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› US

Future FOCUS

As we move into the new year, we asked Leviton network experts to explain what lies ahead for data center and enterprise networks.

DATA CENTER NETWORK TRENDS

Gary Bernstein, RCDD — Even in a year as tumultuous as 2020, investment in higher-speed Ethernet switches remained strong, largely driven by demand from hyperscale data centers and cloud providers. According to market intelligence analyst IDC, in the second quarter of 2020, port shipments for 100 GbE switches rose 51% year over year. The most popular 100 GbE transceiver options have been 100G-CWDM4, a single-mode two-fiber solution with a two-kilometer reach, and 100G-SR4, a 100-meter multimode solution.

At the same time, 100 Gb/s transceiver costs continue to decrease due to competition among manufacturers. The September 2020 High Speed Ethernet Optics Report from analyst LightCounting found pricing of 100G-SR4 transceivers dropped below $1/Gbps in 2019, and 100 GbE PSM4 reached the same price milestone in 2020, with DR1, FR1, and CWDM4 not far behind. The 100 Gb/s options will continue to see strong adoption in the short term but are expected to peak in the next several years as they make way for 400 Gb/s switches.

The $1/Gbps figure is now also used as a benchmark for 400/800 GbE modules, which will contribute the most to market growth in 2021-2025. While new 400 Gb/s switches come at a significant cost, they will also likely drop in price as early adopters in the cloud service provider and telecom industries purchase more 400 Gb/s switches over the next several years.

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Made with Pride

With Leviton systems designed and manufactured in America, customers know exactly what they're getting and where it comes from

Unlike many U.S.-based companies, the vast majority of Leviton Network Solutions products are actually designed and manufactured in the United States. That means complete copper and fiber end-to-end systems — including connectors, cabling and assemblies, patch panels, fiber enclosures and home wiring enclosures, wallplates and more — are all produced in Leviton's U.S. facilities. The most recent addition to our U.S. capabilities comes from our acquisition of Berk-Tek in September 2020, adding American-made copper and fiber optic cable.

Why is this important? Choosing U.S.-made solutions brings big benefits, including a guaranteed quality of goods and high labor standards. Equally important, buying American is an investment in U.S. jobs and the economy.

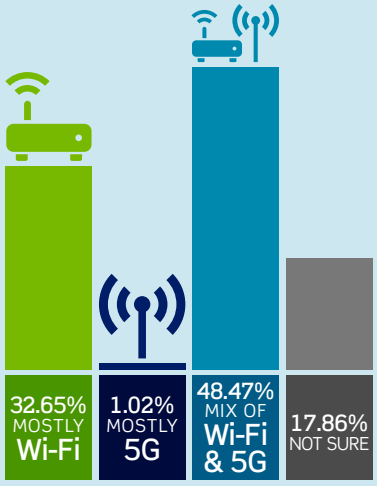
It also means that when you buy Leviton, you have the support of a stable U.S. company who will be there for you in the future. Leviton was founded 115 years ago in Brooklyn, New York, and we continue to expand nationwide to support customers around the globe. Today, Leviton Network Solutions U.S. factories span from coast to coast, with facilities in Pennsylvania, North Carolina, Florida, Illinois, and Washington state.

Learn about Leviton Network Solutions and our U.S.-made systems.

IN THIS ISSUE

LEVITON POLL

Which type of wireless network do you expect to deploy in the next three years?



From a November 2020 survey of 175 network professionals

UPCOMING EVENTS

2021 BICSI Winter Virtual Conference & Exhibition
February 28 - March 4, 2021

Future Focus

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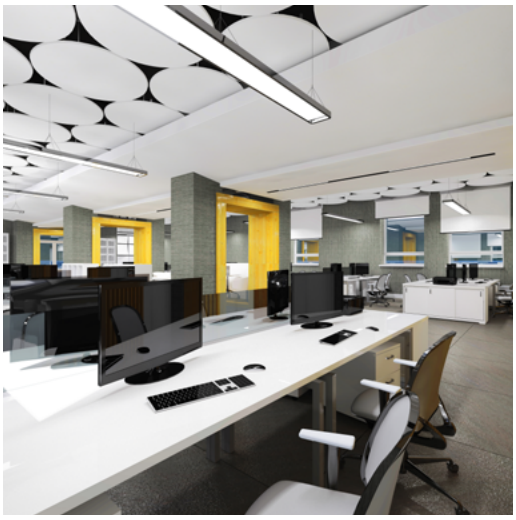
Dave Mullen — The growth of 5G — and IoT applications over 5G — means that data center networks need to reduce latency and support growing bandwidth requirements. Processing and analyzing data in closer proximity to the client will become a key endeavor for cloud providers. This is where edge computing comes in, with more high-density "near edge" data centers close to users — i.e. smaller traditional data centers — as well as mass deployments of micro data centers at base cell towers or customer locations at the far edge.

Even with the rise of edge data centers, more strain well be placed on core computing back in large consolidated and cloud data centers that edge data centers integrate with. These centralized data centers are still where roughly 90% of data is processed today. Over the next five years, we will see more migration to 400 Gb/s and even 800 Gb/s in these core data centers.



Future FOCUS

ENTERPRISE NETWORK TRENDS

Kirk Krahn — It may be premature to point to definitive trends based on the effects of the ongoing pandemic. However, there are signs that some building owners have accelerated adoption of smart technologies as a response to the pandemic. There are numerous ways businesses are using these solutions to keep building occupants safe.

- Infrared cameras recently installed at some airports are used to track body temperature, while offices and factories have installed screening kiosks to measure temperature when employees enter a building.
- With building management systems in larger facilities or factories, issues can be identified and resolved remotely, requiring less human interaction and maintenance.
- Occupancy analytics, an increasingly popular smart building trend before the pandemic, can measure flow of people and alleviate congested areas or pinpoint areas that require more regular cleaning.

Many building operations are currently in a state of flux due to fewer visitors or work-from-home adjustments. However, as companies install smart technologies like the examples above to address return-to-work requirements or more building traffic, the right infrastructure will be important to handle added IoT devices and potential increased bandwidth needs over the long term. We recommend using a cabling infrastructure that is optimized for PoE applications. And it is important to consider higher density patching and connectivity to anticipate additional smart devices on the network over time. This creates a much more flexible infrastructure for dynamic environments and the high probability that network configurations will change as a result of the pandemic.

Asef Baddar — Copper twisted pair cabling technology is evolving at a rapid pace, not only in performance but also in terms of the applications it can serve. Refinements continue to be made to 4-pair Ethernet systems that improve speed, size, weight, density, and flexibility. Equally important are the enhancements for delivering Power over Ethernet (PoE), with improvements in distance, capacity, and temperature management in cable bundles, just to name a few.

Furthermore, new initiatives are underway to address emerging applications and markets. For example, single pair Ethernet (SPE) standards are in development for commercial, industrial, building automation, and automotive network applications. SPE cabling will complement 4-pair cabling in parts of a horizontal cabling structure. While 4-pair copper cabling channels are limited to 100 meters and 4 connections, the TIA SPE channels will be limited to 400 meters with 5 connections (SP1-400) and 1,000 meters with 10 connections (SP1-1000).

Gary Bernstein, RCDD, CDCD — Gary is the Senior Director of Product Management, Fiber & Data Center Solutions, at Leviton. He has more than 20 years' experience in the communications industry, with extensive knowledge in fiber cabling infrastructure and data center architectures.

Dave Mullen — As Senior Product Manager, Fiber & Data Center, Dave has nearly 20 years working in fiber optics. He currently sits on two TIA fiber optic committees: TR-42.11 Optical System (568), and TR-42.12 Optical Fibers and Cables.

Kirk Krahn — Kirk is a Senior Copper Product Manager for Leviton, with 20 years of experience in product management, including 13 years in the telecommunications industry. He manages copper cable assemblies, including patch cords and trunks, as well as bulk copper cable.

Asef Baddar — Asef is a Senior Manager of Engineering at Leviton, with 25+ years in the cabling industry and 14 years with Leviton. He currently manages Leviton's Application Engineering Department at the Network Solutions headquarters in Seattle.

Single Pair Ethernet Explained

Key drivers behind this emerging technology

By Mark Dearing, Senior Manager, Engineering and Jeff Poulsen, Senior Electrical Engineer

With the growth of the internet of things (IoT), machine-to-machine communications, building automation sensors and other emerging technologies, there is greater demand for connectivity that can deliver both power and data over longer distances to support these applications. **Single Pair Ethernet (SPE)** is poised to address these trends, as it combines reliable, economical, lightweight and space-efficient single pair cabling with Ethernet's non-proprietary protocols for greater interoperability.

While the historic progression of Ethernet for copper cabling has been focused on increasing speed at the expense of distance, more recent efforts have shifted towards slower speeds at greater distances, using one pair of conductors instead of four. The emergence of SPE serves to support three main market segments: industrial manufacturing, building automation, and automotive technology.

As **industrial manufacturing** moves towards total automation, the same degree of compatibility is needed for the equipment that makes up the complex manufacturing machine. Solutions for industrial and process control applications do not need high-speed data transmission, but they must support a considerably longer reach. Data rates as low as 10 Mb/s are sufficient, but for lengths as high as 1000 meters.

A key driver for SPE in the industrial market is an emerging megatrend called Industry 4.0, sometimes referred to as "the fourth industrial revolution." Industry 4.0 is the trend towards automation and data exchange in manufacturing technologies and processes which include cyber-physical systems (CPS), the internet of things (IoT), industrial internet of things (IIoT), cloud computing, cognitive computing and artificial intelligence. To achieve this level of autonomy and intelligence will require an increased level of machine-to-machine bi-directional communication. In addition to end devices receiving instructions, they will need to return information in the form of diagnostic data and status reports.

The **building automation** market is positioned to develop rapidly with the trend towards "smart buildings," in which sensors and controls are linked together to improve energy efficiency and overall user experience within the commercial building. Traditional building automation has been limited to HVAC systems and discreet energy monitors, which for the most part are self-contained. To maximize the benefits of a smart building, all systems need to communicate on a common network, with the goal of transmitting data from the device all the way to the cloud using the same communication protocol. Stand-alone systems such as lighting control, fire detection, and emergency lighting are likely to be among those that are connected to a single pair Ethernet network.

Automotive technology is advancing in complexity as vehicles receive more entertainment, communication, and sensor options. To realize the goal of autonomous vehicle operation, all these systems must work together with very low delay in communication. Vehicles need to support high-speed data transmission so that video can be transmitted and analyzed in real time, but since the system is contained within a single vehicle the reach requirements are relatively short. Data rates of 1 Gb/s will be required initially, with data rates greater than 10 Gb/s anticipated for the future. SPE offers the advantages of reduced weight (always a concern for vehicles) compared to 4-pair cabling, and unlike optical fiber, SPE can transmit power along with data.

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Single-Pair Ethernet Explained

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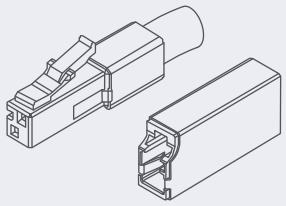
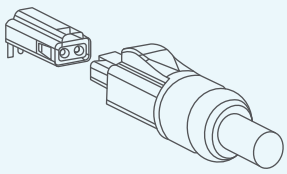
Connector Design

Two connector types are recommended in draft TIA and ISO/IEC standards. The Type 1 (LC) style copper connector (IEC 63171-1), with an optional shield, is recommended for use in commercial building applications. The Type 6 shielded pin and socket type connector (IEC 63171-6) is recommended for use in the harsher environments of industrial and process control applications. Images of these connectors are shown in the figures to the right.



Type 1 SPE Connector
IEC 63171-1 | Copper LC Connector



Type 6 SPE Connector
IEC 63171-6 | Industrial Connector

SPE Will Coexist with 4-Pair Ethernet

SPE will complement, rather than displace, traditional 4-pair Ethernet cabling. SPE is targeted for field level devices that do not currently operate on an Ethernet network, and often on legacy fieldbus networks that would require a gateway to connect to an Ethernet network. Most often these devices only need relatively low data rates, low power, a small connector interface, and may be located more than 100 meters away from the nearest telecommunications room. Ethernet devices that currently include RJ-45 connectors will continue to be supported by 4-pair copper cabling, which can support data rates greater than 1 Gb/s and PoE power delivery up to 90 watts.

SPE Market Timing

As of early 2021, the SPE market is still in the early stages, with many of the IEEE, TIA, and ISO standards still in development. However, there are some early indications that SPE-enabled equipment is coming. As PHY manufacturers near the end of their development cycles, further collaboration will occur between manufacturers to incorporate SPE technology into field devices, eventually giving factories, businesses, and auto manufacturers a reliable and interoperable solution for delivering power and data.

Learn more about SPE

in the new Leviton white paper "Advantages of Single Pair Ethernet", which covers SPE cabling standards, typical deployments, and its advantages versus fieldbus and wireless.

Catch Leviton exhibit and presentations at the

2021 BICSI Winter Virtual CONFERENCE & EXHIBITION

Visit the Leviton virtual booth at the **BICSI Winter Conference**, February 28-March 4. At this free event, we'll be discussing discussing the latest solutions for data centers, smart buildings, and residential networks. In addition, Leviton experts are participating in two technical concurrent sessions:

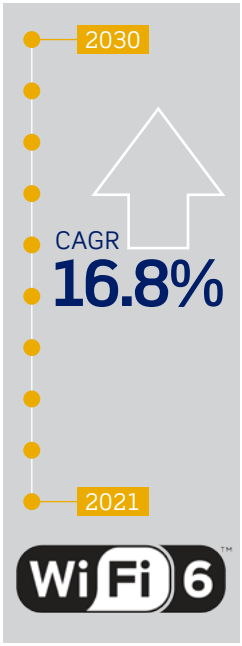
10Mb/s Single-Pair Ethernet for Building and Industrial Automation
» Tues., March 2, 12-1 p.m. EST

To the Edge and Back: What 5G Rollouts Mean for Data Center Networks
» Wed., March 3, 12-1 p.m. EST

NEWS YOU CAN USE

INDUSTRY

IN THE FIRST NINE MONTHS OF LAST YEAR, 25 Gbps, 100 Gbps, and 400 Gbps comprised more than 50 percent of port shipments, according to market research analyst Dell'Oro.



Between 2021 and 2030, investment in Wi-Fi 6 (802.11ax) in the industrial sector is expected to grow at a compound annual growth rate of 16.8%, according to Greenhouse Insights. Their report "Wi-Fi 6 and the IIoT" explains how, unlike previous Wi-Fi generations, the technology behind Wi-Fi 6 is better suited for industrial environments, with the ability to connect many more end devices.

YESTERDAY'S NEWS

1971 – 50 years ago, computer programmer Ray Tomlinson sent the first email, the first messaging system used to communicate across a network. The email contained the text "something like QWERTYUIOP."

Photo Courtesy of Guinness World Records

Standards SNAPSHOT

Below are some highlights of projects from recent committee meetings. For a comprehensive list of the latest updates from IEEE, TIA, and ISO committees, read the **Q4 2020 Leviton Standards Report** (pdf).

IEEE

IEEE 802.3 Beyond 400 Gb/s Ethernet Study Group
Following a successful Call for Interest meeting, a new Study Group was formed to investigate physical layer specifications for more than 400 Gb/s. Data rates investigated are likely to be 800 Gb/s and 1.6 Tb/s.

IEEE P802.11ax High Efficiency WLAN (Wi-Fi 6)
The document is expected to publish in February 2021. This standard supports wireless Ethernet operations in the 2.4 GHz and 5 GHz frequency bands, with a maximum data rate of 10 Gb/s.

TIA

ANSI/TIA-568.2-D-2 Twisted-Pair Telecommunications Cabling and Components Standard Addendum 2: Power Delivery Over Balanced Twisted-Pair Cabling
This Addendum has been published. It converts much of the guidelines from TIA TSB-184-A into requirements for a wide variety of wide variety of safety extra low voltage (SELV) limited power source (LPS) applications, such as LAN devices, wireless access points, and ANSI/TIA-862-B intelligent building systems devices.

ANSI/TIA-568.3-E Optical Fiber Cabling Components
A ballot for this revision to ANSI/TIA-568.3-D will circulate for review at the February 2021 meeting.

ANSI/TIA-PN-606-D Administration Standard for Telecommunications Infrastructure
The TR-42.3 committee activated this as a new project. It covers covers how to properly label and administer a telecommunications infrastructure. It will replace TIA-606-C. A first draft will be reviewed at the February 2021 meeting.

ASK THE **EXPERTS**

Q: In your product info I saw that the LANmark-SST Cat 6A cable includes an icon with a "CA Score: 8.6." What does this mean?

A: This is a Converged Application (CA) Score, which measures how a cabling system will perform under the strain of future demand. It is calculated using a proprietary algorithm that combines the results of four different performance tests, done in a unique four connector, 100-meter channel. The channel is unique because VoIP, data, video, and power are transmitted simultaneously through the channel, and it includes simulated hot plenum spaces as well as nearby power cables throwing off voltage spikes. All of this is done to replicate real-world conditions as closely as possible in the lab. The CA Score process has been verified by UL after undergoing a rigorous audit process.

CA score							
	Score	< 3.6	3.6 - 5.5	5.6 - 6.5	6.6 - 7.5	7.6 - 8.5	8.6 +
	Performance	Unacceptable	Poor	Limited	Good	Better	Best
	Heat Rise	Severe	Significant	Moderate	Moderate	Moderate	Low

A high CA Score of 8.6 (like the LANmark-SST) means that your IP infrastructure performance is outstanding, resulting in near flawless application performance, and that there is relatively low heat rise under the strain of high power PoE. A low CA Score such as 3.6 would mean you could expect to see and hear errors and encounter frustrating delays.

Visit our website to learn more about the Converged Application Score.

Questions? Comments? Ideas?

We want to hear from you! Email: **crosstalk@leviton.com**