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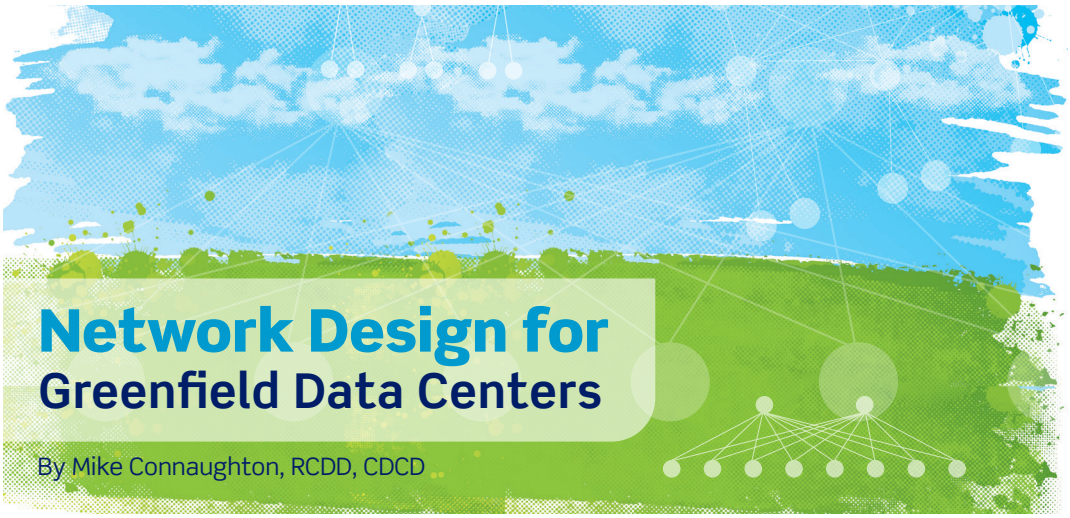

Network Design for Greenfield Data Centers

By Mike Connaughton, RCDD, CDCD

In recent years, economic volatility has done little to slow demand for supporting digital business infrastructure. While new data center construction slowed initially during the pandemic, 2021 and early 2022 saw robust expansion. When data center operators begin the process of defining the makeup of these new networks, there are some important practical design questions they need to answer, with the key considerations being general architecture, distance needs, data rate requirements, fiber types, and cost.

With a greenfield project, network designers may be starting from scratch with only an empty room or even just a concrete foundation. A greenfield project differs from brownfield data center upgrades, which face added constraints from the network infrastructure in place, such as the existing cable type or cabling layout. Brownfield upgrades can also be more constrained by time since updates to an operating data center may involve network disruption and downtime.

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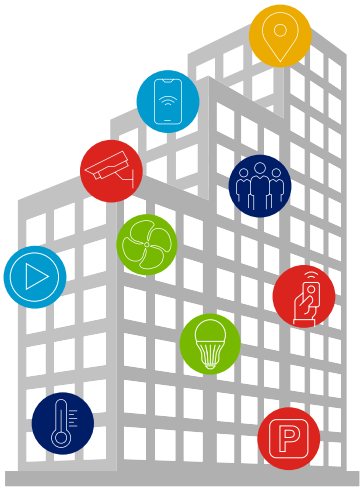

Foundation of a Smart Building

Address the changing enterprise network landscape with a uLAN™ Architecture

With ever expanding urban growth, intelligent devices and sensors have become critical for improving efficiency and sustainability in dense cities and large buildings. Facility managers are adopting building automations systems, while health and wellness initiatives like air quality sensors and occupancy tracking have grown in response to the global pandemic. Yet as more smart devices join the network, traditional infrastructure designs may not always handle the resulting bandwidth demand and added complexity.

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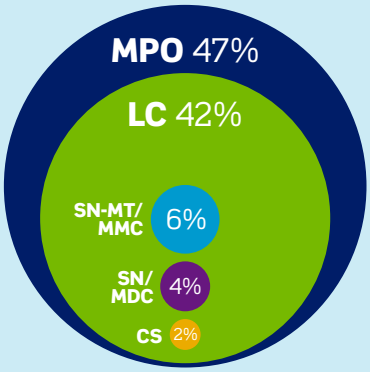
LEVITON **POLL**

Which connector type are you considering for your data center network?



From a June 2022 survey of 105 network professionals.

UPCOMING **WEBINAR**

Smooth Sailing: Best Practices for Planning a Smart Building
Tuesday, 13th September, 2022
1:30 PM – 2:30 PM BST

Network Design for Greenfield Data Centers

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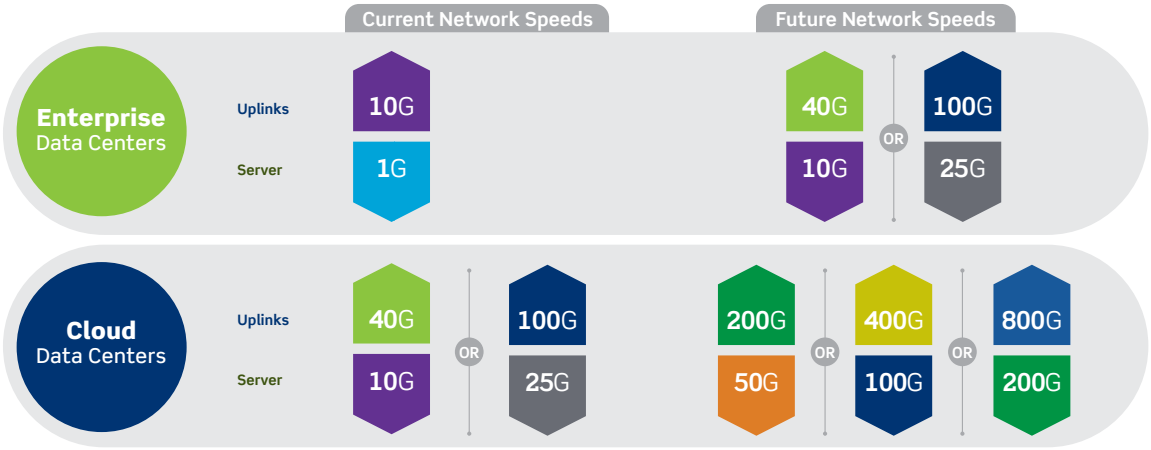
In a greenfield data center project there will be a significantly higher up-front investment as compared to updating an existing network, but there is an opportunity to create the right network architecture from the start since there are fewer existing impediments when making technology and design choices. The primary constraints in these projects are size, power, and money.

Design Considerations

The first decision to make for a new data center network is to choose the right architecture. This involves asking questions like "What are the business needs of the data center?" "What are the workloads and processes that will run in the data center?" While these questions are bigger than just the physical layer, they do lead to size and speed decisions that shape the makeup of the cabling system.

The type of data center architecture will affect the speed requirements of the network and the transceiver types most applicable to the design. Over the past 10 years, a split has formed between enterprise and cloud provider data centers when it comes to network migration patterns. For example, in previous years, cloud provider networks have operated at 40 Gb/s uplinks to the switch and 10 Gb/s from switch to server. These networks are now moving to 100 Gb/s uplinks and 25 Gb/s downlinks to the server, with some even preparing to migrate to 200 and 400 Gb/s uplinks and 50 and 100 Gb/s at the server.



Current vs Future Data Center Network Configurations

Next, data managers need to determine which fiber type is appropriate for each tier. In data center architecture there will be different layer 1 network tiers, and each will have different reach requirements. For example, the transceiver and fiber cabling choices for a Top-of-Rack (ToR) design — which typically have 2- or 3-meter connections — can be very different than the connections for an End-of-Row or Spine design. Extended reach is possible, however when considering extended reach applications, it is prudent to have a full understanding of current and future data applications, target application transceiver specifications, and a careful analysis of the performance capabilities of the passive cabling infrastructure.

Trunk cabling selection is the next key decision when constructing a new data center. Today, most data center connectors are either LC or MPO connectors. LC duplex connectors are currently the most popular fiber connection type. The duplex connector is easy to manage from a polarity perspective, and its established popularity makes it readily available. A common question we hear is "Will LC connections work when upgrading to data rates beyond 25 Gb/s?" While there are LC solutions for connecting networks at 40 Gb/s and 100 Gb/s, the duplex options that use LC connections will typically require multiplexing technologies like CWDM, which can raise the price of transceivers. Beyond 10 Gb/s, parallel optics with MPOs allow for breakout options that create easy connections between higher speed ports and multiple lower speed ports.

These considerations are only the beginning when it comes to designing a greenfield data center. If you would like to learn even more about specific data rate and transceiver choices, cabling topology, and link cost considerations, **check out our full white paper**.

Foundation of a Smart Building

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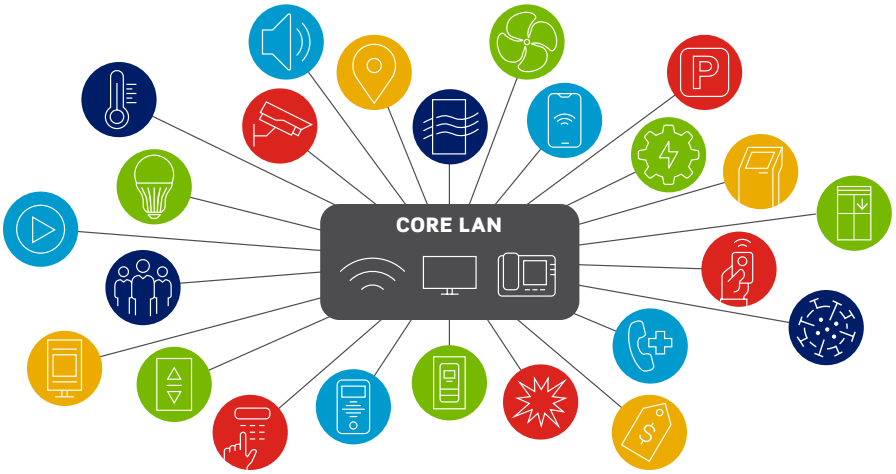
In a traditional enterprise facility, each building system is an island. Ethernet is the common language within the core local area network (LAN) — for devices such as workstations, WAPs, and VoIP phones — but historically all other systems speak their own language, with separate controls, support functions, and different managers responsible for them.

This traditional model is quickly changing. With smart building initiatives, more building systems such as HVAC, lighting, security systems, and energy management systems are being incorporated into the LAN. Organizations are seeing the efficiency and cost-savings benefits of converging once-disparate building systems onto their IP networks.



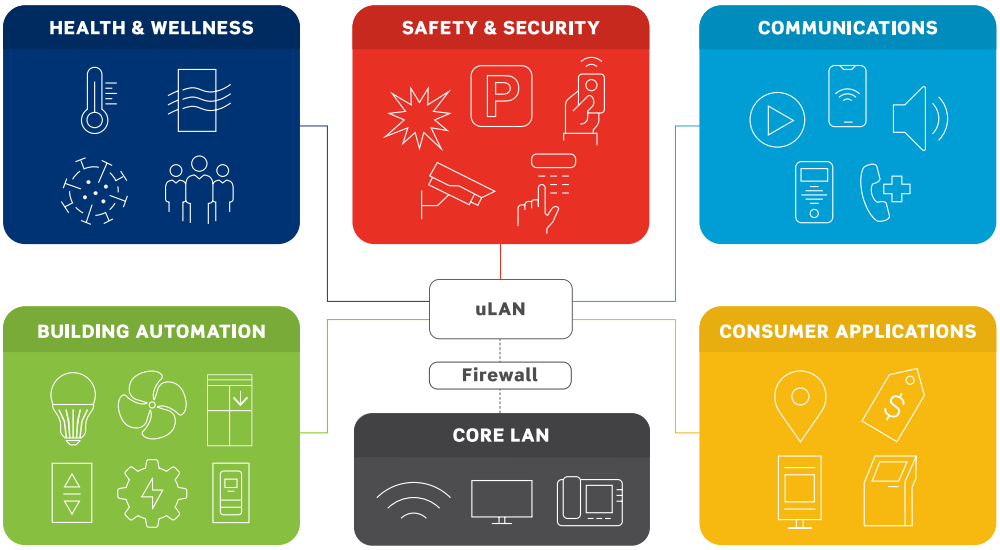
Smart and healthy building technologies converging on the core LAN.

Organizations are seeing the efficiency and cost-savings benefits of converging once-disparate building systems onto their IP networks.

At the same time, some of these new utility applications joining the network can consume higher power and bandwidth, and many network managers are concerned about the stress placed on the core LAN. The utility applications can require a wide range of power levels and data rates that may add more complexity when building the cabling infrastructure. Also, each new device added to the core LAN is a new security risk as a potential portal into the network.

Enter the uLAN™ Architecture

To simplify management, improve security, and alleviate network stress in smart buildings, Leviton recommends the network infrastructure connecting core LAN applications and utility applications become physically separated in telecommunications rooms or closets. This creates a utility LAN or what Leviton calls the uLAN.



Core LAN separated in the telecommunications room, simplifying network management.

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Establishing a separate uLAN™ network creates numerous benefits:

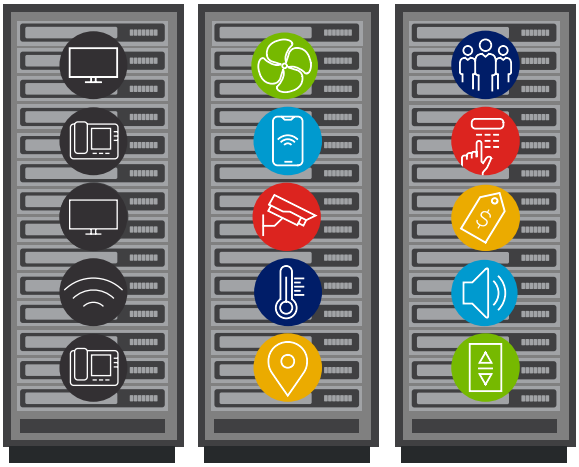
Alleviate Network Stress
It allows for system convergence, consolidating disparate systems while alleviating strain on the core LAN.

Simplify IP Convergence
Functional managers can maintain control of their own systems (security, HVAC, lighting, etc), while continuing to leverage the benefits of IP convergence.

Create Cost Savings
It allows for cost-effective IT equipment and infrastructure designed specifically for utility devices that can vary widely in their PoE and bandwidth consumption, while reserving tier one switching for the core LAN.

Improve Security
Separation allows for a firewall to be placed between the core LAN and uLAN, providing additional security and protection measures for the core LAN.

Traditionally, a standard telecom room will support all the IP connections needed for a building floor. Usually 80-90% of those connections are to traditional LAN devices like computer docking stations, VoIP phones, and wireless access points. The other 10-20% of connections are for utility applications like IP cameras, intercom systems, or access control systems. With the expansion of the Internet of Things (IoT) and non-traditional IP-enabled utility devices, that ratio will start to flip. Considering the numbers of lights, sensors, and other utility devices joining the network, equipment rooms will likely need more space.



Telecom Room with LAN 20% / uLAN 80%

Whatever level of network architecture you require, you can rely on Leviton experts for the right enterprise infrastructure planning, design, and system solutions. For more information on Leviton products and systems to support a uLAN architecture, **visit Leviton.com/uLAN.**

NEWS YOU CAN USE

INDUSTRY

According to Synergy Research, **thirty metro areas generated 68% of worldwide colocation revenues** in the second quarter of 2022. Data center revenues concentrating into a relatively small number of markets is a consistent trend, given data centers tend to pool in the hubs of economic activity, however revenue demographics shift as global regions shift over time. Of these thirty metros, five are in Europe: Dublin, Amsterdam, Paris, Frankfurt, and London. London as the fifth largest colocation market in the world, behind Tokyo, Beijing, Shanghai, and Washington DC. Synergy Research Group also found that, even though it ranks below the top thirty, Milan is a metro in the EMEA region with strong year-over-year growth.

PRODUCT

This new **UTP Mini Panel** adds zero-RU flexibility to the popular e2XHD Snap-in Cassette Patching System. Designed to mount on a wall, overhead tray, or side of a rack, the Mini Panel accepts two e2XHD cassettes to house up to 12 copper or fiber ports.

New e2XHD **Panel Extension Kits** are also available. These extension brackets enable even easier access to the rear of e2XHD cassettes in the panel without having to remove the cable manager, and the brackets can be used to create a recessed e2XHD panel solution.

We have expanded the Quickport™ Decora® line of products to include **antimicrobial inserts**. The inserts are manufactured with an antimicrobial agent to inhibit the growth of bacteria, mold, and mildew. They join **our existing line** of antimicrobial-treated devices.

WEBINAR

Starting a smart building initiative can be daunting. There are a wide variety of technologies and systems available to navigate, and the way forward can become unclear if goals or priorities aren't aligned among stakeholders. Fortunately, new tools and best practices have emerged to help steer smart building projects toward a smooth implementation. In this webinar, Leviton will help you chart a clear course before getting underway.

We'll cover:

- Goal planning and stakeholder buy-in
- Assessment and benchmarking programs
- IT vs legacy OT infrastructure
- The uLAN™ network architecture
- Cabling and connectivity

SMOOTH SAILING:
Best Practices for Planning a Smart Building

Tuesday, 13th September
1:30 PM – 2:30 PM BST

REGISTER

ASK THE **EXPERTS**

Q: When using multimode fiber, will OM5 be required to support higher speeds like 400 or 800 Gb/s?

A: No. OM5 multimode cabling can offer longer link distances for applications using multiple wavelength transceivers, such as Short Wavelength Division Multiplexing. However, OM3 and OM4 will continue to support available speeds to 400 Gb/s and are on the roadmap for 800 G/bs discussions. Leviton offers complete end-to-end systems for OM3, OM4, and OM5 to meet all types of network requirements.

Questions? Comments? Ideas?

We want to hear from you!
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