Ensuring Infrastructure Readiness Across Smart Building Technologies

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Webinar Speakers

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Agenda

NBASE-T Overview	Peter
Who is AEM	Lisa
The Modern Network Infrastructure	Lisa
New Testing Considerations	Lisa
Wrap-up & Discussion	Lisa/Peter

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NBASE-T Alliance

- NBASE-T Alliance (www.nbaset.org/)
  - Vendor alliance for 2.5G/5G BASE-T
- Who are we?
  - Member companies representing all areas of network infrastructure including components, silicon, systems, cabling, testing equipment
- What are we doing?
  - Educate the market about multiple NBASE-T applications, enable widespread deployment, facilitate interoperability and build the market
- Looking for NBASE-T products?

  https://www.nbaset.org/technology/nbaset-products/

Promoters

Contributors

Adopters

Liaisons

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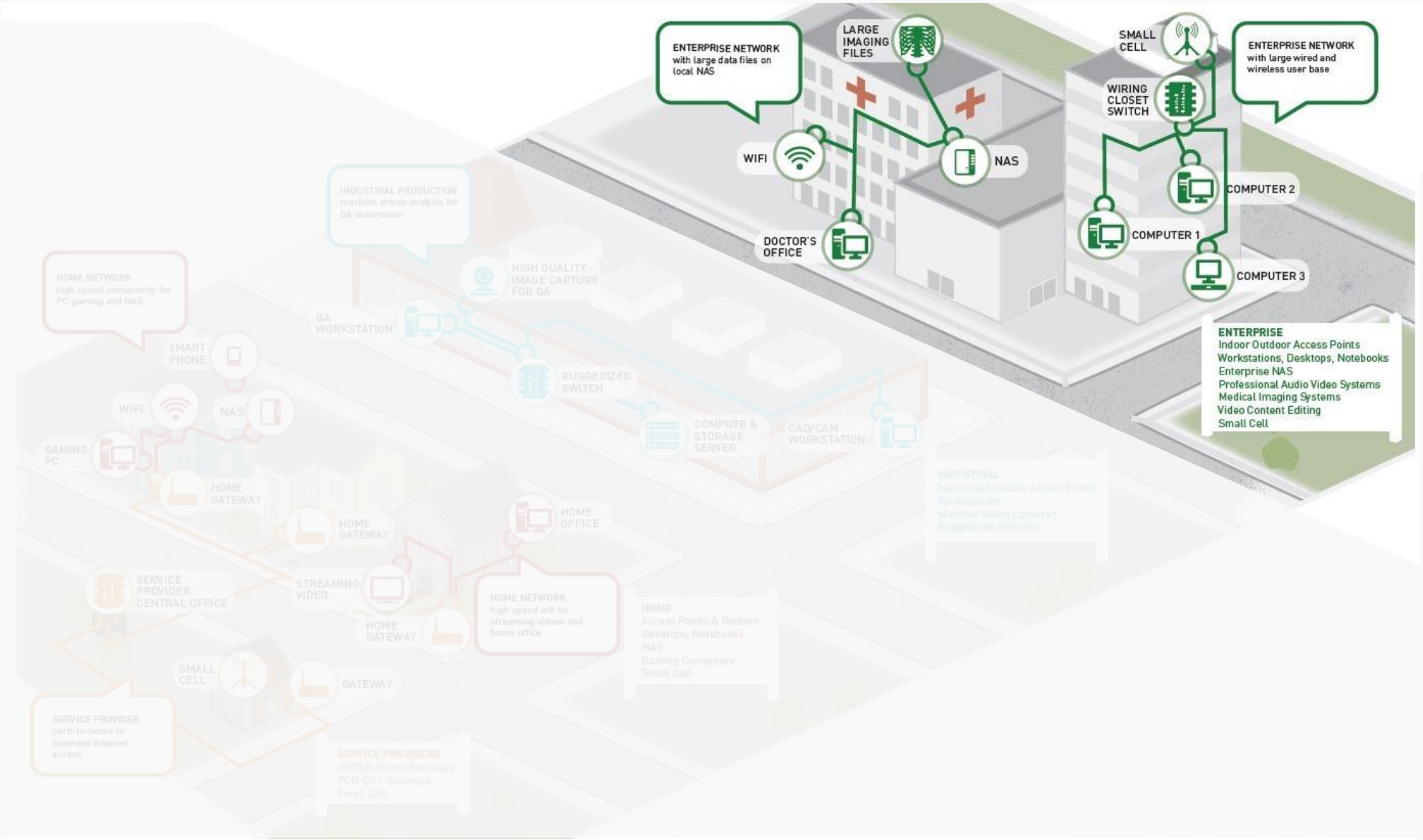
NBASE-T Application Areas



Enterprise:

- Switch
- Wireless AP
- Desktop
- Storage
- Small Cell

Industrial:

- Switch
- Wireless AP
- Workstation
- Storage
- Compute
- Machine Vision

Home:

- Switch
- Wireless AP
- Storage Server
- Home Gateway
- Streaming Media

Service Provider:

- Small Cell
- Home Gateway

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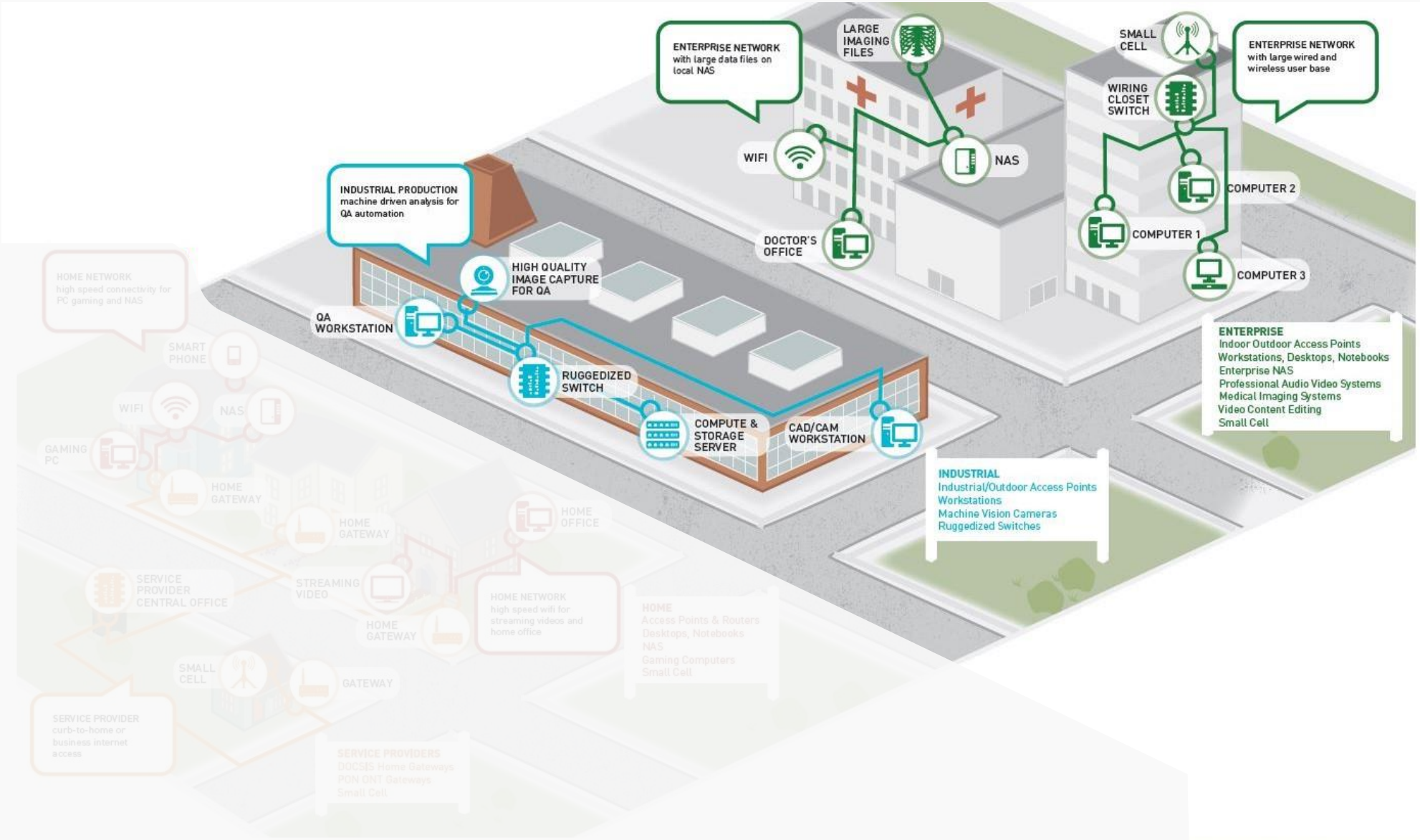
NBASE-T Application Areas



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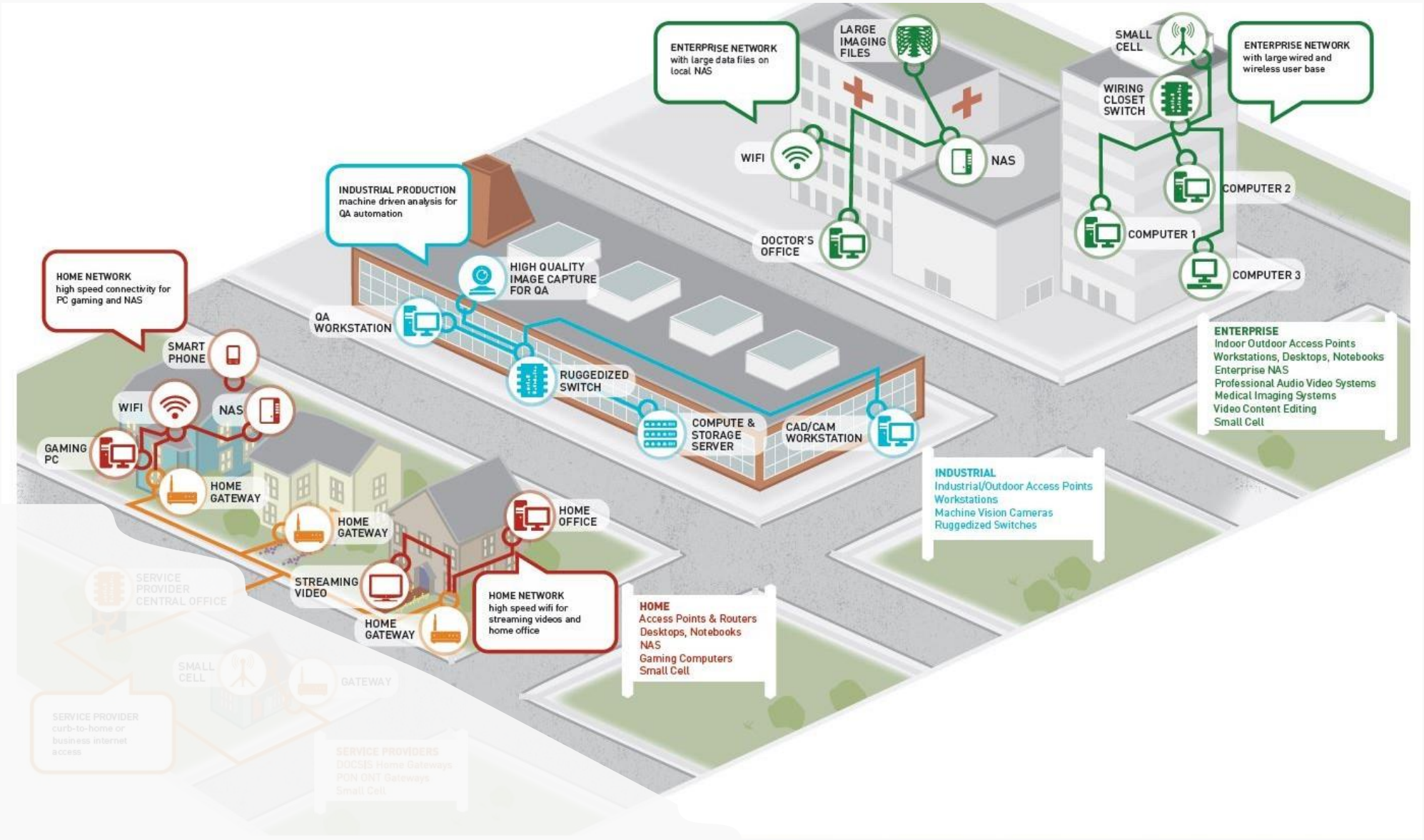

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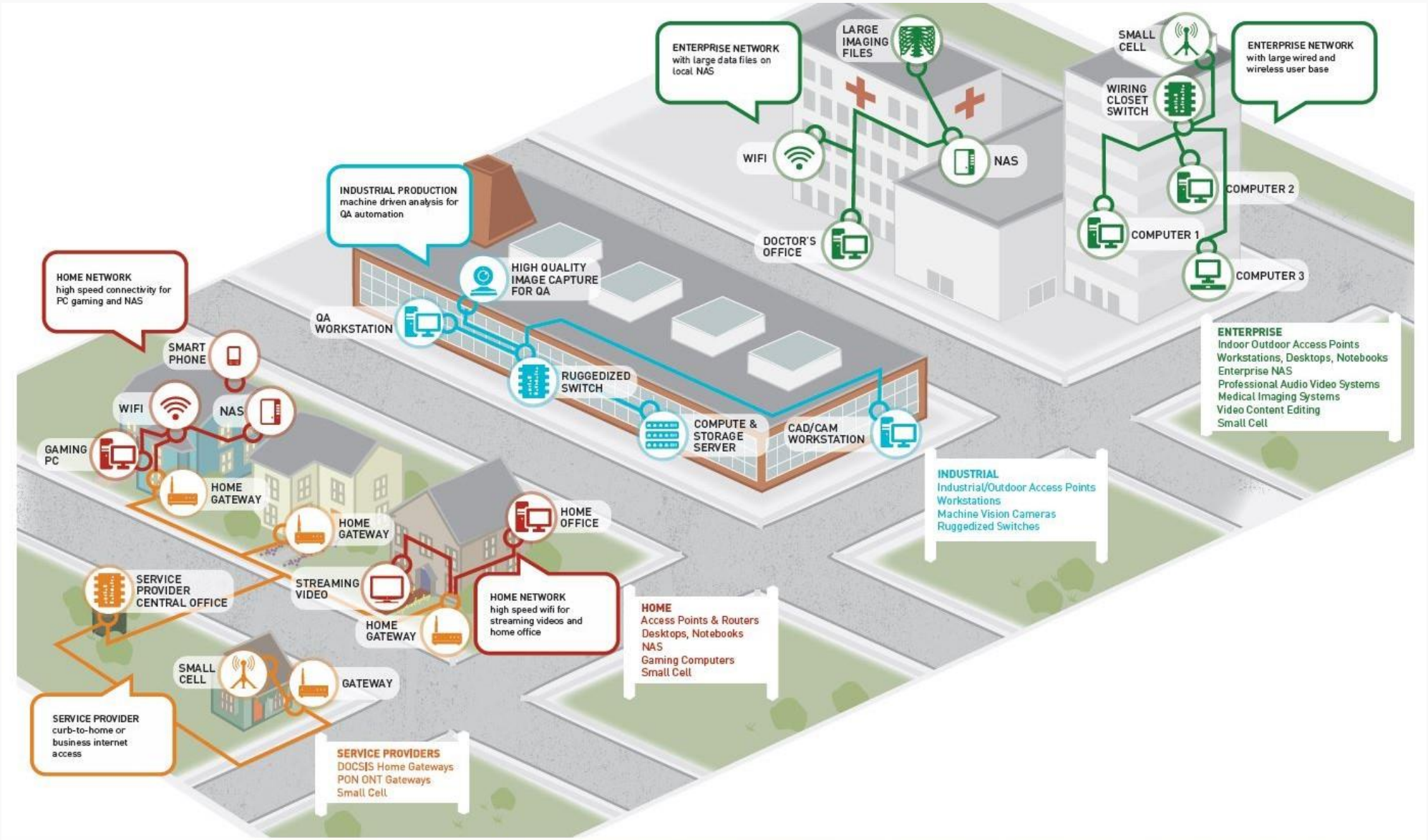

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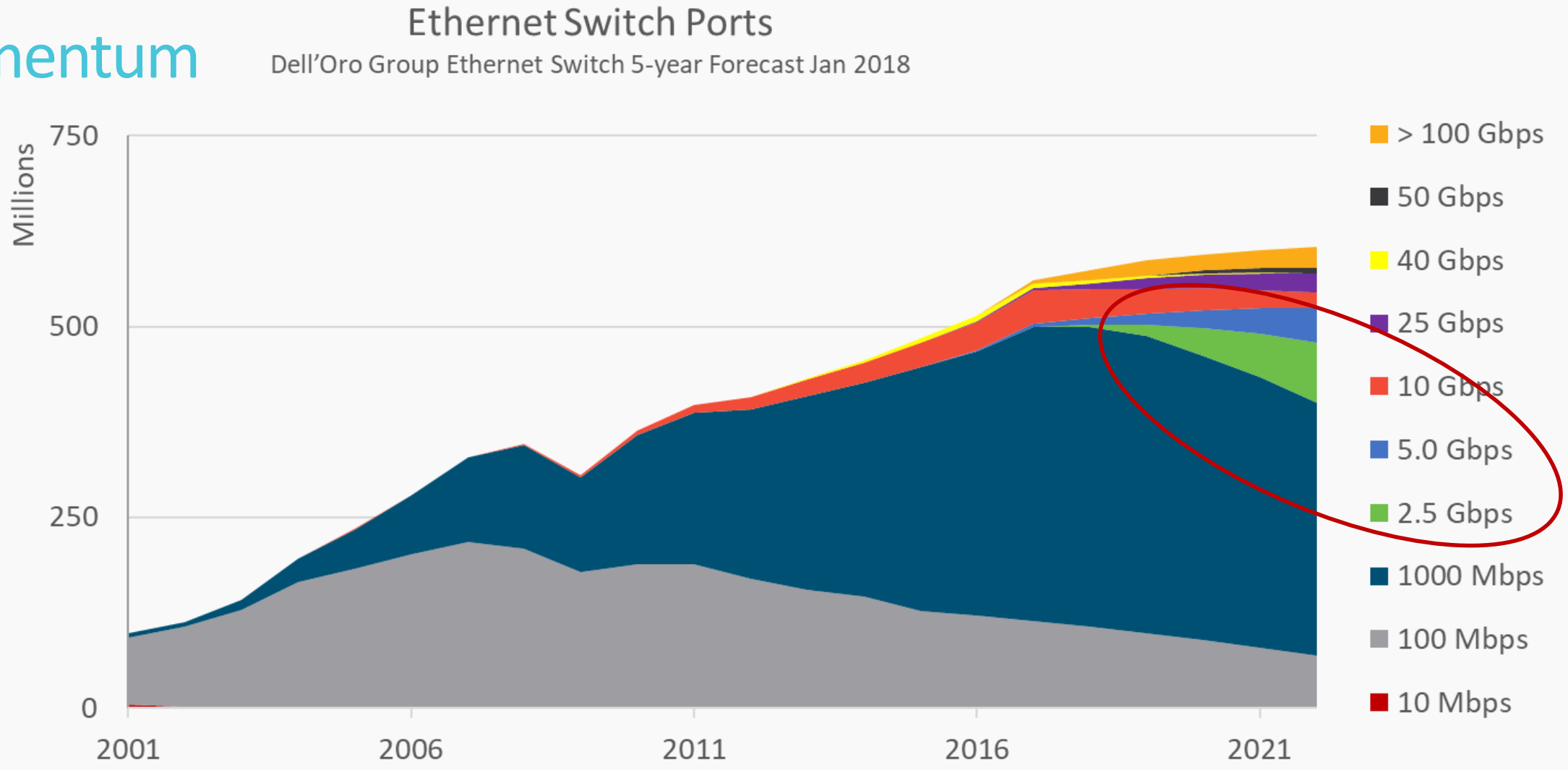
NBASE-T Momentum



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Value of NBASE-T Technology

Leverages 70+ billion meters of Cat5e/Cat6 cables, 1.4+ billion outlets make up 90+% of the installed base

Enables network evolution by providing up to 10x faster speed without pulling cables or requiring building construction

Supports high-speed links to next generation WiFi access points high-data rate client PCs, workstations, machine vision systems, etc

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"NBASE-T technology is significantly impacting the market with the biggest transition we've seen in campus switching since 2000."

- Dell'Oro Group

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Introduction

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About AEM

Profitable global provider of automated handling equipment and test and measurement solutions with $221.6 million in revenue.

- Our solutions power some of the most advanced factories driving the global 5G economy from advanced microprocessors to solar cells, mobile communications and wearables.
- New Test and Measurement solutions for all types of Ethernet from traditional network environments to automotive.
- ISO 9001 certified manufacturer

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AEM Involvement in Global Standardization & Alliance

- Member
  - NBASE-T Alliance
  - OPEN Alliance
  - BICSI
- Active Participation
  - IEEE 802.3 various committees
  - ISO/IEC 11801 committee
    - US and Singapore chapters
  - TIA TR42.7 committee

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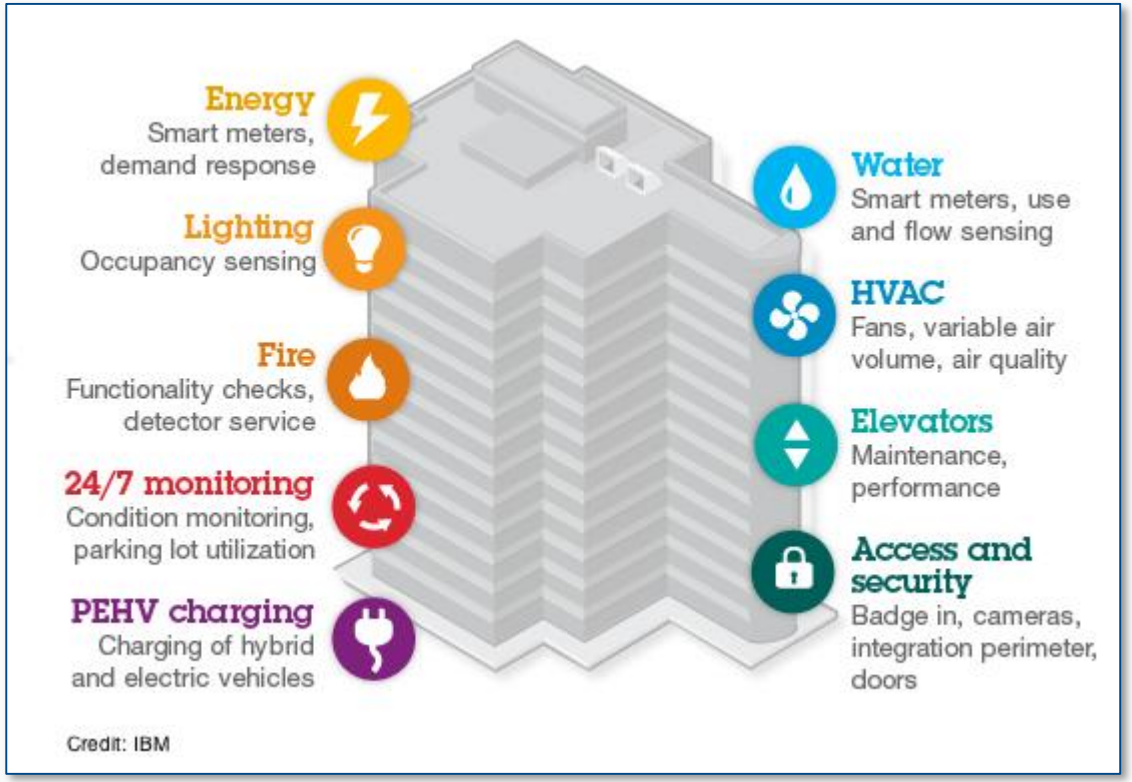
The Digital Building

- Whether it's called Digital, Intelligent, or Smart, these are buildings that combine many disparate building systems into a single platform with the objective to optimizes operations, maintenance and overall cost.



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Solutions for the Digital Age

- Modular platform extends ROI with the ability to use the same platform to ensure infrastructure readiness across Smart Building technologies
  - Multi-gig qualification, PoE validation, and cable certification
- Designed for cable contractors, IT organizations and IoT device installers

2018 Cabling Installation & Maintenance Gold Innovators Awards

ETL LISTED Intertek

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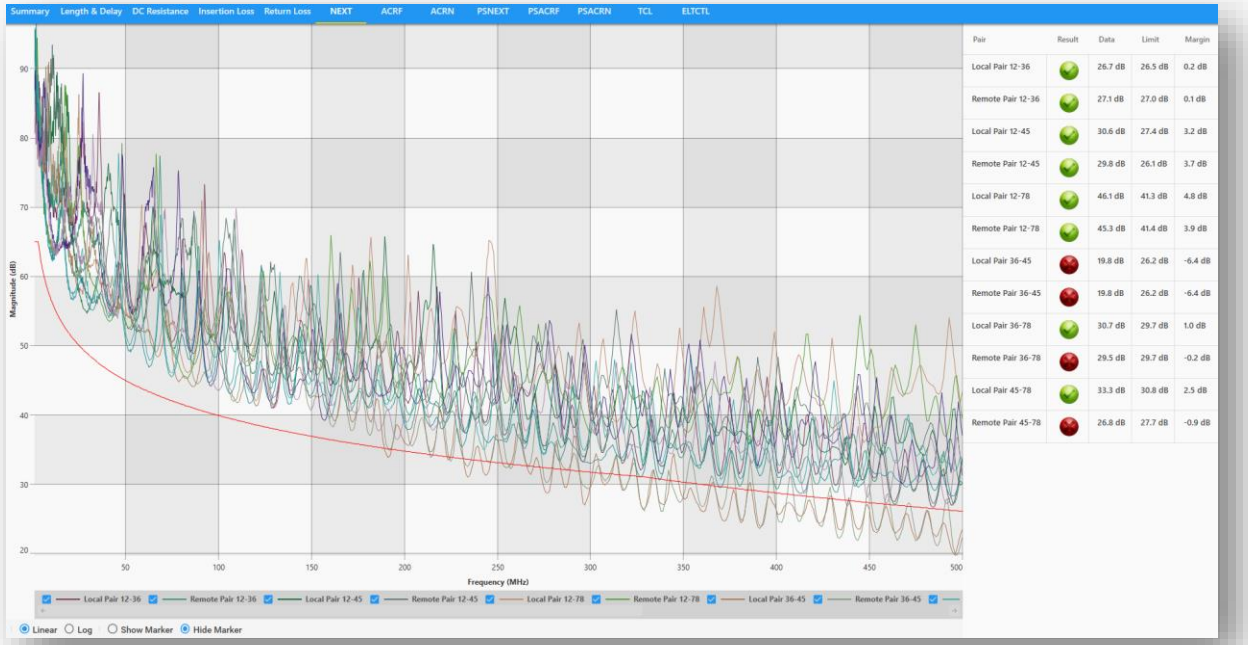
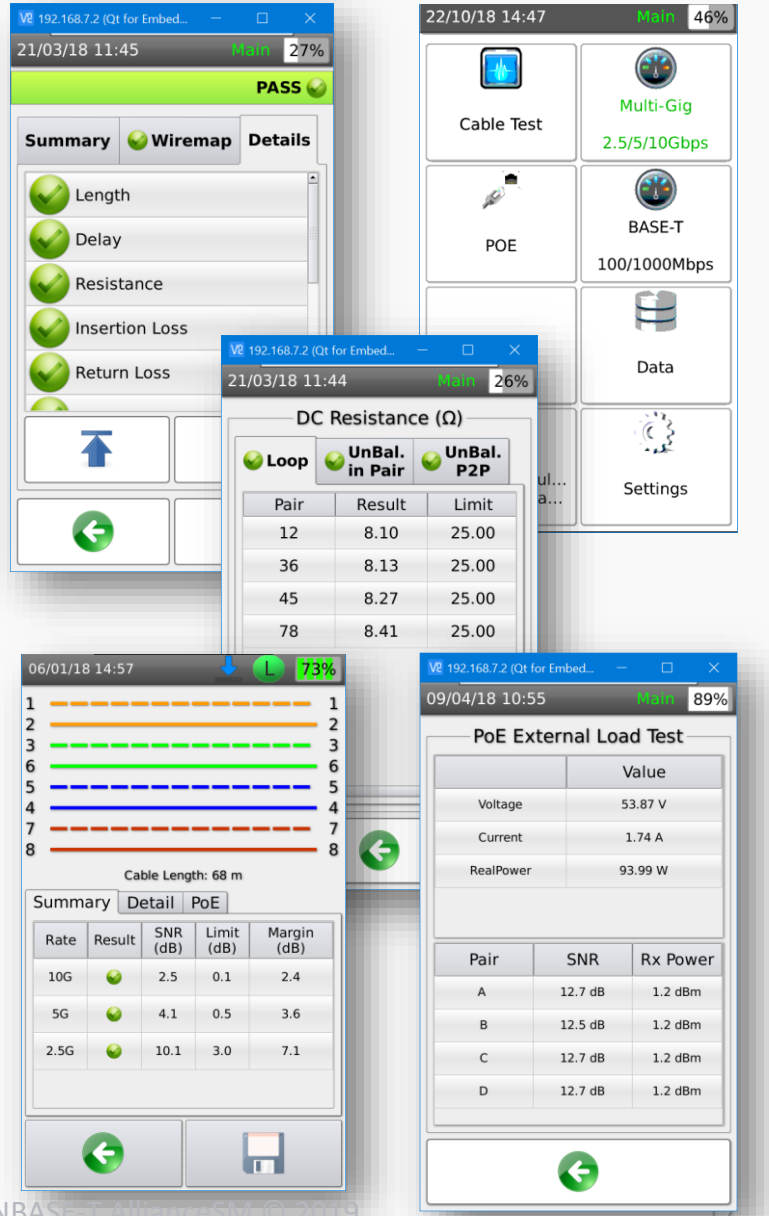
TestPro CV100

- Multi-gig link qualification 1/2.5 /5/10G data rates; SNR and BER
- Loaded PoE testing with support for 802.3af/at/bt
- ETL verified to certify Cat 5e – Cat 8 Level IIG

✓ *Includes TestDataPro results management and reporting software*





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Modern Network Infrastructure

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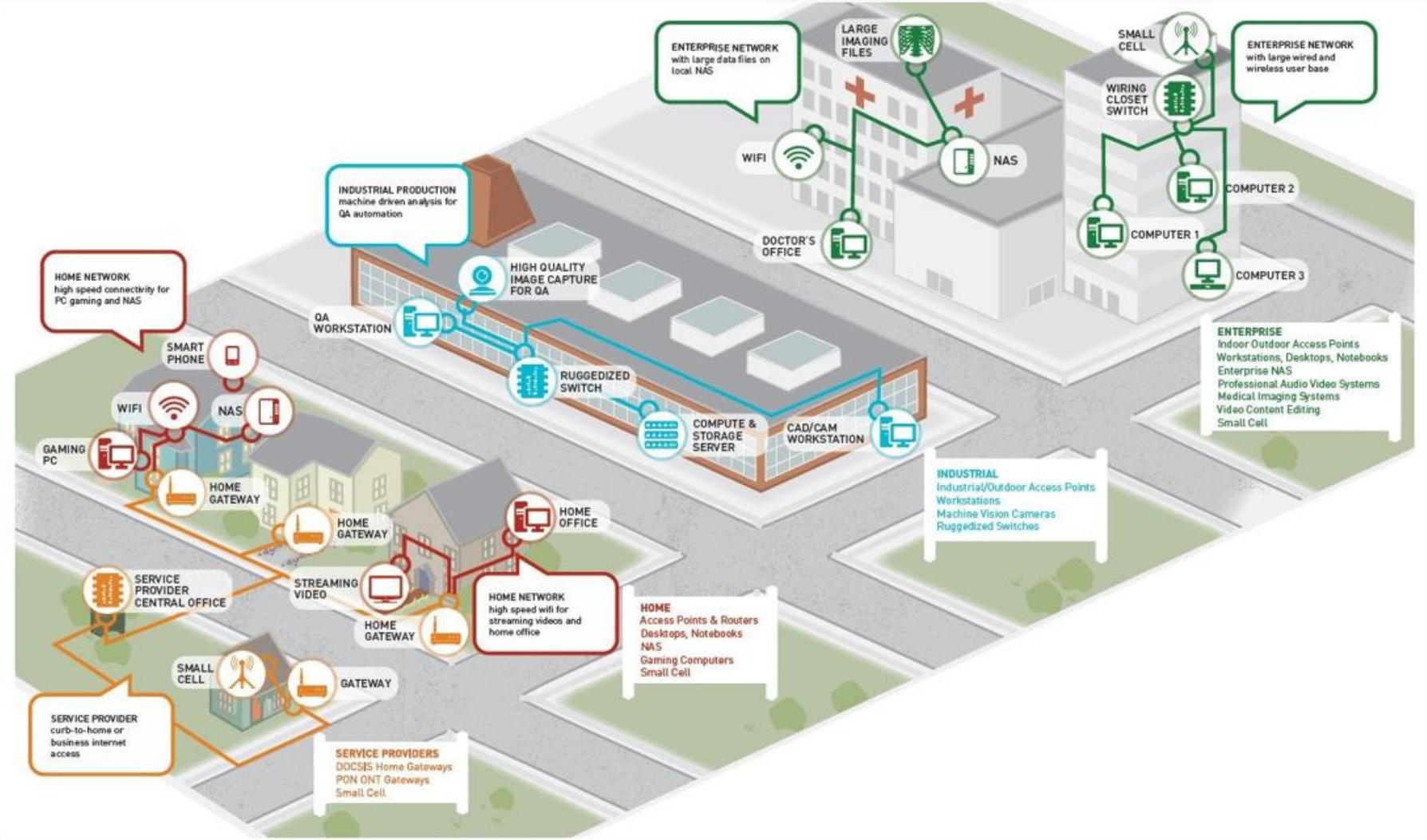
Emerging NBASE-T Device Footprint



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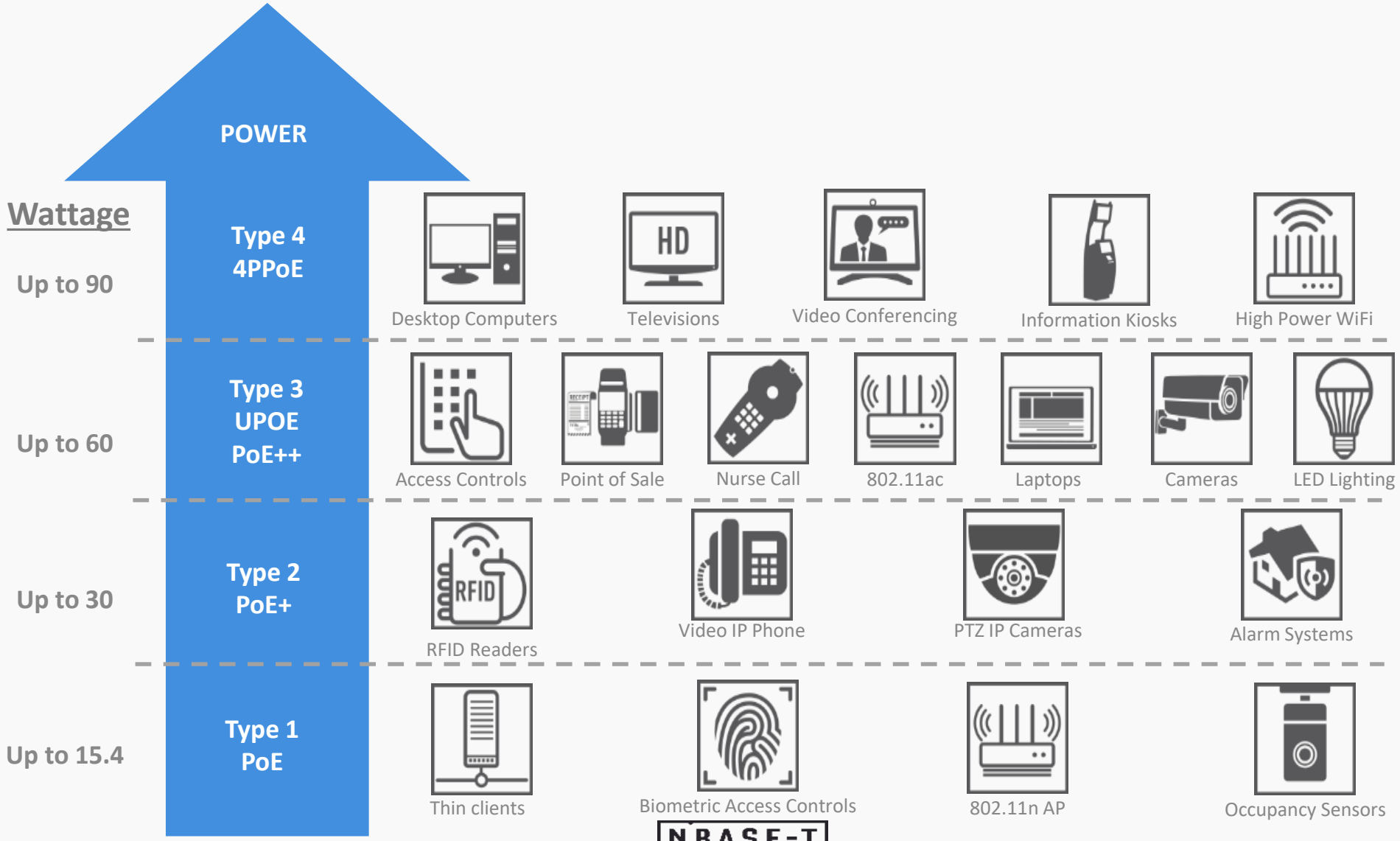
Proliferation of PoE Enabled Devices



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Cabling Infrastructure Factors

Bundled cabling length 0m to 50m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

Bundled cabling length 50m to 75m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

Bundled cabling length 75m to 100m	Category 5e	Category 6	Category 6A
2.5GBASE-T			Assured
5GBASE-T Assured			Assured

ALSNR Risk	High	Medium	Low

- Accommodate substantial installed base of Cat5e and Cat6 to support IoT connected devices such as 802.11ac wireless technologies
- Cat6A was designed such that it is assured to support 2.5G/5G/10G BASE-T

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New Testing Considerations

(PoE, NBASE-T, Physical Infrastructure)

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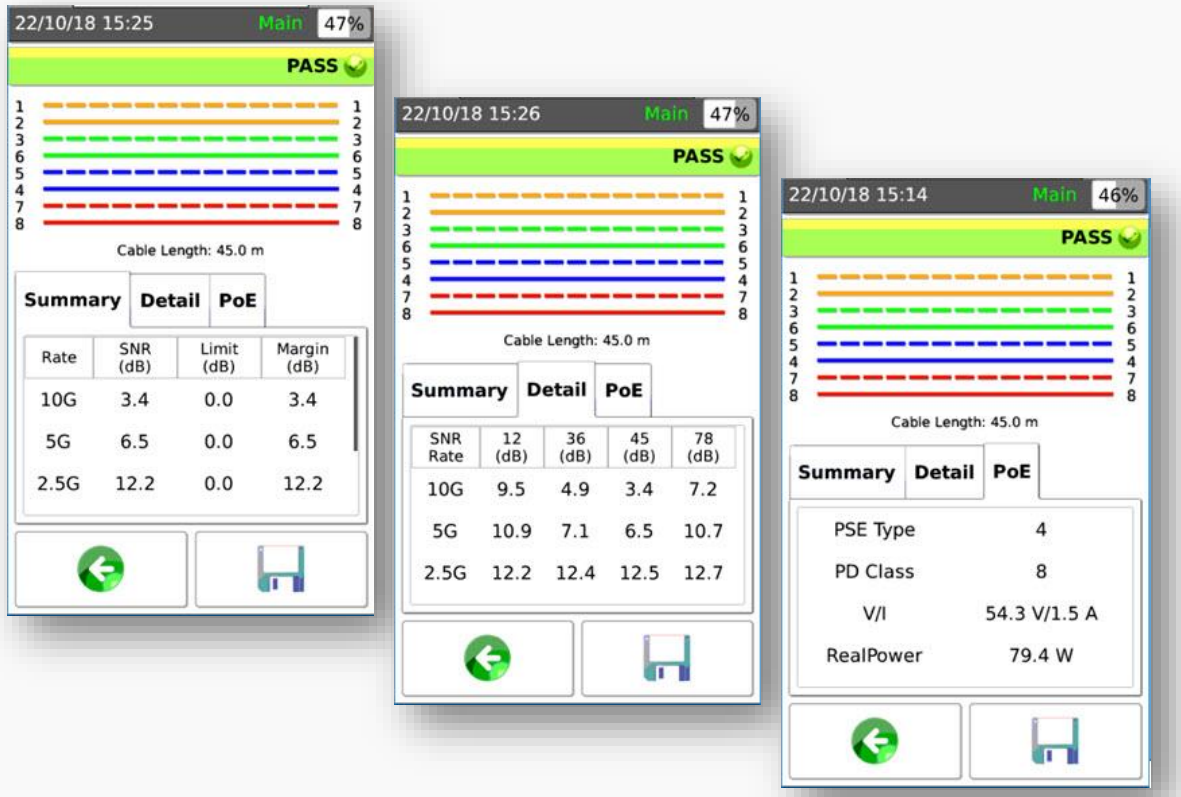
Ensuring NBASE-T Link Speed

- More and more devices are being deployed that require more from the network infrastructure
- Safeguard you're getting the best performance possible with your investment by testing
  - Ensures you're getting the link speed required to support end devices
- Signal to Noise Ratio(SNR) is an important test to provide you with visibility into headroom
  - The bigger the number the better!



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Link Speed Testing

- It's one thing to test a "quiet" network link and another to test a link that's loaded with traffic

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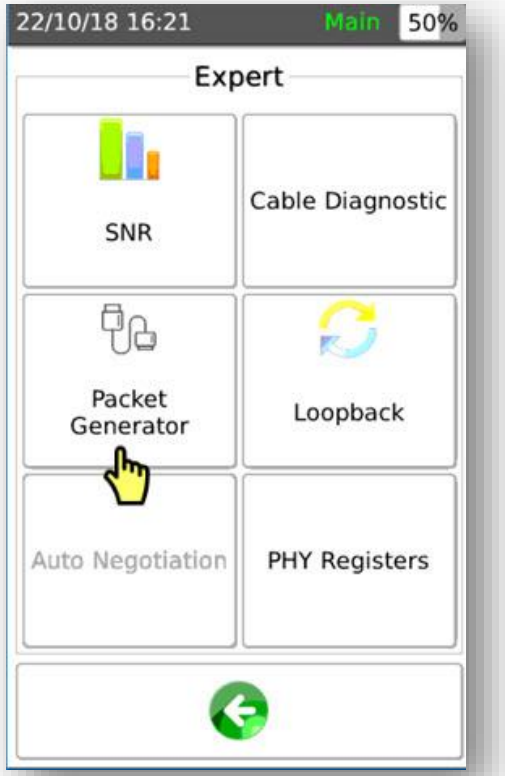
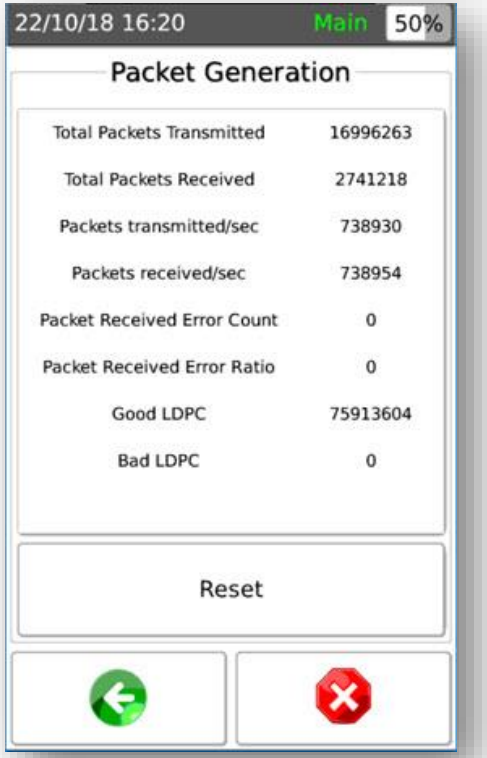
Load it Up!

- It's one thing to test a "quiet" network link and another to test a link that's loaded with traffic
- You load it with packets!





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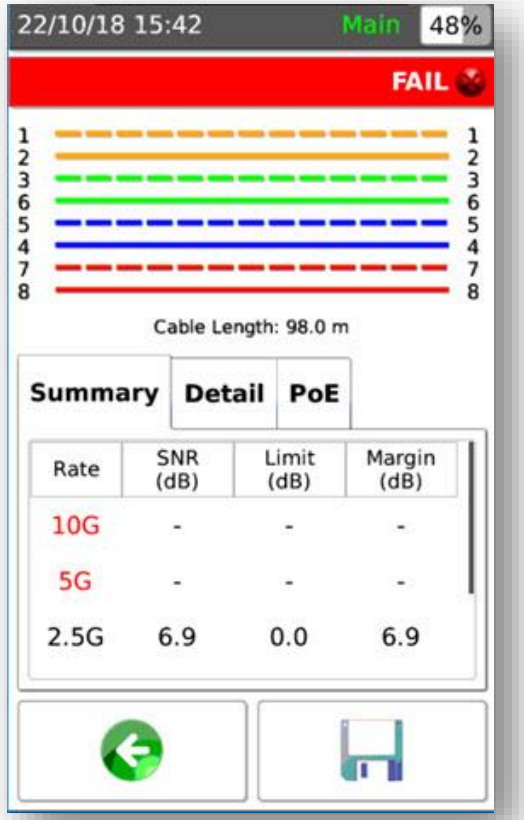
Link Speed Testing

- Let's get real
  - It's one thing to test a "quiet" network link and another to test a link that's loaded with traffic
- You load it with packets!
- Now let's see if we still get the same link speed?



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Dealing with PoE powered things

- It's here to stay, so take control!
- With such a wide range of types of devices and varying power requirements, it's not uncommon for the switch, aka the Power Source Equipment (PSE), to be misconfigured or get overprovisioned
- And, there's always the blame game to deal with when something doesn't work
- Save yourself the aggravation!

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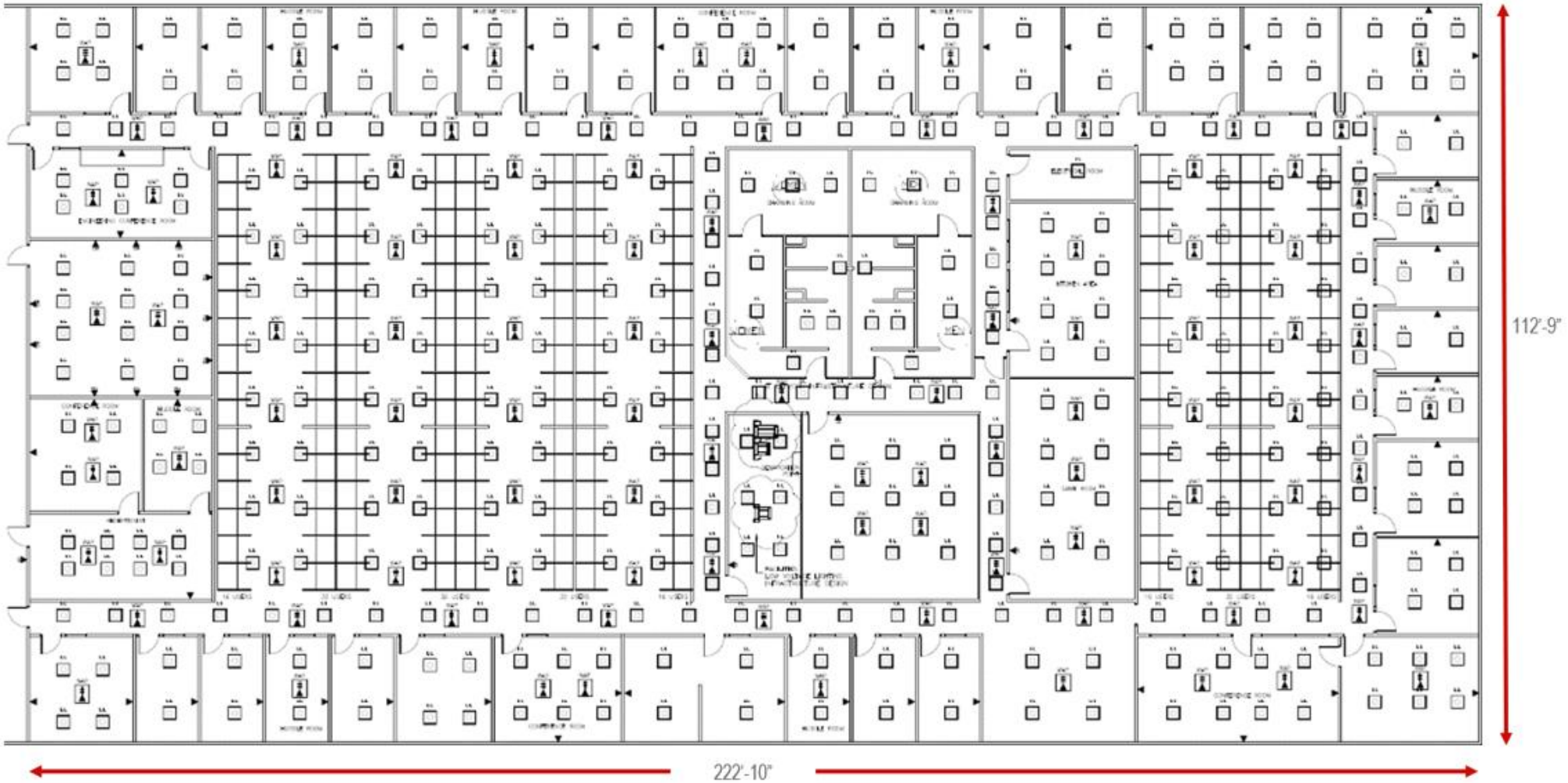
Demanding more from the network infrastructure

PoE Infrastructure

25,000 SQ Feet



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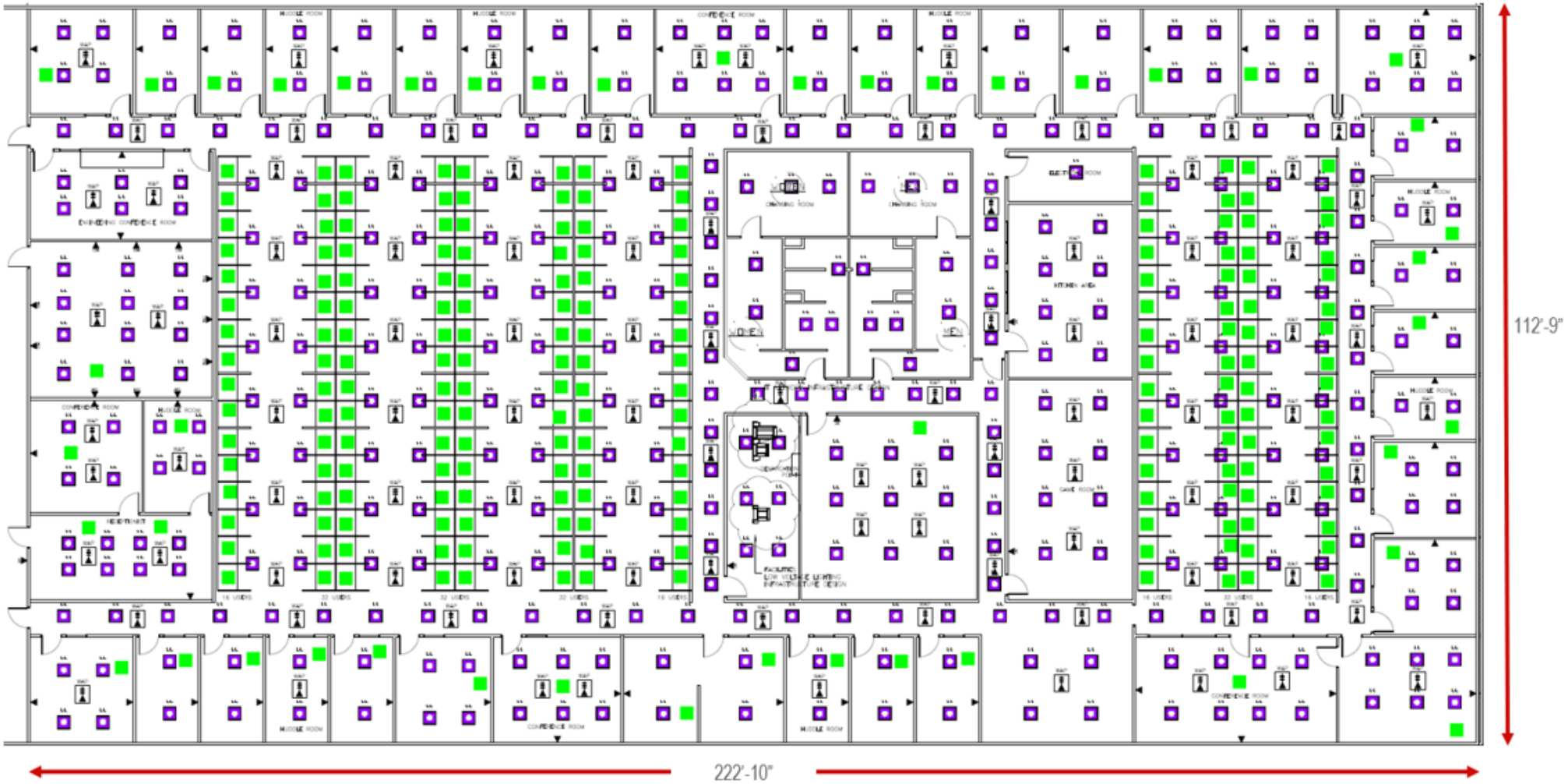
PoE Infrastructure

Phone, Client, Monitor 192

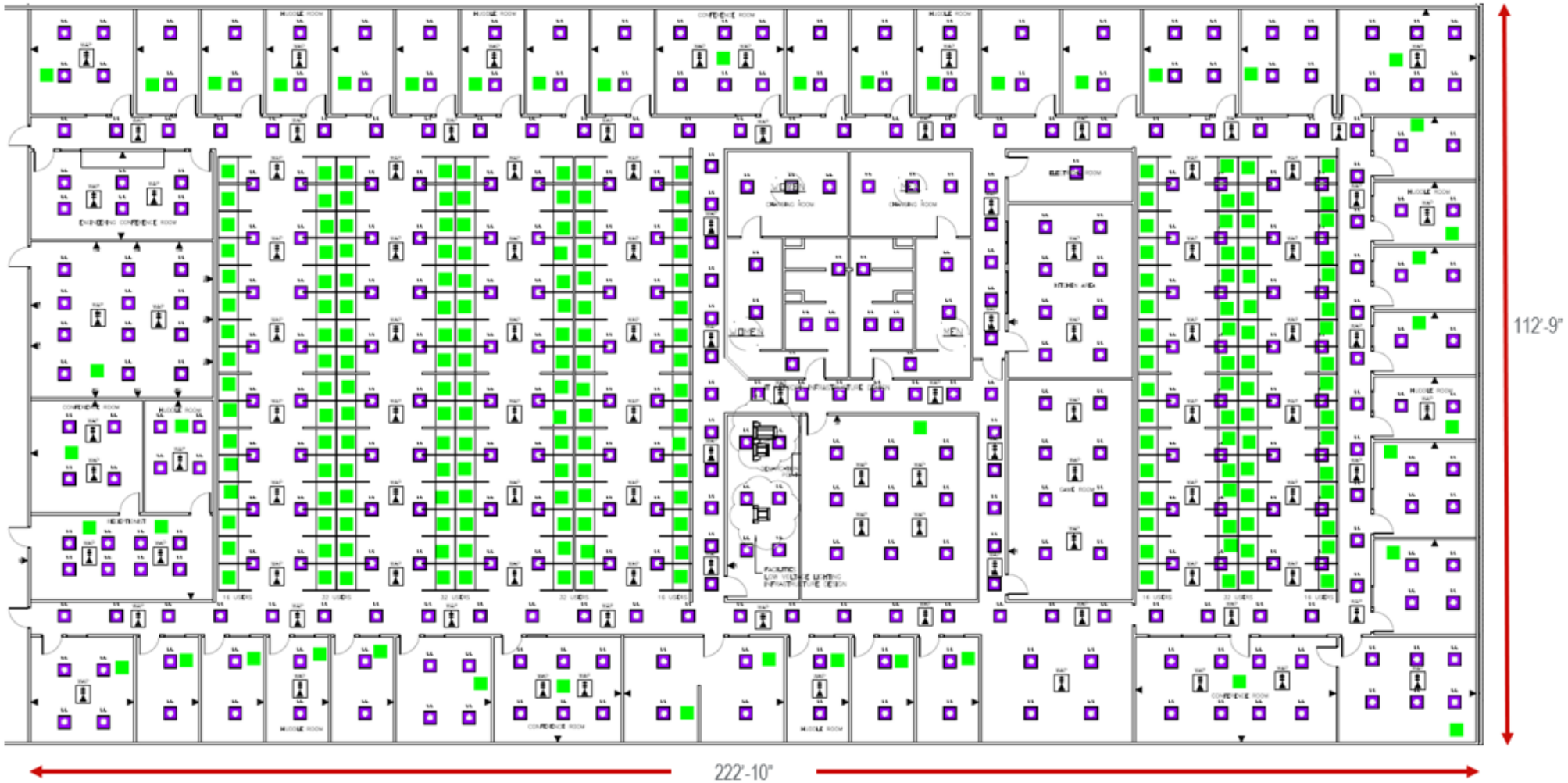
25,000 SQ Feet



PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192

25,000 SQ Feet



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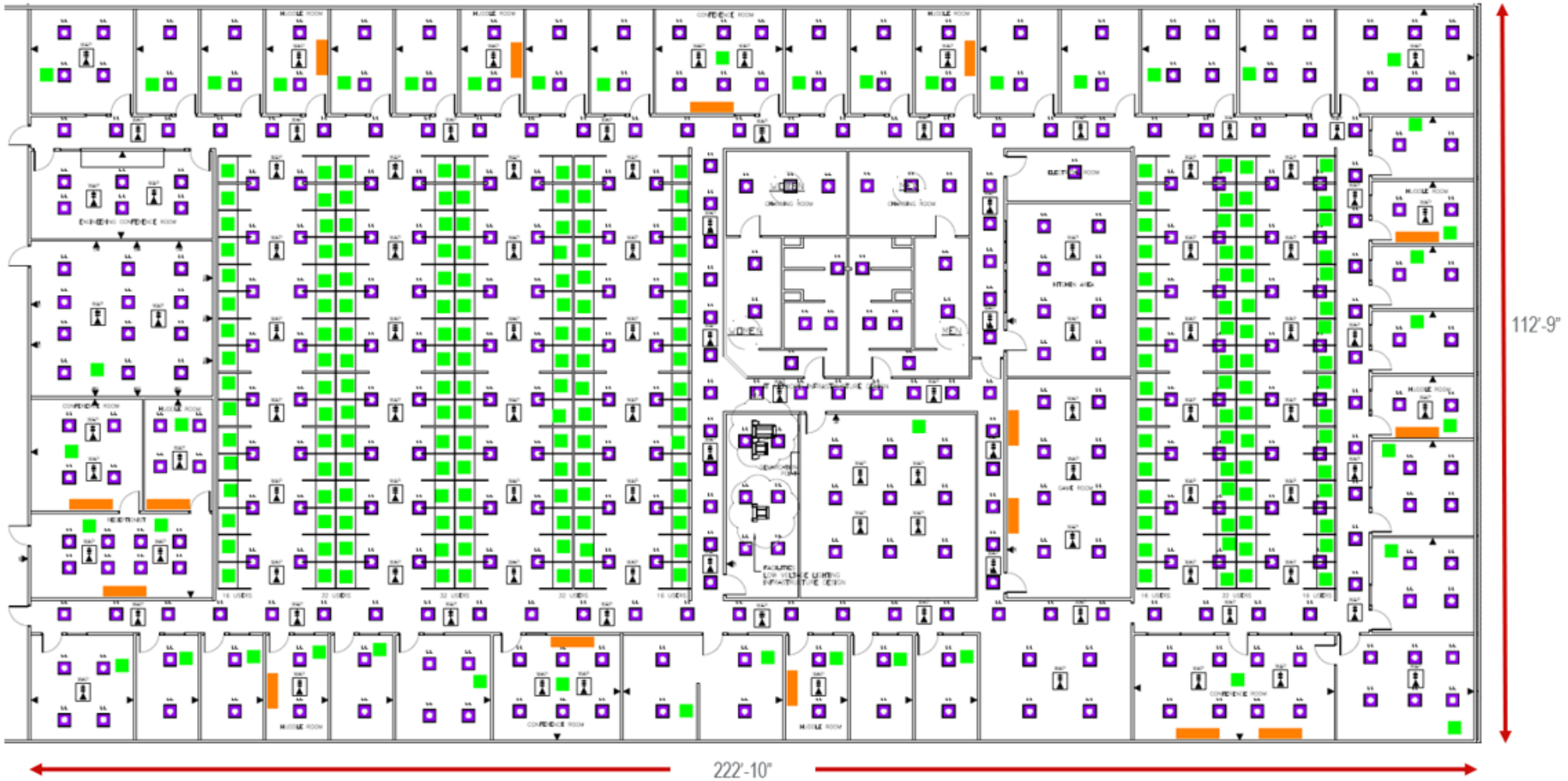
PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15

25,000 SQ Feet



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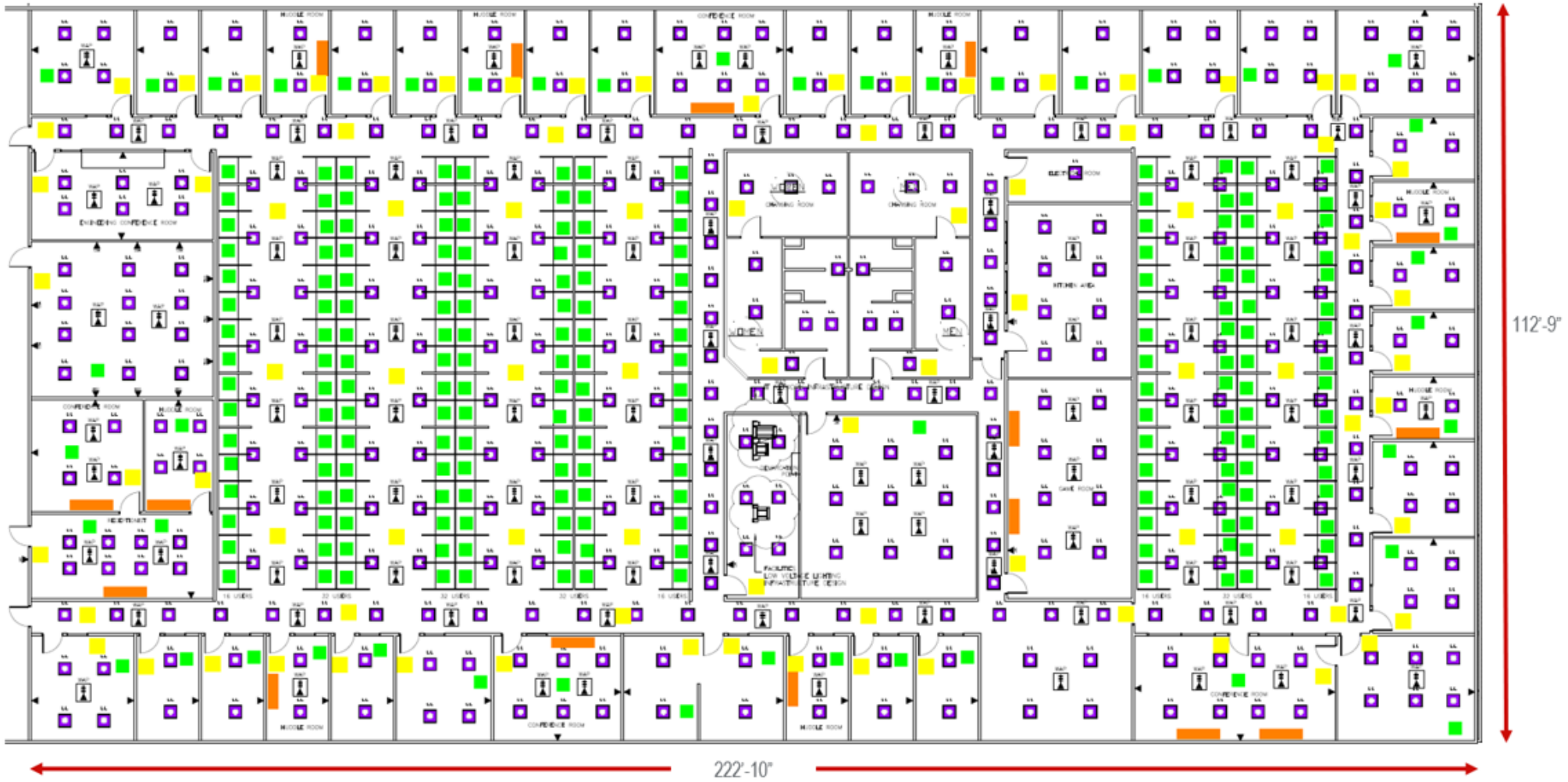
PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15
Occupancy Sensors	89

25,000 SQ Feet



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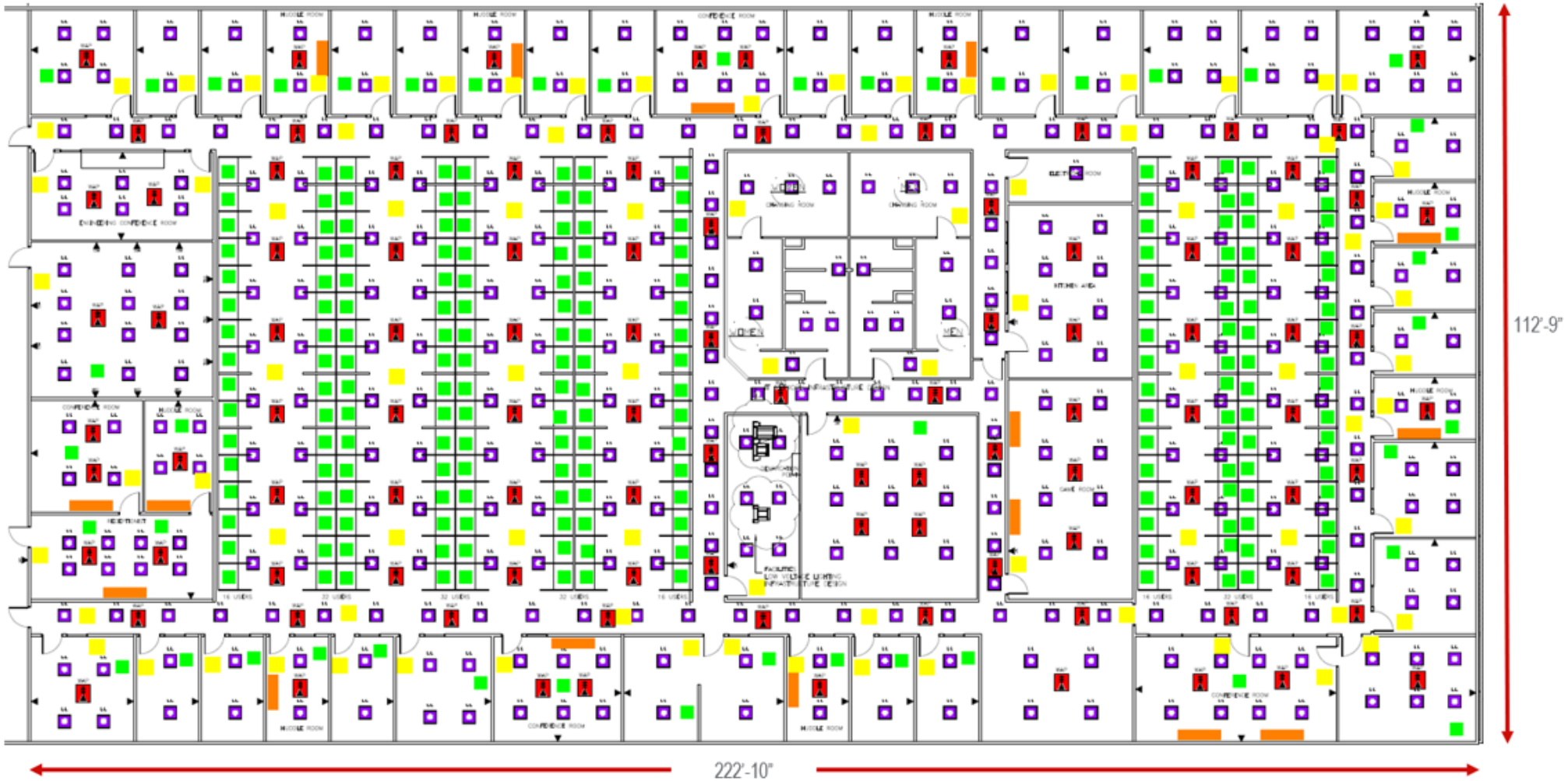
PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15
Occupancy Sensors	89
WAP	10

25,000 SQ Feet



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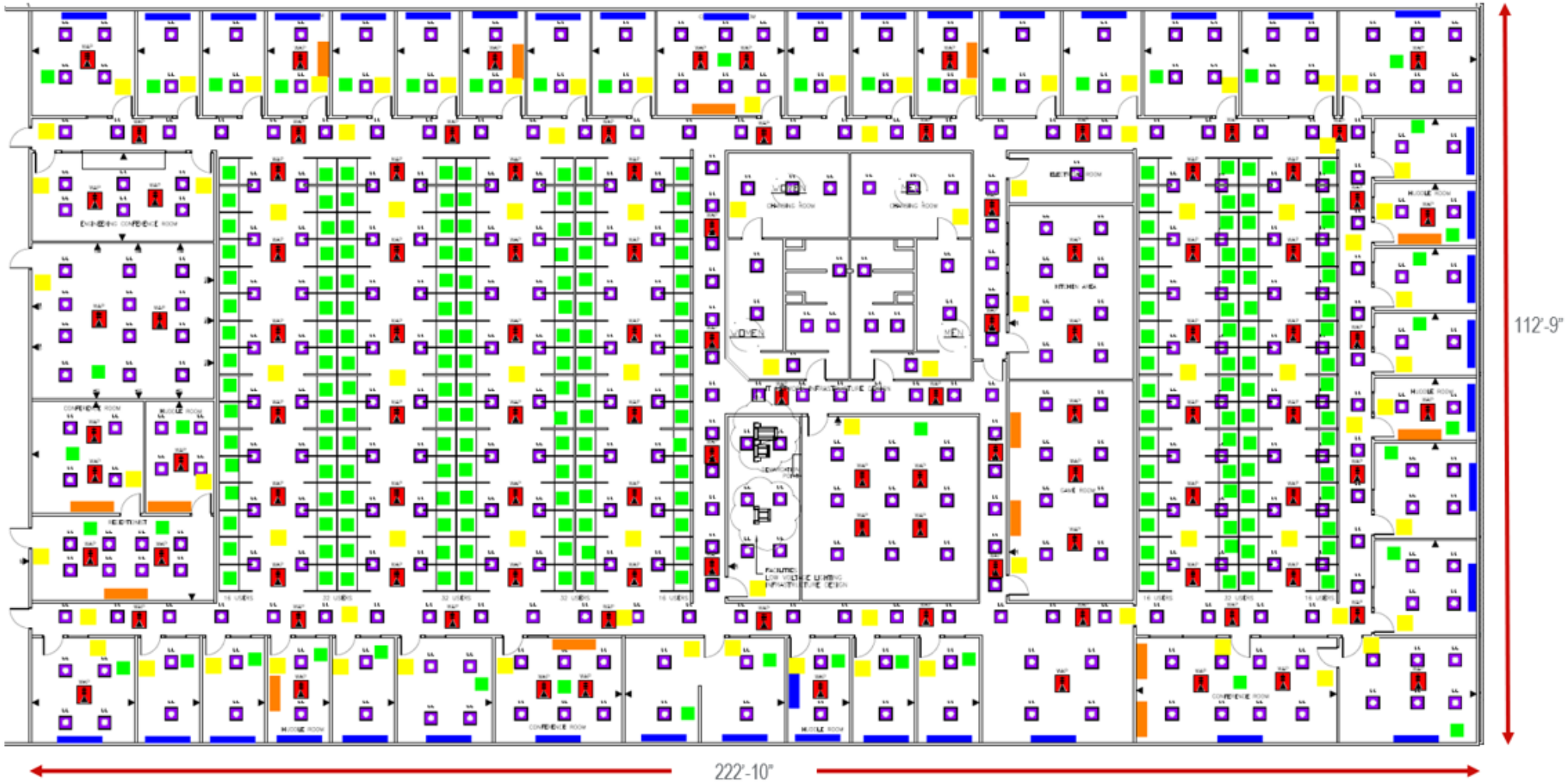
PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15
Occupancy Sensors	89
WAP	10
Shade Control	40

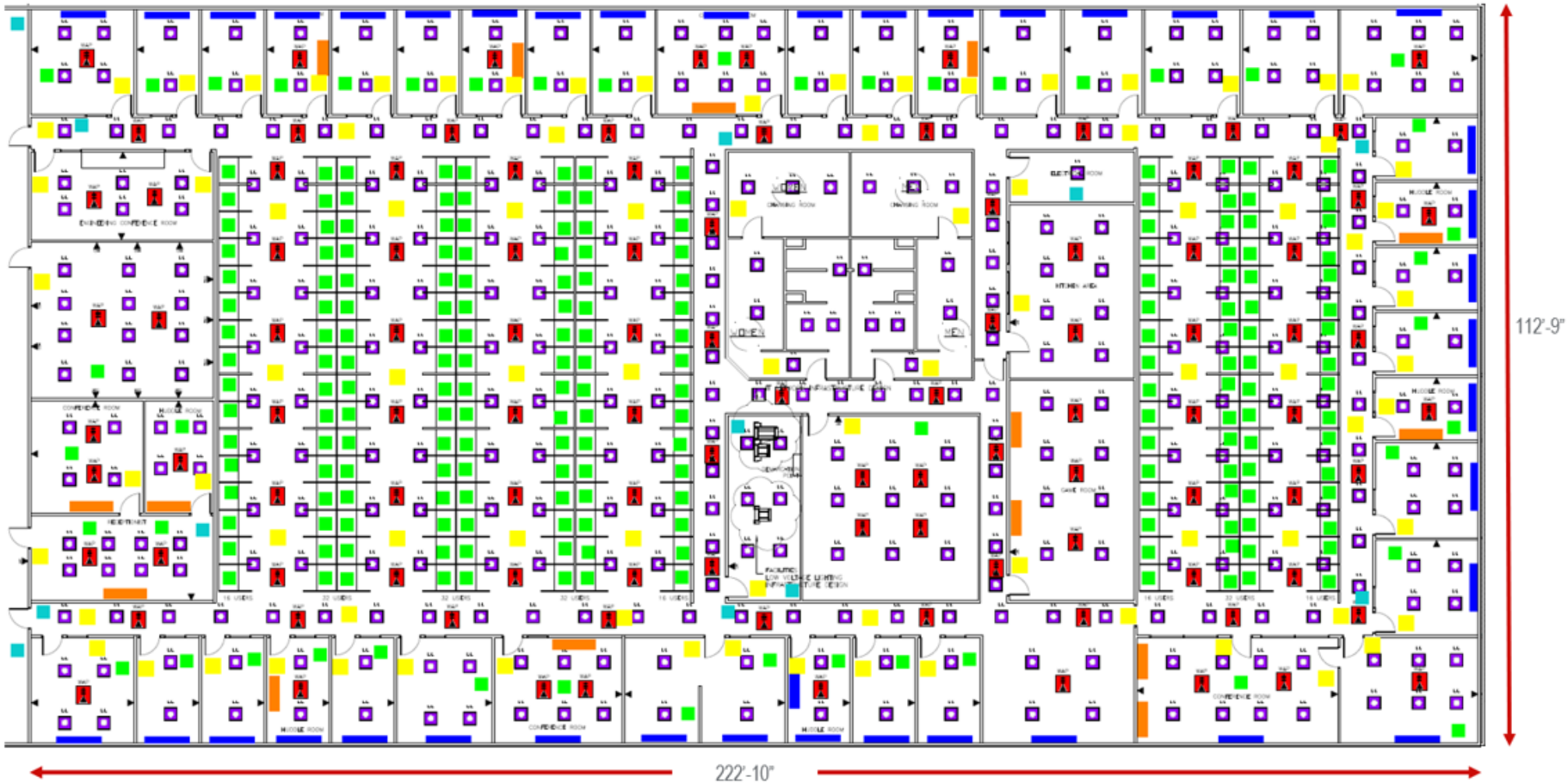
25,000 SQ Feet



PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15
Occupancy Sensors	89
WAP	10
Shade Control	40
Security Camera	12

25,000 SQ Feet



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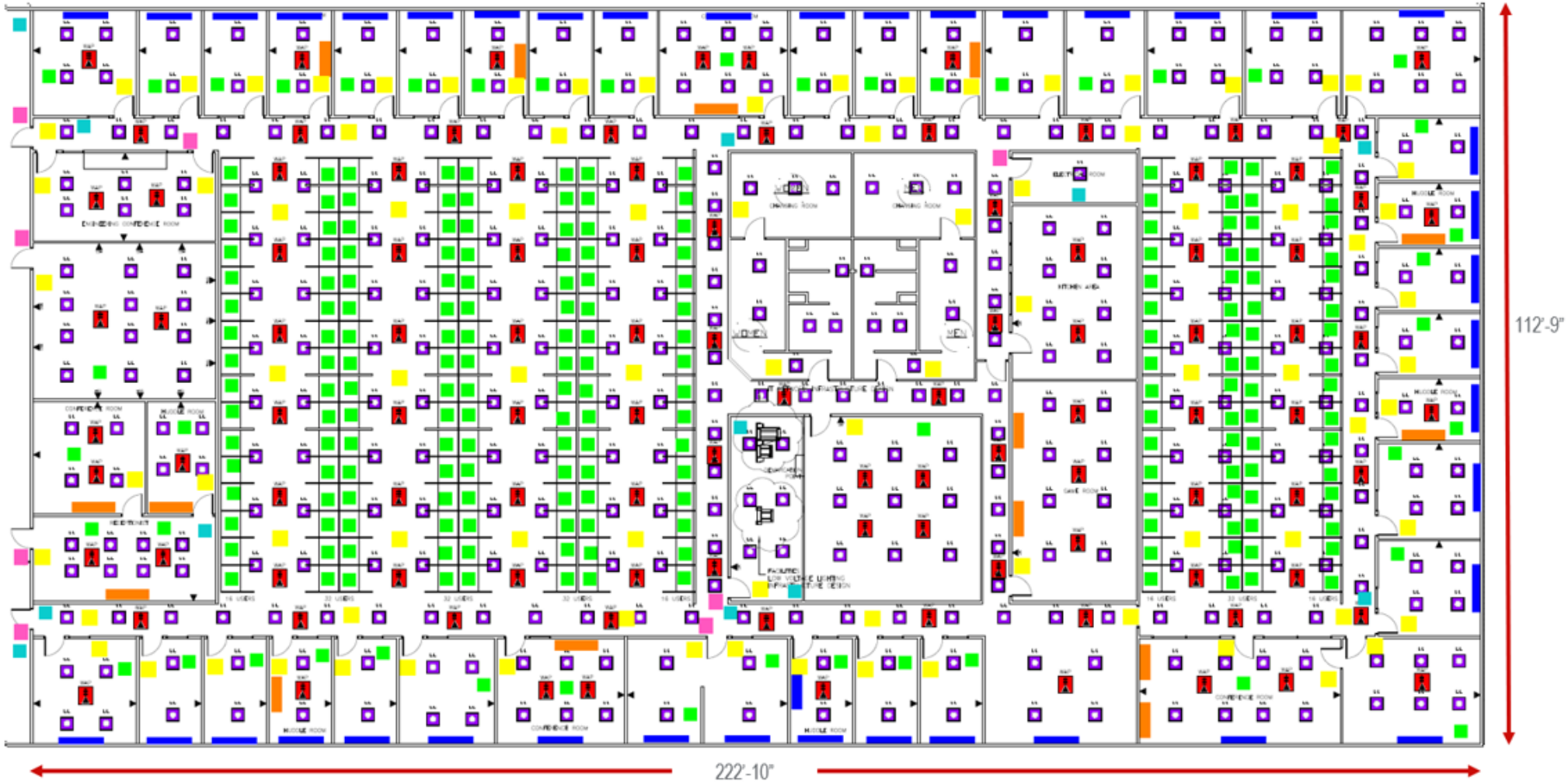
PoE Infrastructure

LED Lighting	389
Phone, Client, Monitor	192
Display	15
Occupancy Sensors	89
WAP	10
Shade Control	40
Security Camera	12
Access Controls	8
Total	755

25,000 SQ Feet



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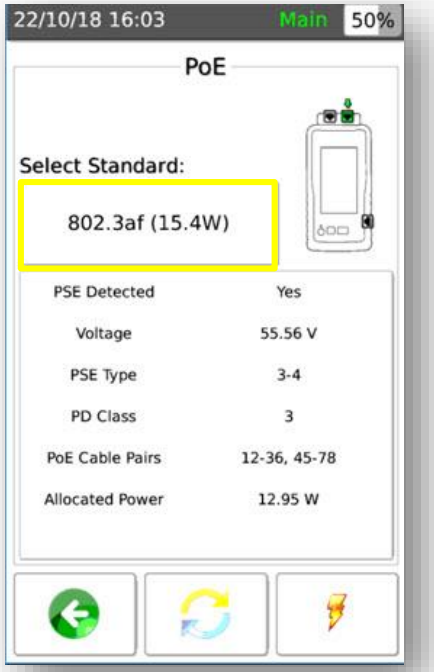
Easy Peasy PoE Testing

- PoE testing can be pretty simple
  - Know how many watts your Powered Device (PD) needs
  - Select the standard to test against
  - Press the button
  - It’s that simple!



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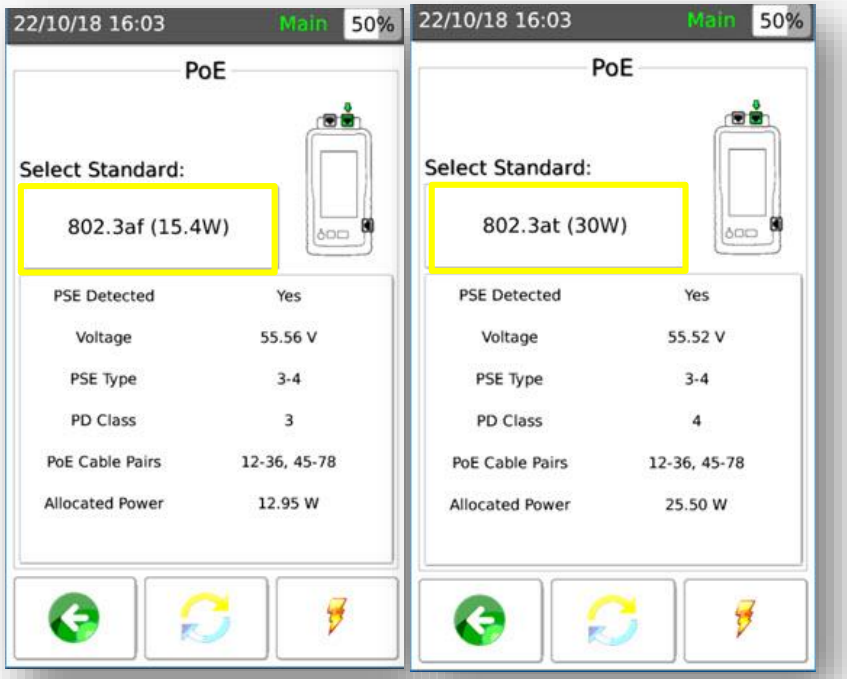

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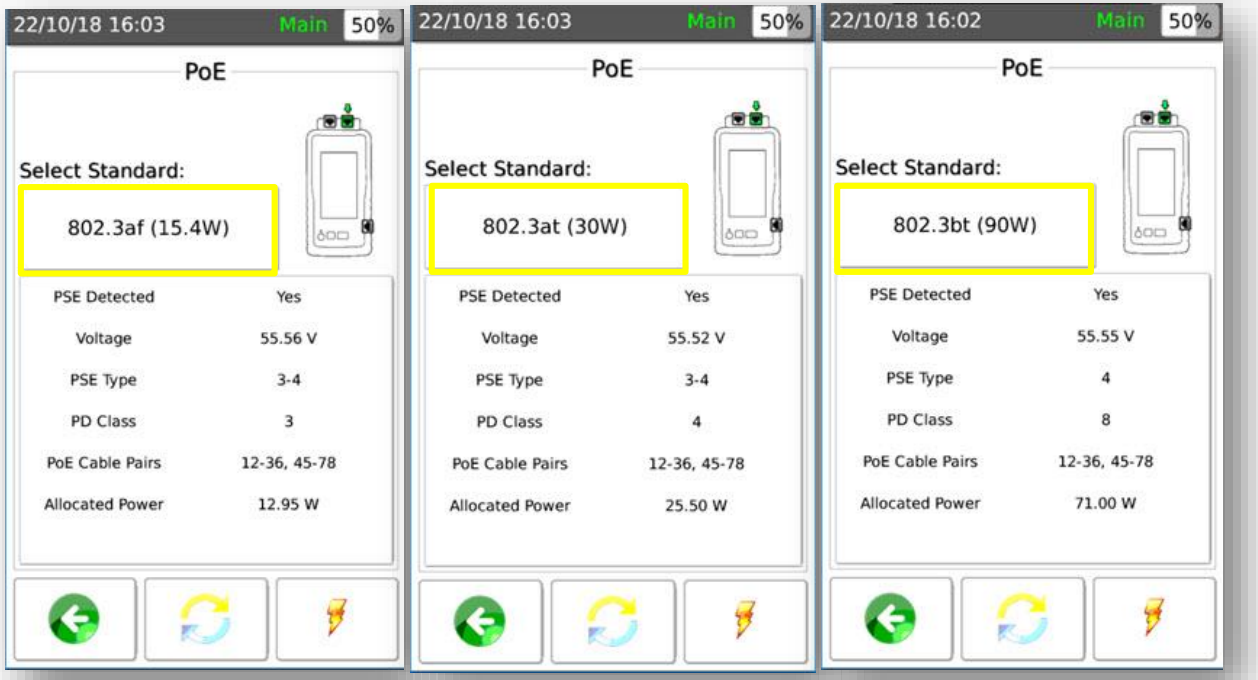

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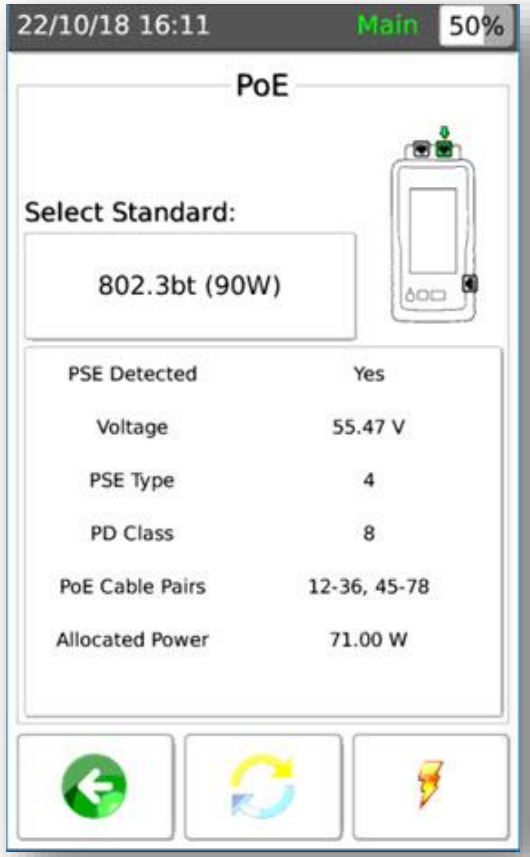
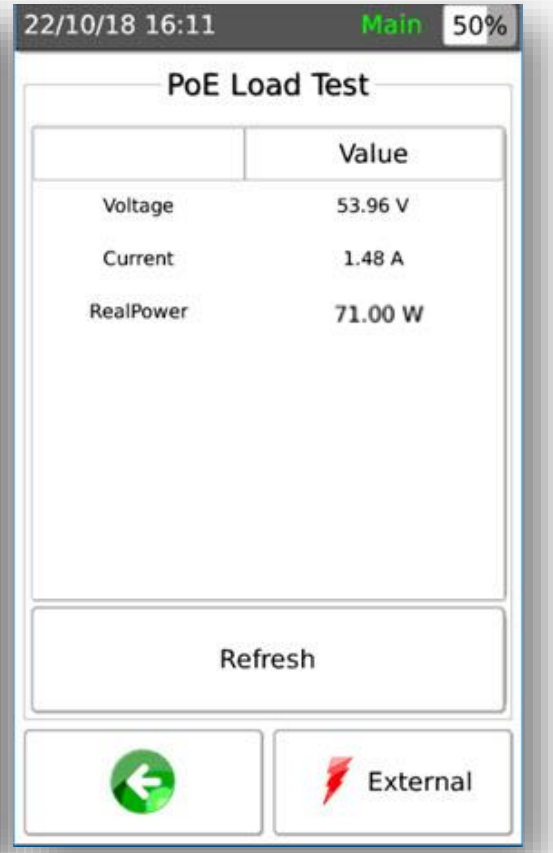
What do you need to know?

- Is the PSE configured correctly
- What pairs is PoE running over
- Do I have enough wattage at the jack for my PD to operate





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Certification of the Physical Infrastructure Cable

- To ensure cabling support, it's important to perform true cable certification based on defined IEEE, TIA and ISO industry standards
- Simple cable verification is not adequate to ensure performance
- Additional measurements that specifically test for required link speed and can indicate if a downshift has occurred should also be considered

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Complete Smart Building Reporting

A014

Pass

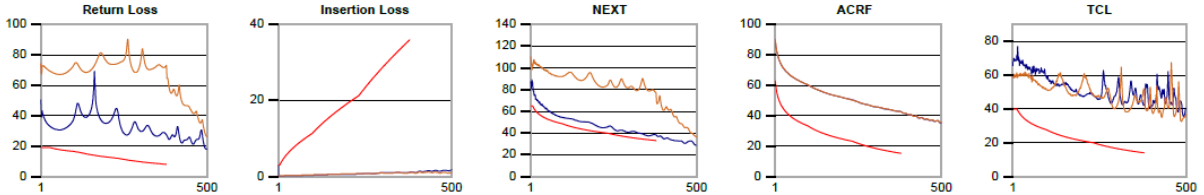
Test Time	: 11/20/2018 2:31:44 PM
Project	: Default
Profile	: Certification
Operator	: Lisa Schwartz
Cable Type / NVP	: CAT 6A UTP , 68
Connector	: RJ45 Plug

Limit	: TIA - Cat 6 Channel
Model	: TestPro CV100 (Main: 5200-0057, Remote: 5200-0058)
Device Software	: 1.3.1
Calibration Date	: Monday, August 6, 2018
Main Adapter	: PROBE CAT 6A CHANNEL
Remote Adapter	: PROBE CAT 6A CHANNEL

Parameter	Result	Pair	Max Value	Limit
Length(ft)	Info	78	10.2	328.1
Prop Delay(ns)	Pass	12	15.0	555.0
Delay Skew(ns)	Pass	12	1.0	50.0
Loop Resistance(Ω)	Pass	78	0.018	25.000
Res. Unbal, pair-pair(Ω)	Info	12-36	0.000	0.200
Res. Unbal, wire-wire(Ω)	Info	78	0.018	0.200

RF Parameters

		Worst Margin-Main				Worst Value-Main			Worst Margin-Remote				Worst Value-Remote		
Parameter	Result	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)
Return Loss	Pass	36	46.7	19.0	1.75	45	24.5	500.00	78	12.6	17.9	16.45	36	18.0	495.00
Insertion Loss	Pass	12	2.8	3.0	2.05	78	1.4	493.00		-	-	-		-	-
NEXT	Pass	36-45	33.6	65.0	2.65	45-78	76.7	250.00	36-45	3.6	34.0	223.50	36-45	37.6	223.50
PSNEXT	Pass	45	36.5	62.0	2.65	36	35.9	500.00	36	6.3	31.1	222.00	36	28.6	494.00
ACRF	Pass	45-36	26.7	39.5	15.25	45-36	35.6	491.00	45-36	26.6	42.8	10.45	45-36	35.2	492.00
PSACRF	Pass	12	23.0	60.2	1.00	36	34.1	490.00	12	25.2	60.2	1.00	36	34.0	491.00
TCL	Info	36	18.2	38.3	5.95	45	32.6	471.00	45	19.1	40.0	4.30	45	32.6	358.00
ELTCTL	Info	45	36.8	10.7	9.25	45	16.3	493.00	36	32.0	30.0	1.00	45	16.4	421.00



A-012

Pass

Test Time	: 3/9/2018 3:46:04 PM
Project	: poe test_nway
Profile	: Validation
Operator	: Default

Limit	: IEEE
Model	: TestPro CV100
Software	: 1.2
Calibration Date	: Monday, January 5, 2018

Cable Length : 36.00 m

SNR

Network Speed	Result	Limit	Pair 12 (dB)	Pair 36 (dB)	Pair 45 (dB)	Pair 78 (dB)
10G	Pass	0.0	3.2	1.9	3.0	3.1
5G	Pass	0.0	10.1	6.5	6.5	6.7
2.5G	Pass	0.0	12.7	12.5	12.7	11.9
1G	Pass		> 26	> 26	> 26	> 26
100M	Pass		> 26	> 26	> 26	> 26

POE

PSE Type	4
PD Class	8
Cable Pairing	12-36 & 45-78
Allocated Power	71.00 W
Voltage	53.09 V
Current	1.424 A
Real Power	75.59 W

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A014

Pass

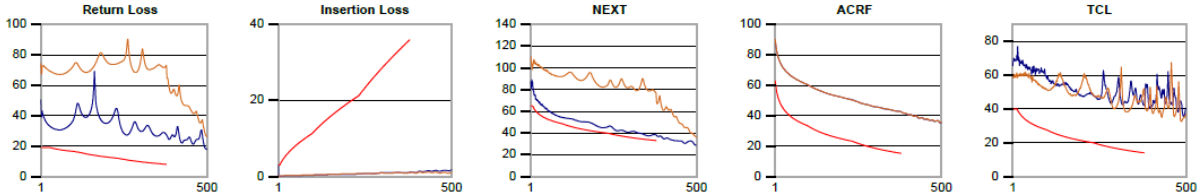
Test Time	: 11/20/2018 2:31:44 PM
Project	: Default
Profile	: Certification
Operator	: Lisa Schwartz
Cable Type / NVP	: CAT 6A UTP , 68
Connector	: RJ45 Plug

Limit	: TIA - Cat 6 Channel
Model	: TestPro CV100 (Main: 5200-0057, Remote: 5200-0058)
Device Software	: 1.3.1
Calibration Date	: Monday, August 6, 2018
Main Adapter	: PROBE CAT 6A CHANNEL
Remote Adapter	: PROBE CAT 6A CHANNEL

Parameter	Result	Pair	Max Value	Limit
Length(ft)	Info	78	10.2	328.1
Prop Delay(ns)	Pass	12	15.0	555.0
Delay Skew(ns)	Pass	12	1.0	50.0
Loop Resistance(Ω)	Pass	78	0.018	25.000
Res. Unbal, pair-pair(Ω)	Info	12-36	0.000	0.200
Res. Unbal, wire-wire(Ω)	Info	78	0.018	0.200

RF Parameters

		Worst Margin-Main				Worst Value-Main			Worst Margin-Remote				Worst Value-Remote		
Parameter	Result	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)
Return Loss	Pass	36	46.7	19.0	1.75	45	24.5	500.00	78	12.6	17.9	16.45	36	18.0	495.00
Insertion Loss	Pass	12	2.8	3.0	2.05	78	1.4	493.00		-	-	-		-	-
NEXT	Pass	36-45	33.6	65.0	2.65	45-78	76.7	250.00	36-45	3.6	34.0	223.50	36-45	37.6	223.50
PSNEXT	Pass	45	36.5	62.0	2.65	36	35.9	500.00	36	6.3	31.1	222.00	36	28.6	494.00
ACRF	Pass	45-36	26.7	39.5	15.25	45-36	35.6	491.00	45-36	26.6	42.8	10.45	45-36	35.2	492.00
PSACRF	Pass	12	23.0	60.2	1.00	36	34.1	490.00	12	25.2	60.2	1.00	36	34.0	491.00
TCL	Info	36	18.2	38.3	5.95	45	32.6	471.00	45	19.1	40.0	4.30	45	32.6	358.00
ELTCTL	Info	45	36.8	10.7	9.25	45	16.3	493.00	36	32.0	30.0	1.00	45	16.4	421.00



A-012

Pass

Test Time	: 3/9/2018 3:46:04 PM
Project	: poe test_nway
Profile	: Validation
Operator	: Default

Limit	: IEEE
Model	: TestPro CV100
Software	: 1.2
Calibration Date	: Monday, January 5, 2018

Cable Length : 36.00 m

SNR

Network Speed	Result	Limit	Pair 12 (dB)	Pair 36 (dB)	Pair 45 (dB)	Pair 78 (dB)
10G	Pass	0.0	3.2	1.9	3.0	3.1
5G	Pass	0.0	10.1	6.5	6.5	6.7
2.5G	Pass	0.0	12.7	12.5	12.7	11.9
1G	Pass		> 26	> 26	> 26	> 26
100M	Pass		> 26	> 26	> 26	> 26

POE

PSE Type	4
PD Class	8
Cable Pairing	12-36 & 45-78
Allocated Power	71.00 W
Voltage	53.09 V
Current	1.424 A
Real Power	75.59 W

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A014

Pass

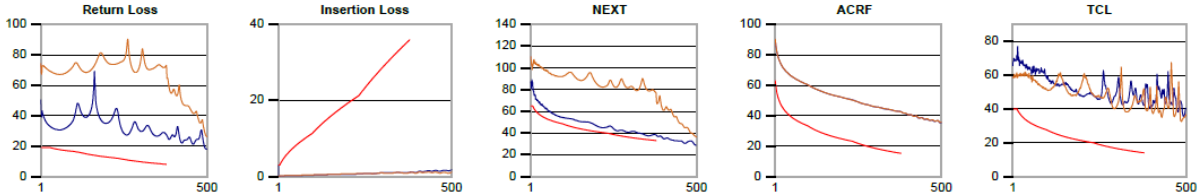
Test Time	: 11/20/2018 2:31:44 PM
Project	: Default
Profile	: Certification
Operator	: Lisa Schwartz
Cable Type / NVP	: CAT 6A UTP , 68
Connector	: RJ45 Plug

Limit	: TIA - Cat 6 Channel
Model	: TestPro CV100 (Main: 5200-0057, Remote: 5200-0058)
Device Software	: 1.3.1
Calibration Date	: Monday, August 6, 2018
Main Adapter	: PROBE CAT 6A CHANNEL
Remote Adapter	: PROBE CAT 6A CHANNEL

Parameter	Result	Pair	Max Value	Limit
Length(ft)	Info	78	10.2	328.1
Prop Delay(ns)	Pass	12	15.0	555.0
Delay Skew(ns)	Pass	12	1.0	50.0
Loop Resistance(Ω)	Pass	78	0.018	25.000
Res. Unbal, pair-pair(Ω)	Info	12-36	0.000	0.200
Res. Unbal, wire-wire(Ω)	Info	78	0.018	0.200

RF Parameters

		Worst Margin-Main				Worst Value-Main			Worst Margin-Remote				Worst Value-Remote		
Parameter	Result	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)
Return Loss	Pass	36	46.7	19.0	1.75	45	24.5	500.00	78	12.6	17.9	16.45	36	18.0	495.00
Insertion Loss	Pass	12	2.8	3.0	2.05	78	1.4	493.00		-	-	-		-	-
NEXT	Pass	36-45	33.6	65.0	2.65	45-78	76.7	250.00	36-45	3.6	34.0	223.50	36-45	37.6	223.50
PSNEXT	Pass	45	36.5	62.0	2.65	36	35.9	500.00	36	6.3	31.1	222.00	36	28.6	494.00
ACRF	Pass	45-36	26.7	39.5	15.25	45-36	35.6	491.00	45-36	26.6	42.8	10.45	45-36	35.2	492.00
PSACRF	Pass	12	23.0	60.2	1.00	36	34.1	490.00	12	25.2	60.2	1.00	36	34.0	491.00
TCL	Info	36	18.2	38.3	5.95	45	32.6	471.00	45	19.1	40.0	4.30	45	32.6	358.00
ELTCTL	Info	45	36.8	10.7	9.25	45	16.3	493.00	36	32.0	30.0	1.00	45	16.4	421.00



A-012

Pass

Test Time	: 3/9/2018 3:46:04 PM
Project	: poe test_nway
Profile	: Validation
Operator	: Default

Limit	: IEEE
Model	: TestPro CV100
Software	: 1.2
Calibration Date	: Monday, January 5, 2018

Cable Length : 36.00 m

SNR

Network Speed	Result	Limit	Pair 12 (dB)	Pair 36 (dB)	Pair 45 (dB)	Pair 78 (dB)
10G	Pass	0.0	3.2	1.9	3.0	3.1
5G	Pass	0.0	10.1	6.5	6.5	6.7
2.5G	Pass	0.0	12.7	12.5	12.7	11.9
1G	Pass		> 26	> 26	> 26	> 26
100M	Pass		> 26	> 26	> 26	> 26

POE

PSE Type	4
PD Class	8
Cable Pairing	12-36 & 45-78
Allocated Power	71.00 W
Voltage	53.09 V
Current	1.424 A
Real Power	75.59 W

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A014

Pass

Test Time	: 11/20/2018 2:31:44 PM
Project	: Default
Profile	: Certification
Operator	: Lisa Schwartz
Cable Type / NVP	: CAT 6A UTP , 68
Connector	: RJ45 Plug

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Model	: TestPro CV100 (Main: 5200-0057, Remote: 5200-0058)
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Parameter	Result	Pair	Max Value	Limit
Length(ft)	Info	78	10.2	328.1
Prop Delay(ns)	Pass	12	15.0	555.0
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Loop Resistance(Ω)	Pass	78	0.018	25.000
Res. Unbal, pair-pair(Ω)	Info	12-36	0.000	0.200
Res. Unbal, wire-wire(Ω)	Info	78	0.018	0.200

RF Parameters

		Worst Margin-Main				Worst Value-Main			Worst Margin-Remote				Worst Value-Remote		
Parameter	Result	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)	Pair	Margin (dB)	Limit (dB)	Freq (MHz)	Pair	Value (dB)	Freq (MHz)
Return Loss	Pass	36	46.7	19.0	1.75	45	24.5	500.00	78	12.6	17.9	16.45	36	18.0	495.00
Insertion Loss	Pass	12	2.8	3.0	2.05	78	1.4	493.00		-	-	-		-	-
NEXT	Pass	36-45	33.6	65.0	2.65	45-78	76.7	250.00	36-45	3.6	34.0	223.50	36-45	37.6	223.50
PSNEXT	Pass	45	36.5	62.0	2.65	36	35.9	500.00	36	6.3	31.1	222.00	36	28.6	494.00
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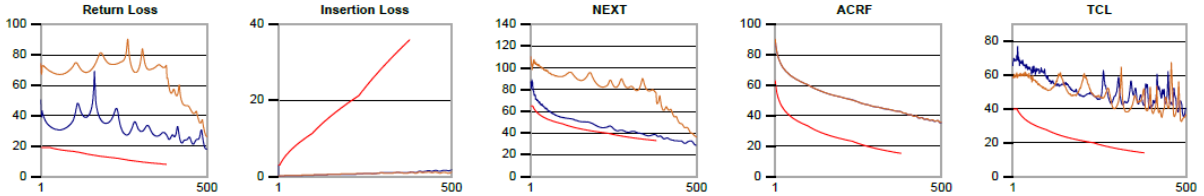
TCL	Info	36	18.2	38.3	5.95	45	32.6	471.00	45	19.1	40.0	4.30	45	32.6	358.00
ELTCTL	Info	45	36.8	10.7	9.25	45	16.3	493.00	36	32.0	30.0	1.00	45	16.4	421.00



A-012

Pass

Test Time	: 3/9/2018 3:46:04 PM
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Profile	: Validation
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Limit	: IEEE
Model	: TestPro CV100
Software	: 1.2
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Cable Length : 36.00 m

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5G	Pass	0.0	10.1	6.5	6.5	6.7
2.5G	Pass	0.0	12.7	12.5	12.7	11.9
1G	Pass		> 26	> 26	> 26	> 26
100M	Pass		> 26	> 26	> 26	> 26

POE

PSE Type	4
PD Class	8
Cable Pairing	12-36 & 45-78
Allocated Power	71.00 W
Voltage	53.09 V
Current	1.424 A
Real Power	75.59 W

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Wrap-up & Discussion

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Wrap-up & Discussion

- Networks have evolved, and require more from the infrastructure
- Testing must deal with all aspects of the modern network
- Cabling infrastructure is the foundation of your network
- Certify the foundation supports the network goals

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Thank you!

Visit www.nbaset.org & www.AEM-Test.com for more information

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