

Data Centre Link Survey

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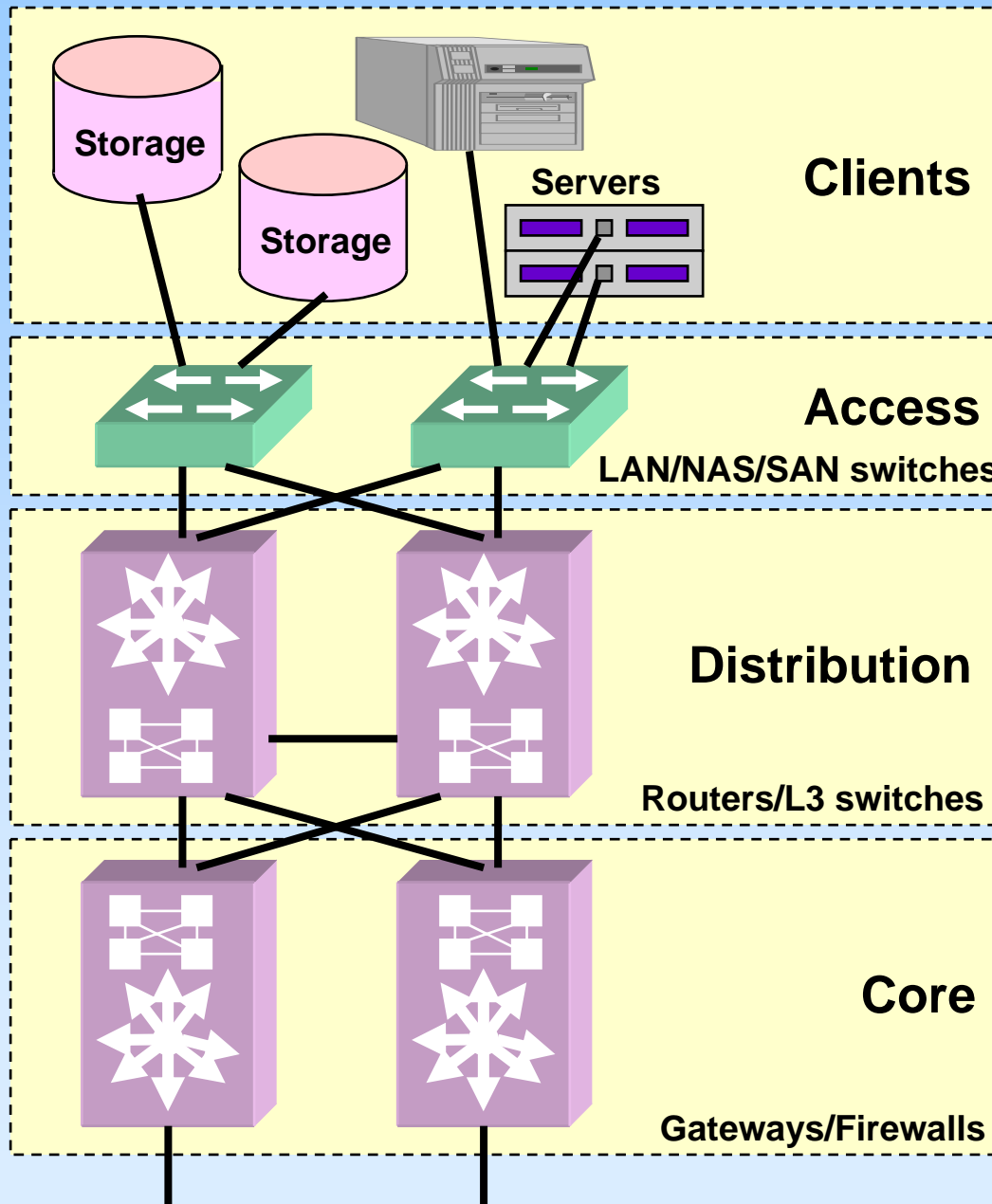
Survey Objectives

- 1. establish length distribution requirements for Higher Speed Ethernet links**
- 2. establish link speed & connectivity requirements**
- 3. focus on recent data centre designs/installations**
- 4. provide greater granularity for the first 30m of horizontal/client links than existing studies**
- 5. assess level of standards compliance for cabling**
- 6. examine differences to existing cabling studies**

Flatman Cabling Surveys for IEEE 802.3

- July 1999** In-premises Optical Fibre Deployment to 2000
- Jan 2003** Installed Copper Cabling Forecast to end 2005
- July 2003** Installed Horizontal Cabling Length Distribution (office & medium-sized data centre)
- Mar 2004** In-premises Optical Fibre Installed Base to 2007

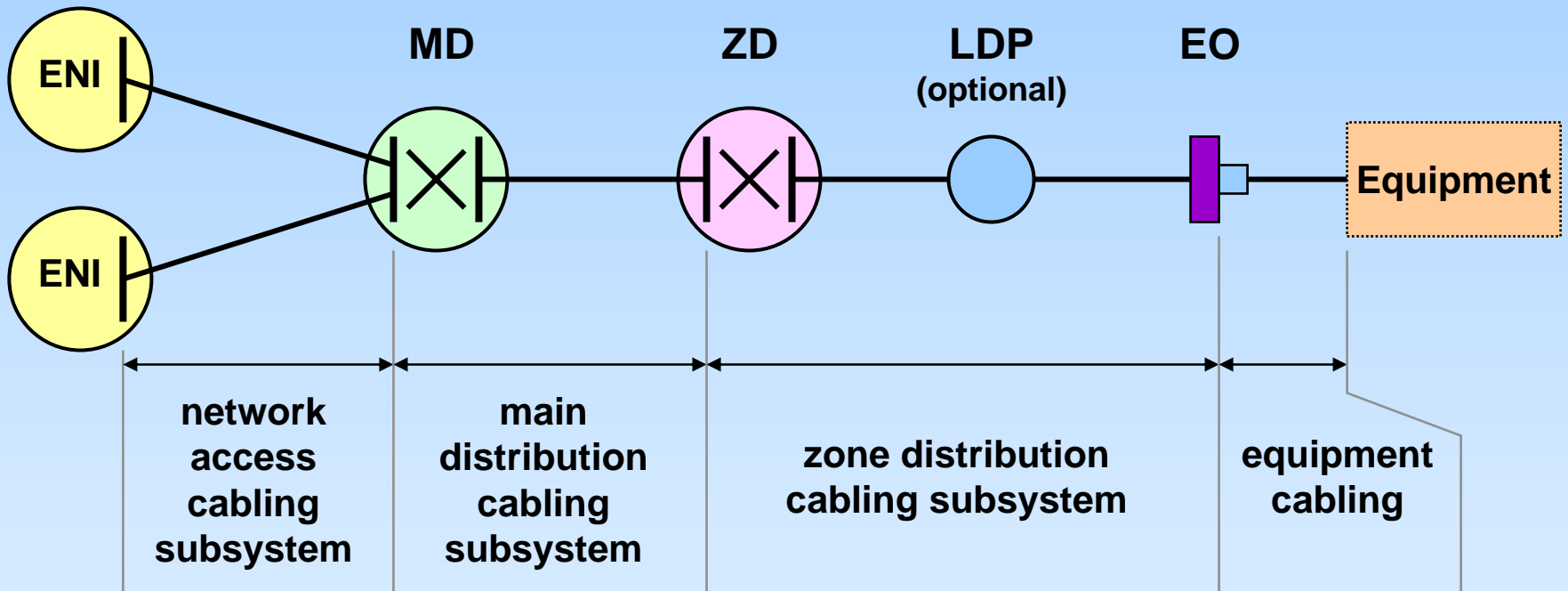
Data Centre Network Infrastructure



Data Centre Cabling Standards

- **EIA/TIA-942: Data Centre Cabling**
 - » published in 2005
- **CENELEC EN 50173-5: Data Centre Cabling**
 - » approved early 2007
- **ISO/IEC 24764: Data Centre Cabling**
 - » based on CENELEC EN 50173-5
 - » approval anticipated in 2008

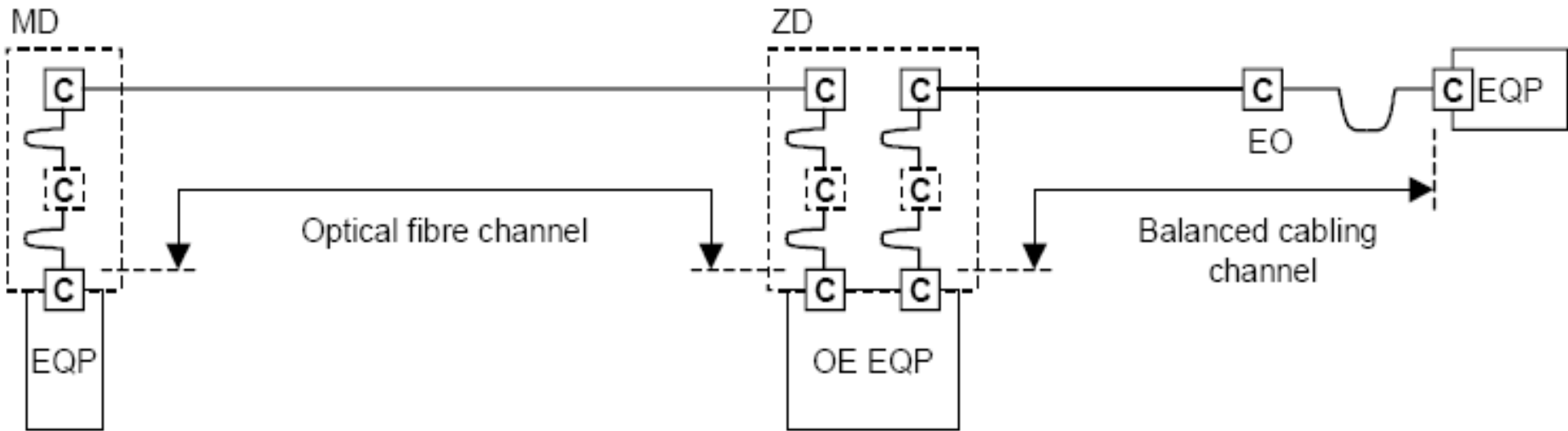
ISO/IEC 24764: Data Centre Cabling



ENI = Equipment Network Interface
MD = Main Distributor
ZD = Zone Distributor

LDP = Local Distribution Point
EO = Equipment Outlet

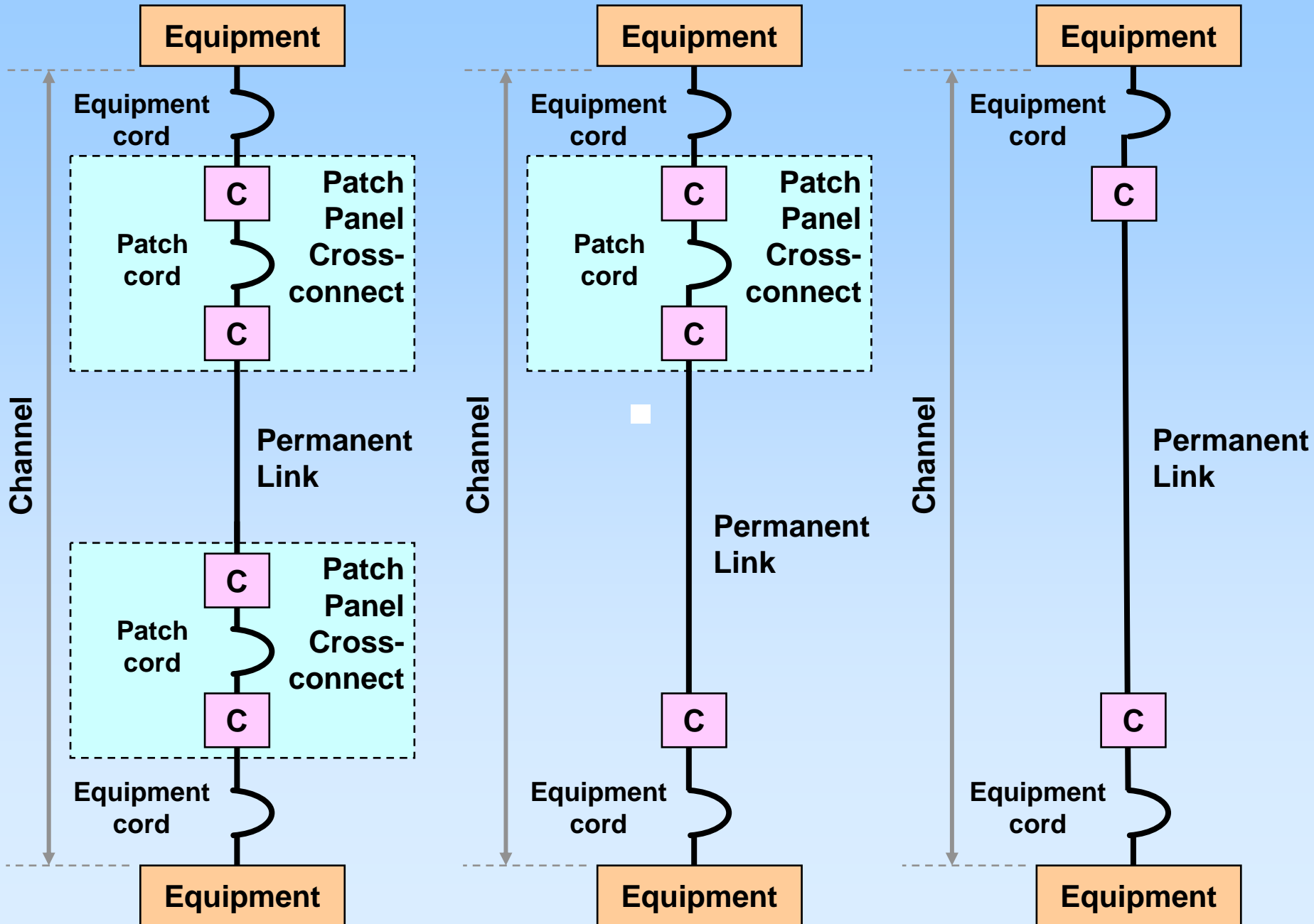
ISO/IEC 24764: Data Centre Cabling



Example of MD to ZD to EO implementation showing equipment interfaces

= optional connection

Standard Data Centre Cabling Models



Data Centre Size Classification

IDC ₍₂₀₀₆₎ identifies 4 different types, distinguished by size:

Small Data Centre

- ~15,000 ft² raised floor
- 350-500 volume servers
- 1-3 high end servers

Large Data Centre

- ~35,000 ft² raised floor
- 2,000-2,500 volume servers
- 6-7 high end servers

Medium Data Centre

- ~20,000 ft² raised floor
- 1,500-1,700 volume servers
- 4-5 high end servers

Very Large Data Centre

- >100,000 ft² raised floor
- <25,000 volume servers
- >8 high end servers

Oct 2007 Data Centre Cabling Survey Summary

- **9 enterprise data centres from US, UK, Germany**
- **total data centre floor space was 715,000 sq. feet**
- **56k servers, 250k switch ports, 920k patch ports**
- **small, medium, large, v. large sizes (IDC classes)**
 - **v. large had 74% links**
 - **large had 20% links**
 - **medium had 5% links**
 - **small had 1% links**
- **data centre cabling mostly standards compliant**
 - **some servers had direct connections to top of rack switches (i.e. no patch cords/patch panels involved)**

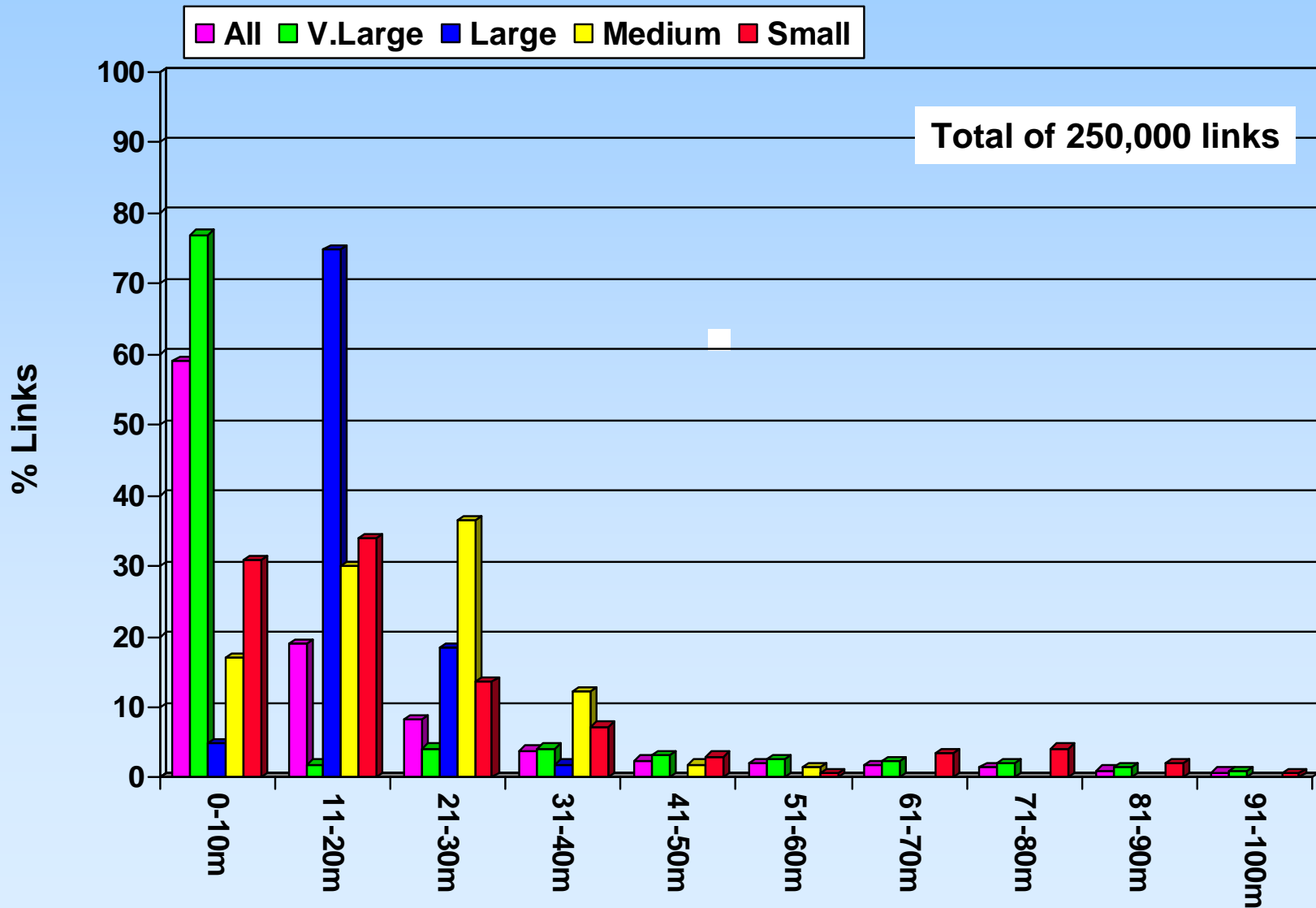
Data Centre Link Speed – the next 5 years

2007 (by site)	100M	1G	10G	40G	100G
Client-to-Access Links	78%	100%	11%	0%	0%
Access-to-Distribution Links	20%	80%	60%	0%	0%
Distribution-to-Core Links	10%	70%	80%	0%	0%

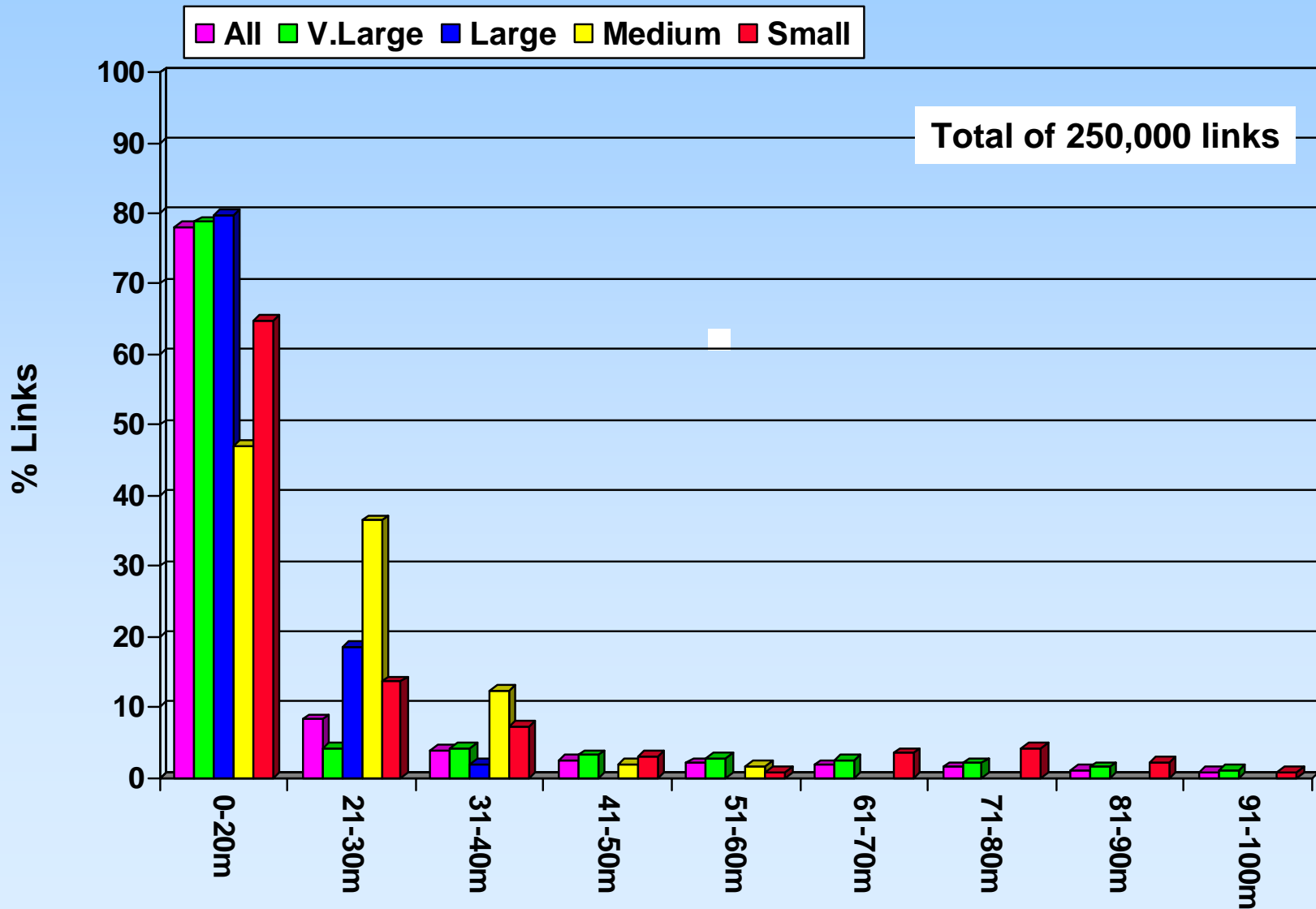
2010 (by site)	100M	1G	10G	40G	100G
Client-to-Access Links	11%	100%	78%	0%	0%
Access-to-Distribution Links	0%	70%	90%	0%	10%
Distribution-to-Core Links	0%	60%	40%	10%	0%

2012 (by site)	100M	1G	10G	40G	100G
Client-to-Access Links	11%	78%	80%	30%	10%
Access-to-Distribution Links	0%	40%	80%	30%	40%
Distribution-to-Core Links	0%	30%	80%	20%	60%

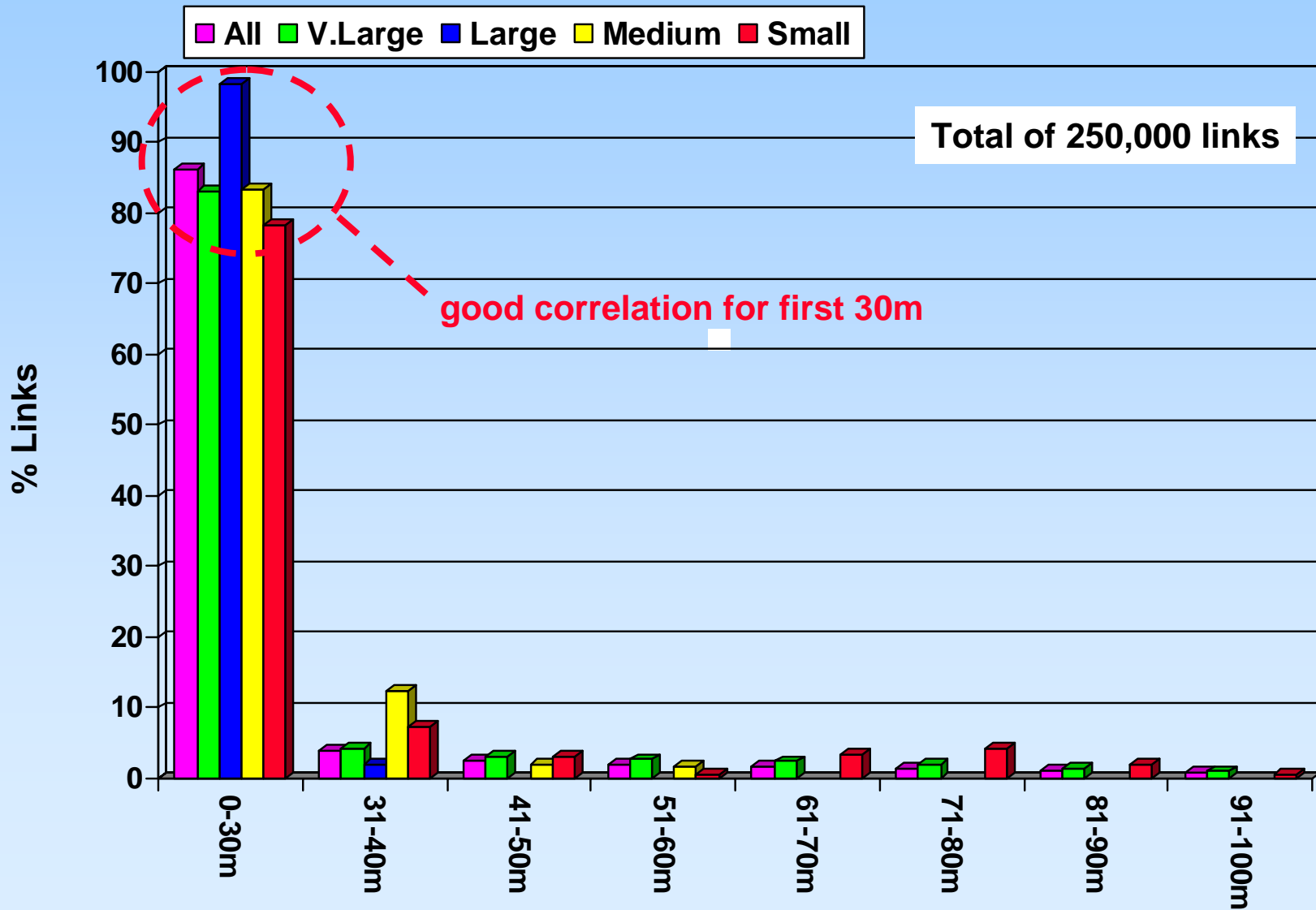
Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links



Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links



Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links



Prior Data Centre Cabling Survey (IEEE 802.3an DiMinico_01_1103)

- Data centers recently built by (M&A) type and size
 - 83% of data center horizontal cables are $\leq 45m$
 - 94% of data center horizontal cables are $\leq 55m$

Note: This is Permanent Link data

Data Center Type	Data Center Size (sq ft)	0-30 m	31-45 m	46-55m	56-75m	76-100m
Corporate	5000	100%	0%	0%	0%	0%
Corporate	10000	8%	23%	38%	31%	0%
Financial	25000	74%	19%	6%	1%	0%
Corporate	30000	99%	1%	0%	0%	0%
Internet	60000	47%	46%	5%	1%	1%
Internet	75000	44%	50%	4%	1%	1%
Internet	120000	35%	32%	27%	5%	1%
Average		58.1%	24.4%	11.4%	5.6%	0.4%

7 Data Centres Total = 325,000 sq. feet

Prior Data Centre Cabling Survey (IEEE 802.3an DiMinico_01_1103)

- Data centers recently built by (J&M) type and size
 - 93% of data center horizontal cables are $\leq 45m$
 - 99% of data center horizontal cables are $\leq 55m$

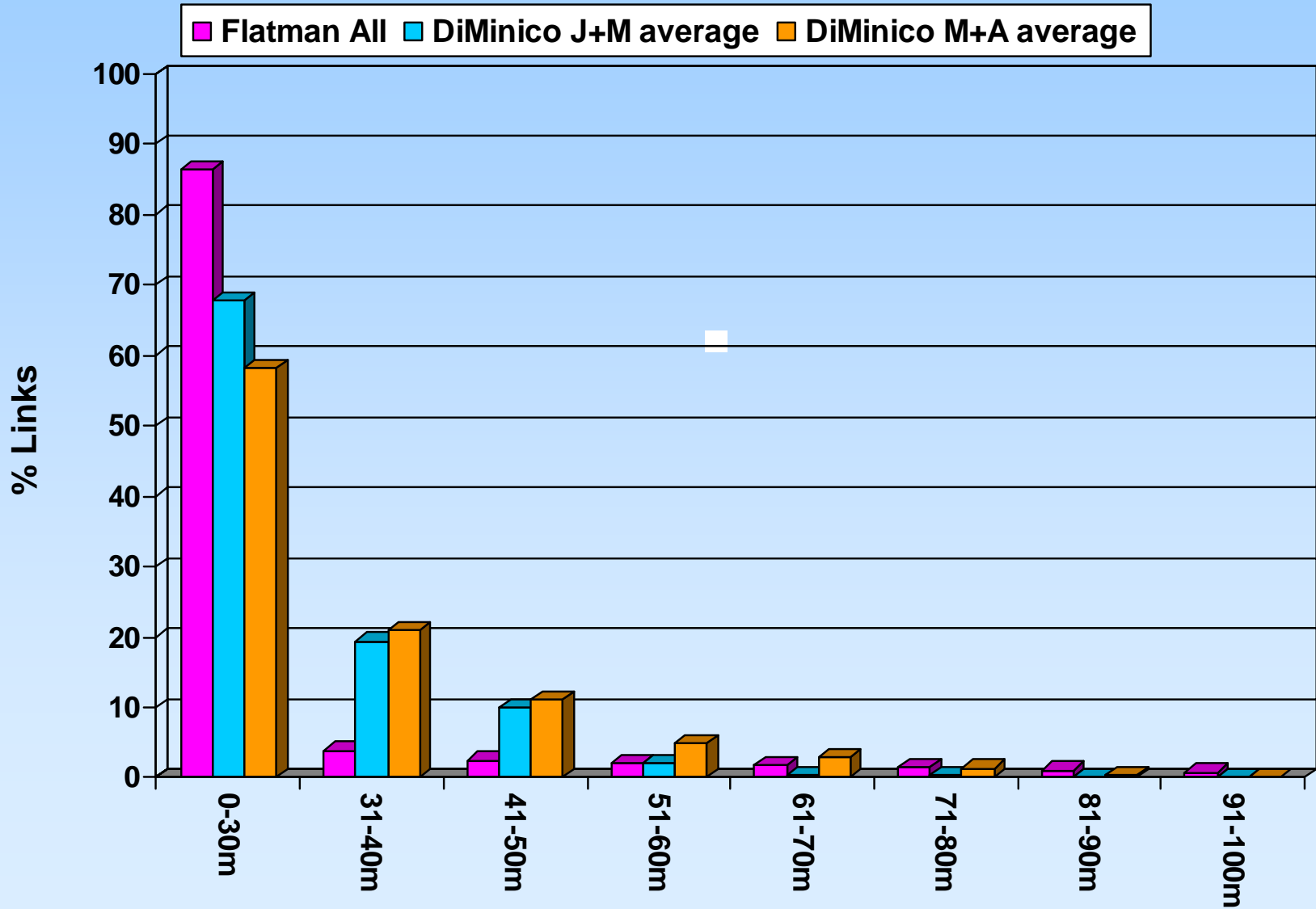
Note: This is Permanent Link data

Data Center Type	Data Center Size (sq ft)	0-30 m	31-45 m	46-55m	56-75m	76-100m
Corporate	5000	100%	0%	0%	0%	0%
Corporate	8000	90%	10%	0%	0%	0%
Govt	10000	70%	20%	10%	0%	0%
Corporate	20000	70%	25%	5%	0%	0%
Corporate	20000	90%	9%	1%	0%	0%
Internet	40000	60%	35%	5%	0%	0%
Corporate	45000	65%	25%	8%	1%	1%
Internet	60000	35%	48%	15%	1%	1%
Internet	60000	55%	35%	8%	1%	1%
Internet	80000	55%	35%	8%	1%	1%
Internet	100000	55%	35%	8%	1%	1%
Average		67.7%	25.2%	6.2%	0.5%	0.5%

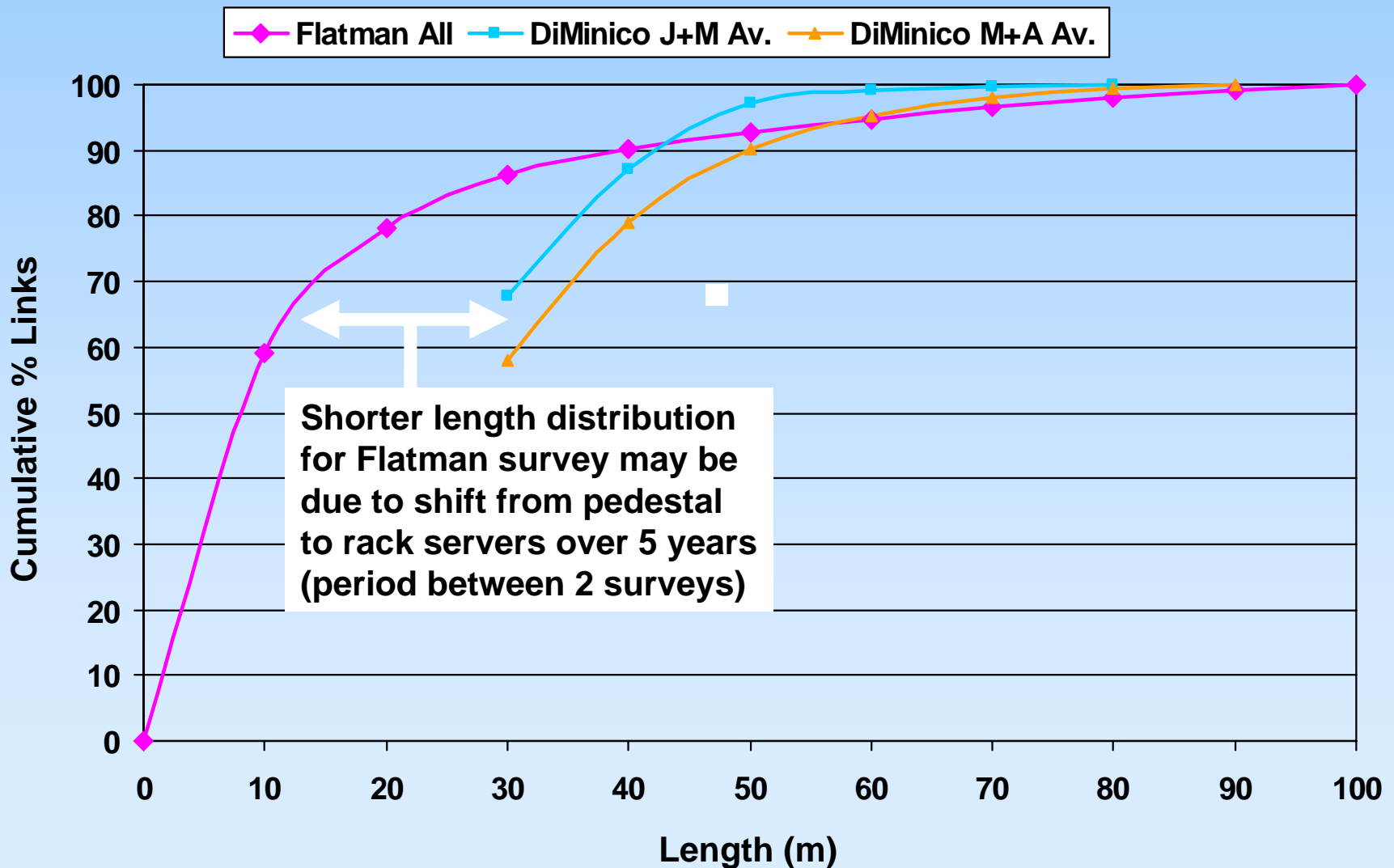
11 Data Centres Total = 448,000 sq. feet

Source: Jonathan Jew, J&M Consultants, Co-chair TR42.1.1- Data Center Standard

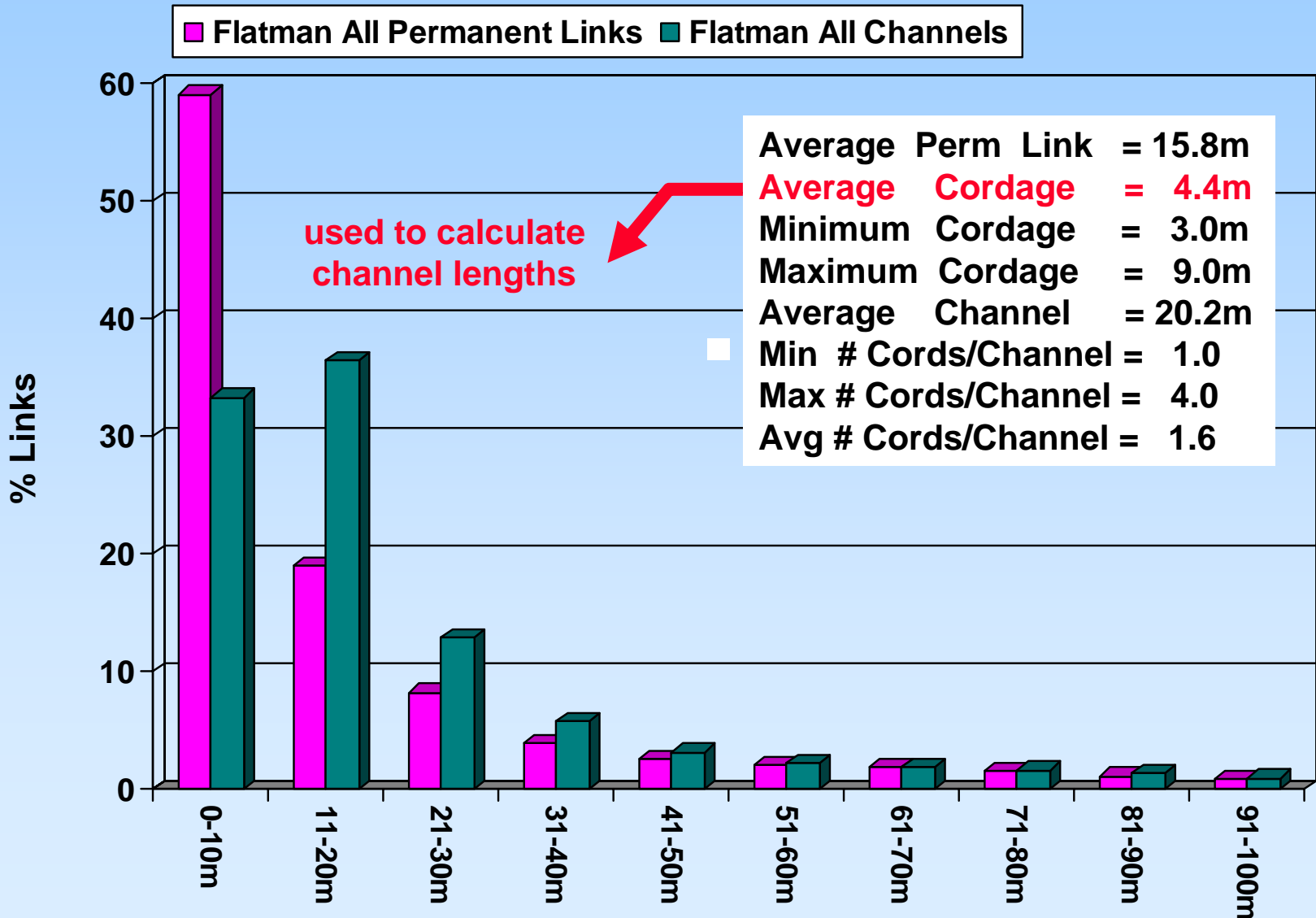
Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links



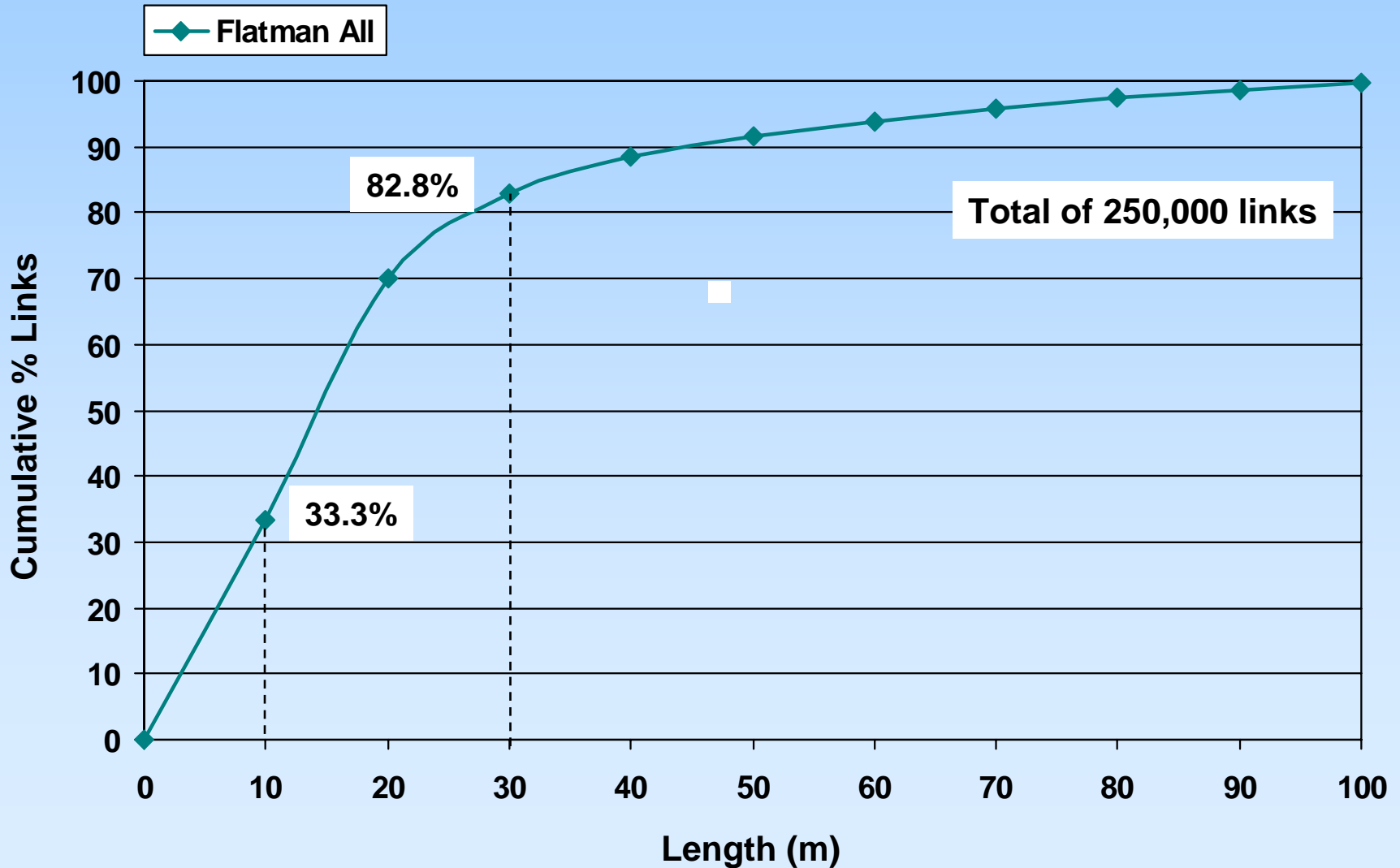
Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links



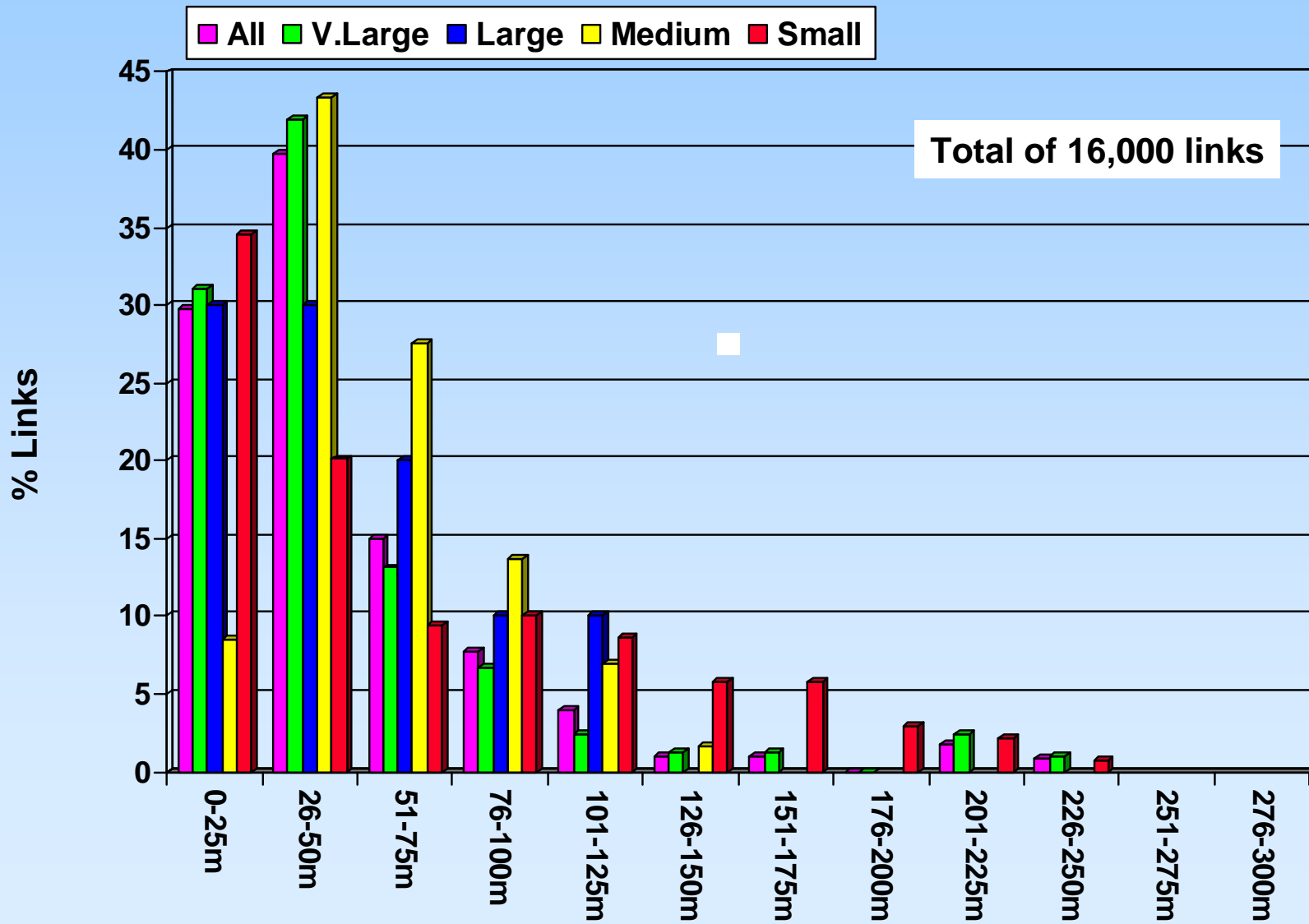
Enterprise Data Centre Cabling Lengths Client-to-Access Permanent Links & Channels



Enterprise Data Centre Cabling Lengths Client-to-Access Channels



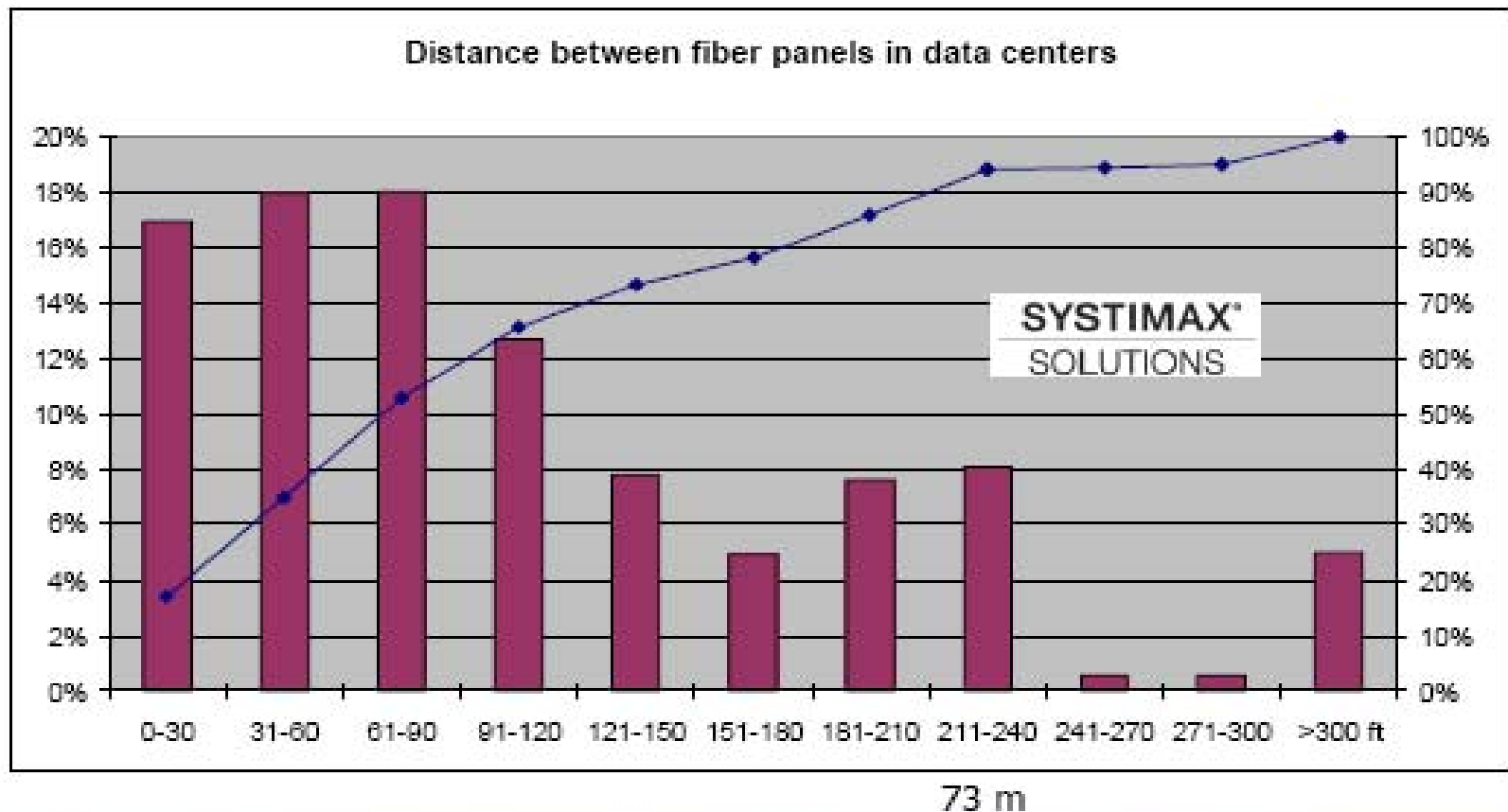
Enterprise Data Centre Cabling Lengths Access-to-Distribution Permanent Links



Prior Data Centre Cabling Study (IEEE 802.3 HSSG Kolesar_01_0906)

Array cable length distribution

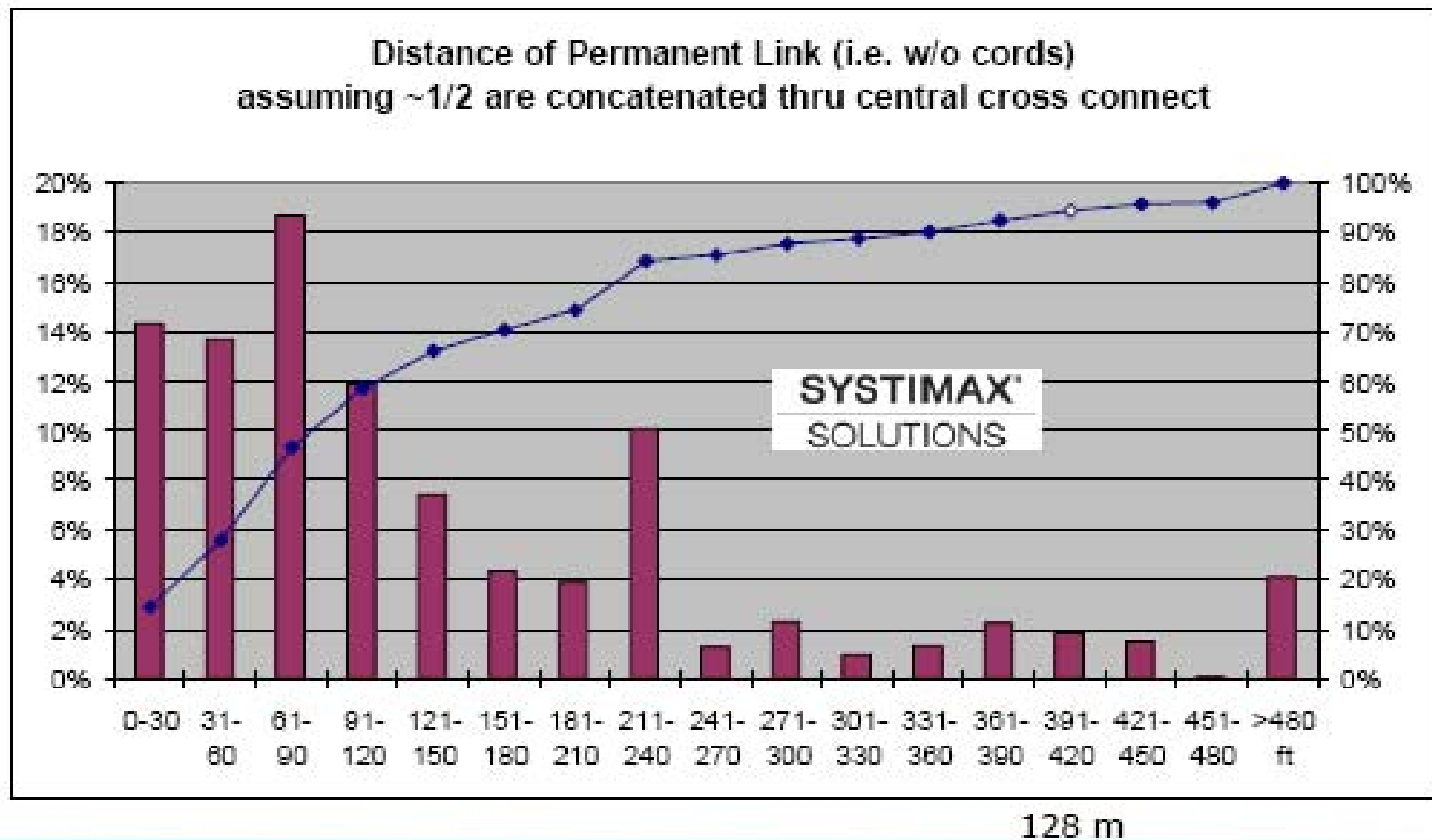
- Many thousands of 12-fiber units



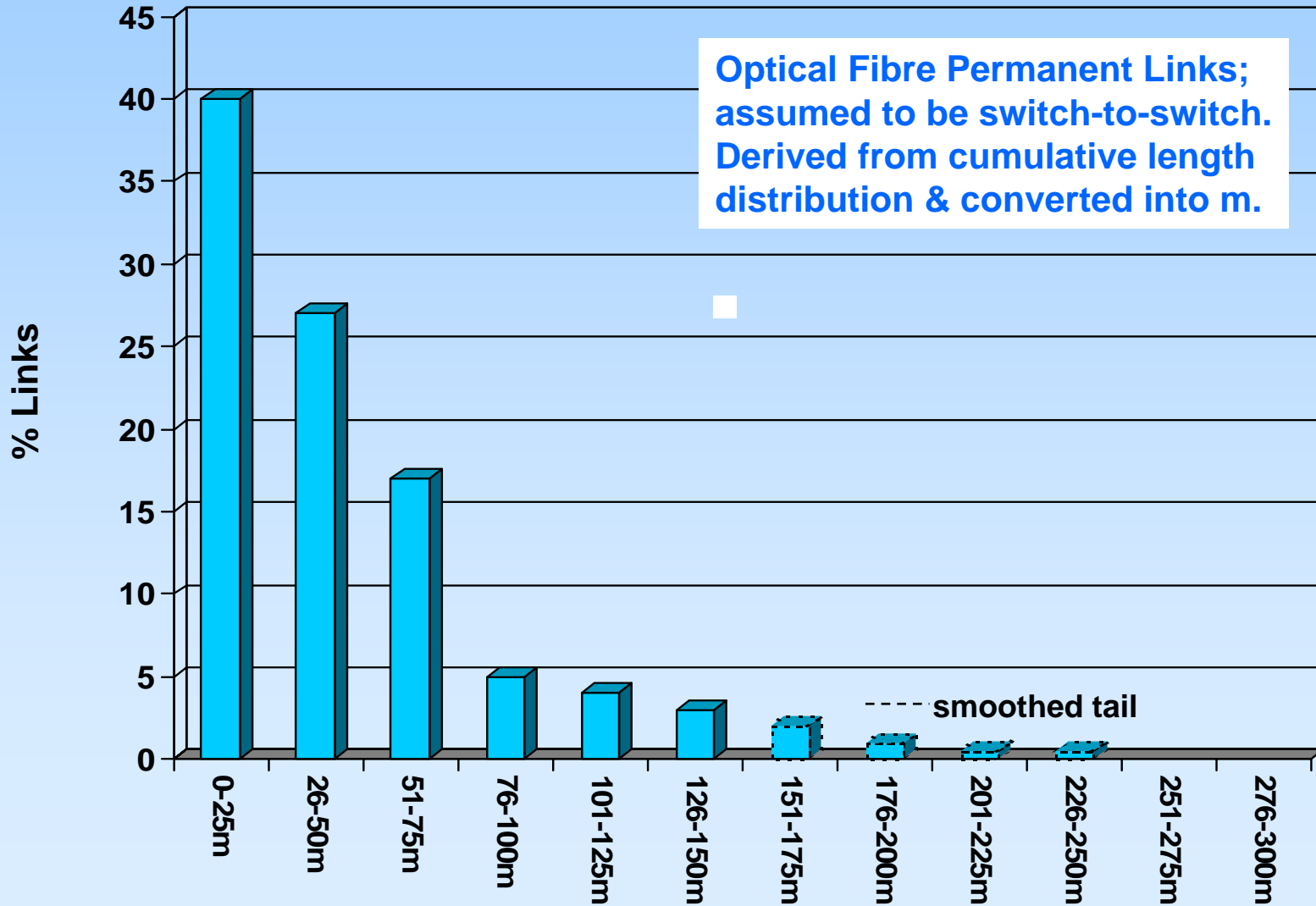
Prior Data Centre Cabling Study (IEEE 802.3 HSSG Kolesar_01_0906)

Permanent link length distribution

- Longer tail emerges



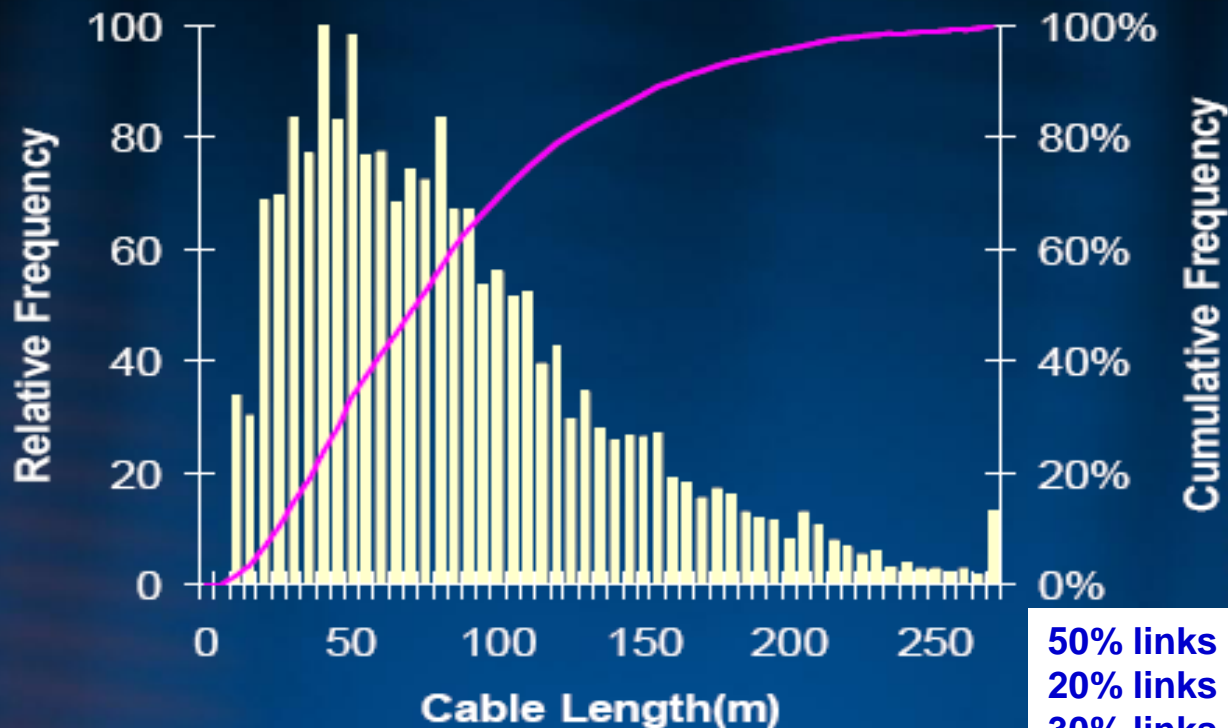
Prior Data Centre Cabling Study (IEEE 802.3 HSSG Kolesar_01_0906)



Prior Data Centre Cabling Study (IEEE 802.3 HSSG Swanson_01_1106)

Note: Data based on several 1000's Corning trunk cable shipments, simulation designed to represent actual data centre deployments (using concatenated trunks)

Permanent link length distribution

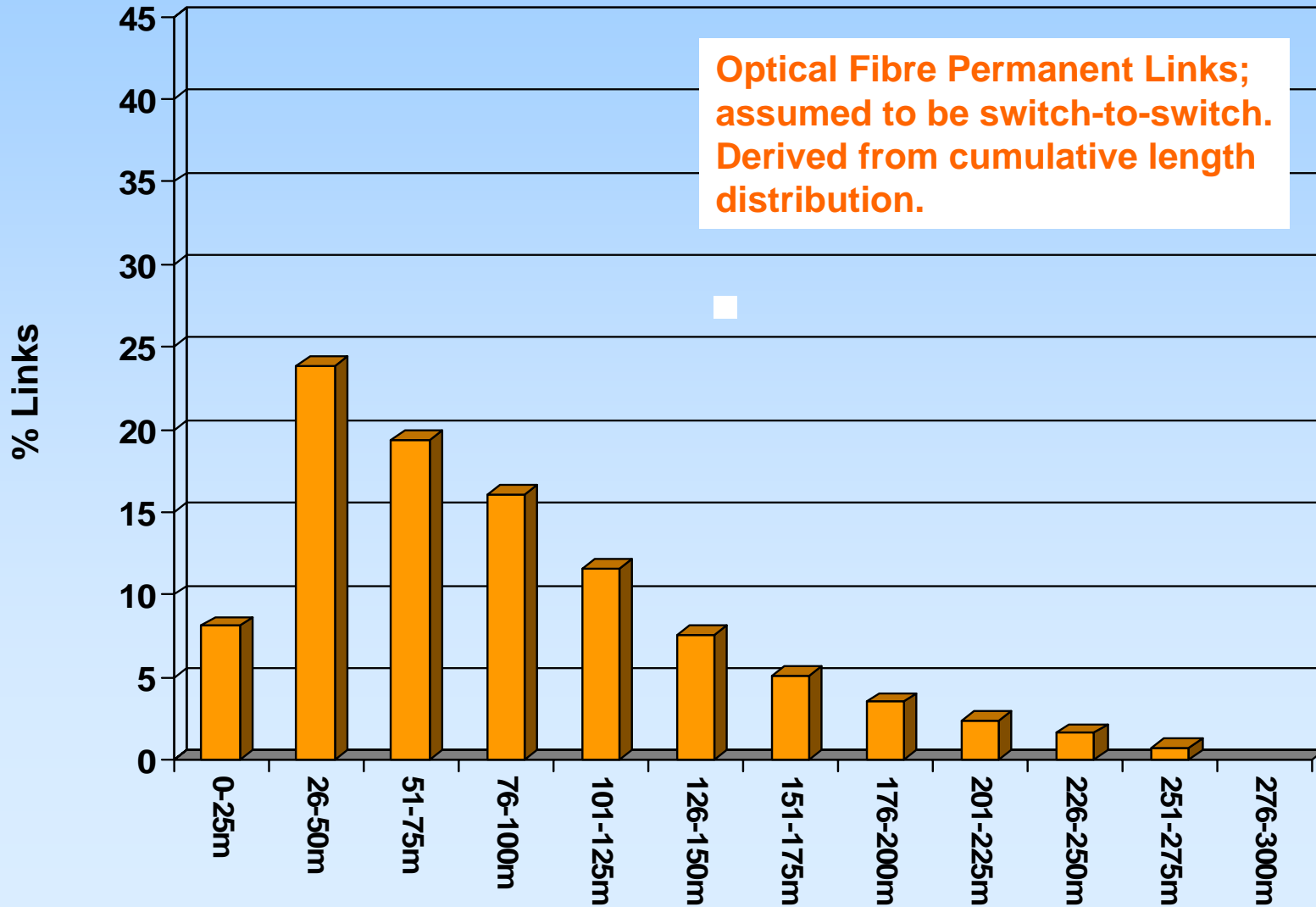


50% links have 2 trunks
20% links have 3 trunks
30% links are point-point

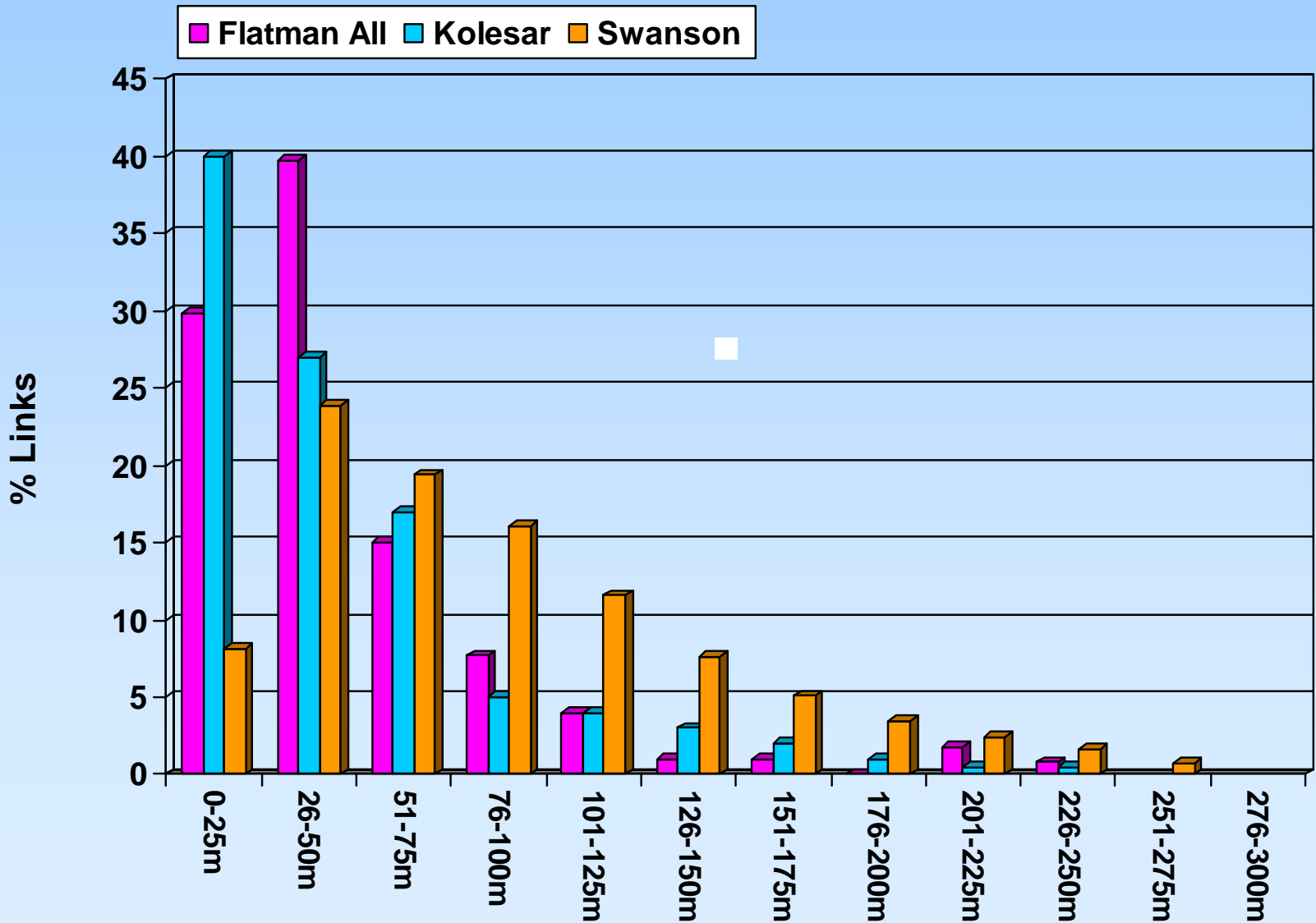
Length Distribution — Cumulative Frequency

CORNING

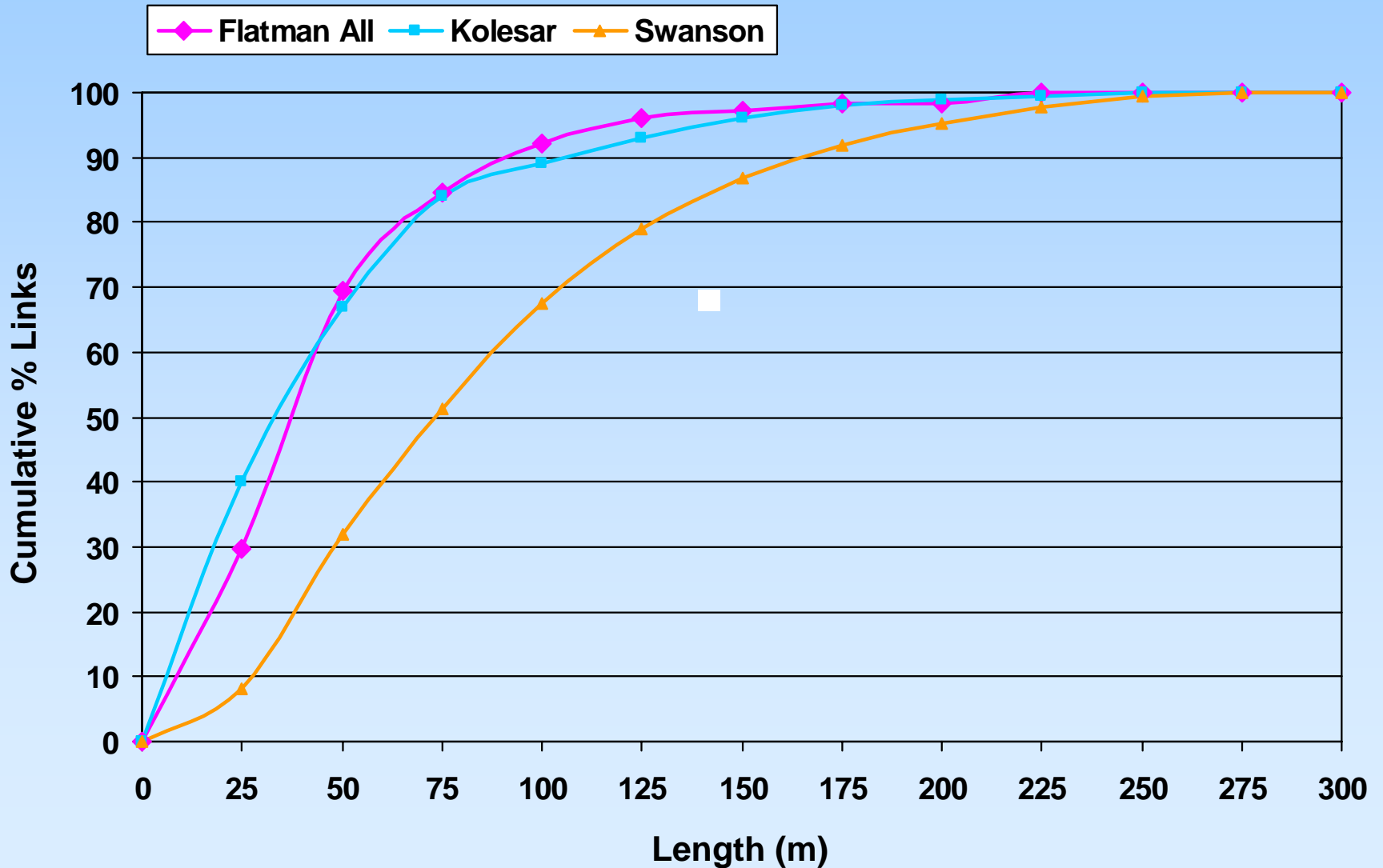
Prior Data Centre Cabling Study (IEEE 802.3 HSSG Swanson_01_1106)



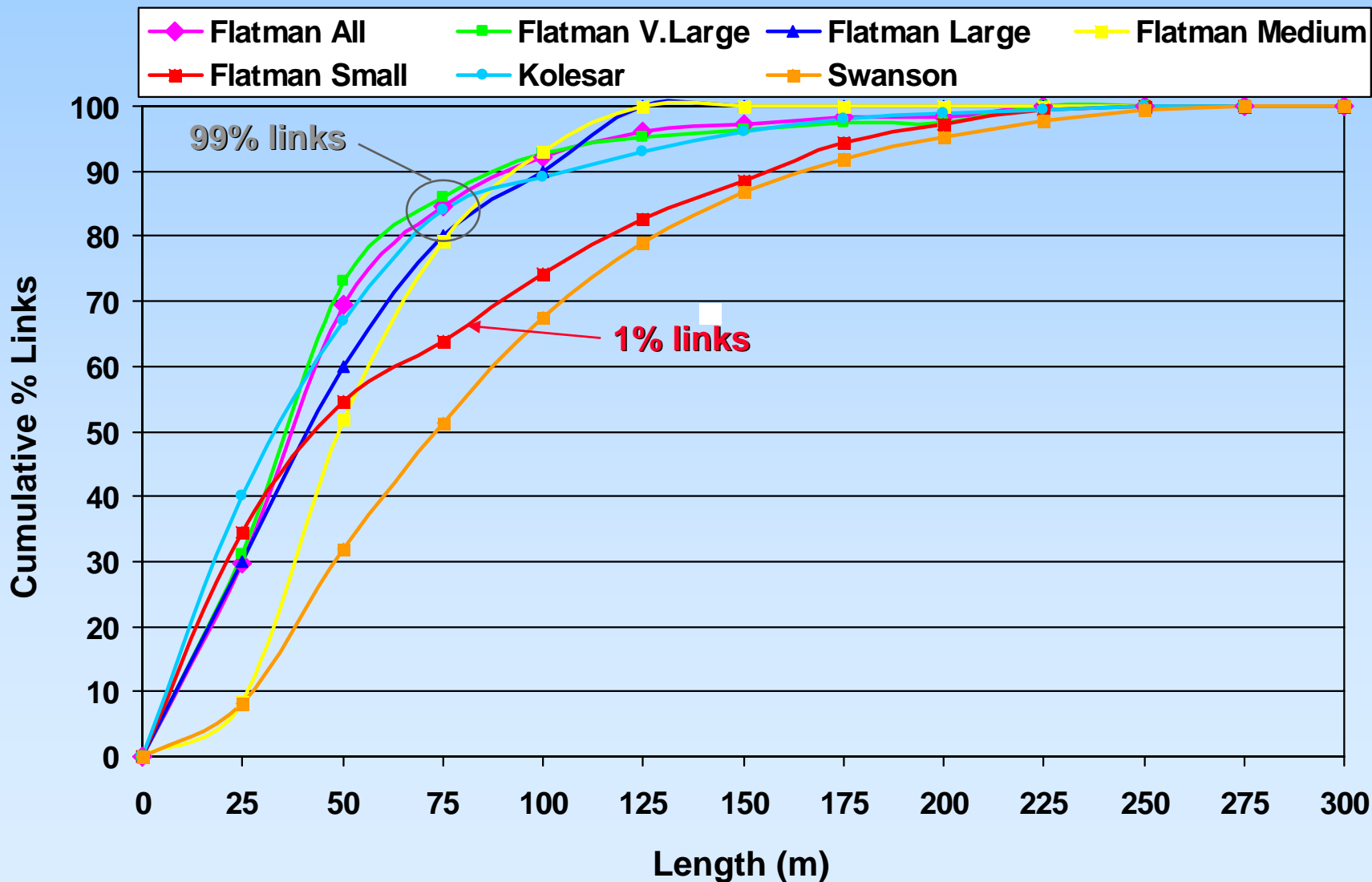
Enterprise Data Centre Cabling Lengths Access-to-Distribution Permanent Links



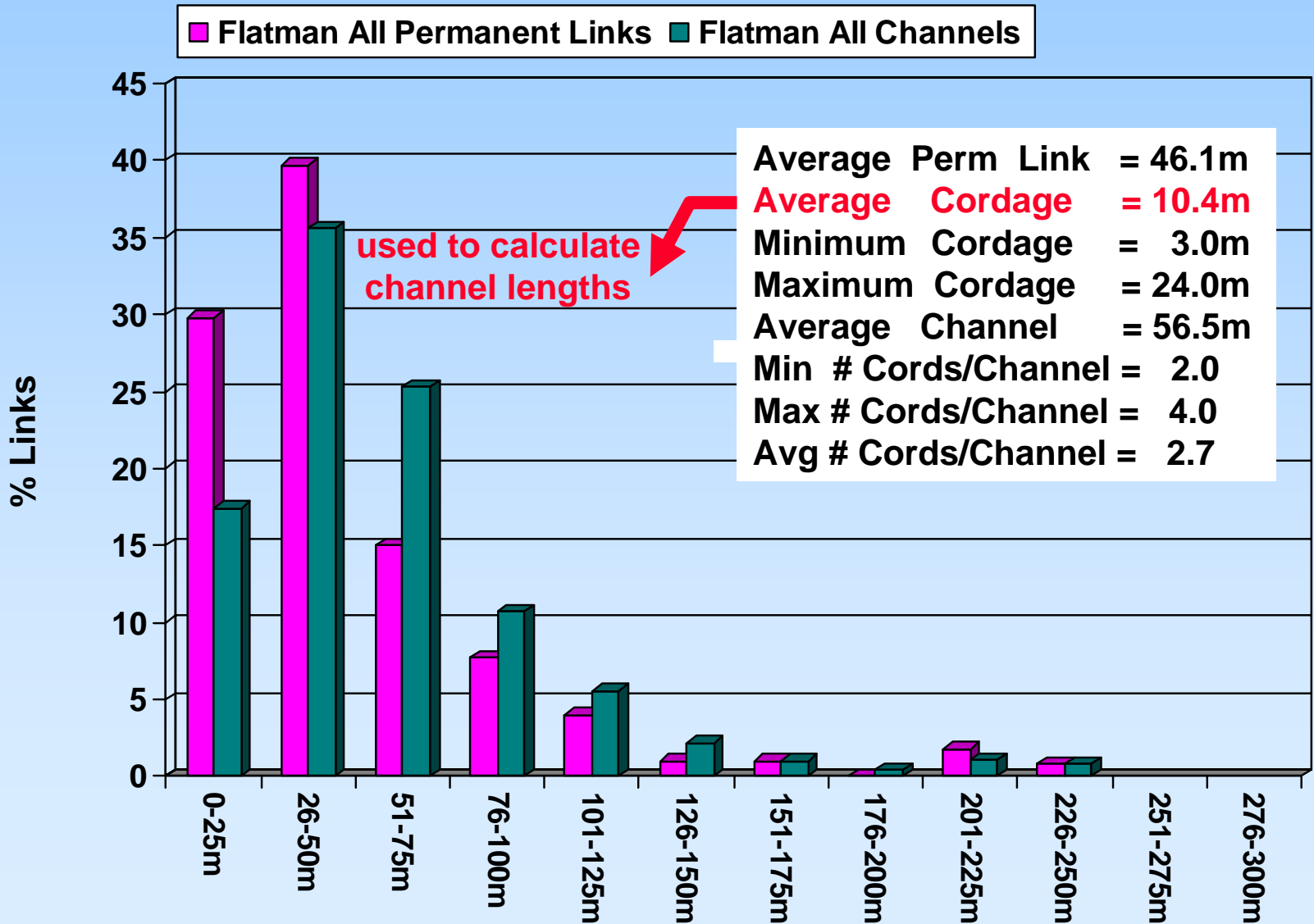
Enterprise Data Centre Cabling Lengths Access-to-Distribution Permanent Links



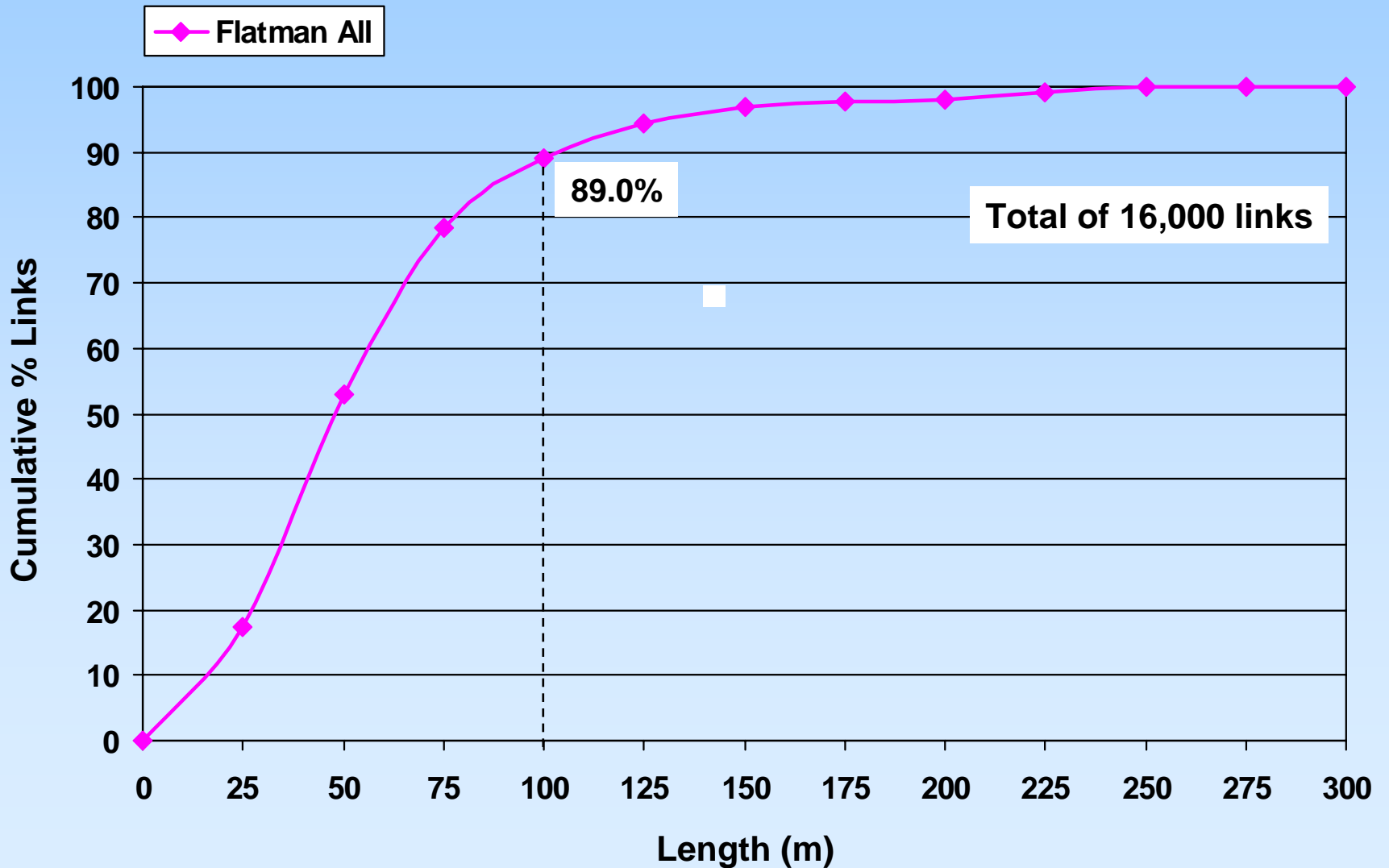
Enterprise Data Centre Cabling Lengths Access-to-Distribution Permanent Links



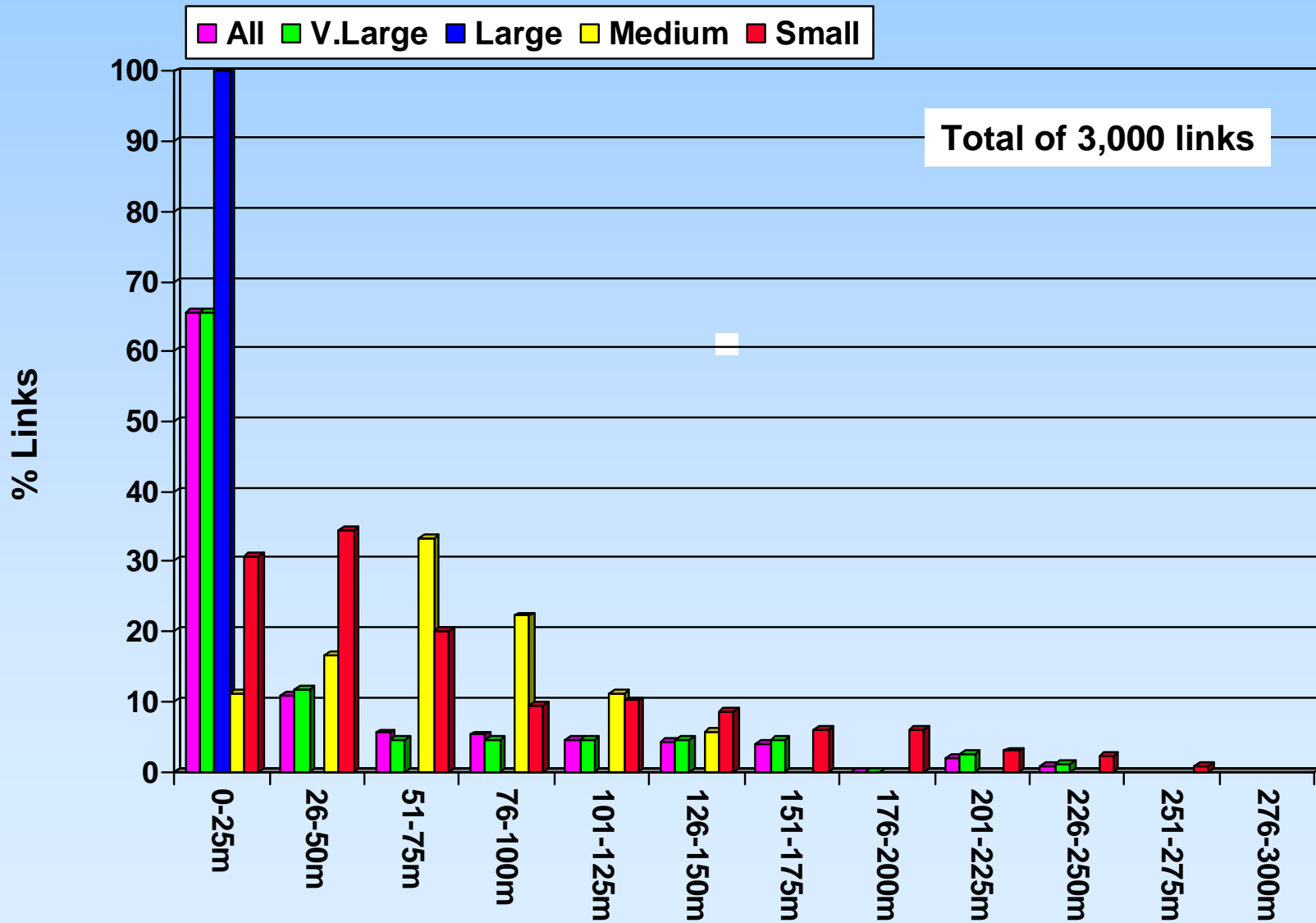
Enterprise Data Centre Cabling Lengths Access-to-Distribution Permanent Links & Channels



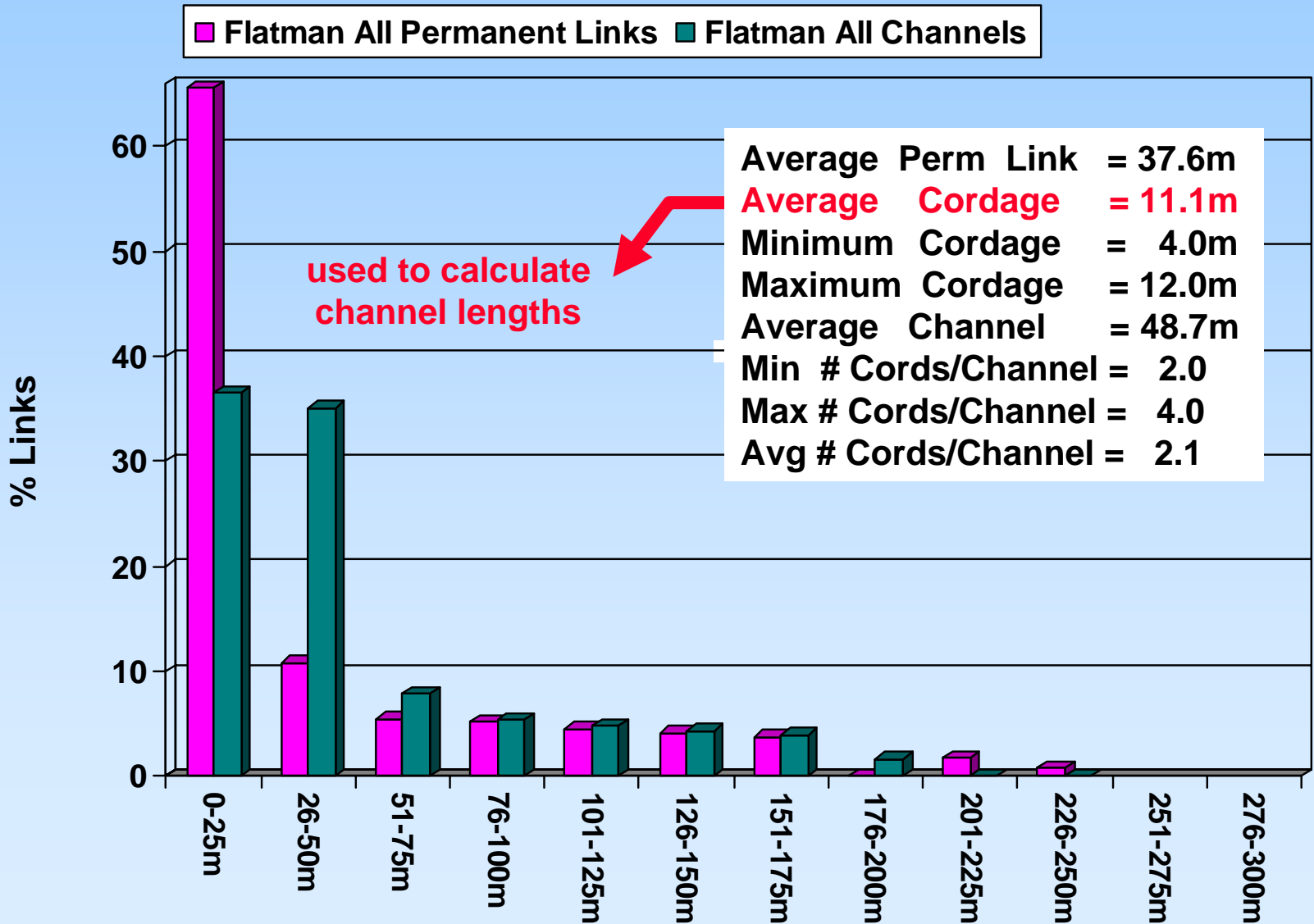
Enterprise Data Centre Cabling Lengths Access-to-Distribution Channels



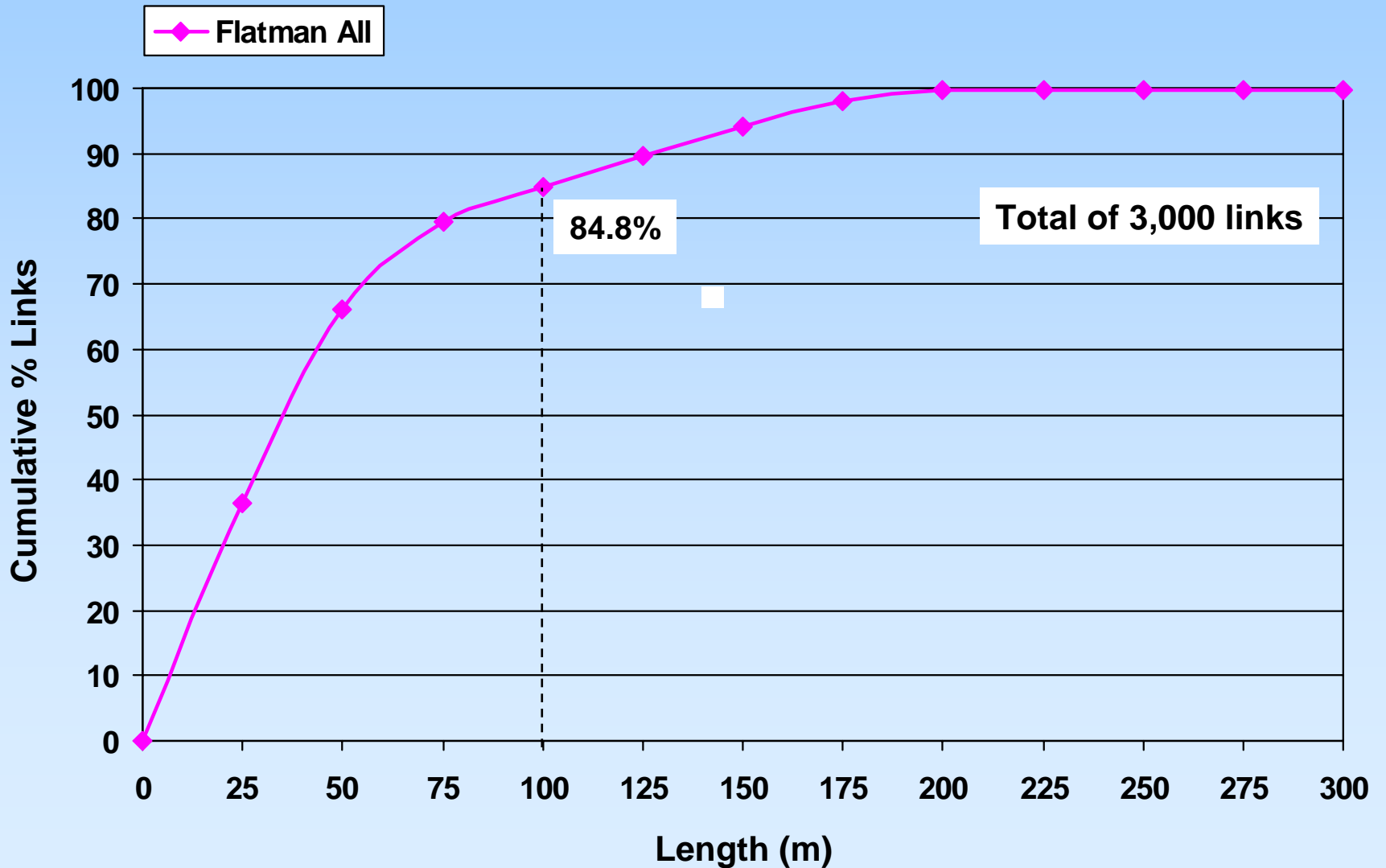
Enterprise Data Centre Cabling Lengths Distribution-to-Core Permanent Links



Enterprise Data Centre Cabling Lengths Distribution-to-Core Permanent Links & Channels



Enterprise Data Centre Cabling Lengths Distribution-to-Core Channels



Data Centre Cabling Market Research

- **detailed data centre cabling analysis by BSRIA**
- **research conducted in the USA during fall 2007**
- **assesses deployment trends 2007, 2008 & 2009**
- **report planned to be published 31 January 2008**
- **see Alan Flatman for prospectus & other details**