YOUR COMMS GROUP IOT GUIDES

Your Comms Group
IOT GUIDES

FOR BUSINESSES RELYING ON 2G OR 3G CONNECTIVITY FOR THEIR M2M & IOT COMMUNICATIONS

The sunsetting of 2G & 3G networks

Focusing on the impact of 3G

Preparing for alternative solutions & technologies

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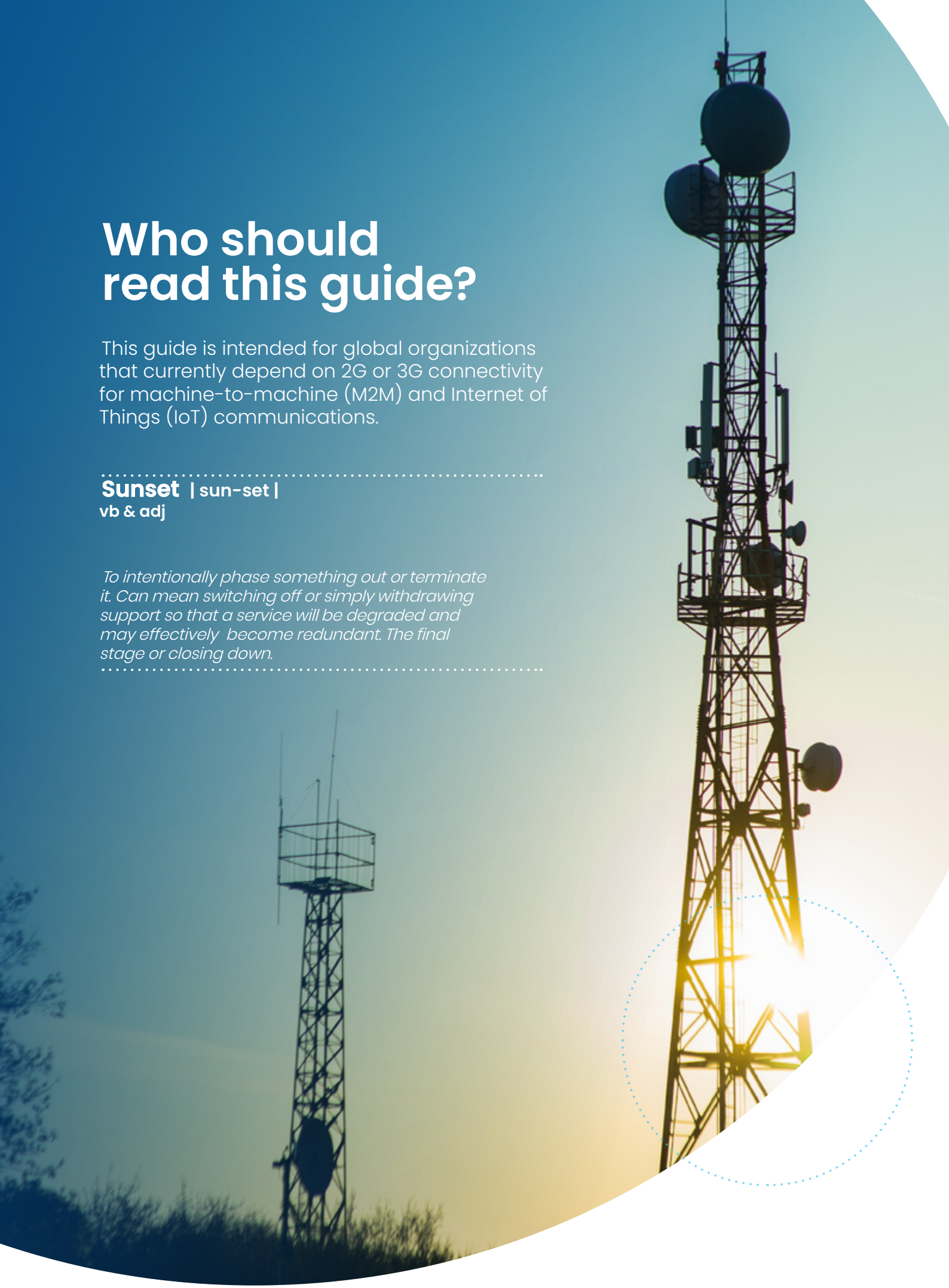
www.yourcommsgroup.com

Who should read this guide?

This guide is intended for global organizations that currently depend on 2G or 3G connectivity for machine-to-machine (M2M) and Internet of Things (IoT) communications.

Sunset | sun-set |
vb & adj

To intentionally phase something out or terminate it. Can mean switching off or simply withdrawing support so that a service will be degraded and may effectively become redundant. The final stage or closing down.



Introduction

Mobile network operators around the world have either already discontinued 3G services or are planning to do so soon. In general, 3G services are being phased out sooner than 2G, meaning that 2G will still be available in many countries, particularly in Europe, for a while.

This guide aims to improve your understanding of the impact of cellular network sunsets on your business and the options you have to secure your IoT landscape. It highlights how Your Comms Group can assist in your migration from 2G and 3G to the most suitable Long Term Evolution (LTE) or 5G technologies for your future needs.

Previously, 2G, 3G, and 4G have coexisted, but with the arrival of 5G, Mobile Network Operators (MNOs) are actively discontinuing 2G and 3G services to allocate spectrum for more efficient and high-potential 5G and LTE technologies.

Despite 2G being a widely used, secure, low-power platform for transporting small packets of data in M2M and IoT connections, particularly in Europe, its phase-out may not be straightforward. Currently, 2G services are expected to remain available in many countries until at least the end of the decade, but forward-planning is still crucial for devices deployed in the field for multiple years.

Sunsetting cellular services: *what, when and why?*

A sunset happens when a technology provider terminates or phases out one of its products or services so that it is no longer supported.

Sunsetting in cellular technology refers to the process of a Mobile Network Operator (MNO) discontinuing one of its bearer services, making it inaccessible to all devices that rely on that network.

While consumer devices like phones can still function after an older network is sunsetted, as they support multiple generations of cellular technology,

IoT devices are usually limited to one or two generations due to the cost of cellular modules.

Sunsetting is a normal part of technological advancement, where older versions are phased out to make room for newer and improved products and services.
An example of this is the replacement of the analog 1G with the digital 2G technology.

Currently, the focus is on sunsetting 3G networks worldwide, with 2G to follow later in the decade, to free up spectrum for MNOs to expand 4G and deploy 5G services.

Reasons why 2G and 3G still operate

Only in the last few years have MNOs started sunsetting their 3G networks and 2G is still used in many parts of the world.

Supporting existing IoT applications

Low data, low power, high need

The continued operation of 2G and 3G networks is largely due to the prevalence of IoT applications. While 5G is bringing new and innovative connected technologies like self-driving cars and remote surgeries, a significant part of the IoT still relies on basic but crucial applications such as fleet management, asset tracking, and metering. These applications prioritize higher efficiency, better yields, and increased compliance and typically require only a low amount of data transfer. Although newer cellular generations offer faster and lower latency data transfer capabilities, many IoT use cases do not require these advanced capabilities.

Logistical challenges

Many IoT sensors are placed in remote and inaccessible locations, which is why these devices are designed to have long battery life, low power consumption, and a long lifespan. Given these requirements, it's logical that the low-cost, low-power, and low-bandwidth 2G networks continue to support a large number of devices already in use in the field, as they meet the needs of these IoT devices.

The need for ubiquitous coverage

Two additional reasons for IoT users to stick with 2G are volume and coverage. IoT applications often involve deploying a large number of devices, also known as Massive IoT, which makes upgrading them all an expensive proposition. Moreover, these applications require widespread coverage. 2G remains the most extensive of all cellular generations and provides better coverage in rural and remote areas in many countries. It also offers better indoor penetration than 3G or 4G. Although Low Power Wide Area Network (LPWAN) services like NB-IoT and LTE-M are emerging as alternative solutions in some regions, the slower-than-expected national deployments of these IoT-specific networks pose coverage challenges for IoT applications.

Why is 3G being sunsetted before 2G?

The original decision to retain 3G services was primarily due to the lack of native voice support in most 4G networks at the time of their deployment.

4G, which stands for Long-Term Evolution (LTE), does not support circuit-switched voice technology, like 2G and 3G. The voice technology used by 4G, known as Voice over LTE (VoLTE), is challenging to deploy and optimize, so only recently have devices and networks begun to support it.

Currently, voice traffic in the UK is mainly being carried over 4G, with decreasing usage of 3G. This is a major reason why 3G is being shut down before 2G in the UK and other countries, and 2G is unlikely to be discontinued until the end of the decade.

While 3G remains useful for voice, in all other aspects it is outdated compared to 4G. During the process of discontinuing these services, there is a higher risk of service degradation and limited support from mobile network operators if any service issues arise. There is no worldwide schedule for the switch-off and the timeline varies greatly across regions.

There are several factors that drive MNOs to sunset network bearer services.

They include:

- Allocate spectrum for more advanced technologies that provide better cost-effectiveness, energy efficiency, expanded features, and enhanced customer experience.
- Prevent the need to maintain and upgrade outdated network equipment, which results in lower investment returns.
- Simplify network operation by reducing the number of bearer services and decreasing the variety of devices that need to be tested, set up, and supported.

Sunsetting in...

Europe

In the field of mobile telecommunications, the dominance of Europe in the early years of cellular technology has come to an end with the advent of 5G. In comparison to their European counterparts, US networks such as AT&T and Verizon have been more aggressive in driving the development of 5G, acquiring spectrum from 2G networks and making significant investments in the technology from the beginning.

While Europe was initially more cautious in their approach to 5G, the competitive landscape and the presence of a large number of devices dependent on 2G services have made the rollout of 5G a more complex task to coordinate. This has resulted in a difference in approach, with many European Mobile Network Operators (MNOs) having completed or actively phasing out their 3G services, while taking a more gradual approach to sunsetting 2G.

This is evident in the UK, where the government has stated their plan to modernise the country's infrastructure and retire 2G by 2033. Some MNOs will begin the process of retiring 3G in 2023, but it is unlikely that 2G will be phased out until the end of the decade. The main factor that will drive this change is the planned switch off of the Public Switched Telephone Network (PSTN) in Europe in 2025, which will eliminate the need for voice services on 3G.

As 5G becomes more widespread, the pressure on MNOs to shift away from their existing offerings and focus on this new technology will only increase.

Asia and North America

In the Asia Pacific region, multiple networks have been discontinued, covering both 2G and 3G.

Some countries like Japan and South Korea have already fully transitioned away from 2G and it has also been shut down in the US.

Sunset in the **UK**...

the influence of major applications

In the UK, 2G technology remains crucial for certain applications like smart meter reading, automotive telematics, vending machines, and agriculture monitoring. Despite the shift towards newer IoT technologies, 2G is expected to remain in use until the end of the decade.

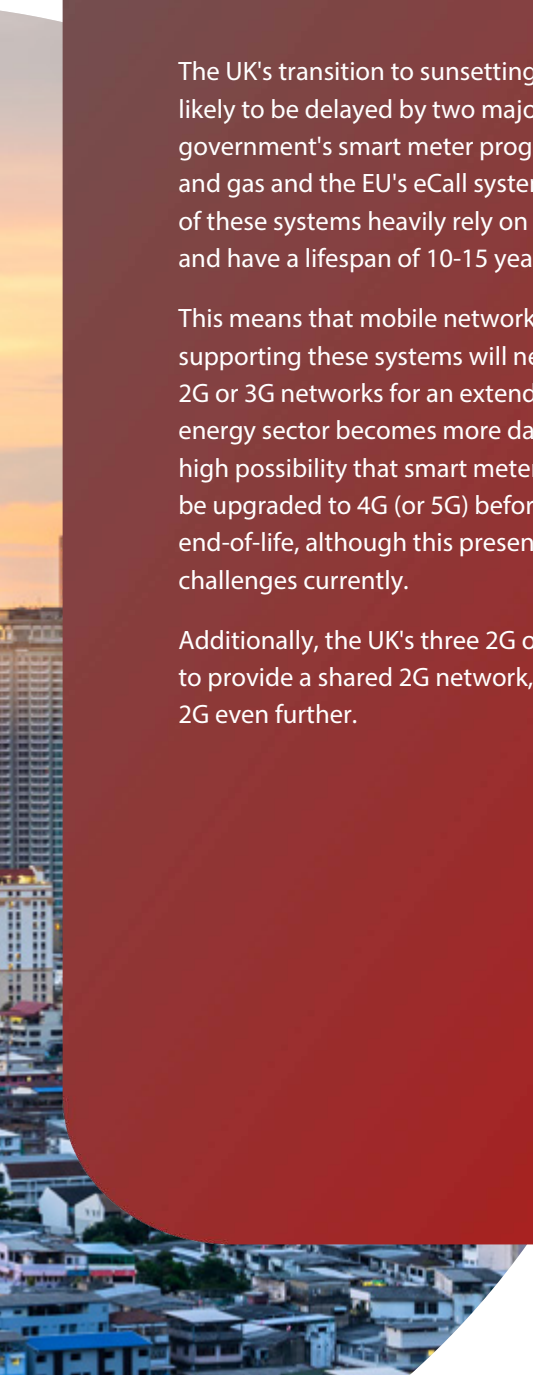
The UK's transition to sunsetting 2G technology is likely to be delayed by two major factors: the government's smart meter program for electricity and gas and the EU's eCall system for vehicles. Both of these systems heavily rely on 2G/3G connectivity and have a lifespan of 10-15 years.

This means that mobile network operators supporting these systems will need to maintain their 2G or 3G networks for an extended period. As the energy sector becomes more data-driven, there's a high possibility that smart meters and vehicles will be upgraded to 4G (or 5G) before they reach their end-of-life, although this presents commercial challenges currently.

Additionally, the UK's three 2G operators may agree to provide a shared 2G network, extending the life of 2G even further.

Users should be aware that 3G services will be discontinued before 2G. While there has been limited usage of 3G in applications like metering compared to 2G, there are critical applications like CCTV and lone worker devices that depend on 3G.

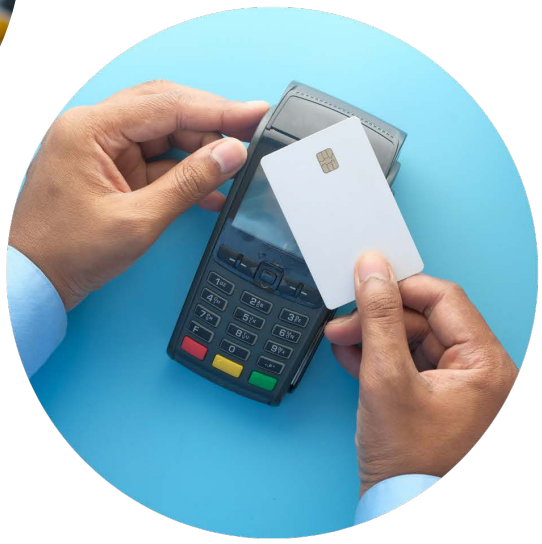
Hence, migration strategies and plans for these applications should be taken into consideration promptly.



Global Sunset Timings

Mobile network operators in the UK must give a minimum of 3 months' notice before discontinuing their 2G and 3G services.

The operators have stated that 2G networks will not be shut down until the close of the decade. To view an extensive and current list of publicly announced sunset dates for each network, please consult the provided link.



Goodbye 3G

Introducing the alternative network technologies.

After 3G sunsets, devices that only support 3G/2G will still be able to connect to 2G (where coverage is available), but businesses must decide if this will satisfy the connectivity requirements of their IoT solution.

Regarding the use of alternative technologies, there are numerous options. One route is utilizing 4G and, eventually, 5G for high-speed and low-latency applications in consumer and mission-critical IoT sectors that require high-bandwidth connections between people or facilities. LTE Cat 1, cellular LPWAN, and emergent, non-standards-based LPWAN technologies like LoRa are other alternatives. In the upcoming years, these will displace 3G as Mobile Network Operators phase them out.

There's never been a more important time to consider the future for your existing and forthcoming IoT deployments.

The alternatives to 3G and 2G services

LTE Cat-1

In terms of functionality (voice, data, SMS, speed), but also in terms of roaming across numerous networks and countries, LTE Cat-1 is the most comparable replacement for 3G. Although it has a few drawbacks, hardware costs and power consumption are slightly higher than with LTE-M and NB-IoT. Because it is an established and widely used LTE/4G technology, businesses will benefit from immediate worldwide support, mobility, and technology that is more capable in terms of bandwidth, latency, eSIM compatibility, and total cost of ownership. LTE Cat-1 BIS is a single antenna variation of LTE Cat-1 that helps down costs, take up less area, and use less power.

LTE Cat-1 BIS (Cat-1) Benefits

Global
Standard 4G technology is called Cat-1 (LTE Release 13). Global network connectivity is offered through current roaming agreements with a single SIM SKU.

Performance and fleet management
Cat-1 is a strong 2G/3G alternative because of its lower latency, better bandwidth, and cell handover (mobility), especially for applications with larger data budgets and OTA update management.

Energy and cost efficient
Compared to other LPWAN technologies, Cat-1 is slightly more expensive in terms of hardware and uses slightly more energy, but it is far more efficient than Cat-4 and Cat-6.

Supports wide range of IoT applications
Take into account for low-power IoT devices that demand mobility, two-way data transfers, or better speed can handle applications that employ rechargeable batteries or batteries with a 3-5 year life.

NB-IoT

The NarrowBand-IoT (NB-IoT) technology offers an alternative to 2G and 3G communication. It works well for stationary sensor devices that are powered by batteries or solar energy, transmit very little non-real-time data, and are placed in areas where other technologies could have trouble receiving a signal.

NB-IoT Benefits

Battery efficient

The most energy-efficient option for battery- or solar-powered applications will be NB-IoT.

Long product life cycles

For sensor applications that use batteries or have no mains power and have low data traffic and intermittent data transfers, NB-IoT helps support long application life cycles.

Strong signal penetration

The ability of any LPWA network to reach sensors placed in basements, underground parking garages, water meters, or other locations below street level.

Mass deployments

IoT installations in high volumes over the long term are feasible because to low hardware and operating expenses.

The alternatives to 3G and 2G services

LTE-M

Compared to NB-IoT, LTE-M (also known as LTE Cat-M) offers a faster throughput speed and more capacity. Over the next few years, it is anticipated to replace 3G (and certain 2G) services since it supports over-the-air (OTA) updates and offers latency and speeds that are roughly comparable to 3G.

LTE-M Benefits

Battery efficient

The most energy-efficient option for battery- or solar-powered applications will be LTE-M.

Supports wide range of IoT applications

Best for low power IoT devices that need voice/ SMS, mobility, or faster speed or two-way data exchanges.

Cost effective

LTE-M is a cost-effective cellular option due to its lower hardware costs and extended battery life.

Supports mobile and stationary applications

LTE-M has improved signal penetration for indoor or underground deployments and supports cell to cell roaming, making it better for mobile applications.

IoT Power Management:

eDRX & PSM

eDRX (Extended Discontinuous Reception) and **PSM** (Power Saving Mode) are two features designed to minimise power usage and extend battery life for devices using Low Power Wide Area (LPWA) technologies such as NB-IoT and LTE-M.

What is eDRX?

Devices on a network generally need to listen for network notifications and send tracking information at regular intervals.

As a general guideline, it's preferable to let a device remain in idle (sleep) mode for as long as possible, waking it up occasionally to check for pending data and report to the network.

Discontinuous Reception is a power-saving feature that LTE networks typically offer (DRX). Devices are able to often stop listening for data and sleep for extremely brief periods of time as a result (usually 1-2 seconds).

For smartphones, DRX works just great. But unlike a phone, many IoT devices don't need to be as reachable or transfer data as regularly. Extended DRX (eDRX), a variation on the DRX principle, enables an IoT device to remain in low-power sleep mode for an extended period of time. A device cannot receive any data provided to it while it is in an eDRX cycle. The gadget must first wake up before the data is sent. The gadget can listen for awaiting data upon waking without first establishing a full network connection, significantly conserving battery.

What are the eDRX technology's main use cases?

The eDRX sleep period for devices connected to LTE-M networks can last up to 43 minutes. The sleep period for devices connected to NB-IoT networks can last up to three hours.

Therefore, eDRX is a suitable power-saving solution for devices if you want to conserve battery life but still need to be able to access the device periodically during the day, up to several hours.
Examples of use cases are:

- Asset trackers for logistics
- Industrial performance monitoring
- systems Smart grid technology

Cycle times can be changed based on the preferences of the application owner, which is a significant benefit of eDRX.

On a performance monitor for a production line, for instance, you might set the eDRX cycle to a few minutes when the line is operating and to several hours when it is not.

What is PSM?

A LPWA network's PSM (Power Saving Mode) feature enables a device to sleep for longer than with eDRX.

The network provider and software in the device negotiate the length of the PSM period for each device. Networks typically permit a maximum of 413 days and a minimum of 4 hours of sleep per night. A device that is in PSM mode continues to be registered with the network but stops sending or receiving data. When a device is in PSM, any data packets submitted to it are kept by the network and sent upon wake-up. A device is only active for a limited amount of time after PSM. Additionally, the network and I agree on the length of the active time.

A gadget uses far less energy throughout its PSM cycle than it does while it is in an eDRX slumber. However, compared to a device emerging from an eDRX, it must be active for a longer period of time (about 100–200 milliseconds) after waking up in order to communicate with the network and exchange control messages before receiving data.

In order to minimize the amount of time a device is active after waking from PSM, eDRX can be utilized in conjunction with PSM to maximize power savings.

When utilizing PSM or eDRX, design and testing are crucial. Users will have to choose between having their smartphones offline and having a longer battery life.

What are the primary use cases of PSM technology?

Compared to eDRX, PSM sleep periods are significantly longer. In situations when it is appropriate for the device to be inaccessible for extended periods of time during the day, PSM is a viable power-saving alternative.

Examples of use cases are:

Water, soil, or pressure monitoring sensors where you only need the device to transmit data perhaps once or twice a day.

Comparing Cellular Bearer Services

	LoRa	NB-IoT (LTE Cat-NB1/2)
Global Standards Based	✗	✓
Major MNO Support	✗	✓
Typical Connection Speed (Up/Down)	Up to 0.05Mbps	0.07Mbps/0.03 Mbps
Number of Antennas	1	1
Deployment Scenarios	Stationary (good for indoor and underground)	Stationary (excellent indoor and underground)
International Availability & Roaming	n/a	Limited
Data transfer frequency	Intermittent	Intermittent
Response Time (Latency)	Medium	Slow (~1 sec)
Mobility	✗	Handover between cells not supported
Cellular Module Cost	£	£ or ££ if 2G also supported
Total Cost of Ownership	Deployment Specific (might have to deploy and manage gateways)	Deployment Specific (might have to deploy allow for local,
Power Source	Battery, Solar	Battery, Solar
Battery Life (not rechargeable)	5-10 years battery life	5-10 years battery life
Power Saving Mode (PSM)	✓	✓ although not always available when roaming
Extended Sleep Cycle (eDRX)	✗	✓ although not always available when roaming
SMS	✗	Not Standard
Two-way Voice	✗	✗
eSIM (eUICC) Compatible	n/a	Not Standard

LTE-M (LTE Cat-M)	4G (LTE Cat-1 BIS)	4G (LTE Cat-1)	High Performance 4G (LTE Cat-4/6)	5G (LTE Cat-16)
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
Up to 1 Mbps	10Mbps/5Mbps	10Mbps/5Mbps	100Mbps/50Mbps	Up to 1Gbps/120Mbps
1	1	2	2	2
Mobile/Stationary (good for indoor and underground)	Mobile/Stationary	Mobile/Stationary	Mobile/Stationary	Mobile/Stationary
Limited	✓	✓	✓	✓
Frequent	Frequent	Frequent	Always On	Always On
Medium (~100ms)	Fast (40ms)	Fast (40ms)	Fast (40ms)	Ultra Fast (~1ms)
✓	✓	✓	✓	✓
£ or ££ if 2G also supported	£ or ££ if 2G also supported	££	£££	££££
Deployment Specific (might have to deploy a(low for local,	Low	Low-Medium	Medium	Medium
Battery, Solar	Battery, Rechargeable Battery or Mains	Battery, Rechargeable Battery or Mains	Mains	Mains
5-10 years battery life	up to 5 years	up to 3 years	1 year	<1 year
✓ although not always available when roaming	✗	✗	✗	✗
✓ although not always available when roaming	✗	✗	✗	✗
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓ although not in sleep mode	✓	✓	✓	✓

3G Sunsets
Get ready for the change

Planning ahead is crucial if you oversee an IoT deployment that depends on 3G (or 2G) services.

The complexity of successfully transitioning to a new cellular service includes everything from device compatibility to the unique connectivity requirements of your solution.
There are five important factors to take into account when switching to an alternative cellular service:

1 Cellular Module

This must support the cellular service required (i.e. 4G, 5G, LTE-M or NB-IoT) and the firmware must be up to date.

2 The SIM*

The SIM profile must correlate with the desired networks service (i.e. 4G) and must not be steering to an undesired service.

3 Contract & Tariff

You need to check with your service provider that these are configured to support the services required.

4 Network Coverage

There must be coverage available for specific bearer services in the location(s) required.

5 MNO Roaming Support

This must be in place (if required) for the cellular services required.

** Devices which support 4G will most likely be unaffected by 3G sunsetting but this will depend on when you procured your SIMs and what services were originally contracted.*

Your Comms Group eSIM

It is challenging to roll out cellular-connected Internet of Things devices globally.

The management of product SKUs, technology, coverage, and regulations present particular difficulties for multinational deployments.

Your Comms Group's eSIM (eUICC) services solve these problems and future proof IoT deployments against commercial,

regulatory and operational change.

Start today *Follow these three steps...*

STEP 1 We need to know more about your existing solution

This will help us recommend the best course of action

What cellular module does your device or solution use?

Consider your current and future connectivity needs:

Do you want a constant stream of data, or would time-stamped data given in bursts suffice?

Will there be mains electricity or do you only have the option of battery or solar power?

Will there be a concentrated region of devices, or will there be a global distribution?

Would you need to migrate the application or will you only need to transfer data once?

Where do you plan to use your products both now and in the future?

***If you purchased your device** (eg Router or Modem) from a vendor, then check the data sheet of your device and/or ask your supplier*

***If you have developed your own device** then ask your design team to validate which cellular module is embedded within your device? (for example, Quectel, Fibocom, or ublox)*

STEP 2 Consider your operational challenges

Consider the logistical challenges and potential costs of hardware / SIM swaps

How many 3G (and/or 2G) supported devices are you operating in the field and/or planning to deploy?

What challenges are there to physically swapping connectivity hardware (i.e. cellular modules or SIMs) in your devices / solutions?

STEP 3 Contact Your Comms Group

With the information from steps 1 & 2, we'll advise the best course of action.

To recommend the optimum end-to-end connection solution, we'll combine the data you've gathered above with our understanding of your contract/tariff, the time of network sunsets, and your SIM capability.

We'll concentrate on the aspects of continuity, resilience, and security that are important to you, as well as the requirement to reduce total cost of ownership.
We will negotiate timings if hardware modifications are necessary to minimize any disruption.

Time to act?

Talk to Your Comms Group

Careful planning and the correct guidance are required for a successful transition to alternate connection options.

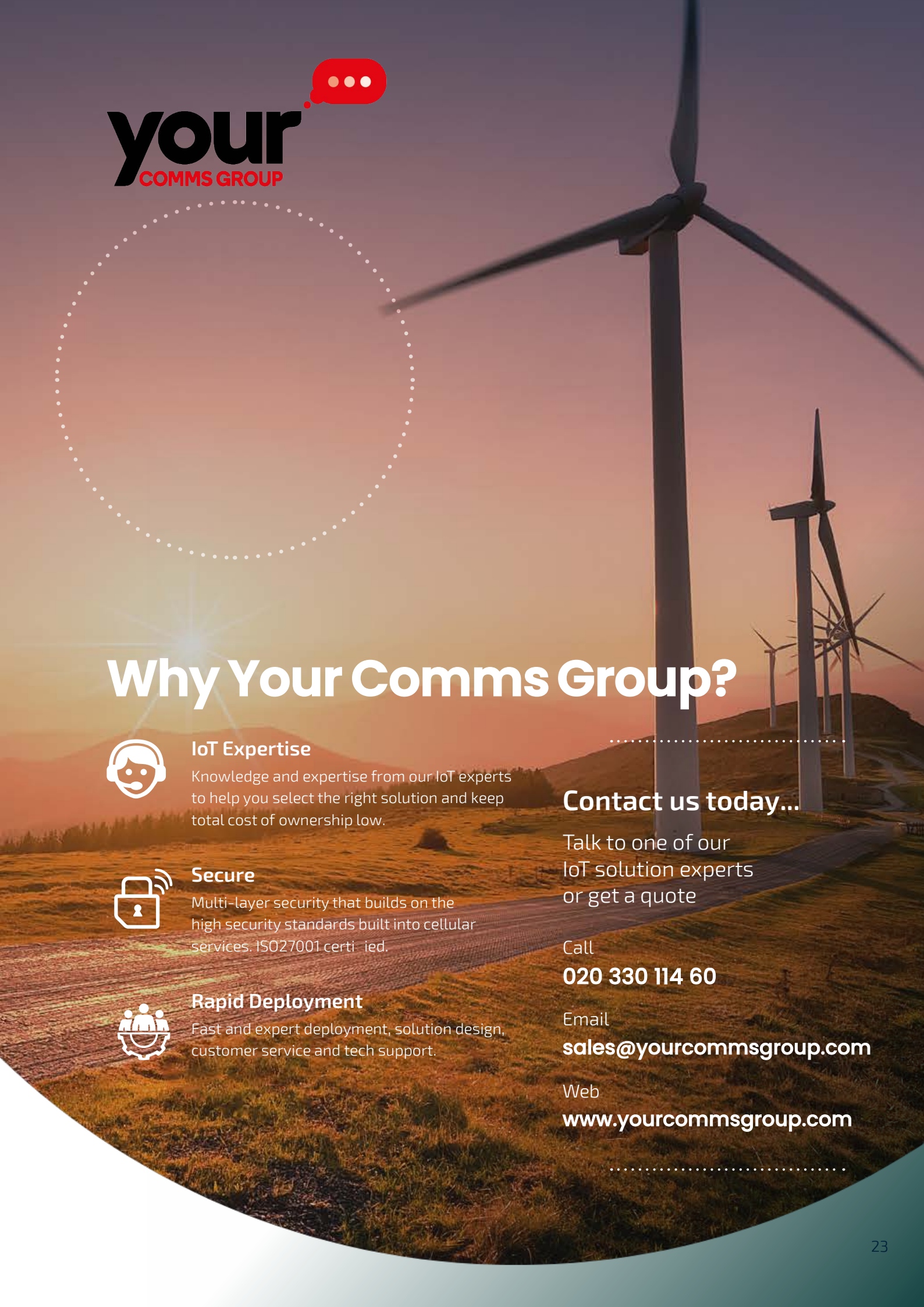
If you're thinking about switching to another cellular network, we'll work with MNO-recommended hardware providers to make sure you choose the right equipment.

We'll evaluate your recent and future 3G deployments.

We'll make a number of suggestions and assist you in creating a deployment or transition plan.

Our primary goal will be to reduce your total cost of ownership..

IoT Connectivity for any device, anywhere



Why Your Comms Group?

IoT Expertise

Knowledge and expertise from our IoT experts to help you select the right solution and keep total cost of ownership low.

Secure

Multi-layer security that builds on the high security standards built into cellular services. ISO27001 certi ied.

Rapid Deployment

Fast and expert deployment, solution design, customer service and tech support.

Contact us today...

Talk to one of our IoT solution experts or get a quote

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