

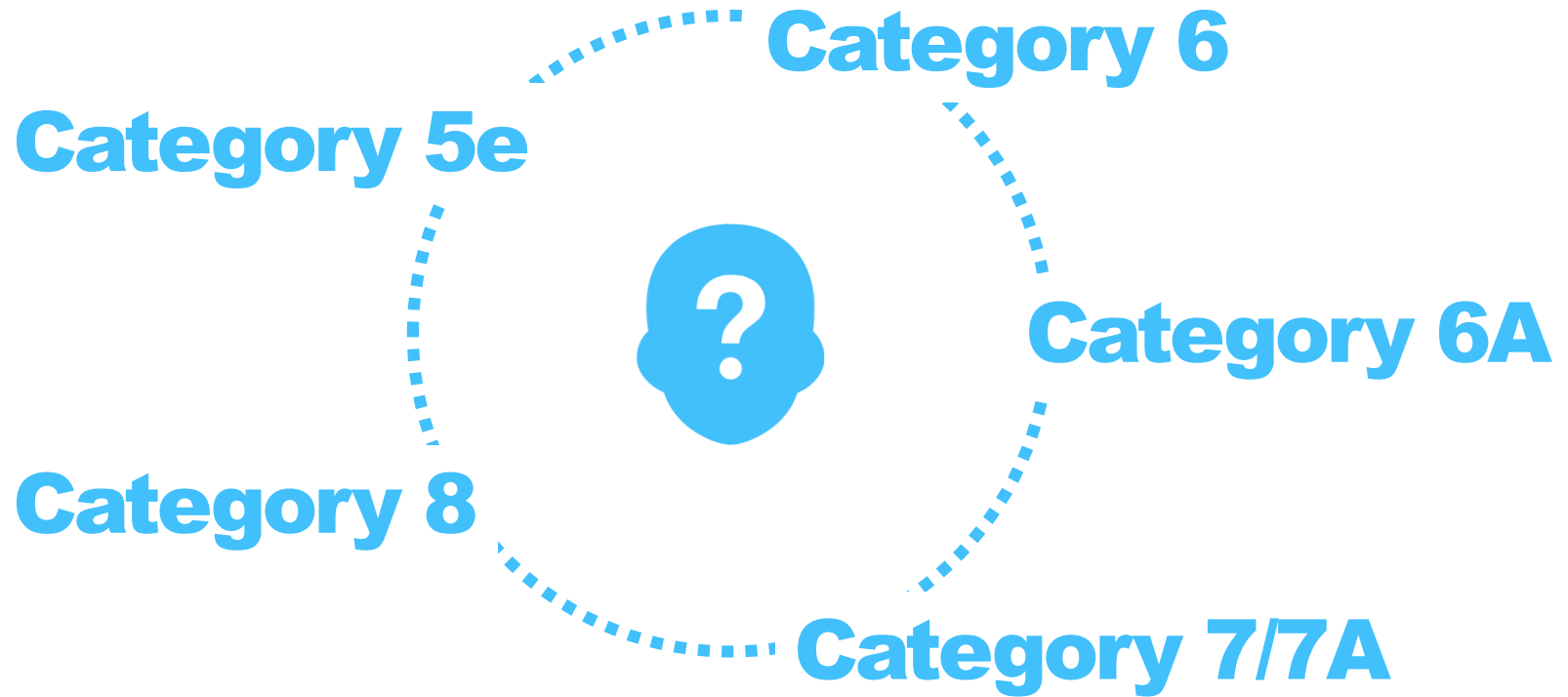
Category 6A A Sensible Choice?

Chandrashekar G

National Technical Manager- Technology and Applications

April, 2017

Copper Cabling



Convergence



2000s

- IP driven
- Brings disparate subsystems under one
- Solution looking for tangible benefits ...



2016 ...

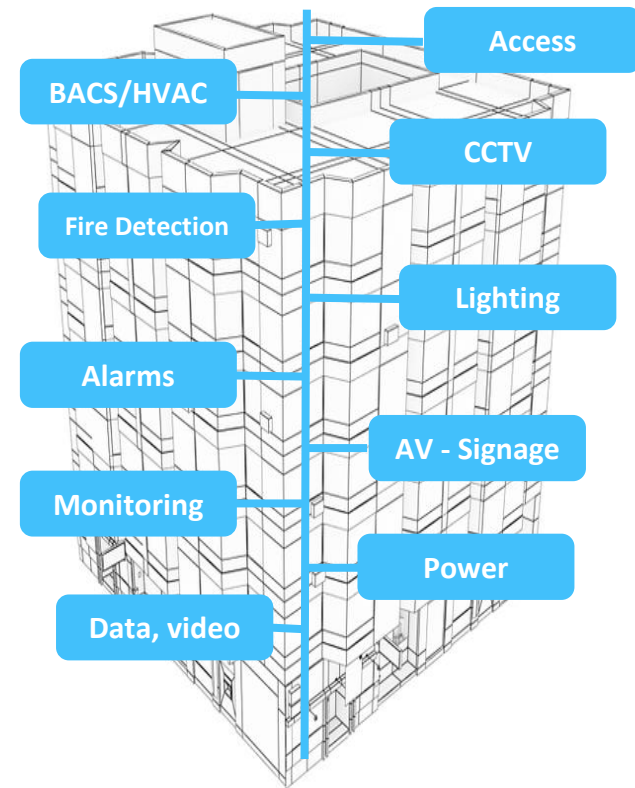
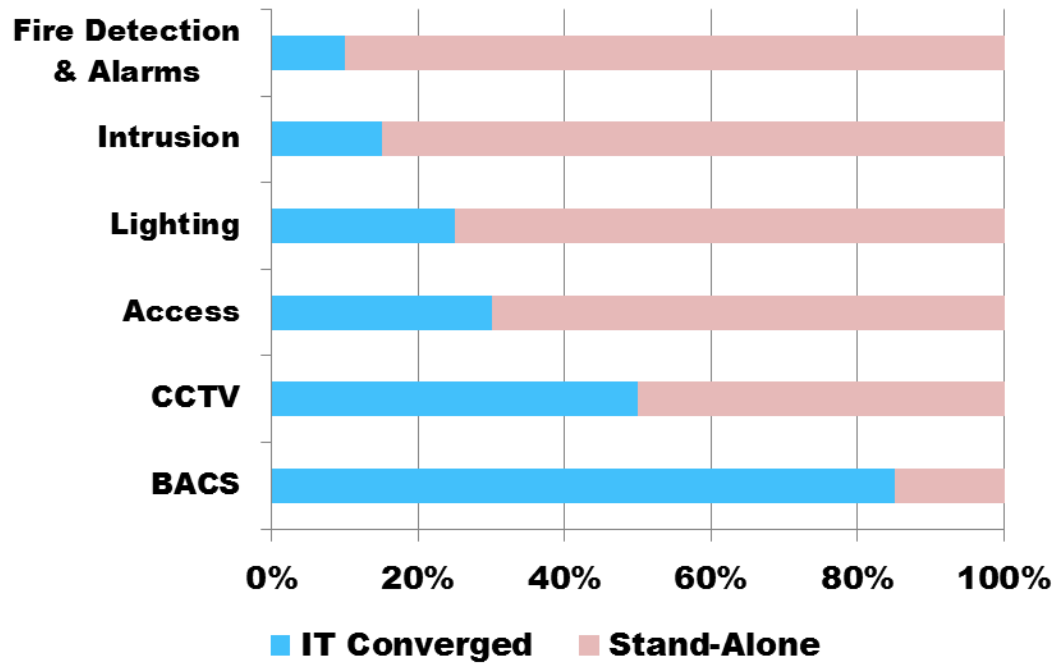
- IoT driven
- Merges not-so-disparate subsystems into one
- Unlocks productivity, efficiency ... and business opportunities



Convergence Uptake in the Enterprise



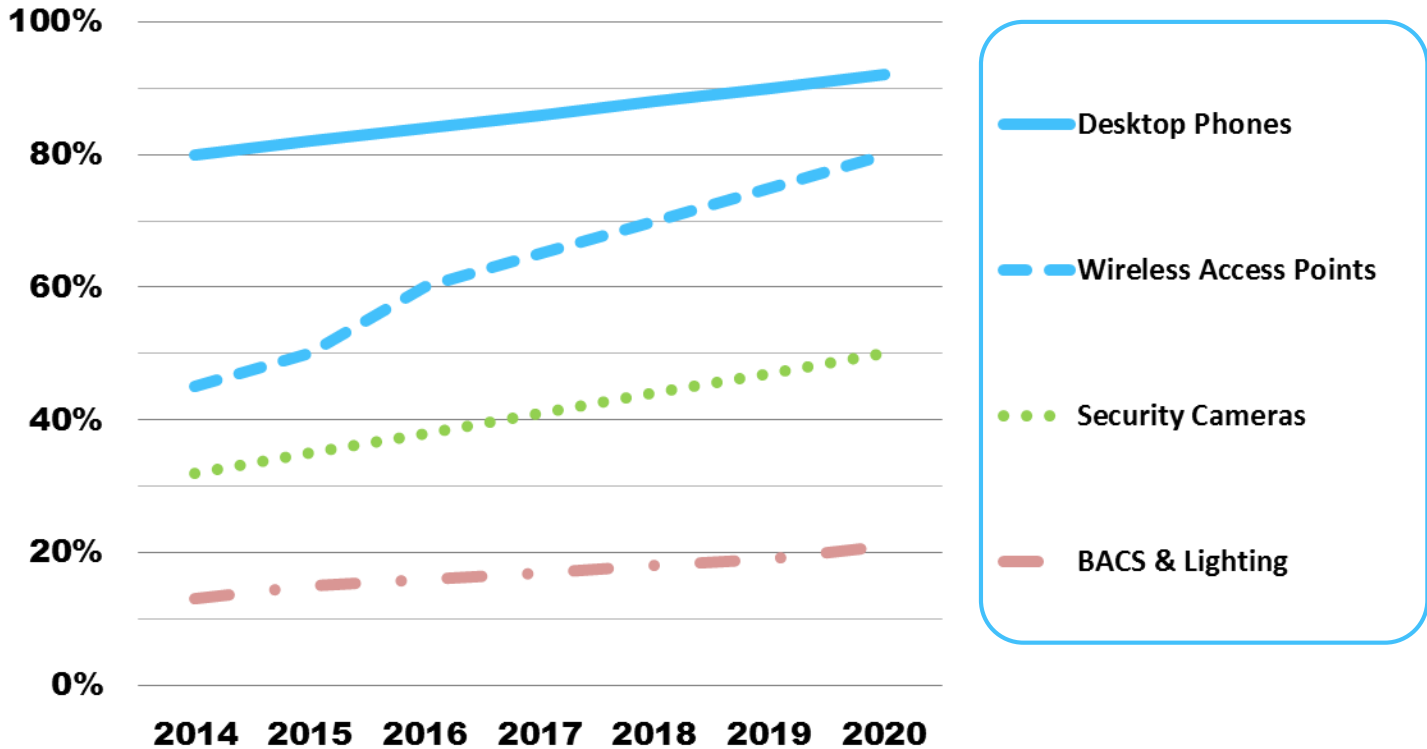
IT Converged vs Stand-Alone Systems (% Share by Value), North America



BSRIA, 2015



Power-over-Ethernet Adoption



BSRIA, 2015



Evolving Usage Patterns



2000s

- 100M NIC over 1G Cabling
- 1 desktop dedicated user
- Sporadic use

- Underutilized capacity of cabling systems



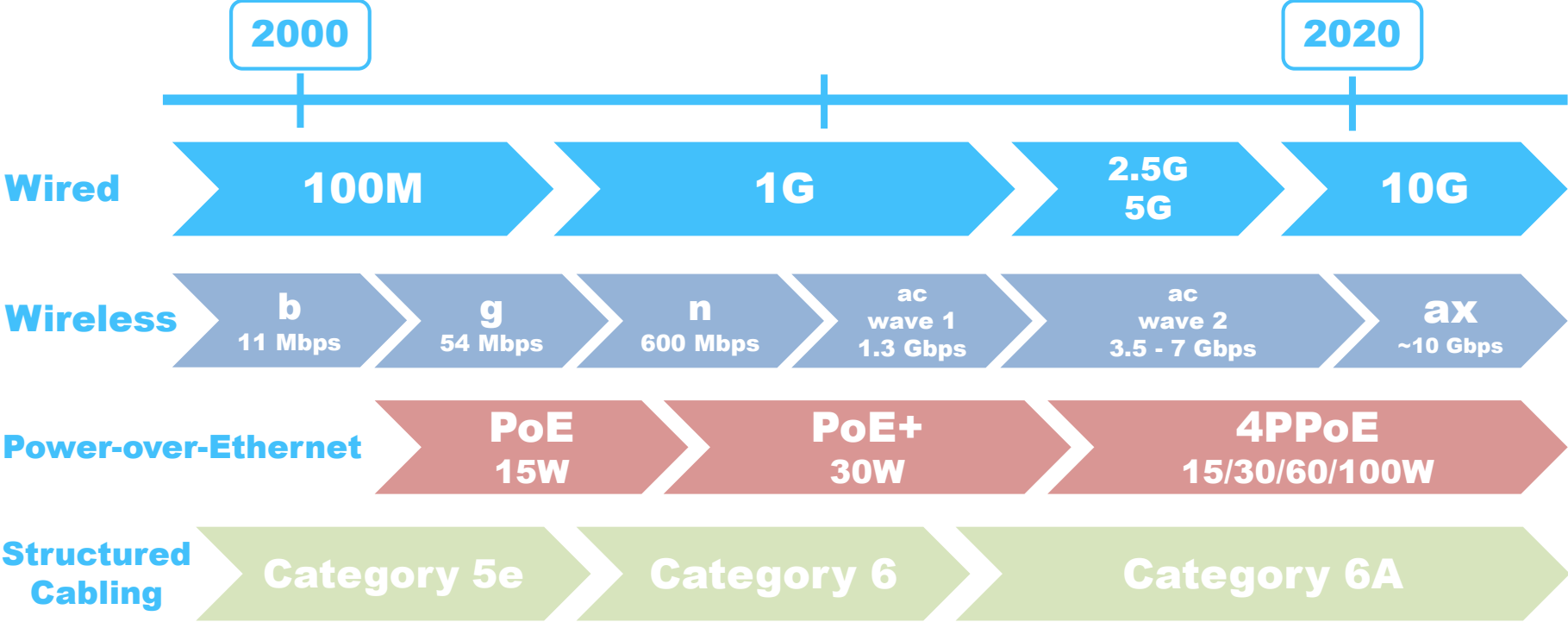
2020

- 5G/10G WAP Uplink
- Multiple users per WAP
- Remote powering up to 100W
- Constant use

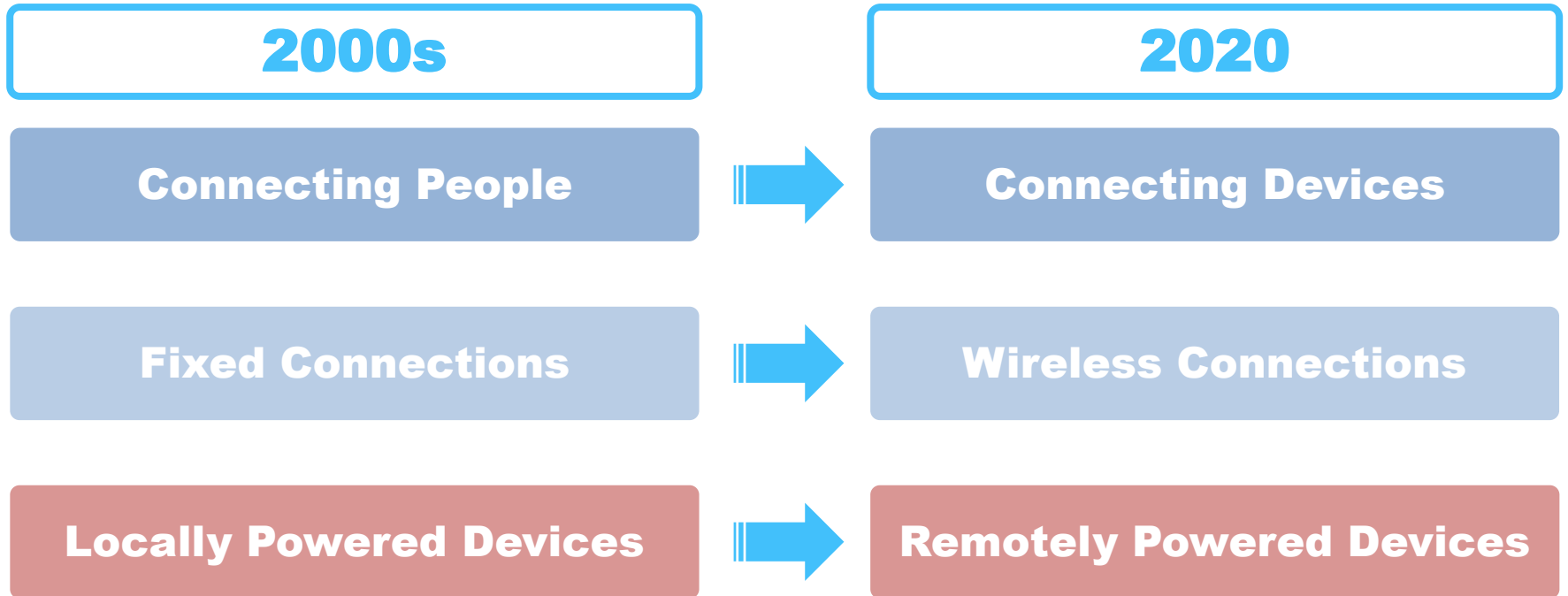
- More demanding applications
- Higher performance cabling required



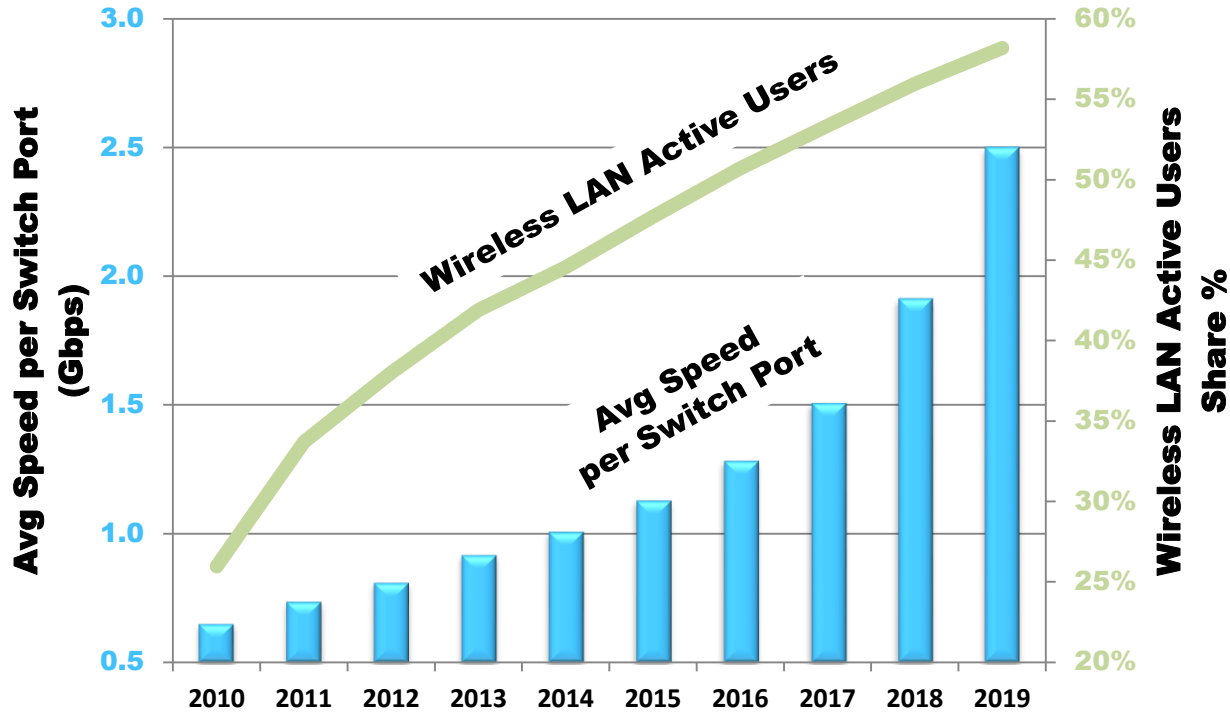
Synergy in the LAN



New LAN on the Rise



LAN Speed Migration



LAN Speed Increase

2.5x from 2015 to 2019

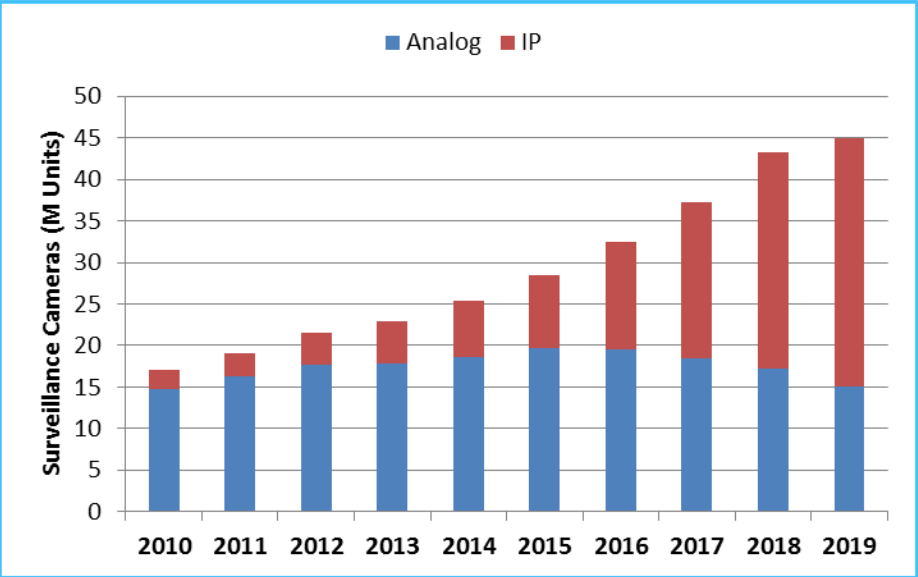
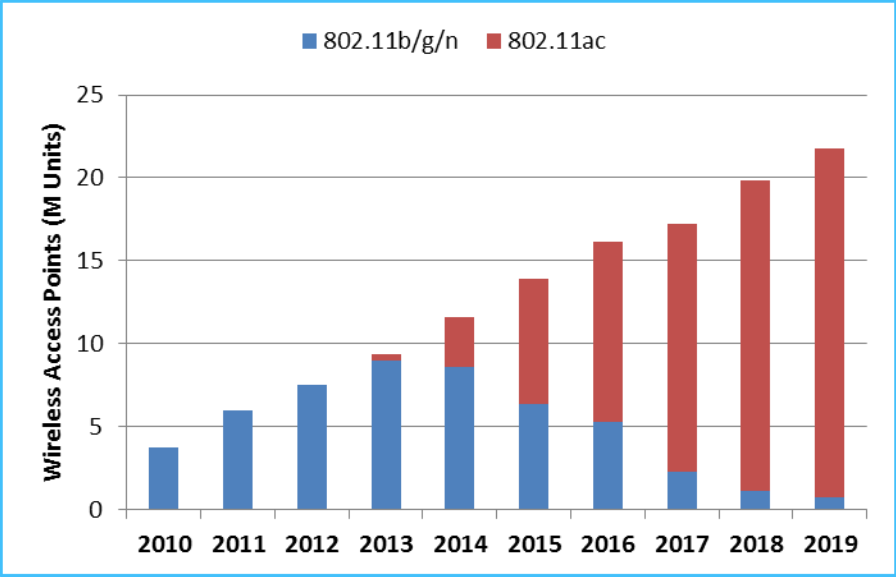
Fueled by
Multi-Gigabit WiFi

Wireless LAN Active
Users Growth Outpacing
Wired LAN

Dell'Oro, 2015



More End Devices

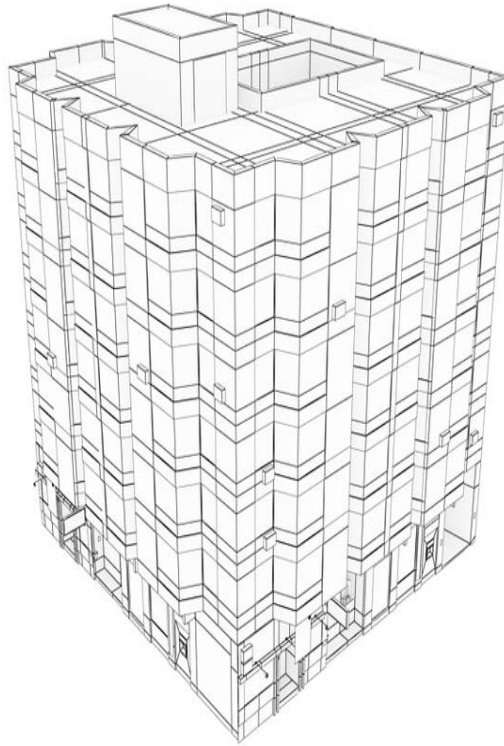


... and More Devices



CommAV

- Monitors
- Signage
- Displays



Building Management

– Gateways ...

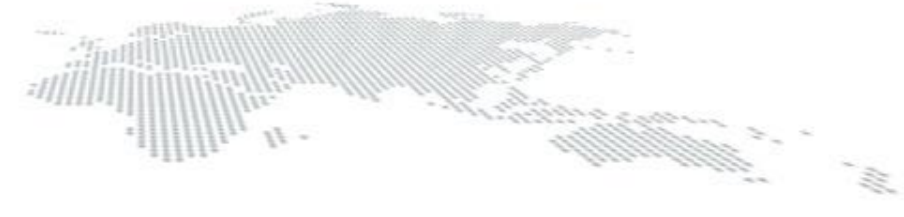
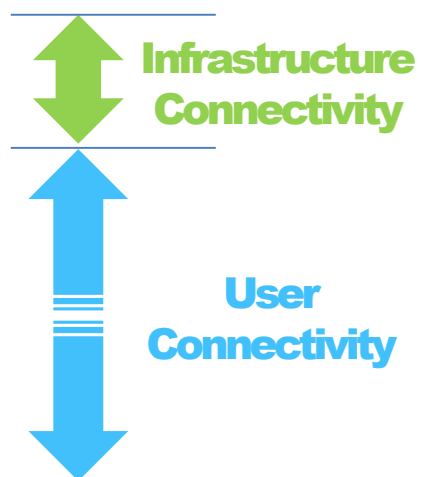
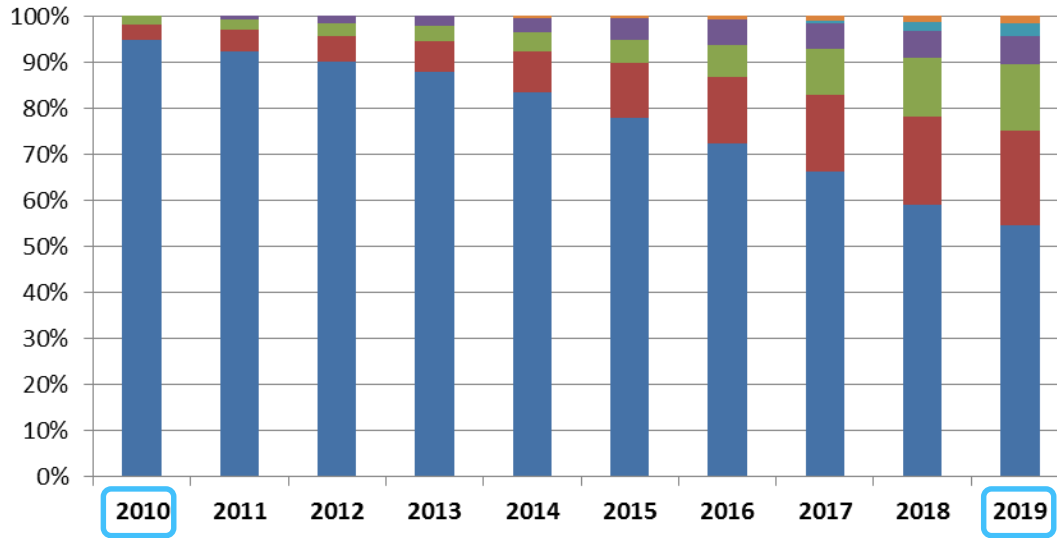
- Access controls and monitoring
- Occupancy sensors
- Emergency notification
- Energy management
- HVAC

Application Mix Shift



Enterprise Mix %

■ Desktop LAN ■ Wireless LAN ■ Security ■ Comm AV ■ LED Lighting ■ BAS



Converging Enterprise Networks



User Connectivity

Desktop
Data & Voice

WiFi

Infrastructure Connectivity

Security

AV

Lighting &
Building
Management

..... **Digital Infrastructure**

New Deployment Strategies



Planning / Provisioning

- People and devices
- Dedicated link
vs. area coverage
- From walls to ceilings

Future Proofing

- Initial deployment
vs. future MACs
- Bandwidth
- Power delivery

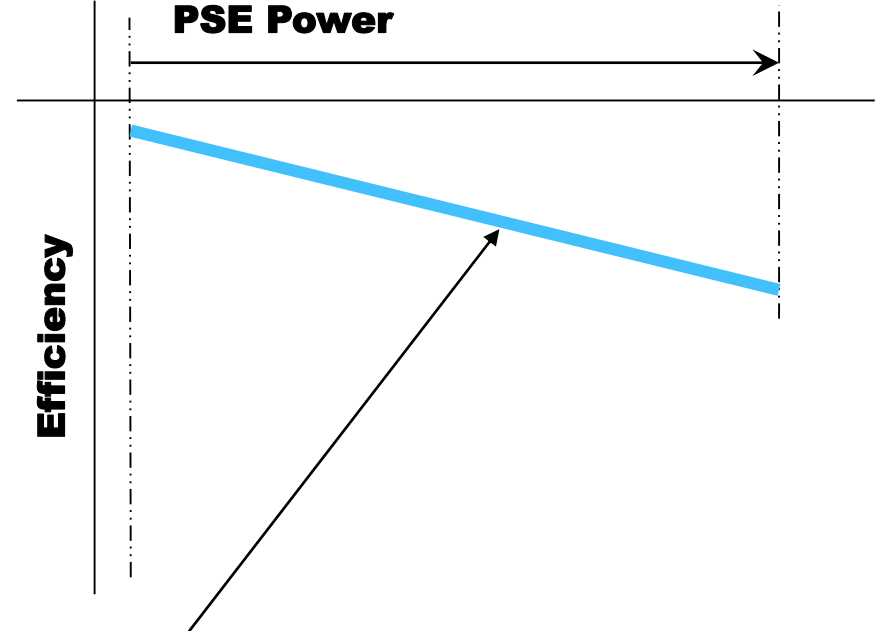
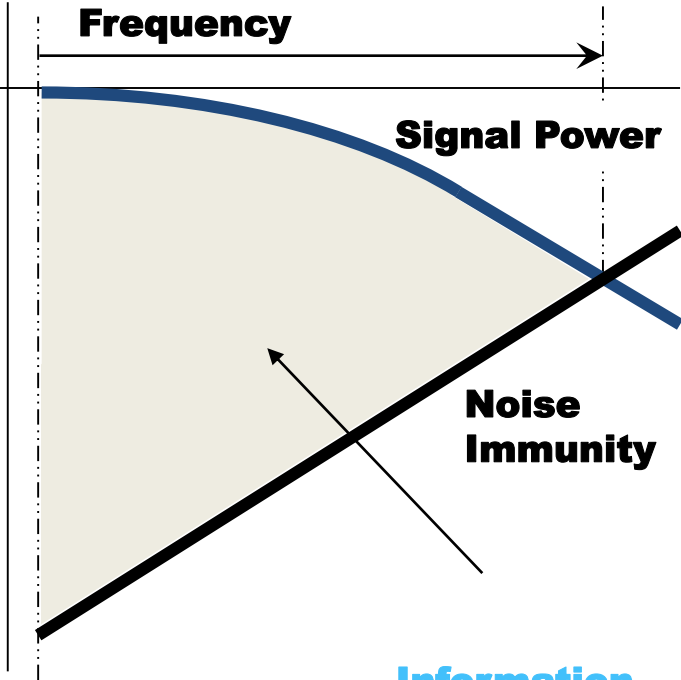
Connectivity Options

- Field termination
- Direct-connect
- Pre-term

Universal RJ45 Connectivity

- Discrete jacks
- Field plugs
- Coupler

Cabling Performance



Information Capacity

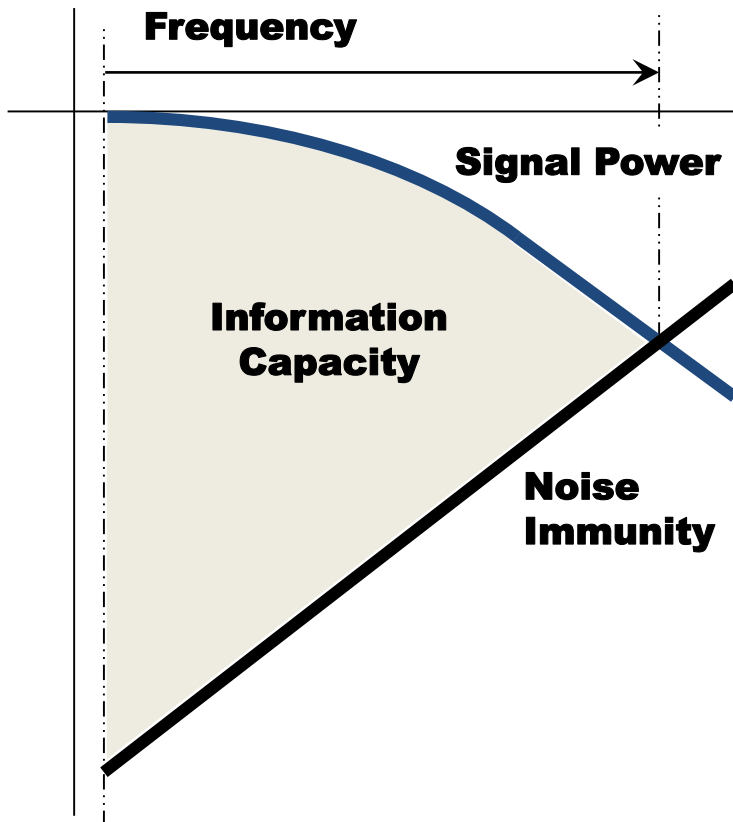
+

Power Delivery Efficiency

=

New Cabling Performance

Maximum Performance and Reliability



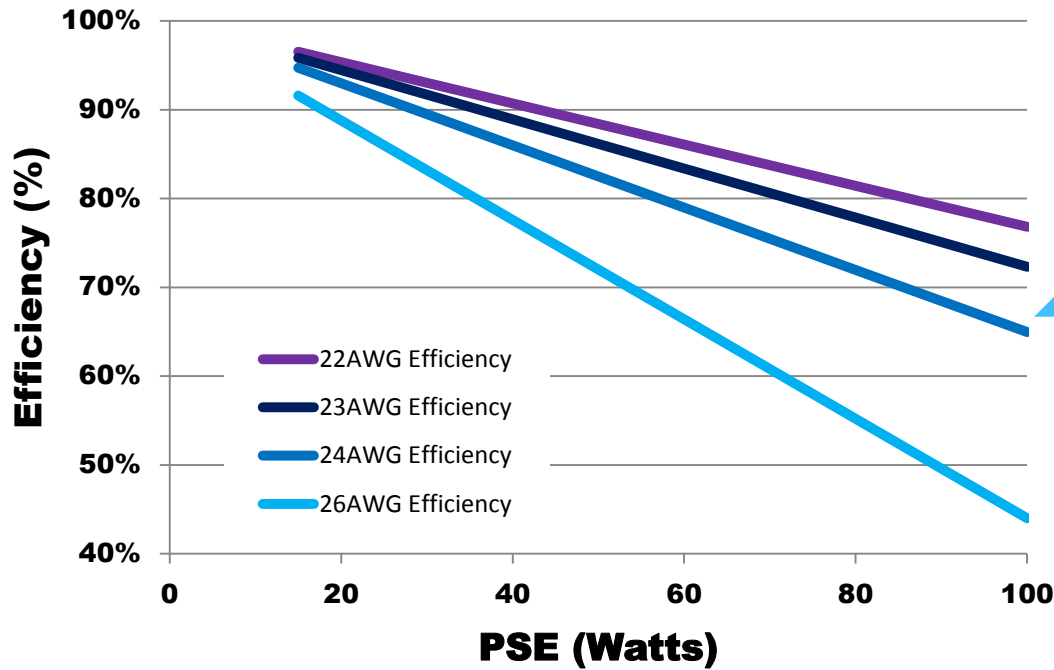
Increased bandwidth

Better RL leads to less reliance on the PHY echo cancellation algorithms

Better NEXT leads to less reliance on the PHY digital signal processing

Less reliance on the computational power of the PHY means a **more reliable data transmission**, more channel up-time, and even lower power consumption

Power is the New LAN Signal



↑ **Wire Diameter**
↓ **DCR**

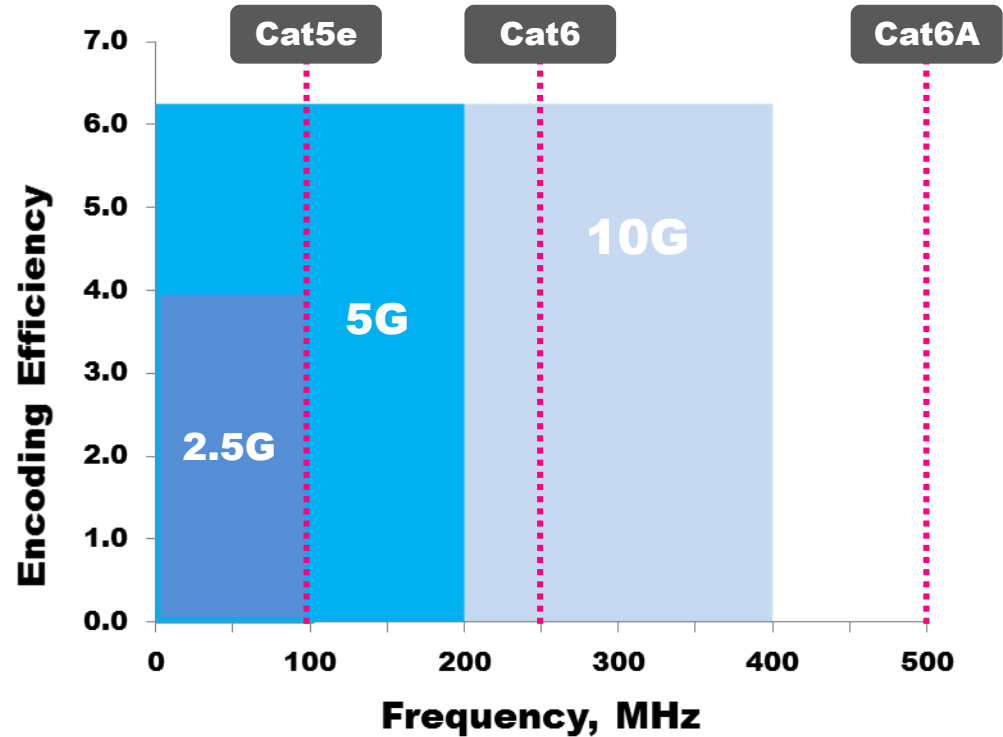
↑ **Wire Diameter**
↑ **Efficiency**

↑ **Wire Diameter**
↓ **Power Delivery Cost**

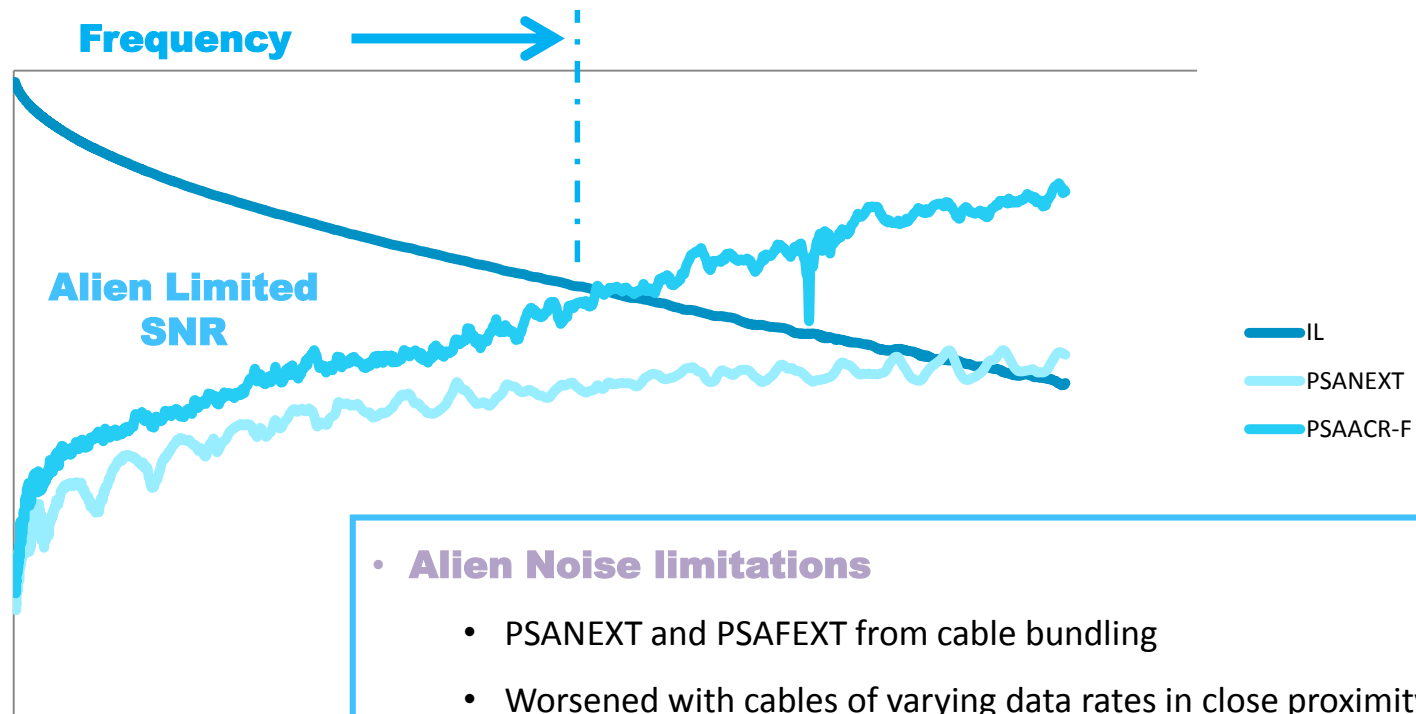
Why Use Higher Performance Category Cable?



Category cabling can supply the frequency spectrum required to support the internal parameters of a **single** channel



2.5G/5GBASE-T Cabling Requirement



- **Alien Noise limitations**

- PSANEXT and PSAFEXT from cable bundling
- Worsened with cables of varying data rates in close proximity

- **Alien Noise minimized with Category 6A cabling**

Using PSANEXT to Estimate SNR



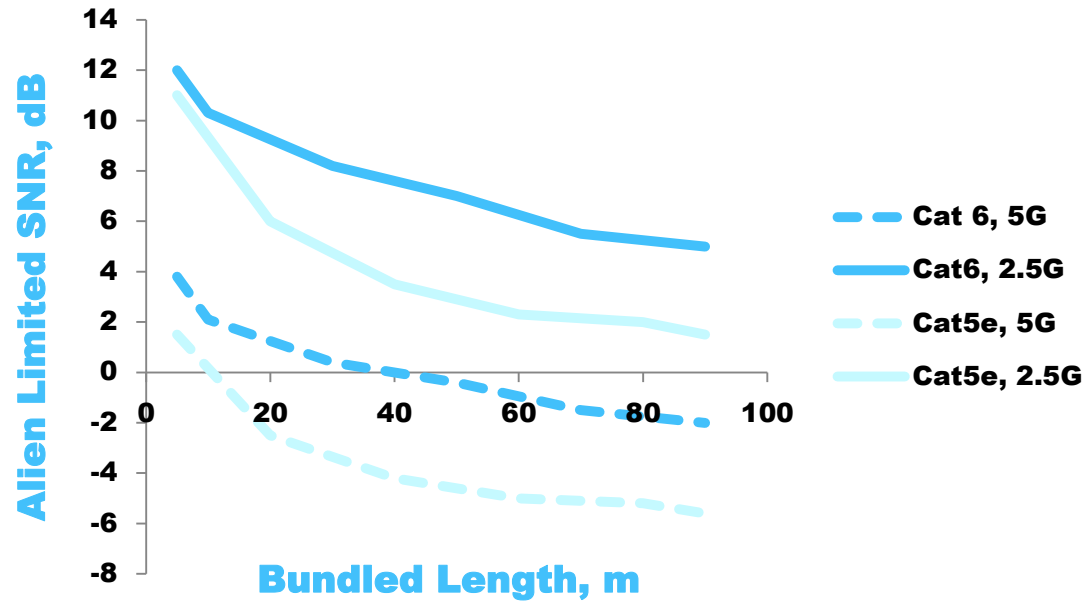
Risk of Low SNR



100m Channels



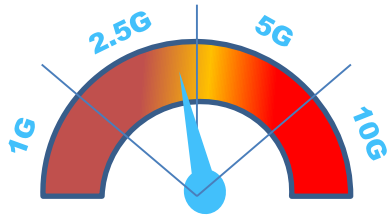
Victim Surrounded by Aggressors



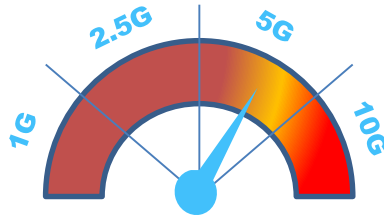
Cabling for Gigabit Wireless



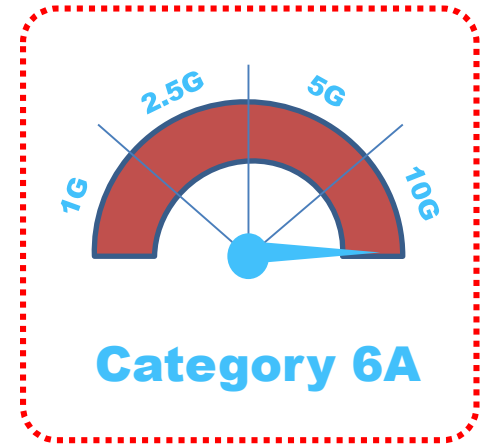
WAP Uplink Speed



Category 5e



Category 6



Category 6A

**Multi-Gigabit
Full Implementation**

TIA Cabling Infrastructure Standards



Category 6A is the recommended cabling media for new installations

Category 6A is the best suited cabling media to support emerging applications



Commercial Premises*
TIA-568.0-D



Wireless Access Point
TSB-162-A



IEEE 802.11ac
Wave 2



IEEE 802.3bz
2.5G/5GBASE-T



Educational Facilities
TIA-4966



Healthcare Facilities
TIA-1179



IEEE 802.3bt
4PPoE Type 2, 3 & 4



Intelligent Building
TIA-862-B



Data Centers
TIA-942-A



IEEE 1191.2
HDBaseT 2.0



IEEE 802.3an
10GBASE-T



What About Category 8?



New TIA standard in development

- Shielded balanced twisted pair copper
- RJ45 connectivity
- Maximum reach of 30 meters



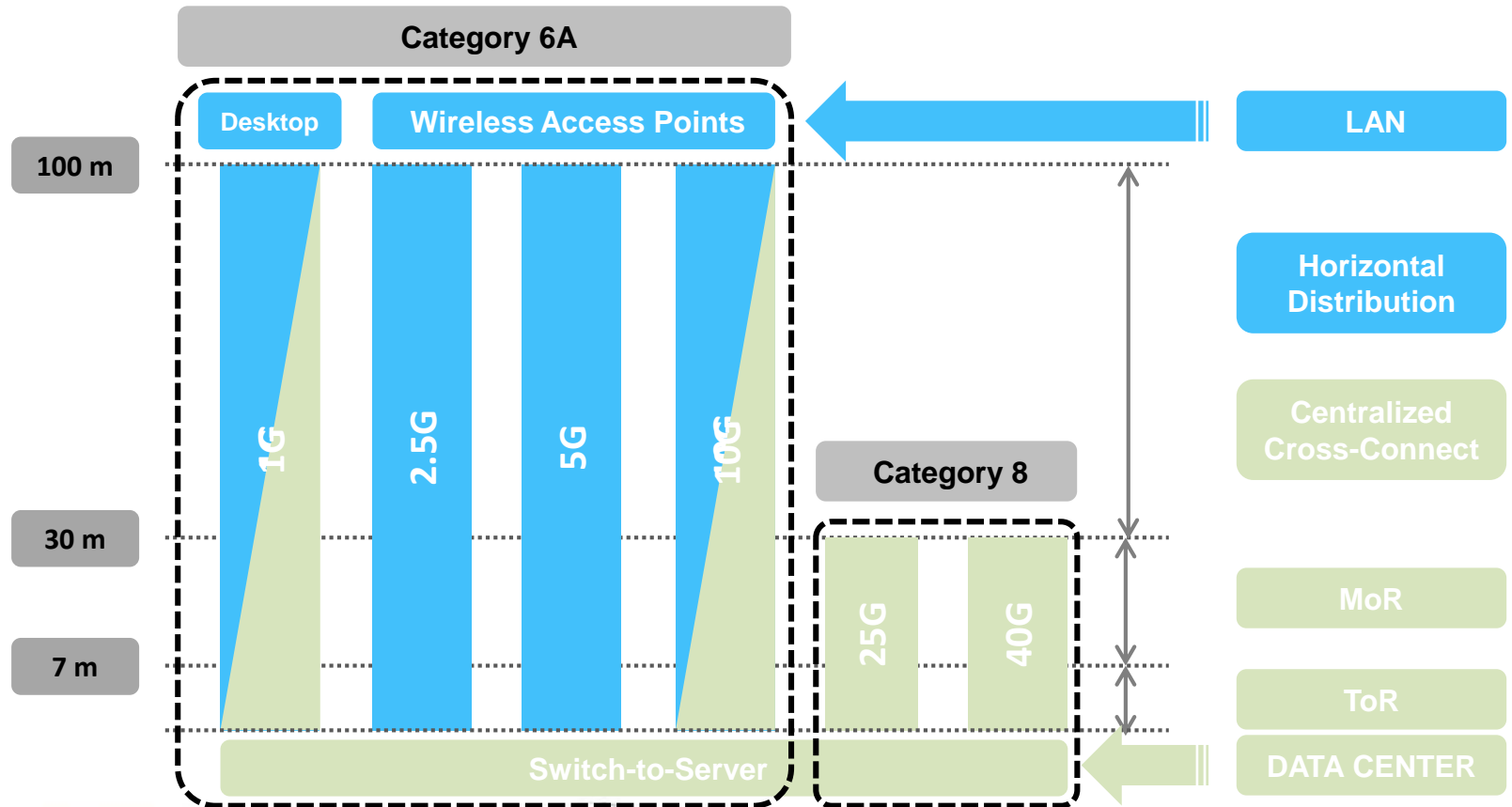
Data Center Applications

Switch to Server links
ToR, MoR

25/40

To support 2 new upcoming
Ethernet protocols

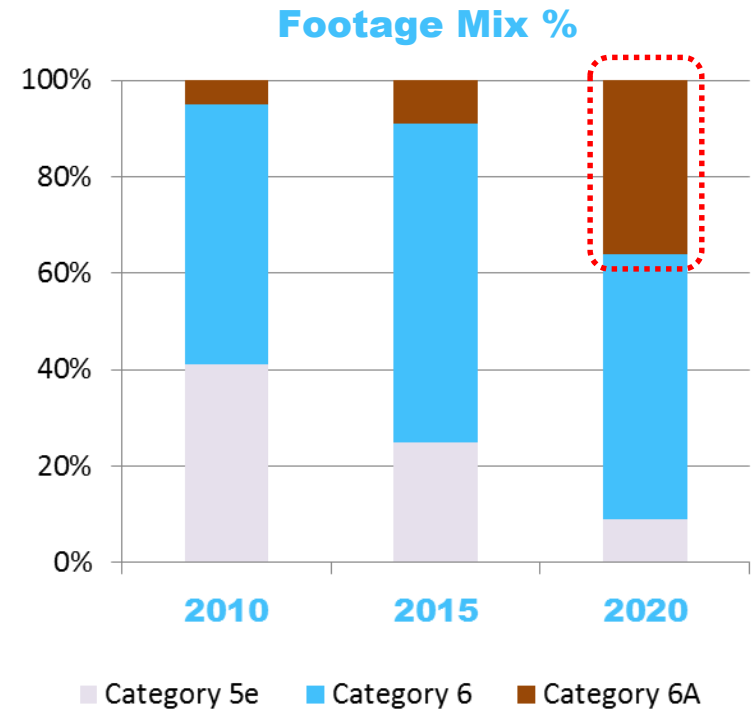
BASE-T Applications



Category Cabling Lifecycle



Standard	Bandwidth	Max. Throughput	TIA Recommendation
Category 5e	100 MHz	1G (2.5G*)	Legacy
Category 6	250 MHz	1G (5G*)	Minimum
Category 6A	500 MHz	10G	Recommended
Category 8*	2 GHz	25/40G	Data Center Switch to Server



Summary



User Connectivity

Enterprise Wireless is becoming a dominant user connectivity application



Infrastructure Connectivity

Enterprise Infrastructure applications require LAN connectivity to unlock their full benefits



The **Digital Infrastructure** will be the backbone of the **New Convergence in the Enterprise**



Enterprise LAN

Digital Infrastructure

Applications

Power-over-Ethernet

Wireless

HDBaseT

Security

Ubiquitous Systems

Performance Metrics

Deployment Strategies

Distribution

Category 6A

Backbone

OM4 / OS2



Belden Recommendations



Enterprise Data Center

Efficiencies

Optimized Integration

Connectivity

Power Management

Thermal Management

Migration Strategies

Access: 1G to 10G

Aggregation: 10G to 40G

Access

Category 6A

Aggregation

OM4 / OM5 / OS2



GET CONNECTED

Join the conversation with our industry experts.

Go to www.belden.com

Installing Category 6A: The Future is Now

Blog Category: Data Centers
Posted by: Stéphane Bourgeois on April 09, January 27, 2017

Category 6A twisted-pair copper received much attention when it first hit the marketplace in 2005. But adoption has been slow, since the 10 gigabit per second (Gb/s) capacity of Category 6A exceeds the requirements of most LAN applications. However, times are now changing. Data rates in the enterprise continue to climb. More devices than ever are being connected. Emerging applications demand higher performance and faster speeds. And those trends haven't escaped the notice of industry standards bodies.



PoE Types: What They Mean and How They're Used

Blog Category: Enterprise Networking
Posted by: on August 19, 2016

PoE can enable fast installation and deployment, lower operating costs and maximum reliability for today's enterprise networks. As PoE changes to meet growing technology and application requirements, it is being classified by classes. PoE devices, on the other hand, are categorized by type depending on their power requirements. The difference between PoE "types" and "classes" can sometimes cause confusion when talking about PoE applications and capabilities.

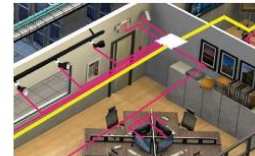
In this blog, we offer a breakdown of the four PoE types – Type 1, Type 2, Type 3 and Type 4 – and where they're used, along with other terms used to describe them.



LAN Connections On the Move: From the Wall to the Ceiling

Blog Category: Enterprise Networking
Posted by: on July 15, 2016

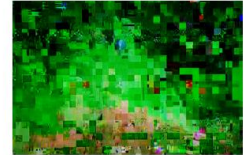
LAN connections are on the move. Where they once resided in the walls of our buildings, they're now relocating to the ceiling. With cabling and wiring located horizontally overhead, devices can connect to it there vs. at a LAN connection point on the wall.



What You Need to Know About Alien Crosstalk Today

Blog Category: Enterprise Networking
Posted by: Ron Telias on January 27, 2017

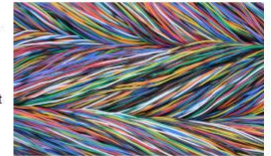
The industry has been predicting the growth of 10GBASE-T for years, and it's finally happening. More networks are planning 10G migrations. Why? Due to demand from more advanced devices, users and applications.



The Negative Impacts of Cable Temperature Rise

Blog Category: Enterprise Networking
Posted by: on September 02, 2016

Devices designed to connect directly to networks require increased power delivery through network cables. To grow the number of devices that can be powered by PoE, available power from the current must be increased – and the amount of heat generated within the network cable must increase as well. Cable temperature rise that is too high can ultimately push cables beyond their rated temperatures, reducing performance and reliability (and causing potential damage to the cable itself).



In this article, learn why cable temperature rise matters, how to reduce the heat, and where LP cables fit in.

Breaking News: TIA Recognizes Direct-Connect Termination Method

Blog Category: Enterprise Networking
Posted by: Ron Telias on February 10, 2017

This week, the industry received some big news: The TIA TR-42.7 subcommittee agreed to include modular plug terminated links (also known as "direct connect") in a TIA-568.2-D normative annex. The annex provides guidance to IT professionals to ensure a proper direct-connect cabling arrangement. Several Belden staff are closely involved with the Telecommunications Industry Association (TIA), holding many leadership positions within the organization.



BELDEN

SENDING ALL THE RIGHT SIGNALS

Follow Us:

Belden.com



[You Tube](#)