
SIEMON™
Connecting The World To A Higher Standard

Agenda

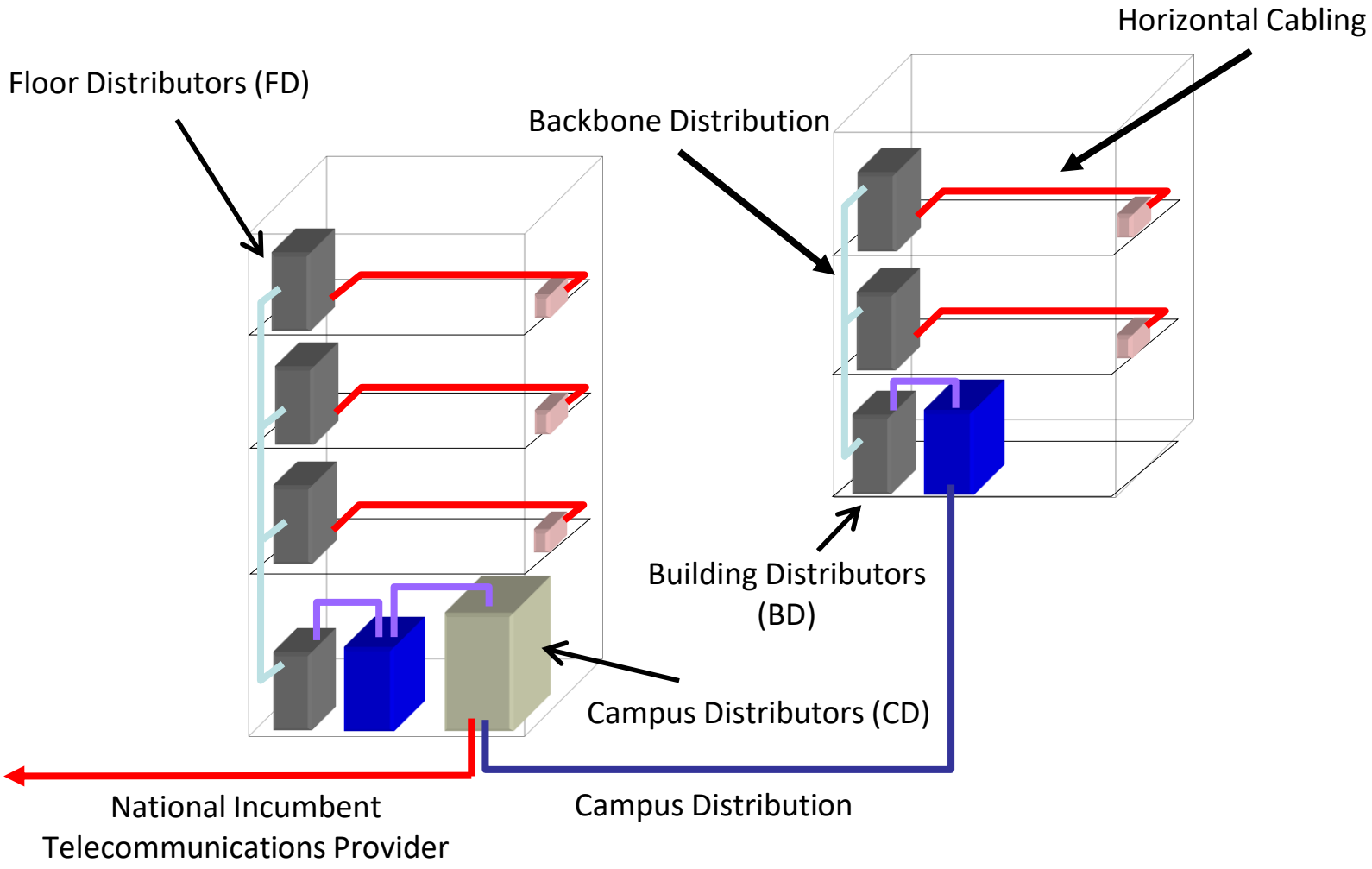
- Cable's Basic
- Data Center Architecture
- Category 8
- Base 8 Plug & Play
- Coverged IT Solutions – King of POE



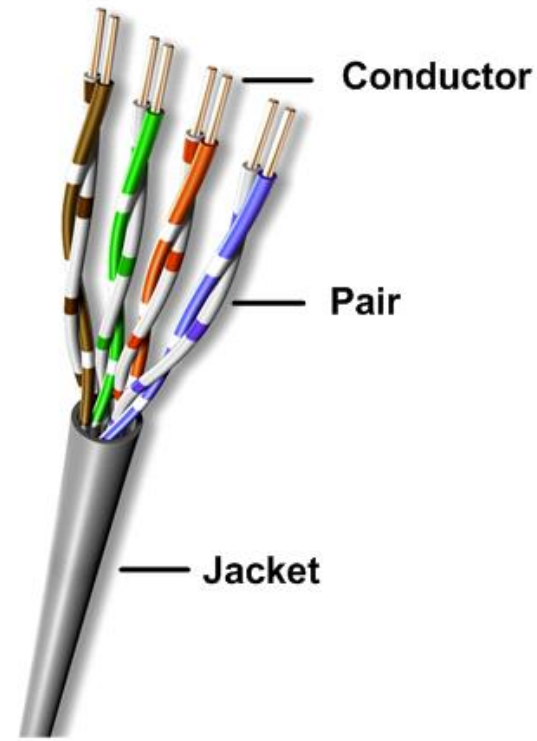
Standards Overview

Generic Cabling System		Commercial
ISO/IEC 11801 Ed. 2.2	ANSI/TIA-568.0-D	ANSI/TIA-568.1-D
CD Campus Distributor	DC Distributor C	MC Main Cross-connect
Campus backbone cabling	Cabling Subsystem 3	Inter-building backbone
BD Building Distributor	DB Distributor B	IC Intermediate Cross-connect
Building backbone cabling	Cabling Subsystem 2	Intra-building backbone
FD Floor Distributor	DA Distributor A	HC Horizontal Cross-connect
Horizontal cabling	Cabling Subsystem 1	Horizontal cabling
CP Consolidation Point (optional)	CP Consolidation Point (optional)	CP Consolidation Point (optional)
TO Telecommunications Outlet or MUTO Multiuser TO	EO Equipment Outlet	TO Telecommunications Outlet or MuTOA Multiuser TO Assembly

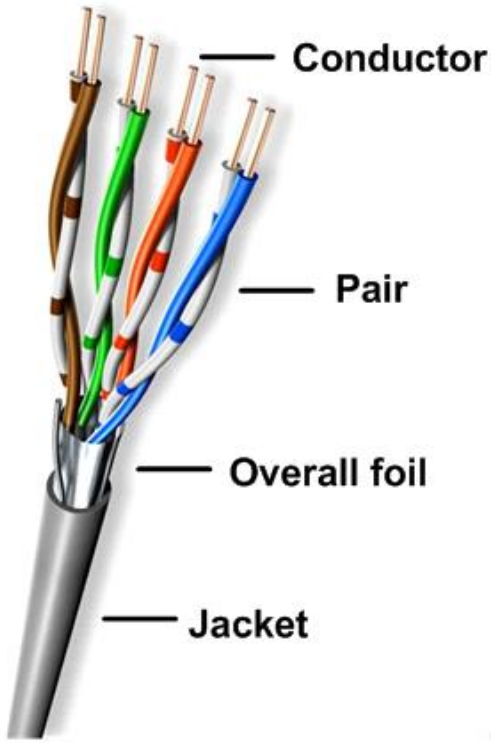
Commercial Building Cabling Architecture



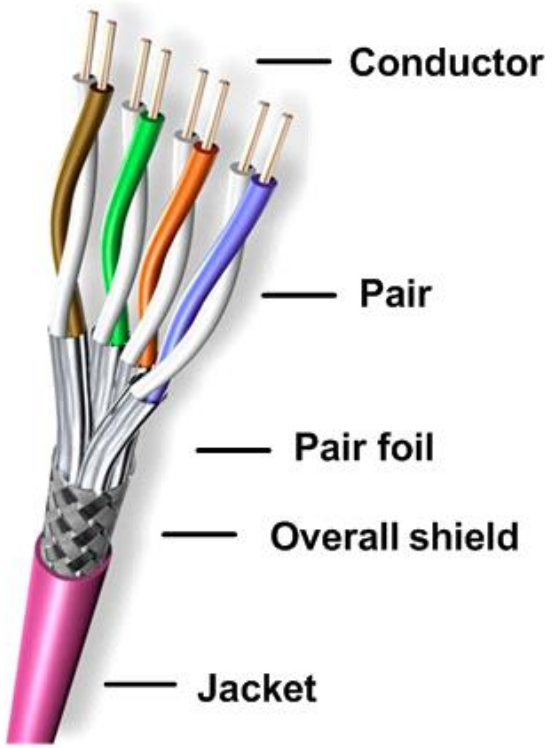
Balanced Twisted Pair Copper



U/UTP (UTP)



F/UTP



S/FTP

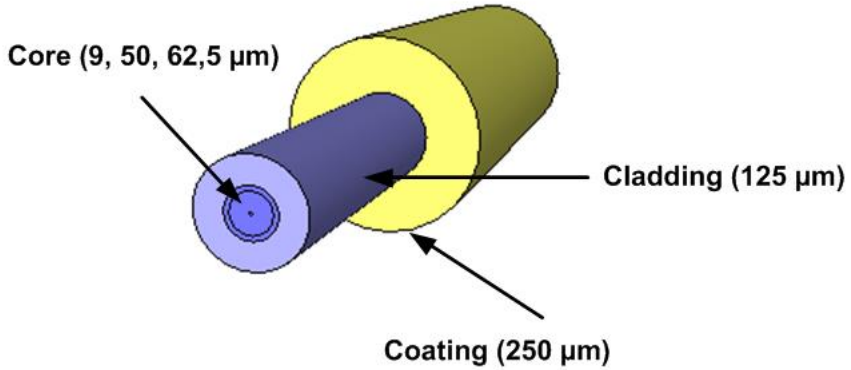
Copper Performance Categories

Channel or Link		Components (cable and connecting hardware)		Bandwidth (Characterization Frequency)	Maximum Recommended Application
ISO/IEC	ANSI/TIA	ISO/IEC	ANSI/TIA		
Class C	Category 3	Category 3	Category 3	16 MHz	10BASE-T
Class D	Category 5e	Category 5	Category 5e	100 MHz	100BASE-TX
Class E	Category 6	Category 6	Category 6	250 MHz	1000BASE-T
Class E_A	Category 6A	Category 6_A	Category 6A	500 MHz	10GBASE-T
Class F	--	Category 7	--	600 MHz	10GBASE-T and cable sharing
Class F_A	--	Category 7_A	--	1000 MHz	Beyond 10GBASE-T, cable sharing and broadband video
Class I*	Category 8	Category 8.1	Category 8	2 GHz	25GBASE-T and 40GBASE-T
Class II*	--	Category 8.2	--	2 GHz	25GBASE-T and 40GBASE-T

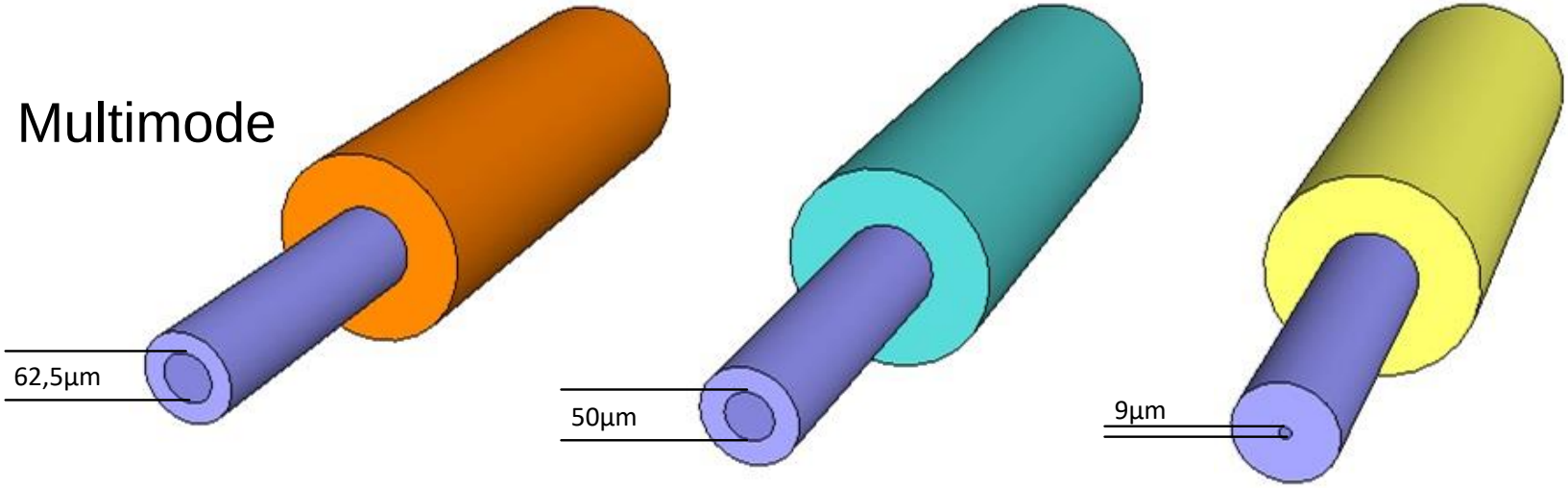
Performance designations are based on International Standard ISO/IEC 11801:2011 Ed. 2.2 and North American Standard ANSI/TIA-568.2-D. (ANSI/TIA-568-C.2-1)

Optical Fiber

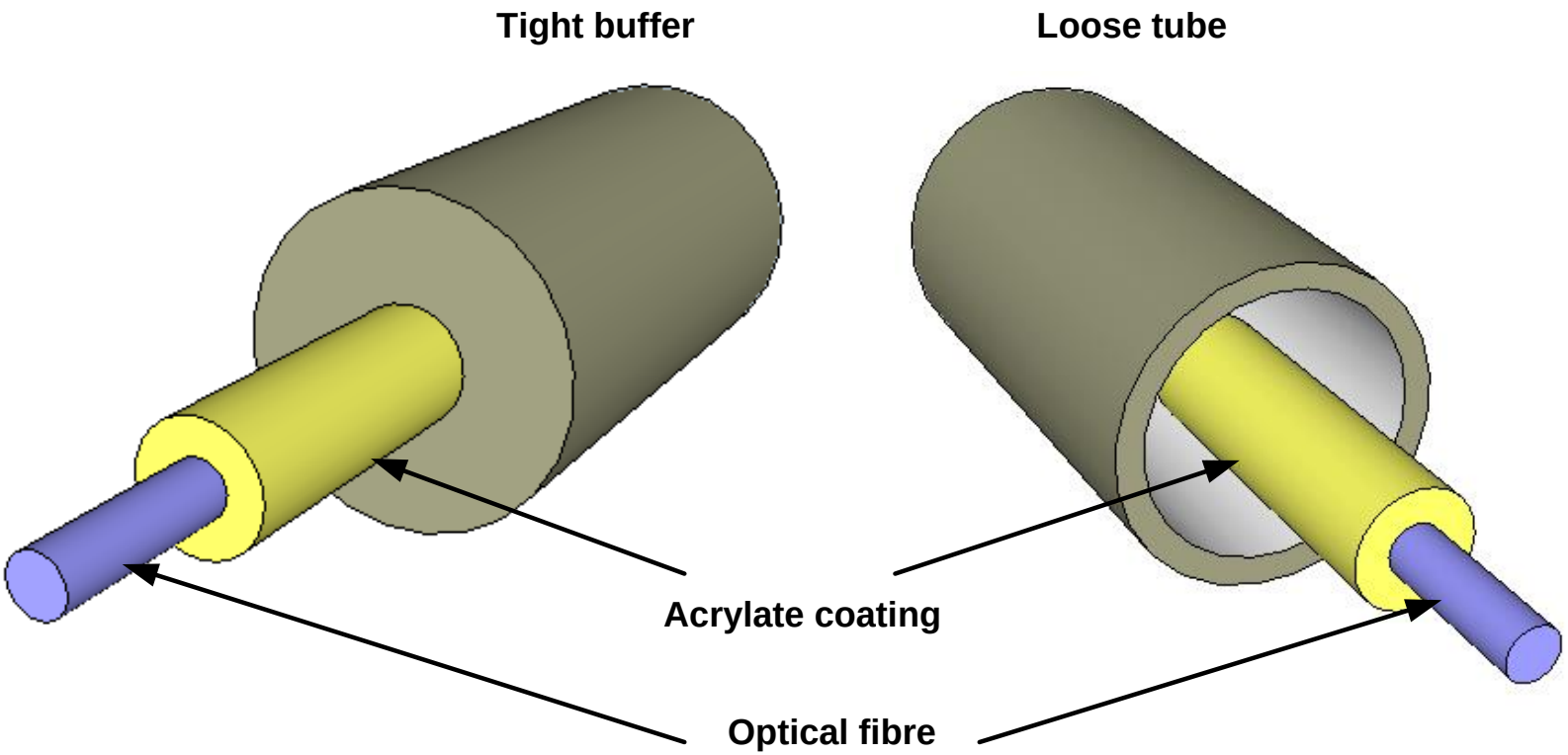
Singlemode



Multimode



Optical Fiber



Optical Fiber Specifications

Optical Fiber Category	Wavelength (nm)	Maximum Attenuation (dB/km)[1]	Minimum Overfilled Modal Bandwidth [OMB] (MHz-km)[1]	Minimum Effective Modal Bandwidth [EMB] (MHz-km)[1]
Multimode OM1 62.5/125 µm	850	3.5	200	Not required
	1300	1.5	500	Not required
Multimode OM2 50/125 µm	850	3.5	500	Not required
	1300	1.5	500	Not required
Multimode OM3 50/125 µm	850	3.5	1500	2000
	1300	1.5	500	Not required
Multimode OM4 50/125 µm	850	3.5	3500	4700
	1300	1.5	500	Not required
Multimode OM5 50/125 µm	850	3.5	3500	4700
	953	2.3	1850	2470
	1300	1.5	500	Not required
Singlemode OS1a	1310	1.0[3]	--	--
	1550	1.0[3]	--	--
Singlemode OS2 (Low Water Peak -LWP)	1310	0.4[3]	--	--
	1383[2]	0.4	--	--
	1550	0.4[3]	--	--

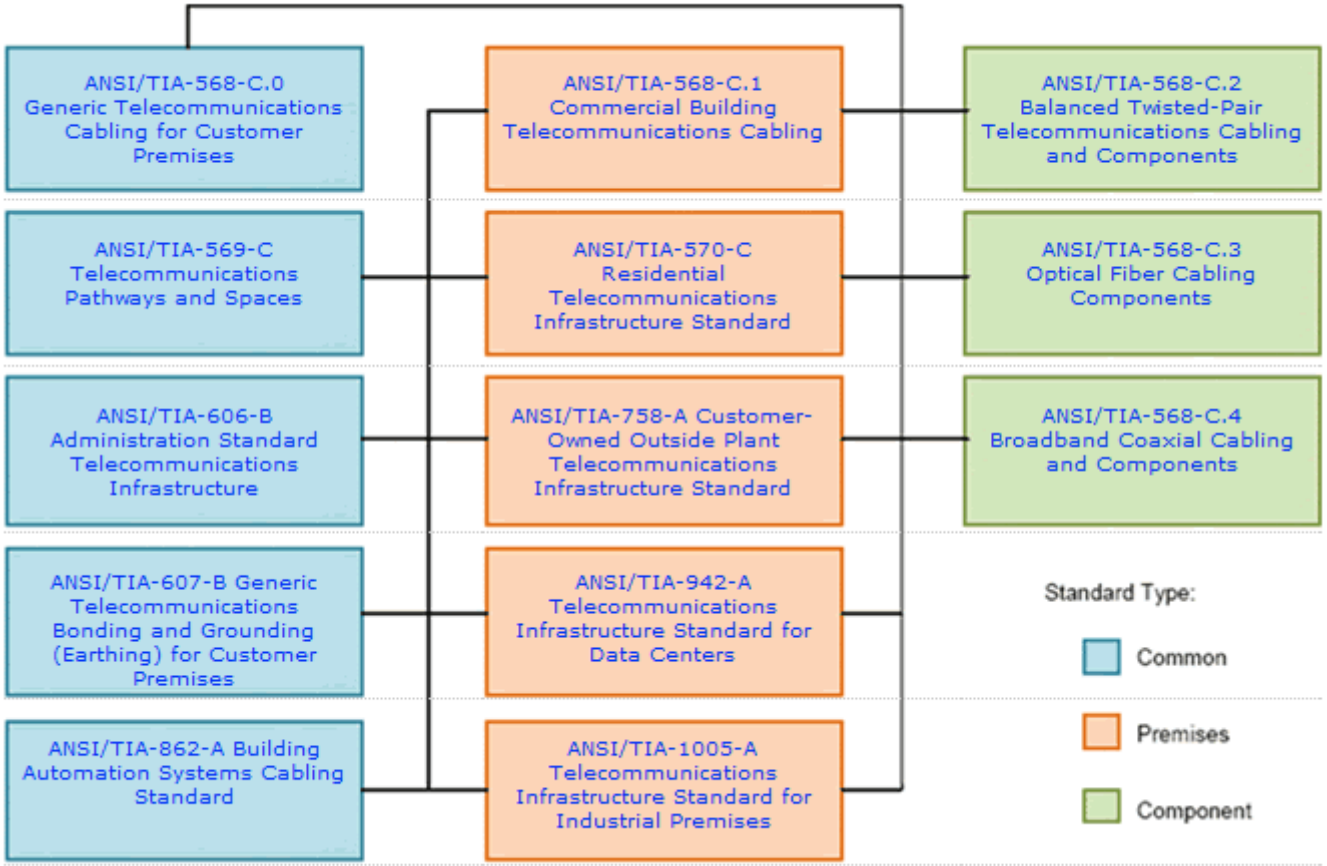
Typical Distances Supported by Optical Fiber

Transmission Standards	OM1	OM2	OM3	OM4	Singlemode
100 Mb	≈550 m (1800 ft)	≈550 m (1800 ft)	≈550 m (1800 ft)	≈550 m (1800 ft)	N/A
1 Gb	≈220 m (722 ft)	≈550 m (1800 ft)	≈550 m (1800 ft)	≈1000 m (3281 ft)	≈10,000 m (32,800 ft)
10 Gb	≈33 m (108 ft)	≈82 m (269 ft)	≈300 m (984 ft)	≈550 m (1800 ft)	≈10,000 m (32,800 ft)
40 Gb	N/A	N/A	≈100 m (328 ft)	≈150 m (500 ft)	≈10,000 m (32,800 ft)
100 Gb	N/A	N/A	≈100 m (328 ft)	≈150 m (500 ft)	≈10,000 m (32,800 ft)

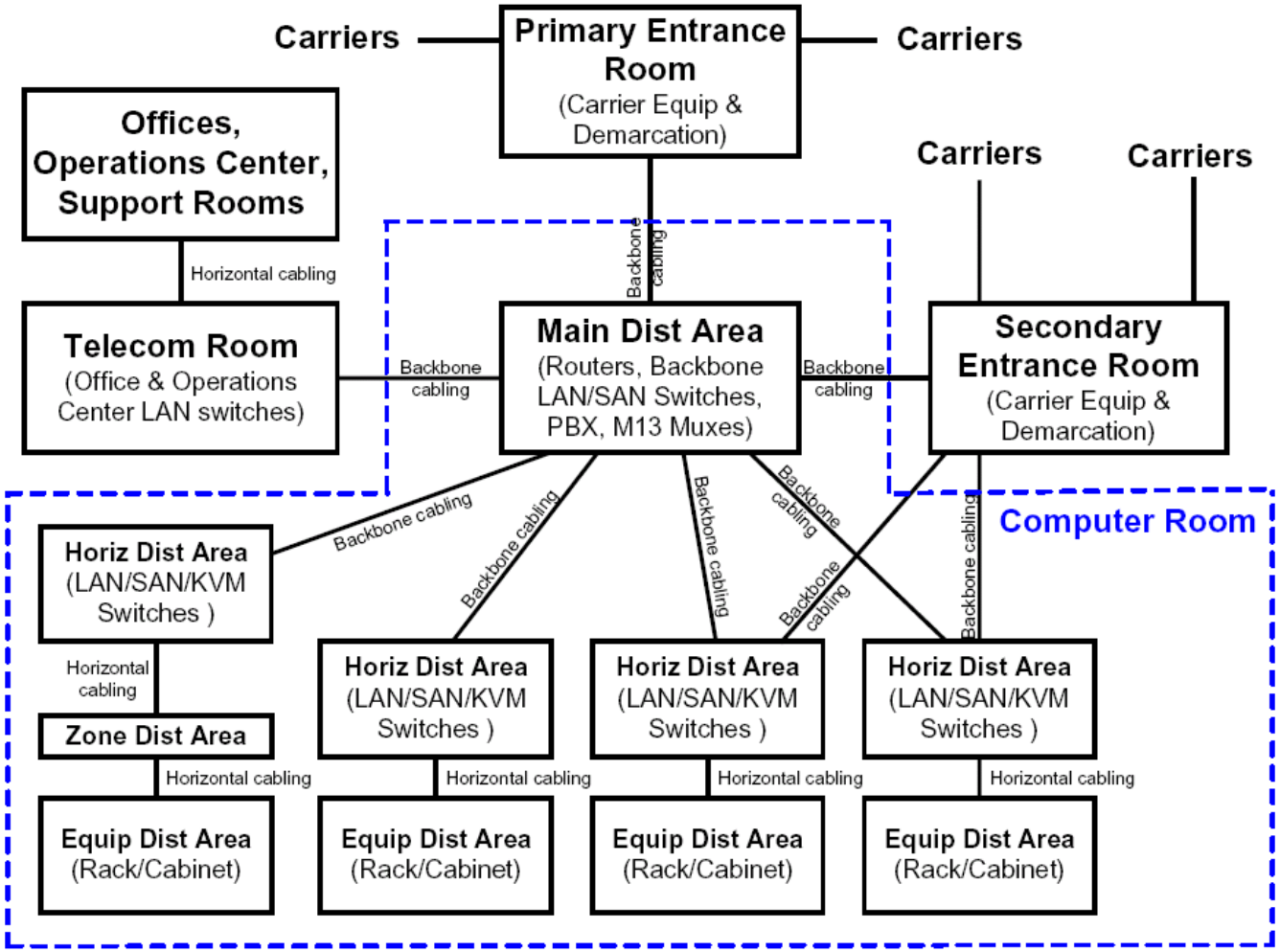
ft = Feet
Gb = Gigabit
m = Meter
Mb = Megabit
N/A = Not applicable
OM = Optical multimode

Standards
TIA 942A Data Center Standard
ISO 24764 Data Center Standard

TIA family of standards



TIA 942 Original Areas

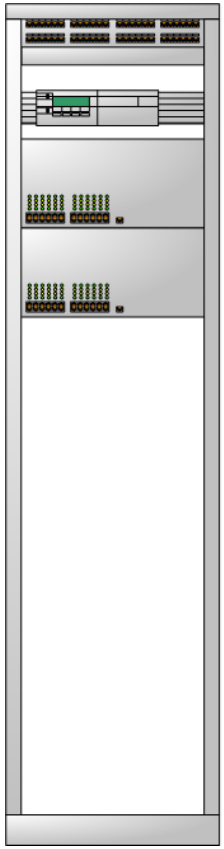


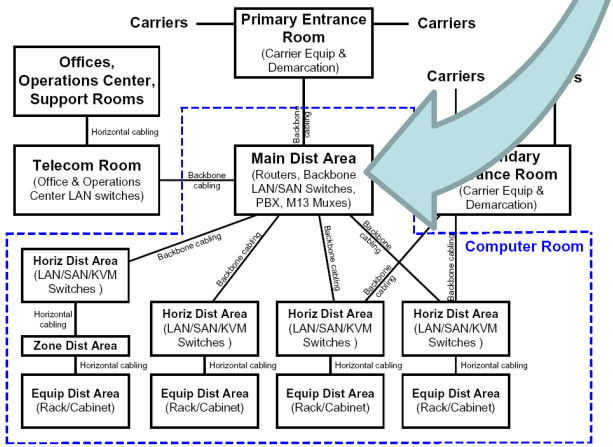
New TLA's

HDA
ZDA
EDA

MDA (Main Distribution Area)

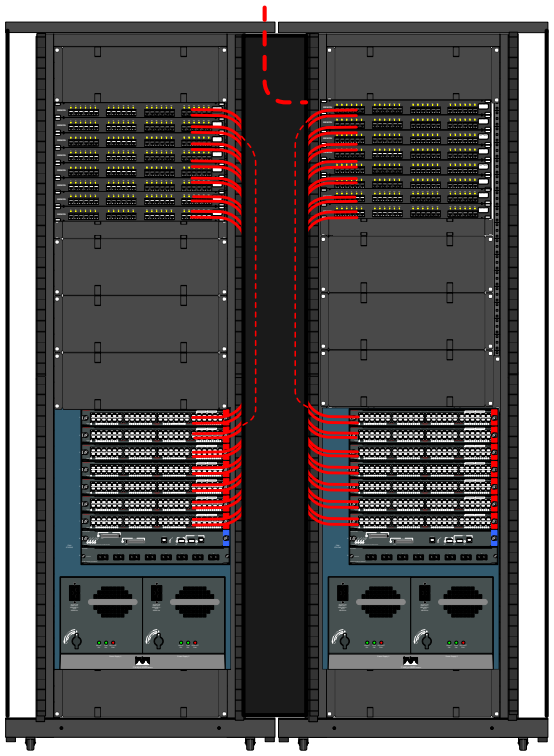
- Core Switches, Routers, PBX, Maybe a Core SAN Switch, NAS possible
  - Generally feeds multiple HDA
  - Connects to Telco and Provider equipment for WAN and Internet Access



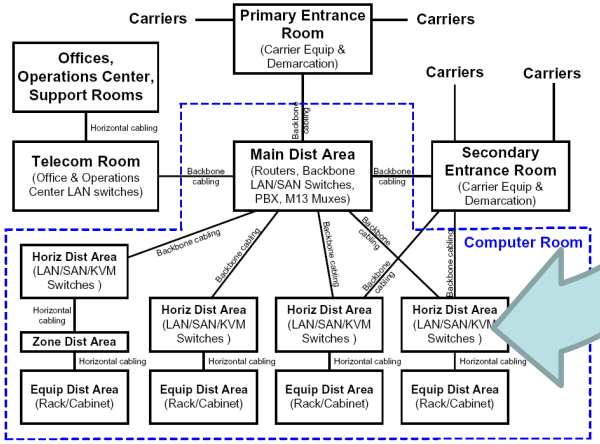


HDA or in ISO called the ZD

- HDA (Horizontal Distribution Area) called ZD(Zone Distributer Area in ISO)
- May be in row with servers, but not necessarily so, some are in their own areas
- Typically multiples
- Contain KVM, LAN Switches, SAN Switches
- Connects to Servers, Rule is One per floor, or in shared tenant environment must be locked)
- Dense
- Mirrored

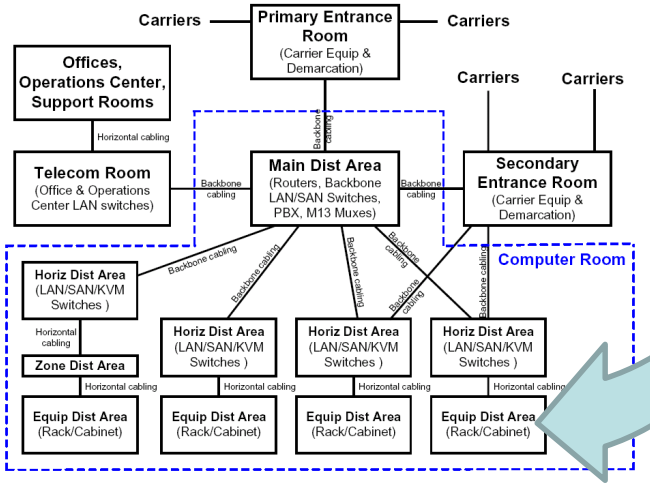


NETWORK ROW



Equipment Distribution Areas (Equipment Outlet in ISO) now EO in TIA also (change in 942A)

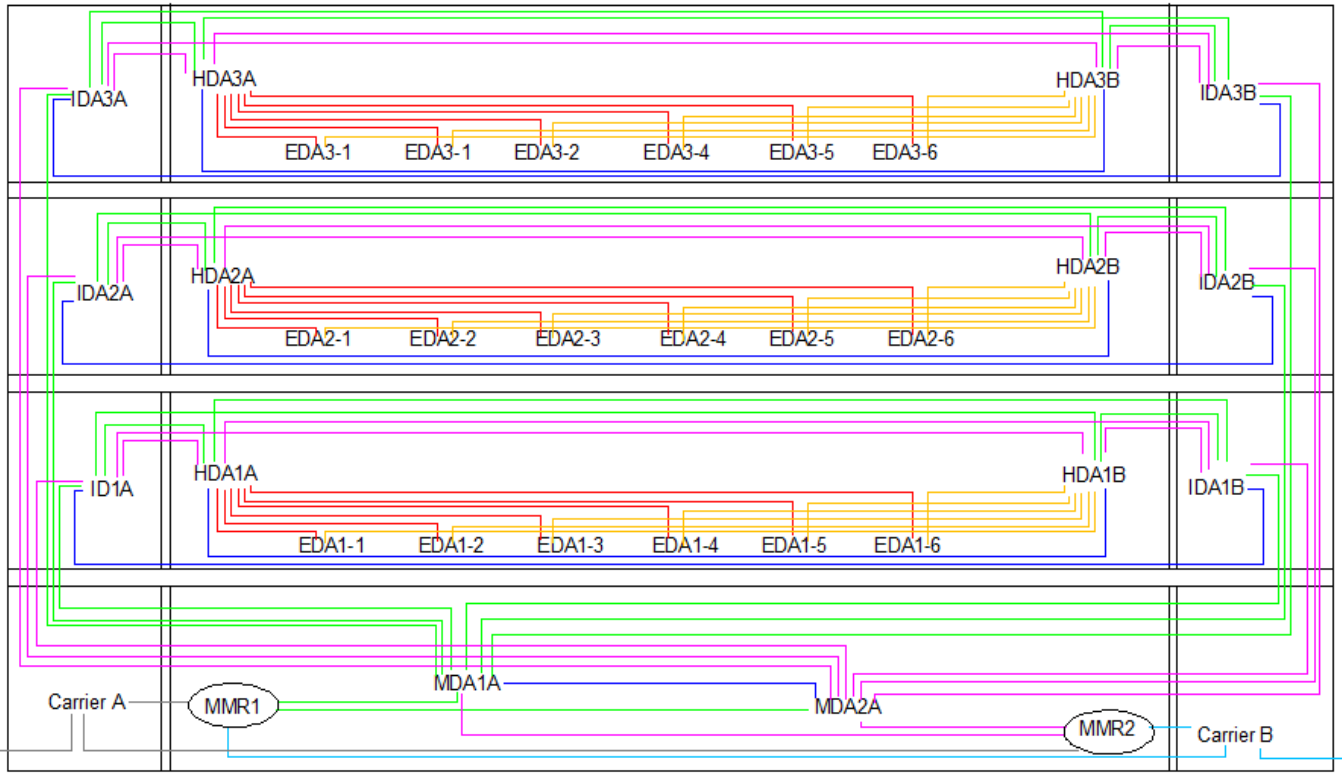
- Server Cabinets Typically
- Servers generally have several connections
  - Primary Network
  - Secondary Network
  - Primary SAN or NAS
  - Secondary SAN or NAS
  - KVM
  - In-band and/or Out of band management



Required Areas

- MDA- Each data center must have at least one
- HDA – Must be one per floor in multi-floor
  - Smaller DC's may combine MDA/HDA
- EDA – In equipment cabinets or ZDA

Tier IV Diverse Pathways



CARRIER SERVICES

- CARRIER A
- CARRIER B

BACKBONE

- PRIMARY FIBRE
- SECONDARY FIBRE
- BYPASS

HORIZONTAL COPPER/FIBRE DISTRIBUTION

- COPPER/FIBRE PRIMARY
- COPPER/FIBRE SECONDARY

PRIMARY AND SECONDARY OCCUPY SEPARATE DISPARATE PATHWAYS

MEET ME ROOM 1 AND 2 MAY INCLUDE CARRIER DEMARCATIONS IF SECURE

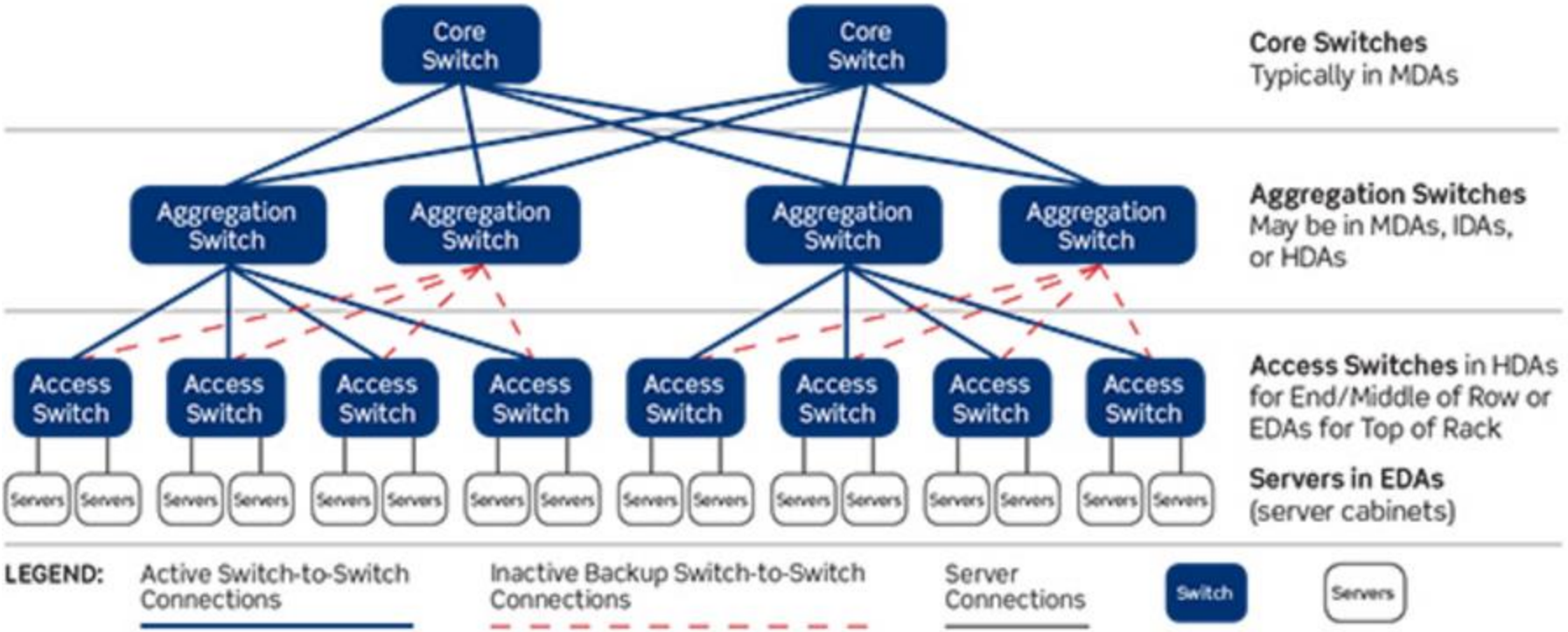
IDA (INTERMEDIATE DISTRIBUTION AREAS) MAY CONTAIN CORE SWITCH COMPONENTS OR ACTIVE COMPONENTS

HDA MAY CONTAIN LAN/SAN SWITCHES THAT FEED VARIOUS EDA (EQUIPMENT DISTRIBUTION AREA) CABINETS

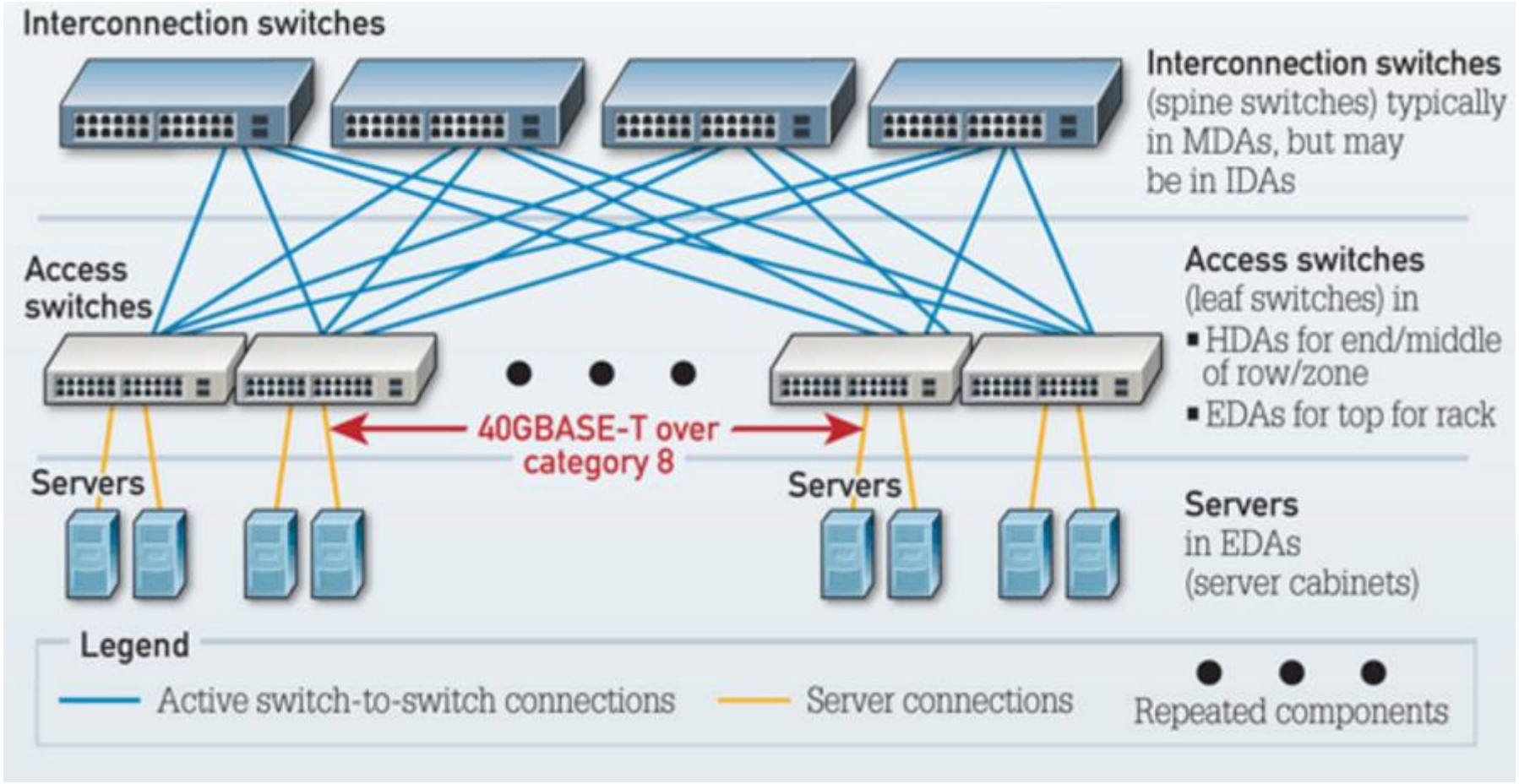
BYPASS FIBRES CAN BYPASS ANY RISER FAILURE OR PROVIDE SUPPLEMENTAL CONNECTIVITY TO DIVERSE CARRIERS

EDA'S ARE INDICATIVE ONLY, NUMBER OF CABINETS WILL CHANGE UPON FINAL DESIGN

Hierarchical Architecture



Fat-Tree/Leaf-Spine Architecture



Advantage of Leaf-Spine

- Because each leaf is connected to every spine, there are multiple redundant paths available for traffic between any pair of leafs. Link failures cause other paths in the network to be used.
- Because of the existence of multiple paths, Equal-Cost Multipathing (ECMP) can be leveraged for flows traversing between pairs of leafs. With ECMP, each leaf has equal-cost routes to reach destinations in other leafs, equal to the number of spines in the network.
- The leaf-spine topology provides a basis for a scale-out architecture. New leafs can be added to the network without affecting the provisioned east-west capacity for the existing infrastructure.
- New spines and new uplink ports on the leafs can be provisioned to increase the capacity of the leaf-spine fabric.
- The role of each tier in the network is well defined (as discussed previously), providing modularity in the networking functions and reducing architectural and deployment complexities.
- The leaf-spine topology provides granular control over subscription ratios for traffic flowing within a rack, between racks, and outside the leaf-spine topology

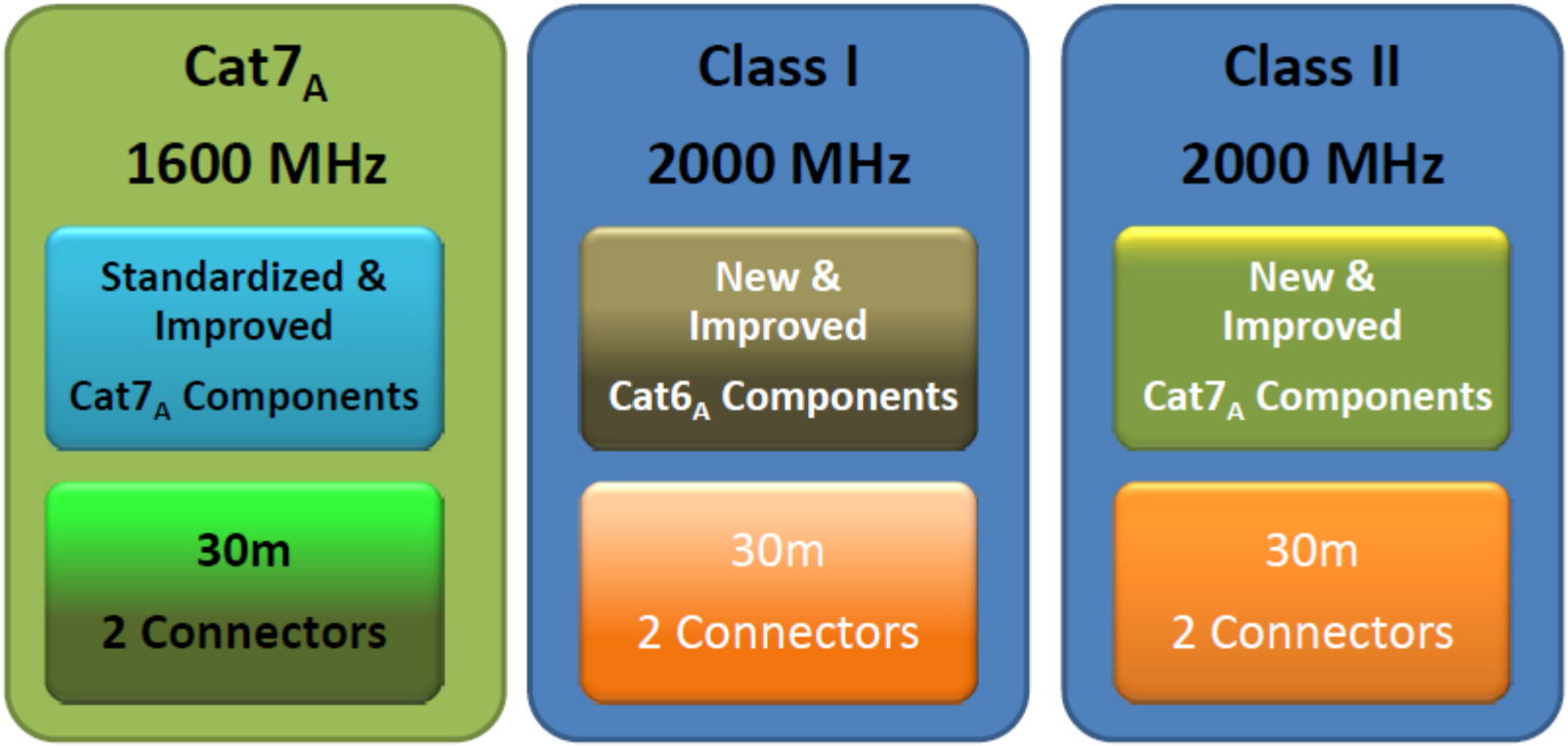
Category 8

TIA Category 8

- 1 MHz to 2000 MHz
- Support for 40GBASE-T (IEEE P802.3bq)
- 30m Channel Length, 24m Permanent Link Length
  - *Approx. 55% of Channels <30m*
- Improved $Cat6_A$ components
  - RJ45 Plug / Jack (Cat 8.1), legacy continues…
  - F/UTP or S/FTP Cable
  - 2 connector configuration
- Extension of $Cat6_A$ Limits to 2000MHz.
- Additional higher performance grade based on enhanced CAT7A components (Cat 8.2)



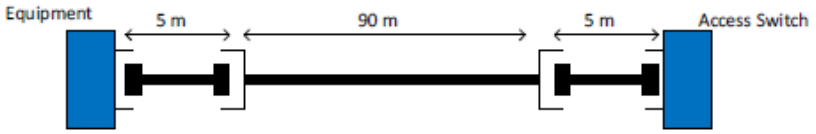
ISO Cabling for IEEE 802.3 40GBASE-T



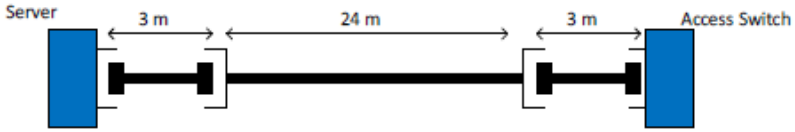
40G Base-T Channels

- Horizontal cabling for EoR applications for CAT6A designed for 100m Channel lengths
- 40GBaseT Channels designed to support 30m only, reducing cooling requirement in DCs
- 30m Channels capable of supporting EoR, MoR and ToR configurations
- Direct Attach configuration of 7m targeted to replace DAC or AOC for intra and inter rack connectivity

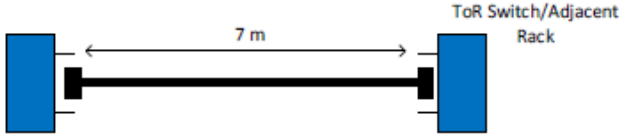
CAT 6_A, Class E_A Channel



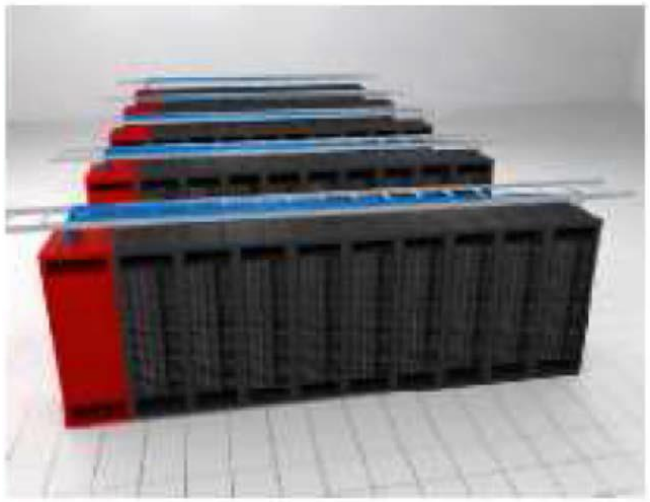
40GBASE-T/ CAT 8 Channel

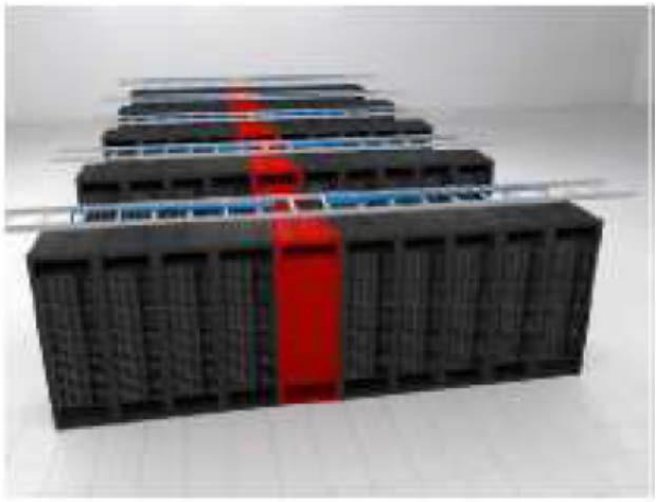


Direct Attach Channel



40G Base-T Deployment scenarios





Traditional EoR or MoR Configurations


Base 8
HD FCP3
Plug and Play
Fiber System

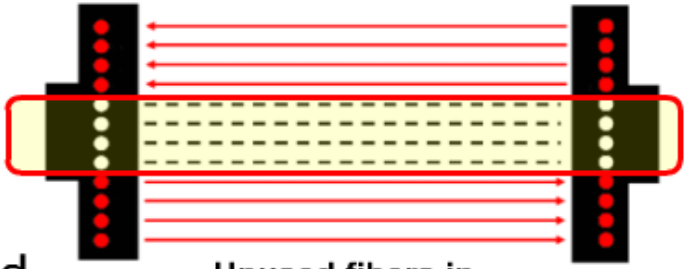
From 12 to 8 Fibers



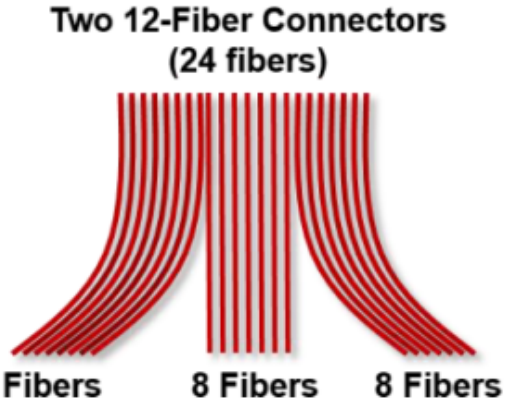
- 12-fiber MPO/MTP connectivity was born in the mid-1990s
  - Helped sparked the growth of fiber infrastructure
  - Divisible by 2 to easily support duplex applications
- But newer SR4-based protocols and QSFP+/QSFP28 applications are based on 8 fibers – **not 12!**
  - 40GBASE-SR4 (4 fibers transmitting and 4 receiving at 10 Gb/s)
  - 100GBASE-SR4 (4 fibers transmitting and 4 receiving at 25 Gb/s)
- Parallel singlemode and multimode 200 and 400 Gig speeds in development are also slated for operation over 8 fibers.
- In fact, all channels for current and future fiber standards from 10 Gig to 400 Gig are divisible by either 2 or 8 fibers – **not 12!**

The Problem with 12

- Using 12-fiber connectivity for 8-fiber applications leaves 33% of the fiber unused
- Achieving 100% fiber utilization with 12-fiber connectivity requires the use of conversion cords or conversion modules
  - Two 12-fiber MPO/MTPs to three 8-fiber MPO/MTP connectors
- Conversion cords/modules add cost, complexity and loss
  - Conversion modules add more material and introduce even greater loss due to extra mated pair



Unused fibers in
40GBASE-SR4 and100GBASE SR4





Conversion Cord
(Siemon)



Conversion Module
(Corning)

Base 8 MTP to MTP Trunks

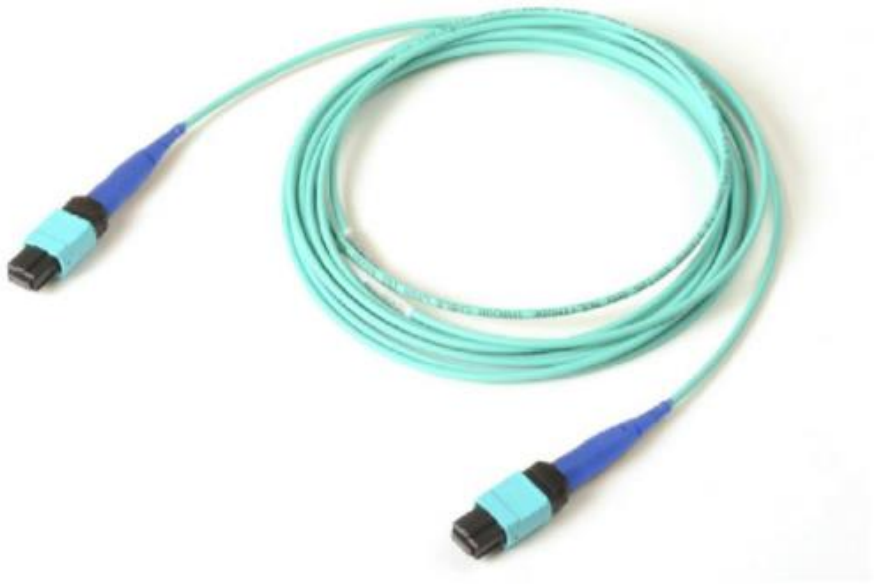
- Similar to our current FR series 12-fiber MTP trunks
- Available in **8**, **16**, 24, **32**, 48, 72, 96, 144 fiber counts using 8-fiber MTP connectors
  - 8, 16 and 32 are new fiber counts divisible by 8
- OM3 and OM4 multimode and OS1/OS2 singlemode
- Standard and low loss
  - Low loss for OM3/OM4 only
- Riser, plenum, and LSOH
- Polarity A, B and C
- Can be used with ***ANY*** MPO/MTP pass-through adapter for 40/100 Gig



SIEMON

Base 8 MTP Jumpers

- Connects 8-fiber MTP backbone to equipment
- RazorCore™ fiber offers 2.0mm smaller diameter
  - Improved cable management and reduced congestion
- Male or female connectors
  - All active equipment is male
- OM3 and OM4 multimode and OS1/OS2 singlemode
- Standard and low loss
  - Low loss for OM3/OM4 only



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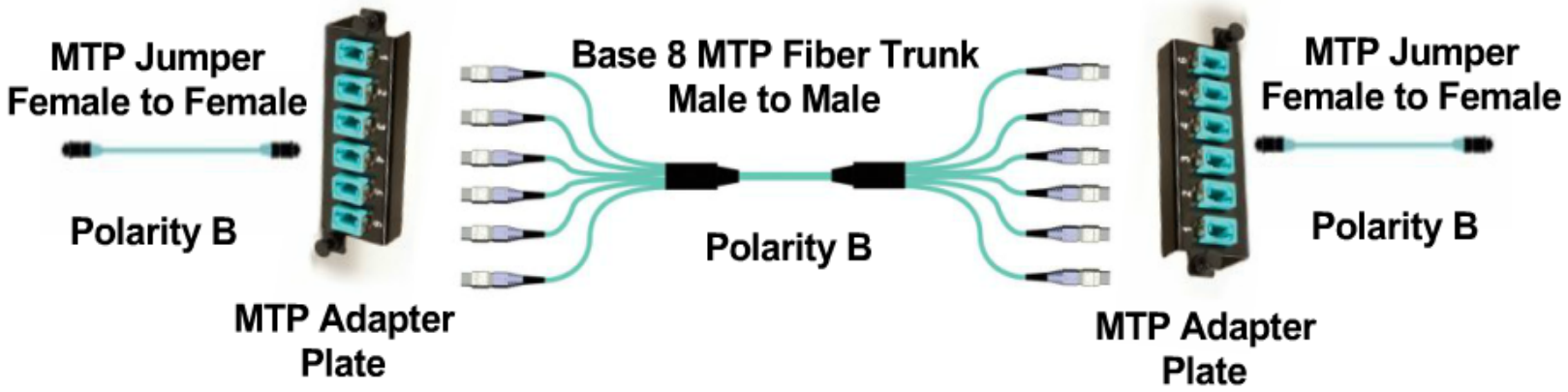
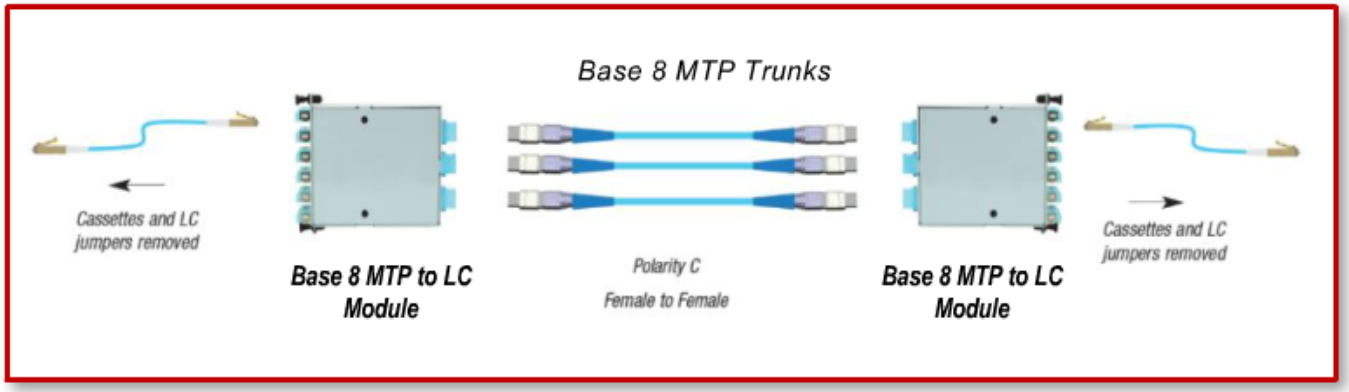
Day One 40/100GBASE-SR4 Deployment

- The MTP interface on all 40/100 Gig active equipment is male.
- Using male to male backbone trunks with female to female MTP jumpers offers simplified jumper configurations and polarity
- 8-fiber MTP trunks and jumpers can be used with ANY Siemon MTP pass-through adapter plate for 40/100 Gig, including LightStack® and RIC MTP adapter plates



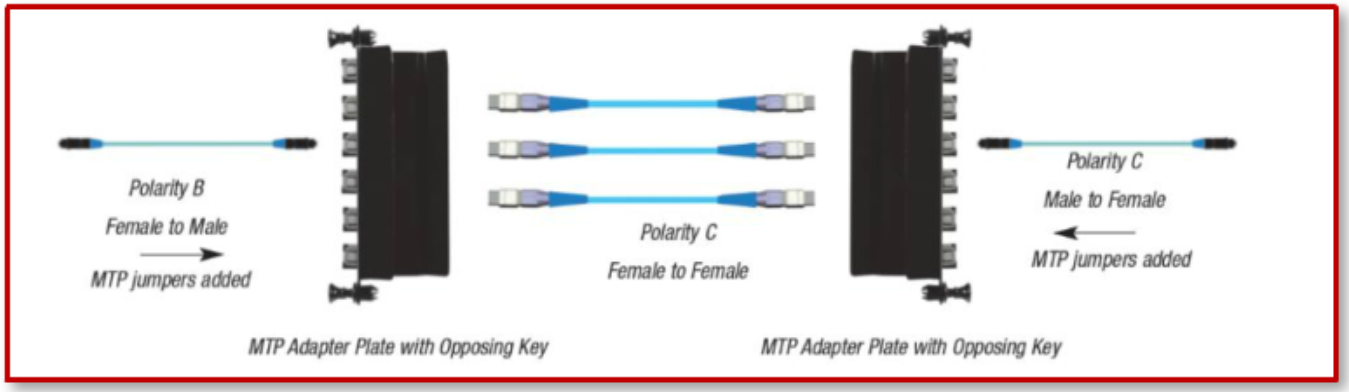
Migration from 10Gig in Its Simplest Form!

From 10 Gig (10GBASE-SR) to…



1. Swap Base 8 modules for MTP adapter plates
2. Remove LC Jumpers
3. Add Base 8 MTP Jumpers (Polarity B & C)

40GBASE-SR4 or 100GBASE-SR4



Note: 8-fiber MTP trunks and jumpers can be used with ANY Siemon MTP pass-through adapter plate for 40/100 Gig, including LightStack® and RIC MTP adapter plates

SIEMON™

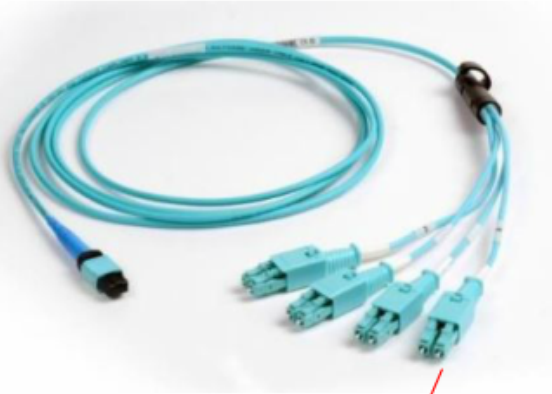
Base 8 MTP to LC Hybrid Equipment Cords

- Transition from 8-fiber MTP backbone to duplex LC or to LC BladePatch® connectors
  - Replaces the MTP to LC module for 10 Gig applications
  - Used with MTP adapter plates for direct MTP to LC patching (10 Gig)
  - Can be used with HD FCP3, LightStack® or RIC MTP adapter plates
- Available in **8**, **16**, 24, **32,** 48, 72, 96, 144 fiber counts
  - 8, 16 and 32 are new fiber counts divisible by 8
- OM3 and OM4 multimode and OS1/OS2 singlemode
- Standard and low loss
  - Low loss for OM3/OM4 only
- Riser, plenum, and LSOH
- Male or female MTP connector

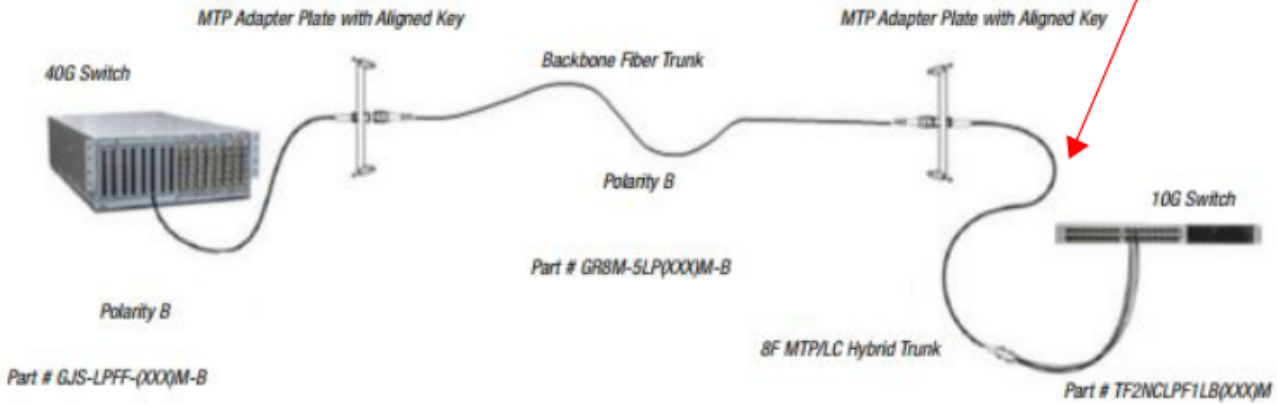


Base 8 MTP to LC BladePatch® 4X10 Equipment Cords

- Transition from 8-fiber MTP backbone to duplex LC BladePatch
- Used with MTP adapter plates for 40 Gig (4X10) applications
  - Can be used with HD FCP3, LightStack or RIC MTP adapter plates
- Over half of 40 Gig transceiver ports are using 4X10 Gig breakout configurations for blade density, power and cost savings
- Ideal for easy access in tight-fitting, high density areas.
- OM3 and OM4 multimode and OS1/OS2 singlemode
- Standard and low loss
  - Low loss for OM3/OM4 only
- Riser, plenum, and LSOH
- Male or female MTP connector



4X10G Application



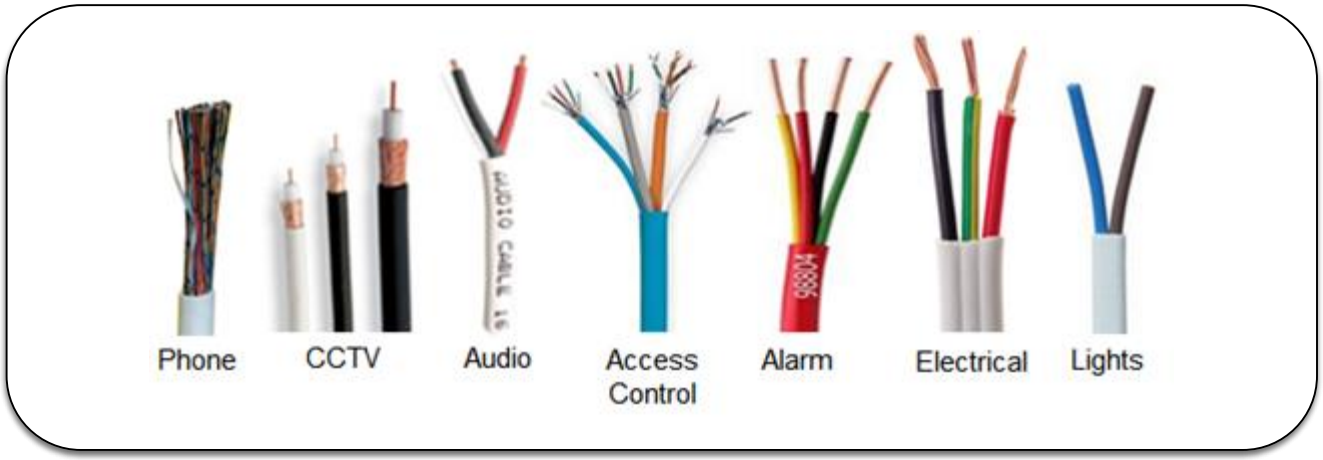
Siemon ConvergeIT Intelligent Building Infrastructure Solutions

Current State – Systems are Siloed

- Most departments and organizations work autonomously and have multiple or individual networks, software, servers and support
- Each solution requiring dedicated power, infrastructure, operation, support, and maintenance
- Buying multiple networks in the same building to perform the same basic functions (wasted dollars for redundant servers, switches, cable and conduit)
- Dozens of different IT standards is difficult for reliability, security and repair
- Siloes inhibit or prevent interoperability
- Drives up the expense or prevents getting data from each system easily
- Systems operate until obsolete

Traditional intelligent building platforms

- Traditional building communication use a vast array of different protocols and cabling systems



- One infrastructure using a zoned cabling topology, means CAPEX savings

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Today's and future intelligent buildings

- Today's building communication systems are moving towards IP Convergence



- One infrastructure using a zoned cabling topology, means substantial CAPEX savings

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Intelligent buildings –



- All IP applications will run over one low voltage RJ-45 platform
- Power and control over the same data infrastructure
- Utilising flexible zone cabling design
- Siemon and our partners working together to design and deliver these integrated intelligent networks
- CAPEX and OPEX savings for the customer

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Attributes of connected and converged

- Reduce installation, infrastructure, training, and operational costs
- Change, Update, Add, and Refresh Subsystems without changing the Platform
- Offer unique services to all departments, engineering, HR, hospitality vendors and guests
- Collect and analyze facility and usage data through IP enabled sensors
- Leverage your wireless and cabled infrastructure to enable analytics based services
- Realize measurable return on investment

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Power over Ethernet trends

- Over 100 million Power over Ethernet *(PoE)* enabled ports are shipping annually
- Cisco® 60w Universal PoE *(UPOE)* technology is driving the adoption of virtual desktop infrastructure *(VDI)*
- Power over HDBaseT *(POH)* technology can deliver up to 100w over twisted-pair cable, supporting full HD digital video, audio, 100BASE-T and control signals in television and display applications
- The IEEE 802.3bt DTE Power via MDI over 4-Pair Task Force is developing a new remote powering application that will provide superior energy efficiency compared to a two-pair application which will significantly expand the market for PoE systems

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Cost Savings with PoE

- The cost of a power outlet includes conduit, wire, a back box for the outlet and the labor of an electrician
- PoE Example: Purdue University installed over 1,100 PoE wireless access points and saved up to $1,000 per location
- An average cost to provide typical power to a device is about $1,000, the whole cost of a PoE network port plus the structure cable drop is $250 per drop

PoE
Power over Ethernet

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Utilize PoE Wherever Possible





- Part of the DC Micro Grid
- No Vampire power loss







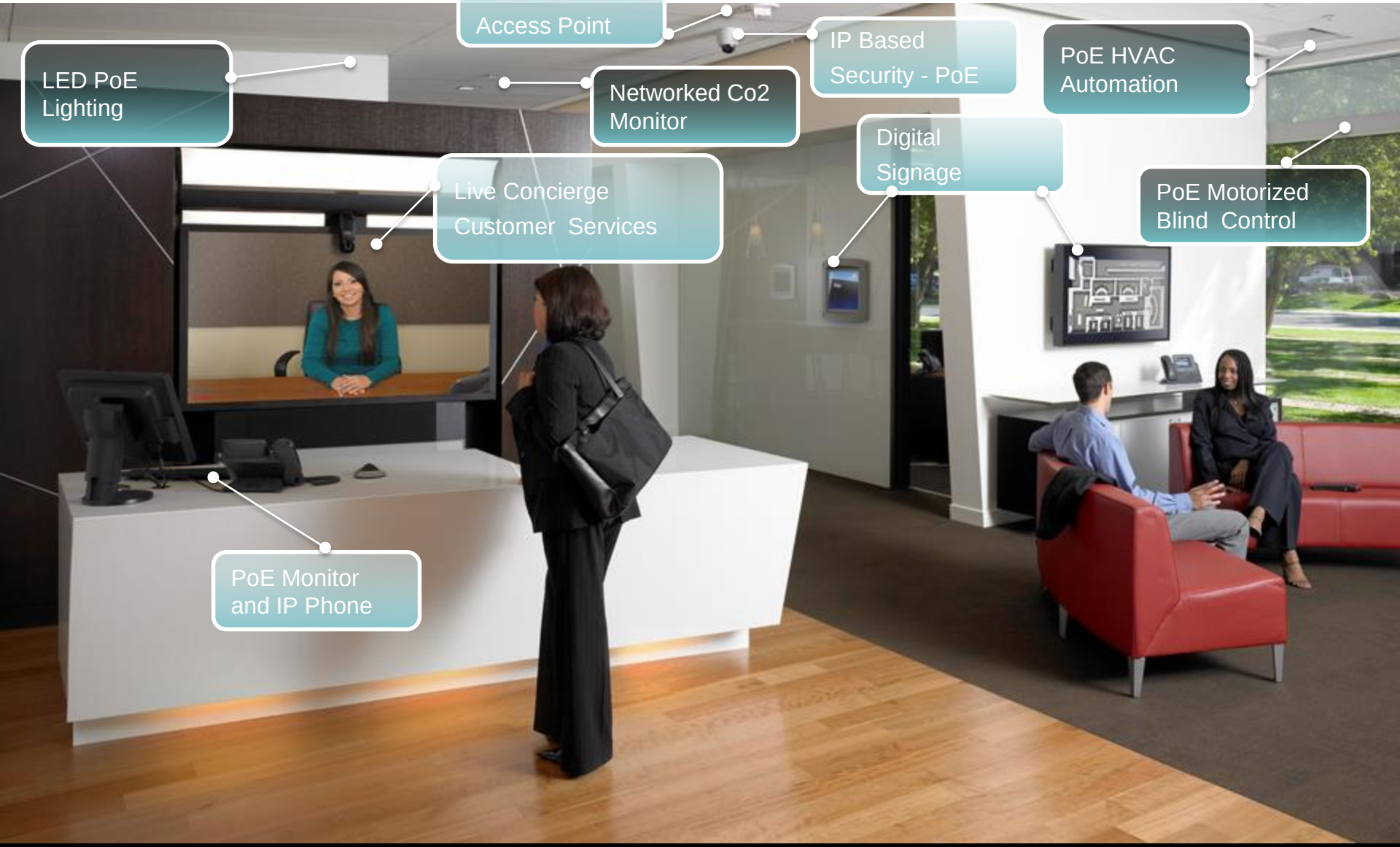






Integration Drives Workplace Experience

Integration Drives Workplace Experience



PoE Applications

- Access Control
- Computer Systems
- Building Automation Systems
- CCTV
- HVAC
- WLAN
- Smart Signs/Web Signs
- Vending Machines
- Gaming Machines
- Audio And Video Juke Boxes
- Electronic Point Of Sale (EPOS) Information Systems
- Time And Attendance Systems
- Battery Chargers For Mobile Phones And PDAs
- Electronic Musical Instruments







Increased Reliability with PoE

- PoE centralizes power distribution
- Centralized power makes it easier to provide uninterruptible and emergency power
- Increases system reliability and uptime



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Easier Moves, Adds, and Changes with PoE

- Easier building renovations and rearranging of spaces since devices only need one cable
- Easier to install devices on walls or ceilings, and to setup temporary installations



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Potential for arcing under load conditions

- Plug and jack contacts are carefully engineered and plated to ensure a reliable, low resistance mating surface
- Remote powering applications offer some protection to these critical connection points by ensuring that dc power is not applied over the structured cabling plant until a PD is sensed by the PSE
- “Unmating under load” produces an arc as the applied current transitions from flowing through conductive metal to air before becoming an open circuit



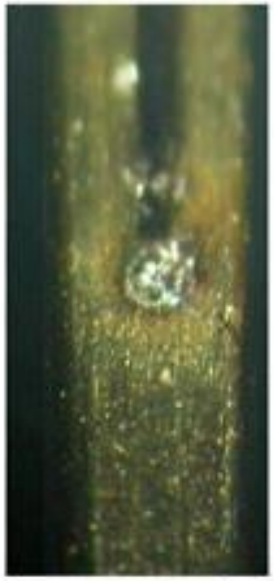
Effects of Spark Gap Erosion caused by unmating under PoE load



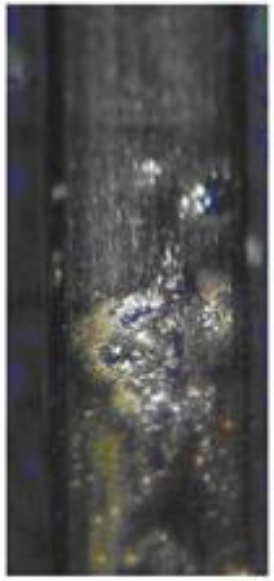
New unused contact



Contact after mechanical cycling under no PoE load



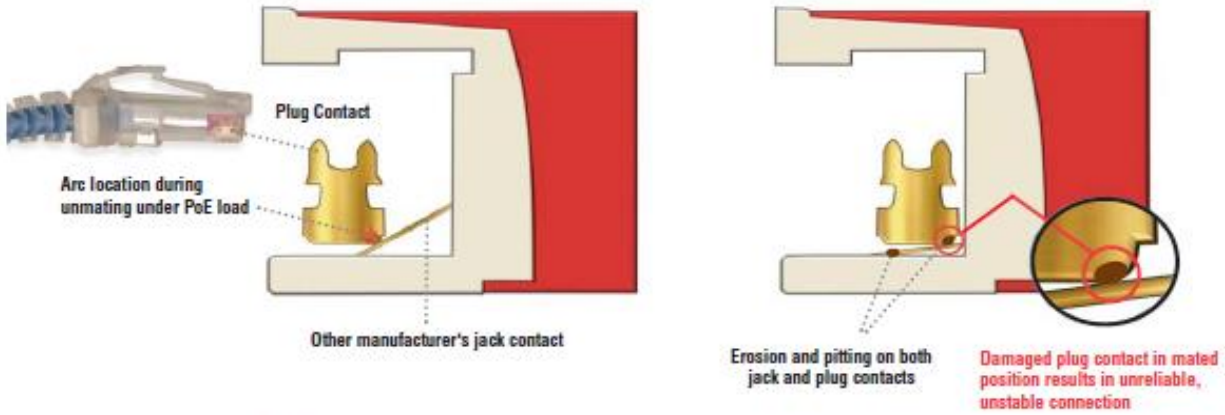
Contact errosion caused by a single arc during unmating under PoE load



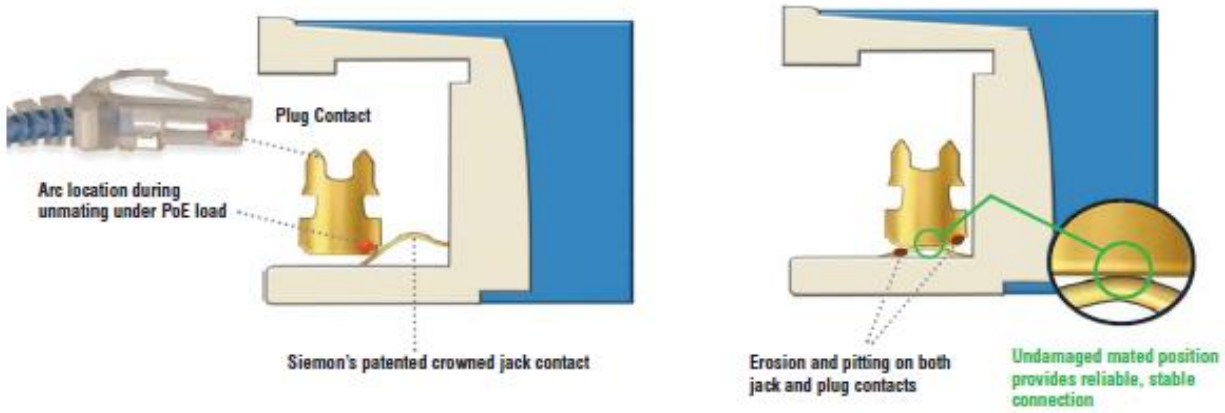
Long-term errosion caused from multiple unmating cycles under PoE load

Siemon Jacks Crowned King of PoE

Other Jacks... Damaged Fully Mated Position

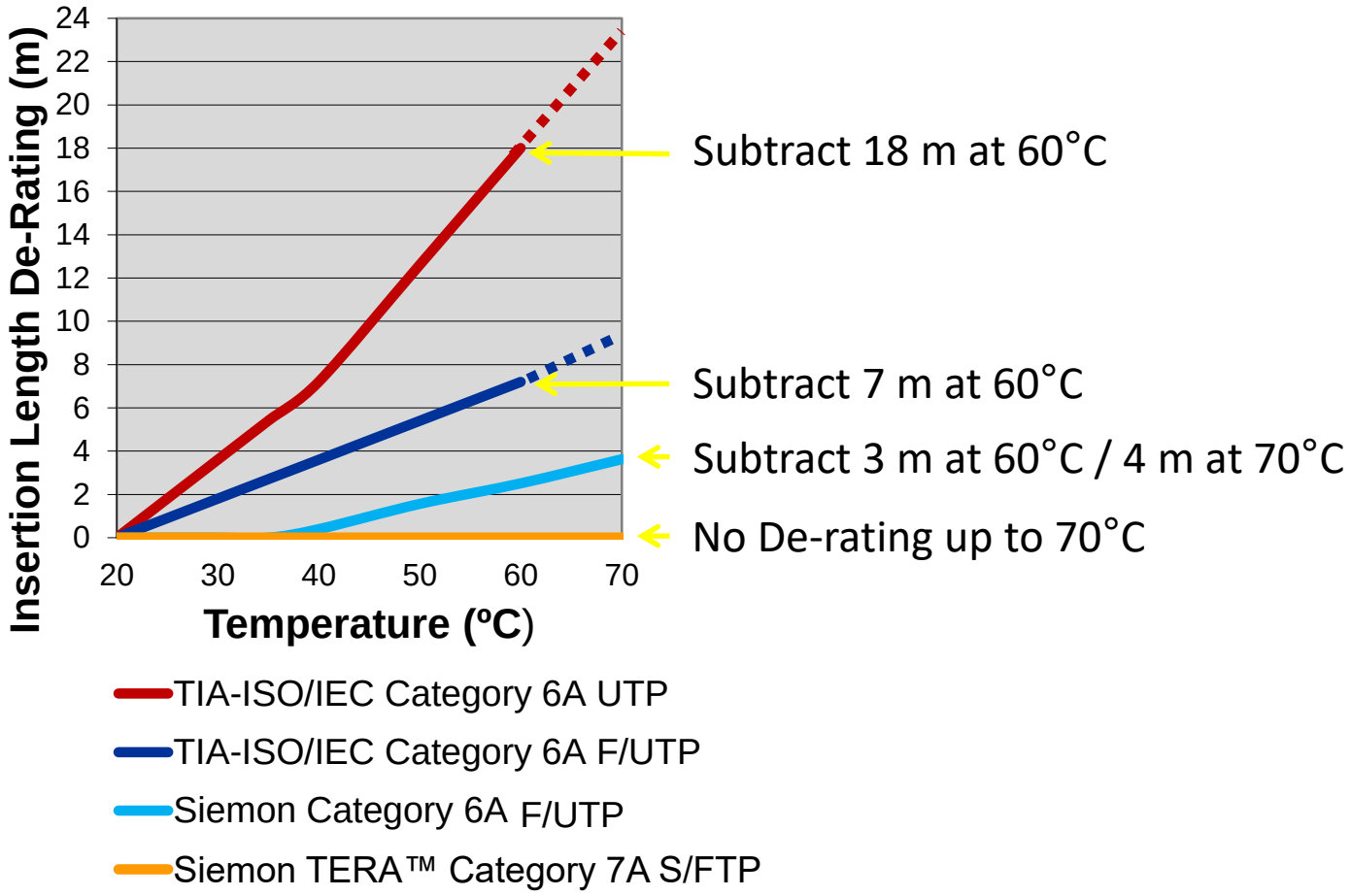


Siemon... Undamaged Fully Mated Position

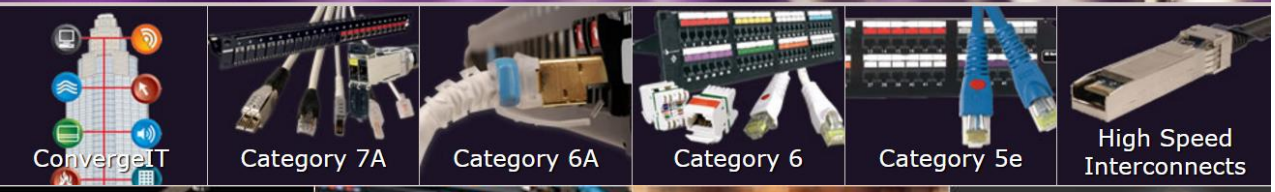


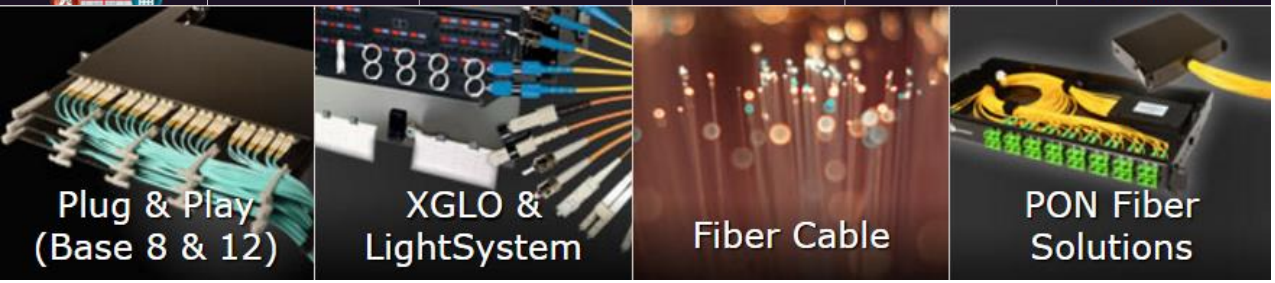
Siemon shielded cables are more thermally stable

- Siemon category 6A shielded cables only need to be de-rated by 4m at 70 ºC [18m for UTP]
- Siemon category 7_A cables do not need to be de-rated to support 10GBASE-T at 70 ºC!











Front





Thank You

CONNECTING THE WORLD TO A HIGHER STANDARD

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