



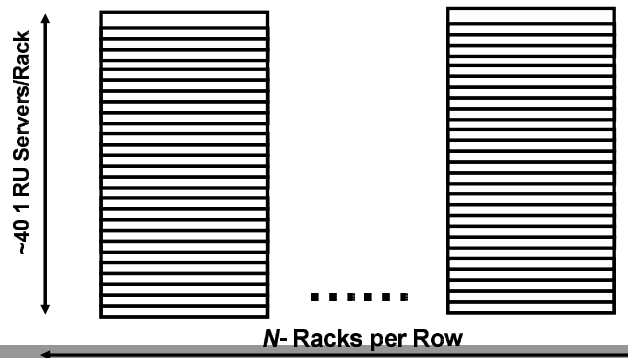
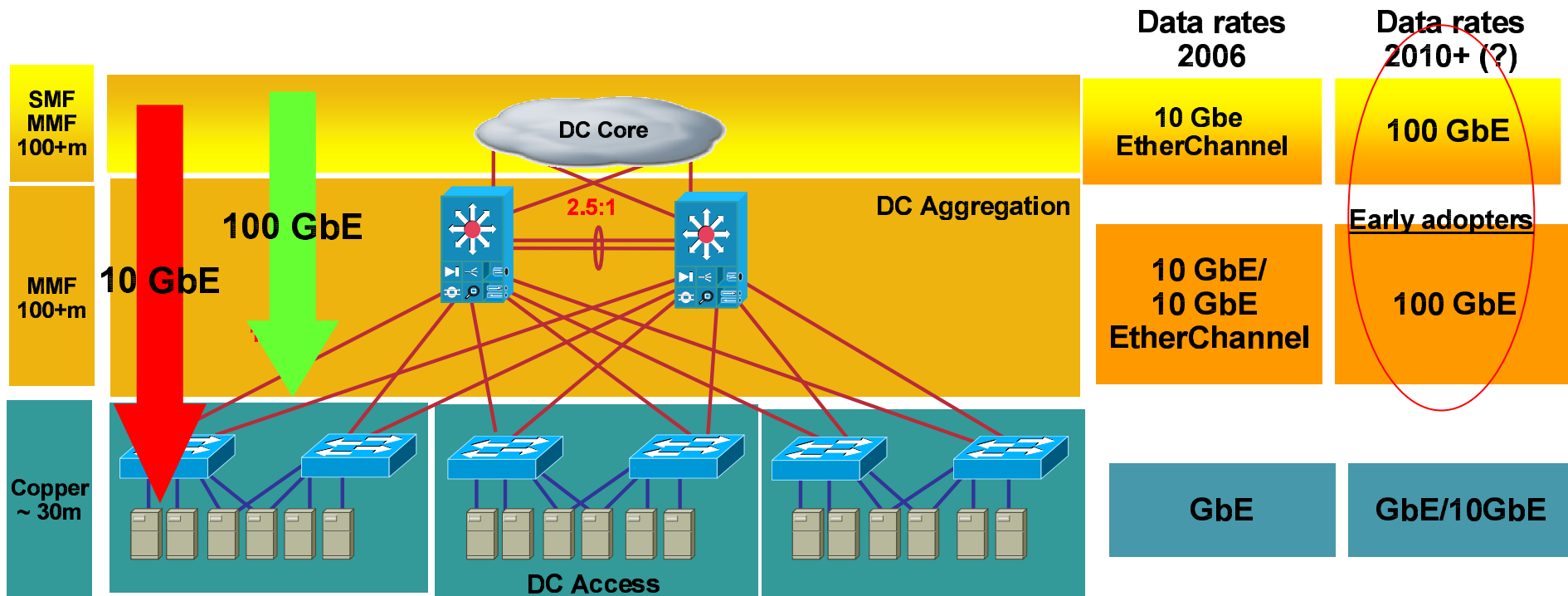
Market drivers for 100 Gigabit Ethernet

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Cisco Systems
Sept 20th, 2006

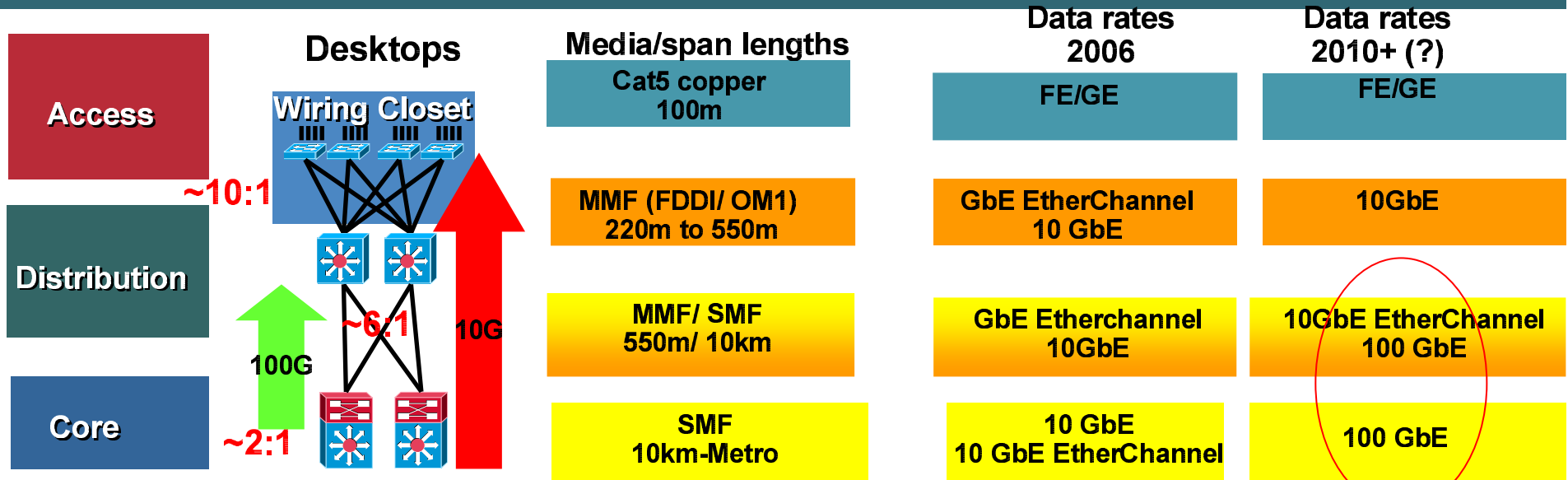
Agenda

- **100 GbE early adopters**
- **(1G → 10G) vs. (10G → 100G) transitions**
- **100 GbE PMD considerations**

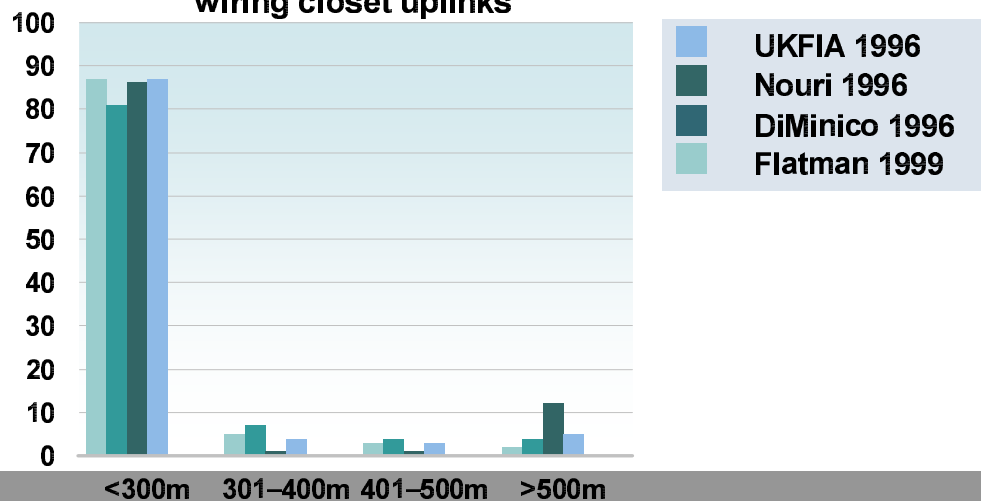
Typical Data Center Architecture: media types, span lengths and data rates



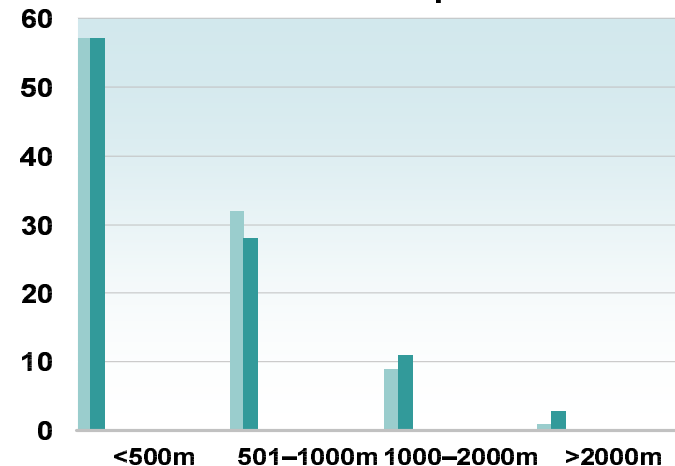
Typical Enterprise Campus Architecture: media types, span lengths and data rates



In building backbones:
wiring closet uplinks



Campus backbones:
distribution uplinks



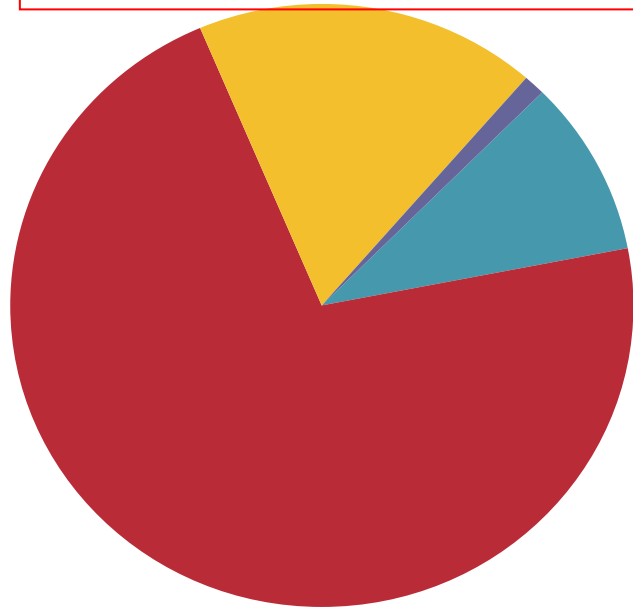
Transition comparisons: (1G → 10G) vs. (10G → 100G)

Differences	1G→10G	10G→100G
Enterprise Campus access	Fueled by 10/100/1000 copper to the desktop	10G copper to the desktop unlikely anytime soon
Data Center access	Gig NICs in servers (data center access) accelerate transition to 10G in DC	10G adoption pace on servers TBD
Access technologies	Copper GigE established low cost technology for access	Copper 10G technology challenges may slow down 10G server adoption
Data Center densities	48-ports 1G cards are available → 10G much needed to aggregate	When will true high density 32+ ports be available on 10 line cards? SFP+ may play a role in accelerating the need for 100G aggregation.
SP metro transport	10G transport was well understood and based on mature technologies	The technical/economical case for 100G metro transport is a question mark → traction in SP?

PMD Mix: 1 GbE (**mature**) vs. 10 GbE (**growth**)

GbE

~75% multimode < 550m
~20% single mode up to 10 km

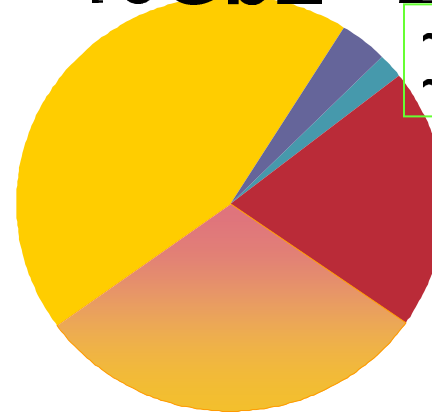


T SX LX Others

~60-70% multimode < 550m
~25-35% single mode up to 10km

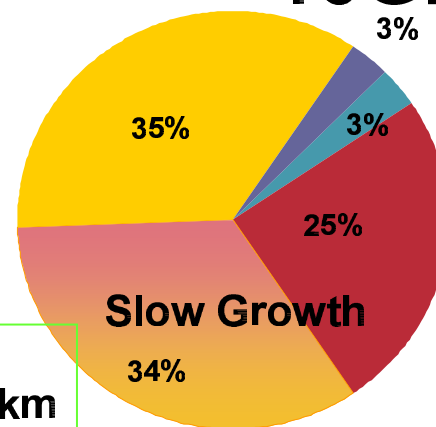
10GbE - 2005

~50% multimode < 550m
~45% single mode up to 10km

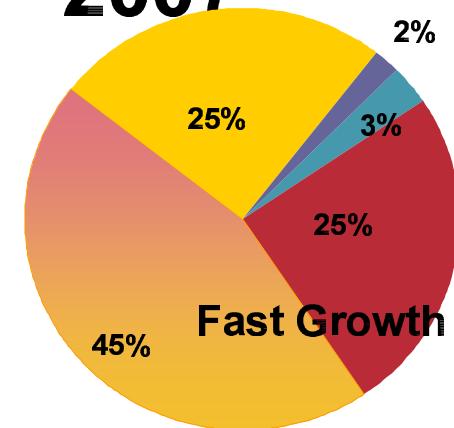


CX4 SR LX4 LR Others

10GbE - 2007



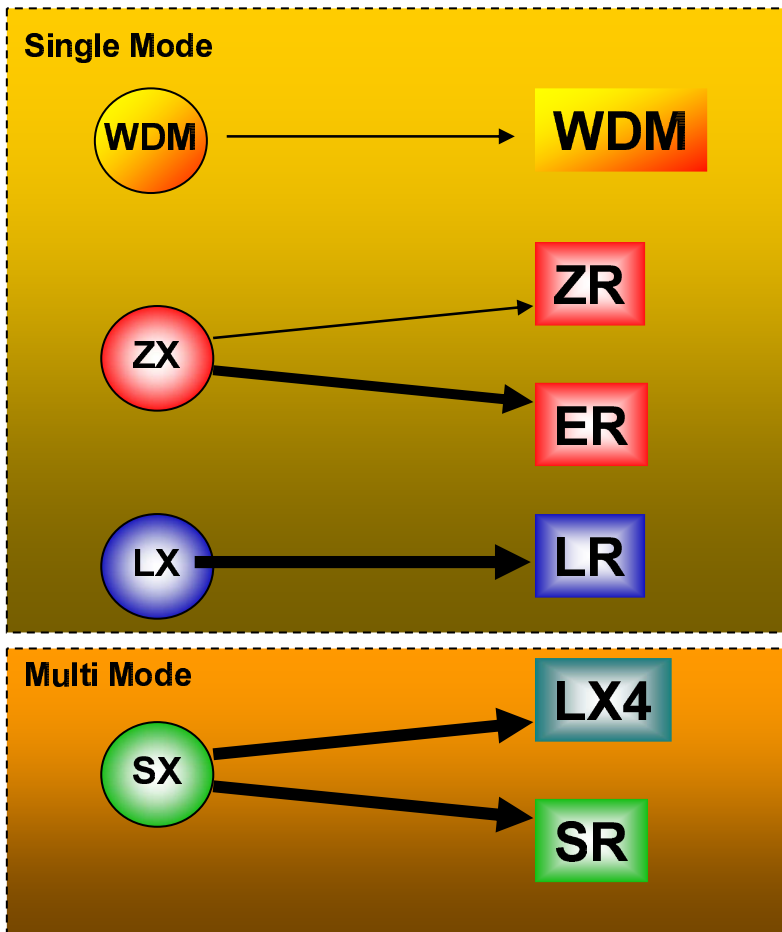
Slow Growth



Fast Growth

CX4 SR LX4/LRM LR Others CX4 SR LX4/LRM LR Others

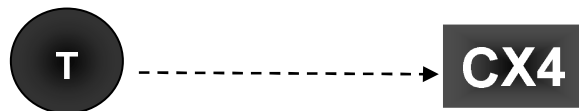
1 Gigabit -> 10 Gigabit PMD migration rates (= Transceiver units at 10G/ Transceiver units at 1G)



Core



	2005	2006	2H/2006 Forecast
SP PMDs	15%	25%	35%
proxy for 10GbE migration SP market/Metro	10%	15%	25%
proxy for 10GbE migration Enterprise campus	5%	10%	15%
Enterprise PMDs	1%	3%	5%



“Edge”

0.06%

1%

2%

$$\frac{\text{\# of 1 GbE copper transceiver/}}{\text{\# of 10GBASE-CX4 transceiver/}}$$

PMD considerations

- **~99%** of the **1 GbE fiber** market is covered by PMDs reaching **below 10km**.
- **~95%** of the **10 GbE** market is served by interfaces **below 10km**
- It makes sense to **limit** the numbers of PMDs to reduce transceiver market fragmentation.
- An interface operating on **both multimode and single mode fibers up to 10 km** (ala 10GBASE-LX4) seems the best candidate to ensure the **widest possible market coverage (>95%)**.

Summary

- **1G→10 GbE adoption faster for core applications.** It is reasonable to expect more of the same for the next transition 10G→100 GbE. **Service providers will be early adopters.**
- The more 10GbE gets pushed to the edge (10Gbe NICs) the stronger the need for 100 GbE in the aggregation layer and above. **Data centers will be early adopters.**
- In **campus** applications 100 GbE will be adopted mostly for **distribution and core uplinks** (lack of 10 GbE desktop solutions).
- **100 G** is the recommended MAC speed for higher speed Ethernet in order to meet the target downlink-uplink oversubscription ratios in data center and enterprise applications.