
SSTX+
SSTX-
GND


UTP Signal Pair
Filler, optional
SDP Signal Pair
Braid
Power
Jacket
SDP Signal Pair
Ground

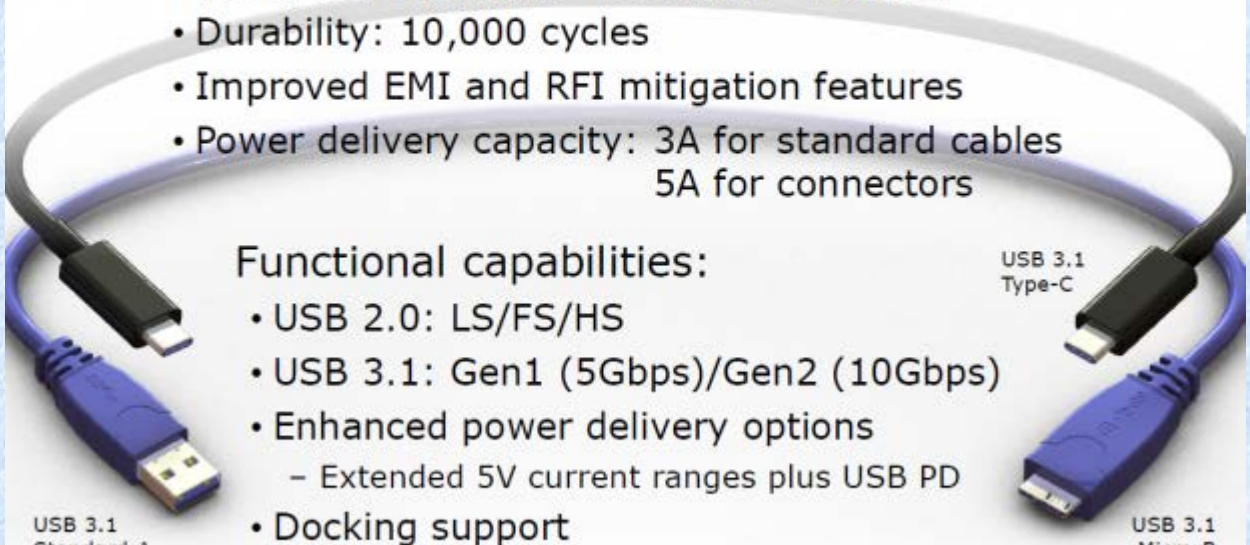
USB Type-C – Additional Characteristics

Mechanical specs (preliminary):

- Receptacle opening: ~8.3mm x ~2.5mm
- Durability: 10,000 cycles
- Improved EMI and RFI mitigation features
- Power delivery capacity: 3A for standard cables
  5A for connectors

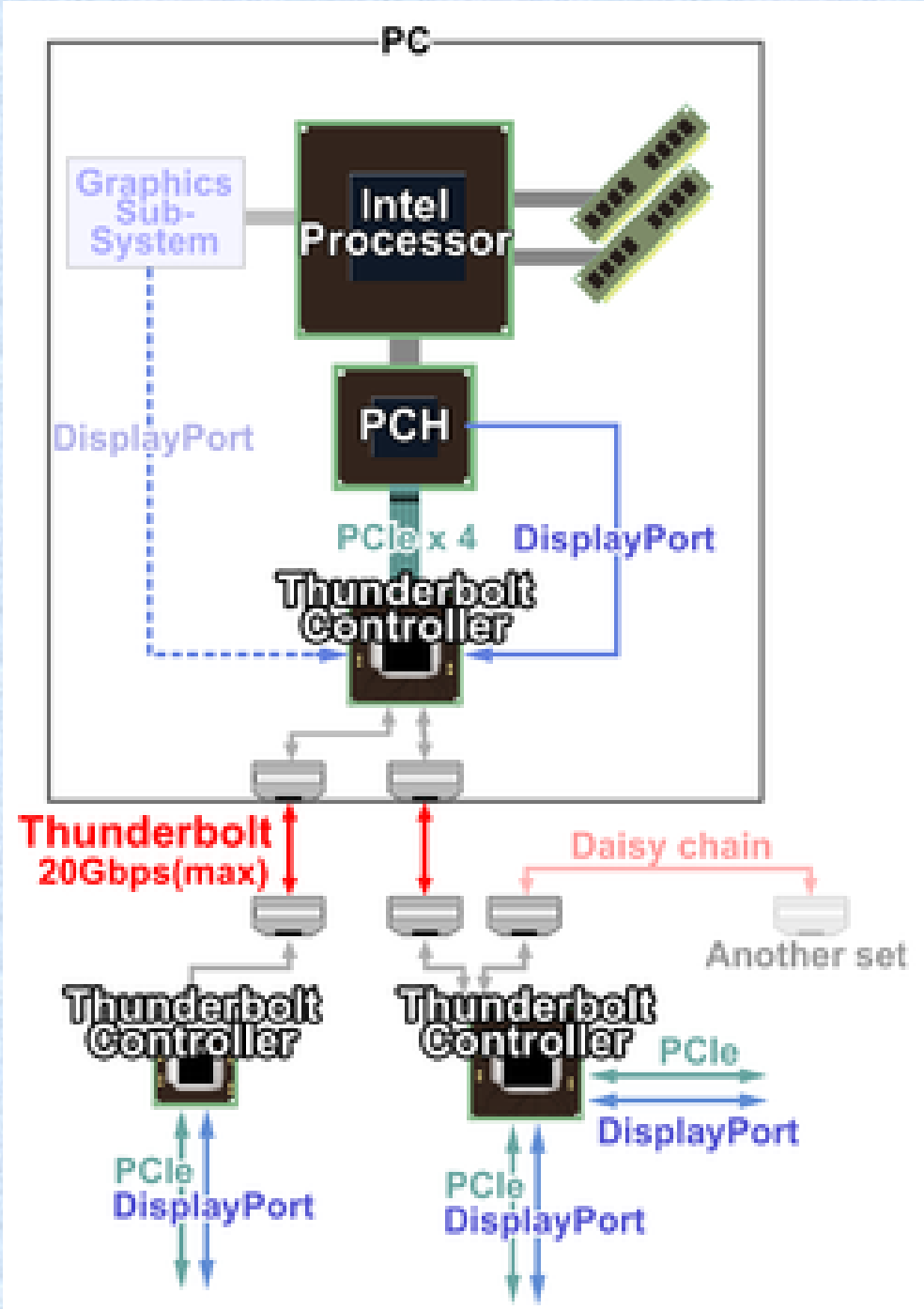
Functional capabilities:

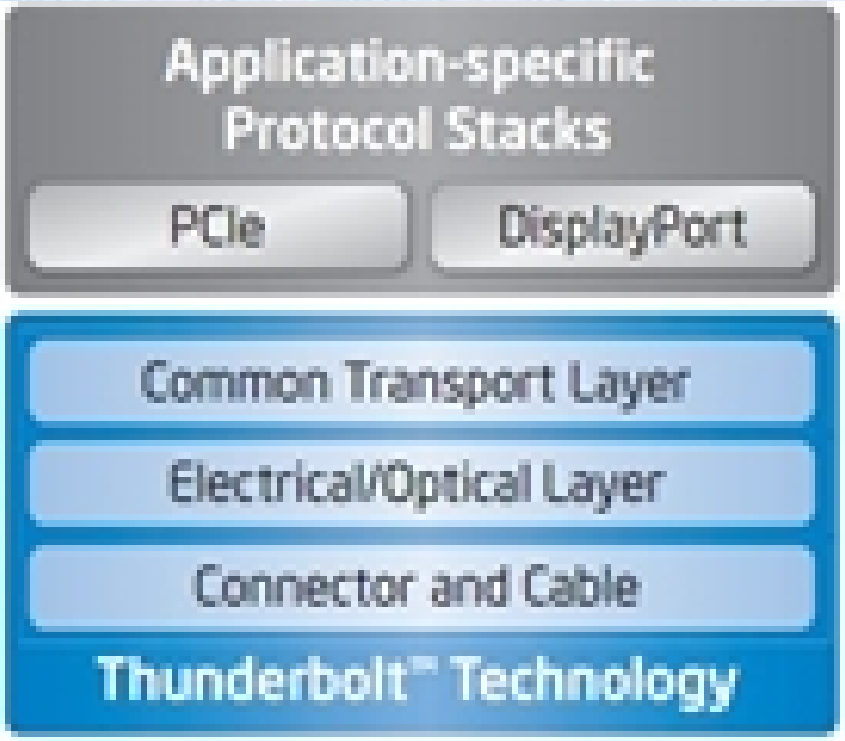
- USB 2.0: LS/FS/HS
- USB 3.1: Gen1 (5Gbps)/Gen2 (10Gbps)
- Enhanced power delivery options
  - Extended 5V current ranges plus USB PD
- Docking support
  - USB PD-based interface configuration option

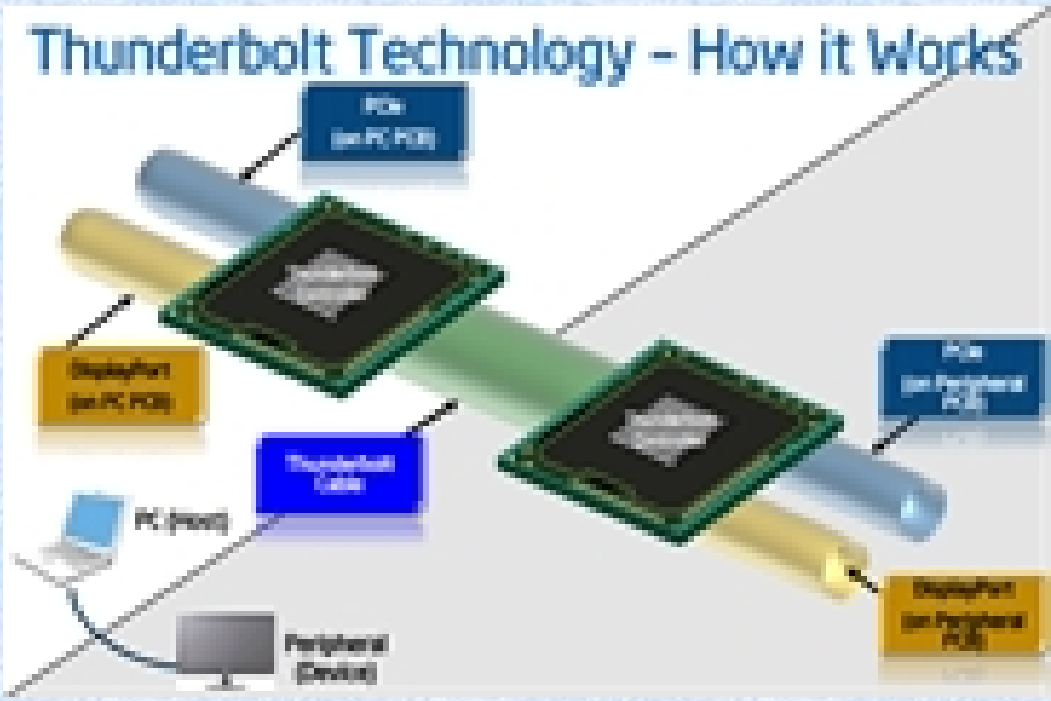


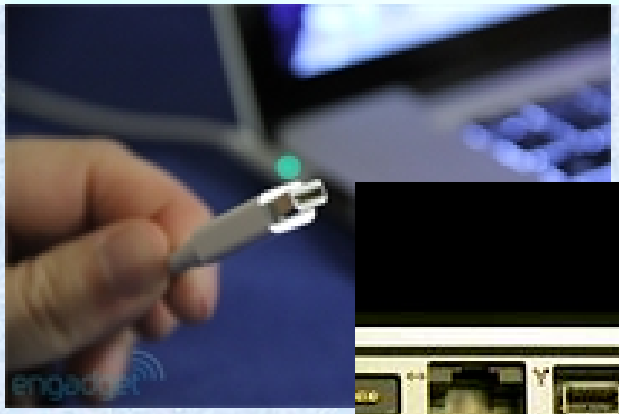
IDF14

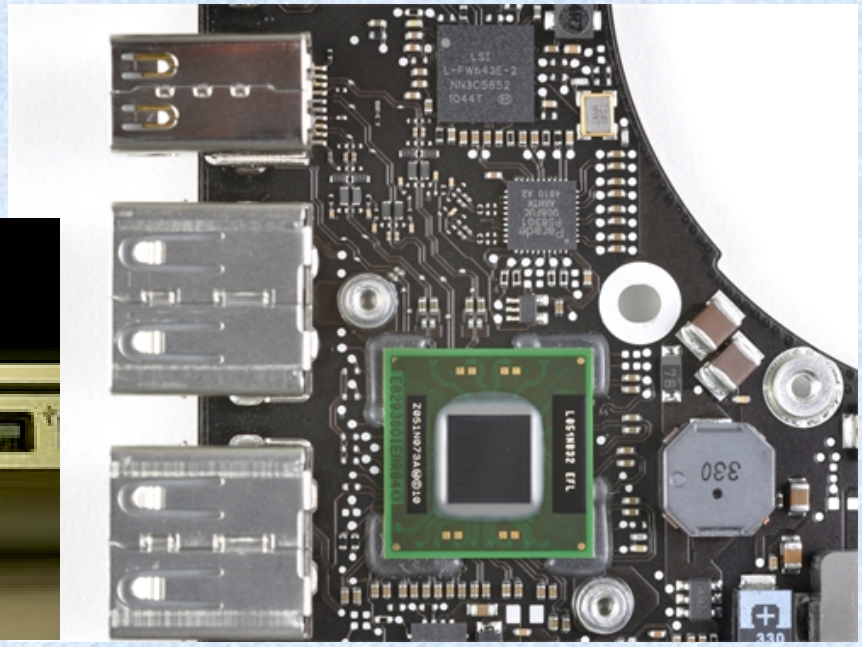
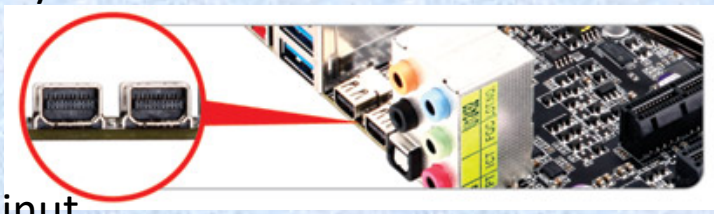
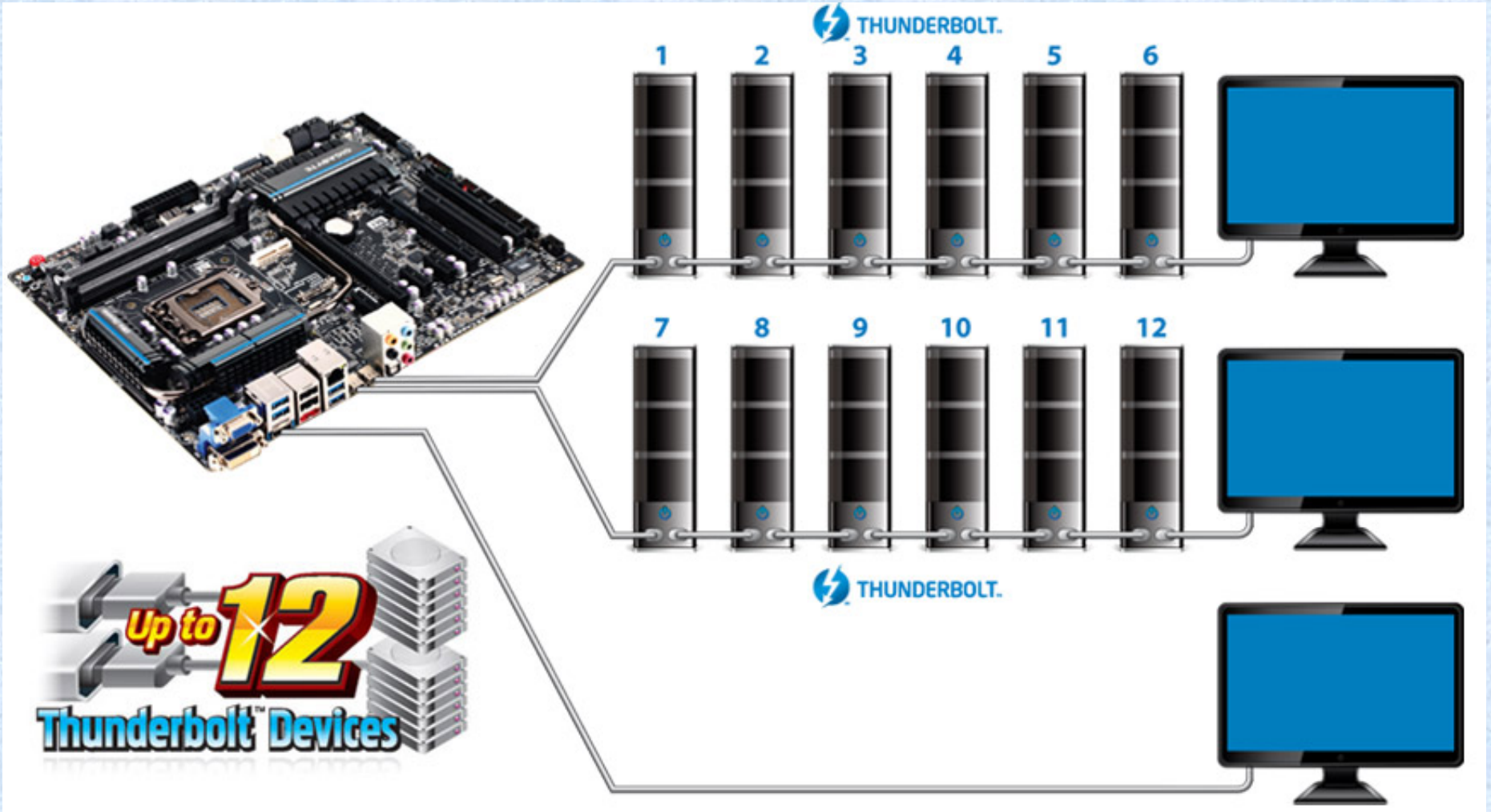
Artist renderings courtesy of Foxconn, final design subject to change*


PC
Graphics Sub-System
Intel Processor
PCH
DisplayPort
PCIe x 4
DisplayPort
Thunderbolt Controller
Thunderbolt
20Gbps(max)
Daisy chain
Another set
Thunderbolt Controller
Thunderbolt Controller
PCIe
DisplayPort
PCIe
DisplayPort
PCIe
DisplayPort


Application-specific Protocol Stacks
PCIe
DisplayPort
Common Transport Layer
Electrical/Optical Layer
Connector and Cable
Thunderbolt™ Technology


Thunderbolt Technology – How it Works





Základní desky GIGABYTE série 7
jako první nabízí 2 plně certifikované vysokorychlostní porty Thunderbolt™.
Je možné k nim připojit až 12 zařízení
společně s až třemi digitálními displeji,
vše při úžasných rychlostech přenosu dat –
Thunderbolt™ dokáže přenést 1 TB dat za pouhých pět minut.