Storage Networking Roadmaps

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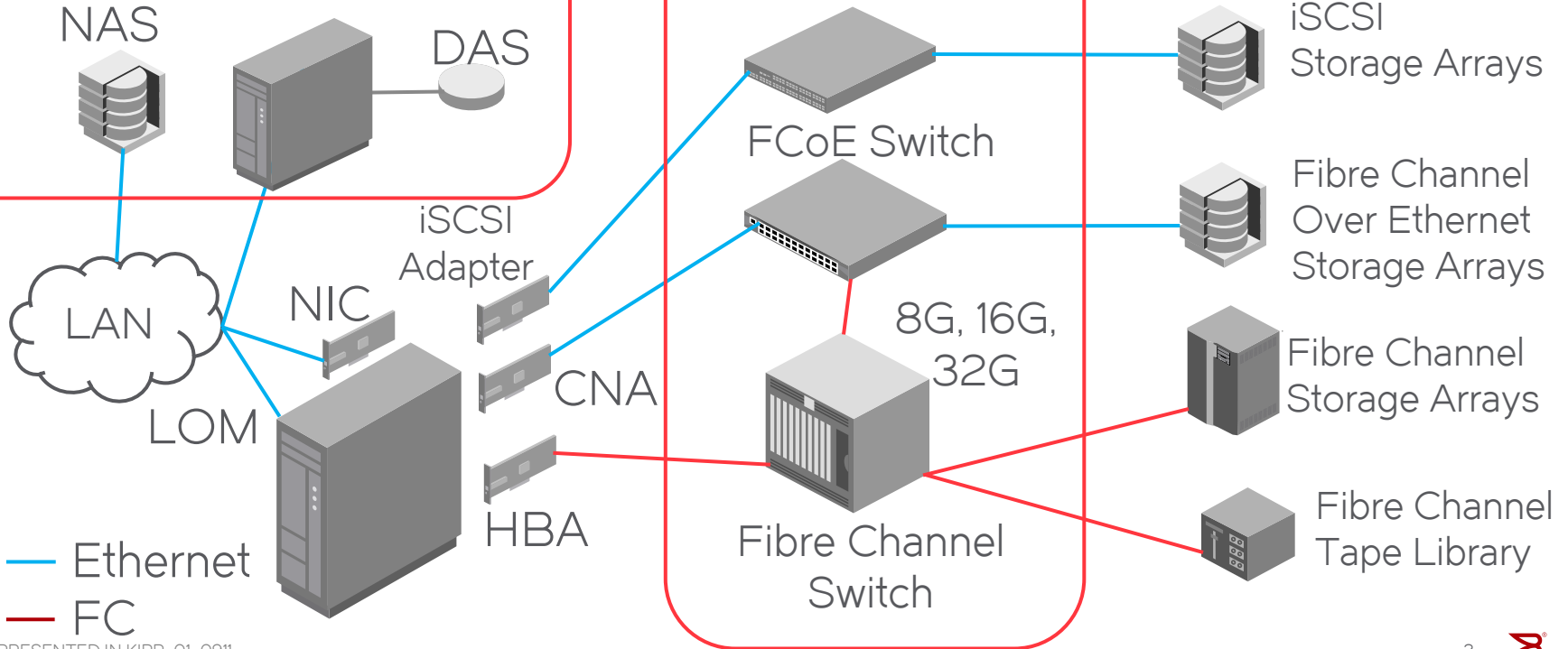
BROCADE

Storage Networking Roadmaps

- More data

- More applications

- More bandwidth

- More HDD capacity

- Slower disk drive speeds?
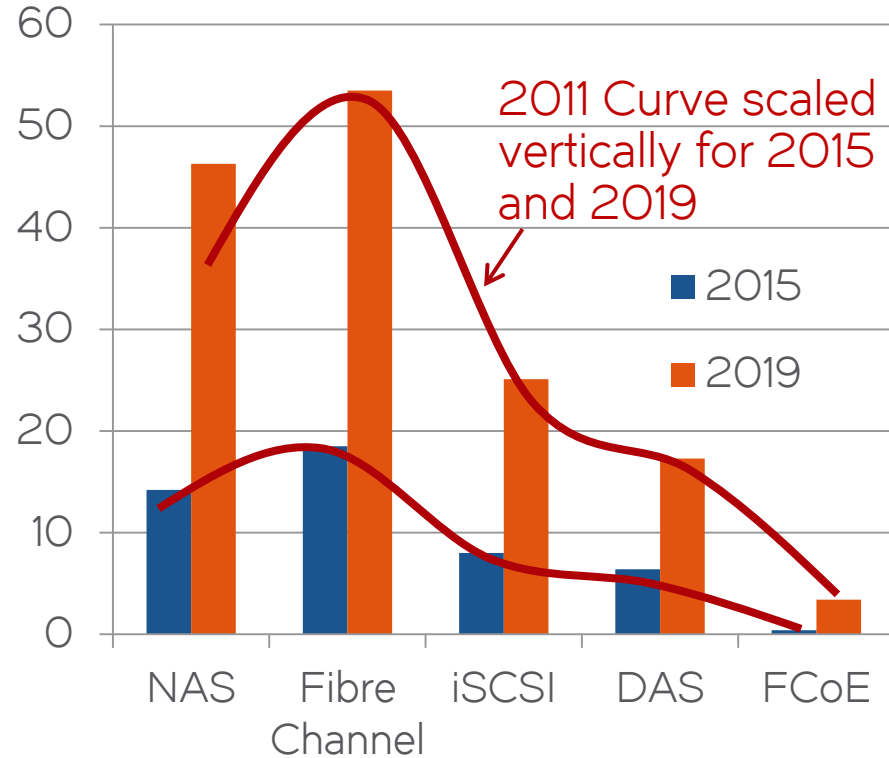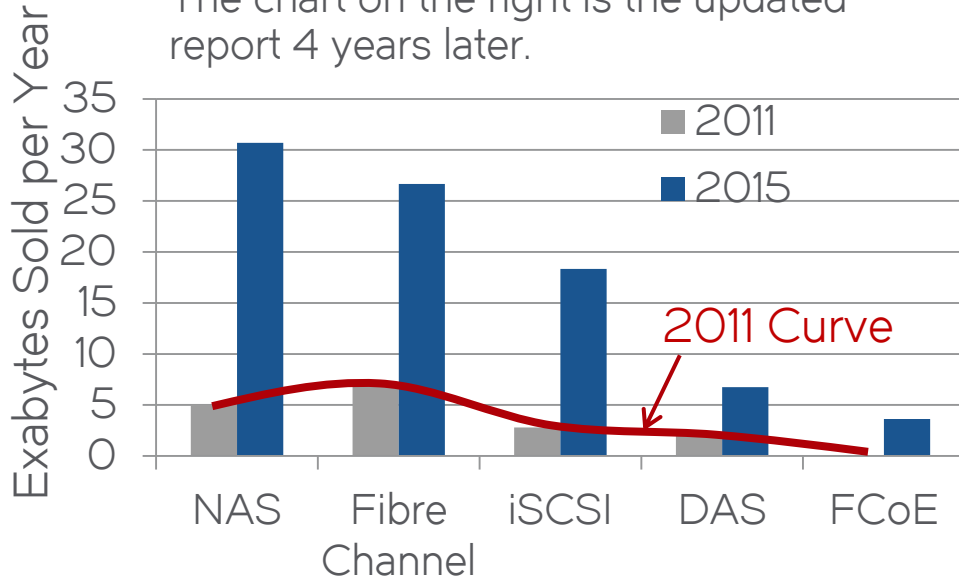
Illustration of Storage Access

DAS = Direct Attached Storage
NAS = Network Attached Storage
iSCSI – Internet Small Computer Systems Interface
LOM = LAN on Motherboard
NIC = Network Interface Card
HBA = Host Bus Adapter
CNA = Converged Network Adapter

Focus of 2.5/5GbE Backplane And Copper Cable Study Group

NAS

DAS

SAN

Ethernet Switch

iSCSI Storage Arrays

FCoE Switch

Fibre Channel Over Ethernet Storage Arrays

iSCSI Adapter

LAN

NIC

CNA

8G, 16G, 32G

Fibre Channel Storage Arrays

LOM

HBA

Fibre Channel Switch

Fibre Channel Tape Library

— Ethernet
— FC
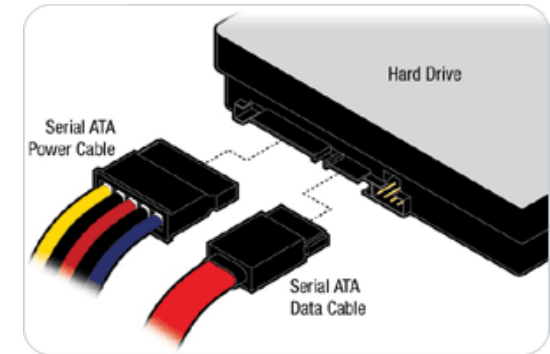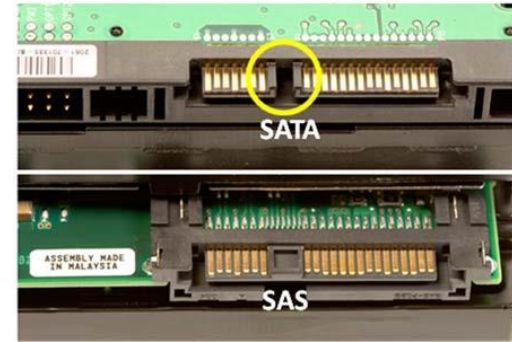
ALSO PRESENTED IN KIPP_01_0911

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Comparison of External Storage Forecasts

The chart below was presented in kipp_01_0911 and based on a 2011 report. The chart on the right is the updated report 4 years later.

**Left chart:** Exabytes Sold per Year — 2011, 2015. 2011 Curve. Categories: NAS, Fibre Channel, iSCSI, DAS, FCoE.

Right chart: 2015, 2019. 2011 Curve scaled vertically for 2015 and 2019. Categories: NAS, Fibre Channel, iSCSI, DAS, FCoE.

Disk Drive Interfaces

| Interface	Data Rate (Gb/s)	Note
Ethernet	1 (2.5, 5)*	Minimal GbE
Fibre Channel	1-8	SAS took over after 8GFC
SAS	3-24	Major Enterprise Storage Drive
USB	0.48-10	Peripheral Drive
PCIe	2-63	Server Drive
SATA	1.5-6	Desktops

*This Study Group

The 2015 Ethernet Roadmap

- The Ethernet Alliance has developed the 2015 Ethernet Roadmap

- Find out more at www.ethernetalliance.org

- The 2016 Ethernet Roadmap will include a chart on backplanes that would include this project

ETHERNET SPEEDS
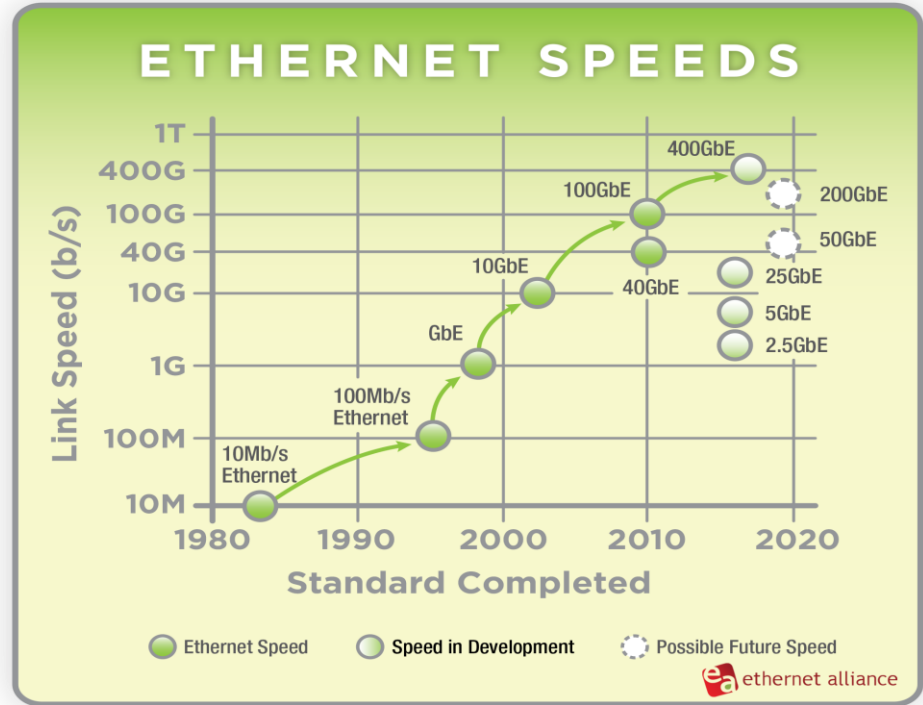
The Fibre Channel Roadmap
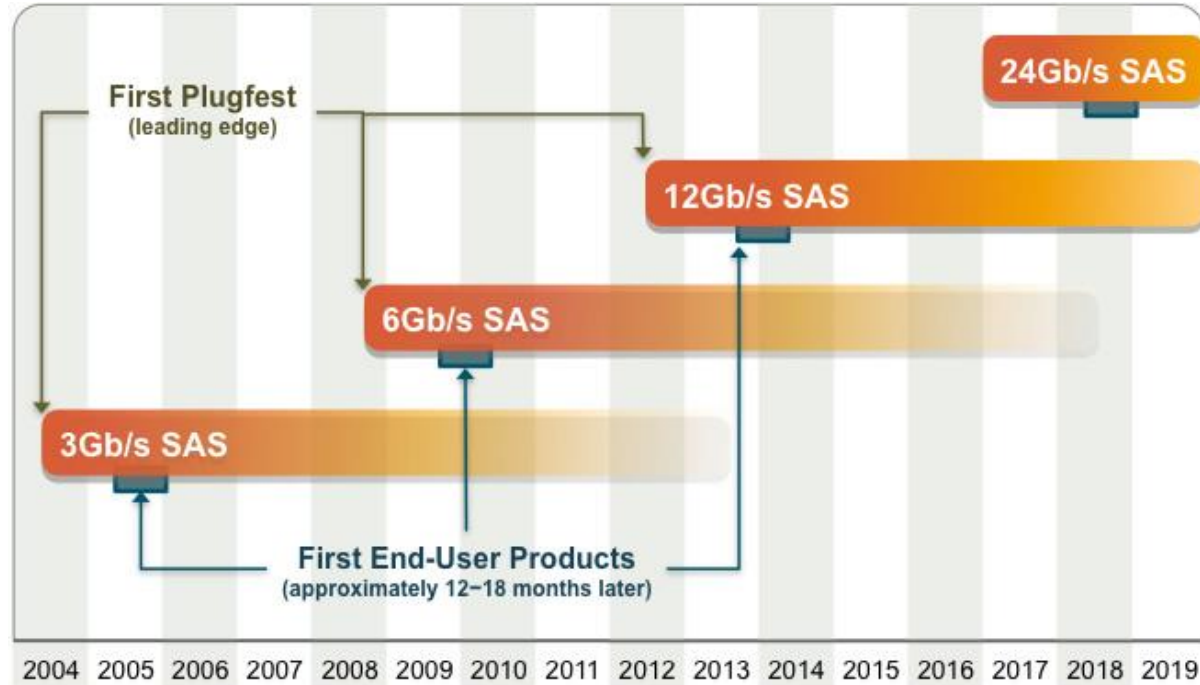
Doubling and now Quadrupling every few years

- Fibre Channel is focused on optics and the 1X/4X paradigm

- No longer HDD Interface

- "The Fibre Channel Roadmap" will be released in October and includes:
  - Physical maps like the 2015 Ethernet Roadmap
  - Electronic version soon at www.fibrechannel.org/roadmap.html
  - White paper
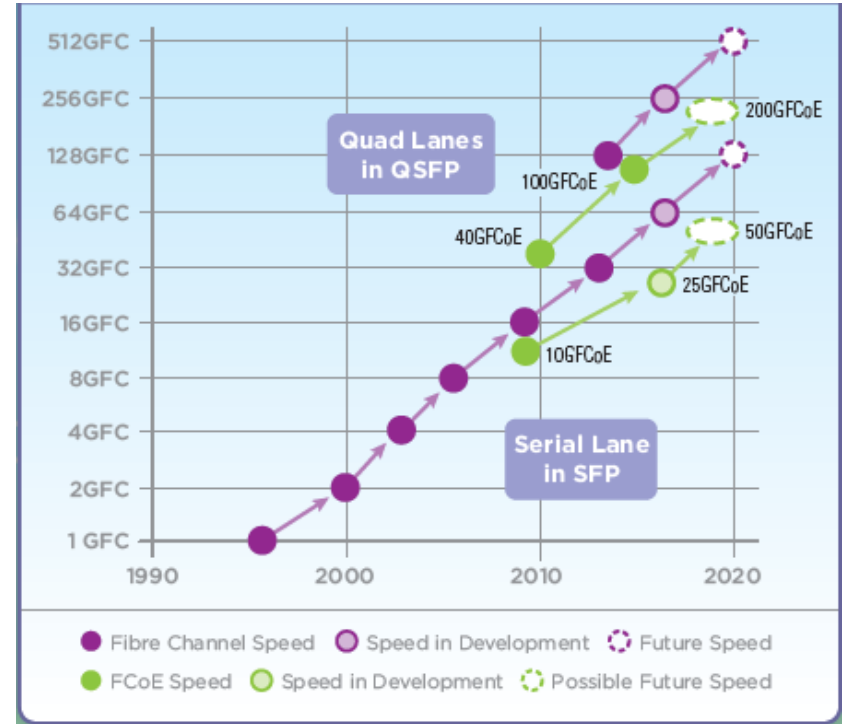
SAS Roadmap

SCSI Trade Association (STA) has this roadmap

- SAS has doubled data rates like Fibre Channel for over a decade
- 12G SAS shipping now and 24G SAS expected in 2018

First Plugfest (leading edge)

24Gb/s SAS

12Gb/s SAS

6Gb/s SAS

3Gb/s SAS

First End-User Products (approximately 12–18 months later)

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

* SAS Roadmap –SCSI Trade Association –March 2014

USB Roadmap

- USB HDD are very popular in consumer space

- USB 3.1 operating at 10Gb/s

Speed (b/s)

10G

5G

0

12 Mb/s
1995

480 Mb/s
2000

5 Gb/s
2008

1990   2000   2010   2020
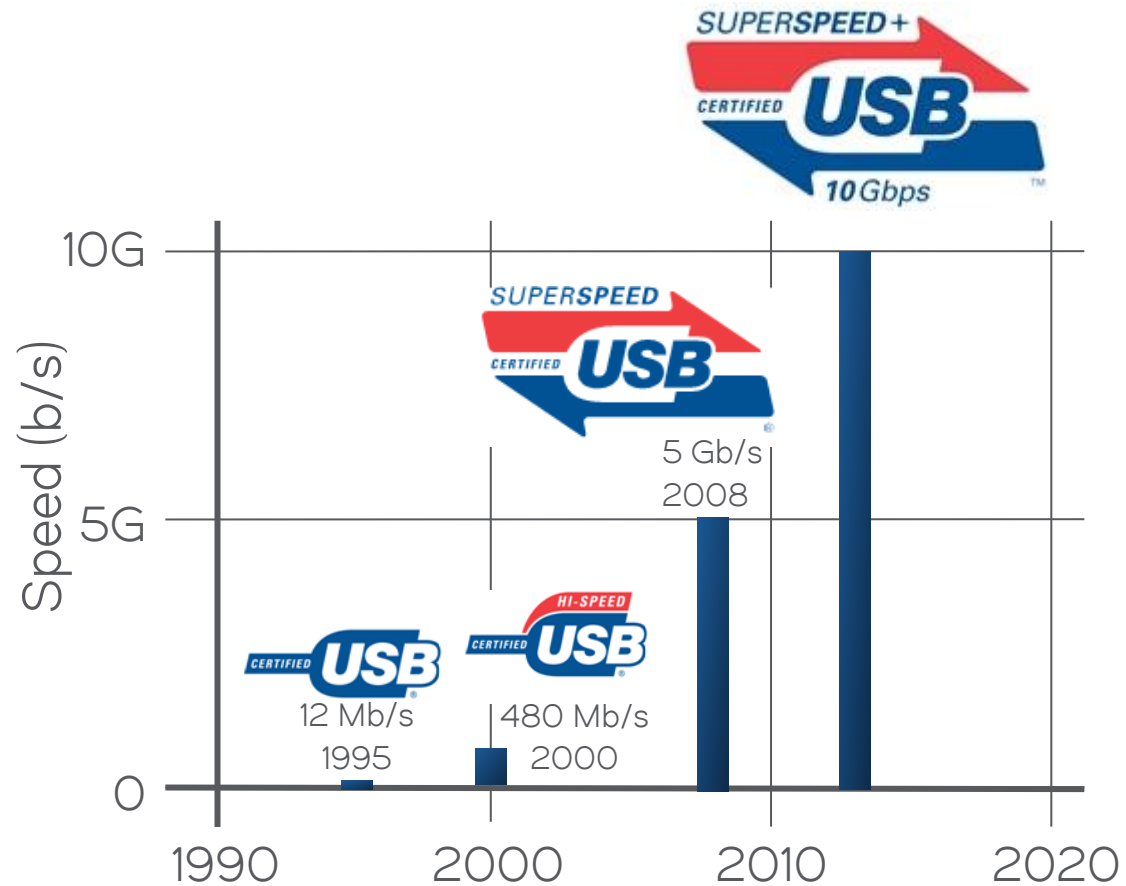
PCIe Roadmap

- PCIe hard disk drives and Solid State Drives (SSDs) are being sold today
- X8/12/16/32 not shown

PCIe Drive

Speed (b/s)

100G

75G

50G

25G

0

2000   2010   2020

4 Lane
Single Lane

2003
PCIe 1.0
2Gb/s/Lane
X4 = 8G

2007
PCIe 2.0
4 Gb/s/Lane
X4 = 16G

2010
PCIe 3.0
7.877 Gb/s/Lane
X4 = 31.5G

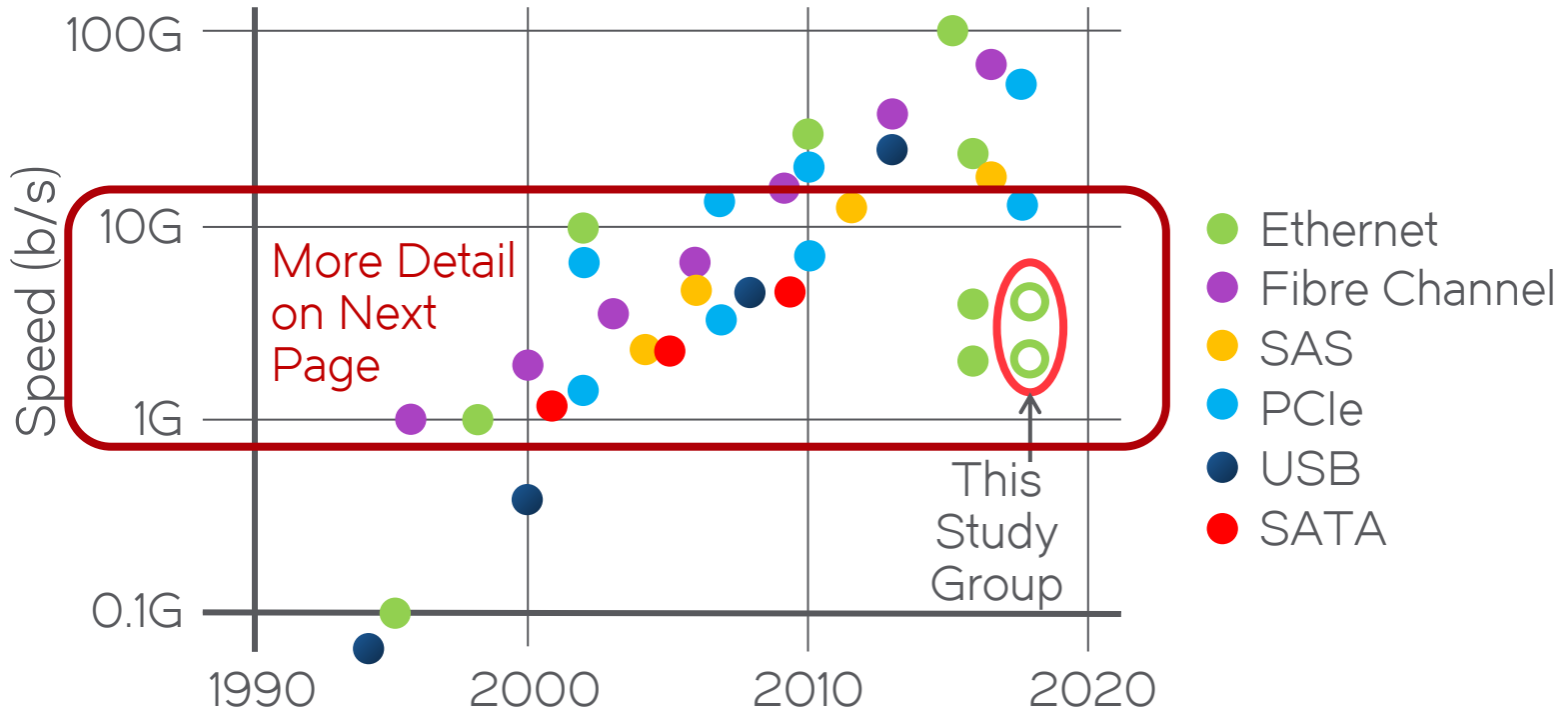2017
PCIe 4.0
15.754 Gb/s/Lane
X4 = 63G
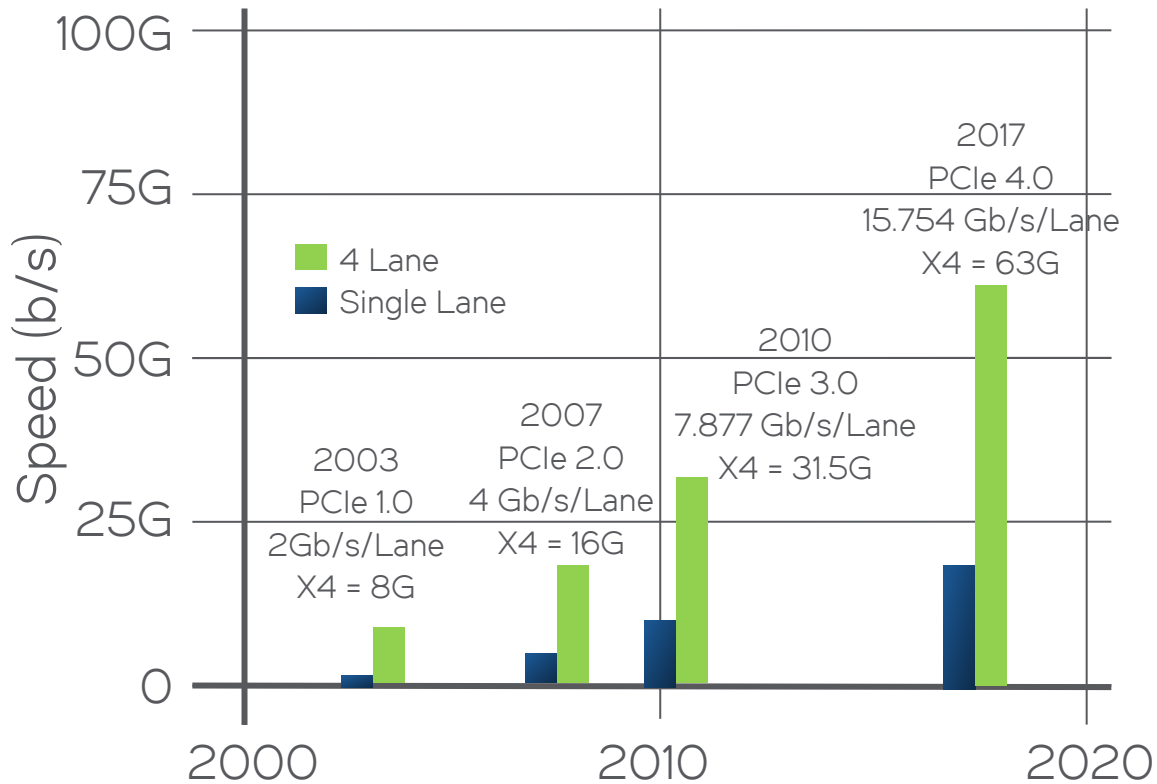
SATA Roadmap

- Serial Advanced Technology Attachment (SATA) has this roadmap that is similar to SAS

	Data Rate
SATA 1.0	1.5 Gb/s
SATA 2.5	3 Gb/s
SATA 3.0	6 Gb/s

SERIAL ATA
SATA-IO Roadmap

SATA 3.2
- Includes SATA Express
- µSSD

SATA 3.1
- mSATA detect, zero power ODD
- Required PM, CAP_ID, USM

SATA 3.0
- 6Gb/S Internal
- Isochronous NCQ cmd, NCQ mgmt cmd, LIF 1.8, 7mm ODD, ATA8
- Certified Logos

SATA 2.6
- 3Gb/S Internal/External, NCQ unload, Slimline ODD connector, Four lane e/xSATA connector

SATA-IO Inc. formed 2004

SATA 2.5
- 3Gb/S Internal/External
- eSATA, Click Connect, SSC, NCQ, Staggered spinup, ASN

Serial ATA WG formed 2001

SATA 1.0
- 1.5Gb/S Internal/External
- Port Multiplier, Port Multiplier, ATA6

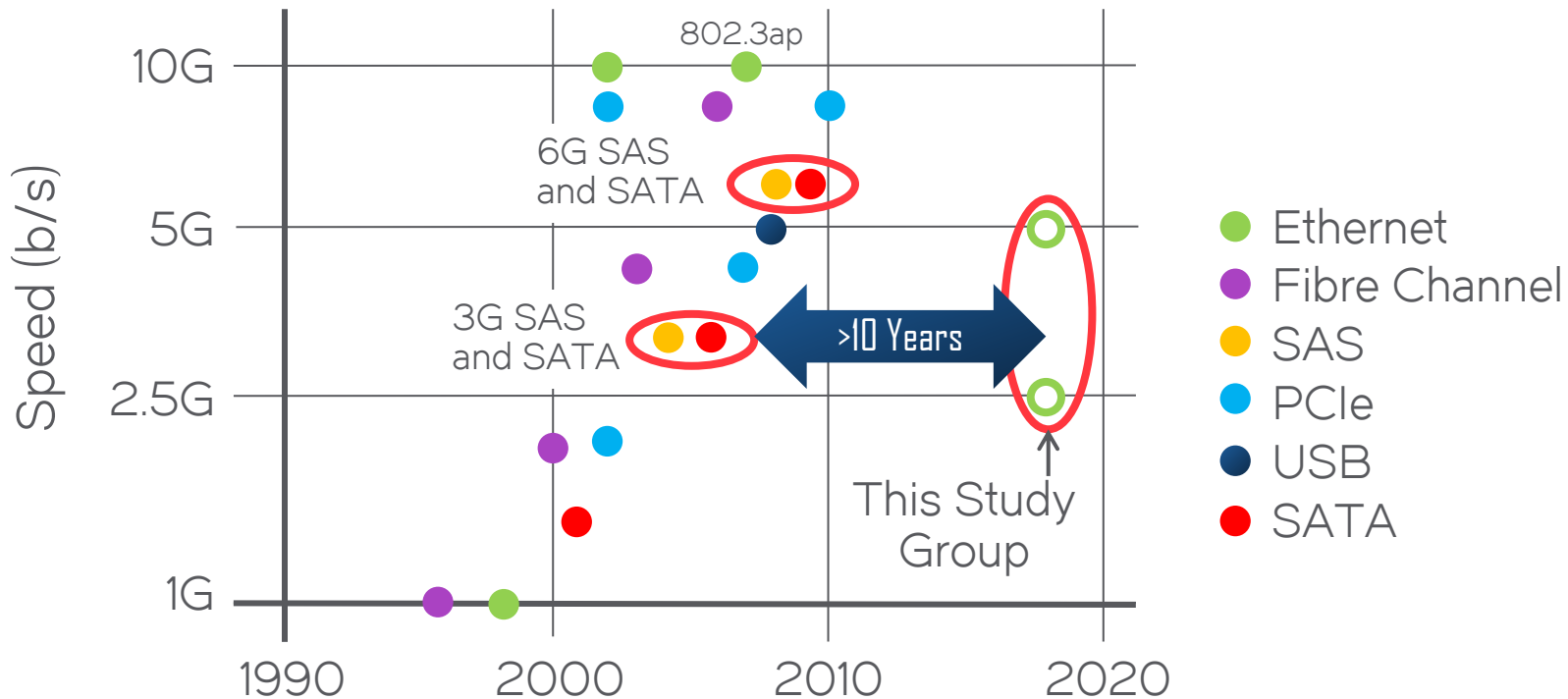2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Aggregate Disk Drive Interface Roadmap

Aggregate Disk Drive Interface Roadmap

New Standard about a decade behind the competition

2.5/5GbE HDD Interfaces Seem Very Late

- Comparable technologies were defined a decade ago
  - SAS mainly using 6G specifications today
- More competition is growing with PCIe
- Should we fracture the market between GbE and 10GbE into 2 more speeds?

Thank you