Transforming Critical Infrastructure with Massive IoT

By: Lawrence Latham

The exponential advance of the Internet of Things (IoT) in recent years is increasingly showing us its potential to establish connections, deliver results and solve complex problems. In critical infrastructure, a term used to define services considered essential – such as healthcare, energy, public services, and telecommunications – IoT applications are already performing a vital role and delivering a wide range of benefits.

Through IoT investments, governments and private companies can transform cities into more intelligent spaces. With low-cost solutions that allow the acquisition of larger volumes of data, they have more accurate information to better structure their planning, reduce costs, eliminate bottlenecks, and develop public policies that address the needs of the people.

This ability offered by IoT solutions to solve real, complex problems stems from the development of sensor systems based on LPWAN (low-power wide area network) type networks. Among the main options, neutral LoRaWAN networks – an open standard globally adopted for IoT connectivity, which operates as a wide-area, low-power network **–** have been distinguishing themselves through the creation of an ecosystem with the participation of mobile network operators (MNOs), global mobile virtual network operators (MVNOs) and managed service providers (MSPs).

Scalable and ultra low-cost, the technology empowers companies in various segments in industry and government to rapidly implement IoT services, without having to bear high investments and infrastructure complexity. In addition, IoT services promote sustainability. Specifically, the

sensors and devices used to transmit data in LoRaWAN networks require very little power to operate. For example, a sensor using a standard AAA battery might last several years given the incredibly low energy needs required of these sensors; and there's no use of SIM cards – both factors that reduce costs and eliminate excessive waste.

Estimated at $384.5 billion globally in 2027 by [MarketsandMarkets](#), the IoT market will grow as the need to capture and transport small packets of data continues to expand. This expansion comes at a time when many organizations are faced with 2G/3G sunset. LoRaWAN provides these organizations with IoT connectivity options that ensure a seamless transition from 2G and 3G thanks to its network longevity, broad coverage characteristics and ability to lower network total cost of ownership. In short, adoption of innovations offered through IoT and LoRaWAN will transform critical infrastructure problems into things of the past.

Lifesaving IoT enhancements in healthcare

Fed by a wide array of sensors and control devices, IoT solutions are already being employed in a growing number of healthcare scenarios to overcome critical infrastructure problems.

They have recently been used, for example, to handle the logistics of the global COVID-19 vaccination campaign, with the aim to prevent losses and waste. According to a meta-analysis study's estimate, 14 to 35 percent of delivered vaccine supply is subject to inadequate storage temperature, resulting in spoilage and waste.

To respond to challenges such as these, Everynet, a global IoT network provider, in partnership with Telkom, a telephone service provider from Indonesia, have worked on the development of a specific isolated vaccine transporter, equipped with a sensor that monitors location and inner temperature and communicates problems or incorrect use.

Another initiative to address pandemic challenges was put into action in Spain, one of the countries in Europe most affected by the pandemic. At the time, Everynet made its network publicly available for the Spanish health system and, in partnership with other companies, installed IoT solutions on hospital beds that, once activated, enabled patients to call nurses via notification, making care more agile.

In addition to these examples, IoT and LPWAN can also enable monitoring the proper function of hospital equipment, such as biosensors and pacemakers.

Transforming safety with public lighting

In smart cities, public lighting is considered key, both for its importance in our lives and for its indirect impacts.

Lighted streets have an important benefit: increasing lighting decreases violence, as demonstrated in a [study in New York](#). When lighted poles were installed on certain streets, there was a 36 percent decrease in criminal activity.

Today, the use of IoT applications offers even more advantages to cities employing the network, including enhancing the feeling of safety, offering benefits such as energy savings, performance analysis and metrification, predictive maintenance, and decreases in light pollution, environmental damage, and public expenses.

Sparing natural resources

With global warming an increasingly important topic and, given discussions at the UN Climate Change Conference (COP-26), it can be said that the Internet of Things is an important tool in situations that demand a better handling of natural resources.

Solutions with connected devices are presently able to do end-to-end analysis, from the water supply to customers' homes, and can acquire information about the presence of faults; enable instant leak detection, which represents water savings of up to 25 percent; and provide insight into water quality.

Technology also offers access to data that allows the study of key indicators for the distribution network, such as available water volume, water volume consumption, apparent losses, network production and operational efficiencies. And, for the customer, there's also the benefit of transparency. For instance, Sabesp, the largest water and waste management company in Brazil, already employs thousands of intelligent hydrometers, which enables following day-to-day consumption through the Sabesp Mobile app.

"Adoption of intelligent meters has been a great experience. The proof is that we'll be acquiring and implementing newer devices and in larger numbers. Our estimated payback for the first project is 14 months and the loss reduction predicted for the period is two gallons per connection per day for the Metropolitan Region of São Paulo. Work in loss reduction is one of the company's main strategies and, in addition, we strengthen our relationship with our customers, who now have easily available information, in the palms of their hands, about the consumption in their house or their business establishment," says Ricardo Baptista, division manager at Sabesp, who is responsible for the project.

Companies in other segments, like power and gas supply, are already using this solution, with similar efficiency gains. Other cases could be considered, such as monitoring parks, forests, or other areas vulnerable to illegally set fires. With the implementation of a sensor system based on LoRaWAN technology, it's possible to detect atmospheric conditions and the gas composition of the air. This can aid in monitoring indexes of gases like hydrogen, carbon dioxide and carbon monoxide, to alert the authorities in case of a fire, which would speed up response times and minimize damage both to nature and neighboring populations.

Another critical infrastructure that IoT solutions could transform is waste management. Intelligent handling of waste by companies and cities based on low-cost IoT allows monitoring of trash cans to optimize collection routes and frequencies, reducing the environmental footprint and improving the quality of service.

By doing so, cities have a better cost-benefit ratio in managing the waste lifecycle, reducing total expenses with waste collection by at least 30 percent and cutting carbon emissions by up to 60 percent. Reykjavik, the capital of Iceland, which has been investing in several solutions to make the city's waste management more intelligent, is an example of a place where this kind of service is already underway.

Finally, there are the challenges facing our global supply chain. As the world re-emerges from the pandemic and consumers start spending, the ability to track goods, identify backlogs and manage cargo becomes more and more urgent. All these activities need LPWAN to track containers accurately and cost-effectively on ships – in and out of port – and on planes and trucks delivering goods to consumers. LPWAN delivers the device connectivity necessary for this level of tracking. Devices can be turned on and used for years, collect data, and send it to the cloud with minimal battery impact – further highlighting the sustainability benefits offered by massive IoT.

As these examples show, massive IoT can transform how businesses effectively deliver products, evolve the customer experience, enable innovation, and create new business models. These benefits are within reach today for enterprises that partner with the right network provider to leverage the future of IoT.