



IEEE ComSoc SCV : Ethernet's Next Evolution – 40GbE and 100GbE

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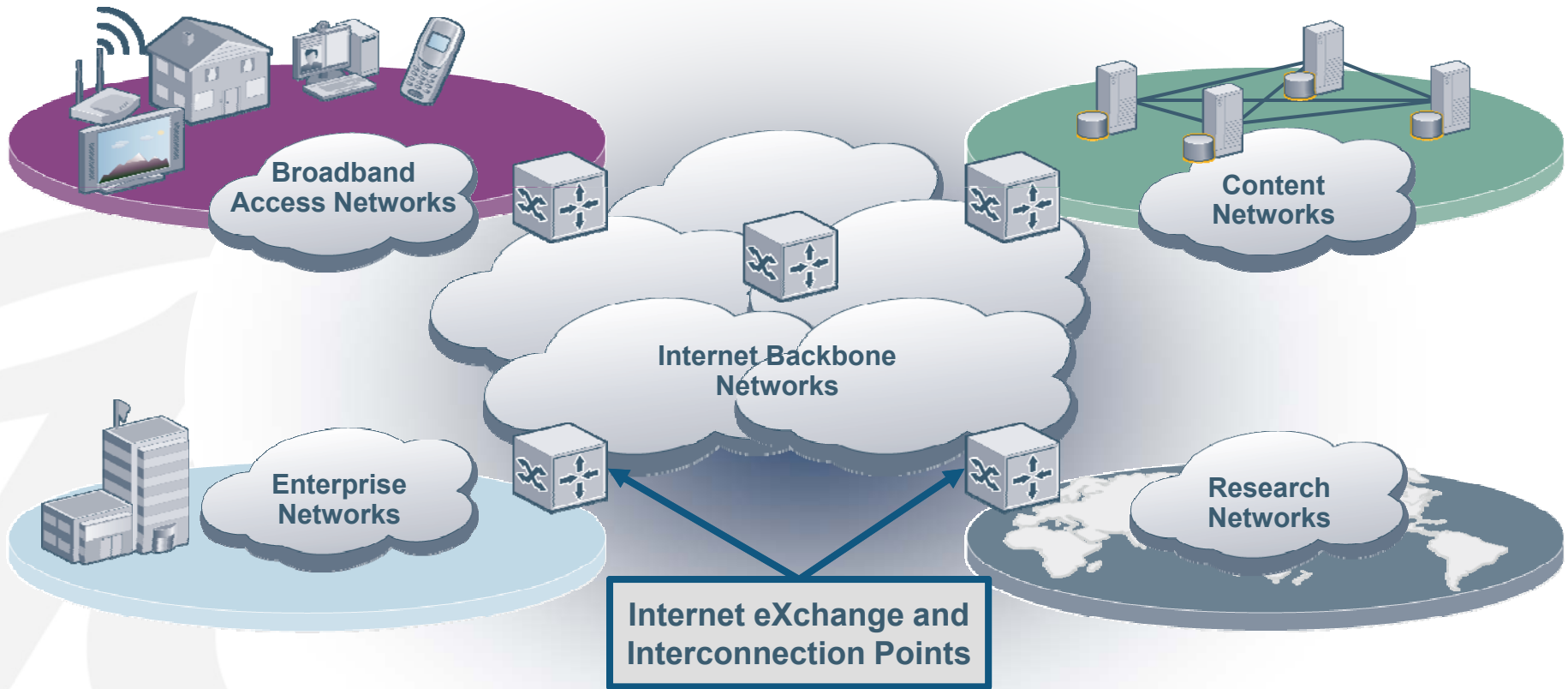
Regarding the Views Expressed

- Per IEEE-SA Standards Board Operations Manual, January 2005:
“At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.”
- The views I am expressing on IEEE standards and related products should NOT be considered the formal position, explanation, or interpretation of the Ethernet Alliance.

The Ethernet Ecosystem

BROADBAND ACCESS

CONTENT PROVIDERS



DATA CENTERS AND ENTERPRISE

RESEARCH, EDUCATION & GOVERNMENT FACILITIES

Why Higher Speed Ethernet?

Fundamental bottlenecks are happening everywhere



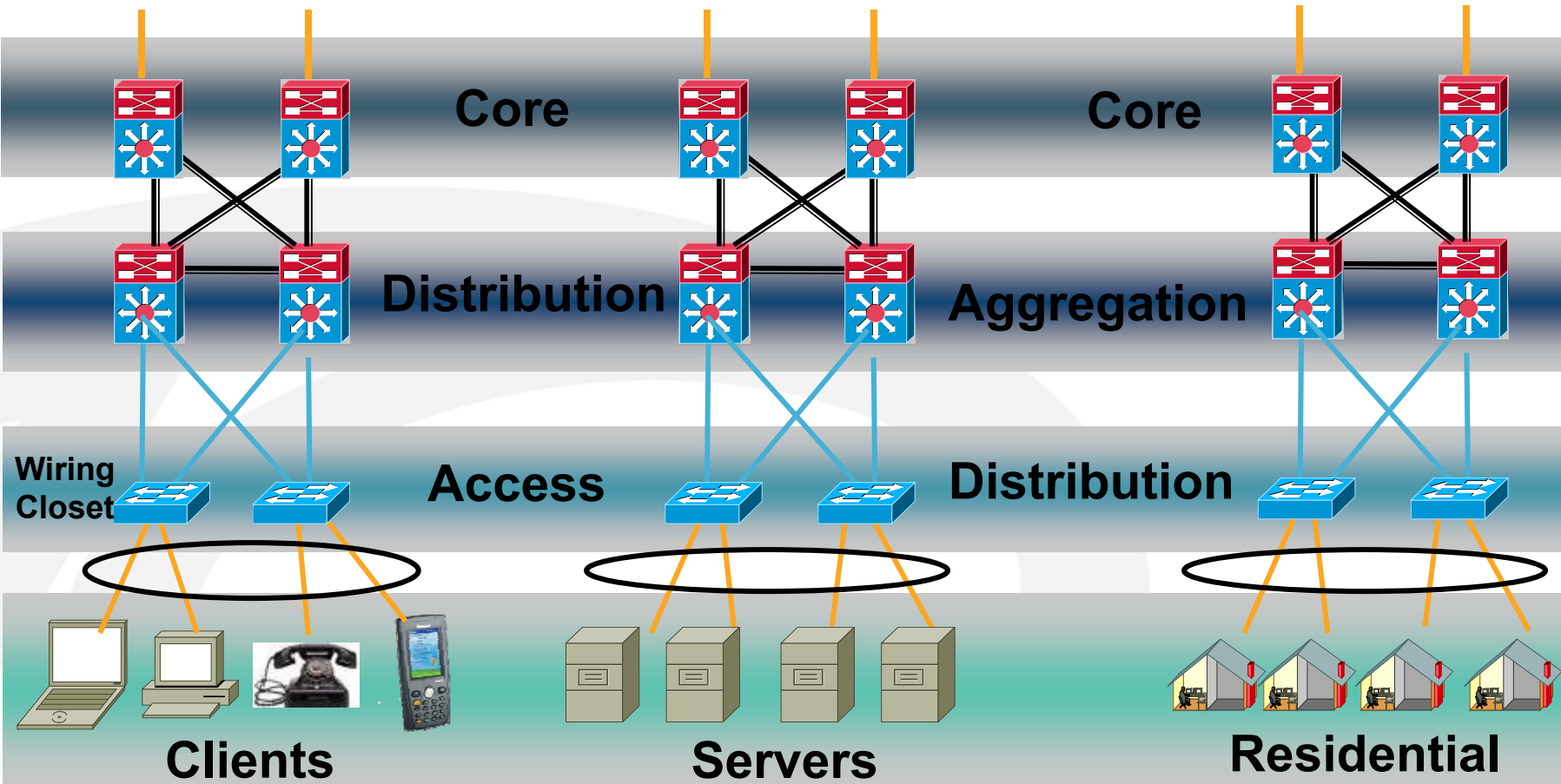
Source: HSSG Tutorial, http://www.ieee802.org/3/hssg/public/nov07/HSSG_Tutorial_1107.zip

Higher Speed Ethernet Penetration

Campus/ Enterprise

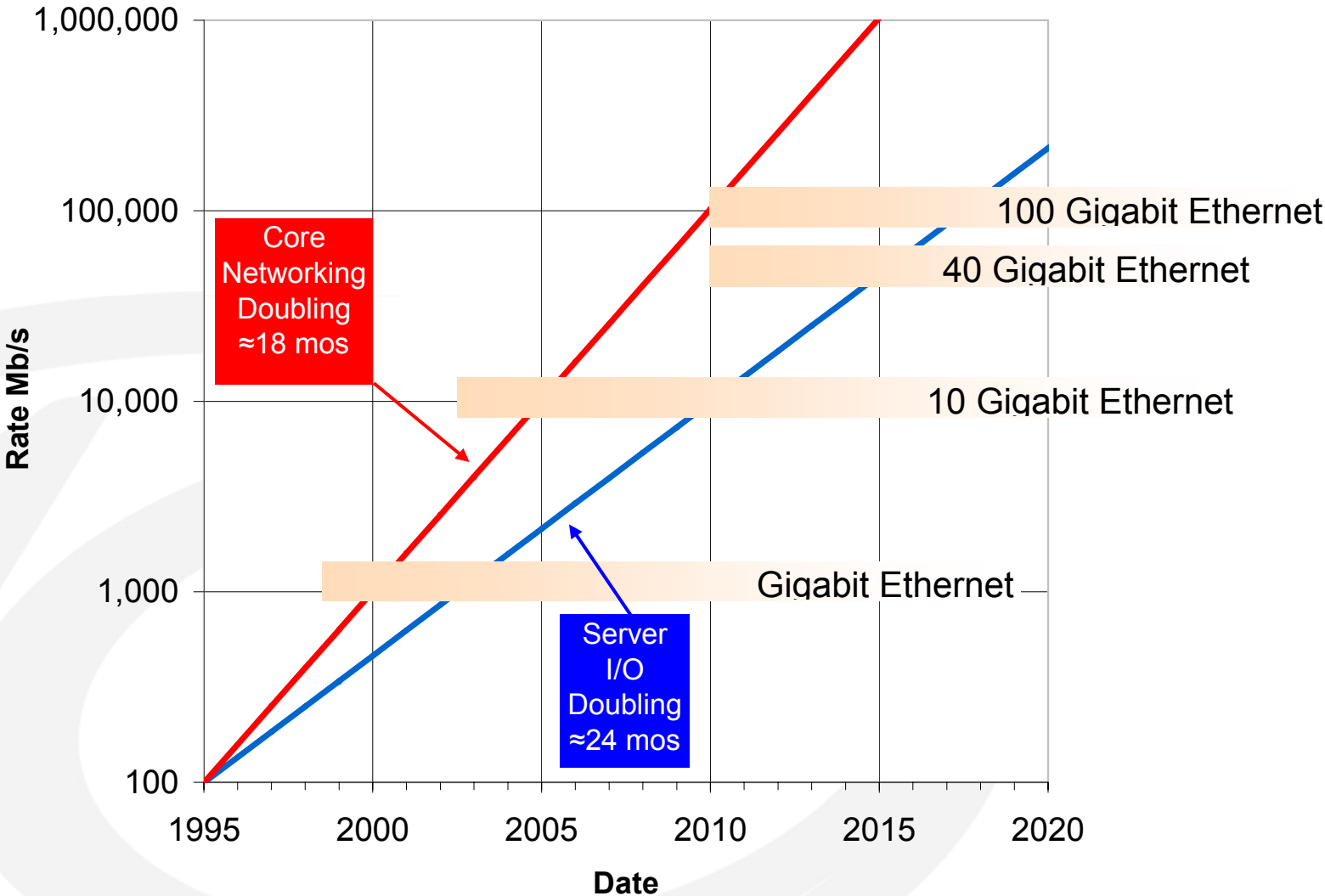
Data Center

Service Provider



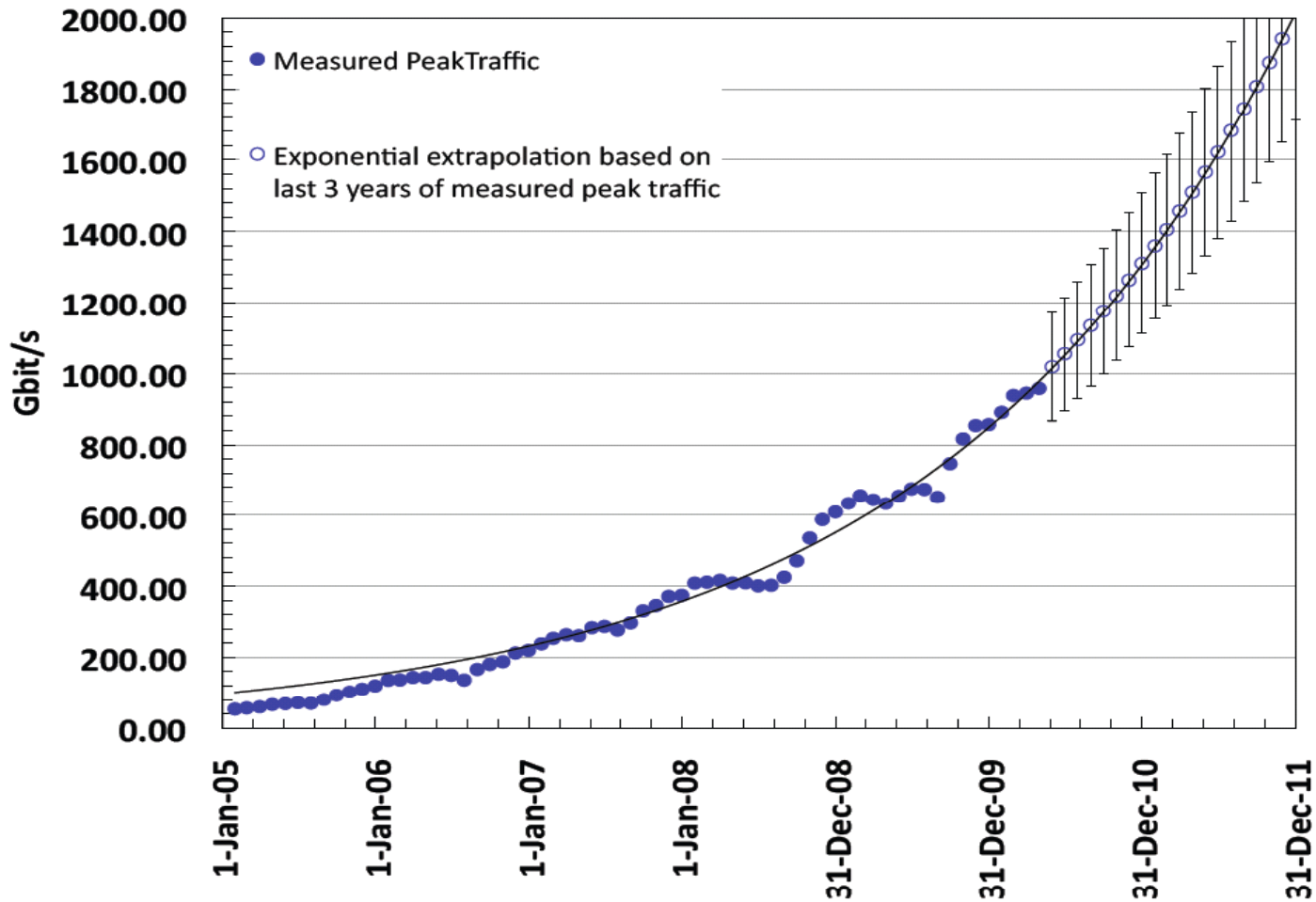
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40GbE and 100GbE: Computing and Networking



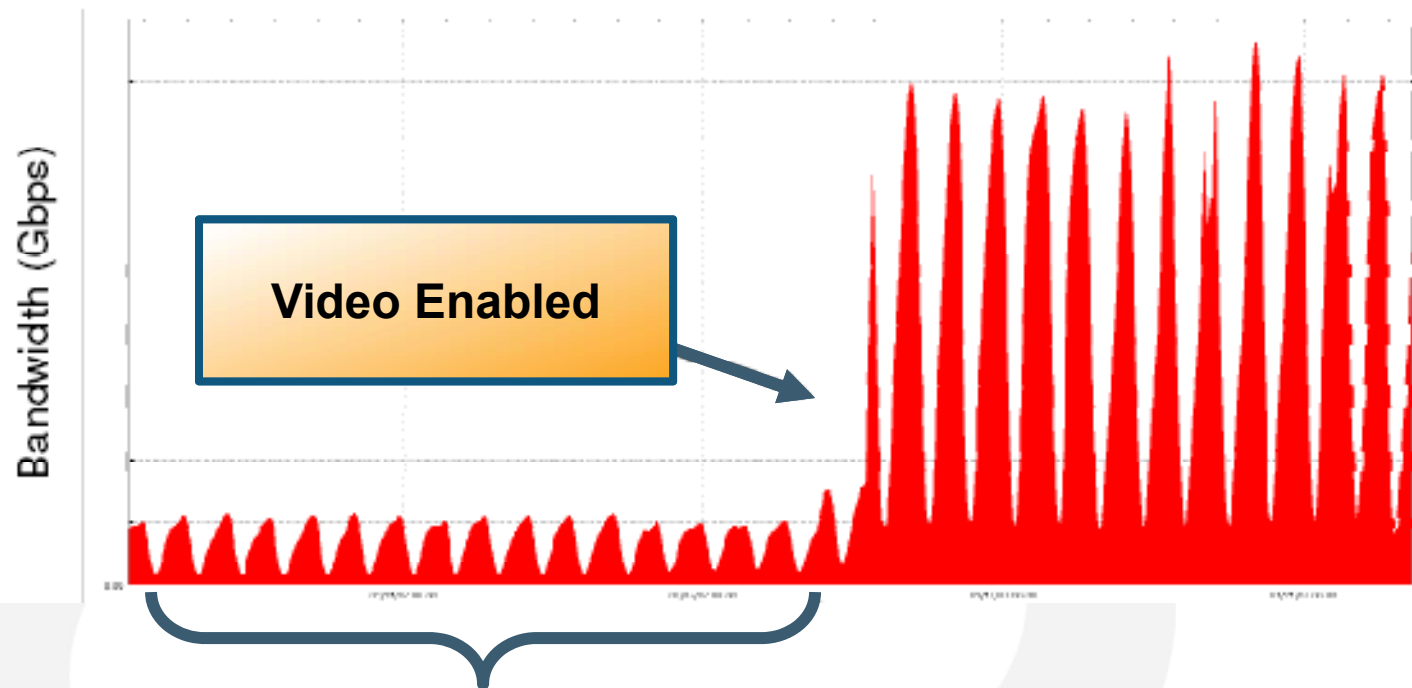
Source: HSSG Tutorial, http://www.ieee802.org/3/hssg/public/nov07/HSSG_Tutorial_1107.zip

Amsterdam Internet Exchange



Data Provided by Henk Steenman, AMS-IX

TOOTHBRUSH GRAPH



This was a huge amount of traffic
(multiple web services, millions of users)

The Many Roles and Options for Ethernet Interconnects

Data Center

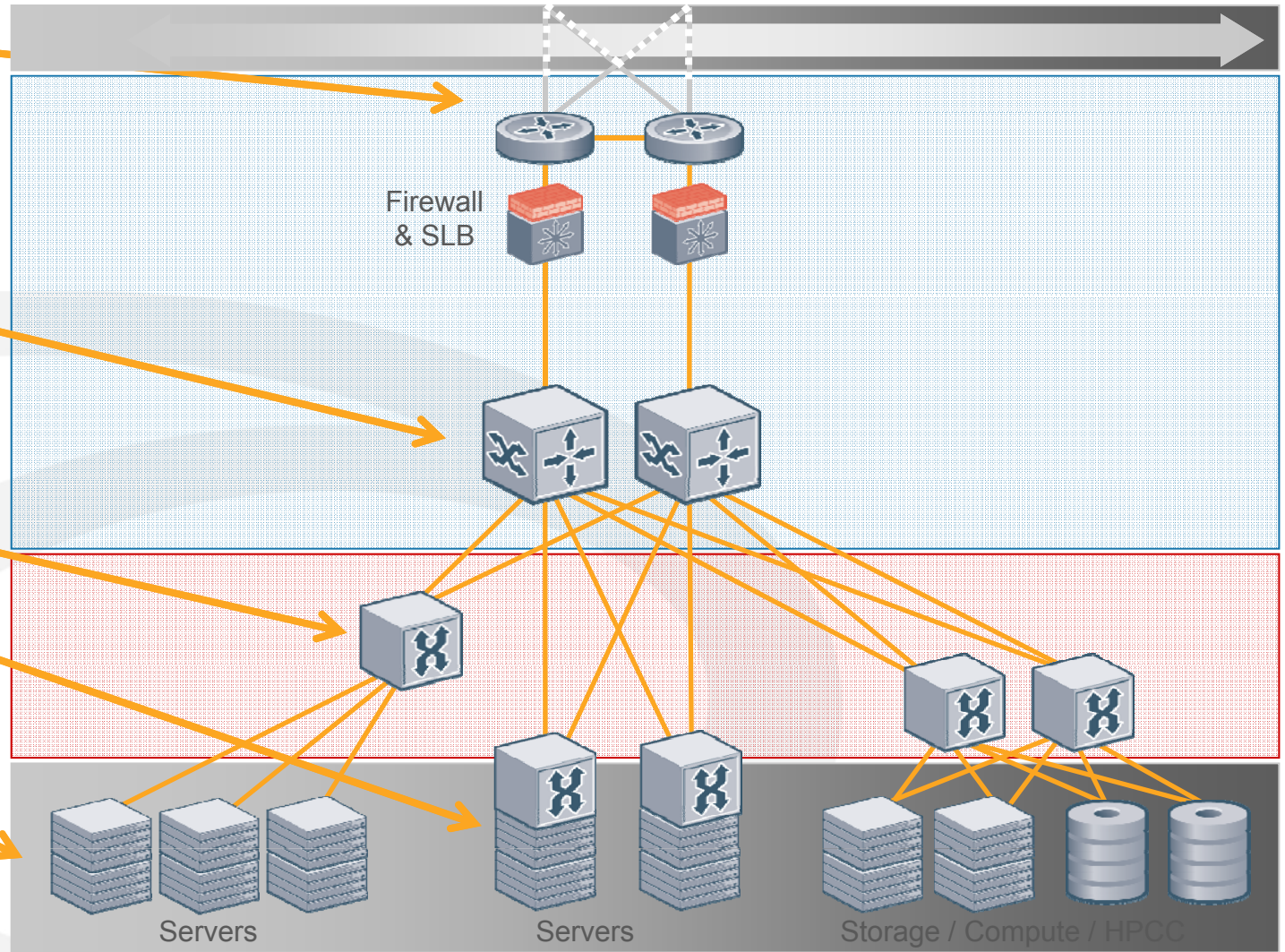
WAN
Rate – G / 10G+
LAG / 40G +
LAG / 100G

Core/
Aggregate—
High & Medium
Capacity
10GbE + LAG
40GbE + LAG /
100GbE

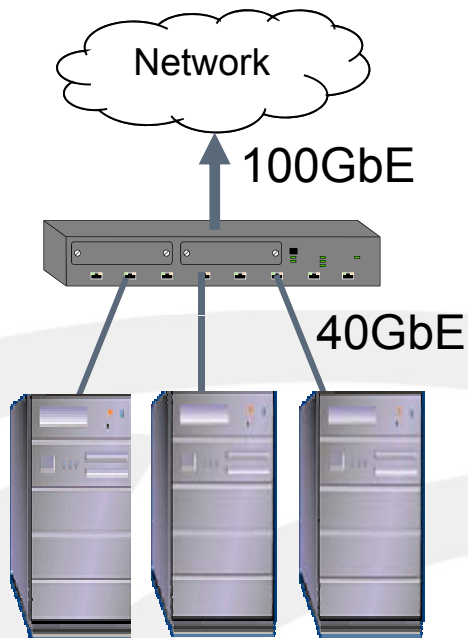
End of Row

Top of Rack
GbE & 10 GbE

Storage &
Compute
Interconnect—
GbE & 10 GbE
8G FC / 16GFC

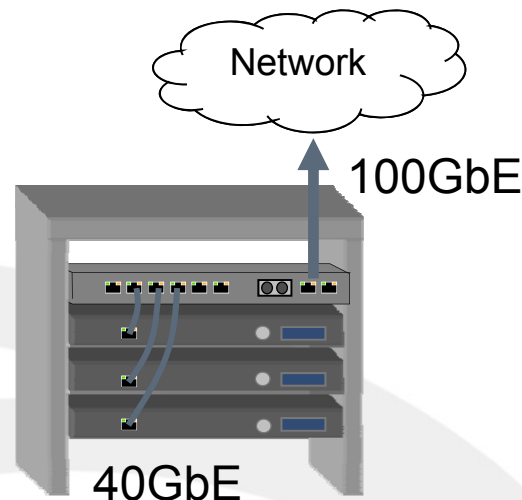


Server Form Factors



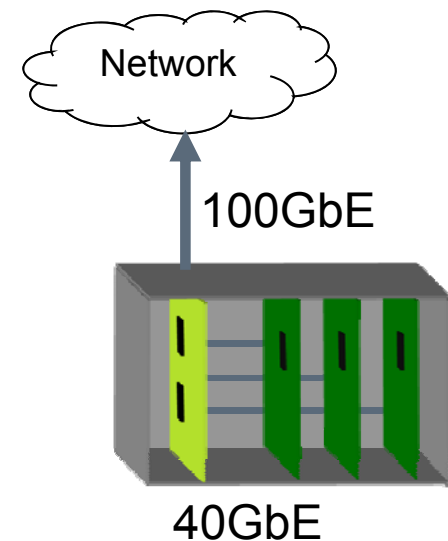
Pedestal Server:

- <100m to switch across data center



Rack Server:

- <10m to switch at top-of-rack or in-row



Blade Server:

- <1m to switch in back of chassis

from http://www.ieee802.org/3/hssg/public/apr07/hays_02_0407.pdf

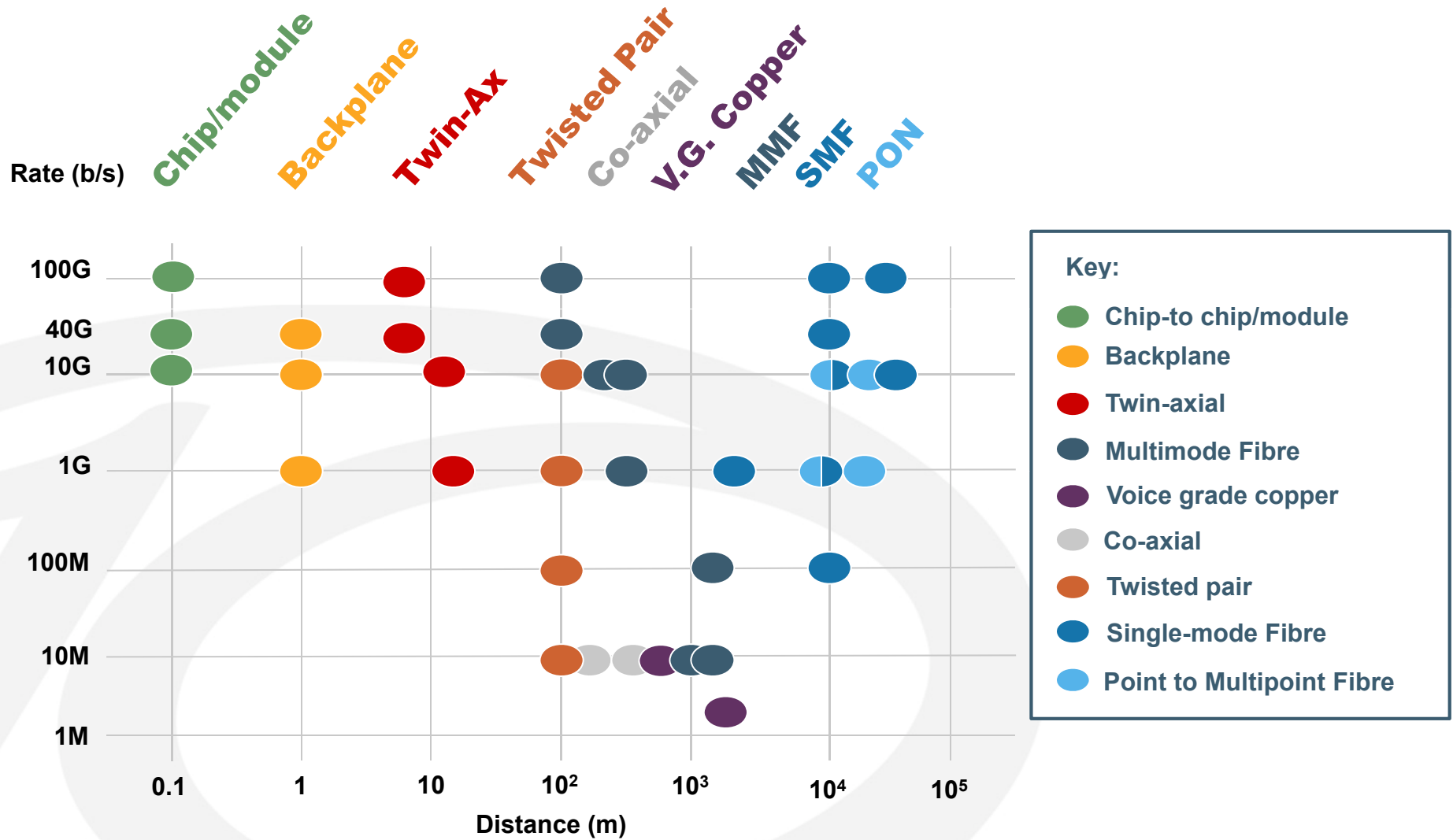
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IEEE 40Gb/s and 100Gb/s: Physical Layer Specifications



Port Type	Description	40GbE	100GbE
40GBASE-KR4	At least 1m backplane	√	
40GBASE-CR4 100GBASE-CR10	At least 7m cu (twin-ax) cable	√	√
40GBASE-SR4 100GBASE-SR10	At least 100m OM3 MMF (150m OM4 MMF)	√	√
40GBASE-LR4 100GBASE-LR4	At least 10km SMF	√	√
100GBASE-ER4	At least 40km SMF		√

The Ethernet 802.3 Umbrella



Based on slide used by permission from David Law.

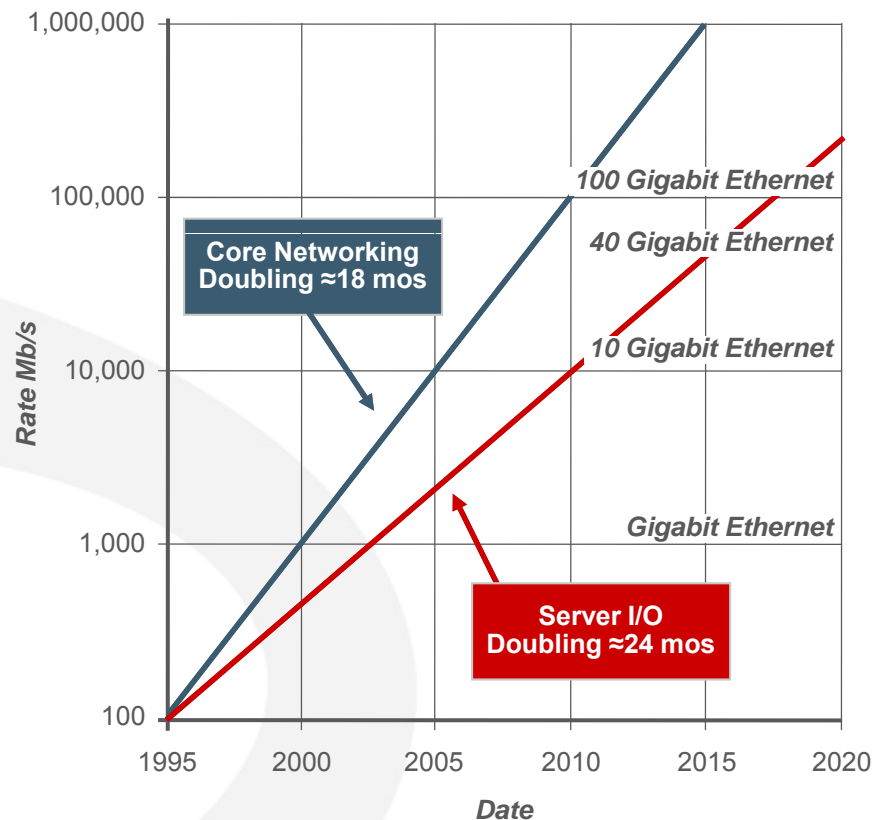
Looking Ahead - Growing the 40GbE / 100GbE Family



	Description	40GbE	100GbE
Chip-to-Chip / Module	10 x 10 Gb/s > 4 x 25 Gb/s		✓
Backplane	4 x 25 Gb/s		✓
Twin-axial	10 x 10 Gb/s > 4 x 25 Gb/s		✓
Twisted Pair	Focus on Data Center Applications (< 100m?)	✓	✓
Multi-mode Fibre	Reduced width or lambda ? Longer reach?	✓	✓
Single-mode Fibre	Single Lambda? Shorter reach? Longer reach?	P802.3bg ✓	✓
Energy Efficiency	Apply to electrical and optical aspects?	✓	✓

Looking Beyond 100GbE

- Industry being challenged on two fronts
 - Low cost, high density 100GbE
 - Next Rate of Ethernet
- Technical Feasibility
 - Electrical Signaling
 - Optical Signaling
- Market Need
 - Data Centers
 - Internet Exchanges
 - Carriers
- The economics of the application will dictate the solution





THANK YOU