How to Manage the Approaching 2G/3G IoT Sunset

A SIERRA WIRELESS WHITE PAPER

Mobile technology has gone through multiple evolutions in the past thirty years, taking the telecommunications from a niche sector into a hugely transformative industry. However, every generation of technology eventually reaches the point of obsolescence before it is replaced by the next, which can cause temporary disruption of the market.

Companies with cellular-based Internet of Things (IoT) devices are facing one such juncture as major networks begin to sunset their 2G and 3G networks in favor of 4G long-term evolution (LTE) technologies. This is not just happening in the U.S., but across the world. The transition will be especially challenging due to the complexities of a typical IoT end-to-end solution, which is often formed from several interlinked components with co-dependencies, including:

- Device
- Device application
- Carrier/coverage
- SIM
- Gateway
- Application
- Cloud Platform

To successfully manage the transition of an IoT end-to-end solution, all these interlinked components must be considered.

DON'T LET THE SUN GO DOWN ON YOU

When it was released in 1991, 2G technology was revolutionary, with 40kbps speeds. However, it has long since been eclipsed by 3G (2Mbps) and 4G LTE (150Mbps), and now with 5G (1Gbps) also in development.

The evolution of the carrier network has two different objectives. The first is to increase data speeds, which has great relevance for consumer devices. The second is to better meet the needs of IoT devices, which often only transmit small amounts of data and therefore do not require high data bandwidth but need long battery life and greater coverage. As a result, the future holds great potential for improved IoT functionality that will enable new business opportunities and innovative services. For carriers to roll out these new network services, they will have to shut down their older 2G and 3G networks to refarm the spectrums to 4G.

SEIZING THE LTE OPPORTUNITY

At first, many companies deploying IoT devices may have been doubtful about the necessity of a 4G LTE network, viewing it as having more benefit for consumer devices (such as mobile phones) that transmit large amounts of data. However, several new technologies such as LTE-M (also known as Cat-M1) and NB-IoT – which both operate on the 4G LTE networks – have been specifically designed for IoT devices. Known as cellular Low-Power Wide-Area (LPWA) technologies, they provide far greater coverage and capacity, while using much less power, ensuring long battery life.

This white paper looks at how to effectively manage the complexity in the transition away from 2G and 3G networks to LTE.
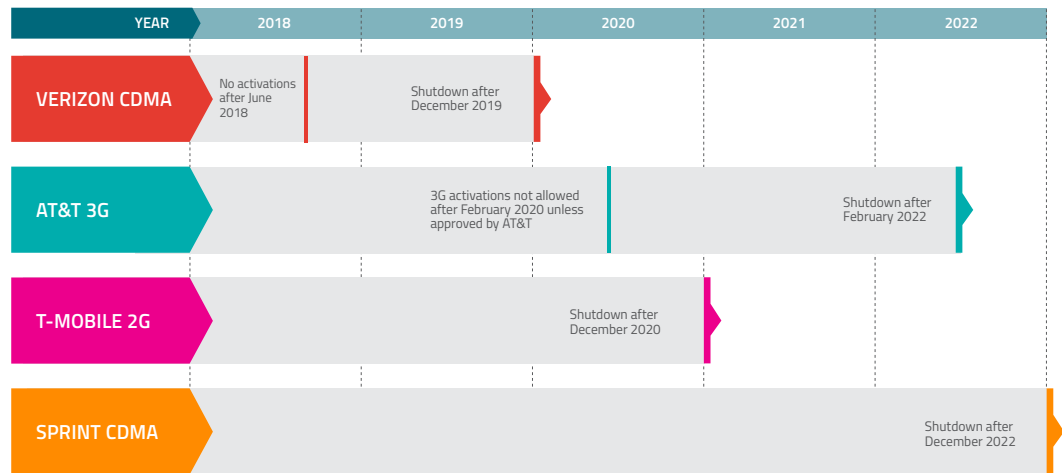
How Ready Are You?

Different companies are at various stages in their transition programs to 4G LTE. For those who have yet to give serious thought to their strategy, it is imperative that they start right away. The timelines given by major U.S. providers are aggressive (See Figure 1), and even the best planned and executed migrations can take between 12 to 18 months.[1] These projects often require a re-evaluation of the business and technical aspects of the IoT solution. This can lead to the need for a redesign of the technical architecture, as well as hardware and equipment replacements in the field.

Timely management of this process is critical to prevent business disruption and negative impact to customers. Those using Verizon CDMA are currently most at risk due to the impending shutdown, although there is still time to transition these devices without undue risk to business operations. But failing to act can be costly and painful as companies could potentially be left with dark units in the field, disrupting business functions and impacting customers. When AT&T turned off its 2G network in 2017, around 70% of San Francisco's buses and trains suddenly disappeared from the NextMuni system, which maps in real time where vehicles are located and predicts arrival times. The San Francisco Municipal Transportation Agency (SFTMA) then spent weeks scrambling to upgrade the legacy monitoring devices amid mounting public outcry.[2]

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[1] Sierra Wireless Internal Data

[2] Hologram, 'Future-Proofing Your IoT Networks: Lessons from the 2G Shutdown.' Available at: https://hologram.io/future-proofing-your-iot-networks-lessons-from-the-2g-shutdown/. Accessed 2018.

YEAR	2018	2019	2020	2021	2022
VERIZON CDMA	No activations after June 2018	Shutdown after December 2019			
AT&T 3G		3G activations not allowed after February 2020 unless approved by AT&T			Shutdown after February 2022
T-MOBILE 2G			Shutdown after December 2020		
SPRINT CDMA					Shutdown after December 2022

Dates subject to change and are based on carriers recommendations

Figure 1: Network sunset schedule for major U.S. providers

Steps to Transition to 4G

ASSESS YOUR CURRENT SOLUTION

The first stage of a migration is to accurately audit and map the module, network and solution architecture your company has deployed today. Of these devices, how many will be impacted and by which date? Will they be easy or difficult to swap-out? Will it require a new technical solution design? Once a company has this information then the next step is to estimate the time and the cost to swap out each device and the resources required. If a new technical architecture needs to be built, implemented and tested, then there may be a longer cycle and this must be factored into the scenario planning. Once these variables are calculated, it is possible to build a timeline. The best approach is to begin with the end date determined by the relevant network shutdown and then work backwards, which gives a clear date to start the migration.

From a network and module standpoint, the migration will in many cases involve moving to LTE-M – an LPWA technology that is specifically designed for IoT devices and offers far greater coverage, capacity and battery life. For more information, see the Sierra Wireless white paper LPWA Technologies: Separating Fact From Fiction (https://www.sierrawireless.com/resources/white-paper/lpwa-fact-or-fiction/).

However, organizations on 3G networks, like AT&T 3G or Sprint CDMA may decide to wait in the hope that costs for LTE technology come down further still. By taking this approach they are risking taking their migration close to the wire, plus the costs of many LTE-M modules have already been driven down. Indeed, this is a technology that is specifically designed to be low-cost.

Those companies planning to jump across from Verizon CDMA to 3G AT&T or Sprint CDMA – instead of 4G LTE or LPWA–are risking a dual upgrade, as these networks will also be shuttered in the near-term. The cost of the double-jump approach can add hundreds of dollars per device in additional truck roll.

EVALUATE YOUR NEEDS

To upgrade effectively, companies need a clear understanding of their operational requirements. Figure 2 outlines the key questions a company should ask to better gauge their needs and determine the most effective solutions. For example, if a company mainly utilizes battery-powered devices, then low-power consumption will be a key requirement for the solution they choose. Alternatively, if they must track mobile assets through remote regions, they will require devices that will retain connectivity even in these areas. LPWA technologies can be very effective in these instances; with their enhanced coverage (+20dB gain), a LPWA device will not lose connectivity even in an area with low network coverage. But if the solution requires high data bandwidth and is not battery powered, a 4G LTE solution may be preferred.

Functionality

What are the data speed/capacity needs of the IoT devices?
What amounts of data transmission are required?
Will the devices be battery operated, or continuously-powered?

Coverage

Is there a requirement for deep indoor coverage?
Does the business require coverage in remote locations?
Is always-on availability needed for the devices? Or is it sufficient to connect when needed?
Is international coverage required? And if so, which countries?

Expansion

What are geographic coverage requirements?
What are the expansions or reduction in current geographic coverage?
Are there plans to expand into new products and new markets?
If so, what are volumes of devices that must be added, and when/timeline?

Security

What are security requirements?
Is physical access to devices possible?
Is the business at high risk of attacks?
What are the current methods of protecting data and communication?

Future-proofing

What will the business look like in five years/ten years?
Have the costs of dual-upgrades been factored into the scenario planning?

Figure 2: Understanding your IoT needs

As part of this evaluation it is also important to consider future growth plans. As noted previously, customers can no longer add new devices to Verizon CDMA. And AT&T 3G plans to stop activating new devices in 2019. Therefore, if a company is planning a wider roll-out and is looking to add new devices in the future, or if they ever need to deploy replacement devices for broken units, then they have to opt for an upgrade to LTE sooner rather than later.

Analyzing the requirements and designing a solution that meets the needs of your business is a highly complex task. Planning a scalable, wireless strategy requires deep technical understanding and involves many variables impacting the final design of the solution. The optimal solution and roll-out will differ greatly depending on the sector you operate in and the specific applications for the technology. To learn more read our white paper, Planning a Scalable Long-Term Wireless Strategy (https://www.sierrawireless.com/resources/white-paper/dont-fear-the-future-plan-a-scalable-long-term-cellular-strategy-for-2g-3g-and-4g-technology/).

DESIGN FOR THE LONG-TERM

When planning a transition strategy, it is essential to think long-term and be ready to evolve. As mentioned, some companies may be planning to cope with Verizon CDMA sunset by transitioning to other 3G networks. This can be a viable solution in some circumstances. For example, if the company has a relatively small number of devices and they are easily accessible or if the IoT devices themselves will only last a few years before obsolescence. But this scenario still requires a longer-term solution, and companies should start planning for the next LTE phase sooner rather than later. Based on Sierra Wireless' experience the key cost drivers in a transition plan include the module, device, system architecture and truck roll. You do not want to do this twice if it is at all avoidable.

START PLANNING YOUR LPWA FUTURE

LPWA technology has many potential advantages for IoT devices. One of the first is the extra coverage, which is extremely valuable for many devices deployed in remote locations or mobile applications. LPWA features such as repetition, hybrid automatic repeat (HARQ) and downlink power spectral density (PSD) boosting are expected to provide 5-10 times better coverage than normal LTE. Many IoT devices need to run on battery for many years. LPWA technologies use protocols to reduce power consumption, such as longer sleep cycles and exchanging only a few messages per day, resulting in up to ten years of service for a typical 5WH battery. Also, IoT devices typically only need to send small amounts of data compared to consumer device, such as phones. By slowing the data rate, LPWA technologies can provide 5-10 times the coverage of traditional cellular networks.
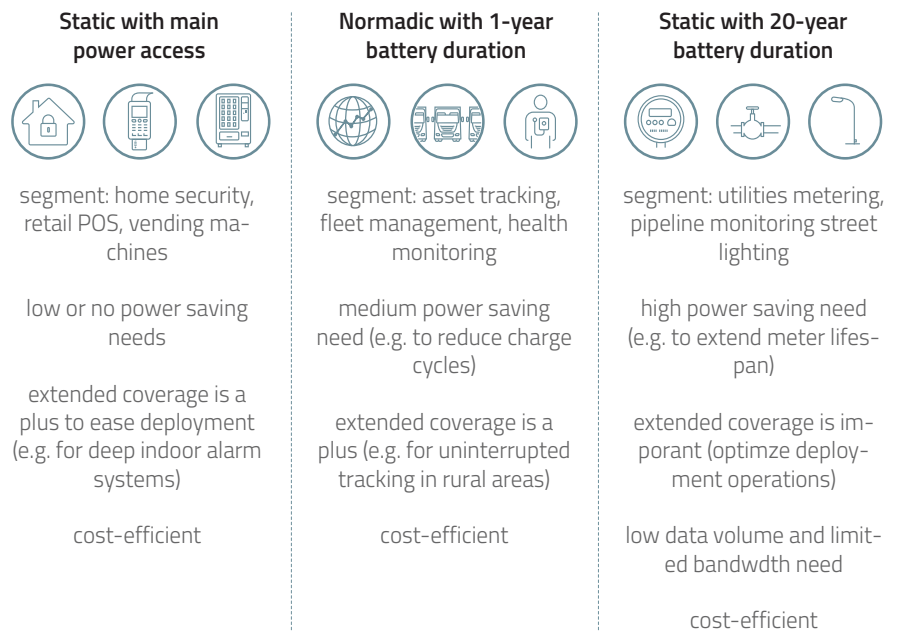
Static with main power access	Normadic with 1-year battery duration	Static with 20-year battery duration
segment: home security, retail POS, vending machines	segment: asset tracking, fleet management, health monitoring	segment: utilities metering, pipeline monitoring street lighting
low or no power saving needs	medium power saving need (e.g. to reduce charge cycles)	high power saving need (e.g. to extend meter lifespan)
extended coverage is a plus to ease deployment (e.g. for deep indoor alarm systems)	extended coverage is a plus (e.g. for uninterrupted tracking in rural areas)	extended coverage is important (optimze deployment operations)
cost-efficient	cost-efficient	low data volume and limited bandwdth need
		cost-efficient

Figure 3: LPWA ideal applications

Preparing for 5G

Some companies may be concerned about moving to 4G LTE technology because it could soon be supplanted by 5G. Although 5G is in the early stages of development, with the standards still being defined and settled, carriers are already starting to invest in this next-generation technology. Certainly, it has great potential as the 5G standard will support higher speeds, as well as ultra-reliability and low latency.

However, 5G is essentially an evolution of 4G, so it is likely that companies will not have to re-architect their solutions. The software interfaces between the two technologies will be largely the same while the modules will be pin-out compatible. As a result, the transition should be simple and straightforward and not on the scale of moving products from 2G, to 3G to 4G. For LPWA cellular modules, a firmware upgrade will likely be sufficient to move to 5G LTE.

The more advanced 5G NR technology being developed will offer massive improvements in capacity, density, spectrum and network efficiency. However, this technology will only be needed by companies that have to deliver huge amounts of data over short distances, which is not the case for most companies using IoT devices. Consequently, this technology is unlikely to be disruptive to most businesses for many years. To learn more read our whitepaper, How do you Prepare for the 5G Future (https://www.sierrawireless.com/resources/white-paper/5g-future/).

5G LTE will take advantage of existing infrastructure

4G LTE devices should work on 5G LTE networks, based on the ongoing 5G LTE/3GPP specification

LTE-M/NB-IOT devices will likely upgrade to 5G LTE over-the-air

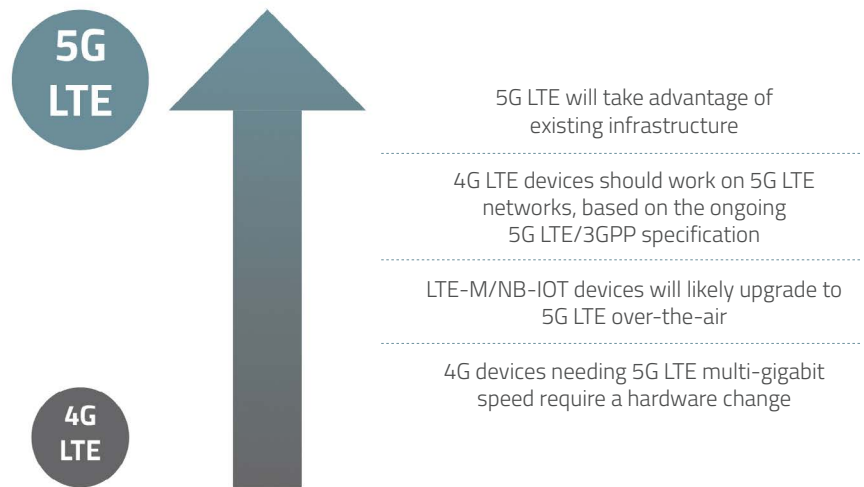4G devices needing 5G LTE multi-gigabit speed require a hardware change

Figure 4: Transitioning from 4G to 5G

ENSURE YOU WORK WITH A TRUSTED PARTNER

The choices that OEMs and enterprises make when selecting wireless ecosystem partners can make a major difference in their ability to develop scalable, long-term IoT solutions and transition to new cellular technologies. This is a major challenge, and so it is important to work with a trusted partner that understands the complexity of integrated IoT solutions and can help streamline your company's deployments.

HOW SIERRA WIRELESS CAN HELP

Sierra Wireless is uniquely positioned to help customers seize the IoT opportunity, providing strategy and expertise on the migration pathway, as well as advice on best technology solutions. We can provide all the building blocks of an IoT solution from the hardware (modules and gateways) and the connectivity services to a unified platform for managing all the company's devices and connections. We can also help companies deploy their products over any cellular network with design assistance, technology expertise and a comprehensive solution portfolio.

Sierra Wireless was first-to-market with the world's smallest module, embedded software platform, embedded SIM and 4G LTE and LTE-Advanced solutions. Sierra also offers the most comprehensive portfolio of wireless devices, including 2G, 3G and 4G embedded modules in a common flexible form factor; rugged cellular gateways and routers; Smart SIMs and connectivity services; and secure device management and cloud services.

By working with a single vendor rather than piecing together solutions from several sources, you can ensure that your IoT projects will be managed efficiently and strategically.

- We have shipped more than 130 million M2M devices worldwide.

- Our devices are operating on more than 80 networks globally.

- We introduced the world's first LTE devices.

- We have secured more than 400 patents in wireless technologies.

- We sell and support products and services in over 130 countries.

- We have extensive experience helping customers deploy their applications in markets including automotive, energy, fleet management, networking, point of sales, home security and more.

- We have maintained our number one position in wireless embedded modules market share for six consecutive years (ABI research).

Start with Sierra

Our expertise, paired with our fully-integrated solutions, makes it easy for you to take advantage of all the promise the IoT offers.

SIERRA WIRELESS SOLUTIONS ARE SIMPLE

With our breadth of IoT expertise, our fully integrated device to cloud wireless solutions including modules, gateways connectivity and IoT platform, we reduce complexity for our customers—so you can spend less time integrating technology and more time innovating.

SIERRA WIRELESS SOLUTIONS ARE SCALABLE

We enable organizations to scale as next-gen technologies and new market opportunities emerge. As the IoT and technology grow, Sierra Wireless helps customers grow with it.

SIERRA WIRELESS SOLUTIONS ARE SECURE

Our end-to-end offering, coupled with over 20 years of field-proven experience, allows us to provide the right security for IoT deployments.

To learn more, visit www.sierrawireless.com.