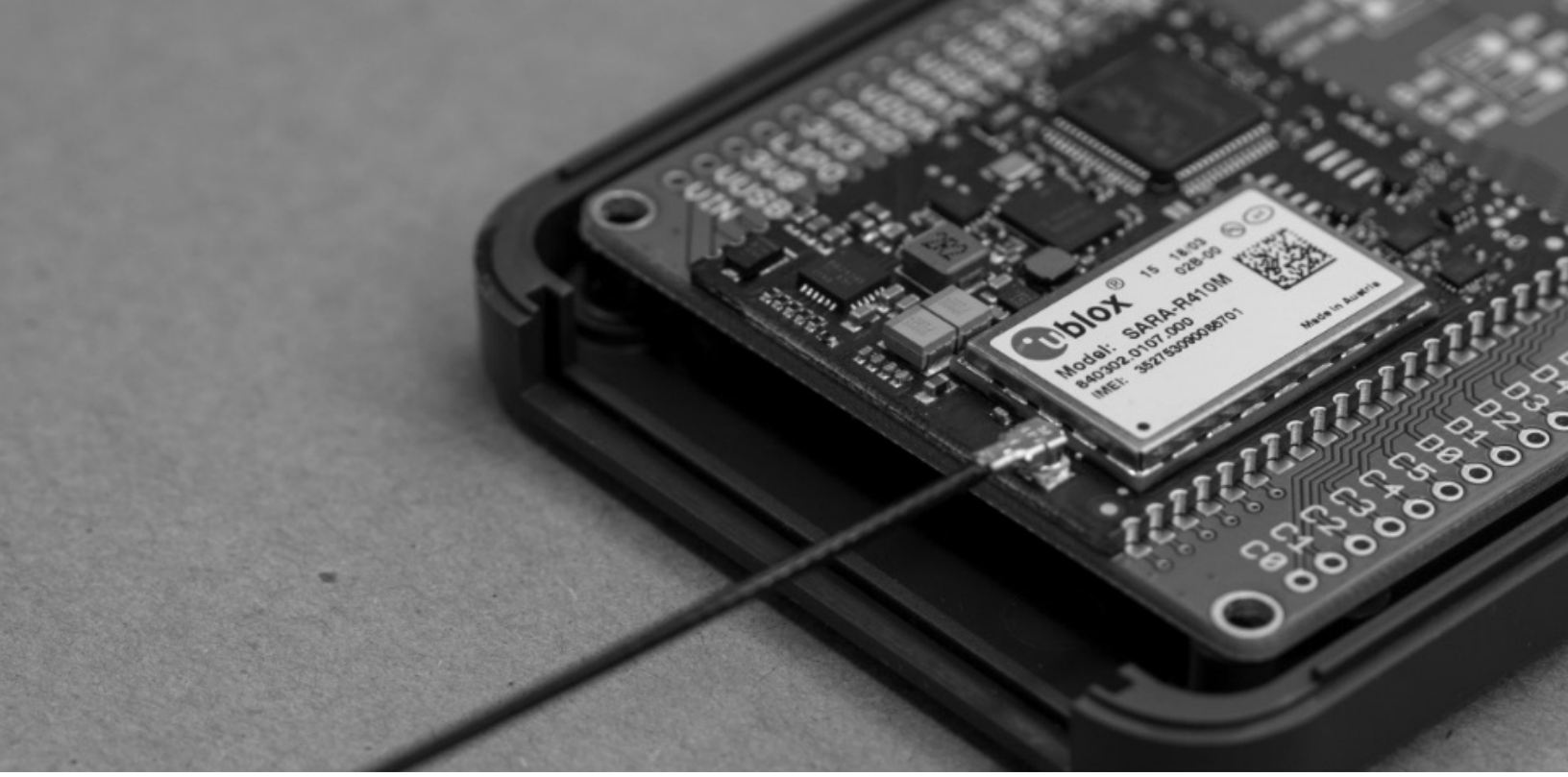

LTE FOR IOT ARRIVES AT LAST

HOW LONG TERM EVOLUTION TECHNOLOGY STANDS TO CHANGE THE IOT MARKETPLACE

BY WILL HART, GM OF DEVELOPER TOOLS, PARTICLE

For the past 2-3 years, both the cellular and IoT industries have been abuzz with the imminent arrival of cheap, lightning-fast, widely-accessible LTE. The entrepreneurs, developers, companies,and journalists waited patiently as deadline after deadline passed. But eventually, that patience gave way to frustration and ridicule. And rightly so.

Finally, with the release of Particle's E Series LTE Module, accessible, scalable LTE for IoT has finally come to fruition. With this new technology, everyone from individual developers to multinational corporations will find real, substantive value from this new form of cellular connectivity. In addition to lower hardware costs and superior coverage, LTE adopters will be certain to future-proof their products from the inevitable sun-setting of 2G and 3G bands.

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WHAT IS LTE?

When first learning about LTE, most people make the mistaken assumption that it refers to a singular, distinct technology. However, LTE actually includes a variety of "categories" that each carry their own distinct advantages and disadvantages. And within this environment, a great deal of fragmentation is occurring, further muddying the already unclear notion of "what is LTE?". However, to put it in the simplest terms, LTE is merely a new, improved standard for wireless telecommunication, much in the same way that 3G improved upon 2G. Because of this, the advent of LTE isn't likely to grab many headlines outside the world of trade press. These sorts of gradual, incremental technological leaps forward often go all but unnoticed.

WHY MAKE THE SWITCH?

Firstly, IoT developers and businesses leaders should make the switch to LTE because of the rapidly approaching obsolescence of 2G and 3G technologies. Most carriers have already announced that they will be sun-setting their 2G networks within the next 1 to 2 years. Even more importantly, most US carriers are no longer accepting new 2G or 3G device certifications and won't allow new 2G and 3G products on their network starting as soon as June of this year, even if they've already been certified. These rapid changes mean that it's critical for product creators to make the jump to LTE quickly, before being stymied by abrupt obsolescence.

IMMEDIATE BENEFITS

Making the switch to LTE also provides businesses with a host of immediate benefits that will both make existing applications more cost-effective, and facilitate completely new use-cases. Firstly, LTE hardware will be less costly than its 2G and 3G predecessors. IoT companies seeking to expand their fleet of devices could save considerably if they choose to expand with LTE rather than their existing solution.

Secondly, LTE provides superior coverage. The value of that attribute speaks for itself, but it will also likely facilitate new use cases that weren't previously possible. With wider, more reliable coverage, companies can begin deploying IoT devices in more remote, or hard-to-access locations.

Such an application would also be facilitated by LTE's significantly more energy-efficient than 2G and 3G devices. Not only will this allow businesses to save money by reducing the number of times , but it will also make those remote, hard-to-access applications even more viable.

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HOW LTE FOR IOT WILL AFFECT YOUR INDUSTRY

Given the aforementioned benefits, virtually every industry will be affected by the dissemination of LTE for IoT. Sadly, we don't have enough time or space to address every potential use case out there. However, we can highlight a handful of hypothetical applications to help better illustrate the potential impact of LTE for IoT.

INDUSTRIAL AGRICULTURE

With the reduced cost of hardware and more efficient battery life offered by LTE, a variety of novel use cases will become available for the field of industrial agriculture. Among those is the widespread implementation of water/humidity sensors which would allow farmers to know if, when, and precisely where their crops are in need of water. This will allow for more fine-tuned, targeted watering —– reducing water waste, and improving crop performance at the same time.

ENVIRONMENTAL MONITORING

With its superior coverage, range, and battery life, LTE will allow for more robust environmental monitoring in locations that may have previously been inaccessible to 2G and 3G modules. Monitoring erosion around bodies of water, tracking animal and plant populations, and more will be made feasible with LTE.

VEHICLE TRACKING

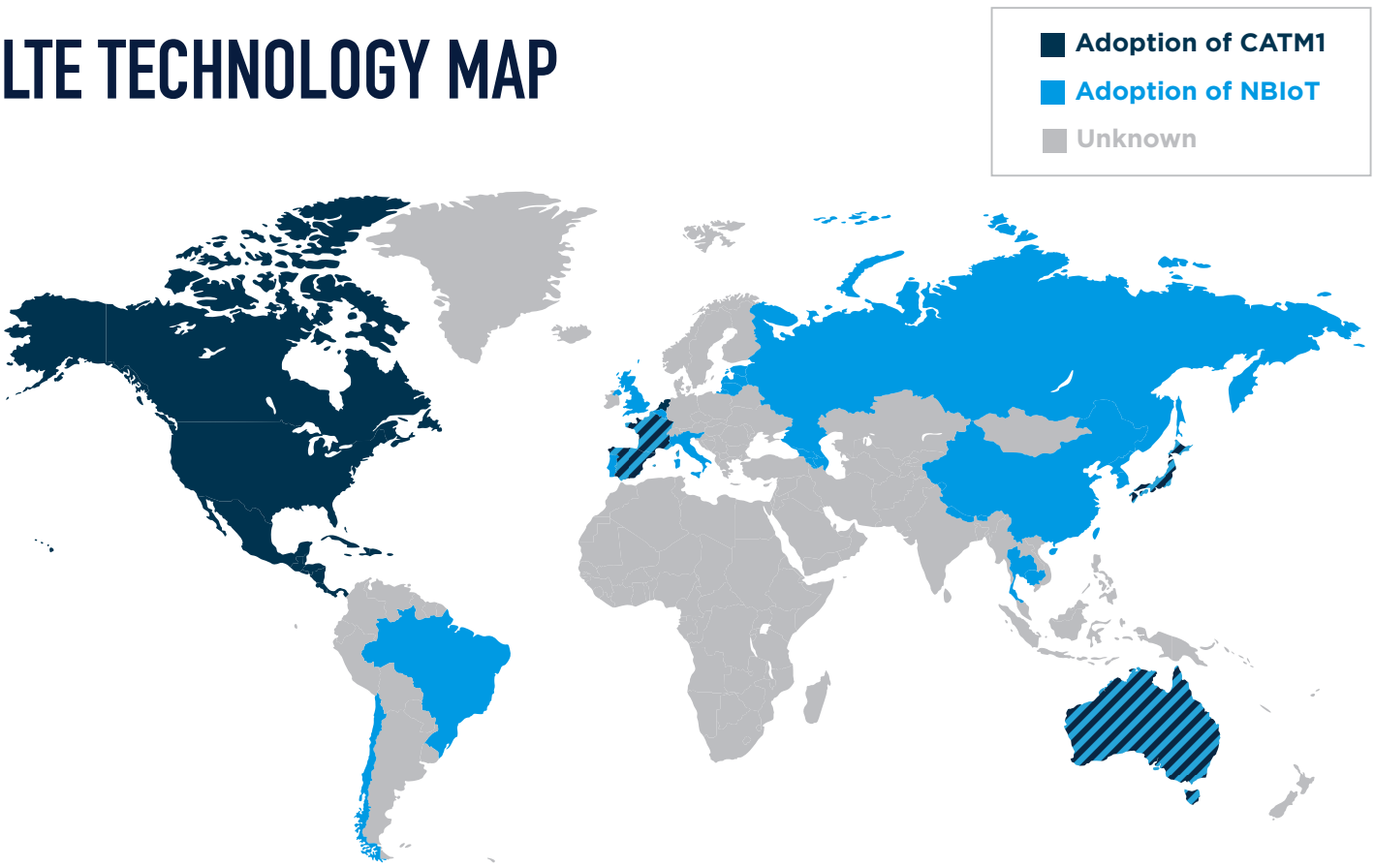
From trucking companies to insurance providers, the long-term, accurate, and long-range tracking of vehicles will become more tenable with the advent of LTE for IoT. Although asset tracking solutions already exist in IoT, LTE will facilitate superior solutions, in which modules will be less costly, with better coverage, and longer battery lives.

CHALLENGES & POTENTIAL SOLUTIONS

In the race to implement (and become standard bearer of) LTE, various countries, carriers, and hardware manufacturers are embracing a slew of different cellular technologies and bands. As a result, the LTE landscape has grown increasingly fragmented and complex.

Currently, the fundamental divide exists between two technologies – CAT-M1 and NB-IoT.

LTE TECHNOLOGY MAP



Each band has their own unique advantages and disadvantages, but the split in their adoption has largely formed along geographic lines (see above). Which of these two solutions will ultimately emerge as the de facto gold standard is still unclear. There is also the possibility that these divides will persist, and hardware manufacturers will step in to offer their own solutions for global implementations.

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THE CAT M1 ECOSYSYTEM

CAT M1

Full Mobility
and In-Vehicle hand-over

5+ Year Battery Life
Low power consumption

Voice Support
Via VoLTE

Deep Penetration
Extended range inside buildings & basements

Smart Metering
Gas & Water Metering

Connected Health
Monitors & Vital Tracking

Smart Buildings
Alarm Systems, HVAC, Access Control

Smart Cities
Streeetlights, Parking, Waste Management

Automotive & Transportation
Shipment Tracking, Fleet Tracking

THE NB-IOT ECOSYSYTEM

Smart Metering
Gas & Water Metering

Consumer
White Goods, People Tracking

Smart Buildings
Alarm Systems, HVAC, Access Control

Smart Cities
Streeetlights, Parking, Waste Management

Agriculture/ Environment
Environmental Monitoring, Polution Monitoring, Animal Tracking

NB-IoT

Secure & Reliable
Industry Standards Based

10+ Year Battery Life
Optimized for low power consumption

Easy Deployment
Integrates into cellular system

Deep Penetration
Extended long range coverage indoors & underground

That's why some innovative companies, such as U-blox, are beginning to develop solutions that are capable of supporting both bands. Although these innovations are still in development, technologies such as the embedded SIM (eSIM) – a rewritable SIM card that would be compatible with any wireless operator in the world – hold promise as a means of maintaining a global market despite so many already existing fault lines.

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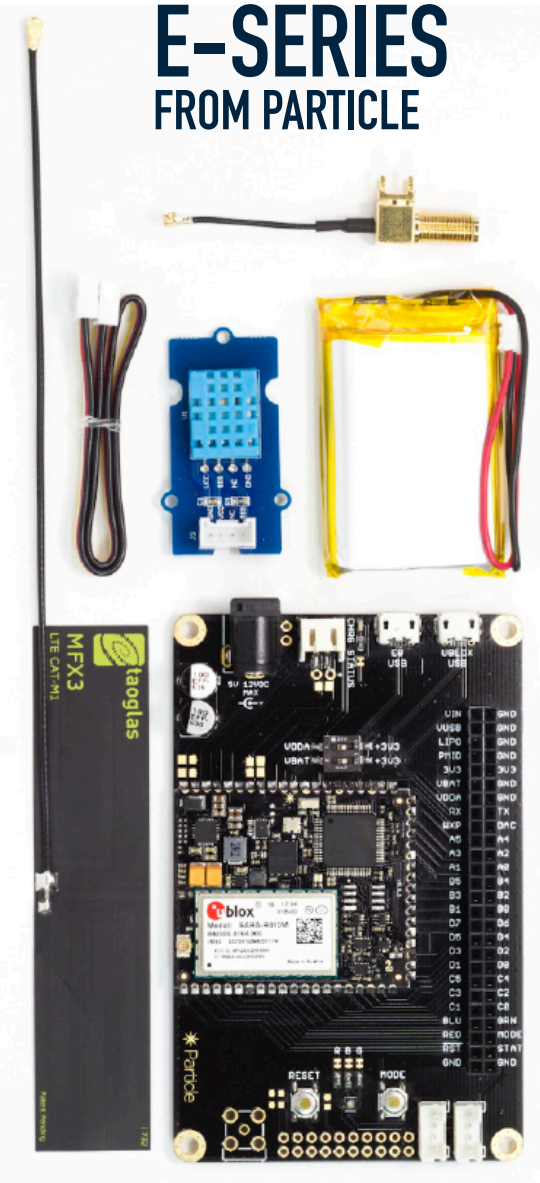
Meanwhile, all-in-one IoT platforms such as Particle are fueling the adoption of LTE by simplifying the path to market. As part of their new E Series collection, Particle has recently introduced an industrial-grade, LTE-enabled IoT module; which offers out-of-the-box connectivity, built-in security measures, and more. Plus, with features like the Device OS and scalable data plans, IoT platforms like Particle are working hard to break down the barriers to LTE's growth in their industry.



LOOKING FORWARD

Sending data wirelessly is fundamental to IoT applications. It has been ever since the very first 2G cellular modules were added to assets to help reduce servicing costs. The data received could include things like stock levels (in vending machines), evidence of tampering (in payment kiosks), or hours of use (in manufacturing equipment). Data could also include simple functions such as taking an asset in or out of service, alerting an operator that a fault has been reported, or delivering over-the-air updates.

As the roll-out of LTE networks continues, a much wider range of applications will become possible. Applications with more varied data demands, such as video, audio and control telemetry, will drive demand for more connections that are reliable, flexible and power efficient.

Meanwhile, technologies like eSIM, give hope for the development of global products. Put simply, an eSIM allows hardware to be carrier-neutral, enabling the hardware to be switched in the field or provisioned after shipping. Some in the industry believe the eSIM will help build cooperation between MVNOs and thereby improve supply-chain efficiencies.

Finally, it is anticipated that, further along in its evolution, LTE will provide superior RF penetration than its predecessors. This feature will facilitate even more novel applications, such as: mining safety, underground garage monitoring, and more.

CONCLUSION

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LTE lacks the flair of most major innovations, such as the smartphone or personal computer. That's because unlike the latter two, LTE does not represent an entirely new class or form of technology. Instead, LTE is simply an improvement upon existing cellular technologies.

However, IoT product creators would be wise to treat LTE with the kind of enthusiasm that comes with major innovations. The overwhelming majority of scientific and technological advancements come in the form of improvements in form. And as such an advancement, LTE stands to both disrupt and remake the IoT landscape; with brand new applications, and significant improvements on existing ones. Although many questions still remain about the future of LTE, there is no doubt that LTE is the future of cellular IoT.

LOOKING FOR MORE INFORMATION?

Visit **particle.io/sales** or contact **sales@particle.io**