

Evidence of Broad Market Potential for 200G over 1-pair MMF

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NGMMF Study Group

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Supporters 1

- Michael Teal, SB Commonwealth Bank of Australia
- Nick Bonadi, Mulvey and Banani Int'l, Canada
- Oscar Kramer, Staff IT Engineer, Qualcomm, USA
- Hu Xingzan, Centrin Data Systems, China
- Marcos Lelis, Banco do Brasil
- Daryl Yoeh, Wespac Australia
- Li Chong Hui, Minsheng Bank China
- Justin Cooley, Staff IT Engineer, Qualcomm, USA
- James Deese, Wells Fargo, USA
- Dan Seiberling, Sr. IT Engineer, Qualcomm, USA
- Roger Beirigo, Embraer
- Arthur Zhen, GDS China Ltd.
- Zhang Jiangping, China Cache
- Zhang Sheng An, ICBC Beijing
- Maurício Guimarães, Copel, Brazil
- David Bain, PwC, USA
- Carl Rumbolo, Wells Fargo, USA
- Matthew Deatherage, Principal Network Engineer, Qualcomm, USA

None are 802.3 attendees.

They all are customers of servers, switches, routers and transceivers!

Supporters 2

- David Piehler, Dell EMC
- Mike Dudek, Cavium
- Scott Kipp, Broadcom
- Ted Sprague, Infinera
- Rich Mellitz, Samtec
- Derek Cassidy, ICRG/IET
- Adrian Amezcua, Prysmian Group
- Mabud Choudhury, OFS
- Vipul Bhatt, Finisar
- James Young, CommScope
- Raed Samamra, Prysmian Group
- David Lewis, Lumentum
- Pavel Zivny, Tektronix
- Andrew Jimenez, Anixter
- Earl Parsons, CommScope
- Robert Lingle, OFS
- Christian Urricariet, Finisar
- Paul Vanderlaan, Berk-Tek
- Jonathan King, Finisar
- Matthias Fritsche, Hartung
- Ed Sayer, Samtec
- Hans Lackner, QoSCOM Limited
- Jack Jewell, GreenVCSEL

These folks may be familiar to you from IEEE activities.

Background

- Ambiguity for 200G in Large Enterprise is due to focus on imminent, large cloud investment in 400G and assumption that Large Enterprise will simply follow suit. But the voice-of-the-customer (VOC) has been absent. We aim to provide that VOC here.
- As we interact with enterprise market, we find they are often confused about the prospects for higher speeds on MMF, being unaware of basic possibilities that we discuss in 802.3 forums. They are not being well-educated on technical options available, and feel they have few choices.
- We will show BMP for 200G over 1-pair MMF across Large Enterprises by
 - Geographies: North America, South America, China, Australia
 - Industries: financial, multi-tenant DC, manufacturing, utility/ISP, consultancy and audit services, technology

Customer Testimonials

- The next several slides present testimonials and opinions of customers, located in different regions and representing multiple industries, regarding utility of 200G over 1-pair MMF and Ethernet standardization.

China MTDC market responses

- Four of the largest multi-tenant data center operators in China were asked if they agree with the following statement:
 - Given our current IDC business status and future bandwidth growth requirements, we believe there is great market potential for 200G transmission over two-fiber multimode fiber.
- Three of the four responded, and the following experts agreed:
 - Hu Xingzan, Design and Planning Manager, Centrin
 - Zhang Jiangping, Chief Network Architect, ChinaCache (NASDAQ: CCIH)
 - Zhen Zongya (Arthur Zhen), Product Director, GDS (NASDAQ: GDS), partner with CyrusOne in U.S.

Quote: Michael Teal, Data Centre Operations Manager, SB Commonwealth Bank of Australia

- “We need the standards to keep up and be proactive with the fast-changing market.
- The sooner we have a standard on multi-wavelength MM optics, it will open up the options for solutions and streamlines future development in this space.”

Brazil

- To gather the opinion of Data Center experts in Brazil about market adoption of a future interface for a single pair of MMF working at 200Gb/s
- Three of four large enterprise datacenter operators contacted in January 2018 took calls on this topic
- Questions asked to the Professionals:
 - “- As an expert in Data Center, do you believe a 200Gb/s over 1 pair MM fiber interface will be adopted by the market? Would you consider to use this interface in the future, if available?”;
 - “- In which way this could be helpful?”

Brazil Expert Testimonial #1

- **Name: Maurício Guimarães**
Telecomm Systems Engineer
- **Industry: Utility / ISP**
- **Affiliation: Copel**
 - Ranked best power utility company by consumers (National Electric Power Agency - over 400k HPs) is also recognized as best ISP of Parana State. More info:
 - <http://www.copel.com/hpcopel/english/>
 - <http://www.copeltelecom.com/site/>
 - <https://en.wikipedia.org/wiki/Copel>

Important points

- He is very excited about the possibility to use WDM technology over 1-pair MMF as they already take advantage of similar technology in SM links at many different speeds;
- According to him, even if they need to replace OM4 fiber by better MM fiber in order to run WDM it will be cost effective, as there's no more room to grow (patch panels, cable trays) in the current site;
- Today they use the same physical space allotted in the past for lower speed duplex connections, so an increased rate using same space is very welcome.
- He believes that this alternative will solve the lack of space in some cases and will increase infrastructure lifespan;
- He also offers his company's infrastructure for future tests

Brazil Expert Testimonial #2

- Name: Marcos Lelis
Team Manager – Datacenter Management
- Industry: Financial
- Affiliation: Banco do Brasil
 - (Bank of Brazil) Is the second largest bank by assets in Brazil and all of Latin America. More info:
 - <http://www.bb.com.br/pbb/pagina-inicial/investor-relations#/>
 - [https://en.wikipedia.org/wiki/Banco do Brasil](https://en.wikipedia.org/wiki/Banco_do_Brasil)

Important points

- He believes that the 1-pair MM 200Gb/s interface will be widely adopted as it will increase operational efficiency due to reduction in required area and raceway occupancy;
- He notes that redundancy is still required as a huge amount of information is being transported by one single channel – (topology matter).

Brazil Expert Testimonial #3

- **Name: Roger Beirigo**
IT Analyst – IT Infrastructure & Support
- **Industry: Defense / Aerospace**
- **Affiliation: Embraer**
 - The Company is the third largest producer of civil aircraft, after Airbus and Boeing.
More info:
 - <https://en.wikipedia.org/wiki/Embraer>
 - <https://embraer.com/global/en>

Important points

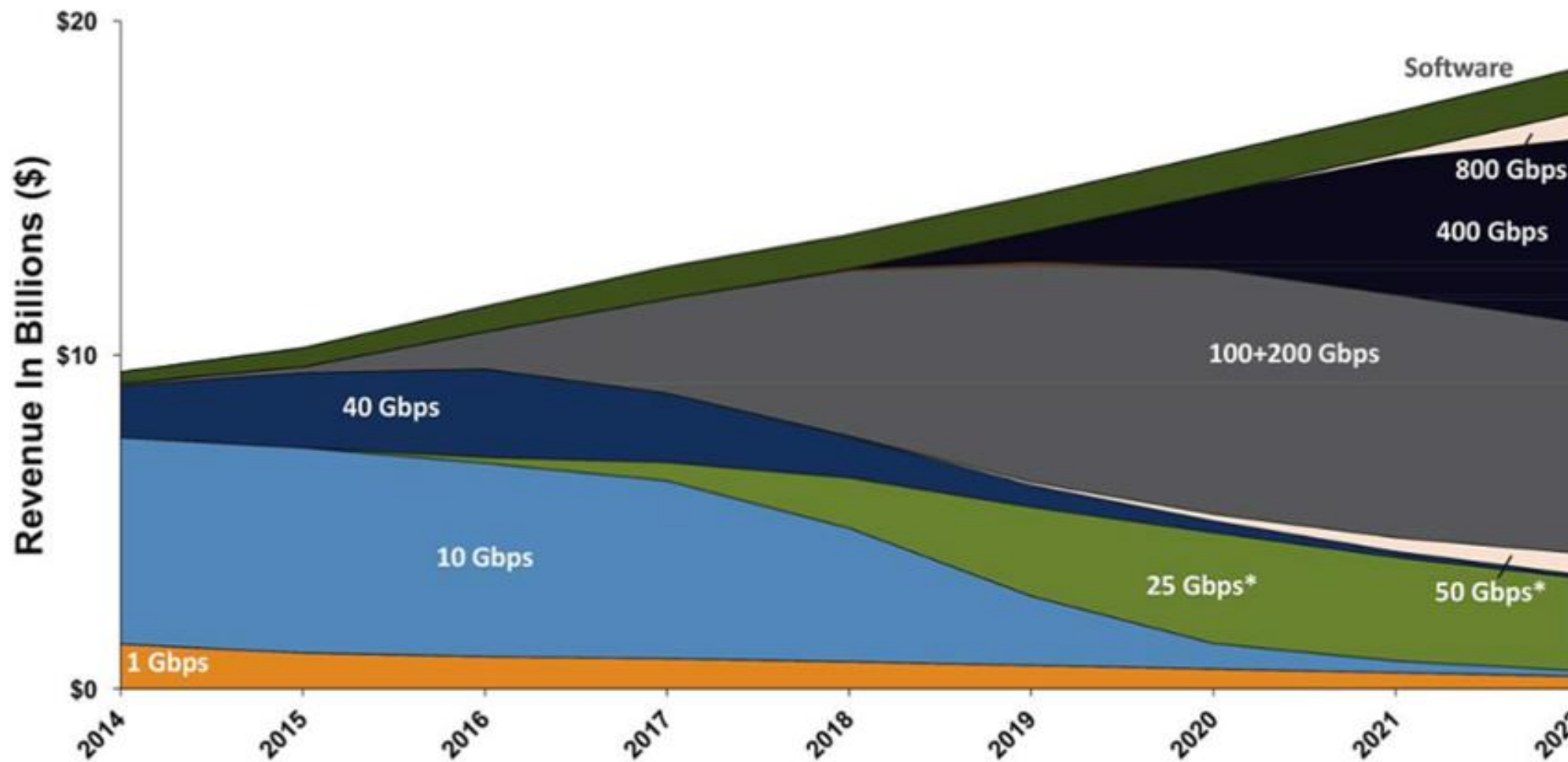
- In his view of future Datacenter, uplinks of 200Gb/s will be very useful while it will increase functionality;
- Advantages of 1-pair cabling are reduction of internal infrastructure like raceways, ODFs and etc;
- He also offers his company's infrastructure for future tests.

Quote: David Bain, Manager, Information Technologies, PwC (PricewaterhouseCoopers)

- “As an expert with more than 25 years of experience in the large enterprise data center space, I support the development of a 200 Gb/s Ethernet standard over a pair of multimode fibers.
- Most of the data centers that I work in are cabled with multimode fiber today.
- I anticipate that a 200G duplex multimode solution will be attractive in the future for higher speed network trunk links.
- Also, I strongly support the development of Ethernet standards to prevent the increased fragmentation of the market into proprietary solutions.”

Market Potential by Speed

Data Center Ethernet Switch Revenue (\$Bn)



100G + 200G projected for long and large life cycle

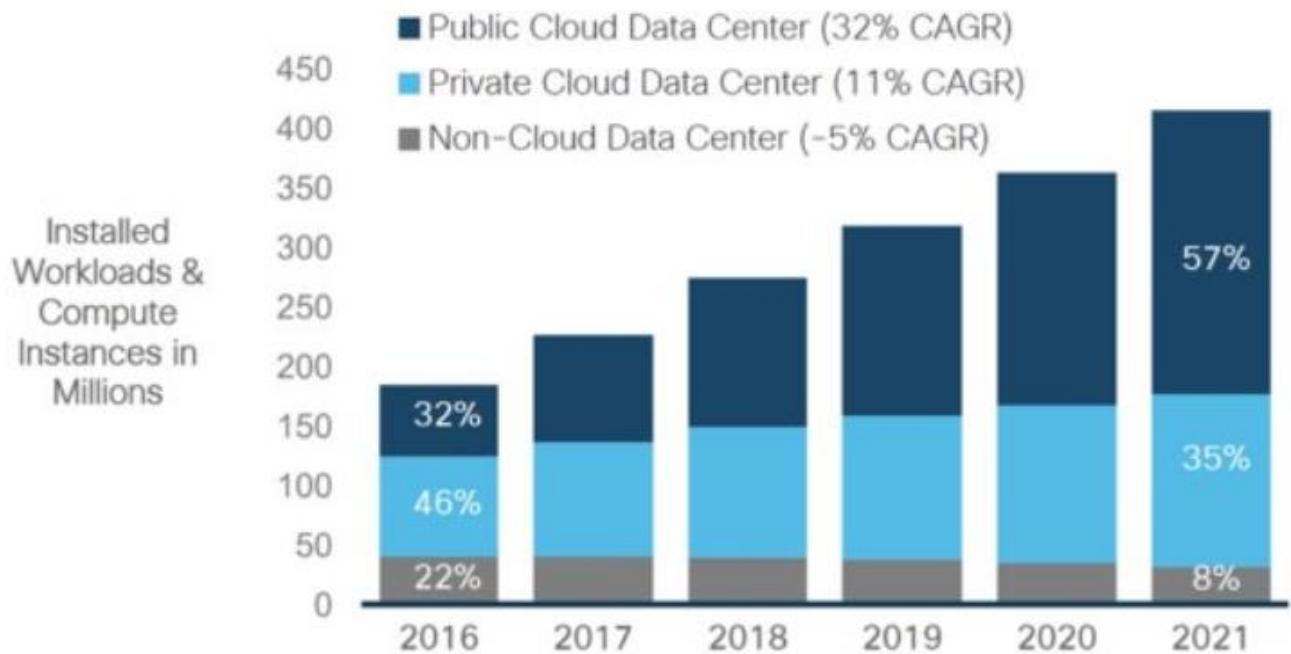
Source: 650 Group December 2017 Long Term Ethernet Switch forecast

*Shows discrete 25G or 50G ports only. A significant portion of 25/50GE server ports are expected to connect via QSFP-100G break out to 100 GE switch ports at the large Cloud Service Providers.

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Cisco shows Private Cloud growing at 11% CAGR

Global Private vs. Public vs. Non-Cloud Enterprise Application Workloads and Compute Instances

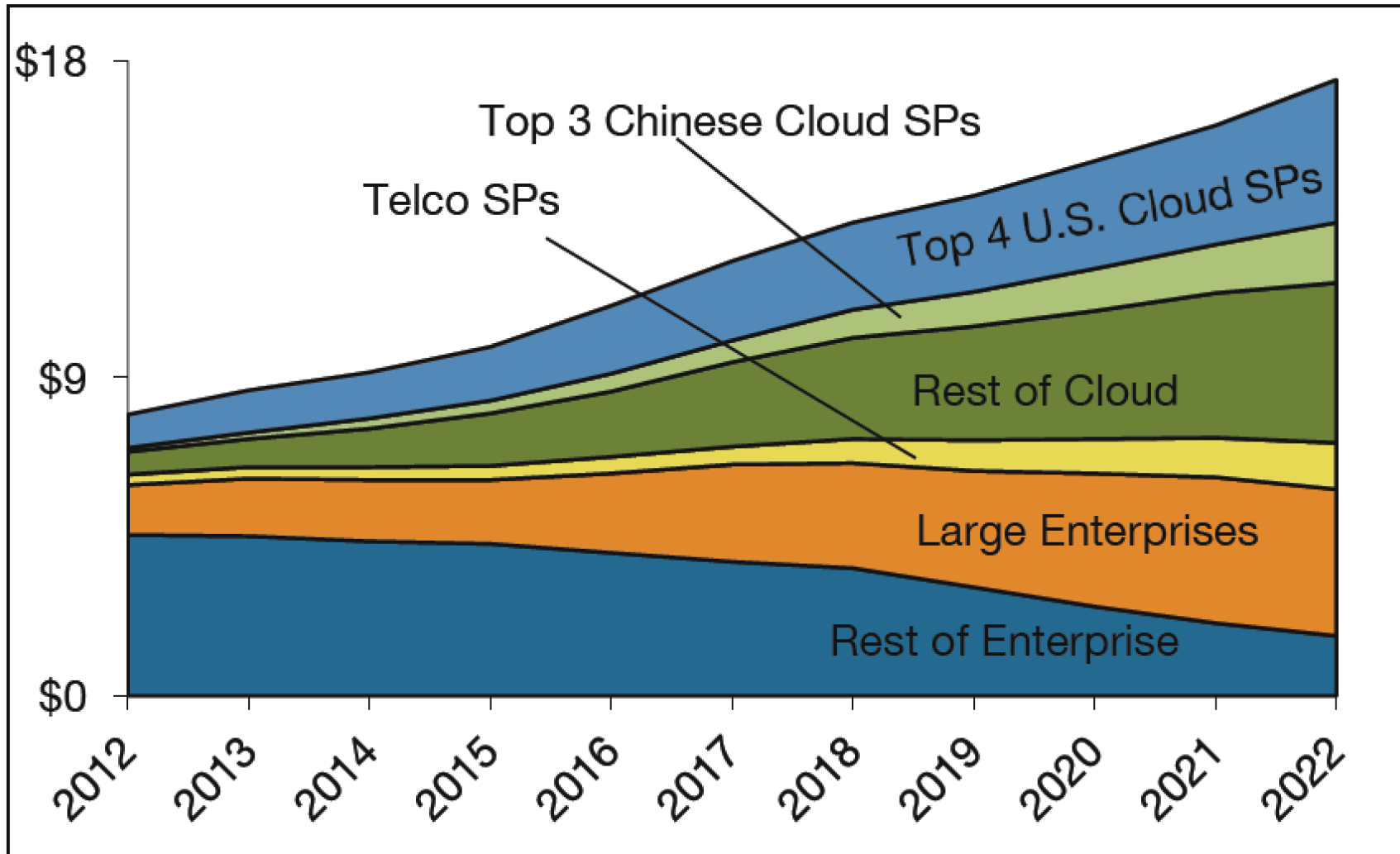


Source: Cisco Global Cloud Index, 2016-2021

Cisco

- Large Enterprise market is closely associated with Private Cloud
- 200G over 1-pair MMF is of greatest interest here

Data Center Ethernet Switch Revenue



- Revenue view shows the monetary significance of the enterprise market.
- Large Enterprise is growing and remains significant.

Conclusion

- Customers around the world see value in 200G over 1-pair MMF
- Industries represented here include:
 - Financial
 - Multi-tenant data centers
 - Manufacturing
 - Engineering
 - Consultancy
 - ISP / Utility
- It's time to adopt an objective for 200G over 1-pair MMF