There's no time like the present!

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MTDC, HyperScale – South Pacific

"*The world is changing very fast. Big will no longer beat small.
It will be the* **fast beating the slow.**"
Rupert Murdoch

AI, and especially Machine Learning, is making everything *scale faster and at lower cost*.

Nielson's Law: Bandwidth doubles every 21 months (~45% CAGR)

Comcast: Bandwidth doubles every 18 months (~60% CAGR)

Emerging trends expected to fuel increase in connectivity and data:

Near Term

Longer Term

360°

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Network owners are having to change

HyperScale

Invest in space

Cellular

Wi-Fi

Invest

Service Provider

Fixed Wireless Access

Content

In home opps

RF

Edge DC

Enterprise

SaaS
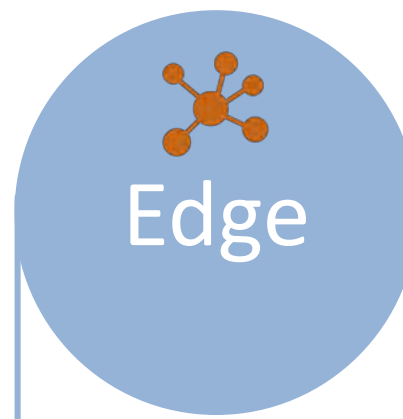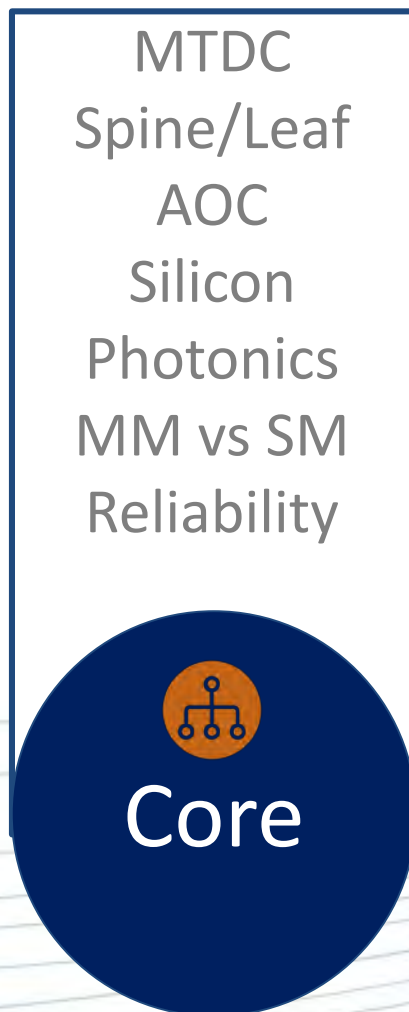
MTDC/ Cloud DC

Private LTE

In Building

Wireless (Wi-Fi?)

Ownership from operator to building owner

WiFi or unlicensed LTE?

IoT?

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Network Changes/ Effects

Access

More Macro sites
Multi use of fibre
NGPON2 adoption

MTDC
Spine/Leaf
AOC
Silicon
Photonics
MM vs SM
Reliability

Core

Edge

Edge Computing
Edge/ Cloud DC
Higher Freq
Spectrum mgmt

FTTX
3G/LTE/5G
Virtualisation
SDN/NFV

All

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Mobile Edge Computing:
Data Centres moving closer to the Edge

Core Compute

High Latency

Centralised

Client owned

Edge Compiuting

Low Latency

Distributed

Co-Located/ POP

Service Provider prime locations

2017 This Is What Happens In An Internet Minute

facebook

Google 3.5 Million Search Queries

900,000 Logins

16 Million Text Messages

You Tube 4.1 Million Videos Viewed

NETFLIX 70,017 Hours Watched

342,000 Apps Downloaded

$751,522 Spent Online

46,200 Posts Uploaded Instagram

1.8 Million Snaps Created

452,000 Tweets Sent

15,000 GIFs Sent via Messenger

990,000 Swipes tinder

120 New Accounts Created Linked in

156 Million Emails Sent

50 Voice-First Devices Shipped

40,000 Hours Listened

amazon echo Spotify
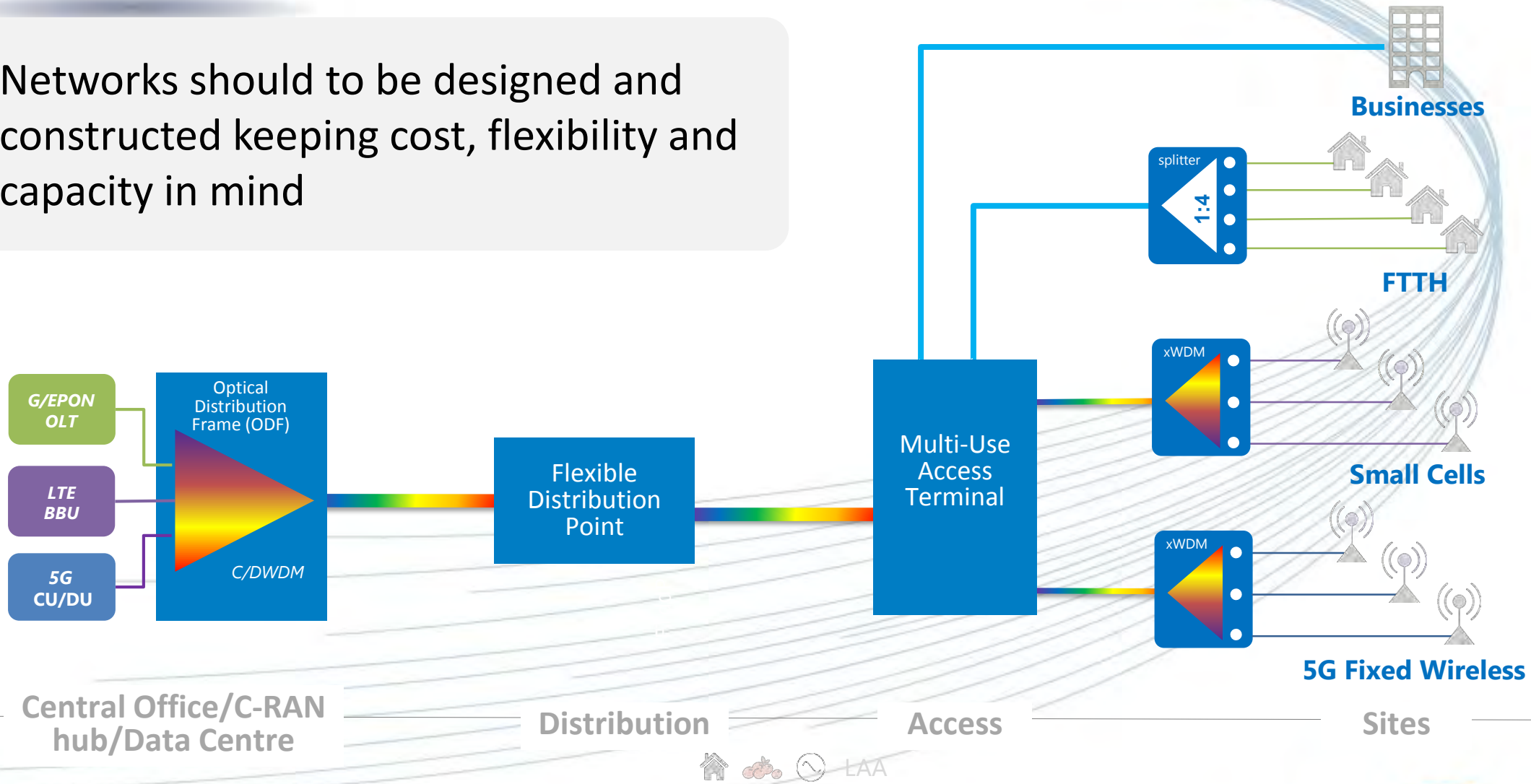
Created By: @LoriLewis @OfficiallyChadd

By 2025 60% of cloud servers will be deployed in Edge locations

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Converged Access Network Architecture

Networks should to be designed and constructed keeping cost, flexibility and capacity in mind

G/EPON OLT

LTE BBU

5G CU/DU

Optical Distribution Frame (ODF)

C/DWDM

Flexible Distribution Point

Multi-Use Access Terminal

splitter 1:4

xWDM

xWDM

Businesses

FTTH

Small Cells

5G Fixed Wireless

Central Office/C-RAN hub/Data Centre

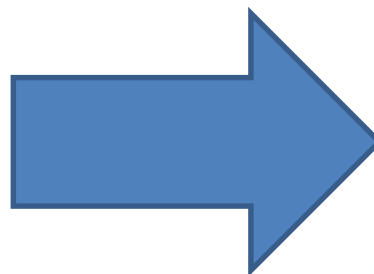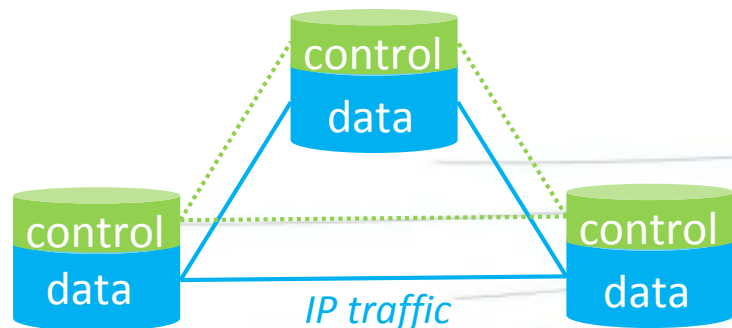Distribution

Access

Sites

LAA

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SDN - Software Defined Networking
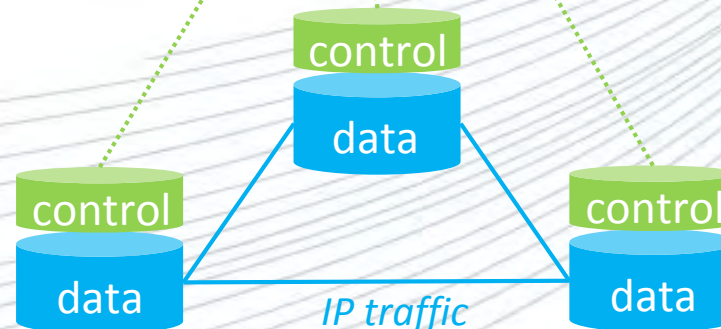
TRADITIONAL ARCHITECTURE

app

No centralised control/orchestration.
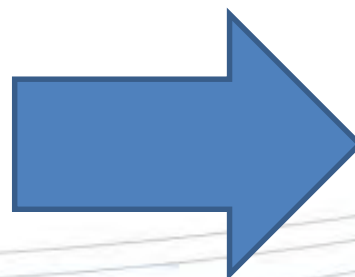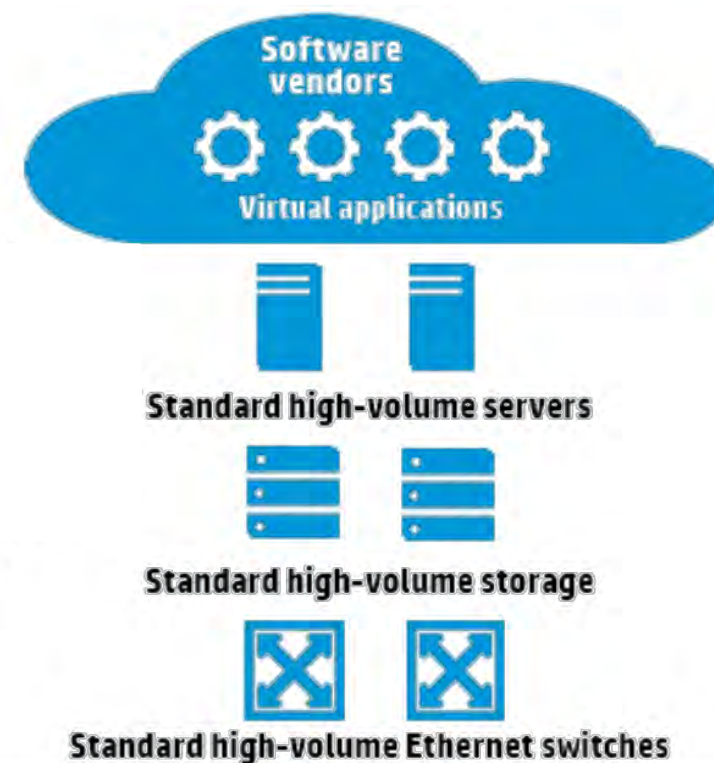Each element individually touched.
Static Routing.

control
data

control
data

control
data

IP traffic

SDN

app   app   app

SDN controller

control
data

control
data

control
data

IP traffic

NFV – Network Function Virtualization

CLASSIC

Router

CDN

Session border controller

HSS

DPI

Firewall

EPC

HLR

SGSN/GGSN

CPE

BRAS

PCRF

NFV

Software vendors

Virtual applications

Standard high-volume servers

Standard high-volume storage

Standard high-volume Ethernet switches

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So how do we transmit this data?

Parallel and Serial

40GBASE-SR**4**

100GBASE-SR**10**

Duplex

10GBASE-SR
10GBASE-LRM
10GBASE-LX4

25GBASE
50GBASE
100GBASE
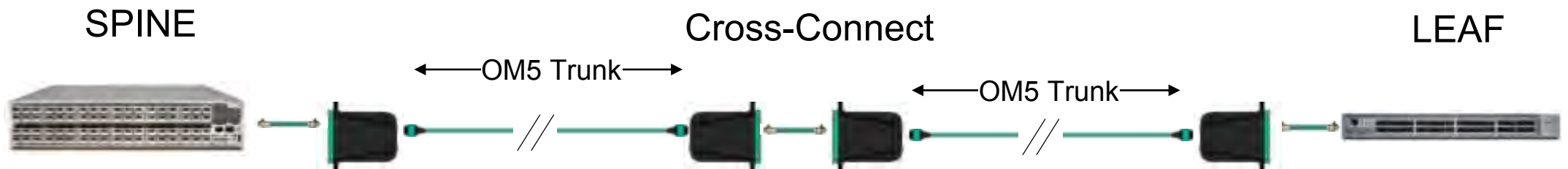200GBASE

OM5

10 Gb/s	40 Gb/s	100 Gb/s	100 Gb/s	200 Gb/s
2002	2010	2010	2017 Duplex	2018 Duplex

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So how to we transmit this data?

10GBASE-SR

SPINE

Cross-Connect

LEAF

OM5 Trunk

OM5 Trunk

200GBASE-SR

SPINE

Cross-Connect

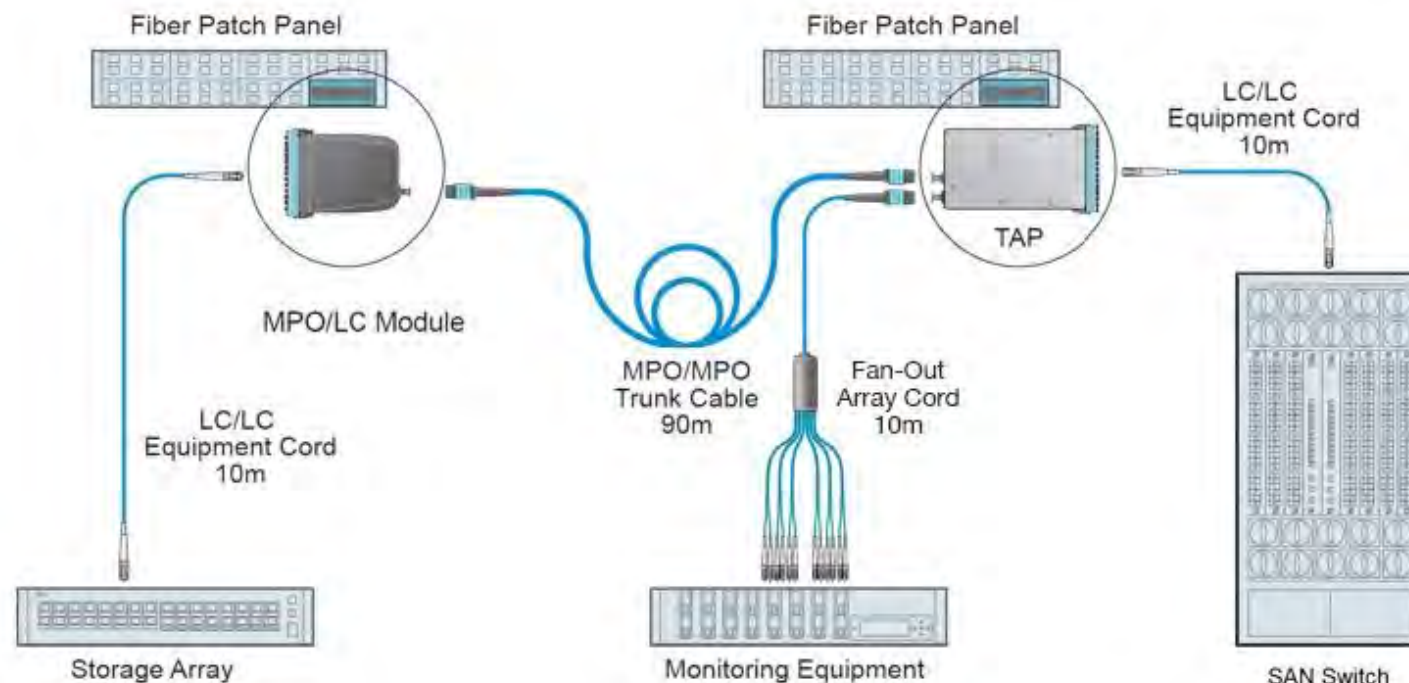LEAF

OM5 Trunk

OM5 Trunk

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Increased use of TAP/ Monitors

Passively monitor network links without impacting traffic

- Non-intrusive troubleshooting
- No IP address or power required
- Lawful intercept
- Network performance monitoring

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Copper – multigigabit changes

- **Class D (Cat 5e) and Class E (Cat 6) are not fully specified to support the requirements of 2.5GBASE-T or 5GBASE-T**

- **ISO/IEC TR 11801-9905 / TIA TSB-5021 provide guidelines to qualify existing Class D and Class E (Cat 6) installations**
  - **ALSNR risk assessment guidelines**
  - **Mitigation steps**
  - **Category 6A recommended for new installations**

- **ISO/IEC 11801 3rd Edition**
  - **Upgrades minimum office cabling to Class E (Cat 6)**
  - **Recommends Class E$_A$ (Category 6A) in Offices to support applications above 1 Gb/s**

ISO/IEC TR 11801-9904 Risk Assessment Tables

Class D (Cat 5e)

Bundled Distance	Speed	Victim Length		
		1 m to 20 m	20 m to 75 m	75 m to 100 m
Up to 20 m	2.5G	Low	Low	Low
	5G	Low	Low	Medium
20 m to 75 m	2.5G	N/A	Low	Medium
	5G	N/A	Medium	High
75 m to 100 m	2.5G	N/A	N/A	Medium
	5G	N/A	N/A	High

Class E (Cat 6)

Bundled Distance	Speed	Victim Length		
		1 m to 20 m	20 m to 75 m	75 m to 100 m
Up to 20 m	2.5G	Negligible	Low	Low
	5G	Negligible	Low	Low
20 m to 75 m	2.5G	N/A	Low	Low
	5G	N/A	Medium	Medium
75 m to 100 m	2.5G	N/A	N/A	Medium
	5G	N/A	N/A	High

Class E$_A$ (Cat 6A)

Bundled Distance	Speed	Victim Length		
		1 m to 20 m	20 m to 75 m	75 m to 100 m
Up to 20 m	2.5G	None	None	None
	5G	None	None	None
20 m to 75 m	2.5G	N/A	None	None
	5G	N/A	None	None
75 m to 100 m	2.5G	N/A	N/A	None
	5G	N/A	N/A	None

Multigigabit developments driving increased adoption of Category 6A cabling in buildings

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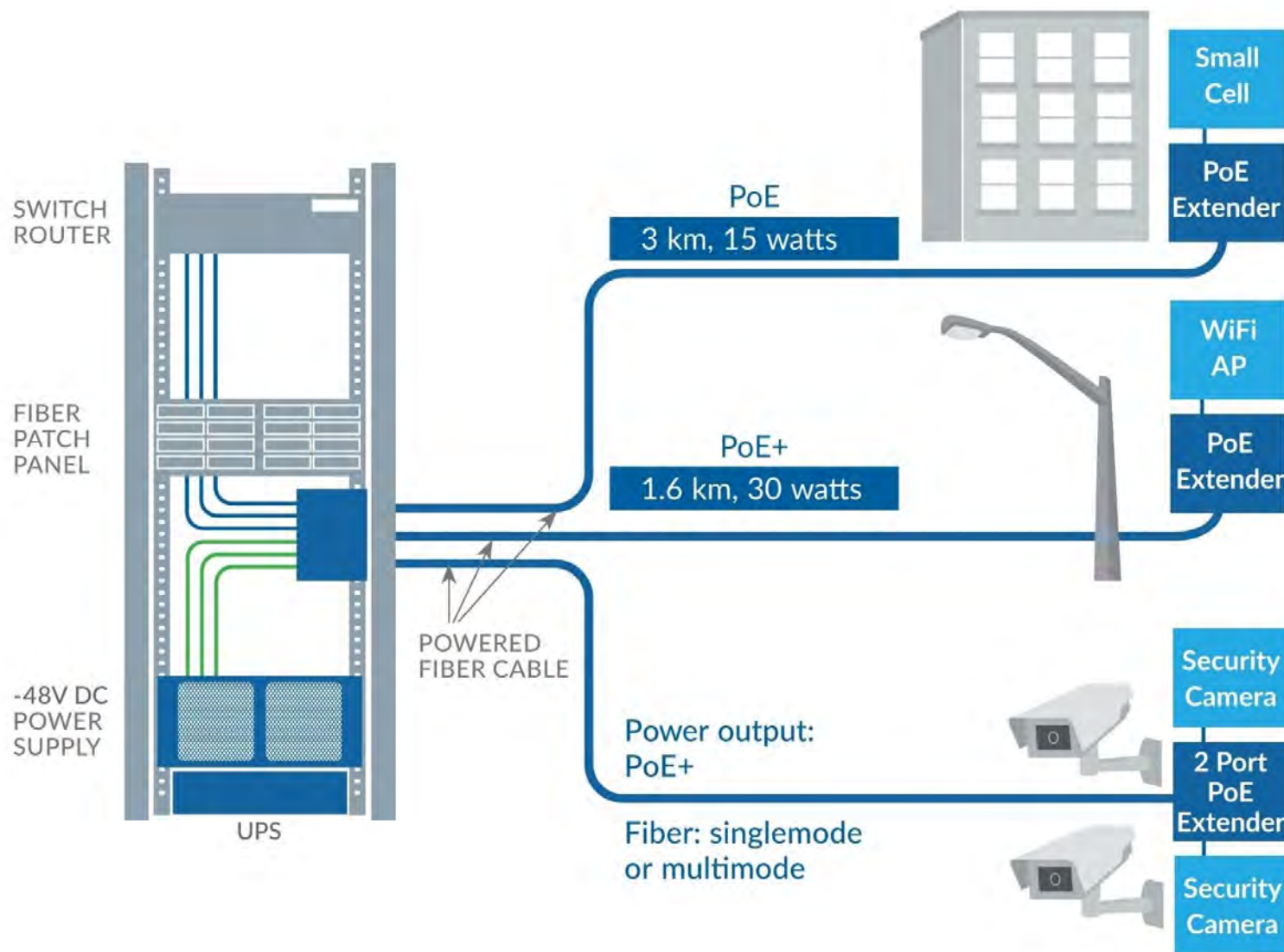BICSI

Network Challenge – Providing Power and Comms to Edge Devices

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Solving the Power and Comms Challenge

Key Takeaways

Convergence

Network Convergence will be a necessity to cater for all the future demands of the network

The future is here

The demand for bandwidth, low latency and capex/opex savings drives virtualization and edge computing

Flexible

Network operators need to be able to support multiple network applications on a single network. In order to support edge computing and SDN/NFV, data centre architectures will be deployed in central offices

Migration ready

The data centre architectures in the central office need to focus on providing the required density and flexibility in a High Speed Migration structured cabling solutions that must be able to support the next generations of applications

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THANK YOU

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