WHITE PAPER

Smart Building Planning, Best Practices, and Network Design

Start off smart building projects right with proper goal planning, stakeholder buy-in, benchmarking, and a uLAN™ network architecture

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LEVITON®

The smart building sector is one of the fastest growing market segments.

In 2021, Fortune Business Insider valued the smart building market at $68 billion and anticipates growth that will put the market at $328.6 billion by 2029.

There are several key reasons for this growth:

1. **Competition for tenants.** Many companies have shifted to work-from-home or hybrid work policies over the past several years, leading to fewer occupants in commercial real estate buildings. Increasingly, building owners are evaluating smart building features to improve the workplace, attract tenants, and remain competitive.

2. **Growing focus on human centric design and operation.** Human centric design includes the health, safety, and wellbeing of building occupants. Many smart building applications can help improve comfort, reduce sick days, improve productivity, and make the building a more appealing place.

3. **Operational cost reduction and greater sustainability**. Building automation systems can reduce energy consumption and create operational efficiencies that save on costs. At the same time, reduced energy consumption leads to a smaller carbon footprint, supporting sustainability efforts.

Even with the bullish outlook on smart buildings, there remains some uncertainty around tackling a smart building project, as building owners must navigate the added complexity of integrating intelligent technologies and building systems.

Common questions include:

- What devices and software should we use?
- How do we coordinate so many independent systems?
- What best practices are available?
- How do I measure the ROI for a smart building?
- What kind of network architecture is ideal for handling so many new connected devices?

Fortunately, there are smart building experts, organizations, and best practices that can help you resolve these questions and simplify the planning process.

STAKEHOLDERS, GOAL SETTING, AND BENCHMARKING

Enlist a smart building design professional

While there is no specific industry designation or certification to be called a smart building design professional, there are many architecture and engineering firms that recognize the need for such a person with this expertise on staff. These experts act as a representative for the building owner or property manager, documenting their primary objectives. The design professional ensures integration and interoperability of every building function and service in a smart building. They identify specific use cases and technologies that support objectives, then categorize metrics to measure progress toward defined goals.

Bring all stakeholders to the table

Planning for the creation of a smart building involves more than just connecting the various systems and building functions in the facility. Planning must include a clear definition of the goals and desired outcomes of making the building intelligent. The benefits of a smart building extend to many stakeholders, including the building owner or management, tenant organizations, and the individual building occupants.

The impact on all building stakeholders should be addressed when designing a smart building and determining what specific functions or systems need to be interconnected. This “all hands on deck” approach is crucial. Traditional building systems have historically been siloed and were not designed to communicate with each other. In new construction, work contracts normally solicit proposals from separate firms. Mechanical, electrical, and plumbing firms will solicit a proposal for systems that are separate from the architecture and engineering proposals or security proposals. Smart buildings need these systems to work together and share information from the outset.

Stakeholders will help define the goals and objectives for a smart building project. Typical stakeholders include departments under the facility's management: IT, tenant representatives, and building owners. These groups will likely bring different priorities to the table, but they all have an important role to play in identifying overall goals.

Facility Management

- Utility management
- Building maintenance
- Property security

IT Staff

- Network operations
- Business systems support
- Network security

Tenant

- Worker productivity
- Safe, healthy environment
- Common area management
- Comfort and amenities

Building Owner

- Operational efficiency
- Risk mitigation and resiliency
- Environmental sustainability
- Asset protection and enhancement

Set goals for success

How do you narrow down your goals? The best place to start is by asking "What problems are we trying to solve?" The follow-up question should be "What value will these goals deliver to our business or to the building owner?" Stakeholders will bring a range of goals. The following is just a short list of common goals for a smart building project:

- Public perception
- Talent retention
- Reduce and optimize operating costs
- Occupant satisfaction, safety, and wellbeing
- Reduce maintenance costs
- Attract tenants
- Efficiently manage and service building portfolio
- Achieve sustainability goals
- Improve occupant productivity
- Reduce operational risks
- Manage risk of catastrophic events and building downtime
- Prepare buildings for new technology additions

Benchmark against existing facilities and set targets

Identifying goals is an important step, but you likely can't meet those goals without some measurable benchmarks for success. To create the most effective objectives for reaching goals — and to better understand what success looks like — you should take advantage of programs that allow you to benchmark other similar buildings in your area. Many of these programs provide assessments that let you score your building against others based on the technologies and design used in your project.

There are numerous programs available for benchmarking and self-assessment, and many of these programs will focus on specific building priorities. For example, the International Well Building Institute focuses on health and wellbeing of building occupants, while the US Green Building Council is more focused on energy efficiency and sustainability. Others are tailored to specific regions of the world. Of the list below, two programs address the most comprehensive elements of a smart building: WiredScore and SPIRE™. The SPIRE assessment was established by the Telecommunications Industry Association (TIA) and Underwriters Laboratory (UL) to provide an overall smart building rating and create a roadmap for recommended performance improvements.

Identify the technologies that will achieve your goals

Once goals are set and benchmark criteria is established, you can begin to identify the technologies that will support your smart building. The key to any smart building project is data access, as data from intelligent devices is essential to optimize each function and make adjustments to achieve your pre-set goals.

With so many disparate building systems generating data, selecting the right purpose-built control software is essential for creating cross-platform compatibility and integration between the different building functions and systems. There are many software options on the market today, with offerings from IBM, Honeywell, Siemens AG, Johnson Controls, and more. Many of these systems use artificial intelligence to improve system optimization over time.

NETWORK DESIGN

Address network technology considerations

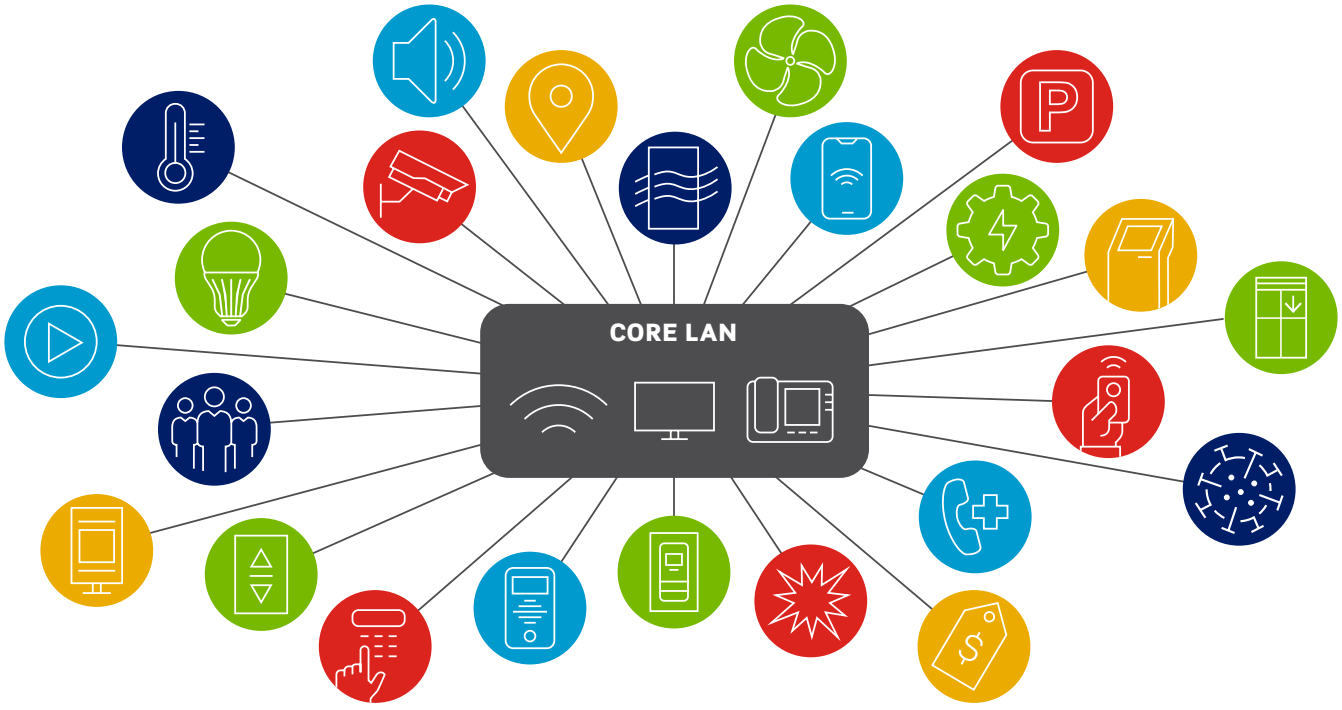
In the past, building automation systems often operated in silos: they weren't always interoperable, and they ran on proprietary stand-alone networks. Today, these systems are managed natively over IP-enabled platforms based on Ethernet connectivity, while legacy operational technology systems are being adapted to run on the Ethernet network.

As more operational technology systems converge on the IP-network, there are some important considerations that should be resolved early in the design and construction process. Leviton recommends including a master systems integrator and network cabling contractor to help with these decisions:

- **Decide who is responsible** for the infrastructure design. If everything is on one network, should it be IT, the facilities department, or both that decide the cabling infrastructure or where connections are located?
- **Operational technology (OT) functions often need to be up and running** before the IT cabling system is installed. For example, if the building will have connected HVAC controls or a PoE-enabled lighting system, those controls or systems should be designed and installed much earlier in the project than when installing the building LAN.
- **Traditional IT systems integrators may not have experience** providing OT systems with the needed connections.

Choose the right network foundation with a uLAN™ architecture

Ethernet is the common language within the core local area network (LAN) — for devices such as workstations, WAPs, and VOIP phones. As mentioned before, with the rise of smart buildings, more utility applications such as HVAC, lighting, security systems, and energy management systems became Ethernet enabled and converged onto the LAN. Organizations are seeing the efficiency and cost-savings benefits of converging once-disparate building systems onto their IP networks.

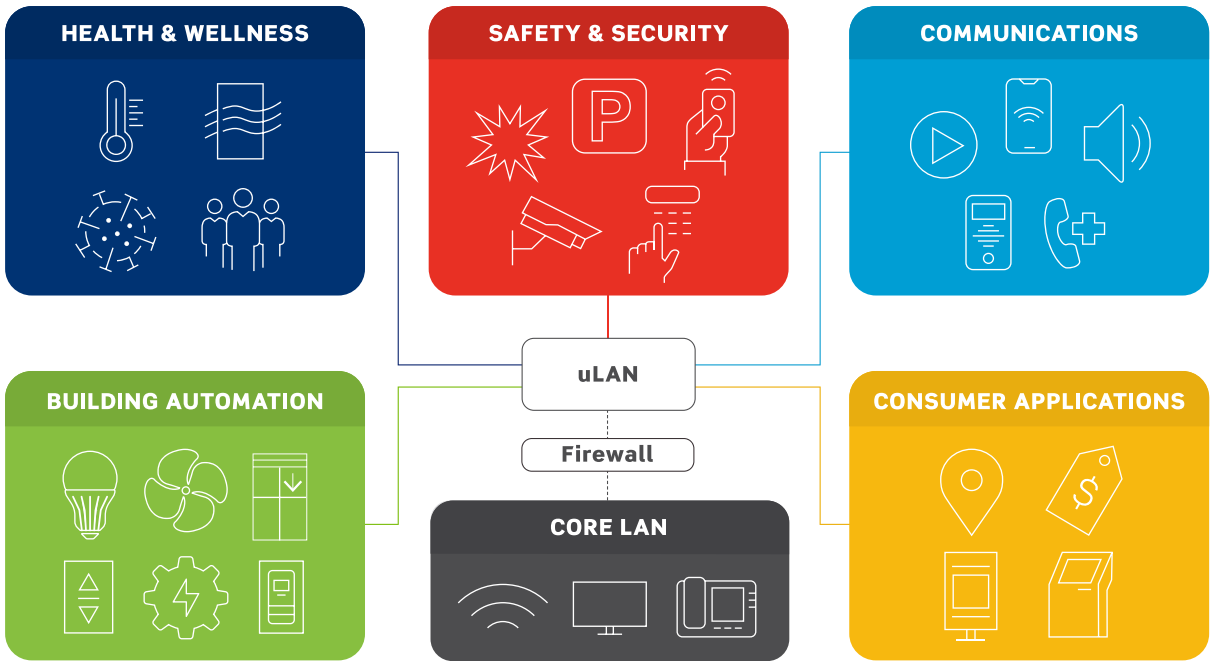


Smart and healthy building technologies converging on the core LAN.

At the same time, some of these 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 stress and strain on the network caused by connecting so many new utility devices (IoT) can cause the network to become sluggish and adversely affect the user experience. Also, each new device added to the core LAN is a potential portal into the network, raising security threats.

To simplify management, improve security, and alleviate network stress in smart buildings, Leviton recommends that 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™.

The uLAN is designed to support all the different building functions that can make up a smart building. These building functions include health and wellness initiatives, security systems, AV and communications systems, building automation, and consumer applications such as digital signage and customer kiosks.



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

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.

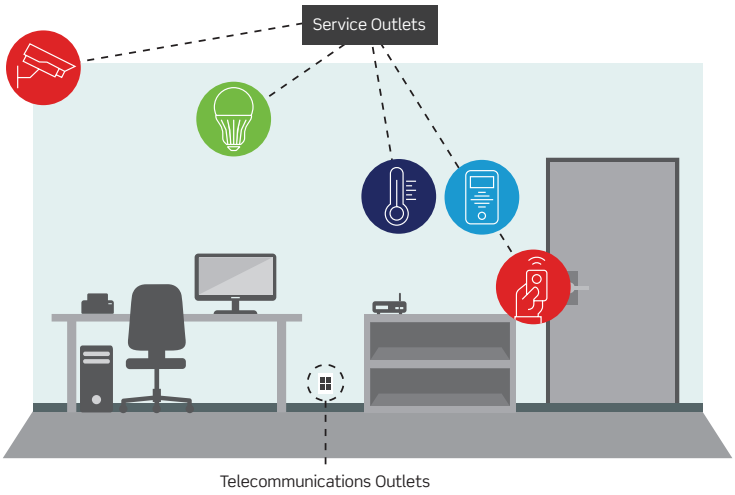
Create Cost Savings
It allows for cost-effective IT equipment and infrastructure designed specifically for utility devices that can vary widely in their PoE and bandwidth consumption, while reserving tier one switching for the core LAN.

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.

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.

Cabling design

There is a wide variety of locations where connections for intelligent devices should be placed throughout a smart building. Instead of installing a telecommunications outlet 18 inches above the finished floor in a wall or at desk height in a cubicle — as typically seen for a core business network — installers are now provisioning IoT devices in many areas of the building, including ceilings, walls, and above doors. These utility connections are now referred to as service outlets as opposed to telecommunication outlets, and there is a much higher density of service outlets than required for a traditional LAN.

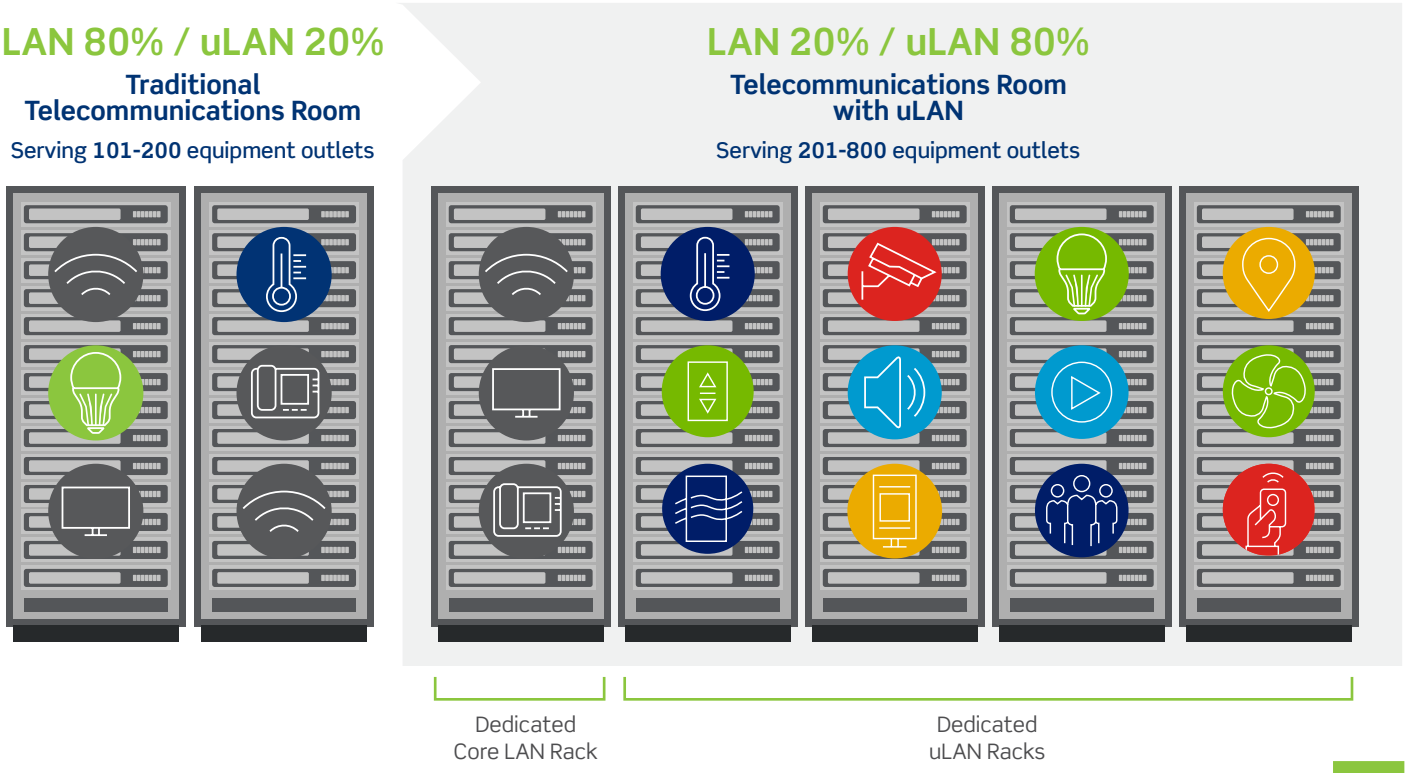


Service Outlets supporting utility applications can vary in location and greatly increase the number of connections at the Telecommunications Room

The higher density of connections in a smart building translates into greater space requirements in the telecommunications room or closet.

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, and wireless access points. The other 10-20% of connections had been 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, as shown below. Considering the numbers of lights, sensors, and other utility devices joining the network, equipment rooms will likely need more space. A uLAN simplifies network management in these rooms, as all the different control systems for utility applications are to be located together, separate from the core LAN. Network planners will want to anticipate additional utility connections over time, so room for expansion of the uLAN should be considered during the planning process.

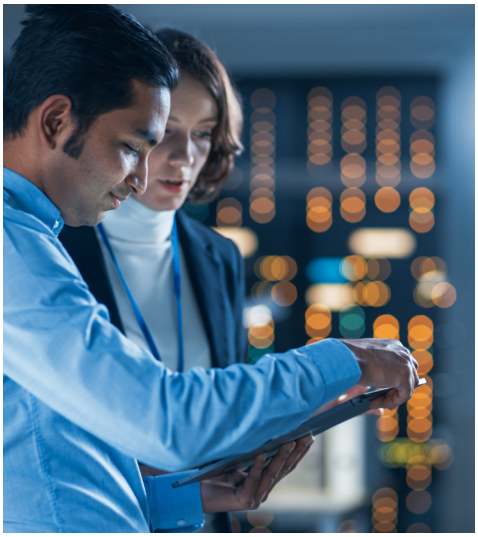


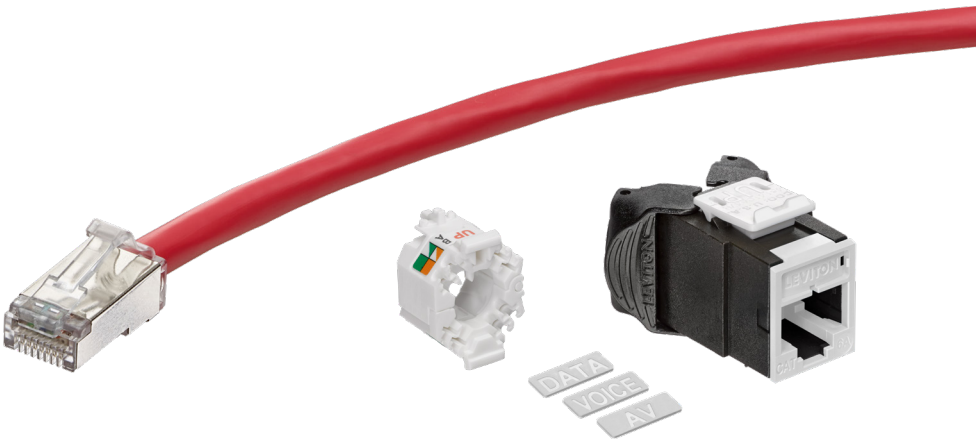
Rely on network infrastructure experts

In addition to creating the right network design for smart buildings, it's important to select cabling and connectivity that will provide optimal performance for the bandwidth and PoE requirements of the system's applications. Leviton supports smart buildings with end-to-end cabling systems designed for specific applications, from high-bandwidth backbone infrastructure to connectivity for a range of smart devices, including building automation, lighting, security, and more.

Leviton infrastructure experts understand your unique network requirements, with extensive experience in all types of enterprise environments, including businesses, hospitals, schools, factories, and government facilities.

Learn more about a uLAN architecture and Leviton solutions at **Leviton.com/Enterprise**.





Today's networks must be fast and reliable, with the flexibility to handle ever-increasing data demands. Leviton can help expand your network possibilities and prepare you for the future. Our end-to-end cabling systems feature robust construction that reduces downtime, and performance that exceeds standards. We offer quick-ship make-to-order solutions from our US and UK factories. We even invent new products for customers when the product they need is not available. All of this adds up to the **highest return** on **infrastructure investment**.

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