

The 3G switch off:

Turning on new IoT opportunities in NZ

How to effectively manage the 3G IoT shutdown and transition to 4G LTE

Mobile technology has gone through multiple evolutions in the past thirty years, taking telecommunications from a niche sector into a hugely transformative industry. Every generation of technology reaches the point of obsolescence and is then replaced by the next – temporarily disrupting the market.

As major carriers such as Spark and One NZ (formerly Vodafone NZ) prepare to shut down their 3G networks in favour of 4G long-term evolution (LTE) and 5G technologies, New Zealand companies with Internet of Things (IoT) devices are facing disruption.

There are tens of thousands of 3G IoT devices active in New Zealand. They include large point-of-sale networks, devices used to monitor patient health, and sensors used to optimise agriculture yields.

This transition will be especially challenging due to New Zealand's unique landscape, aging device fleets, and the complexities of a typical IoT end-to-end solution, which are 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 to 4G LTE, all of these interlinked components must be considered.

4G LTE opening the door to new opportunities

The evolution of New Zealand's carrier network has been complex. 2, 3, 4 and 5G networks now operate in tandem at different frequencies. When it was released in 1991, 2G technology (GSM) was revolutionary, with 40kbps speeds. However, it has long since been eclipsed by 3G (2Mbps) and 4G LTE (150Mbps), and now with 5G (1Gbps).

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 transmit smaller amounts of data and do not require high-data bandwidth but need long battery life and greater coverage. As a result, the future holds enormous potential for improved IoT functionality that will enable new business opportunities

and innovative services.

For carriers to roll out new network services, 3G networks need to be shutdown to 'refarm' the spectrums to 4G LTE and 5G.

Seizing the 4G LTE opportunity

At first, 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, new technologies such as LTE-M (also known as Cat-M1) and NB-IoT – which also 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.

Spark commenced the development of a nationwide LPWA network to enable IoT in 2017. LPWA networks are now widely available across NZ.

This white paper looks at how to effectively manage the complexity in the transition away from 3G networks to 4G LTE.

NZ's unique network landscape

With active 2, 3, 4 and 5G networks, New Zealand's network landscape is unique compared to other parts of the world. Alongside network providers including Spark, One NZ (formerly Vodafone) and 2Degrees, the Rural Broadband Initiative also delivers 4G LTE in remote regions.

In March 2023, Spark announced plans to shut down its 3G network by the end of 2025. This follows One NZ's announcement that it will commence its shutdown from the end of August 2024.

This is a significant milestone for New Zealand's IoT industry, which will enable Spark and One NZ to repurpose their respective 3G spectrums. This transition will also enable the ongoing rollout of 5G and pave the way for new 5G-led innovation.

The Spark 3G network primarily operates on an 850MHz spectrum. This lower-band frequency is required to provide greater 5G coverage in rural areas. Following the closure of their 3G network, Spark will primarily operate 4G LTE on a Band 28/700MHz spectrum, which is already widely available everywhere the 3G 850Mhz operates.



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 as carrier timelines are aggressive.

Even the best planned and executed migrations can take between 12 to 18 months. 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.

For example, antennas bought for 3G will not be compatible, 4G may require new SIM cards for each IoT device, and power and connector requirements may be different. Critically, 3G devices will not operate on a 700MHz (LTE Band 28), which will be the primary band for 4G LTE IoT devices.

Timely management of this process is critical to prevent business disruption and negative impact to customers. Failing to act can be costly and painful as companies could be left with dark units in the field.

These challenges are global and not unique to New Zealand. For example, when US carrier AT&T turned off its 2G network in 2017, around 70 per cent 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.

Steps to Transition to 4G LTE

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 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, providing a clear date to start the migration.

From a network and module standpoint, the migration is likely to entail moving to LTE-M – an LPWA technology. LPWA is specifically designed for IoT devices and offers far greater coverage, capacity and battery life. However, organisations 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.

Evaluate your needs

To upgrade effectively, companies need a clear understanding of their operational requirements. There are key questions they should ask to better gauge their needs and determine the most effective solutions. For example, if a company mainly utilises 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.

Futureproofing

What will the business look like in five years/ten years? As part of this evaluation, it is also important to consider future growth plans. If a company is planning a wider rollout and is looking to add new devices in the future, or if they ever need to deploy replacement devices for broken units, then they must opt for an upgrade to 4G LTE sooner rather than later.

Analysing the requirements and designing a solution that meets the needs of your business is a 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.

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 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 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.

Table LPWA ideal applications

Static with main power access



segment: home security, retail POS, vending machines

low or no power saving needs

extended coverage is a plus to ease deployment (e.g. for deep indoor alarm systems)

cost-efficient

Normadic with 1-year battery duration



segment: asset tracking, fleet management, health monitoring

medium power-saving need (e.g. to reduce charge cycles)

extended coverage is a plus (e.g. for interrupted tracking in rural areas)

cost-efficient

Static with 20-year battery duration



segment: utilities metering, pipeline monitoring street lighting

high power-saving need (e.g. to extend meter lifespan)

extended coverage is important (optimise deployment operations)

low data volume and limited bandwidth need

cost-efficient

Preparing for 5G

Some companies may be concerned about moving to 4G LTE technology because it could soon be superseded by 5G. Although 5G is being deployed by carriers in NZ, it is an evolution of 4G, so it is unlikely that companies will 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 LTE. For LPWA cellular modules, a firmware upgrade will 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.

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.

Transitioning from 4G to 5G



**5G
LTE**

**4G
LTE**

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



How M2M One NZ can help

M2M One NZ, as part of Semtech, is uniquely positioned to help our 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 (gateways), proving compatibility of modules in end devices, and solutioning the connectivity services to a unified platform for managing all a 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.

M2M One NZ, via Sierra Wireless, also offers 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. What makes us unique:

- Our engineers are the number one industrial IoT experts in NZ
- We deliver speed-to-service within 24 hours
- Our data services are built on New Zealand's largest mobile network (Spark) and provide connectivity for tens of thousands of machines and devices
- Our managed services make us unique – including IPX, data usage management, predictive intelligence and failover
- Our technologies span satellite, short range, cellular and low power wide area networks – including CAT M1, 4G/5G and NB IoT, LoRaWAN.

Start with M2M One NZ

As NZ's industry leaders for IoT offering customised solutions, we make connectivity simple, fast and easy to deploy. Our expertise, paired with our fully-integrated solutions, makes it easy for you to take advantage of all the promise the IoT offers.

Our solutions are simple

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

Our solutions are scalable

We enable organisations to scale as next-gen technologies and new market opportunities emerge. As the Internet of Things and supporting technologies evolve, M2M One helps customers evolve with it.

Our solutions are secure

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

To learn more, visit www.m2mone.co.nz