Future Proofing

HOW TO MAXIMIZE THE LIFESPAN OF
WIRELESS IOT ROUTER INVESTMENTS

inseego™

Introduction

Cellular networks have reached an inflection point that complicates decisions for new wireless Internet of things (IoT) router solution investments. Cellular operators and technology providers are beginning to roll out 5G solutions, yet 4G LTE will remain the fastest option in most areas for the next several years. Coverage and speed will continue to grow as networks are prepping for 5G support.

Given the current state of flux, businesses or organizations considering new investments in IoT solutions face a dilemma; how can you get the best service quality available today for connected infrastructure, connected transportation, and first responder solutions without missing out on exciting new capabilities that will be rolled out in the next few years?

This paper:

- Explains what to expect from wireless network providers in coming years.

- Covers how LTE is changing and why that matters.

- Explores the hardware features that will be needed to take advantage of fast-evolving cellular offerings so you can choose near-term investments will provide long-term value.

Tapping into the full potential of
LTE for wireless IoT

The adoption of IoT hardware and the constant stream of new technologies being introduced for transportation, public safety and infrastructure applications is continuously evolving. Across industries, wireless IoT routers enable improvements in efficiency, safety, and operational productivity. For example:

- Connected transportation— In vehicle IoT routers improve efficiencies, safety, and optional productivity by providing reliable connectivity for vehicle tracking, instant communication and remote mobile computing. Buses, taxis and delivery vehicles utilize industrial grade hardware with high-speed connectivity to confidently complete the job at hand.

- Connected infrastructure— As utilities and infrastructure technology improves, there is increasing demand to have a secure and reliable method to communicate with remote endpoints. Remote enclosures used for surveillance, security, digital signage, and machine/station control are using routers to collect and manage equipment based off real-time data to give deeper insights into operations. In addition, secure tunneling to the endpoints is absolutely critical to ensure data is not compromised.

- Emergency Response— Police, fire, and ambulatory services are preparing for initiatives like FirstNet and will be using IoT solutions to support and monitor day to day activities as well as mission critical emergency situations. In these rugged environments it is required to have reliable mobile coverage with a large WiFi range for in or out of vehicle connectivity as well as high-speed video offloading.

In these types of cases, connection reliability, quality and speed are essential. That means the ability to use the latest wireless network features is key. But there is also more to the future-proofing equation. The environments in the scenarios described above are often extreme, so hardware durability matters. For example, factors such as vibrations, shock, thermal shock/load, or impact can greatly affect wireless router performance and longevity. In other words, there are a lot of important factors to consider when making long-term wireless router investments. Let's quickly explore how cellular networks will be evolving in the next several years along with what router features will be needed to take advantage of the new capabilities and to deliver an optimal ROI.

Path to 5G:
The Evolution of LTE to Gb speeds

While the industry fixates on 5G solutions, it's important to understand a few critical points about LTE networks. First, LTE speeds and coverage will continue to improve over the next several years. Second, as LTE is a mature technology, it will take several years for 5G networks to have widespread adoption. Third, it will be a few years before cost-effective hardware is available.

As a precursor to 5G, regulators around the world are opening new spectrums for use on LTE networks, which are often overwhelmed by traffic due to the rapid proliferation of smartphones and IoT data demands from consumers, SMB, and enterprise. The addition of unlicensed and previously off-limits sub-6Ghz bands increases network capacity, leading to the realization of gigabit speeds to devices on LTE networks.

In the U.S., for example, AT&T is rolling out LTE License Assisted Access (LAA) offerings across markets in major cities. At the same time, Verizon is utilizing Citizens Broadband Radio Service (CBRS) spectrum.[i] Devices that are configured to support LTE LAA and CBRS can take advantage of both licensed and unlicensed spectrum bands as well as carrier aggregation to reach gigabit speeds. [ii]

Considerations around 5G

5G has received a lot of hype for good reason. 5G offers a unified air interface that is flexible enough to support an array of new use cases and increased subscriber count by greatly increasing throughput and decreasing latency. Unlike previous generations of cellular networks, 5G utilizes spectrum across two distinct frequency sets. These two frequencies sets are called sub-6 and mmWave. Both enable a 10 – 40X capacity increase over current 4G LTE networks. The sub-6 frequencies are also the same spectrum as the LAA/CBRS that will be enabled in 2019 as the path to 5G.

Although the leaps in 5G technology are revolutionary in many ways, 5G isn't necessarily a replacement for 4G LTE. It's more of an enabler for new cellular solution possibilities. For example, it will:

- Solve network congestion challenges that lead to network slowdowns
- Support service-level-agreements for specific use cases
- Facilitate service plan customization for different use cases

Part of the beauty of 5G is that it relies on universal standards and it is fully backward compatible with 4G LTE, so it's already worth investing in solutions that are 5G compatible. For the next several years, however, the vast majority of use cases will rely on 4G LTE.

Future Proofing:

Features to look for when selecting wireless routers today

Given all the advancements happening across cellular networks, there are multiple features wireless routers either need to support or include to ensure they will be able to support 4G LTE gigabit speeds.

5-CARRIER AGGREGATION
Carrier aggregation is essentially a workaround for congested networks. When network speed is lagging, routers that support carrier aggregation can combine multiple types of bands from different LTE operators into faster pathways for device workloads. That makes carrier aggregation key to getting 1 Gb speeds from 4G LTE networks.

4X4 MIMO
Multiple Input, Multiple Output (MIMO) capabilities help reduce interference between devices and cellular networks by relying on a greater number of antennas to optimize connection quality.

256 QAM
Carrier signals are transmitted using Quadrature Amplitude Modulation (QAM), which can be delivered in 16 QAM, 64 QAM, 128 QAM, or 256 QAM. [3] The higher level of QAM rate enables a device and network to transport more data in smaller packets, which increases the overall network speed for everyone. [4]

CBRS/LAA SPECTRUM SUPPORT
The CBRS and LAA spectrum are being enabled in 2019 for LTE networks to provide gigabit speeds. These frequencies will be available on B42 (CBRS 3500 – EU), B46 (LAA 5 GHz – AT&T), B48 (CBRS 3600 MHz – US, Verizon)

5G SUPPORT
With carriers already rolling out 5G solutions, it's well worth considering how soon offerings may be available in your area and what they could mean for your operations. At the very least, it's worth looking for devices that can support 5G capabilities whether they are built in or available through a plugged-in modem.

In addition to the items above, there are a couple of other critical considerations to making good long-term router investments for harsh transportation, infrastructure and public safety environments.

RUGGEDIZED
Routers are often subjected to extreme temperatures, shocks, electrical variations, constant vibrations, dust and water exposure and more. For devices to reliably run 24x7 unaffected in these types of conditions, they need to be industrial grade. Key things to look out for include:

- IP rating—Protection from dust proof and water-resistant rating of IP64 or better.
- SAE testing rating---To confirm the device holds up in punishing environments, including vehicles, trailers or manufacturing environments.
- Military Standard testing —To ensure the device can stand up to shocks, dramatic temperature variations and humidity.

CENTRALIZED MANAGEMENT

From a total cost of ownership (TCO) and manageability standpoint, when selecting wireless routers, it's critical to consider how you will do things like:

- Deploy and maintain devices
- Protect devices from IoT malware attacks
- Manage data usage across devices
- Monitor assets, environmental factors, and troubleshoot issues

After all, the devices may be widely geographically dispersed or constantly moving. A good cloud management platform makes all these tasks easier while helping you control device TCO.

Be Ready for What's Next with Inseego

Skyus 300 and 500 routers from Inseego provide a ruggedized, future ready solution to support gigabit speeds. With 5-carrier aggregation, 4x4 MIMO and 256 QAM features that support LTE LAA and LTE CBRS, Skyus 300 and 500 routers are built for speed and the latest generations of wireless networks. They have also passed stringent MIL-STD 810G and SAE J1455 testing and have an IP64 rating, so they are proven to have what it takes to hold up in rough transportation, public safety and connected infrastructure environments. Inseego's IIoT routers offer the industry's best cellular reception and transmission by offering dedicated primary and diversity antennas to each LTE frequency range including CBRS and LAA spectrum. And because they feature MiFi-powered technology, with more than 32 million units shipped, you can trust in the re-liability of Skyus 300 and 500 routers.

About Inseego

Inseego enables high performance mobile applications for large enterprise verticals, service providers and small-medium businesses around the globe. Our product portfolio consists of Enterprise SaaS Solutions and IoT & Mobile Solutions, which together form the backbone of compelling, intelligent, reliable and secure IoT services with deep business intelligence. Inseego powers mission-critical applications, such as asset tracking, fleet management, industrial IoT, SD WAN failover management and mobile broadband services, with industry-leading uptime. Our solutions are powered by our key innovations in IoT, purpose-built SaaS cloud platforms and mobile technologies, including the newly emerging 5G technology.

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[1] LTE over Citizen Broadband Radio Service (CBRS) Just Got Real, Ericsson, 2018.

[2] Limited Assisted Access: Operation Principles, Ericsson, 2015.

[3] With 256-QAM, what's good for the small cell is good for the macro, FierceWireless, October 2016.

[4] Gigabit LTE Explained, Qualcomm, 2018.