

Results driven business

Lisa Schwartz of AEM looks at how smart building network environments are reshaping cable testing requirements

▶ The continuous integration of previously disparate systems into the IT network necessitates seamless delivery of simultaneous data and power over the same cabling. With each device having unique network and power requirements, it is imperative for installers, integrators and network owners to comprehend the significance of certifying the cable at the outset and continuing with ongoing troubleshooting, as well as moves, adds and changes (MACs) throughout the lifecycle of the cabling infrastructure. This ensures network continuity and reliability.

A NEW ERA

In the era of smart building systems, the testing of cable and connectivity has become more complex. Today, testing encompasses new technologies and assurance of active and passive components to ensure it will support the needed bandwidth, power and distance. A few of these new technologies include power over Ethernet (PoE), hybrid powered fibre and Single Pair Ethernet (SPE).

Smart buildings introduce new performance challenges, driven by heightened power and transport requirements placed on installed cabling. This encompasses more than just accommodating increased bandwidth and data speeds – it entails integrating previously segregated building systems, such as heating, ventilation and air conditioning (HVAC) and public safety, on to a unified enterprise network platform. Consequently, the convergence of

information technology (IT) and operation technology (OT) roles is essential, requiring collaborative efforts to ensure optimal system performance and scalability, while accommodating future device integrations.

Industry standards such as TIA 568.2D and ISO/IEC 11801-1 specify cable certification test requirements that address field measurements and connectivity options. These standards define measurements that include wiremap, DC loop resistance, DC resistance unbalance within two wires of a pair, DC resistance unbalance pair to pair, length, delay, delay skew, insertion loss, return



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loss, TCL, ELTCTL, coupling attenuation, NEXT, PSNEXT, ACRF, PSACRF, PSANEXT, PSAACRF and, in some cases, ACRN/PSACRN.

Some of these measurements are considered typical and some are defined as optional.

NEW CHALLENGES

Understanding the evolution of smart building network environments necessitates that system designers, integrators, and IT and OT personnel acknowledge the expanded requirements for cable testing. The emergence of technologies addressing data, power and link speed for each unique endpoint

further underscores the need for updated testing considerations. These technologies encompass a range of wired and wireless applications including private 5G, Wi-Fi, 5, 6 and 6E, as well as Multigigabit Ethernet.

Additionally, deploying new technologies on existing cable infrastructure introduces additional testing requirements. Let's explore some of the key technologies driving this imperative for expanded testing considerations.

• PoE

PoE is one of the biggest technology shifts for enabling smart buildings. It is the means in which many devices receive their power. Utilising DC power has a huge impact on installation and operational cost savings. But there are different methods of delivery. The PoE type selected – Type 1 PoE, Type 2 PoE+, Type 3 and 4 PoE++, Cisco's UPoE, or SPoE – will be determined by the wattage, voltage and distance required by the powered device and the power source equipment.

PoE is designed to operate without interfering with data transmission. However, DC resistance unbalance between wires and wire-pairs can cause deterioration in data transmission performance, particularly with high PoE current. From a testing perspective, you should be able to test DC resistance unbalance as an initial indicator during certification that the cabling will support the intended application. From an ongoing perspective, the ability to test actual power load along with power source equipment configuration is needed.

• Hybrid powered fibre

Hybrid fibre cable is also an option for long distance applications, such as security cameras in parking lots. These cables extend far beyond traditional Ethernet limits and can carry data and power under



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one jacket. This cable consists of two fibres to run the data, while the power is transmitted over adjacent electrical copper conductors. In addition to testing for optical loss, you will need to be able to validate the electrical voltage on the copper wires.

• SPE

SPE is an emerging technology for cabling in many different environments, ranging from automotive to industrial to enterprise, and TIA-568.5 specifies SPE cabling for enterprise environment. SPE has several advantages, most notably the ability to



support distances upwards of 1,000m and even PoE for lower power consumption devices, such as sensors and simple cameras.

CABLE TESTERS

Cable test equipment traditionally falls into categories such as verification, qualification and certification. Certification testers are essential for contractors to secure manufacturers' cable warranties post-installation. However, once the contractor completes the cabling project and hands it over to the building owner, the responsibility

shifts to network managers. They must ensure real world network connectivity and delve deep into applications to maintain consistent network uptime.

With the growing reliance on network

connected technologies, particularly in smart buildings, IT departments require cable testers that offer a comprehensive range of testing functionality. This might include physical cable testing for both copper and fibre, network device connectivity, troubleshooting features such as ping and trace route, and the ability to verify link speed and PoE loads. Meeting these diverse testing needs is essential for addressing the complexities of modern network environments effectively.

Various types of cable testers are available in today's market, and it's crucial to discern the appropriate level of tester to meet your specific testing needs. If certification and warranty support from the cable manufacturer are prerequisites, opting for a certificate grade tester is imperative. These testers enable selection of standards compliant test protocols, facilitating comprehensive testing against predetermined criteria. Additionally, they generate printed reports that can be furnished to the cable manufacturer to validate warranty claims.

FURTHER READING

If the cable has already undergone certification, and you're conducting MACs or general troubleshooting, you may consider a validator, qualifier, or even qualification+ tester. For further insights into the diverse categories of cable testing and to ascertain the appropriate level of test equipment based on your specific requirements, I recommend referring to the February 2024 issue of Inside Networks and an article titled Speaking Terms. This article provides detailed information on the various testing levels and may help you to determine the type of cable tester you need. [CLICK HERE](#) to read it. ■



LISA SCHWARTZ

Lisa Schwartz is director of product marketing at AEM. She has worked in the test and measurement industry for 31 years, spanning five major brands of test equipment for cable certification and network connectivity testing. The primary capacities Schwartz has served in have been product management, business development and marketing. In her current role at AEM she oversees product marketing, working closely with sales and engineering to ensure AEM's test solutions are competitive and innovative.