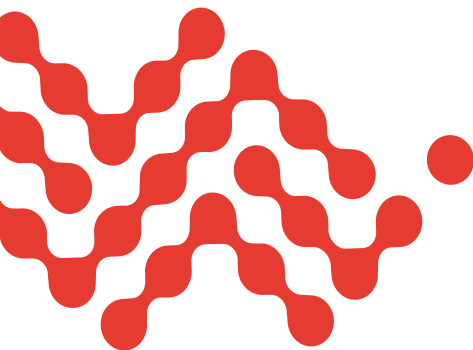




Discover the Benefits of Cellular LPWA Over Proprietary Protocols

Low-power wide-area (LPWA) technology is a powerful IoT technology that has gained global acceptance. Sierra Wireless began talking about this concept in 2015 and launched our first module in 2017. It connects IoT devices that need long battery life and low maintenance, while offering fast data rates.

Many companies will find LPWA's unique capabilities appealing, but it is important to note that there are different flavors of this technology and not all of them are equal. Sierra Wireless held a webinar with IoT World to discuss the use cases inherent in LPWA, along with some of the technology options available, before exploring the difference between cellular LPWA technology and proprietary protocols later on.



LPWA Use Cases



ASSET MONITORING

LPWA's low power consumption, long range, and two-way data communications, makes it well-suited for monitoring remote equipment. ABI Research has found that shipments of asset trackers will increase by more than 50% annually through 2024, driven by growth in LPWA technology.¹

Asset monitoring is especially important for energy utilities. Regulators increasingly require gas companies to monitor for pipeline leakage for compliance with environmental laws. Energy companies also need two-way access to control remote equipment. For example, being able to shut down a remote pipeline segment instantly rather than rolling a truck for physical access could be the difference between safe operation and a leak.



SMART METERING

National regulation also drives smart metering projects as governments seek better energy efficiency in a bid to meet climate control targets. The ability for business and residential meters to communicate in near-real time makes reliable, low-powered IoT communications a critical component.

The use of LPWA for enhanced monitoring also extends to water meters. The average household's leaks can account for nearly 10,000 gallons of water wasted every year, while one in ten homes have leaks that waste 90 gallons or more per day.² As with smart electrical meters, smart water meters equipped with LPWA can collect and communicate data more quickly and frequently than human meter readers. This enables water repair teams to identify potential problems more accurately and even makes predictive maintenance possible.



INFRASTRUCTURE MONITORING FOR SMART CITIES

Other municipal opportunities include monitoring and control for smart city components ranging from street lighting to smart parking and electrical vehicle charging. Inexpensive, low-powered LPWA modules can even help to make monitoring and collection from municipal waste bins more efficient.



ASSET TRACKING FOR CONSTRUCTION AND LOGISTICS

LPWA has some unique characteristics which supports the tracking of mobile assets. Cellular networks provide global coverage, so it can be used to provide the real-time location of cargo as it travels anywhere the world. If there is a disruption, then managers can dynamically adjust routes to reduce any delays. Advanced sensors also mean it is possible to get detailed information on environmental indicators such as temperature, humidity, light, shock or tilt, to ensure the goods are being transported in optimal conditions. If a certain, pre-defined threshold is exceeded then an alert can be sent to notify the relevant stakeholders. This is especially useful for industries such as pharmaceuticals or food and produce, which require a precisely controlled environment and must adhere to strict regulatory requirements.



Industries that have to move high-value goods such as consumer electronics or construction equipment, can also use asset tracking solutions to prevent theft or locate products that have been mislaid. This can happen both during transport or on-site. For example, tools such as air compressors used in this sector will often move around buildings, causing lost productivity as workers spend time locating them.

Understanding LPWA Technologies

LPWA technology is available in various forms. There are several spanning proprietary technologies created by private companies, along with two technologies developed by the Third Generation Partnership Project (3GPP). This is a group of seven telecommunications standard development organizations responsible for creating internationally accepted mobile broadband standards.

3GPP TECHNOLOGIES

The 3GPP offers two primary LPWA technology protocols: Long Term Evolution Machine Type Communications Category M1 (LTE MTC Cat M1, also referred to as LTE-M or Cat-M1) and Narrowband IoT (NB-IoT). LTE-M offers higher throughput than NB-IoT, while also delivering lower latency. This makes it appropriate for applications where real-time tracking is important, such as asset tracking in transportation. It is also the best choice for highly mobile applications because it handles cell-tower hand-offs.

NB-IoT is the lower-speed, higher-latency alternative for static use cases. Although it doesn't offer cell-tower hand-offs, its use of a single narrow communications band achieves power efficiency which for certain use cases can be on par or better than LTE-M.

Both of these technologies have already been specified as 5G IoT standards by the 3GPP. They can be implemented in either private or public network configurations and were enhanced in the organization's Release 14 specifications.³

PROPRIETARY LPWA

Private companies or industry alliances have also introduced their own LPWA implementations, including LoRa and SigFox, but as private ventures they face market doubts about their future evolution. Lacking the widespread support of 3GPP networks, they struggle to reach critical mass among potential users worried about their longevity.

Concerns over proprietary technology showed up in a poll conducted by IoT World and Sierra Wireless in a recent webinar. Significantly, while 20% of the respondents to the IoT World poll reported using a mixture of cellular and proprietary LPWA technology, just 2% said that they used LoRa or Sigfox.

Standards-based LTE-M and NB-IoT technology is growing in popularity, with 16% of respondents reporting using it exclusively. Almost one in three respondents said that the jury was out, as they continue to evaluate the best way to connect their equipment. The largest proportion of users (33%) who had chosen a connectivity method still connected their equipment using legacy cellular technology. Clearly, there's a lot of headroom for 3GPP-based LPWA to grow.

The Advantages of Cellular LPWA over Proprietary Technology

Standard cellular LPWA technology offers several advantages that make it an appropriate asset tracking and monitoring technology when compared to non-cellular technologies.

INDOOR COVERAGE

Cellular LPWA's low-frequency connection gives it an enhanced capability in indoor environments. It offers deep penetration into buildings that otherwise wouldn't have coverage. Its strong propagation makes it useful for devices located in basements, for example, such as water moisture monitors, or smart parking applications in underground parking lots. It can also be used to locate goods that have been misplaced in warehouses or other storage facilities, without having to waste resources searching the building.

ENHANCED LONG-RANGE COVERAGE

Although standardized cellular LPWA operates on LTE cellular networks, their usage and performance profile is different from traditional smartphone devices that are optimized for streaming data. The IoT modules' chipsets offer a 15db improvement over smartphone hardware. This not only improves their indoor coverage further but also extends their range in outdoor environments, making them useful for applications where they might be further away from a cellular tower. This contrasts with other proprietary protocols such as Wi-SUN. At around 4km, its range is much shorter than the 10km or more offered by 3GPP protocols.





UBIQUITOUS COVERAGE

Proprietary technologies force clients to build out their own private networks, limiting their coverage. Conversely, the standard nature of 3GPP-based LPWA technologies gives them a global reach, making geographical expansion easier. Now that narrow-band IoT roaming agreements are in place in both Europe and the US, companies can take advantage of IoT ecosystems using LPWA technology for asset tracking.

Standard cellular LPWA can take advantage of existing cellular networks. Cellular base stations need little more than a software upgrade to become LPWA-capable, which has made it ubiquitous in both dense conurbations and rural areas.

LOWER POWER CONSUMPTION THAN CONVENTIONAL CELLULAR

The chipsets in cellular LPWA devices are designed with low power consumption in mind. Rather than streaming data, they send it in batches, enabling them to reduce their power consumption by entering a standby state.

These devices can also take advantage of core network functionality such as Extended Idle-Mode Discontinuous Reception (eDRX), in which devices turn off part of their circuitry to save power during times when they need not be in contact with the network. Features like eDRX help LPWA devices to reach ten years of battery life or more.

DATA INTEGRITY AND SECURITY

Both the security and integrity of data is important in many LPWA applications. Data about gas flows through a pipeline must be correct to avoid potentially disastrous consequences. It must also be secure so that intruders cannot tamper with it for nefarious purposes.

Both LTE-M and NB-IoT support mandatory user identity confidentiality, entity authentication, data integrity, and mobile equipment identification, along with optional mechanisms including user data and signaling confidentiality.





While advocates of proprietary protocols have attempted some security measures, the standards-based security inherent in LTE-M and NB-IoT cannot be overstated. The inclusion of hardware based integrated SIM cards for security sets these technologies apart from some proprietary low-powered technology stacks. Ultimately, it's difficult to compete with three decades of open security standards.

LOWER TOTAL COST OF OWNERSHIP (TCO)

Building out your own network with a proprietary technology quickly becomes expensive, especially when the networks need to scale. Using existing cellular networks with standardized 3GPP LPWA technology drastically lowers deployment costs.

HIGHER DATA RATES

LPWA technologies offer data rates that support various use cases. Each of them is geared to a particular application class. LTE-M offers higher data rates of 590 kbps (downlink) and 1100kbps (uplink), compared to downlink speeds of 127kbps and uplink speeds of 158kbps for the Cat-NB2 enhanced NB-IoT protocol in 3GPP Rel 14. They are also configured to send data in larger block sizes than some proprietary protocols, which are limited to tiny message sizes, making communications more difficult. These high data rates that LTE-M and NB-IoT offer, enable more complex and detailed information to be sent from the IoT devices, expanding their use cases.

HIGHER DENSITY COVERAGE

3GPP-based LPWA is geared for dense deployment thanks to the high penetration of base stations on existing cellular networks, and the use of dedicated licensed spectrum for communications, which reduces the likelihood of interference from other devices. This creates a much higher level of service when deploying standards-based LPWA, especially in massive machine-to-machine environments involving devices such as sensors. Both of the 3GPP technologies can easily support over a million devices per square kilometer. This is technology that is designed directly into modern cellular standards, giving them a distinct advantage over proprietary systems.



Case Study: iSwip

Asset tracking is a big business, and LPWA has created more opportunities than ever for OEMs to serve their customers with new innovations. French IoT architect iSwip used LPWA to create a service that saves its customers time and money by tracking the status of shipments at unprecedented levels of accuracy.

iSwip has ten years of experience building custom IoT solutions from conception through to deployment. It has served dozens of customers and has deployed 44,000 connected devices in the field. Its outdoor geolocation system locates fleets of equipment including trailers, dumpsters, pallets, construction equipment, and containers.



iSWIP

The French IoT specialist chose the Sierra Wireless HL7802 LPWA module after it became clear that it offered the lowest power consumption of any module evaluated.

"A good connected object is an object that can be forgotten for up to ten years. Our tracker can be installed and forgotten about while being operational during that time."

Pascal Meyer,
Marketing and Sales Manager, iSwip

PRO-ACTIVE MANAGEMENT

The service determines the position of the target asset along a route, enabling it to map assets in real time for its clients and calculate the estimated time of arrival. This not only enables the company to optimize routes for the transportation of assets, but also lets them detect theft or transportation disruptions ahead of time.

iSwip's clients can also set rules to alert staff emails or text message about any emerging issues. These include devices coming into contact with too much moisture, leaving a predefined route, or entering specific geographic zones.

The company also offers an indoor tracking service, enabling customers to track valuable equipment such as industrial equipment or medical devices.

SWIPTRACK-LTE

To power its service, iSwip produces an industrial tracker called the SwipTrack-LTE. This provides GNSS tracking for positioning, along with accelerometer and temperature readings for extra information about the asset and its environment. The compact 12 x 8 x 4 cm device is waterproof to IP67 standards so it can be used in any weather conditions and is equipped with Bluetooth for short-range communications.

The SwipTrack-LTE is designed based on the Sierra Wireless HL7802 LPWA module, which supports Cat-M1 and NB-IoT networks worldwide. It also falls back to 2G if LPWA networks become unavailable. This is all managed via an embedded SIM card that is pre-connected to global cellular networks.

Using this Sierra Wireless technology, iSwip can communicate measurements including temperature, humidity, and distance. It can even detect whether a button on an asset has been pushed and notify the owners immediately.

Conclusion

LPWA has been here for a while, unlike 5G, already transforming business for companies like iSwip. Sierra Wireless's exemplary track record in designing radio communication modules puts us at the forefront of the LPWA movement. With over 25 years of experience in embedded module design, we bring end-to-end expertise in IoT connectivity to our client engagements. Visit our website to find out more about how LPWA can help your company.

Start with Sierra

For more information on Sierra Wireless, please visit www.sierrawireless.com

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About Sierra Wireless

Sierra Wireless is the leading IoT solutions provider that combines devices, network and software to unlock value in the connected economy. Companies globally are adopting IoT to improve operational efficiency, create better customer experiences, improve their business models and create new revenue streams. Whether it's a solution to help a business securely connect edge devices to the cloud, or a software/API solution to help manage processes associated with billions of connected assets, or a platform to extract real-time data to make the best business decisions, Sierra Wireless will work with you to create the right industry-specific solution for your next IoT endeavor.

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