Merits of 850nm Serial PMD

Jack Jewell, Stan Swirhun, Chris Simoneaux, Russ Patterson - Picolight
Rob Marsland, Rob Williamson, Herman Chui - New Focus
Jason Yorks, Mike Dudek - Cielo
Paul Kolesar, John George, Giorgio Giaretta - Lucent
Chang-Joon Kim, Jonghwa Wan - Samsung
Mark Donhowe - Gore
Steve Swanson, et al. - Corning
Gerard Kuyt - Plasma Optical Fibre
David Hyer - Compaq
Pat Gilliland, Ted Washburn, Dipak Patel, Luis Torres - Methode

Objectives

Support the 850nm Serial solution having the spec's proposed by Kolesar to provide a set of PMDs which best satisfies the needs of 10Gb Ethernet.

Support Existing Objective(s) of IEEE 802.3ae

Continue Ethernet's reputation for cost effectiveness and simplicity.

"Lowest Cost Solution for the Highest-Volume Product"

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Fiber PMD Adoption

Lessons from Gigabit Ethernet

- **In 10 GbE just as in GbE**
  - Highest volume application is short distance links (<300m)
  - Crucial to provide the most cost-effective solution for the highest volume application
  - Cost-effective to adopt common solution with storage & processor interconnects (higher volume)
  - Adding silicon ICs is more cost effective than …
    - adding more fibers
    - adding more lasers/detectors
    - adding optical alignment complexity
  - The 850nm serial PMD has cost/performance benefits for <300m lengths

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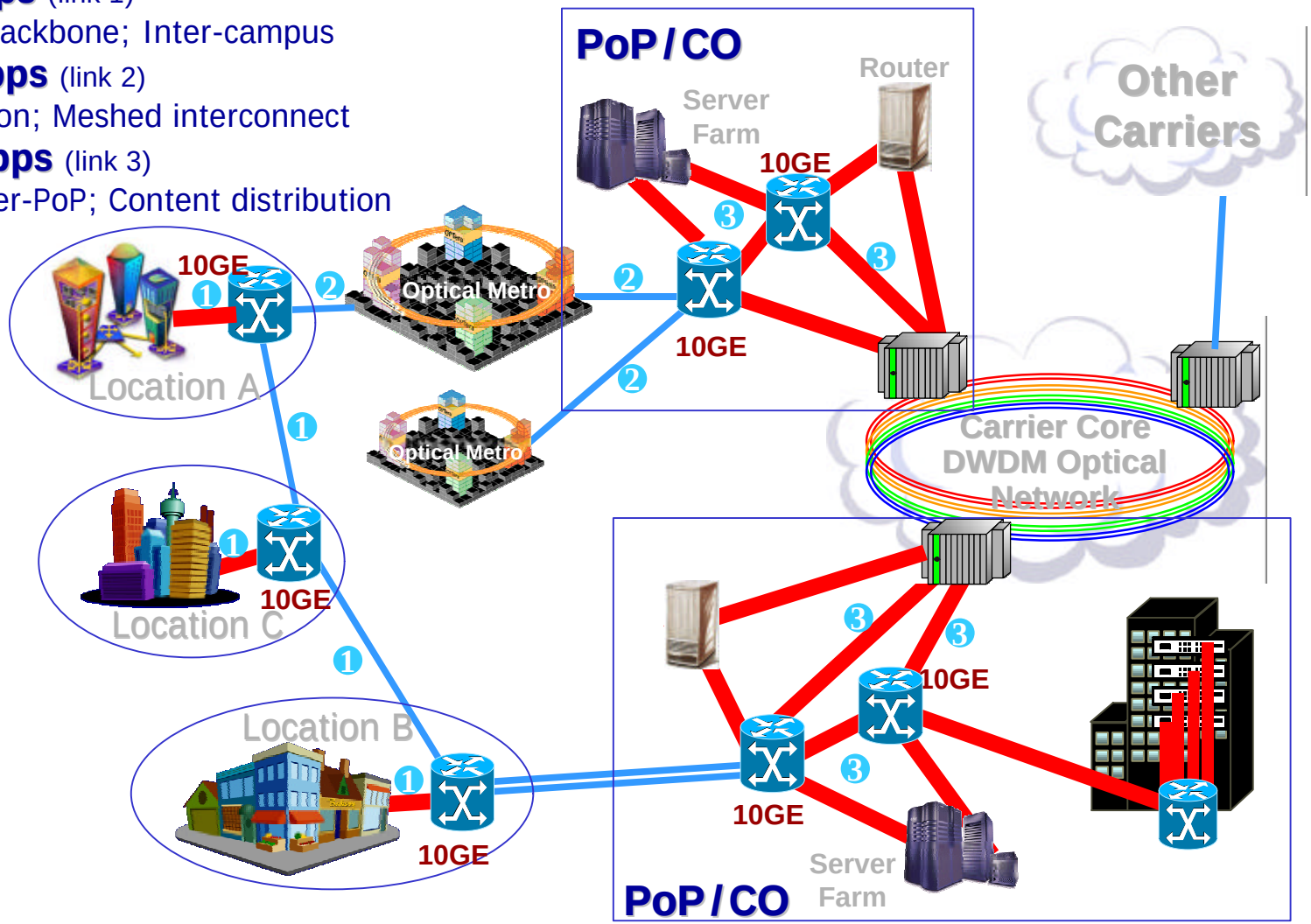
Spaces where Multimode PMD makes sense

LAN Apps (link 1)
Campus backbone; Inter-campus
MAN Apps (link 2)
Aggregation; Meshed interconnect
WAN Apps (link 3)
Intra-/Inter-PoP; Content distribution



= Typical 850nm Serial Space

Comparative Costs

	GbE-SX	GbE-LX	Serial 850	WWDM	Serial 1300
	1-VCSEL	1 - F-P	1-VCSEL	4-DFBs	1-VCSEL/DFB
λ					
Detector	1	1	1	4	1
Fiber Coupling[3]					
Tx	1-MM	1-SM	1-MM	4-SM	1-SM
Rx	1-MM	1-SM	1-MM	4-MM	1-SM
Mux/Demux[4]	N/A	N/A	Elect. 4:1	Optical 4:1	Elect. 4:1
Tx+Rx ICs	1+1 @ 1G	1+1 @ 1G	1+1 @ 10G	4+4 @ 2.5G	1+1 @ 10G
Fiber	Installed MM	Installed SM	Installed MM High BW MM	Installed SM/MM	Installed SM
Cost[5] **(Pico)**	0.5X	1.0X	1.25X	4X	2X
Cost[5] **(Rich T)**	-	1	2-3	3-4	2-4
Cost[5] **(Paul K)**	0.67	1	1.5	2.92	2.25
Cost[5] **(Ed C)**	0.7	1	2.5	3.3	2.6
Cost[5] **(AVG)**	0.62	1	1.94	3.43	2.46
	Ratio = 1.61		**Ratio = 1.77**		

1. 10G uses same basic VCSEL as 1G
2. Tolerance at a nominal temperature; 0.25% subtracted for 0-70C temperature drift
3. MM supports most relaxed coupling conditions
4. Cost advantages for electrical implementation
5. **Concensus of a clear cost advantage!**

"Lowest Cost Solution for the Highest-Volume Product"

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Leveraging the 850nm Serial PMD

- Optical Interconnect Forum
  - intra switch
  - transport-to-core switch
  - core-to-aggregation switch
- Fibre Channel
  - storage array to server to SAN switch
- Higher capacity (arrayed) interconnects
  - Nx10 Gb/s

Summary

- **“Lowest Cost Solution for the Highest-Volume Product”**

- **The Customers have “voted”** that the cost ratio of GbE LX/SX was sufficient to justify the SX product. A greater ratio is estimated for10GbE: WWDM/850 Serial.
- Multiple vendor support
- Multiple applications for volume leveraging
- It’s easy to downselect a PMD after July, but near impossible to insert one
- We recommend 802.3ae PMD set include the proposed 850nm Serial PMD