

100GE Fiber and Optics Options

Tom Issenhuth- thomasis@microsoft.com

Microsoft Global Network Services

July 16, 2012

Introduction

We are looking for the most cost effective options for distances up to 1km

- While we do envision some distances up to 1km we see the vast majority of distances being 500m or less
- Our data centers are designed not to exceed 300m cable runs but as they continue to grow 300m distances are not always achievable
- We are looking for the most cost effective optics options for distances up to 500m with support up to 1km highly desirable
- Use of 10km reach optics to meet our 100m to 500m needs is cost prohibitive
- Current typical data center fiber usage
 - 3 years ago data centers consumed 1,000 fibers per MW
 - Today they consume 2,000 + fibers per MW
 - 75%+ of this fiber averages 40m with a range from 15m to 100m
 - 100m and less lengths are growing at 2x the rate of longer lengths

Introduction

What is driving these requirements

- We are seeking to find the optimal design for constructing the lowest cost data center networks. All relevant costs will be included not just the interface costs
- Increasing server outputs coupled with reduced oversubscription is increasing the bandwidth flows within the data centers
- We are seeing larger and larger server “networks” that cannot always be supported in the same space
- These factors are driving larger interconnection speeds over longer distances
- We have produced network designs for deployments with a physical size that drives 300-400m links in large volume
- We are beginning to see demand for deployments which can drive distances up to 1km
- We would like to understand the costs of building data center networks which span 300m, 500m and 1km as a way to model the tradeoffs between server network size and cost. Are the overall costs less with a large server network with higher interconnection costs or with multiple smaller server networks with lower interconnection costs?

Cost sensitivities

Our view on optics cost

- (Fiber * Distance) + (Optics) + Power/3yrs + (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
 - Cost comparison includes fiber jumpers, connector panels and 72 count fiber cables with MPO connectors
 - Multimode fiber is OM4
 - There are too many variables specific to each company to make definitive cost comparisons
 - At 50m SM is cheaper than MM
 - Between 100m and 400m MM is between 1.5 and 3x the cost of SM
- We prefer the use of SM due to lower costs and “future proofing” at most distances but the fiber costs must be coupled with the interface costs

Conclusions

Summary

- Data centers are not getting smaller, they are getting bigger
 - 300m to 500m reaches are becoming very common
 - 1km reaches are starting to be seen
- Use of single mode fiber important to lower fiber costs and increase distances
- Cost of Power over 3 years is significant
 - Attention to lower power alternative is important
- We would prefer a single interconnect solution for all distances to simplify planning and reuse opportunities
- Parallel fiber implementations could have an advantage over single fiber solutions as they support 4 x 25Gb flows which could be a better sized flow within the data center