

100GE Fiber and Optics Options

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March 5, 2012

Introduction

Microsoft is looking for the most cost effective options for distances up to 300m

- Four PMD variations in standard:
 - 100GBase-CR10 – Ten lanes over shielded copper cabling up to 7m
 - 100GBase-SR10 – Ten lanes over ten MMF pairs up to 100m
 - 100GBase-LR4 – Four lanes of WDM over one SMF pair up to 10km
 - 100GBase-ER4 – Four lanes of WDM over one SMF pair up to 40km
- Microsoft data centers are designed not to exceed 300m cable runs
- Microsoft is looking for the most cost effective optics options for distances up to 300m
- Use of 10km reach optics to meet our 100m to 300m needs is cost prohibitive
- Ten lane MMF fiber option could be cost prohibitive based on cost of MMF fiber

Cost sensitivities

Microsoft view on optics cost

- $(\text{Fiber} * \text{Distance}) + (\text{Optics}) + \text{Power}/3\text{yrs} + (\text{Physical Factors})$
- Physical Factors include
 - **Density target: 24-32 * 100GE in 1 RU, End 2013**
 - Size of fiber bundles affecting scalability and cost of fiber trays
 - Ability to reuse installed fiber plant
- Multimode vs. Single mode
 - Single Mode fiber is low cost
 - Multimode fiber (OM3, MTP) can be 12x this cost

Overview of 100GE use at Microsoft

Scenario	Distance	Volume	MTP Fiber Market Cost	SM Fiber Market Cost	SM Optics Cost Budget
Within Rack	1-5m	Very Small volume, between devices in same rack	12x	1	6x
DC Medium reach	100m	Small - Between devices	60x	5x	30x
DC Long reach	100m-300m	High - Thousands per data center	5000x	300x	1700x
DC Extended reach	600m	Small	n/a	600x	3400x

* All costs relative to short reach SM fiber + connectors

Conclusions

- Datacenters driving volume at 100m-300m reaches
- Data centers are not getting smaller, they are getting bigger
 - 300m to 500m reach on SMF is imperative
- Cost of Power over 3 years is significant
 - Attention to lower power alternative is important