



WHY LORAWAN® IS THE FOUNDATION FOR SMART BUILDING SUCCESS



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INTRODUCTION

Smart buildings present an obvious sector of the market in which Internet of Things (IoT) enabled services can generate efficiencies, improved user experiences and profits. Much of the early focus has been on utilizing IoT applications to generate savings in utility consumption but this is now widening to encompass applications that support the new ways that people use the buildings they live and work in. Popular applications include room and desk sharing, individual environmental control, predictive maintenance and many others.

Costs associated with traditional workplaces have typically followed the 3:30:300 model set out by real estate firm JLL which outlines operating costs of US\$3 for utilities, US\$30 for rent and US\$300 for employee compensation per square foot. Naturally, the actual cost of this varies from market-to-market but the ratio generally holds true. The traditional view has been that you can't influence rent or employee compensation and that utility costs are the only area with room for maneuver. Historically, these are the easy wins with IoT-enabled sensors and meters being used to monitor and manage power, heat, cooling and lighting-related energy consumption more efficiently.

However, organizations are now starting to realize that having a smart building means much more than making small adjustments to energy and water consumption. Smart building initiatives now form part of organizations'

sustainability and employee recruitment and retention programs and, with millennials who are used to automation and expect attractive work environments, the role of smart building applications will become of greater importance. For organizations to attract younger generations of workers, who have come of age in the age of technology and flexible work locations, they will need to offer workspaces that attract them to come in and spend time there. Applications that enable the smooth sharing of desk space, enable individualized environmental and other controls and are maintained to a high standard of cleanliness and décor will be vital.

Even so, buildings themselves remain unsmart. New buildings continue to be constructed with no reference to enablement of smart building applications forcing most smart building technology to be retrofitted. In the past, this had caused substantial challenges in terms of installing hardware, power supplies and connectivity ultimately making it both time and cost prohibitive. From a building owners' perspective, being able to swiftly and cost effectively add new functionality to existing real estate and thereby increase its value is a key driver. The ability to add such capability at a low cost and with minimal disruption to tenants is of significant attraction and accelerates the time to additional profits for building operators.

Low power devices with wireless connectivity therefore look particularly attractive for building tenants and owners but there is a bewildering and growing list of technological options that claim to offer this functionality for customers

to select from. This paper explains how the smart buildings market is developing and the various innovations that are driving its growth and compares LoRaWAN® technology to legacy approaches as the connectivity foundation for this and future generations of smart buildings.

MARKET INSIGHTS

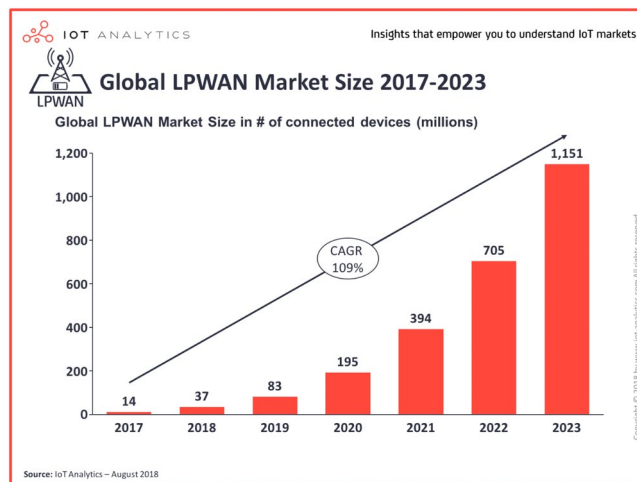
Traction towards large-scale IoT deployments is starting to become evident and the smart buildings segment is predicted to be one of the fastest growing segments for IoT. Recent research from IoT analyst firm Berg Insight has found that the installed base of sensors, actuators, modules, gateways and other connected devices deployed as part of IoT-based building automation in smart and connected commercial buildings was an estimated 151 million units worldwide at the end of 2018. The firm says that it expects this figure to increase at a compound annual growth rate (CAGR) of 33% between 2018 and 2022, when the installed base will reach 483 million units.

Importantly for LPWAN, the firm says only 4.5 million of these devices were connected via cellular networks in 2018 and is not expected to exceed 19.4 million in 2022. This market therefore will be dominated by non-cellular connections, such as LoRaWAN, Wi-Fi, Zigbee and Bluetooth Low Energy.

In a survey of 1,600 enterprise IoT projects, research firm IoT Analytics also uncovered that the smart buildings category is an area enjoying strong growth. Of the live projects it analyzed, the firm found that smart city initiatives make up the largest part of identified projects (23%), followed by projects implemented in industrial settings (17%) and projects evolving around connected buildings (12%).

Commenting on the findings, IoT Analytics' managing director Knud Lasse Lueth, said: "New IoT projects are emerging across the board, however we have noted that projects centered on the themes of smart city and smart building have increased more than others."

The firm also projects substantial growth in LPWAN device deployment in the period 2017-2023 (shown in Figure 1 below), demonstrating that LoRaWAN is part of a fast-growing segment of the IoT connectivity landscape, which also includes the rapidly-growing smart buildings segment.



WHAT IS LoRaWAN?

LoRaWAN is an LPWAN protocol specifically designed for IoT. Its power management and long range are ideal for connecting battery operated "things" wirelessly to the internet in localized, regional, national or even global networks. It targets key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services. LoRaWAN operates in unlicensed bandwidth allowing it to be deployed without a license in both public and private networks in much the same manner as Wi-Fi. LoRaWAN technology has amassed several hundred known uses cases for smart cities, smart homes and buildings, smart agriculture, smart metering, smart supply chain and logistics, and more. With 105 million devices, LoRaWAN is the most widely adopted LPWAN technology to date and offers a vibrant ecosystem of device and application developers.

Key features of LoRaWAN include: extreme immunity to interference allowing it to effectively operate in the unlicensed band and to easily cover several floors of a building with a simple gateway; low power to enable long battery life of up to ten years, security enabled via end-to-end encryption, mutual authentication and integrity protection; and standardization to ensure network to device interoperability.

WHERE LoRaWAN FITS IN SMART BUILDINGS

LoRaWAN is a particularly good fit for deployment within smart buildings because its indoor coverage is excellent (it easily penetrates walls, metal and concrete), and it is cheap and fast to install without requiring specialist skills, permits or integration with IT departments. This makes it ideal for the retrofitted applications that currently make up the vast majority of all smart building installations.

LoRaWAN is designed in accordance with the OHIO principle of only handling it once. The quickest way to destroy a project's return on investment (ROI) is to add cost associated with human intervention. Quick installation and, thanks to the low power consumption of a LoRaWAN device, years of battery operation are imperative for many projects to prove a return. So, for both complex and simple applications, such as monitoring of rubbish bins, soap dispensers, conference rooms, desks, metering or basic HVAC controls, these capabilities make LoRaWAN a cost-effective option.

Although its throughput is lower than 5G – which isn't available yet in most markets – the fact is that most smart building applications only need to communicate relatively small data packets. Given this, LoRaWAN is more than adequate for the needs of an electricity meter, a restroom monitoring system or a leak detection sensor. Connected devices using 5G networking implementations will also have much shorter battery lifetimes, further adding to cost. Consider how long your smart phone battery lasts without recharging and you can easily see the power consumption limitations imposed by cellular networks.

Wi-Fi is another technology often discussed for smart buildings. On its own it faces some performance challenges in the building environment; however, it is in fact highly complementary to LoRaWAN and together the two technologies can offer a compelling option. In this scenario, LoRaWAN handles the building-wide networking to gather device data and implement basic controls, while Wi-Fi provides networking for higher bandwidth applications (e.g. video) or even backhaul. This approach leverages the bandwidth strengths of Wi-Fi and the low power (long battery life) and long range (through walls, basements, and elevator shafts) capabilities of LoRaWAN.

WHY LoRaWAN IS AN IMPORTANT PART OF ANY SMART BUILDING INITIATIVE

SMART BUILDING APPLICATIONS

Popular smart building applications that are routinely being rolled out include deployments in the following areas:

Maintenance

- HVAC
- Electronics systems

Utilities

- Sub-metering & energy usage
- Water consumption & leak detection

Workspace Management

- Desk and room usage
- Predictive cleaning
- Environment control (including individual area control)
- Energy usage

LoRaWAN's benefits can be summarized in five simple points:

LOW POWER CONSUMPTION

Long battery life is critical for ROI and means no need for wired power supply or frequent battery replacement. This is vital in buildings where disruption needs to be minimized.

INDOOR COVERAGE

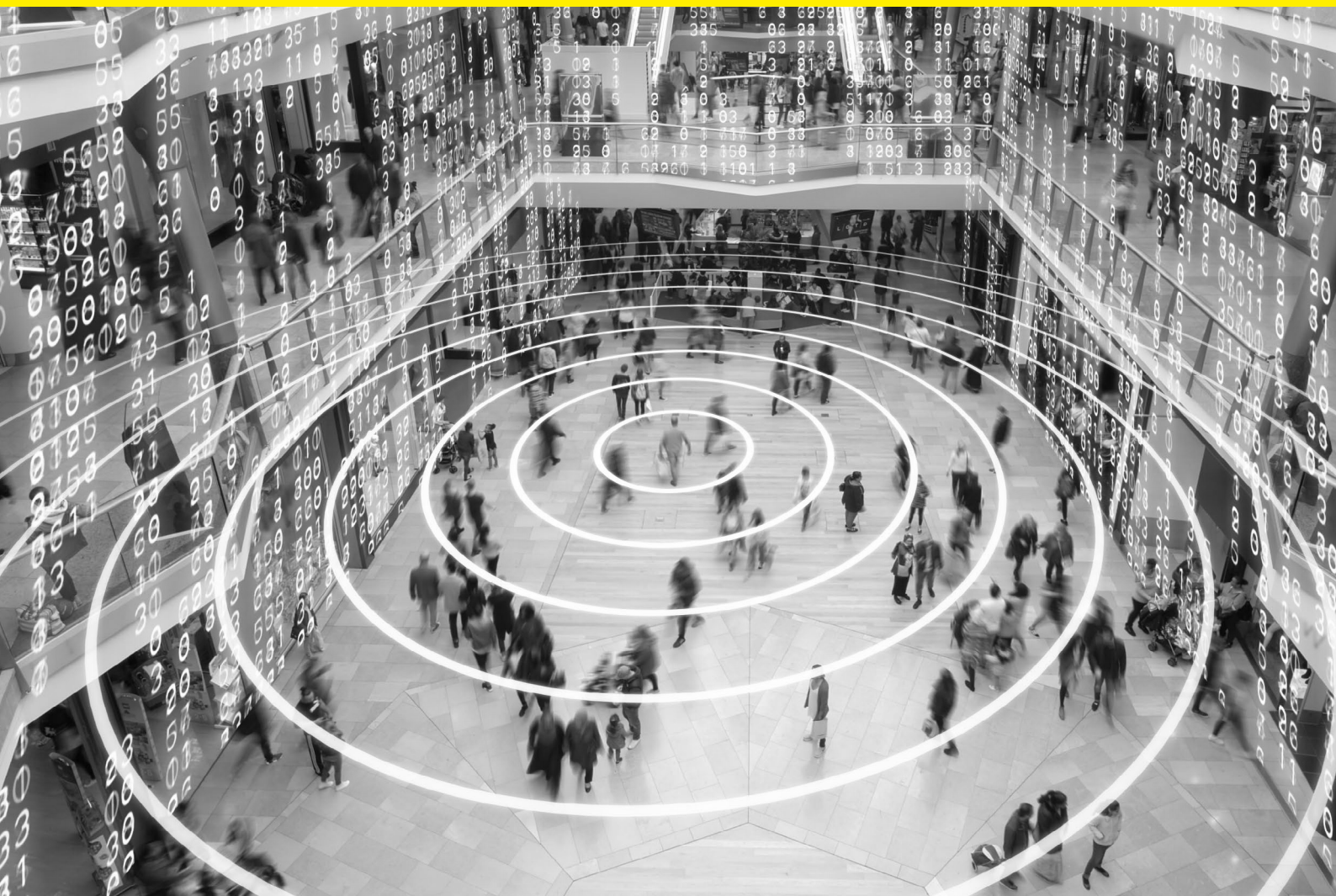
The ability for signals to penetrate deep within smart buildings is a prerequisite for in-building connectivity. However, while basic, this is often overlooked, especially as significant amounts of smart building operations are located in tucked away areas or basements of buildings.

WIDE ECOSYSTEM

LoRaWAN's current footprint means there is an already-established worldwide ecosystem of app and device developers for smart building operators to access and buy products and apps from. This ecosystem has already developed devices and trialed applications which smart building operators can readily access and draw upon.

EASE OF INSTALL

LoRaWAN devices are simple to install and can be easily installed by non-specialized workers. This makes it particularly suited to the retrofit market. Even in the



relatively distant future when new buildings are designed to be smart, LoRaWAN will continue to be attractive because the cost of wiring and configuration of networks will remain simpler and significantly more cost effective than hard-wired solutions.

PRIVATE NETWORKS

LoRaWAN enables organizations to install a completely private network requiring no contract with a network operator or coordination with corporate IT infrastructure.

CONCLUSION

As smart building capabilities increase and smart functionality becomes an expectation among building users,

LoRaWAN is an ideal fit for the majority of applications. Typically, smart building apps require connectivity at relatively low data rates with no requirement for ultra-low latency. The throughput offered by the technology is more than adequate for applications such as booking meeting rooms, controlling localized cooling or determining whether rubbish bins need emptying.

LoRaWAN capacity and indoor range exceed the needs of the fast growing smart building IoT segment. Further, because of its wide deployment footprint, there is already a mature and strong developer community creating new devices and applications all the time. Importantly, LoRaWAN is a technology that can support multiple use cases simultaneously and do so at low cost, with easy installation.

To learn more about LoRaWAN technology, capabilities and applications, visit <http://lora-alliance.org>