SEMTECH

Smart Cities Transformed
Using LoRa® Technology

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Using Semtech's LoRa® Technology

Cities are growing and are adopting new smart solutions to better manage services,
improve quality of life and reduce operating expenses in a sustainable way.
LoRa Technology is expected to be a critical component in the success of these initiatives.

EXECUTIVE SUMMARY

The world's population is increasingly moving to cities, which has kicked off a quest to use smart city technology to help cities build a sustainable infrastructure that provides smart governance, smart energy, smart mobility, smart infrastructure, smart technology, smart healthcare, and smart citizens.

Smart city technology is one way that governments and municipalities provide sustainable services required to meet this urban influx effectively. Semtech's LoRa Technology and low power, wide area networks (LPWAN) based on the LoRaWAN™ protocol provide a smart sensing and control infrastructure, which allows cities to collect and analyze data from thousands of connected devices in a streamlined manner, in order to make intelligent decisions about the services they need to offer. LoRaWAN-based networks deliver secure, bi-directional communication with long data transmission range to blanket an urban area using minimal network infrastructure. LoRa Technology delivers solutions that are optimized for smart city applications that rely on battery-powered sensors that need up to 20 years of battery life. Smart city technology is changing the way cities, governments and citizens interact, and LoRa Technology is a contributing enabler of these solutions.

> *LoRaWAN-based networks deliver secure, bi-directional communication with long data transmission range.*

SMART CITY TRENDS AND FUTURE DEVELOPMENTS

Smart city initiatives are increasing as government agencies and municipalities deploy wide area networks to gather data and use advanced applications and cloud-based or enterprise-based systems to process and analyze the data. These emerging networks are called Internet of Things, or IoT, networks. These initiatives seek to place sensors and other instrumentation on key systems within a city to collect data about active and passive elements that are an integral part of municipal and city services. The information is often detailed and measurable to help inform for better decisions and lead to more efficient city services.

The range of smart city applications currently in consideration is vast. Both trial and deployed projects have shown measurable impact ranging from faster car parking to better emergency healthcare. Some examples of smart city solutions include:

- **Parking:** Smart parking monitors show parking spaces available in a city to help reduce the traffic congestion created by people looking for a parking space.

- **Traffic Flows:** Traffic congestion is a significant challenge to urban residents, and smart traffic systems can monitor vehicle and pedestrian traffic to better route automobiles and pedestrians. This is taking place now through smart traffic lights that sense traffic and coordinate light timing, but in the future, smart traffic systems may also include communication from lights to sensors in automobiles.

- **Street Lighting:** Electricity from street lights is a significant municipal expense, and by better managing it, cities can save money and cut greenhouse gas emissions by reducing energy consumption. Smart street light systems provide the data cities need to reduce energy usage while maintaining well-lit streets.

LoRa-based Smart Lighting System

- **Traffic Light Maintenance:** Monitoring traffic lights allows municipalities to quickly respond to burned out lights, broken light poles from accidents, or malfunctioning signaling equipment. This can help with traffic congestion, potential accidents, and other hazardous situations.

- **Predictive Mantenance:** Smart building systems can provide data that ensures structures are maintained properly by providing a predictive maintenance system. These systems can monitor vibrations and other physical conditions in buildings, bridges and historical monuments.

- **Waste Management:** Collecting waste is an essential city service, but too often resources are used to collect under-filled waste containers when others are overflowing. Smart waste management systems can help detect garbage levels in containers to optimize the waste collection routes for efficiency and cost effectiveness.

- **Noise and Air Pollution:** As more people move to cities, noise and air pollution become a bigger challenge. Smart noise and air pollution monitoring can provide data that can improve citizens' well-being and detect systemic health issue correlation.
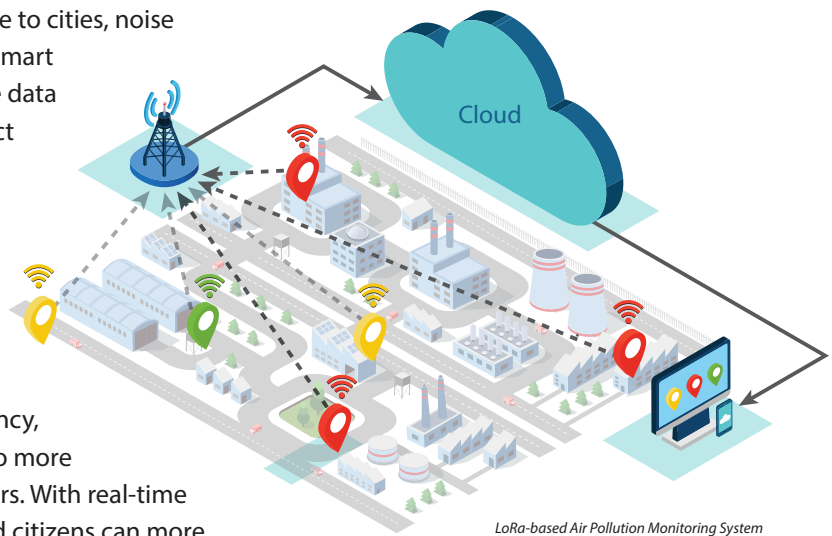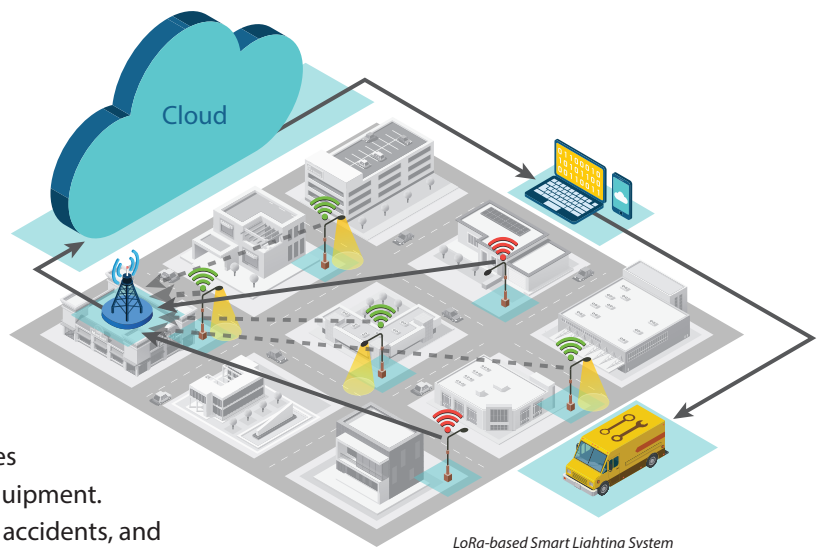
MEASURABLE BENEFITS TO CITIES AND RESIDENTS

The goals of implementing smart city technology are to improve quality of life for the public, to create efficiency, to increase preventive response to service needs, and to more efficiently use city resources, and in turn, taxpayer dollars. With real-time data on city systems and infrastructure, city officials and citizens can more easily assess the efficiency of city initiatives and make improvements as necessary.

LoRa-based Air Pollution Monitoring System

Already, there are 14 categories of indicators for measuring the success of smart city initiatives, compiled by the International Standards Organization. These include education, health, city finances, and others, although the fast-expanding nature of smart city technology means this list is sure to grow in the coming years. Following are some real examples of how smart city projects are currently benefiting local communities:

Better waste collection with lower costs in Seoul, South Korea:
Many big cities see an influx of millions of commuters and travelers every day, and must deal with the waste generated as they move through the city. In Seoul, waste became a significant problem as overflowing public waste bins would create litter problems that would increase the cost of keeping the city clean. In the past, the city had no idea of the rate in which waste bins filled up or which ones were overflowing. With the installation of smart waste bins, the city was able to track the fill level of each can and also to track the efficiency of the waste collection. The benefit of the solution was less litter and cleaner public areas with a 66% reduction in waste can collection frequency, which resulted in an 83% reduction in costs and a 46% increase in recycling.

LoRa-based Waste Management System
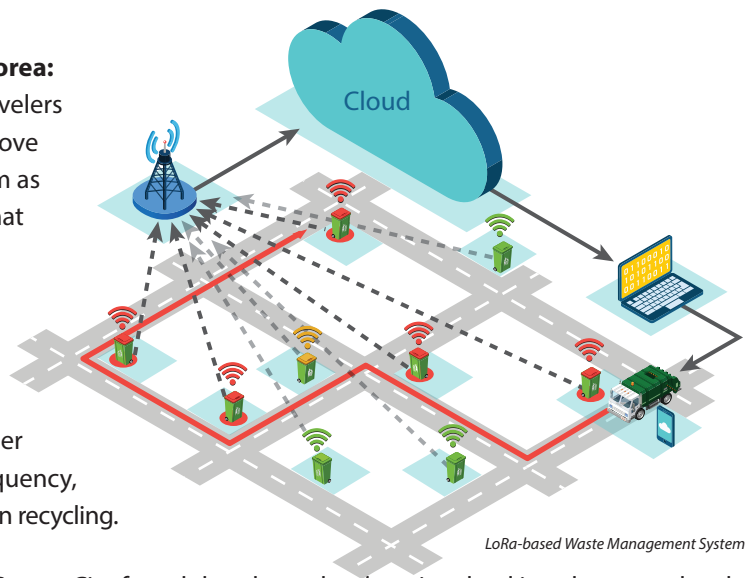
Integrating solar power in Carson City, NV: City leaders in Carson City found that the technology involved in solar can only take so much exposure to the wind and snow that are part of the city's climate. Additionally, effective transitions between the legacy power production and solar equipment is important for maintaining capacity when it is cloudy or at night. The city turned to a smart city technology to manage this infrastructure, which included virtualization technology and report access via mobile computing devices. The result is improved efficiency by infield operators and management, including a 15% reduction in operations staff while boosting solar power output to nearly 750,000 KWH of clean power.

Reducing energy costs in Lyon and Grenoble, France: When IoT is deployed to help consumers monitor their power usage, they will have the tools available to help to reduce their consumption, which saves money and potentially reduces greenhouse gases. The neighboring cities of Lyon and Grenoble teamed up to develop a platform for monitoring consumption by equipment type (i.e. furnace, hot water heater) with a separate system that offers consumers financial rewards for reducing energy consumption. The result was a 16% reduction in heating costs, which resulted in happier and more aware energy consumers, environmental benefits, and the ability to defer costly new energy generation construction.

As these examples prove, smart city technology can have a significant impact on the finances of a city and its citizens, on the livability of the city and on the environment.

WHY LoRa IS A GAME CHANGER FOR SMART CITY APPLICATIONS

Semtech's LoRa Technology offers both technical and business benefits for smart city applications.

Technical Benefits

- Low asset deployment cost due to:
    - *Great indoor penetration:* One gateway operates in a star network with sensors communicating directly to the gateway from a range of up to 20 kilometers. Sensors can be located indoors or outdoors. There is no need for complex coverage analysis as is required for mesh network solutions.
    - *Ease of installation:* Battery-operated sensors are capable of lasting up to 20 years depending on the application being used. This means there is no need for power source wiring for sensors as opposed to existing solutions such as GSM, LTE or WiFi.

Semtech's LoRa Technology offers both technical and business benefits for smart city applications.

- *Secure:* AES-128 encryption is built in.

- *Open standard:* The LoRaWAN™ specification is supported and maintained by the LoRa Alliance™ allowing seamless and easy scalability.

- *Geolocation:* LoRa Technology utilizes a GPS-free geolocation technology that does not require additional power.

- *Low connection costs:* LoRa Technology operates in the unlicensed ISM band, which means no or very low spectrum costs (there may be a very low connection fee if using an external service provider).

Business Benefits

- Available today for public and private deployments.

- Low deployment and operational costs when compared to emerging cellular-based solutions like LTE-M and NB-IoT.

- *Open network:*
    - Cities have the capability of choosing from multiple and competing network service providers, helping to drive down prices.   *OR*
    - Cities can deploy their own local municipal network, which can host multiple applications. The cost can be minimized by leasing bandwidth to companies within the city who want to run their own applications.

- *Leverage deployed assets:* LoRa Technology's robust signaling can penetrate buildings for wide ranging coverage even in dense urban areas. This allows one LoRa-based gateway to potentially cover multiple buildings within a range of 2+ kilometers.

- *Growing ecosystem:* The fast-growing LoRa Alliance™ currently comprises over 400 companies that are creating solutions using the LoRaWAN specification. The LoRa Alliance™ includes major industry players and many other start-ups and network operators. Combined, this ecosystem offers multiple sources of supply from communications ICs to networks to server-based application platforms. The LoRa Alliance also certifies sensors and other devices for interoperability.

CONCLUSION

As cities move toward efficiency, smart city technologies can provide new solutions for smarter and improved city services. A scalable and low cost IoT network is the cornerstone of a Smart City program, and LoRa-based devices and the LoRaWAN specification provide high-capacity, low power networks that form the basis of successful smart city solutions.

For more information about Semtech's LoRa Wireless RF Products and Technology for smart city applications, go to **www.semtech.com/IoT** or scan the quick response code below.

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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