



Data Center Solutions Addressing New Operational Demands

Zacharias Baveas

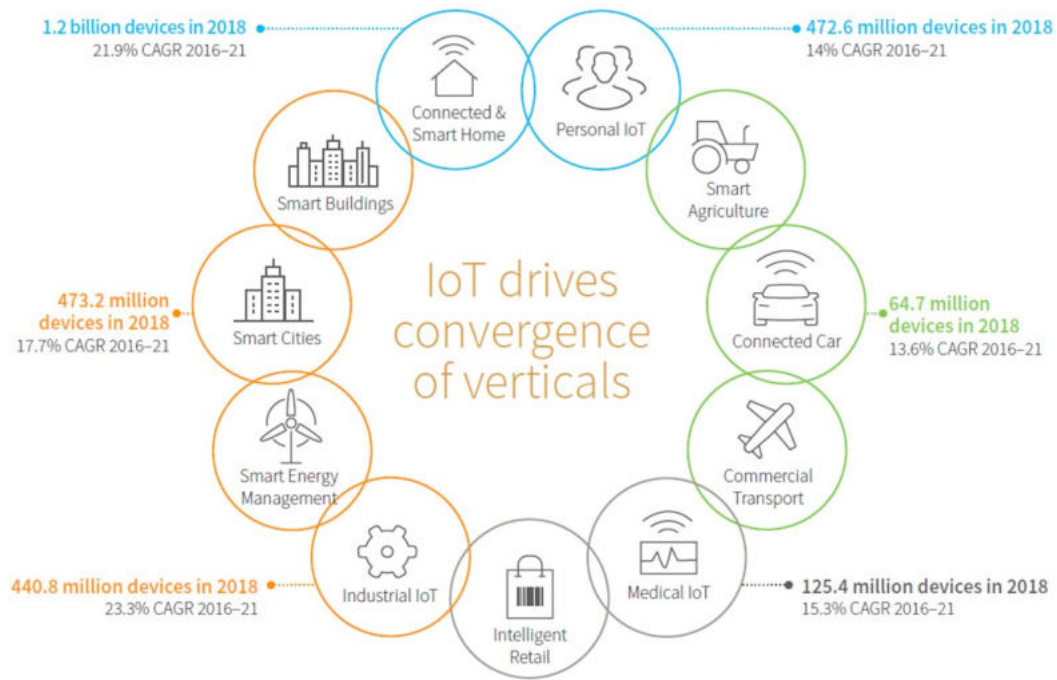
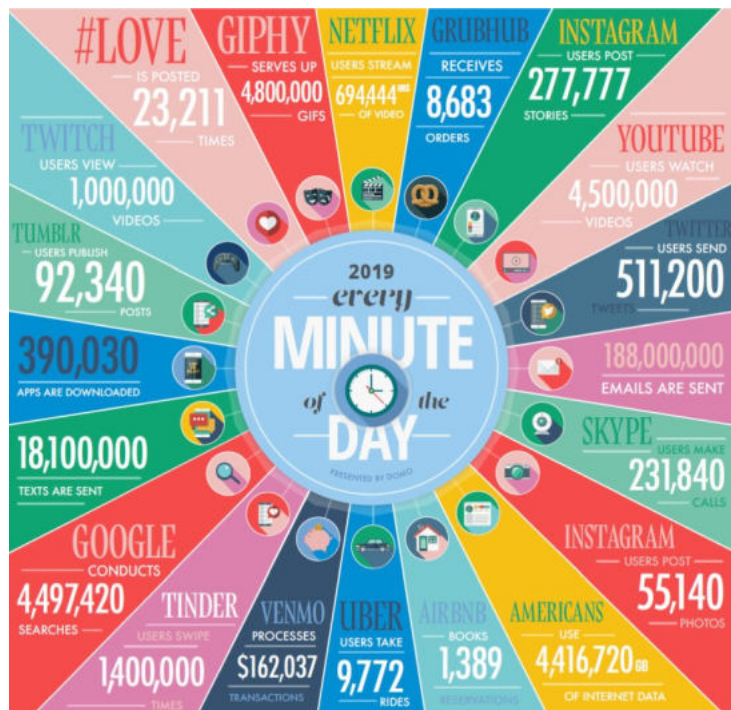
Technical Systems Engineer EMEA

Agenda

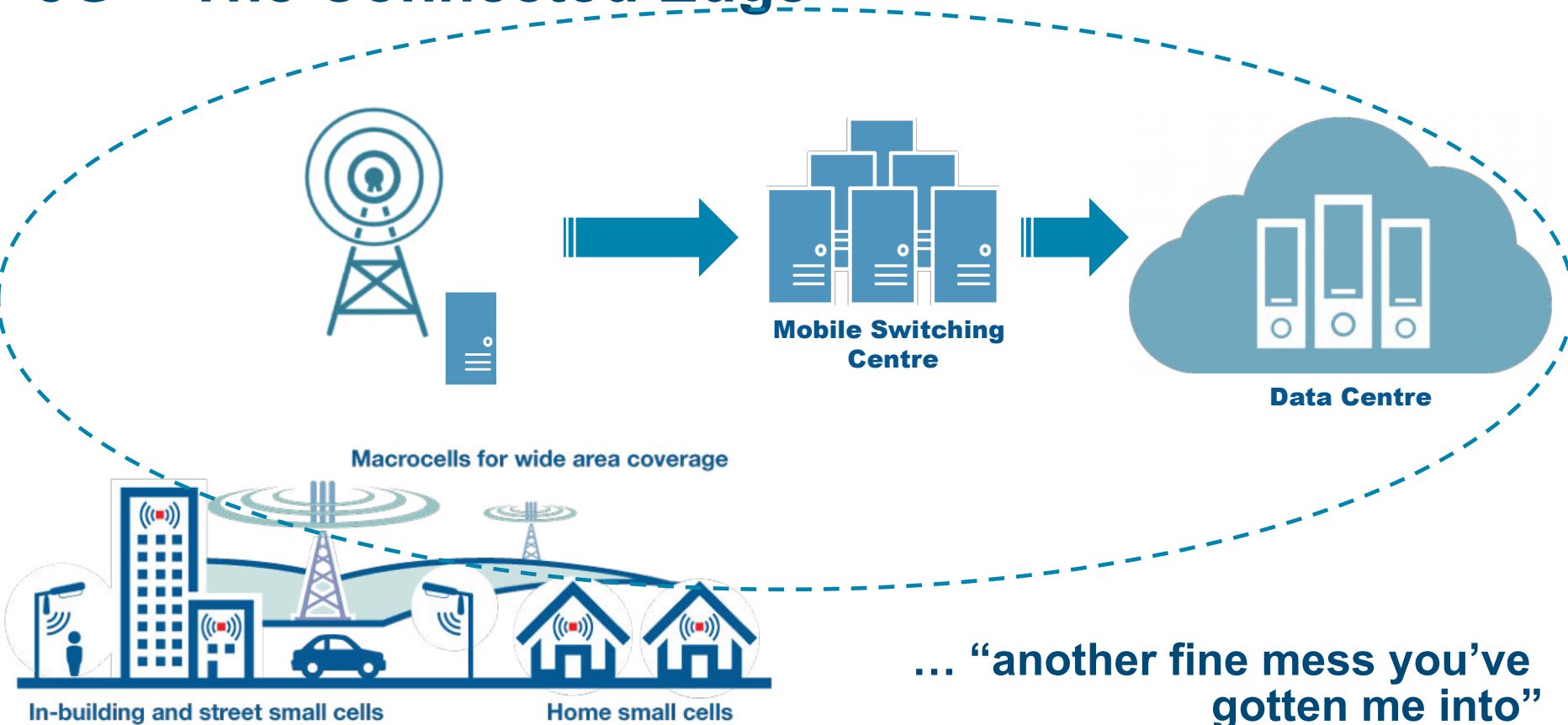
- Changing Times – Digital Era
- Fiber In the Data Center
- Scalable and Flexible Fiber Deployments
- Passive Thermal Solution - Cabinets
- Single Pair Ethernet



Data Drives Us



5G – The Connected Edge

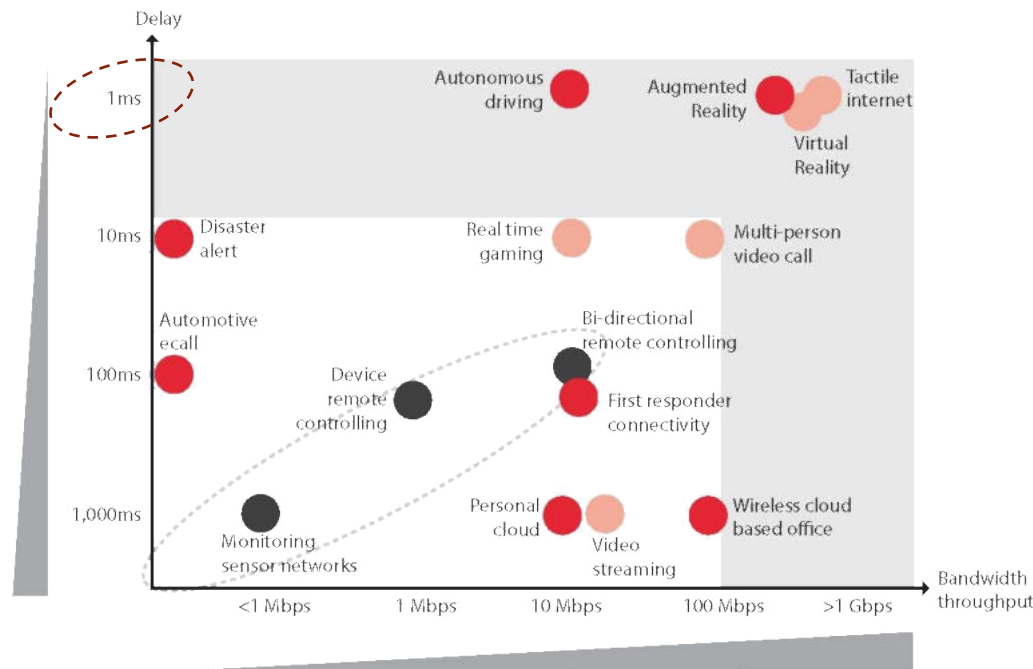
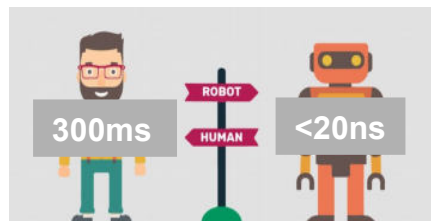


The Edge

Organisations are working hard to decentralise compute power and place it closer to the point where data is generated. That is, the edge”

why...

Why do we need Edge?

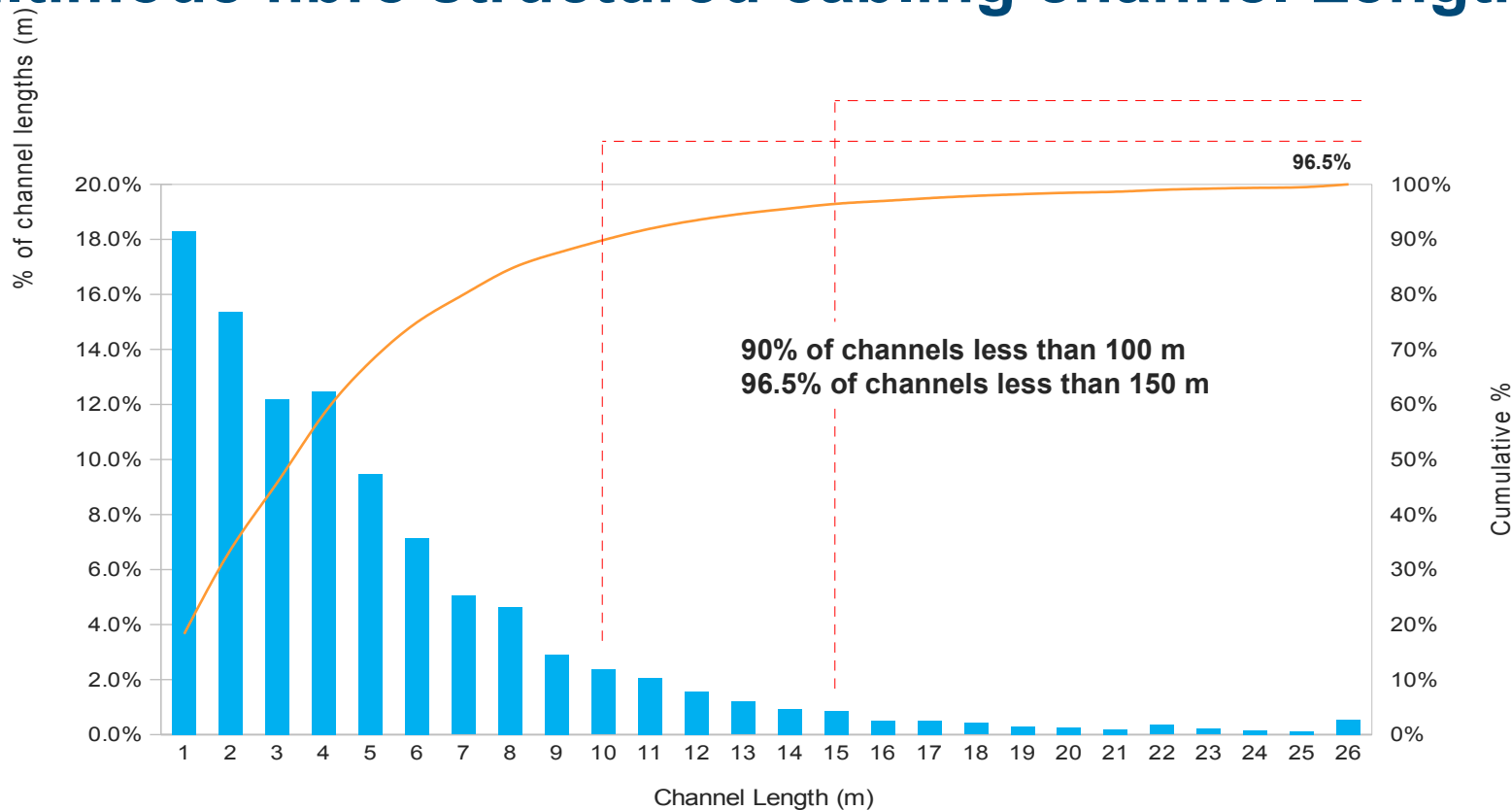


- Services that can be delivered by legacy networks
- Services that could be enabled by 5G

- Fixed
- Nomadic
- On the go
- M2M connectivity

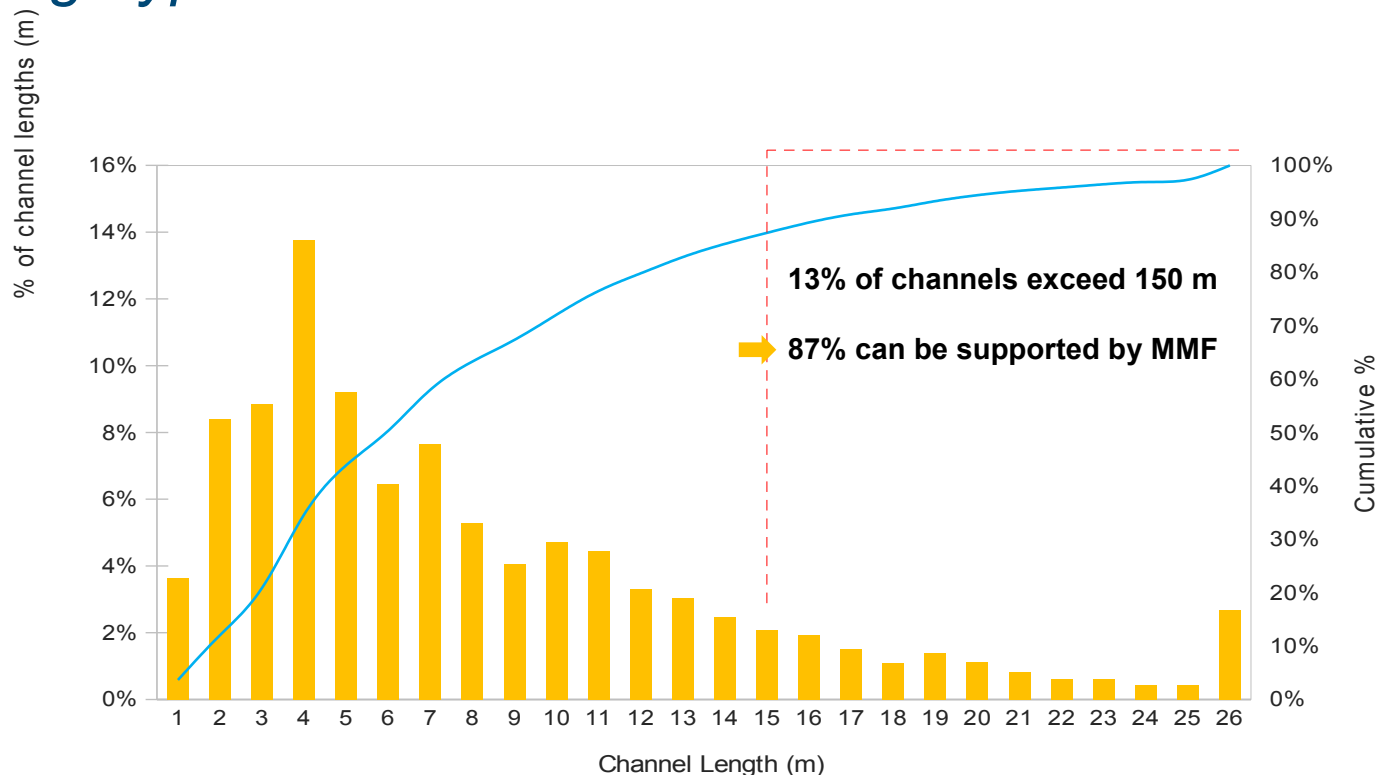
Fiber in The Data Center

Multimode fibre structured cabling channel Lengths



Single-mode fibre structured cabling channel Lengths

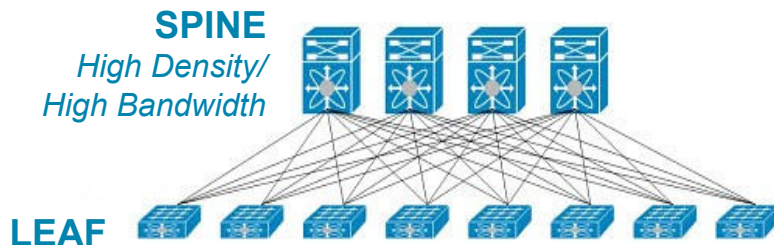
- *Excluding hyperscale data centers*



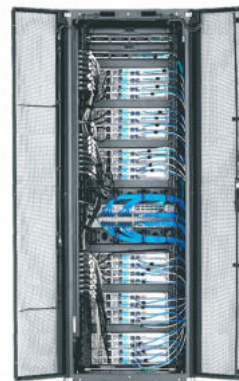
Multimode Fibre Channel Reaches

Application	Specification	OM3	OM4	SigCore OM4	OM5
10GBASE-SR	IEEE 802.3ae	300	400	550	400
40GBASE-SR4	IEEE 802.3ba	100	125	165	125
100GBASE-SR4	IEEE 802.3bm	70	100	125	100
4G Fibre Channel	INCITS T11 PI-4	380	400	500	400
8G Fibre Channel	INCITS T11 PI-4	150	190	250	190
16G Fibre Channel	INCITS T11 PI-6	100	125	200	125
32G Fibre Channel	INCITS T11 PI-7	70	100	125	100
128G Fibre Channel	INCITS T11 PI-7	60	85	95*	85
Cisco 40G BiDi	Proprietary	100	135	200	150
Cisco 100G BiDi	Proprietary	70	100	150	130
40G SWDM4	MSA	240	350	420	440
100G SWDM4	MSA	75	100	150	150

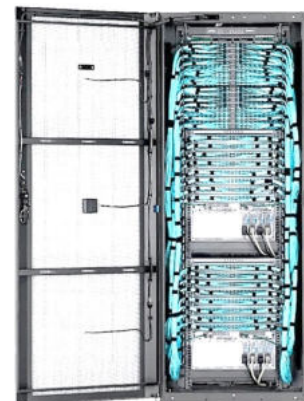
Spine and Leaf – two tier architecture



Leaf
Cabinet
Design -
Nexus
93128



Spine
Cabinet
Design -
Nexus 9508

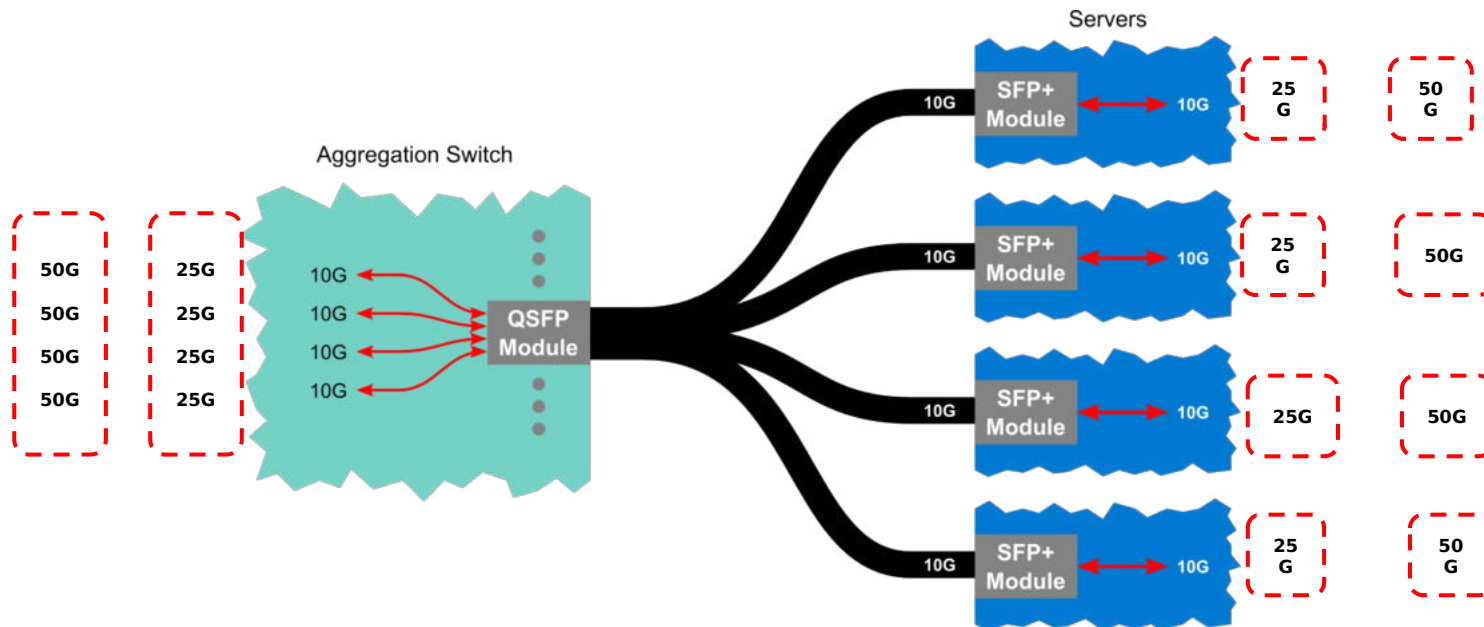


- **Lower latency**, higher reliability – compared to three tier.
- Operational efficiency (lower power), faster deployment.
- **High Density** and High Bandwidth
 - Aggregation of leaf connections in Spine.
- East-West traffic relevant - 76% of DC traffic is East to West

Progression of Multimode Fibre Ethernet PMDs

	Data Rate Gb/s	Nomenclature	Lane Rate Gb/s	Number of fibre pairs	Number of wavelengths	Year Standardized
10G PMD Series	10	10GBASE-SR	10	1	1	2002
	40	40GBASE-SR4		4		2015
25G PMD Series	25	25GBASE-SR	25	1	1	2016
	100	100GBASE-SR4		4		2015
50G PMD Series	50	50GBASE-SR	50	1	1	2018
	100	100GBASE-SR2		2		
	200	200GBASE-SR4		4		
				8		
	400	400GBASE-SR8			2 BiDi	~2021
		400GBASE-SR4.2		4		
NEW →	100	100GBASE-SR		1		

Increase Number of Data Paths => Breakout Application



Proliferation of Breakout

- **Cost, Power and Space = efficiency per G/bit**

- Wide adoption of **breakouts/aggregation** solution
 - 40G to 4x10G
 - 100G to 4x25G
 - 200G to 4x50G (future)
 - 400G to 4x100G (future)

- Circa 30% cost saving

Spine transceivers

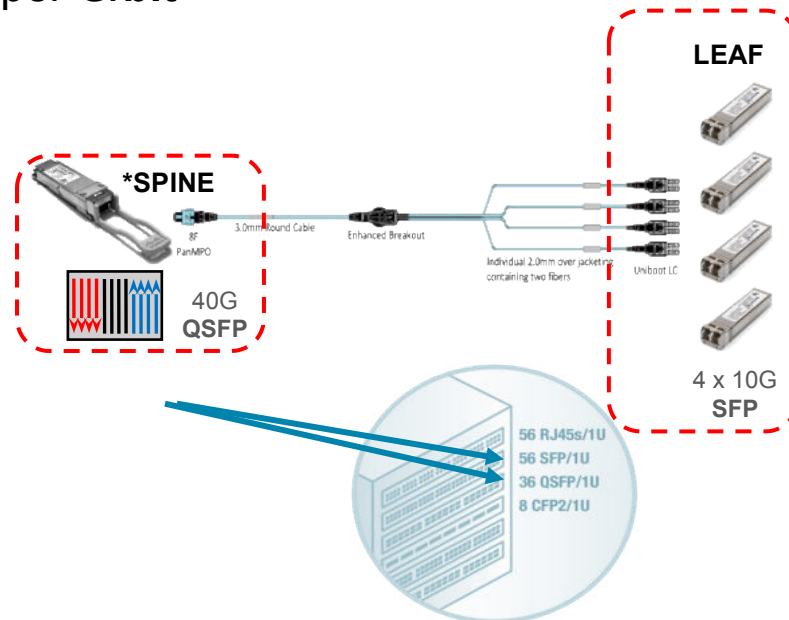
- >60% less power

at Spine

- **>Space saving 2:1 – 3:1 typical**

at Spine

- More space for revenue generating equipment
- Where space is a premium/limited
- Multiple generations of switch refreshes



Scalable and Flexible Fiber Deployments

MIGRATION ROADMAP

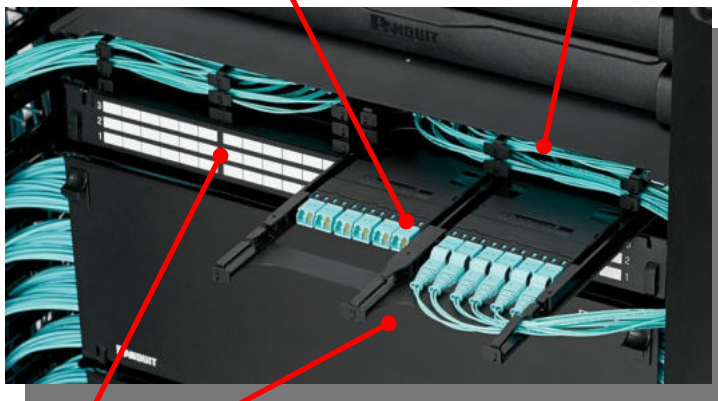


HD Flex™ 2.0 Enclosures and Panels

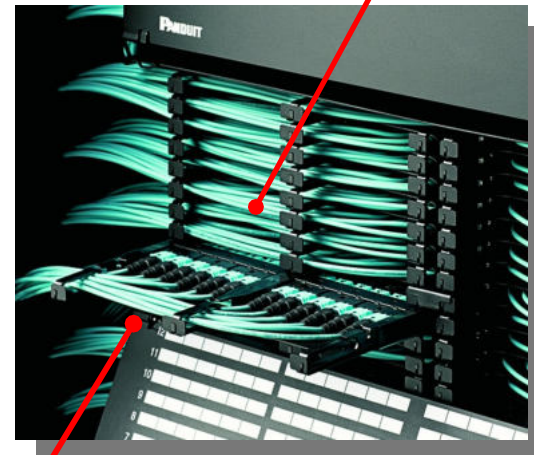
Drop-in Module feature prevents adjacent link disruption

144-fibers per 1RU (LCs)

864 fibers per 1RU (MPO)



Split Tray Feature for A/
B Redundancy



Integral Front Cable
Management

HD Flex™ 2.0 Duplex LC Cassettes

- Single mode and multimode
- Available in two widths
 - 4 duplex LCs
 - 6 duplex LCs
 - 12 duplex LCs
 - 6 MPO
 - 6 duplex LCs Splicing
- Advantage of 12-port cassettes
 - Easier cable management
 - Lower time to install
 - Lower cost



PanMPO™

- Migrate from 10G/25G/40G to 50G/100G/200G
 - Using industry standards best practices for polarity and gender
- Field configurable
 - Gender and Polarity
- Very easy and reliable field test
 - One PanMPO reference cord tests all
 - Use the 'one jumper' reference test method*
- Allows improved end face cleaning
- Never have the wrong product
- Fast Deployment – enabling on-time & on-budget



PanMPO™ Connector

Change Polarity



Key - Up



Remove Outer
Housing, Flip &
Reinstall

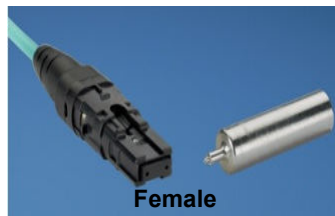


Key - Down

Change Gender

CapEX Cost Savings

One fiber cable assembly with the PanMPO™ Connector replaces six standard assemblies.



Female

Remove Outer
Housing

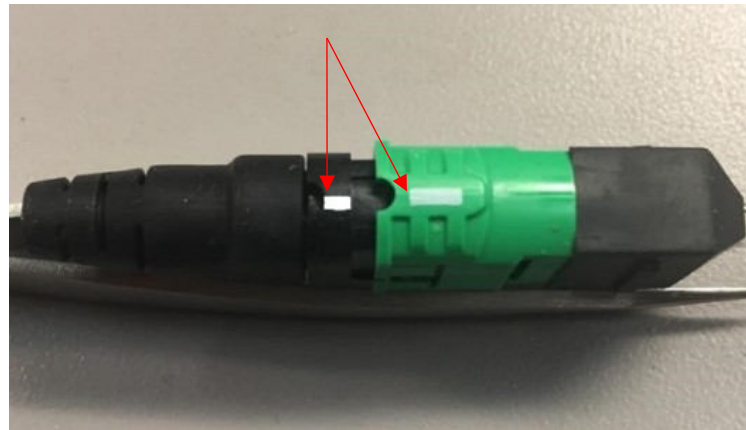


Male

Using Pin Extend/
Retract Tool
Pull Pins Forward

Singlemode PanMPO Assemblies

- Gender changes possible
- Align marks to ensure correct angle
- Polarity change NOT recommended



Laser Optimized Multimode Fibre Types

Fibre Sorted and Classified Based on Quality of Modal Dispersion

Fibre Type	EMB at 850 nm (MHz·km)	EMB at 953 nm (MHz·km)
OM3	2000	NA
OM4	4700	NA
OM5	4700	2470
Signature Core OM4+	5500	2000

- MMF is sorted as OM3 & OM4 based on Effective Modal Bandwidth (EMB)
 - EMB is calculated from a Differential Mode Delay (DMD) measurement, i.e., modal dispersion
- OM3 and OM4 are designed for 850nm transmission and minimum channel reaches of 100 m and 150 m respectively
- OM5 includes a specified EMB at a longer wavelength (953nm)
 - Only provides a benefit for SWDM-4 applications where the required reach exceeds the standards specified maximum channel reach (non-standard)
- Signature Core OM4+ is a dispersion compensating OM4 fibre

Passive Thermal Solution Cabinets

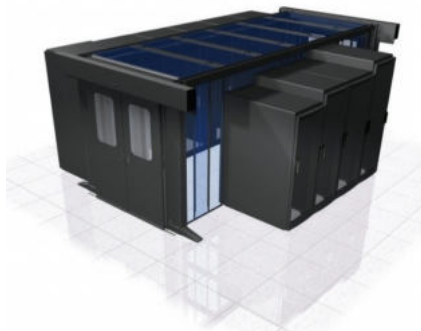
Universal Aisle Containment

- Universal Aisle Containment System – allows to retrofit in **Brownfield** or deploy in **Greenfield** application
 - Flexible design
 - Floor mounted, free structure
 - Height adjustable frame
 - Hot aisle or cold aisle
 - Compatible with industry leading brand of cabinets
 - Full or partial pod
 - Raised or slab floor
 - Expandable containment length
 - Tool-less full or top of cabinet blanking panels

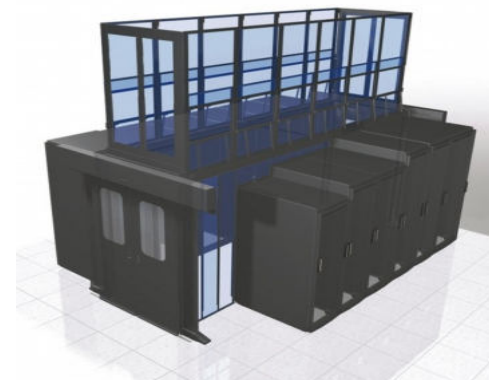
Day 1 – Containment Ready



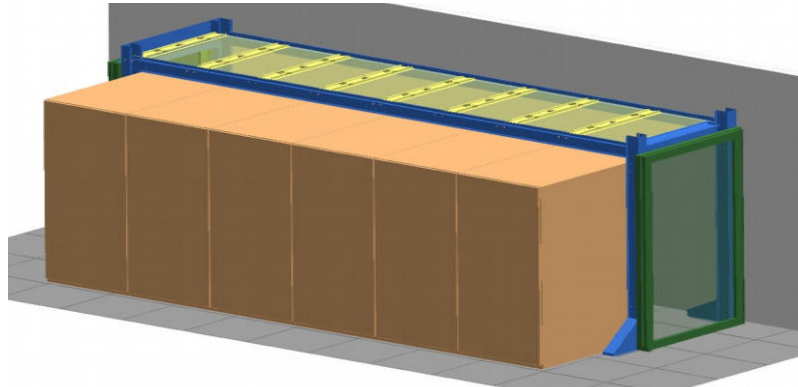
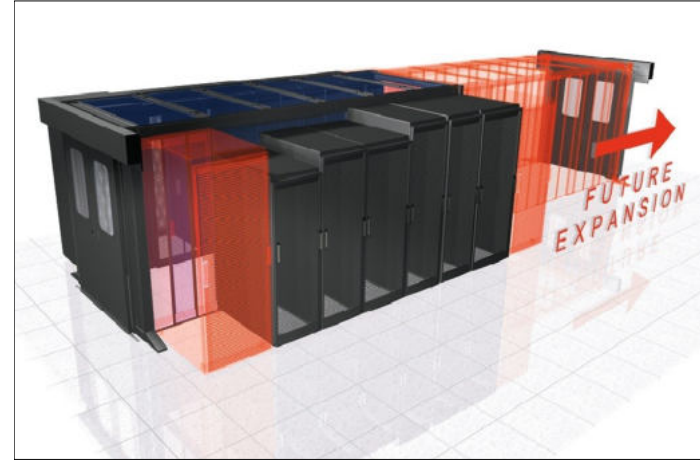
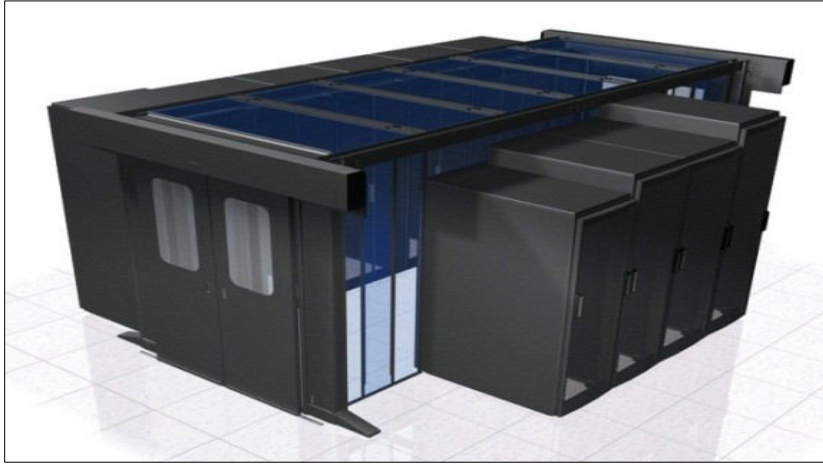
Partial Populated Cold Aisle Containment



Partial Populated Hot Aisle Containment



Containment – Universal Aisle



Net Access Network Cabinet

Dual Hinged Door Speeds moves, adds and changes by 30%

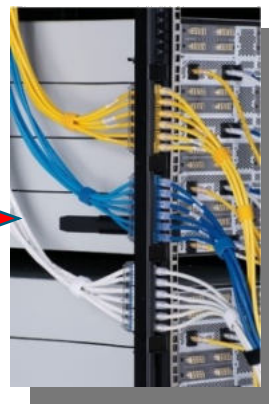
- Standard for N-Type cabinets
- Doors can **swing either way**
- Provides **open access** for fast and easy moves, adds and changes
- Cross patching on both sides
- Quarter-turn to open, push to close swing handle.
- 69% open perforation – allows **un-interrupted flow of air**



Adjoining cabinets with dual hinge doors

Net-Access Server Cabinet - Zero RU Patching

- Any 60-, 70- or 80cm wide Net-Access cabinet supports **vertical** installed Copper & Fiber ports
- Maximum **flexibility** using the pre-terminated QuickNet cabling System
- Zero RU** Patching Brackets:
 - SN8VPPB : 80cm wide N-Type & S-Type
 - S7VPPB : 70cm wide S-Type
 - E-Rail: 60cm wide S-Type**
- Install **any mix** of Copper & Fiber ports:
 - 42RU=84 / 45RU=90 / 48RU=96 ports
- Use **short(er) patch cords**: safe money, easier cable management, high density applications, optimize airflow
- Typical **7% less** white space needed in the data center



Unique to Panduit:
Vertical installed copper- & fiber ports in a 60cm wide cabinet



Gen 5 Intelligent PDU Key Features

High Density
Outlet configuration allows full length SKU's fit within 42U rack with top, bottom, or front exit cable

Hot Swappable Network Module
For easy maintenance and upgrade-ready



Low Profile Design
Industry leading design saves rack space and ensures good access

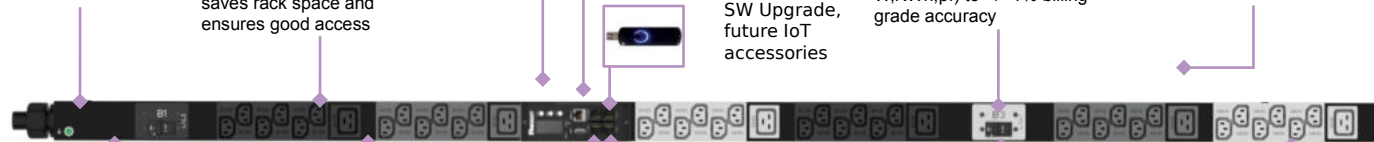
Dual Network Access (DNA)
In 2N configuration for network redundancy or tenant/client use

USB Port
SW Upgrade, future IoT accessories



Power and Energy Metering (V,A,VA, W,KWh,pf) to +/- 1% billing-grade accuracy

Color Coded Outlets and Circuit Breakers
For easy source Identification



Designed for High Temperature
Safe, Reliable Operation at 60°C with Full Load Rating

Best-in-Class Billing Grade Accuracy
+/- 1% throughout entire range of operational spec



Daisy Chain
Up to 4 PDU's and 32 sensors

Premium Hydraulic-Magnetic Circuit Breakers
Stable trip characteristics at extreme temperatures

Locking IEC Outlets
Provide secure power connection with optional locking cords or integrated locking features

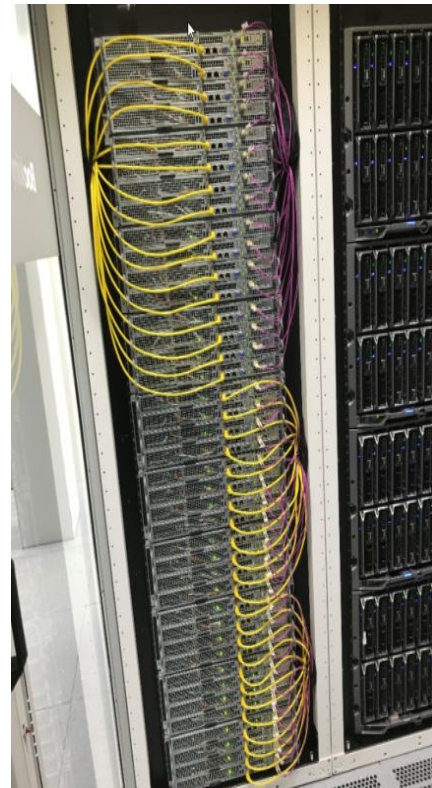
Environmental & Security
Ready with support for up to 8 digital plug-and-play sensors or proximity card access



Tendency for Pre-Configured and Validated Deployments

Requirements

- IT and Network Hardware Pre – Installed
- Network Connectivity Pre-Cabled
- Solution Validated and Commissioned
- Cabinet Capable to Support high Dynamic Loads



Dynamic Cabinet

- Rated to hold equipment while shipping
- **Reinforced frame** & horizontal supports
- **Split latching** side panels
- Safely **holds 2,000 lbs.** of equipment
- Vertical blanking panels with pass-throughs
- S-Type, 42 RU, 700mm wide, 1200mm deep
- Special **dynamic skid**
- **Ramp available** with cabinet or separate accessory
- 4 part numbers – with and without side panels, with and without ramp



SmartZone™ Security (iHandle)

Electronic

HID

HID+Keypad

Keypad



Features

- Up to 200 Users
- Multifrequency Card Access
 - HID 125KHz/13.5MHz, Mifare, iClass & EM Cards
- Dual Authentication Keypad
- GDPR Compliant Ready
- Biometric Card Support
- Replaceable Tumbler & Keys
- Large Status LED
- Euro Style Lock
- High Intensity Beacon LED's
 - Customer selectable color for different warnings and/or grouping rack by function
- Direct connect to PDU
- Integrated Humidity sensor
- Optional Door + 3T or Door +1T sensor direct connects to handle
 - Visual indication of rack temperature warnings (green/yellow/red) via Beacon LEDs
- Optional Light Bar Attachment
- Network Authentication – AD/LDAP/S&BSS APIs



Customer Case - Universal Aisle Containment







Customer Case - Universal Aisle Containment



Single Pair Ethernet Coming

Single Pair Ethernet

- **50% more dense than RJ-45**
- **Low Power Low Data**
- **Expected to Support Longer Distance**
- **Investigating Multidrop Capabilities**
- **802.3cg defines 10Mb/s Ethernet over a single balanced pair**

Parameter	4-pair	Single Pair
	 	 
Data Rate	Up to 10 Gb/s (10GBASE-T)	10 Mb/s at 1000 m
Power Levels	Up to 71 W (PoE++)	7 W to 52 W <i>depending on cable length</i>
Reach	Up to 100 m	Up to 1000 m
Connector Type	RJ45	Modified LC

10BASE-T1L SPE System Overview

Data

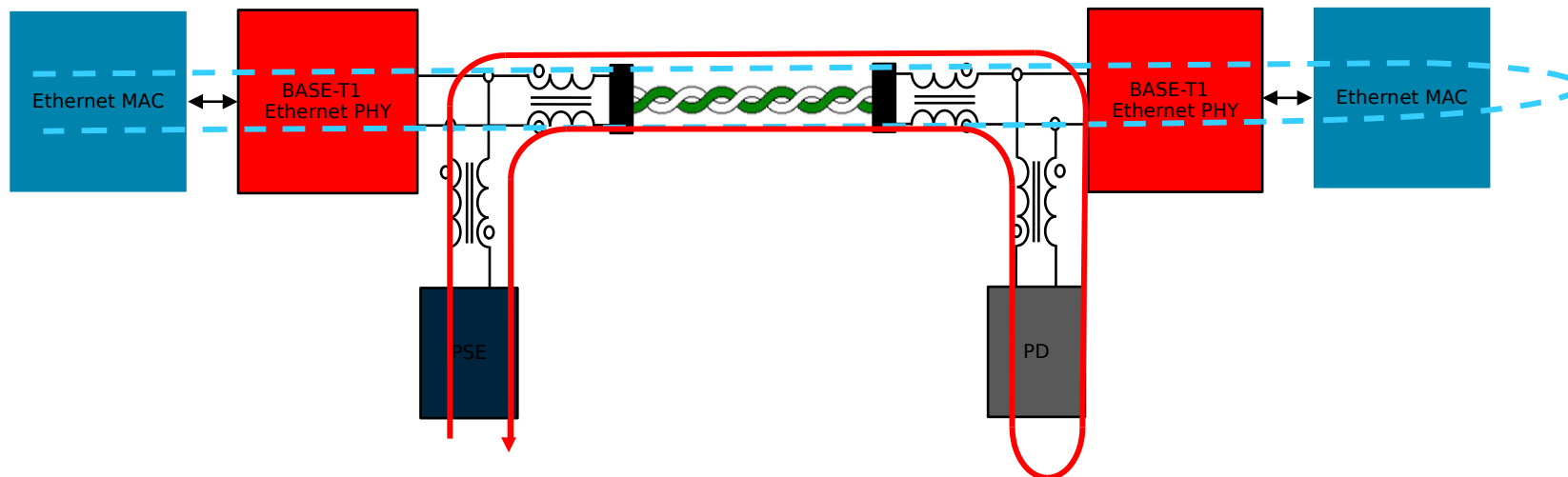
- 10Mbps
- Full duplex – Both sides transmit at the same time

Cabling/Connectors

- Up to 1000 meters
- Accommodate both data and power
- Can be bundled

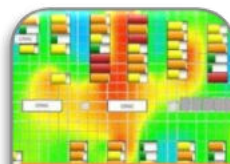
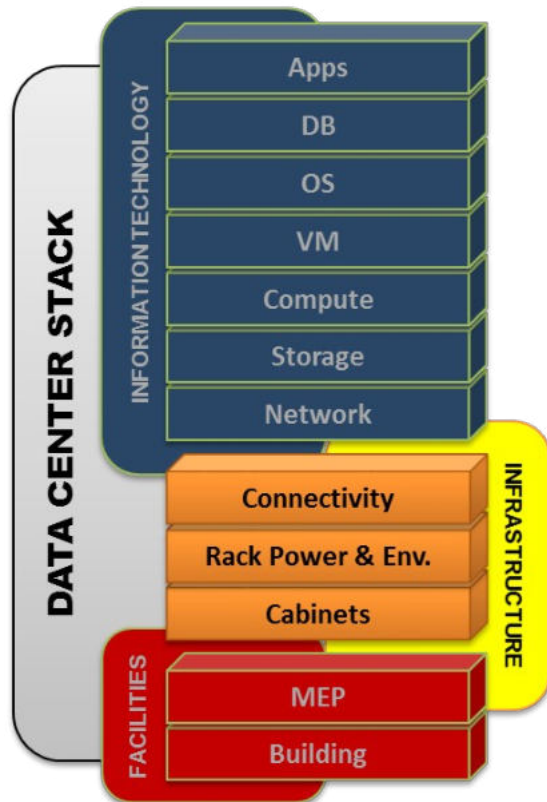
Power

- 50-58V classes for maximum power transfer
 - Up to 52W
- 20-30V classes for low voltage applications
 - Up to 8.4W

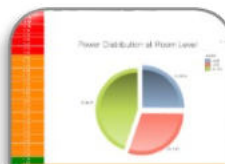


CONVERGED DATA CENTER SOLUTION

← Implementation and Support



DCIM Cooling Optimization



DCIM Power Management



DCIM Asset & Connectivity



Professional Services



Copper Connectivity



Fiber Connectivity



Cabling Mgmt. & Pathways



Physical Accessories



Network and Server Cabinets



Pre-Configured Cabinets



Thermal Containment



Rack Power Distribution

Design and Optimization →

Thank You!



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