25 Gb/s Ethernet Over Single Mode Fiber Call For Interest Consensus Presentation

IEEE 802.3

David Lewis, Lumentum

Dallas, TX

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Supporters

Background

To be deleted from main CFI consensus deck.

The CFI request email stated:

The IEEE 802.3by Task Force is developing standards that utilize 25 Gb/s technology for cost optimized serial solutions. As adoption of ASIC IO becomes more common across networking silicon, the opportunity to leverage low-cost serial technologies extends beyond the large scale data centers and into enterprise applications. A gap exists in the family of 25 Gb/s Ethernet PMDs which would be needed to fully address the enterprise application and the inclusion of single-mode fiber PMD(s) are needed. There is growing interest from enterprise and cloud services providers in extending 25 GE serial technology to reaches greater than 100 m for applications such as metro network access and building-to-building interconnects.

This Call For Interest is a request for the formation of a study group to 1) explore the development of new 25 Gb/s Ethernet single mode fiber PMDs, and 2) evaluate the market requirements supporting the longer-reach 25 Gb/s Ethernet interface.

CFI Objectives

- To gauge the interest in studying SMF PMD(s) for 25 Gb/s Ethernet over reaches greater than currently supported by 802.3by PMDs

- We do not need to:
  - Fully explore the problem
  - Debate strengths and weaknesses of solutions
  - Choose a solution
  - Create a PAR or 5 Criteria
  - Create a standard

- Anyone in the room may vote or speak

Overview: Motivation

Leverage technologies from 100GE (4x25G) to develop cost optimized SMF PMDs using the 25GAUI interface and 802.3by protocol layers

- 25G Serdes
- Single lane of CAUI-4 chip-to-chip or chip-to-module
- KR4 FEC

Initial applications include: Campus interconnect; Wireless (CPRI); Metro network access.

Agenda

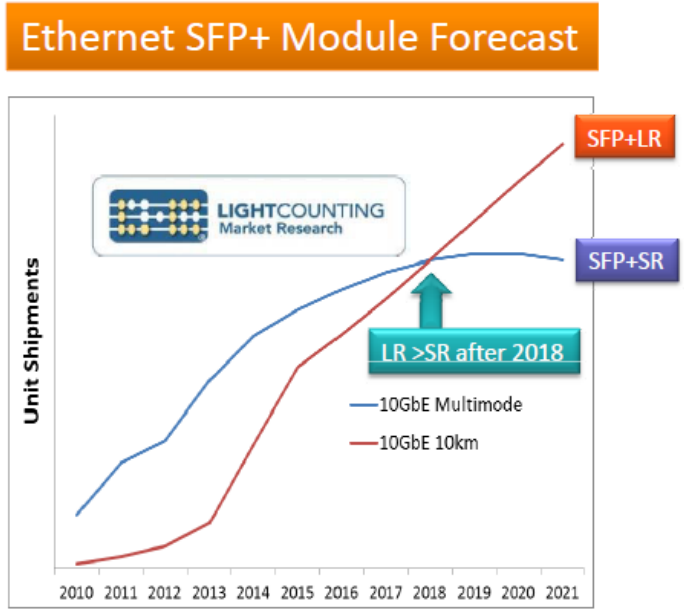
- Overview Discussion
  - 25GE SMF PMDs – David Lewis, Lumentum
- Presentations
  - 25GE SMF Market Drivers – TBD
  - 25GE SMF Technical Feasibility – TBD
  - 25GE SMF: Why Now? – David Lewis, Lumentum
- Straw Polls

Market Drivers

25GE SMF PMD

Large Market Demand for 10GE SMF Transceivers

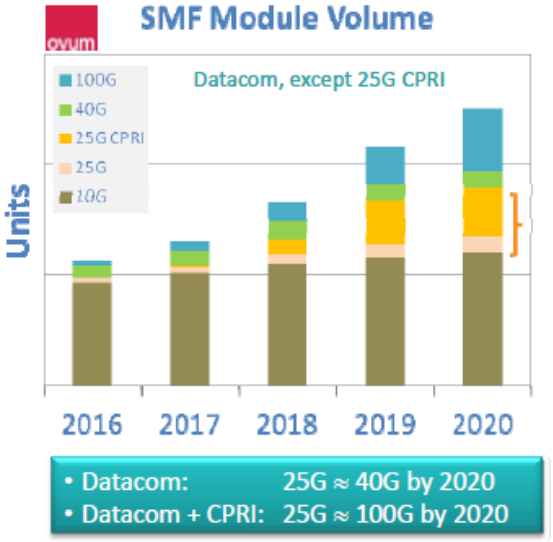
- Increasing deployment of 10GE links in large data centers and between sites is driving demand for LR
- LR is on track to surpass SR volume by 2018
- Expect the same pattern at 25GE – where MMF reach is limited to 100m

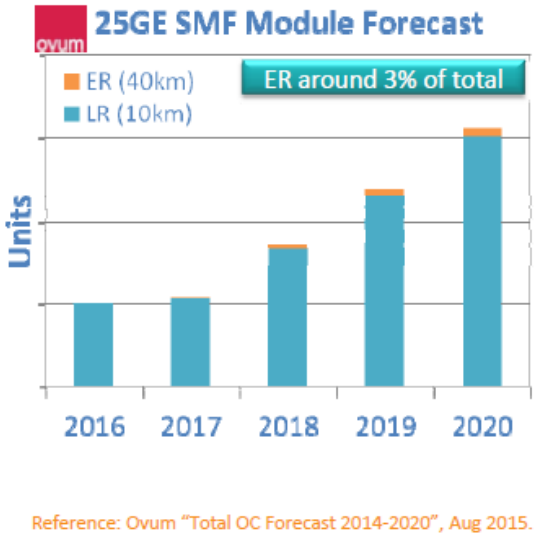


1. Trend reflects wide range of SMF applications
2. Need for SMF standards for next gen applications

Ovum Market Forecast for 25G modules

- Total 25G SMF module predicted to be similar to 100G module volume through 2020





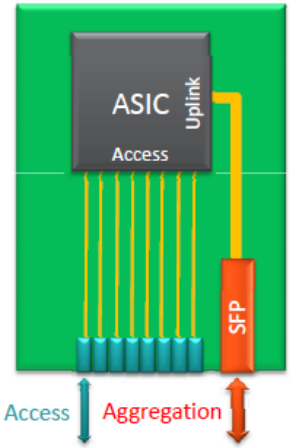
Reference: Ovum "Total OC Forecast 2014-2020", Aug 2015.

Technology Feasibility

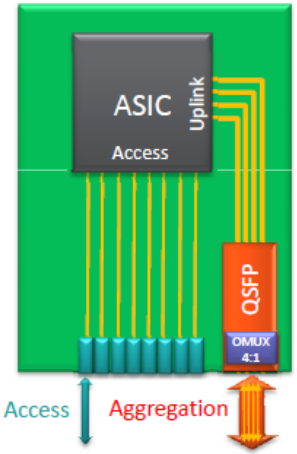
25GE SMF PMD

Matching Transceivers to ASIC Port Speed

Case 1:
ASIC port speed matches transceiver rate



Case 2:
ASIC ports MUX'd inside transceiver (OMUX case)



Case 1 best for enterprise/campus networks?

- Avoid MUX and use serial optics for lowest cost & power per Gbps

Technology Choices for 25GE SMF PMD

Choices	25G NRZ
Product availability (est.)	2015+
Technology development driver (examples)	• 25G Ethernet • 100G Ethernet • Gen6 Fibre Channel
Related optical specifications	• 500m:PSM4 • 2km: CWDM4 • 10km: 32GFC, 100GBASE-LR4 • 25km: 100GBASE-"ER4-Lite" • 40km: 100GBASE-ER4,"ER4-Lite"
Reach (w/o FEC)	20km?
Reach (w/ FEC)	40km
Assessment	**25G NRZ**
Difficulty (risk)	Easy
Pros	• Established technology • Wide range of applications • Matches 25G ASIC port
Cons	• Only 2.5 x increase over 10Gbps

LR Transceiver Comparisons

LR Transceiver Comparison	10GE	40GE	25GE?	50GE?
Size	SFP+	QSFP+	SFP28	SFP56
Modulation	NRZ	NRZ	NRZ	PAM4
Lane scheme	1 x 10G	4 x 10G	1 x 25G	1 x 50G
Power [1]	1W	3W	~ 1W	?
mW/Gbps	100	75	~ 40	?
Relative cost / Gbps	1	2.8-3.5 [2]	<1.2-1.6 [3]	?

[1] Assume reasonable numbers for 10km C-Temp transceivers at high volumes.
[2] Based on "LightCounting Forecast Database – February 2015" numbers. SFP+LR (15.4Mpcs) and QSFP+LR4 (1.1Mpcs for 2km+10km) in 2020.
[3] From Ovum Total OC Forecast for 2020 (August 2015).

25GE SMF PMD

Why Now?

Why Now?

- 25GE is a good choice as the next step after 10GE for SMF transceivers
  - Particularly for cost sensitive markets that don't need 40GE / 50GE / 100GE speeds
- 25GE SMF is needed to complete the 25GE ecosystem

PMD	Lanes	Reach	Standard
Twisted Pair	"Single"	30m	802.3bq
PCB backplane	Single	IL<35dB @ 12.9GHz	802.3by
Copper Twin Ax	Single	3m, 5m	802.3by
MMF	Single	100m	802.3by
SMF	Single	TBD	x

Straw Polls

Call-for-Interest Consensus

- Should a study group be formed for “25 Gigabit/s Ethernet PMD(s) for single mode fiber”?

- Y: N: A:

- Room count:

Participation

- I would participate in a “25 Gigabit/s Ethernet PMD(s) for single mode fiber” study group in IEEE 802.3
  - Tally:

- My company would support participation in a “25 Gigabit/s Ethernet PMD(s) for single mode fiber” study group
  - Tally:

Future Work

- Ask 802.3 at Thursday's closing meeting to form study group

- If approved:
  - 802 EC informed on Friday of the formation of the study group
  - First study group meeting would be during the January 2016 802.3 interim meeting (in Atlanta)