
THE LESSONS OF ETHERNET TRENDS IN 2016

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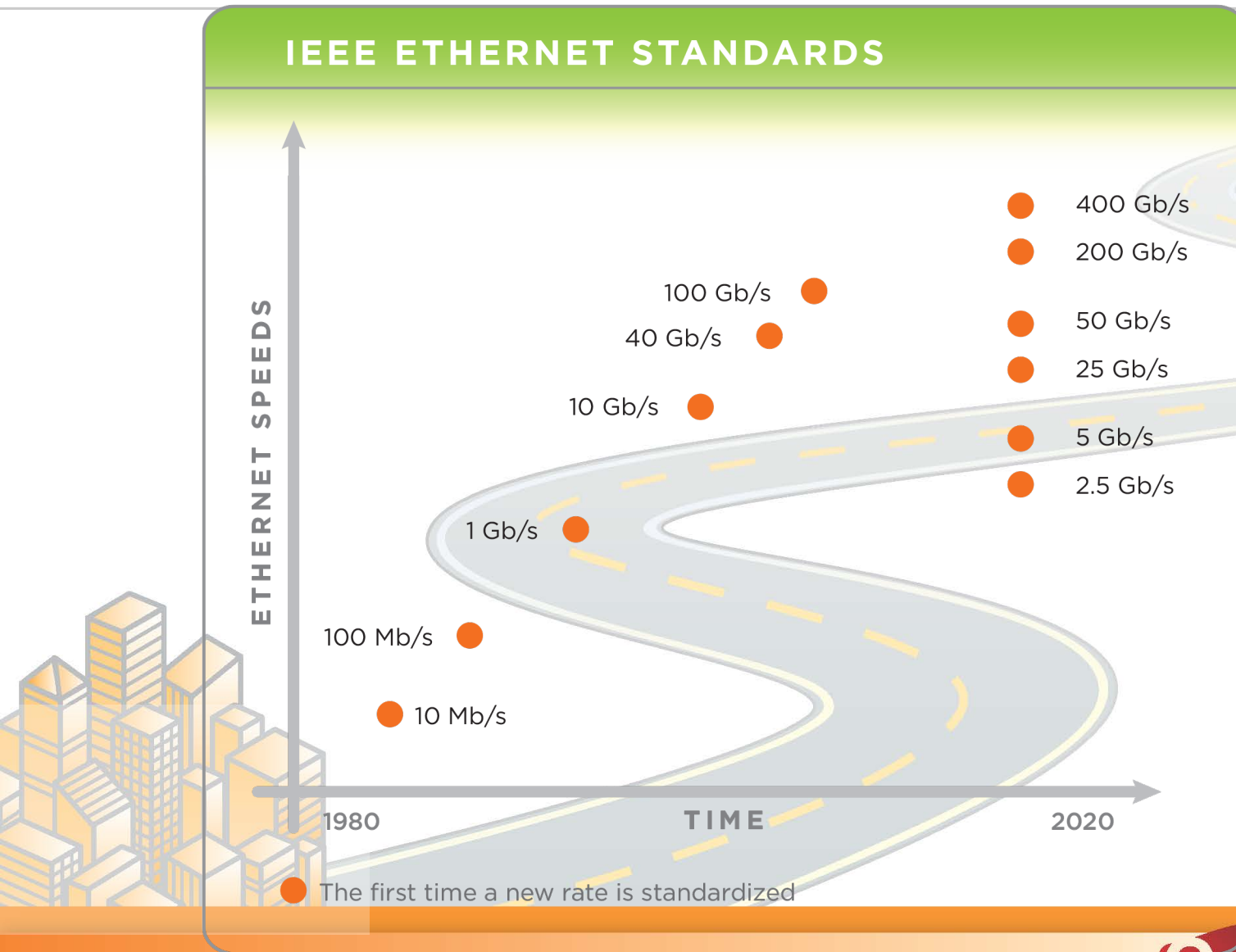
Agenda

- Understanding the current state of Ethernet
- Understanding what enables the roadmap
- Understanding what drives the roadmap



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IEEE Ethernet Standards



Ethernet Standards

Six new Ethernet rates over 35 years

— Followed by —

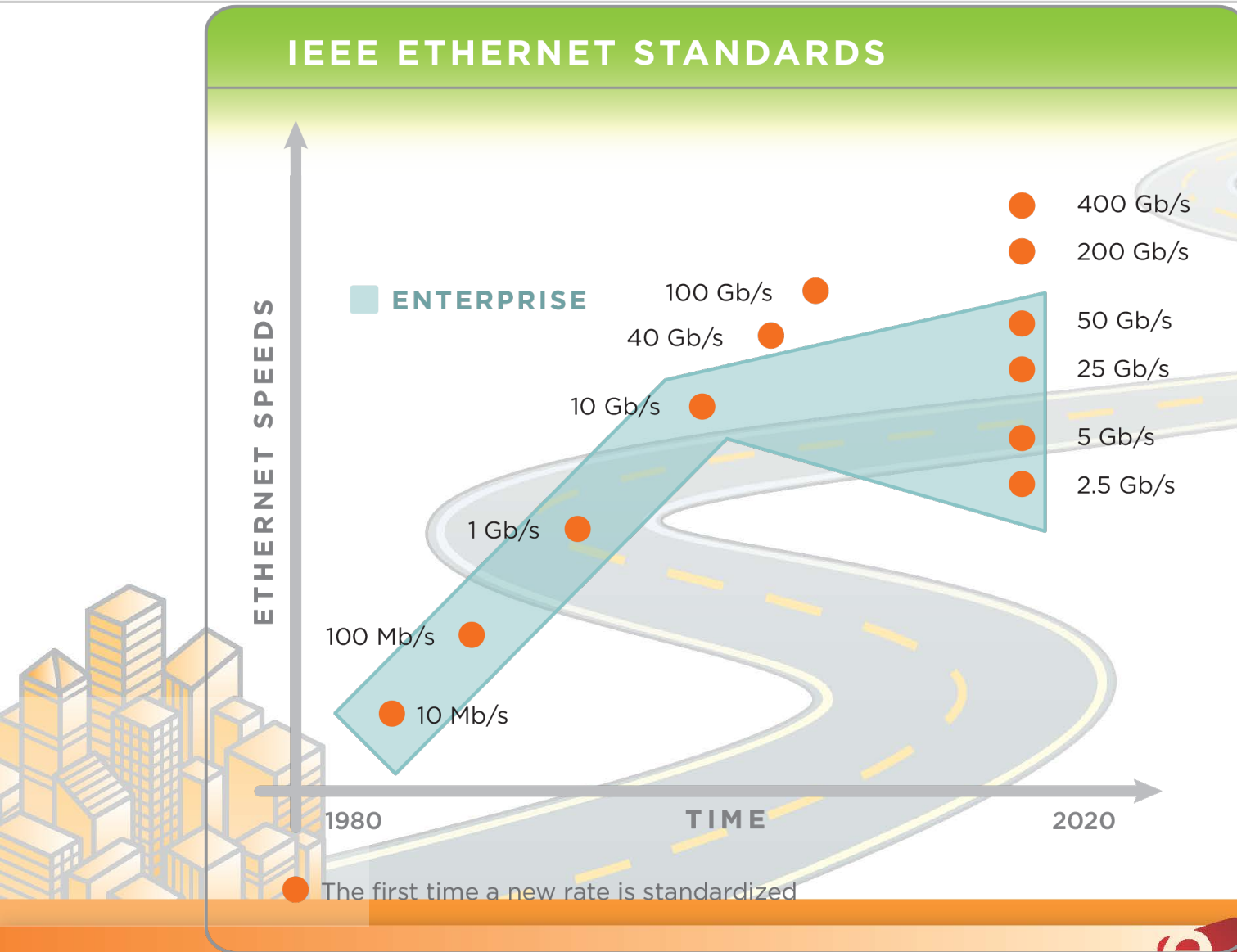
Six new Ethernet rates currently in progress or recently finished

Can we predict Ethernet in 2026 by understanding Ethernet in 2016?



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Market Adoption of Ethernet Speeds



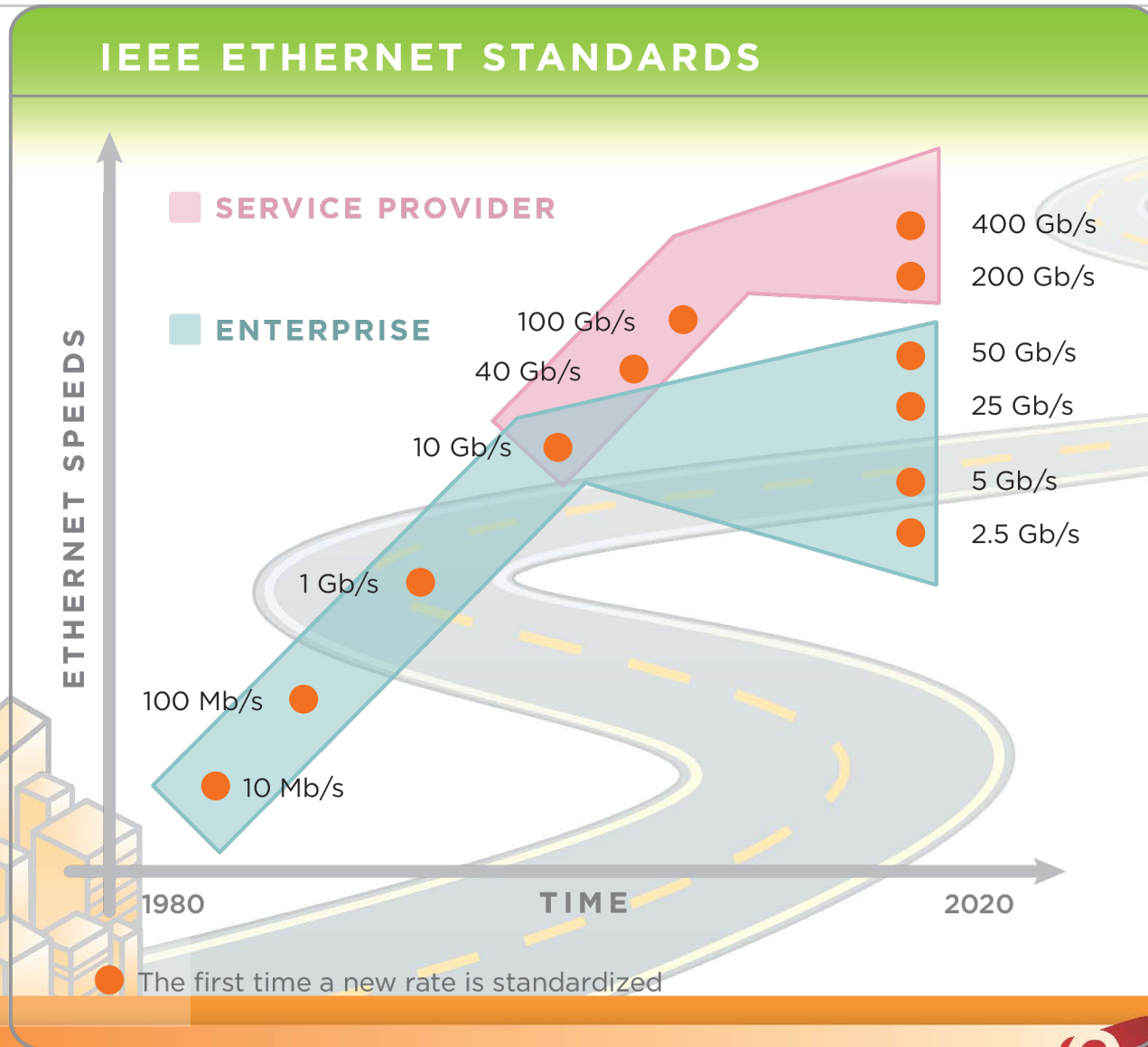
Ethernet's original target market: Enterprise

Continued adoption now spanning core applications and access applications such as a WiFi access point interconnect



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Market Adoption of Ethernet Speeds



Ethernet's "success" in providing cost-effective and reliable solutions, soon expanded into new markets.

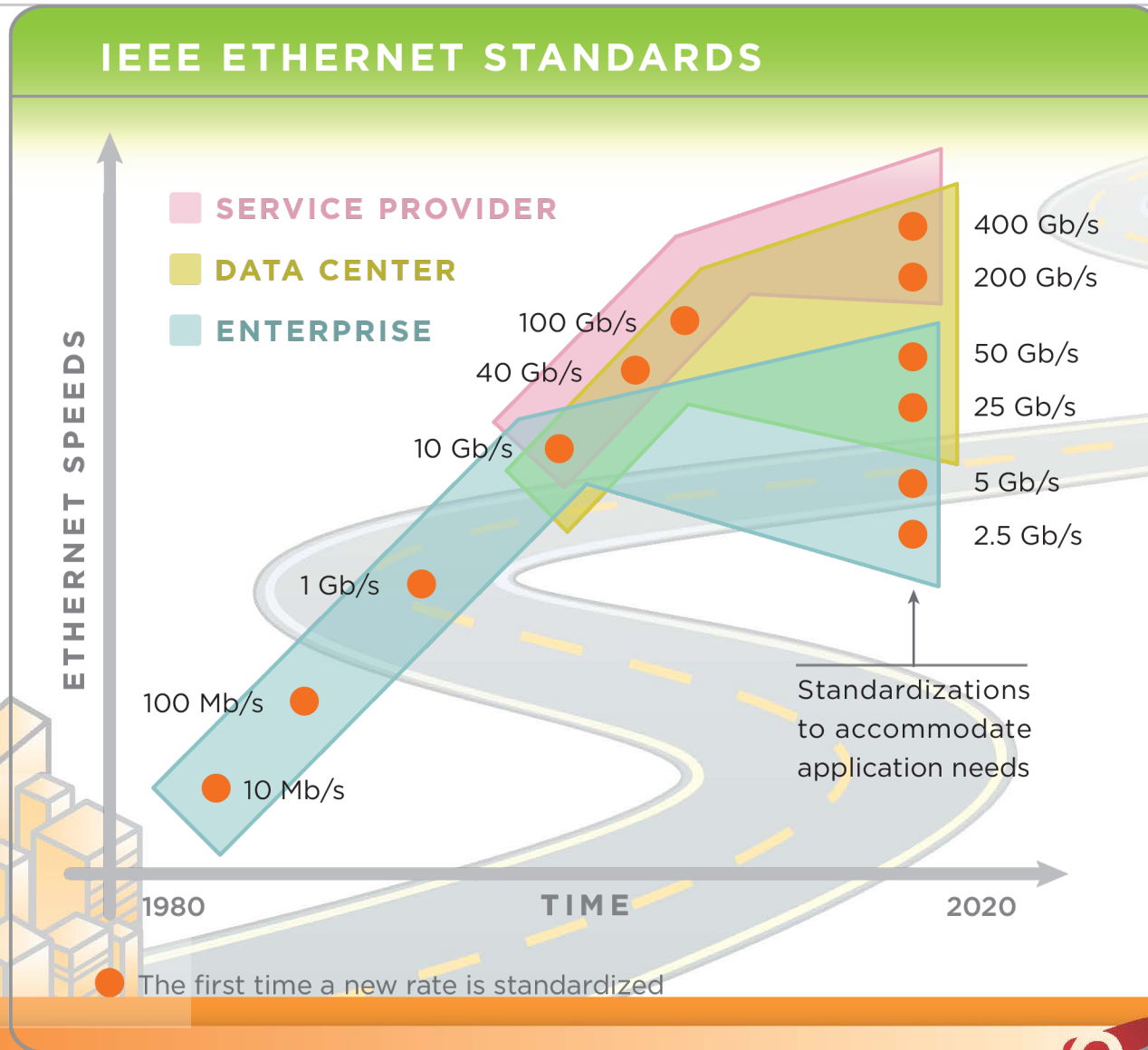
Service Provider applications started deploying Ethernet due to customer requests

Service Provider applications started driving Ethernet's new higher speed rates



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Market Adoption of Ethernet Speeds



And finally Data Center adoption...

Breadth...

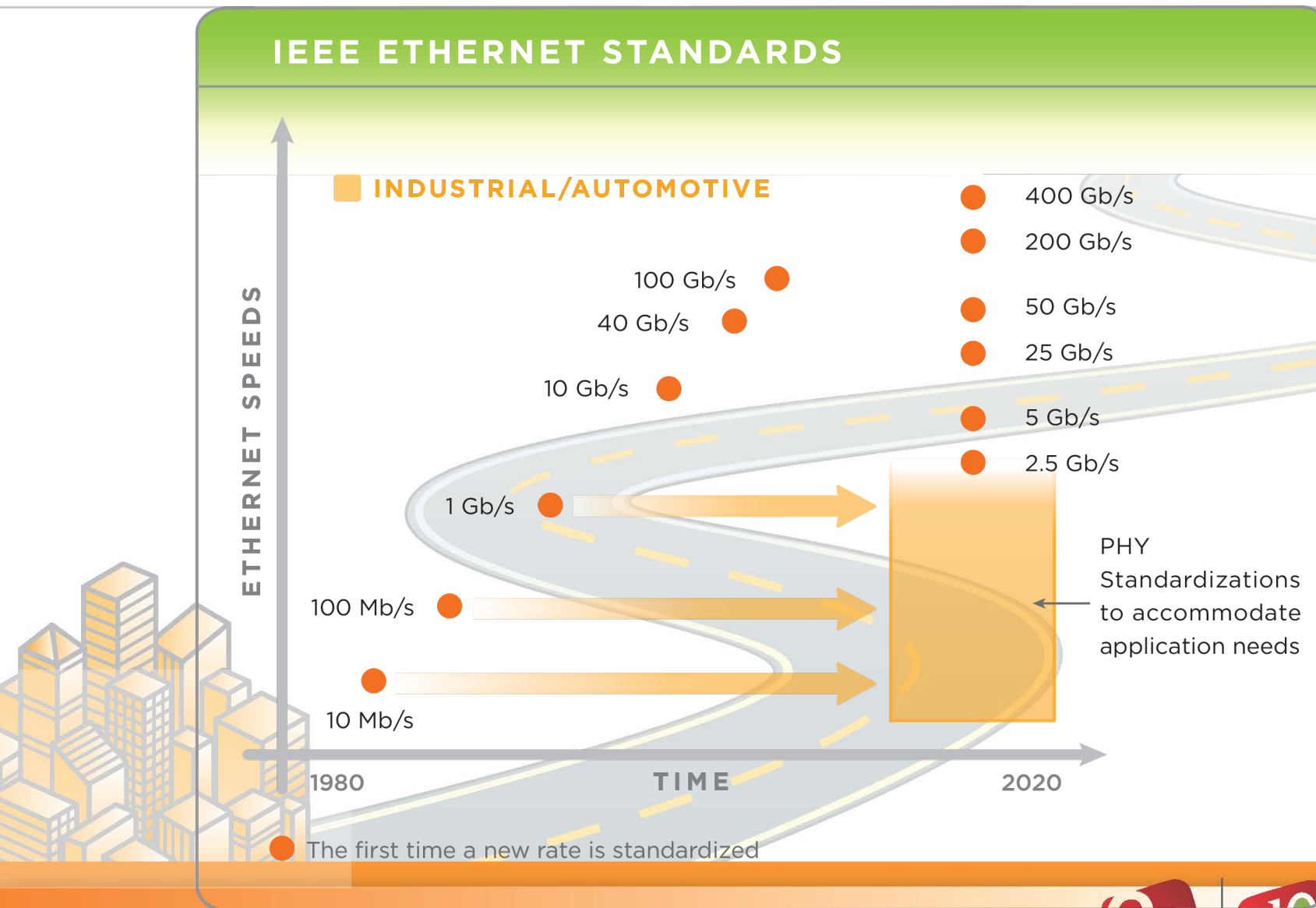
...of markets
... of applications

Is driving Ethernet's progression. The initial linear 10x steps in Ethernet's first market have led to Ethernet broadening in many directions



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Market Adoption of Ethernet PHYS



Market breadth increase continues with new markets such as:

- Industrial Ethernet
- Automotive Ethernet
- Internet of Things

Looking to leverage the Ethernet ecosystem advantages by creating new PHYs to optimize for these new applications.



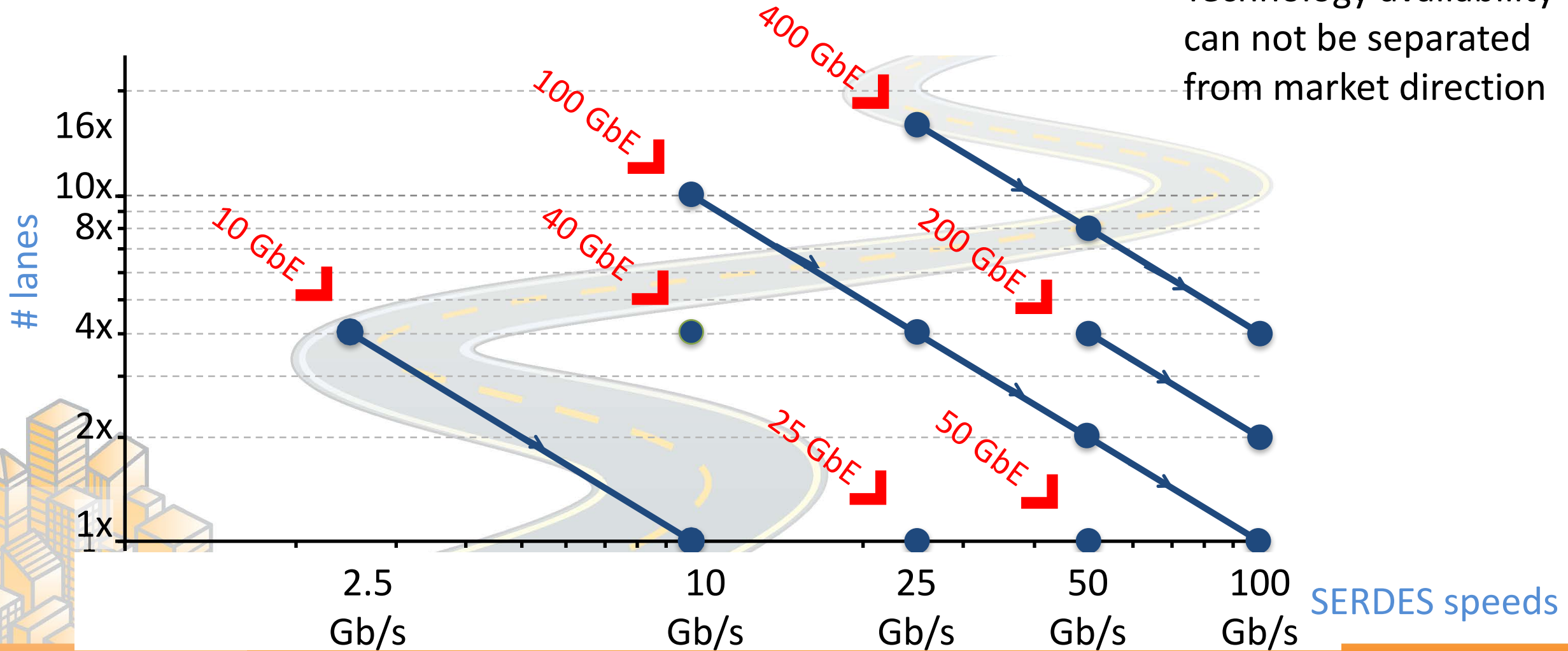
Understanding what enables the Ethernet roadmap:

Why can so much be happening at once?

SERDES reuse



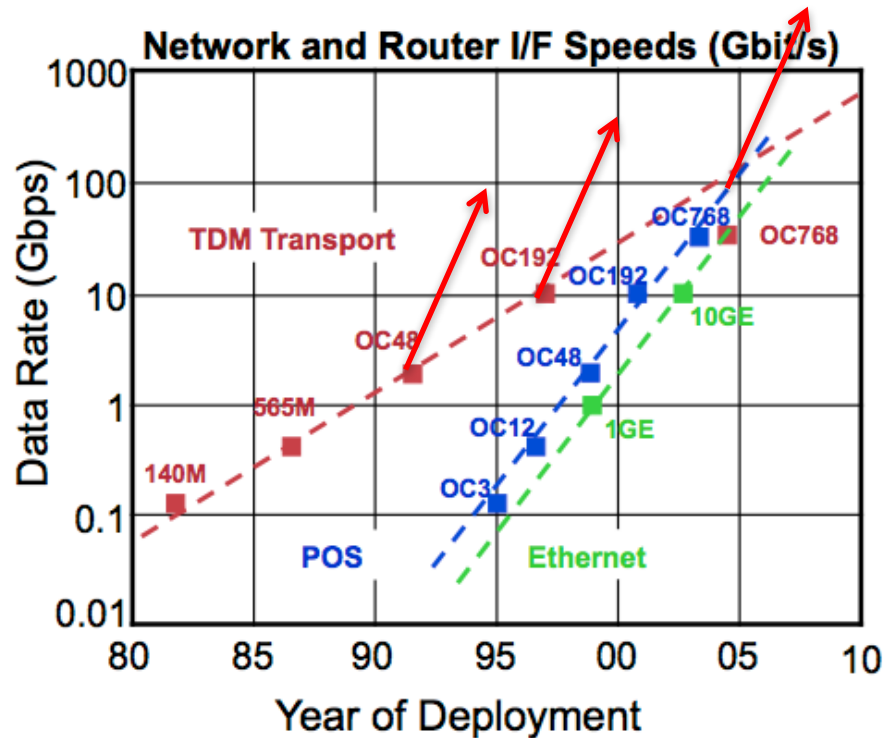
Technology availability
can not be separated
from market direction



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Ethernet has always leveraged existing technologies

Observations about interface rates



- Data interfaces were able to leverage telco technology investment

- SONET enabled interface progression to advance with technology

- Beyond 10G, data interfaces are pushing the optical technology. This isn't new for 802.3 - just new for optical PMDs. (1000Base-T, 10GBase-T)

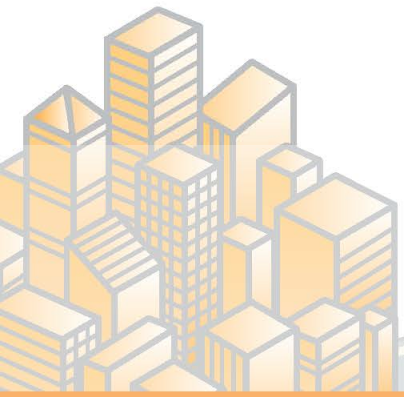
- Ethernet highly leveraged technology from TDM/SONET/FibreChannel application spaces
- Ethernet is now the driver of higher speed technology
- When technology can't keep up – we go parallel
- Today = Yesterday



Understanding what drives the Ethernet roadmap

Applications Drive Technology

- Interconnect technology doesn't drive applications (Markets)
 - It enables applications
 - It is driven by applications (markets)



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Example: Cloud Data Center

Operational challenges

- Scale and upgrade requirements drove new architectures (aka Leaf-Spine)
- ASIC architecture and design challenges
 - Driven by Radix requirements
 - Serdes Challenges – speed and count
 - Driven by need for higher bandwidth
 - Ethernet PMDs challenges
 - Cost effective support of system requirement

“Interconnect follows Silicon”

Cloud Data Center Fabrics

- 40 GbE was the dominant interconnect deployment
 - ASIC generation based on 10 Gb/s serdes
 - 40 GbE only option able to support 32+ ports
 - Quad optics (QSFP)
- 100 GbE deployment underway
 - ASIC generation based on 25 Gb/s serdes
 - 32+ ports possible
 - Quad optics (QSFP28)
- 400 GbE future deployment
 - ASIC generation based on 50 Gb/s serdes
 - 32+ ports required
 - x8 Optics required → QSFP-DD



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Predicting Ethernet 2026 from the lessons so far...

Ethernet's breadth will continue to expand to new markets

- New Ethernet rates
- New Ethernet PHYs

Applications will drive the requirements. New technology will be driven as needed and existing technology will be leveraged for cost effectiveness

ASICs capabilities will continue to define the interconnect requirements

Ethernet Alliance will continue to support the industry in working towards Ethernet's ongoing success



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