New Low Power Wide Area Network Protocols Lower the Cost of Connectivity

INDUSTRY BRIEF

AT A GLANCE:

Until standards emerge, many connectivity players will compete in the enormous IoT marketplace. In a recent report, the GSMA noted that NB-IoT and LTE-M technologies will be an integral part of 5G and are expected to fulfill the 5G LPWA requirements.

IoT industry standards, as set by the 3rd Generation Partnership Project (3GPP)*, recently saw more licensed technology protocols join the low power wide area (LPWA) network sector. The most promising examples include LTE-M (also known as LTE-CatM1 and Narrowband IoT (NB-IoT). These two licensed protocols can alleviate some of the issues associated with IoT connectivity by introducing extended coverage, power efficiencies with prolonged battery life (up to 10 years), heightened reliability, and lower costs, including less expensive hardware.

How They Work

LPWA networks are designed for IoT and machine-to-machine (M2M) applications that have low data transmission rates, need long battery lives, can provide low-cost services, sometimes operate in remote or hard to reach locations (underground or geographically dispersed), and be easy to deploy across basically every business sector, including manufacturing, automotive, energy, utilities, agriculture, healthcare, wearables (for humans or animals), or transport.

Present day cellular mobile technologies are designed to work on costlier consumer-oriented networks where the premium is placed on fast connections that can transport large amounts of data, whereas low-cost LPWA networks can support devices requiring low mobility, low-power consumption, long-range abilities, and security. One of the benefits of LPWA is that data transfer rates, as well as power consumption, are very low. Device connectivity in this case requires less bandwidth than standard cellular, which means that LPWA networks can operate with far greater power efficiency. Additionally, LPWA networks can support more devices, at a lower cost, over a similar coverage area to consumer mobile technologies.

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LPWA: A Needed Intervention

The concern for many businesses, however, is that the cost of cellular connectivity, as exemplified by smartphone functionality, could blow up many business models. Also, the rapid advancement of technology might leave some companies behind before they can establish an IoT beachhead. Businesses realize that cellular connectivity is driven by non-IoT applications, such as smartphones. And that cost, with high data rates and very low latency, when applied to most enterprises, is far too expensive. What the majority of businesses entering the IoT sphere want is low cost cellular networks with low data rates, extended battery lifecycles for devices, data acquisition that sends or receives intermittent transmissions per day (rather than being on 24/7, with lower per-device costs (well below $5 per radio module when purchased in large volumes), and service costs that reflect low usage. Below, we review two new LPWA protocols, with advantages and challenges that each bring to the connectivity world.

LTE-M

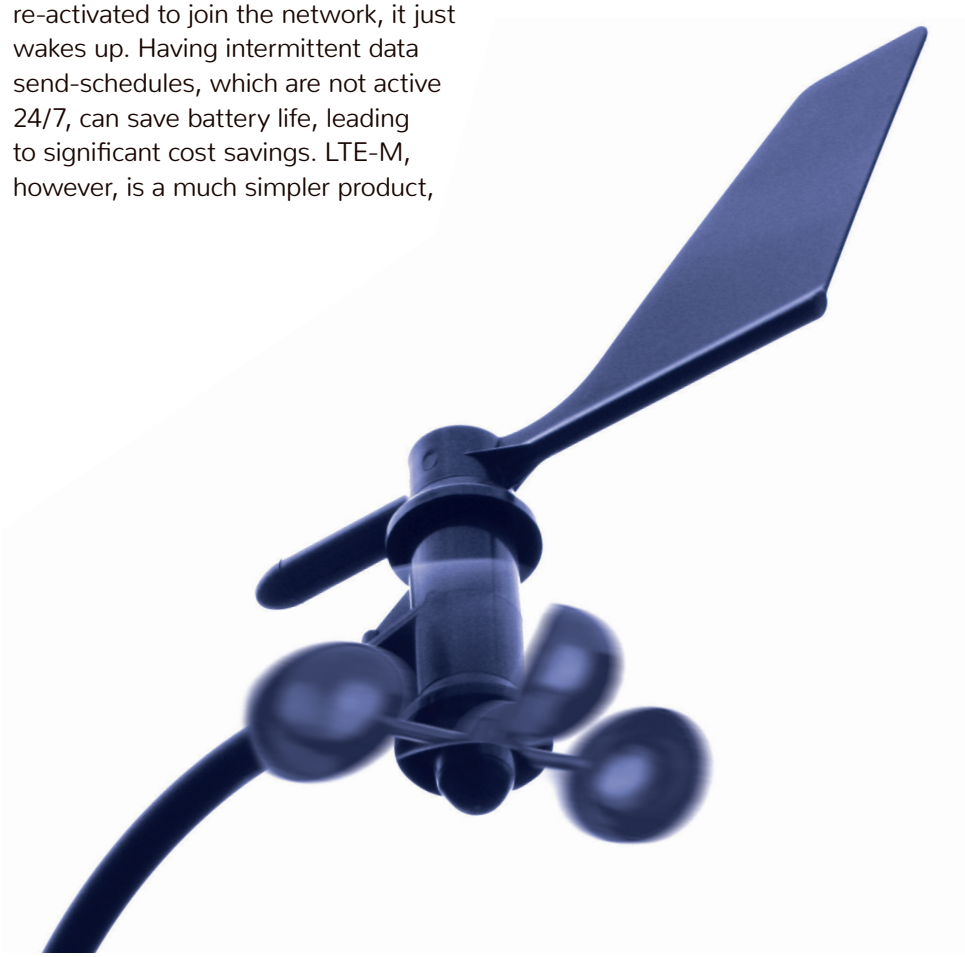
LTE-M, also known as LTE Cat-M1, is a bidirectional, standards-based protocol within a dedicated spectrum. It provides carrier-grade security, long battery life, low data needs, and low-cost modules. It is a low power wide area technology that supports IoT through lower device complexity while providing extended coverage. This allows for an extended battery lifetime, potentially as long as 10 years or more, for a wide range of use cases, such as low-data-rate sensors; automated meter reading; and asset tracking.

Additionally, modem costs are reduced to 20-25% of current hardware prices.

One of the strengths of LTE-M is that it does not need a new infrastructure as it can piggyback on existing LTE networks. What that means is that a carrier can update software on its network, get LTE-M functional, and not spend any additional funds on infrastructure or support services.

Using an extended discontinuous repletion cycle (eDRX), the data collection devices can transmit data on a non-continuous schedule, as set by the end user. The device, when not sending data is not off, but just asleep. When data is scheduled to be sent, the device does not need to be re-activated to join the network, it just wakes up. Having intermittent data send-schedules, which are not active 24/7, can save battery life, leading to significant cost savings. LTE-M, however, is a much simpler product, only using 1.4 MHz channels instead of the 20 MHz bands possible with higher categories of LTE.

Supported by all major mobile equipment, chipset, and module manufacturers, LTE-M can co-exist with standard consumer LTE mobile networks and benefit from all the security and privacy features of these networks, such as support for user identity confidentiality, entity authentication, data integrity, and mobile equipment identification. Data rates for LTE-M are somewhat higher than NB-IoT, but it can transmit larger blocks of data. Access to LTE-M functionality will be available for much of the world (China excluded) by 2018-2019.



NB-IoT

Narrowband IoT (NB-IoT), also known as LTE Cat NB1, is the latest entry to the IoT sector. With its standards-based LPWA IoT technology, NB-IoT has a global reach with better bi-directional data than any of its unlicensed counterparts. And, unlike LTE-M, NB-IoT is based on Direct Sequence Spread Spectrum (DSSS) modulation, which 'widens' the signal so as to reduce interference. With NB-IoT, however, it might be a bit harder to go national since it can't yet hook into the LTE network.

NB-IoT is supported by all major mobile equipment manufacturers and can work with cellular mobile networks, so it also enjoys the higher security of mobile networks, including user ID, authentication, data integrity, and more.

The NB-IoT LPWA solution is optimized for applications that need to communicate small amounts of data over long periods of time (think smart meters, smart city functions, waste management, wearables, and more). Because of its point-to-point topology, NB-IoT results in lower latency with a higher transmit power limit (in a 200 kHz bandwidth), which improves range and reliability, even underground or inside buildings. And since it operates in a licensed spectrum, it is secure with highly reliable data transmission, assuring a high quality of service. NB-IoT, using very low power consumption, is easily deployed into existing cellular network architecture and provides extensive network security and reliability.

NB-IoT devices and hardware are at the lower end of the cost spectrum and improved efficiency helps batteries last more than a decade, allowing for long-term projects. With its simpler underlying technology, costs for NB-IoT modules will continue to decrease as demand increases. The technology roll-out, with a commercial module and network, is due worldwide by late 2018.

Currently, NB-IoT deployments are more common than LTE-M, although some operators have started to deploy both technologies.

*The 3rd Generation Partnership Project (3GPP) is an association of seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), providing standardization oversight for cellular telecommunications network technologies.

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