IT/AV Designs for Schools
Stronger Networks for Smarter Students

By Kit Gaines, Specification Engineer, Network Solutions

AV technology expectations in today’s K-12 and higher education classrooms are significant. Classrooms have graduated from chalkboards and overhead projectors to using connected tools like interactive whiteboards and document cameras. To ensure a quality learning experience throughout all types of environments, including lecture halls, libraries, and computer labs, teachers need to be able to easily extend HDMI®, VGA, and USB signals from their desks to the latest devices anywhere in the room. The challenge is to provide AV tools that maximize student engagement, are easy to use, and meet budgetary guidelines.

eBay Data Centers Upgrade to 40GbE with Leviton

As part of its data center technology roadmap, eBay planned to upgrade to 40GbE servers. In order to meet the requirements of the new design, eBay required a custom OM4+ cabling solution that would help solve the following challenges:

- Support long multimode fiber runs up to 500 meters in length
- Increase fiber density to six times greater than the existing design
- Have the flexibility to support various active equipment vendors
- Allow migration to future bandwidth speeds of 100GbE and 400GbE
- Offer easy network management and maintenance

Through extensive collaboration with Leviton, eBay was able to meet its requirements, and the OM4+ system is now installed in four data centers. The company now makes more efficient use of its existing facilities, can quickly respond to customer demand, and is in a stronger position to expand in the future.
Technology Demands in the Classroom

An up-to-date audiovisual network is a crucial component for any classroom. Sound and video help capture the attention of students so they learn and retain more information. Plus, interaction with these audio and video devices helps to prepare students for the level of technology they can expect to see in later stages of life, such as in enterprise and commercial environments.

When it comes to choosing the right components to support an education AV network there are many factors to consider:

- Source signal type (HDMI vs VGA or composite video)
- Distance from source(s) to display(s)
- Use of passive cable vs active signal extension
- Ease of use
- Options for future technology upgrades

The options can be overwhelming and school budgets vary greatly.

IT/AV signal extension is a reliable solution for supporting large-format displays in hospitals, hotels, conference rooms, and other enterprise applications, but it is most ideal for deployment throughout school lecture halls, classrooms, and other learning environments. By installing a standards-based certified permanent link as part of an IT/AV network, schools and other learning institutions can save money and time during the initial construction while providing the capability for future technology upgrades.

Common Education IT/AV Scenarios

There are a number of ways in which IT/AV technologies can be deployed in real-world classroom applications.

Three common scenarios include:

- Connecting multiple sources to a single display
- Connecting a PC to an interactive projector via VGA and USB connections
- Upgrading an interactive projector from VGA to HDMI for greater bandwidth and higher resolution

Multiple Sources

By running an IT/AV signal over category-rated cable, schools benefit from the reliability and performance associated with a tested, standards-based permanent link. Classrooms can use multiple sources, such as document cameras and laptops, to connect to projectors or large-format displays. These displays are already capable of managing video signals from multiple sources, eliminating the need for a dedicated switch and allowing schools to save additional resources by investing in less equipment.

In some cases, audio output is taken from the source. This can limit sound quality and distance. An audio amplifier connected to the display allows better synchronization of audio and video. Teachers will be able to use the remote control supplied with the display to adjust audio and video outputs, simplifying operation.
In this scenario, a PC is connected to an interactive projector with a USB connection for control and a VGA connection for audio/video output. To allow an extended distance (up to 100 meters for VGA and up to 50 meters for USB) between the source computer and the projector, while protecting against signal degradation, a category-rated permanent link is necessary. In addition to signal extension capability, using a permanent link and category cabling prepares the system for easy upgrades to newer technologies, as shown in the following scenario.

In this scenario, the VGA connection can be upgraded to HDMI to handle greater bandwidth for supporting higher resolution displays and greater interactivity. HDBaseT technology upgrades are simple and easy, and replacing the existing IT/AV infrastructure is not required. The same reliable, standards-based permanent link is used; just swap out the VGA extenders for HDMI extenders. The USB connection remains unchanged. The link now provides a significant boost in audio/video quality and increased interactivity with no change to the cabling infrastructure. It is a simple plug-and-play solution that does not require any programming; a qualified datacom installer can easily perform the upgrade in a short period of time.

Extending the Lifecycle of Audiovisual Systems with IT/AV

An up-to-date audiovisual network helps students engage with classroom activities while familiarizing them with technologies they will see later in life. By using standards-based systems to create their AV network, schools and other learning institutions can rely on established best practices to provide performance assurance while balancing technology demands, budget concerns, and education benefits. Installation is simple, and technology upgrades only require swapping the extenders, with no change to the network infrastructure. And since these plug-and-play solutions do not require programming and can be added to an existing certified permanent link, a single datacom contractor can facilitate all datacom and audiovisual networking needs.

To learn more about HDBaseT solutions and how they enhance the student learning experience, visit: Leviton.com/ITAV.
eBay Data Centers Upgrade to 40GbE with Leviton • continued from pg. 1

Push for Higher Bandwidth and Greater Reach Drives Innovation

eBay is a recognized leader in data center advancement. From aggressively reducing power consumption to unique space-saving initiatives, the e-commerce company is at the forefront of data center efficiency and design.

In 2014, eBay developed a new Leaf-Spine network design that would deliver 40GbE to server cabinets in its existing data centers. As part of this fourth-generation “G4” upgrade, eBay data center engineers wanted to use high-density switch ports with cost-effective multimode optics, as opposed to more expensive single-mode optics. However, they weren’t sure if multimode fiber would be able to support the distances required in their large data centers — up to 500 meters in some cases.

The engineers tested a multimode system using Arista 120GbE MXP ports in the spine switch, cabled to extended reach 40GBASE-XSR4 transceivers in the Top-of-Rack (ToR) switches. In order to ensure interoperability, eBay used switches from various manufacturers in the testing, including Arista, Cisco, and Juniper.

eBay also chose the Leviton OM4+ Violet Fiber cabling system for the testing, which provides higher bandwidth and a longer reach than standard OM4 cabling.

While extended reach 40GBASE-XSR4 transceivers have a manufacturer’s stated maximum distance of 400 meters, the test was successful with zero errors or dropped packets when transmitting over 750 meters. This real-world application demonstrated the longest-known channel for supporting 40GbE over multimode fiber.

Value Through Density, Flexibility, and Scalability

eBay tested the optical channel using four mated pairs with 24-fiber MTP® connectors. The cabling system included Leviton Opt-X® Unity trunk cables, harnesses, and array cords, and e2XHD snap-in cassettes.

Each Arista 120GbE MXP switch port enables twelve 10GbE, three 40GbE, or one 100GbE channels. By using 24-fiber MTP connections at the distribution switch, eBay is able to convert to three 40GbE 8-fiber MTP cables. This configuration optimizes density while utilizing 100 percent of the fibers in the channel, and allows eBay to keep the same 24-fiber cabling in the system when migrating to 100GbE or greater bandwidth in the future.

The 40GbE channel design and testing demonstrated to eBay that it could meet its length requirements and minimize cost per channel. The ability to optimize density at the switch port while meeting the 750-meter reach translates into less overall hardware required. This also puts eBay in a better position to accommodate growth and handle future customer demand.

Since the initial testing, eBay has installed the OM4+ extended reach system in four of its locations in the United States. In these installations, eBay switched to compact Leviton HDX cassettes for higher-density patching, creating greater space savings and more capacity for expansion. Several products in the OM4+ system were custom designed and manufactured specifically for the G4 project:

- Leviton engineers created an entirely new high-density top-of-rack patch panel for eBay. The custom angled panel accepts the HDX cassettes, and can patch up to 144 fibers using LC or 576 fibers using 8-fiber MTP connections in just one rack unit. Leviton was able to build a prototype panel within six weeks and began production on the panel shortly thereafter.

- The Opt-X Unity violet-colored OM4+ trunks include 288 fibers in one cable that then break out into 8-fiber MTP connections, a unique solution in the industry. The trunks use Berk-Tek MDP cable with GIGAlite-10XB fiber, which offers the industry’s smallest form factor, allowing eBay to reduce pathway fill and improve airflow.

- eBay deployed custom color-coded MTP array cords and harnesses that help data center technicians identify polarity changes throughout the system. For example, green connector boot colors signify MTP method B polarity, while grey boots designate MTP method A. This type of clear identification supports ongoing maintenance and MACs, helping technicians save time and maintain the correct parallel groupings for switch ports. In addition, the cable assemblies are color-coded violet to identify OM4+ fiber in the network and avoid confusion and channel loss that can occur when OM3 and/or OM4 fiber cabling is used in the same data center. The Leviton OM4+ system was the first all-violet end-to-end solution on the market.
Collaboration for the G4 Upgrade

When selecting the right products and infrastructure design for the initial testing and G4 upgrades, Shawn Tugwell, eBay’s Data Center Whitespace Engineer, worked closely with Leviton to develop a full solution for the new G4 upgrade. Leviton team members collaborated extensively with eBay in developing the custom high-density products, new polarity configurations and unique color-coding schemes.

Impact

The G4 tech refresh has allowed eBay to increase bandwidth to servers in its existing data centers. The extended reach OM4+ multimode design gives the company greater design flexibility while using more cost effective multimode transceivers. And the high-density design — with 120G MXP ports, 24-fiber MTP connectivity, 288-fiber trunks, and custom patch panels — makes the most efficient use of eBay’s space and creates capacity for future growth.

You can learn more about Leviton’s innovative OM4+ violet fiber solutions at Leviton.com/OM4plus.

Leviton receives 2015 Gold and Silver Innovators Awards from Cabling Installation and Maintenance

Leviton Network Solutions and eBay were recognized as a Gold honoree by the judges of the Cabling Installation & Maintenance 2015 Innovators Awards program for successfully using OM4+ technology to solve unique data center challenges. For the full story, see the complete article in this issue of CrossTalk.

Leviton Network Solutions and California State University Monterey Bay (CSUMB) was recognized as a Silver honoree by the judges of the Cabling Installation & Maintenance 2015 Innovators Awards program for installing an intelligent network and establishing CSUMB as a technology leader in higher education.

Leviton partnered with CSUMB to implement a forward-thinking intelligent network in their new Business and Information Technology building. The Leviton Intact™ Intelligent Port Management System allows CSUMB to easily monitor port status, manage network changes, and diagnose problems remotely while Atlas-X1™ QuickPort® UTP connectors provide the bandwidth needed to meet the growing demands of students and faculty.

For more information about the CSUMB project, see the case study in the CrossTalk July/August 2015 Issue or Leviton.com/CaseStudies.
Responsive Support Teams Make Life Easier for Contractors

By David Rumpakis, Contractor Programs Manager, Network Solutions

In the July/August issue of CrossTalk, we talked about some of the new Leviton products designed to make life easier for contractors. Contractors are not only top-of-mind within our product development teams, but with our customer and technical service teams, too. That’s important, as I regularly hear from contractors that their choice of manufacturer often comes down to the level of product and system support they’ll get on a project.

Take contractor Zenith Systems in Ohio. Marcus Dehler, the technology infrastructure group director at Zenith, told me “We choose Leviton because of the excellent support they provide and because of the strong relationship we have with our area representative. Good relationships are important, carry a lot of weight in the industry, and add value to the equation.”

Giving contractors the assistance they need comes from a comprehensive, multi-tiered structure of support teams.

For example, contractors might talk to one of our many knowledgeable Customer Service Representatives to answer questions about purchases, get a quote on a product, or find the right field support or distributor in their city.

Our Technical Support Reps respond to questions over the phone or through online live chat. They work closely with contractors to provide product-specific recommendations and guidance in solving field-installation problems. More than 90 percent of tech support issues are resolved on the first call.

Applications Engineers and Data Center Specialists can assist with topology, layout, elevations, and pathways. They’re also ready to help though remote or on-site support. For example, when Leverage Information Systems, a Leviton certified contractor in Woodinville, Washington, installed its first ever Cat 6A installation, Leviton engineers came out to the jobsite to assist. Rich Thorpe, director of cabling operations at Leverage, said of Leviton, “The people are great. If I want help I make a phone call and I’ve got an engineer on the line.”

Receiving this kind of feedback makes our support staff proud to come to work every day, and it drives Leviton to constantly look for new ways to support contractors at every stage of a project. You can hear more from Leviton Certified Contractors at our Featured Contractors page.

WEB

Keep up on the latest network connectivity news and trends at the Leviton Blog.


If you download the Leviton 2 Go App, you can enter for a chance to win a $100 gift card. The Leviton 2 Go app for iOS and Android devices allows you to search over 25,000 Leviton products, use our competitor cross reference tool, and get the latest Leviton news.

YESTERDAY’S NEWS

October 1969: The first successful message on the ARPANET was sent by UCLA student programmer Charley Kline.
TECH TIPS Extending High-Quality AV Signals

All digital and analog AV have their distance limits. Longer lengths will increase signal degradation, creating poor video resolution or slow data rates. The following charts show the maximum category cable lengths between extenders for three Leviton HDMI extenders.

### Vertical Resolution

<table>
<thead>
<tr>
<th>Resolution</th>
<th>480, 720, 1080</th>
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<tbody>
<tr>
<td>Frame Rate</td>
<td>60 fps</td>
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<tr>
<td>Bit Depth</td>
<td>8 bit, 12 bit</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Cat 5e UTP</th>
<th>Cat 5e SHLD</th>
<th>Cat 6 UTP</th>
<th>Cat 6 SHLD</th>
<th>Cat 6A UTP</th>
<th>Cat 6A SHLD</th>
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<tbody>
<tr>
<td>41910-HTE</td>
<td>50M</td>
<td>100M</td>
<td>50M</td>
<td>100M</td>
<td>100M</td>
<td>100M</td>
</tr>
<tr>
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<td>70M</td>
<td>35M</td>
<td>70M</td>
<td>70M</td>
<td>70M</td>
</tr>
<tr>
<td>41910-H00</td>
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<td>40M</td>
<td>40M</td>
<td>40M</td>
<td>40M</td>
<td>40M</td>
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Note: Passive HDMI cables are recommended for distances up to 12-15m.

<table>
<thead>
<tr>
<th>Vertical Resolution</th>
<th>2160</th>
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<tbody>
<tr>
<td>Frame Rate</td>
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### ASK THE EXPERTS

**Q:** What labeling options do you have for 24 and 48-port QuickPort Patch Panels?

**A:** Standard-density 24- and 48-port panels are available with white write-on blocks, or with label holders that include a patented magnifying lens.

The tradeoff of having higher density, such as a 1RU 48-port panels, is there is less room for labeling. Leviton Atlas-X1 connectors include icons directly on the QuickPort connector. Also, a labeling key can be made and placed elsewhere in the installation based on these port numbers. Or a front-mount cable manager, such as the Leviton 5R1UL-CMT could be used and the labeling could be placed on it.