

Early Market PMD Types for:

Core Router to Transport interconnect
and
Router to Router interconnect

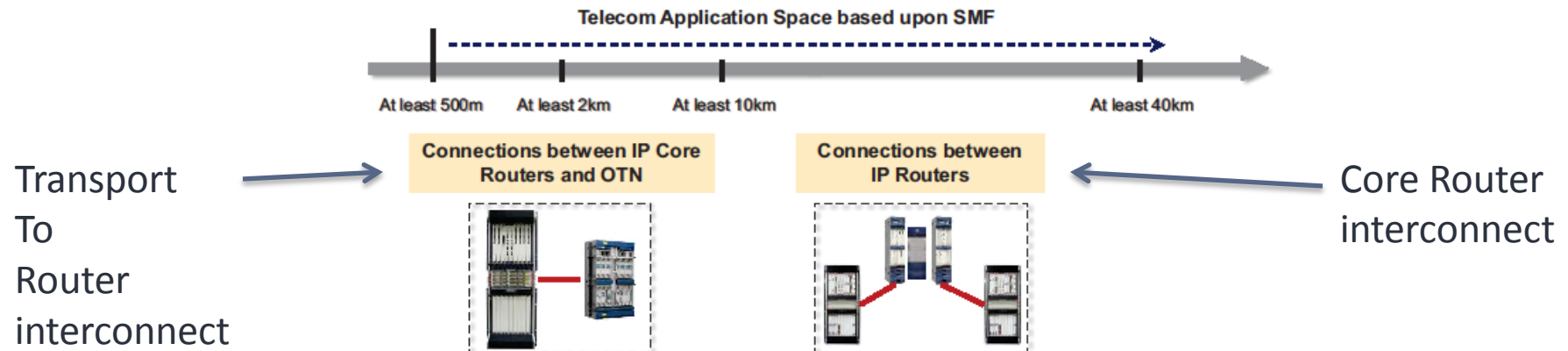
Andy Moorwood, Infinera

Acknowledgements

- ▶ Dale Murray: Light Counting
- ▶ Gary Nicholl: Cisco
- ▶ Jeffery Maki: Juniper
- ▶ Scott Kipp: Brocade

Reference: Early Market Applications presented at the September interim meeting

Motivation and Application Space of 400GbE SMF

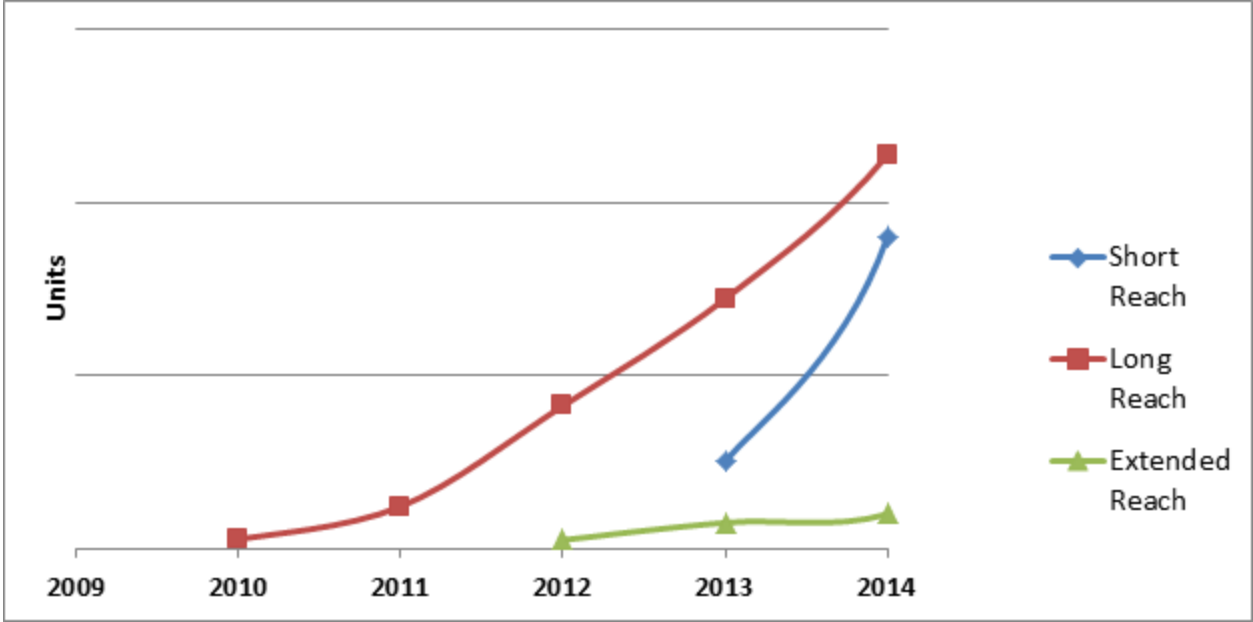


- Telecom application is an important domain for the first adoption of 400GbE.
 - ✓ Connections between IP Routers suggest an SMF distance objective of 10km, and additionally 40km for some of the Metro applications. Duplex fiber solutions are regarded necessary for both applications.
 - ✓ Connections between IP Core Routers and OTN equipments, suggest SMF distance objective of 2km. Also in this case Duplex fiber solutions are regarded necessary.
- So we definitely need an SMF distance objective of 10km.
- If we can generate a specification for at least 2km which enables a significantly lower cost solution than for 10km then a 2km SMF objective should be added.

Premise

- ▶ Early market applications for 400 Gb/s Ethernet will be similar to those seen in early market 100 Gb/s Ethernet
- ▶ PMD types seen in these early market 400 Gb/s applications are expected to be similar to those seen early market 100 Gb/s applications
- ▶ Data from 100 Gb/s installations in these early market applications can be used to help prioritize 400 Gb/s PMDs for study and standardization by the TF

Early Market Data for 100G PMDs – Total Market



Courtesy of:



Early Market 100G PMD Usage, Router to Transport Application: Andy Moorwood, Affiliation/Employer: Infinera

IEEE 802.3ba PMDs (insertion loss)				10x10 MSA PMDs (insertion loss)		
100GBASE -CR10 (17.04dB ^A)	100GBASE -SR10 (1.9/1.5dB ^B)	100GBASE -LR4 (6.3dB ^C)	100GBASE -ER4 (18.3dB ^C)	10x10 -2km (2.6dB ^D)	10x10 -10km (5.0dB ^E)	10x10 -40km (10.9dB ^F)
-not offered-	10%	81%	-not offered-	2%	7%	-not offered-

Note: 40GBASE-SR4 and -LR4 usage <1% combined
Based on 6 calendar quarters of volume numbers.

References A to F may be found at the end of the presentation

Proposals:

1) To support the early market adoption of 400 Gbit/s Ethernet, the SG should adopt objectives for PMDs with insertion losses equivalent to 100G-LR4 and 100G-SR10 to support this application.

2) There appears to be utility in an SMF specification supporting a budget less than that specified in 100GBASE-LR4, however this dataset cannot accurately quantify its relative magnitude. The SG should adopt an objective to identify this budget and define a PMD to support it

Note: insertion loss information is illustrative, specifications may use differing values for impairments and wavelength dependent optical cable attenuation, users should assess the applicability of impairments etc. to their operating environment

Early Market 100G PMD Usage, Router to Router & Router to Transport Applications: Jeffery Maki, Affiliation/Employer: Juniper

IEEE 802.3ba PMDs (insertion loss)				10x10 MSA PMDs (insertion loss)		
100GBASE -CR10 (17.04dB ^A)	100GBASE -SR10 (1.9/1.5dB ^B)	100GBASE -LR4 (6.3dB ^C)	100GBASE -ER4 (18.3dB ^C)	10x10 -2km (2.6dB ^D)	10x10 -10km (5.0dB ^E)	10x10 -40km (10.9dB ^F)
-not offered-	20%	79%	1%	-not offered-	-not offered-	-not offered-

Notes:

Based on 6 calendar quarters of volume numbers.

All router types

References A to F may be found at the end of the presentation

Note: insertion loss information is illustrative, specifications may use differing values for impairments and wavelength dependent optical cable attenuation, users should assess the applicability of impairments etc. to their operating environment

Early Market 100G PMD Usage : All

Gary Nicholl, Affiliation/Employer: Cisco

IEEE 802.3ba PMDs (insertion loss)				10x10 MSA PMDs (insertion loss)		
100GBASE -CR10 (17.04dB ^A)	100GBASE -SR10 (1.9/1.5dB ^B)	100GBASE -LR4 (6.3dB ^C)	100GBASE -ER4 (18.3dB ^C)	10x10 -2km (2.6dB ^D)	10x10 -10km (5.0dB ^E)	10x10 -40km (10.9dB ^F)
-not offered-	11%	89%	-not offered-	-not offered-	-not offered-	-not offered-

Notes:

Based on 11 QTRs of shipment.

Routers and switches

References A to F may be found at the end of the presentation

Note: insertion loss information is illustrative, specifications may use differing values for impairments and wavelength dependent optical cable attenuation, users should asses the applicability of impairments etc. to their operating environment

References

- ▶ A: IEEE 802.3™-2012 Table 85–9—Cable assembly differential characteristics summary
- ▶ B: IEEE 802.3™-2012 Table 86–9—40GBASE–SR4 and 100GBASE–SR10 illustrative link power budget
- ▶ C: IEEE 802.3™-2012 Table 88–9—100GBASE–LR4 and 100GBASE–ER4 illustrative link power budgets
- ▶ D:10X10 MSA Technical Specifications Rev 2.5 Table 2-5: 10X10-2km illustrative power budget
- ▶ E:10X10 MSA Technical Specifications Rev 2.5 Table 3-5: 10X10-10km illustrative power budget
- ▶ F:10X10 MSA Technical Specifications Rev 2.5 Table 4-5: 10X10-40km illustrative power budget

Thank You