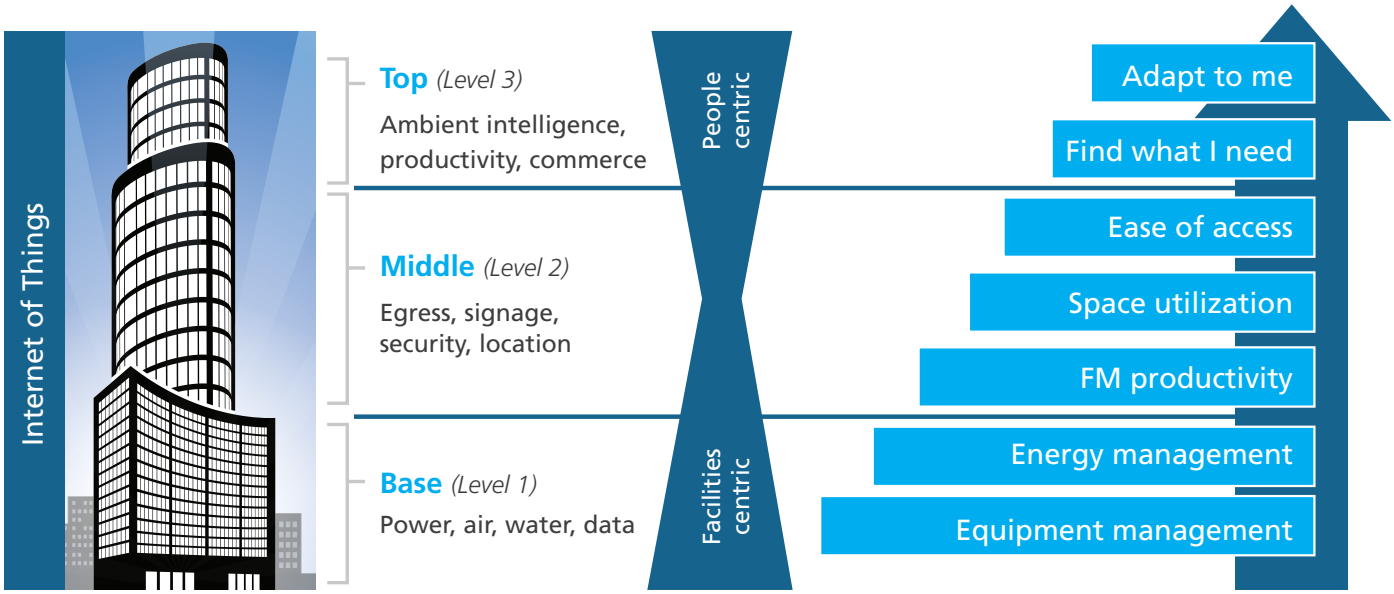
SEMTECH

Smart Buildings Transformed

Using Semtech's LoRa Technology

SMART BUILDINGS TRANSFORMED USING LORA TECHNOLOGY

Enabled by LoRa and Cloud-based Analytics, CRE (Commercial Real Estate) is shifting from a Hardware Business to a Software & Services Business.



Source: Microsoft, 2016

EXECUTIVE SUMMARY

For the last 10 years, analysts have projected the IoT (Internet of Things) to be a high growth opportunity with an extremely large potential market. However, only recently have technologies such as low-power wireless connectivity, Cloud-based processing and data analytics have come together to fulfill these projections.

In this document, we discuss how the convergence of various IoT technologies will transform the commercial real estate (CRE) industry. The availability of real-time, Cloud-based analytics, reporting and services enables a dramatic shift in thinking for CRE owners, property managers, and sensor manufacturers. The power of data and information collected from hundreds or more sensors within a building enables different business models to also be implemented as real-time, data-based analytics, fueling a tremendous number of potential new service offerings.

LoRa architecture enables hundreds of sensors, actuators or tags to connect to the network in a cost effective way.

LoRa® is a low-power, long-range wireless radio frequency (RF) connectivity technology (LoRa Technology) developed to address the challenges of IoT deployments. For example, its extremely low-power usage enables battery powered sensors to last many years depending on use, while its long range capabilities allow sensors to communicate with the network over long distances of up to 10 kilometers or more. In addition, LoRa architecture enables hundreds of sensors, actuators or tags to connect to the network in a cost effective way. This combination of long battery life, long range connectivity and large capacity allows network operators to set up a LoRa-based network quickly while dramatically reducing deployment costs. And, unlike mesh networks like Zigbee or short range RF technologies like Bluetooth and Wifi, LoRa does not require property management companies to use expensive building installers to deploy the network or highly-skilled technicians to manage it.

SMART CITY TRENDS AND FUTURE DEVELOPMENTS

STATUS QUO

In the past, CRE owners have seen technologies deployed for a small number of specific solutions aimed at reducing operational expenses through targeted energy efficiency applications. Companies have primarily done this using disparate building management systems (BMS), but the use of such systems still involves a significant amount of local, manual interaction, low automation, and dedicated infrastructure per application.

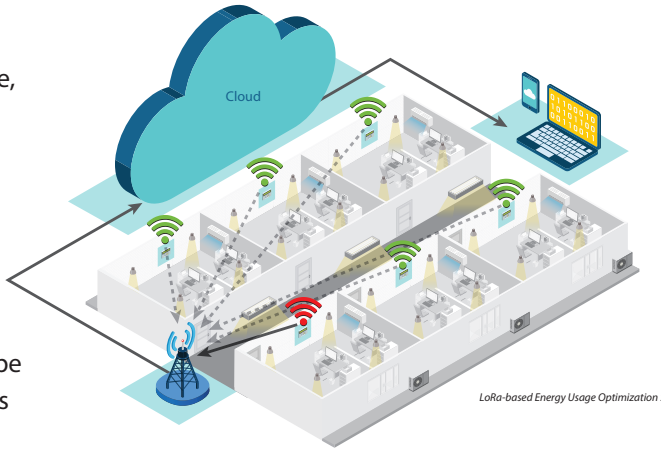
Certain building verticals have seen some mildly integrated solutions for making buildings more energy efficient. These systems typically require lower manual interaction, allow faster decisions (due to centralized data) and may be integrated with enterprise resource planning (ERP), asset management and business intelligence (BI) tools. Quite often however, these are more adapted to new building construction and become complex and expensive to retrofit into existing buildings.

IoT connectivity solutions and associated, Cloud-based data analytics can be leveraged to provide real value for real estate owners.

HIGH LEVEL USE CASES

The following use cases are examples of how new IoT connectivity solutions and associated, Cloud-based data analytics can be leveraged to provide real value for real estate owners, as well as tenants and their customers:

- **Precision metering**: Smart meters deployed for entire buildings allow more precise monitoring of energy consumption throughout the building, while using smart electric plugs allows tenants to detect high-energy devices and take appropriate actions to reduce their consumption.
- **Efficient heating and cooling**: Using sensors, smart thermostats can now monitor indoor/outdoor air temperature, humidity and the presence of people in a room. This data can then be used to intelligently control the HVAC, heater and ventilation systems inside buildings so that they cool or heat rooms only when necessary to reduce energy costs.



LoRa-based Energy Usage Optimization System

- **Maintenance**: The use of sensors can dramatically reduce maintenance costs by using 'predictive analytics' and 'on demand' services. For example, water flow and presence can be monitored to identify water leaks early, before costly damages occur. Elevator motors and equipment can be monitored to detect early signs of potential failure. Dirty windows that become hazy can trigger an automated cleaning service request. Trash cans can inform operators of their fill status and request pickup when they are full. Using a connected wall button, restrooms user can alert maintenance services when they need to be cleaned. Pest traps can alert operators when rodents are caught so they can be removed before they decompose and emit a bad smell.

- **Safety**: Smart sensors in buildings make everyone safer by monitoring and reporting a wide range of issues, including fires alarms, office air quality, dangerous chemical detection for industrial buildings, and structural integrity reports such as when a building has been through an earthquake.
- **Security**: Occupants can be equipped with badges to control access, but also provide presence information. Motion detectors can be used to detect intrusion. Window and door opening detectors can be used to identify open entry points that should be closed, and remote control allows them to close without setting foot on site.
- **Space optimization**: Real-time occupancy, geolocation and foot traffic data can be used to identify spatial usage patterns, allowing space efficiency optimization and reconfiguring offices and retail location layout based on real usage data to increase building density usage.

LoRa-based Badge Control System

- **Real-time insights**: Access to traffic data can also be used to propose solutions directly to tenants. For example, building managers can use the information to optimize interactions between occupants to increase productivity, devise action plans for peak hours, deliver targeted information (i.e. safety, special events) in strategic places, and improve tenant health by providing fitness insights.
- **Sustainability**: New trends are placing social responsibility at the forefront of corporate governance. In the United States, B-Corps have been created to recognize social value creation. Sustainability reporting is part of that trend, and the emergence of standards such as GRESB and GRI, will likely become an important metric for the smart building ecosystem. Automated integration of data collected can facilitate sustainability reporting and reduce associated costs.

The table below shows an example of the value proposition for owners, tenants and occupants. The retrofit column describes the time-to-revenue and ease of retrofitting such solutions to existing buildings. The retrofit market is much larger than the new construction business and provides quicker revenue potential. Some advanced solutions, however, are better suited to new construction, as they require deeper integration of sensors into the building.

	Property Value	Owner Opex	Tenant Satisfaction	Tenant Operating Income	Retrofit Returns
Precise Metering	Differentiation ★	Utility Bills ★★	Utility Bills ★	Utility Bills ★	★
Heating & Cooling	Differentiation ★★	Utility Bills ★	Comfort ★★	Productivity ★★★	★★
Maintenance	Differentiation ★★	On-Demand ★★★	No Downtime ★		★★
Safety	Structure Repair ★	Reduced Insurance ★★	Employee Retention ★★		★
Security	Differentiation ★★	Reduced Vandalism ★	Reduced Insurance ★★		★
Space Optimization	Less Turnover ★★★		Comfort ★★	Productivity ★★	★★
Real-time Insights	Differentiation ★★★	Tenant Retention ★★		Commercial Insight ★★★	★★
Sustainability		Reporting Costs ★★		Reporting Costs ★★	★

★★★ *Highest Value* ★★ *High Value* ★ *Some Value*

FULL INTEGRATION BENEFITS

The use cases described above rely on both a proliferation of sensors generating large quantities of data and a Cloud-based analytics infrastructure capable of processing the data. By leveraging the full breadth of available data, an integrated IoT solution can provide much more insight and value than a non-integrated approach.

Fully integrated systems benefit users in many ways. For example, connected systems allow all data to be combined, analyzed, and acted upon automatically to reduce the costs associated with manual, error-prone processes. In addition, the breadth of available data gives users strategic insight on industry and social trends, which facilitates decision making, enables ERP integration and provides predictive analytics.

VALUE CREATION FOR THE COMMERCIAL REAL ESTATE INDUSTRY

The value of a fully integrated IoT solution for CRE operators comes from the following:

- **New sources of revenue:** Direct marketing, developer industry insight on occupant needs, tenant productivity improvement, investment advisers.
- **Differentiation in the market:** Lower utility bills, no tenant issues (i.e. issues fixed before they become visible through predictive maintenance), increase to property values.
- **Valuation:** More precise and granular valuation based on real data (owner side, but also tenants with specific requirements).
- **Financial benefits:** Real-time data for real estate valuations allowing standardized risk profile.

WHY LoRa IS A GAME CHANGER SOLUTION FOR CRE

The benefits of the LoRa connectivity solution are summarized below:

TECHNICAL

- **Low asset deployment cost thanks to:**
  - **Great indoor penetration:** One gateway can cover the entire IoT, including the building, underground parking and the surrounding outdoor recreational area. No need for complex coverage analysis as needed for mesh network solutions.
  - **Ease of installation:** No need for power source wiring as opposed to existing solutions such as GSM, LTE or WiFi, thanks to low-power consumption.
- **Secure:** AES-128 encryption built in.
- **Worldwide standard:** LoRaWAN™ specification allows seamless and easy scalability.
- **Geolocation:** LoRa is the only commercially available solution that features this GPS-free service at no extra power cost.
- **Low connection costs:** Operating on free spectrum ISM bands (very low connection fee if using external service provider).

BUSINESS SIDE

- **Available today:** For commercial deployments in both private and public networks.
- **No/very low provisioning cost:** Costs compared to other SIM based solutions, LTE-M and NB-IoT.
- **Open network:**
  - Ability to choose from multiple and competing network service providers (competition driving prices lower over time, and no lock-in with one provider as opposed to other technologies).

    OR
  - Deploy private local network at building-level, possibly expanding coverage through managed building pool to create own network offering or lease bandwidth to other operators (e.g. partner with hotel chain to get instant widespread coverage).
- **Leverage deployed assets:** Business parks and industrial zones are usually dense and grouped, and hotels are often close by. One LoRa-enabled gateway may be able to cover many buildings within a range of up to 3 kilometers even in a dense urban environment.
- **Growing ecosystem:** The LoRa Alliance™ is an open, non-profit association with more than 450 companies committed to promoting the open, globally standardized LoRaWAN protocol for secure, carrier-grade LPWAN connectivity for IoT applications. To date, there are public and private LoRaWAN networks in more than 50 countries worldwide.

BUSINESS MODEL OPTIONS

Beyond the sale of hardware, a generic, flexible and modular Cloud-based software platform for analytics and services will create additional value for everybody. When combined with hardware, this type of platform could then be deployed on buildings for free (or be part of a leased service) and remain owned by the service provider. The service provider could then charge building owners and tenants for value added services the network provides (Customer Premise Equipment model). The platform and associated services can easily be tailored to the unique needs of the owners and tenants.

Another approach would be to sell the hardware and provide the service either as a branded service or a white label to a building owner who would then share revenue and brand the platform themselves.

CONCLUSION

New CRE business models for IoT are being enabled today through the implementation of new technologies that enable:

- Data aggregation through sensor connectivity, integration and interoperability
- Data analysis using advanced Cloud-based software and analytics
- Real-time service offerings based on data analytics

LoRa Technology enables an immediate and predictive return on investment. It also provides more flexible business model, which can increase the value for solution providers over time.

By embracing integrated IoT solutions for CRE, customers will have a tremendous competitive advantage when it comes to managing their portfolio of commercial buildings. Not only will these integrated solutions reduce the maintenance and operational costs associated with the upkeep of their buildings, they will also help increase property values, improve customer service and provide new revenue streams for CRE owners and managers for years to come.

www.semtech.com/IoT

ABOUT SEMTECH

Semtech Corporation is a leading supplier of analog and mixed-signal semiconductors for high-end consumer, enterprise computing, communications, and industrial equipment. Products are designed to benefit the engineering community as well as the global community. The Company is dedicated to reducing the impact it, and its products, have on the environment. Internal green programs seek to reduce waste through material and manufacturing control, use of green technology and designing for resource reduction. Publicly traded since 1967, Semtech is listed on the Nasdaq Global Select Market under the symbol SMTC. For more information, visit **www.semtech.com**.

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