PoE and Digital Buildings: Why Zone Cabling Architectures Make Sense

When Power over Ethernet (PoE) was introduced in 2003, it was available for only a handful of low-power operations and devices. Today, PoE is one of the fastest growing networking applications. A wide range of enterprise devices and technology rely on PoE, including lighting, access controls, laptops and desktop computers, IP cameras, information kiosks, industrial automation equipment, and wireless access points (WAPs). With the advent of digital buildings and the Internet of Things (IoT), PoE is poised for unprecedented expansion in the enterprise.

To leverage the many capabilities of PoE, network designers are increasingly turning to zone cabling architectures as an alternative to traditional home run cabling in digital buildings.

New GreenPack® Packaging Streamlines Installation and Reduces Material Waste

IT network managers constantly seek more efficient and cost-effective options for large connector installations. Leviton has introduced new GreenPack® packaging that supports these efforts while contributing to an organization’s environmental initiatives.

The bulk packs — available for select Atlas-X1® and eXtreme® RJ-45 connectors — hold 12 jacks in individual, clear pockets. The jacks can be removed quickly, one at a time, with remaining jacks and components well organized and easily counted. The packs offer an environmentally sound alternative to individually packaged jacks, and the corrugated cardboard sleeve and PET plastic packaging is 100 percent recyclable.

For more information, visit Leviton.com/CopperSystems.
There are three basic topologies commonly implemented when designing for PoE systems: home run, passive zone, and active zone architectures.

**HOME RUN**

- Permanent Link Cable
- Patch Cords
- Jack to Plug Assembly
- PoE Switch
- Patch Panel

In this network architecture, all active gear is located in the telecommunications room (TR), with permanent link cabling running from the TR patch panel to each device. A surface mount box or other type of termination at a port may also be included, with patch cords connecting to the devices.

**PASSIVE ZONE**

- Permanent Link Cable
- Patch Cords
- Jack to Plug Assembly
- Consolidation Point

Like home run cabling, this type of architecture locates all active gear in the TR. However, a consolidation point is added between the TR and the devices to facilitate moves, adds and changes.

**ACTIVE ZONE**

- Optical Fiber Links
- Permanent Link Cable
- Patch Cords
- Jack to Plug Assembly
- TE
- Switch
- Patch Panel
- PoE Switch
- TR

In this architecture, a PoE device is located in the telecommunications enclosure to accommodate long distance runs between the TR and the TE, or to facilitate the transmission of large amounts of data. The cabling from the TR to the TE is typically fiber, with copper cabling running from the telecommunications enclosure to the devices.

An active zone design reduces the size requirement for the telecommunications room by running optical fiber from the TR to zone enclosures, and copper cabling from the enclosures to the device outlets. Moving the PoE switch from the TR to the zone enclosure — and closer to the end device — reduces energy loss in cables. In addition, smaller PoE switches used in zone enclosures are generally more cost effective than larger switches housed in a TR.

Zone cabling options also have a lower cost after installation (“day two cost”). There are, however, several disadvantages to using zone cabling. These include a higher initial cost and fewer measurable benefits to fixed workspaces where MACs are rare.

There is no one-size-fits all topology for PoE, and each architecture offers advantages and disadvantages. However, for high-power PoE, passive and active zone architectures create some clear benefits.

While a traditional home run scenario makes it easy to manage active equipment and power — as it is centralized in the TR — the cabling infrastructure is much less flexible, making future moves, adds, and changes (MACs) more difficult.

In the passive zone topology, all active equipment and power is also centralized in the TR. But unlike the home run, the added consolidation point creates the flexibility of not having to provide cabling all the way back to the TR. Instead, it includes a break point in the middle that allows for adjustments. This provides a big advantage in environments like open offices, where work spaces or cubicles are often reconfigured and moved around.

---

continued on pg. 3
SHIPMENTS OF 10 AND 40 GBE DATA CENTER SWITCHES declined in 2018, while 25 and 100 Gbe shipments grew significantly, according to Crehan Research. Although 10 GbE data center switch shipments declined, 10GBASE-T shipments continued to grow in 2018.

COMPANY

LEVITON DONATED $250,000 toward the creation of Leviton Engineering Lab at the North Carolina School of Science and Mathematics (NCSSM) Morganton campus. The new campus, slated to open in 2021, offers classes in STEM fields with an added focus on data science. Leviton’s Morganton manufacturing facility has been in operation for more than 50 years.

LEVITON UPDATED ITS ELECTRICAL LOAD CENTER offering with a breaker panel that works with an integrated Wi-Fi or Ethernet hub, offering circuit control and monitor energy consumption via iOS and Android apps. The update was unveiled at the 2019 NAHB International Builders’ Show in February.

YESTERDAY’S NEWS

1999 — 20 years ago, IEEE standard 802.3ab was ratified, defining Gigabit Ethernet (1000BASE-T) over Cat 5, 5e, or 6 twisted pair cabling.

POE-OPTIMIZED CONNECTIVITY FOR ZONE ARCHITECTURE

Digital building technology can provide significant energy savings, but it’s important to select cabling that will provide optimal performance for the bandwidth and power requirements of the system’s applications. In turn, high-quality connectivity must meet the PoE performance requirements for digital building applications.

Leviton’s end-to-end PoE-compatible systems of cable, jacks, patch cords, and patch panels are component rated, and third-party tested and verified to exceed industry standard performance, including higher bandwidth and power levels. Leviton Atlas-X1® connectivity has successfully demonstrated readiness for 100-watt PoE, which will enable the transmission of power and data to a wide range of remote devices.

Also, Atlas-X1 Cat 6A jacks include the only UTP jacks on the market with a solid metal body. By using a metal jack body, instead of the more common ABS plastic, the jacks achieve higher performance and a 53% improvement in heat dissipation.

The jacks are designed with PoE-optimized tine geometry that prevents tine damage that can be caused by higher current PoE applications. Leviton’s patented Retention Force Technology™ maintains constant contact force at the jack and plug interface, preventing inadvertent intermittent disconnects. This increases system longevity and prevents costly repairs.

Leviton zone cabling enclosures are the perfect solution for adding flexibility within an open-office architecture. Active zone enclosures, typically a tie-in to a ceiling grid, should be used when active equipment is included in the consolidation point. Passive enclosures can be used in open-air environments or unfinished ceilings, where only passive cabling is used in the consolidation point.

To learn more, download the Leviton white paper “Network Infrastructure Considerations when Deploying a Digital Building.”
IEEE 802.3
IEEE P802.3cg 10Mb/s Single-Pair Ethernet — This standard was approved to progress to Standards Association ballot stage, so the next round of balloting is available to the entire 802.3 group, not just the 802.3cg working group. This standard is expected to publish in September 2019.

The project supports two different PHY designs. The long reach application (10BASE-T1L) supports distances up to 1000 meters, while the short reach application (10BASE-T1S) supports distances up to 15 meters.

IEEE P802.3cn 50 Gb/s, 200 Gb/s, and 400 Gb/s over Greater than 10 km of Single-Mode Fiber — This standard is currently at draft 2.0, although no changes occurred between drafts 1.0 and 2.0. This standard is expected to publish in June 2020.

IEEE P802.3cm 400 Gb/s over Multimode — This project will support 400Gb/s over multimode fiber. The 400GBASE-SR4.2 application supports OM5 cable up to 150 meters. The 400GBASE-SR8 application supports OM4/OM5 cable up to 100 meters and OM3 cable up to 70 meters.

This standard is currently at draft 2.0 and will progress to a first working group ballot. It is expected to publish in December 2019.

TIA TR-42
TR-42.1 Commercial Telecommunications Cabling — Work on the E revision for generic (568.0-E) and commercial (568.1-E) cabling systems has been deferred until the June 2019 meeting to allow a Task Group to complete work relevant to both standards.

The standard for outside plant cabling (ANSI/TIA-758-D) has progressed to a second industry ballot. This standard is likely to publish by the end of 2019. Work continues for a revision to the education cabling standard (ANSI/TIA-4966-A). A revision for the TSB providing guidance for WAP cabling (TSB-162-B) will begin work at the June 2019 meeting.

TR-42.7 - Telecommunications Copper Cabling Systems — The Single-Pair Ethernet standard (ANSI/TIA-568.5) has moved from the Task Group into the balloting cycle. The first mock ballot has been circulated to the sub-committee and will be reviewed at the June 2019 meeting.

TR-42.11 - Optical Fiber Systems — Development continues for a new document (TSB-5069) providing guidance for single and double row fiber polarity. A first committee ballot has been circulated, which will be reviewed at the June 2019 meeting.

ISO/IEC
Single-Pair Ethernet — Multiple amendments are in process to add single-pair Ethernet to the 11801 series of standards. These include: 11801-1 AMD1 (Generic), 11801-3 AMD1 (Industrial), and 11801-6 AMD1 (Distributed Building Systems). All three documents are in a preliminary state, with a working draft (WD) pending. Document 11801-1 AMD1 is awaiting publication of TR 11801-9906.

Modular Plug Terminated Link (MPTL) — Development has begun on a technical report (TR 11801-99xx ED1) to define a Modular Plug Terminated Link (MPTL) topology. This document will most likely adopt the MPTL definition from ANSI/TIA-568.2-D. This effort is a preliminary investigation, with a Working Draft (WD) having been circulated for comment.

Power over Ethernet — TS 29125 AMD1 ED2 is an amendment that expands the power delivery document scope to include 28 AWG 4-pair cabling and support for 1-pair (802.3bu PoDL) cabling. This amendment is in a preliminary stage, with a Working Draft (WD) pending.

Multimode Optical Fiber — Work is progressing on TR 11801-9908 ED1, which addresses higher speed applications over multimode fiber. A second Working Draft (WD) has been circulated for comment.
TECH TIPS

Protect Jacks from Tine Damage in Work Areas

We know it’s often necessary to insert 6-position (6P) plugs into RJ-45 8-position (8P) connectors. When the outside “shoulders” of the 6P plug push against pins 1 and 8 in an 8P connector, the pins may be bent beyond their ability to return to normal position. When 8P plugs are later plugged in, open or intermittent-open circuit conditions may occur. Denying this reality in the design and development of jack systems ultimately leads to the development of an inferior product.

Industry standards such as ANSI/TIA-1096-A and ANSI/TIA-568 do not adequately address the issue. Fortunately, Leviton patented Retention Force Technology™ (RFT), found in Atlas-X1® and eXtreme® Jacks and select patch panels, features a patented polymer spring that supports jack tines and increases their resistance to strain and damage.

For example, when a 4- or 6-pin plug or probe is inserted into any Leviton jack or patch panel with RFT, the spring returns tines to their pre-stress location and protects against long-term damage. Because insertion of 4- or 6-pin plugs into 8-pin connectors is common, we plan, design, build, and test for this real-world occurrence.

Damaged jacks can cost an estimated $150 per replacement. Leviton jacks with RFT provide long-term reliability and performance saving valuable time and money by avoiding these costly repairs.

Learn more about Leviton solutions that use RFT (pdf).

ASK THE EXPERTS

Q: We are upgrading a network at a brownfield site where most fiber runs are close to 100 meters, and we’re considering an upgrade from OM2 to either OM4 or single-mode. Which one should we choose?

A: Customers prefer to stay with multimode, as the transceivers are generally cheaper. If your runs are 100 meters or less, OM4 would allow you to migrate to 400 Gb/s in the future, based on the draft requirements of IEEE 802.3cm. If your runs are over 100 meters, there are proprietary transceivers that would allow you to go farther at 100 Gb/s on OM4, but at this stage you should be looking at single-mode.