

The Vitesse logo is rendered in a bold, white, italicized sans-serif font. To the left of the text are three horizontal white lines. The background of the slide features a dark blue gradient with white circuit-like lines and nodes, and a repeating pattern of light blue 'X' shapes at the bottom.

# VITESSE<sup>®</sup>

Making Next-Generation Networks a Reality.

## *Considering 40GbE MMF and SMF Reach Objectives*

Frank Chang  
10-Mar-2008

IEEE 802.3ba Task Force, March 2008

## 40GbE Reach Objectives

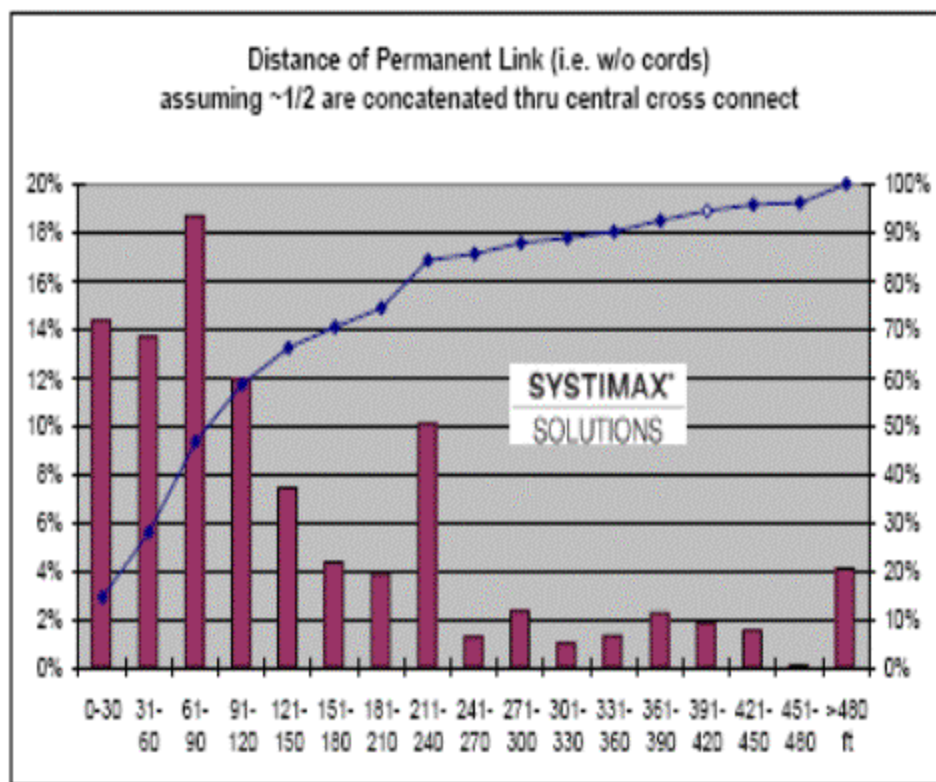
- ▶ Now since 40GbE SMF was brought up by economic reasons for data center intra-switch links, 100GbE ports will be possibly pushed for performance oriented high-end applications such as metro core router/switches.
  - ▶ The proposal of 40GbE 10km SMF I/F is based on the assumption that the adoption of SMF is higher volume than MMF. And 40GbE will possibly take the majority of initial shipment of HSE ports.
- ▶ Generally believe 4x10G based 40GbE leverage the existing 10G chipset & optics investments and assume quicker to market.
  - ▶ This change against the basis of the group's July decision that 40GbE will not happen until 2012 primarily for servers.
  - ▶ 40GbE technical and economic feasibilities are commonly considered less issue.
- ▶ Its time to revisit the 40GbE MMF and SMF reach objectives.

# 40GbE MMF Reach Reqs (1 of 3)

- ▶ CommScope data shows ~150m pre-terminated cabling length with patchcords

- ▶ LRM Precedent : 300m covers similar percentage of in-building LAN backbones.

## • Longer tail emerges



128 m

Multimode fiber structured cabling 150m with >95% coverage. [Kolesar 01\\_0906.pdf](#)

## Putting it all together

- Recommend aiming to cover 90 to 95% of Data Center channel lengths
  - Precedent: 300 m covers similar percentage of in-building LAN backbones
- Using a simple summation of constituent lengths near this coverage level gives:

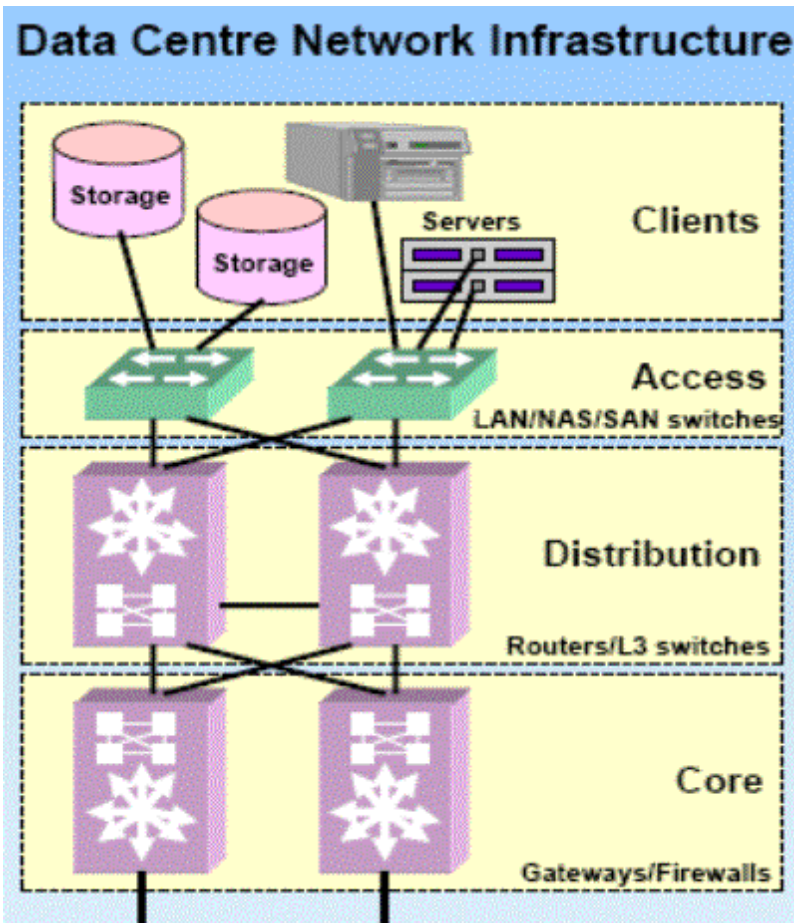
	Distance Requirements at ~95% Coverage	
	ft	m
Permanent Link Allocation	420	128
3 Patch Cord Allocation	74	22
Total Channel Allocation	494	150

Recommend setting short reach length objective = 150 m

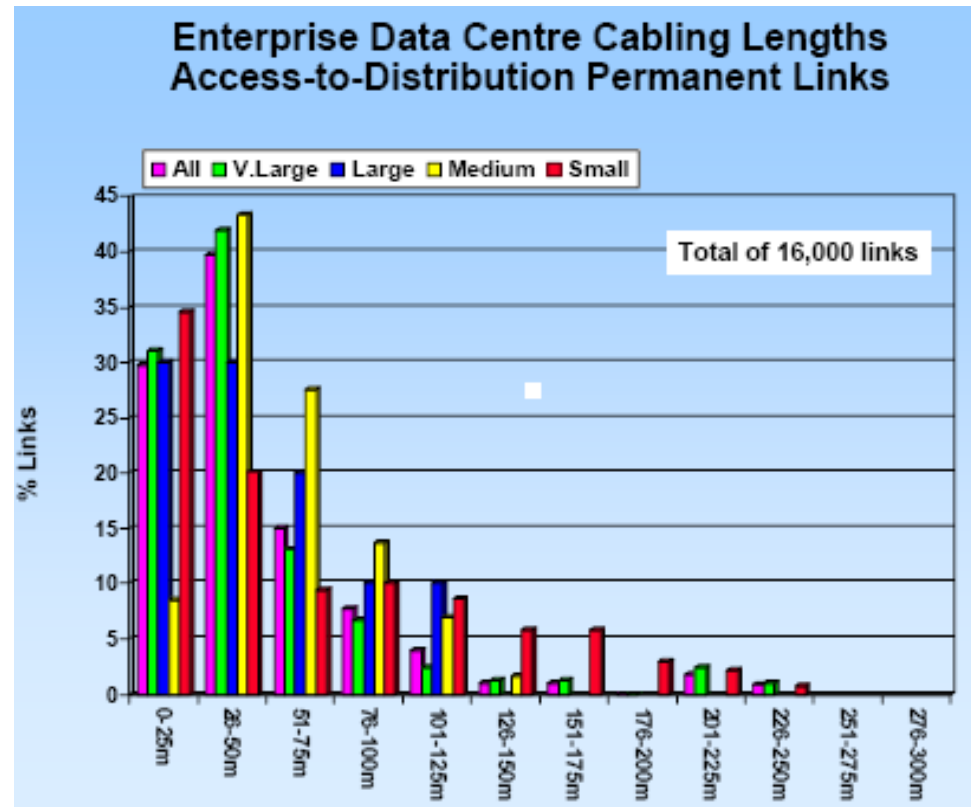
# 40GbE MMF Reach Reqs (2 of 3)

- ▶ DataCenter LinkSurvey by Mr. Flatman shows 220-300m for over 95% coverage

[flatman\\_01\\_0108.pdf](#)

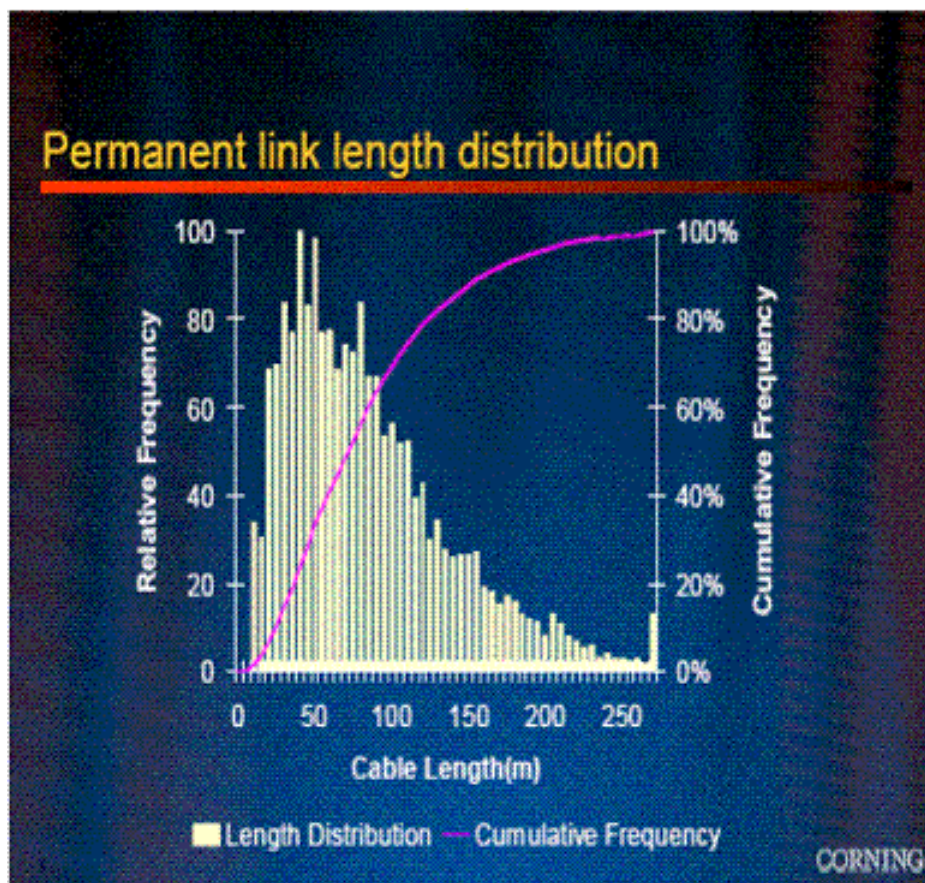


100m is only 89% of the coverage; over 95% coverage should be 220-300m.



# 40GbE MMF Reach Reqs (3 of 3)

- ▶ Corning data shows 220-250m for over 97% coverage.
  - ▶ Link length distribution up to 250m



100m is only 69% of the coverage; over 97% coverage should be 220-250m.

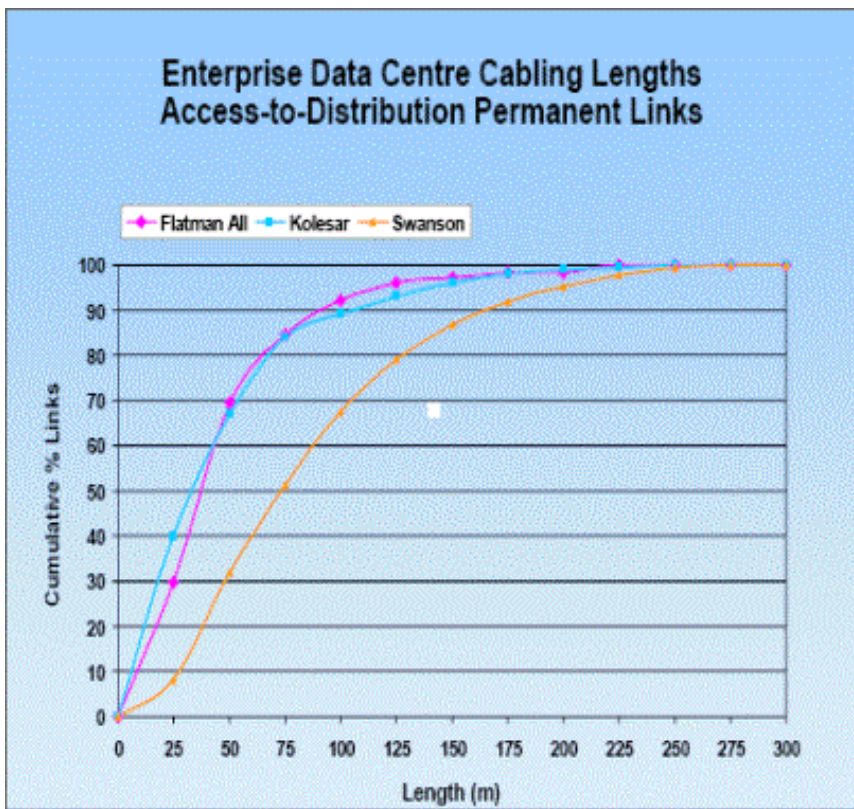
## Coverage rates at key lengths

Link Length	% Coverage
100m	69.22%
150m	87.65%
200m	95.78%
220m	97.74%
300m	100%

[swanson\\_01\\_1106.pdf](#)

# 40GbE MMF Reach Considerations

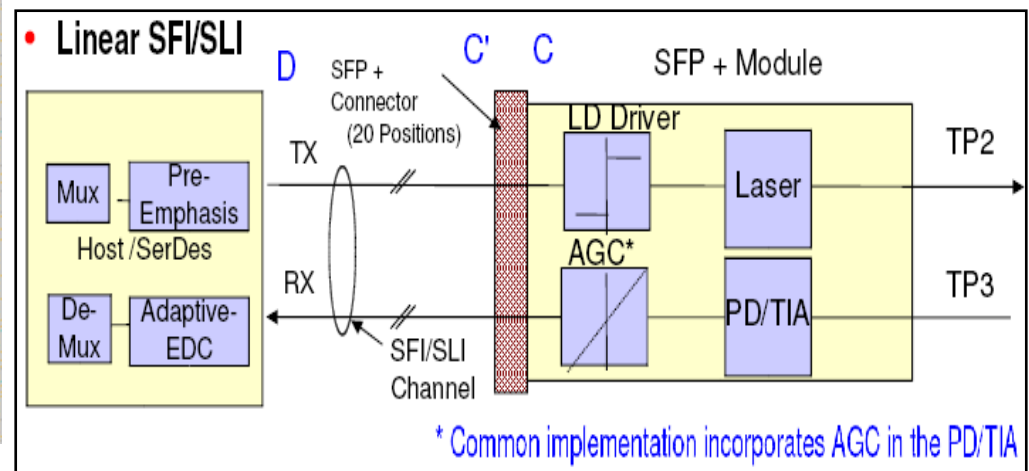
- ▶ Does the 100m reach objective satisfied the demand?
  - ▶ Obviously 100m satisfies only the cabling reqs for Client-to-Access Channels, but not for Access-to-distribution links.
  - ▶ Should consider to maximize application coverage at lowest cost.



[ghiasi\\_01\\_1107.pdf](#)

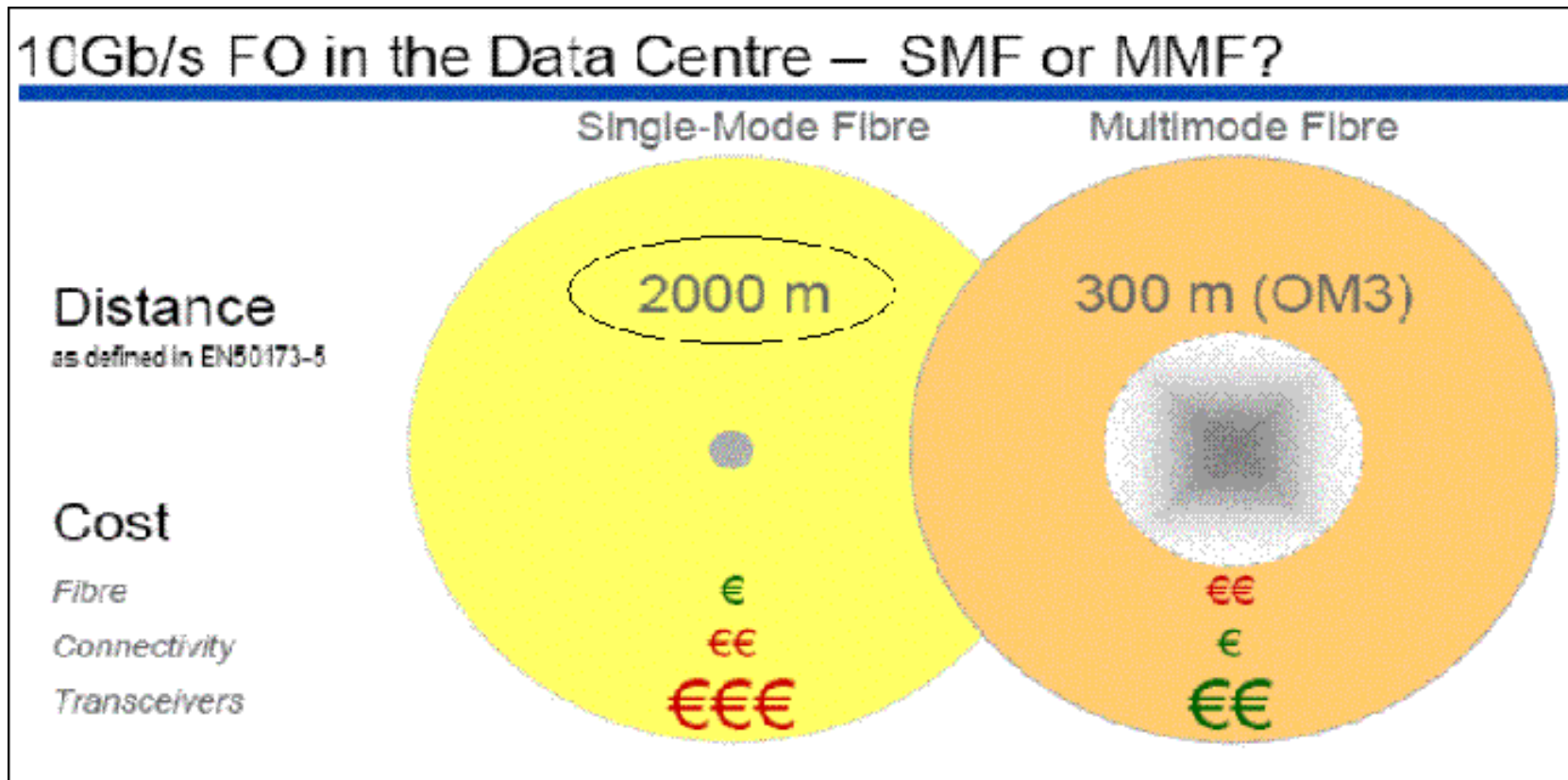
Actually no extra cost from 100m to 300m.

- EDC-enabled Linear Interface (6T/2 FFE +2T DFE) can do 300 m with about 1 dB less penalty than limiting can do 100 m!



# 40GbE SMF Reach Reqs. (1 of 3)

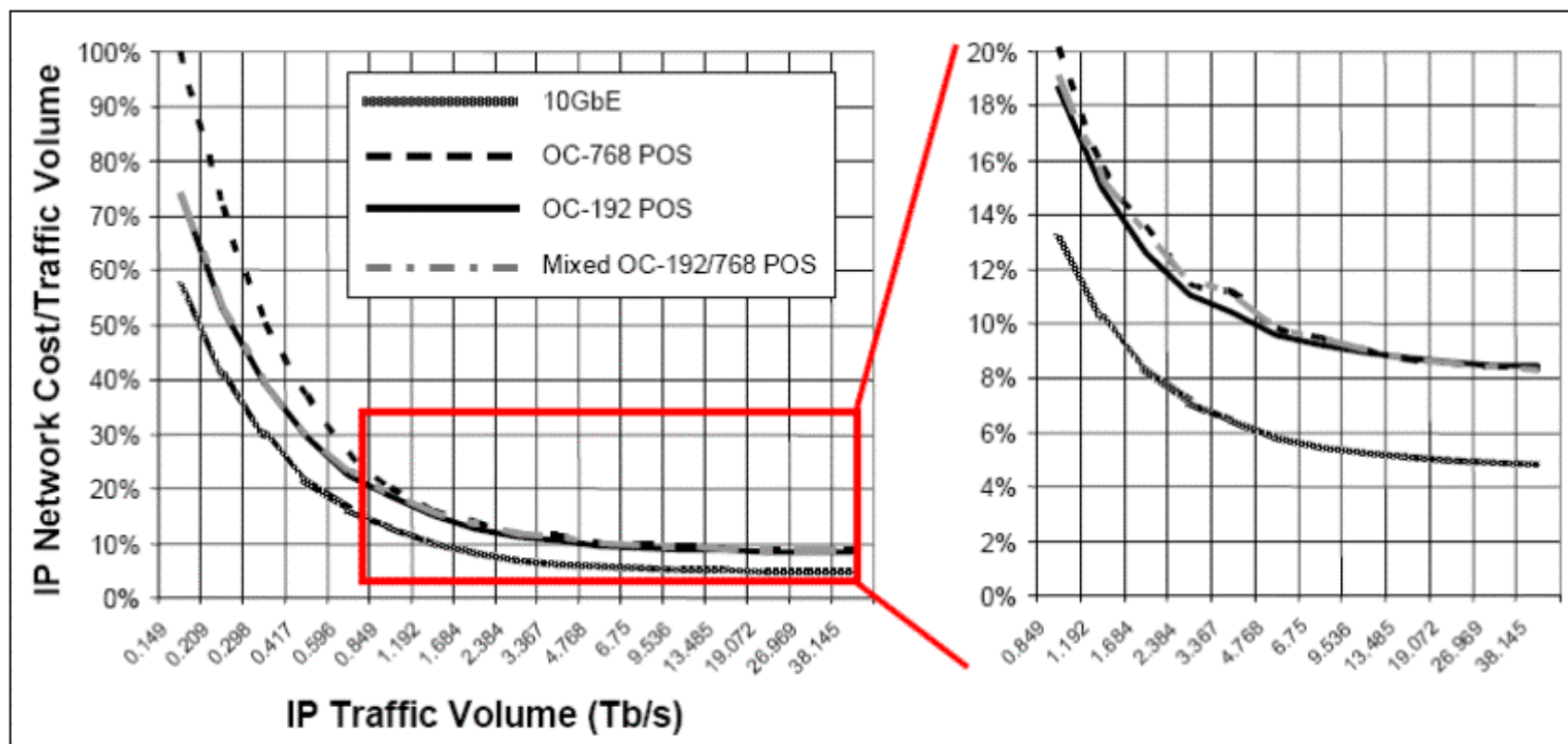
- ▶ **Datacenter cabling standard: the maximum span of data centre cabling is specified as 2km, using SMF.**



Ref to: **CENELEC EN 50173-5** (“Information technology - Generic cabling systems – Part 5: Data Centres”) which specifies data center cabling standard.

## 40GbE SMF Reach Reqs. (2 of 3)

- ▶ **40GbE SMF is critical for 4x10GE aggregation into 40G OTN**
  - ▶ Current OC-768 VSR is about 2km (40ps/nm).
  - ▶ Future optical transport network should be Ethernet-based, as 40GbE in terms of 4x10GbE should be more economic than OC-192 POS or OC-768 POS.



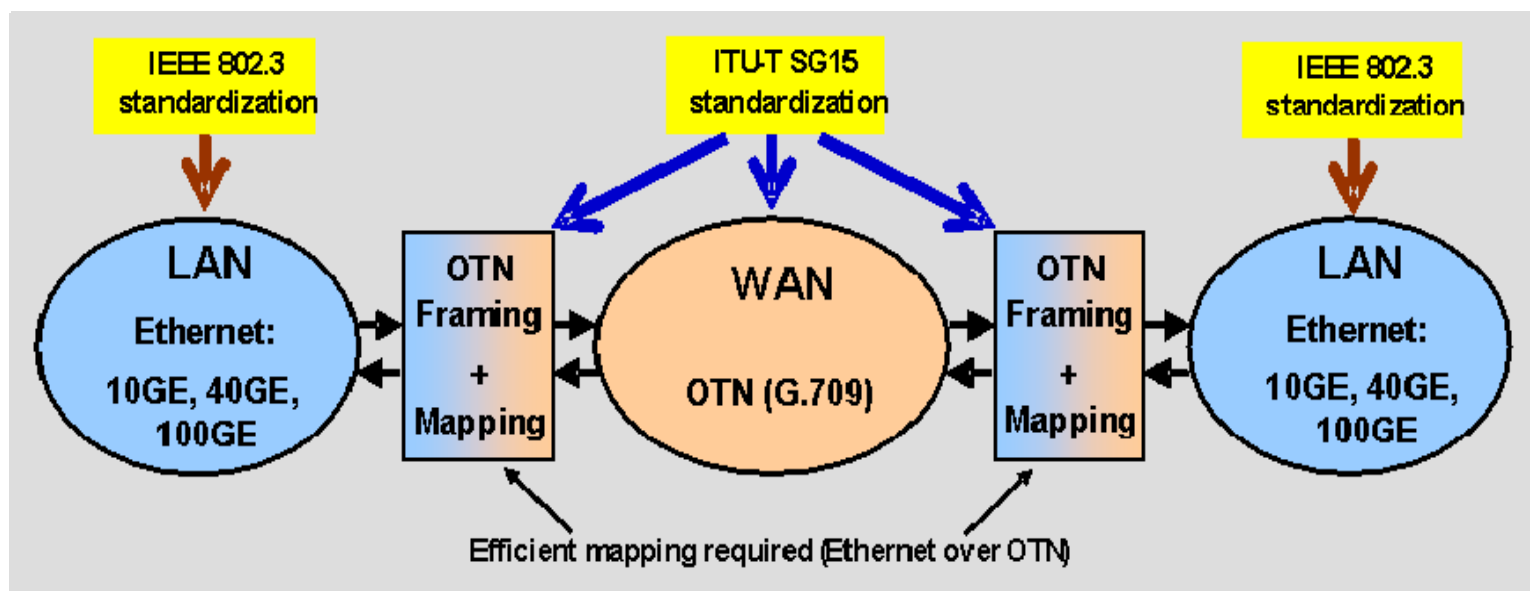
Source: Infinera (Drew Perkins)



# 40GbE SMF Reach Req. (3 of 3)

## ▶ Carriers' Reqs from OIF (OIF2008.031.04)

- ▶ **R16:** OTN systems operating at the OTU-3/ODU-3/OPU-3 level shall support 40 GbE client signals interfaces.
- ▶ **R17:** Physical layer interface specifications for 40 and 100 GB Ethernet shall include an option for SMF minimum 2 km. The interface architecture should support an evolution to a single wavelength serial interface.



OIF2008.031.04

# Recommendations

- ▶ **40GbE MMF** better support the longest data center link that is possible.
  - ▶ **Maximize application coverage at lowest cost;**
  - ▶ **Suggest 220-300m reach with OM3**
    - NO extra cost added using linear I/F with EDC-based host.
- ▶ **40GbE SMF** should primarily address the needs of longer reach in servers and computing apps as well as OTN transport of Ethernet services.
  - ▶ This comply with the position of 40GbE for server interconnect in data centers while 100GbE for network aggregation.
  - ▶ **While low cost is the king, so suggest 2-3km reach with SMF-28.**
    - Shorter distance than 10km help 4x10GbE for system margin, packaging and yields costs.
  - ▶ Consider it will be end-users' choice how to implement 40GbE SMF for other applications like in cost-sensitive networking aggregation.