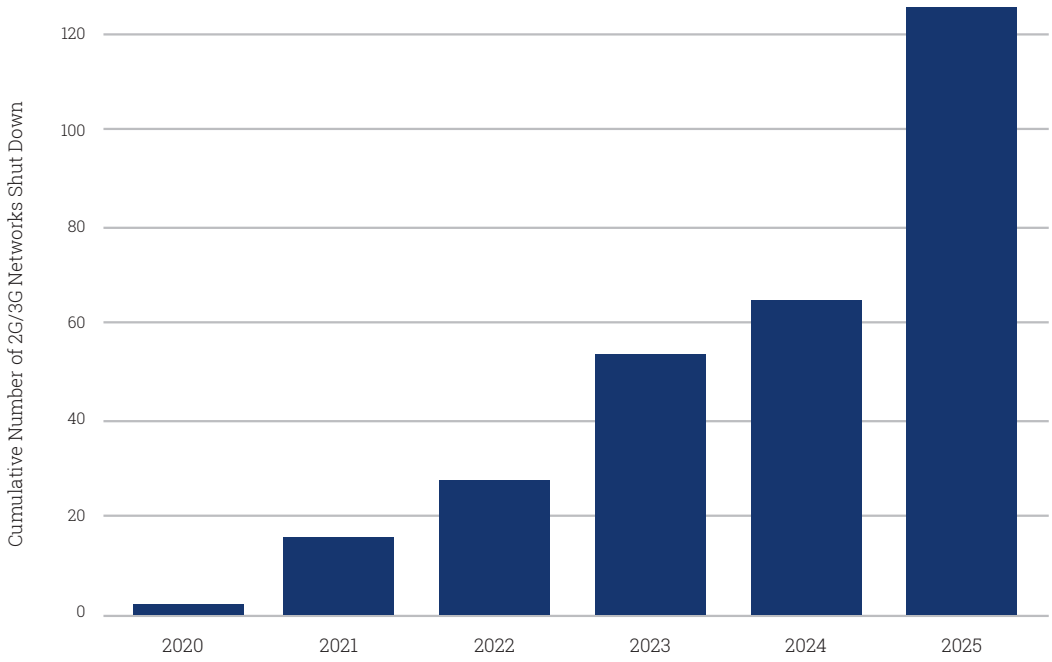
Kaleido Intelligence

SEMTECH

How should companies prepare for the 2G/3G Sunset?

The mobile industry is in a period of transition between two different types of network technology. 2G and 3G networks, which have been in place for over 20 years, have traditionally supported CS (circuit-switched) voice services in addition to IP data connectivity, but the desire to supply more spectrum for the latest data-centric generation of cellular technology has driven the retirement of legacy CS networks. The US offers a prime example of this, with most network operators having shut down 2G and 3G networks, while legacy networks are increasingly being shut down in Europe. Globally, this process is rapidly accelerating; according to the GSMA, over 100 networks are already shut down worldwide, but this number will more than double by 2025, with 71 shutdowns planned in the EMEA region alone over the next 2 years. This is part of a wider switch in telecoms infrastructure, with PSTN (public switched telephone network) also being retired in many places. The 2G and 3G sunsets mean that many of the voice services offered by MNOs, which have historically relied on CS technology even for LTE, will become unusable and necessitate a move to VoLTE services.

Figure 1: 2G/3G sunsets in EMEA, 2020-2025



Source: GSMA

The shutdowns will cause some minor disruption in the handset space, particularly in roaming scenarios, but it is in the IoT that the biggest impact will be felt. Many of these devices were intended to last for over a decade, and now need to be replaced or upgraded ahead of time. More than this, a new technology will need to be chosen in many instances. 2G and 3G have been in use for many different use cases, and many of those currently still in use are vital. They run the gamut from elevator communications to fall detectors to emergency services data relays. Although, in some cases, the use of unlicensed wireless technologies may provide similar benefits and not be dependent on infrastructure owned by network operators, they are less likely to support voice communications, and are typically confined by range, data rate or both. Choosing LTE or 5G cellular in these situations can enhance operations with new voice and data services that LTE and 5G can enable. While the technology choice even within cellular IoT can be daunting, they offer a high level of flexibility so that technologies can be selected on the precise needs of the use case. LTE Cat 1 and Cat 1 bis have already emerged as strong alternatives to cellular LPWAN (low power wide area network) technologies, as they fit seamlessly into existing operator network infrastructure. These are also more able to carry the full range of voice and data LTE capabilities and support network-enabled power-saving measures for devices, such as eDRX (extended discontinuous reception) or PSM (power saving mode).

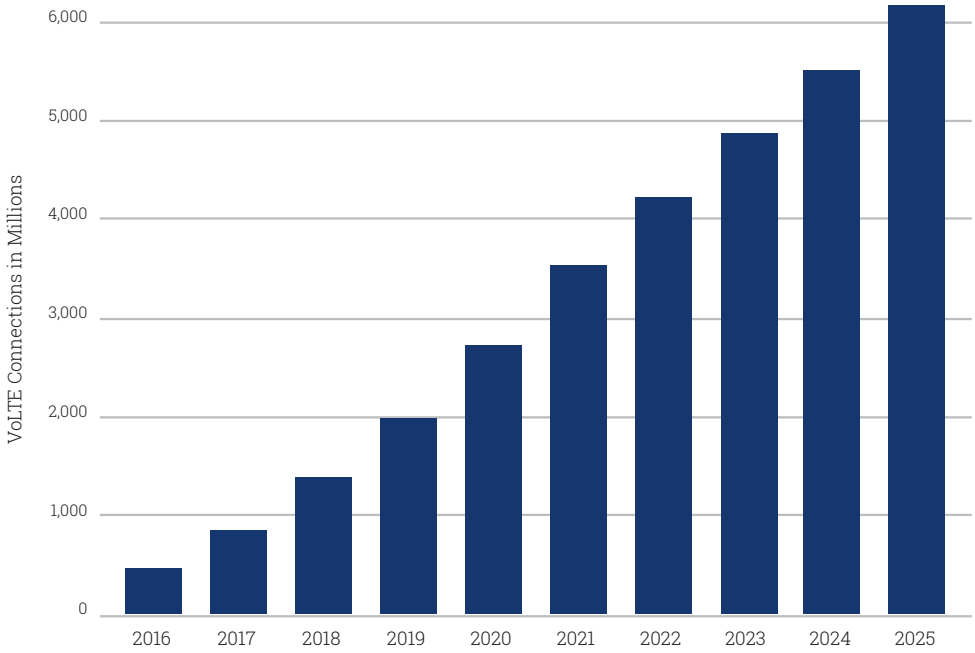
Companies can see the sunset as an opportunity not just to replace devices but expand the capability of their devices as data-based services become far more available with LTE. However, this kind of switch-over will require more planning than a simple device replacement, as more aspects beyond the devices themselves need to be considered. The timescales needed for such a shift will need to be considered in each geography where devices are to be deployed, as well as consulting with any operator partners about when their specific shutdown plans are. In addition, the coverage of any potential replacement network will need to be ascertained. Particularly when it comes to LPWAN, many networks are far from universal.

The Benefits of LTE

Switching to a VoLTE (voice over LTE) solution changes the transfer of voice signals to data packet transfer, allowing faster and clearer signal than in previous cellular generations, as well IMS-enabled (IP multimedia subsystem) session management which stabilises QoS (quality of service) to a far greater degree than 3G networks. This technology is already very mature in the voice sector, and Kaleido expects almost 5 billion active VoLTE connections by the end of 2023. The switch to 5G is also driving this, as VoLTE is the only fallback solution for 5G SA/VoNR (voice over new radio) communications.

A switch to LTE will enable a unified services approach, covering voice, data and video applications on the same network. Alongside providing better quality voice services, LTE can support data services without additional expenditure on infrastructure. For example, this allows diagnostic data to be sent for maintenance and troubleshooting use cases while reducing hardware costs for additional radios. Many systems with 2G/3G connectivity are in critical use cases with lifesaving consequences, such as emergency services and distress call functionalities, and a switch to VoLTE in these cases will mirror a replacement of LMR (land mobile radio) currently underway. Choosing VoLTE for these products will not only allow replacement of 2G/3G devices ahead of the sunset, but also broaden OEMs' potential addressable market to accommodate legacy LMR systems converting to cellular.

Figure 2: VoLTE Connections, 2016-2025



Source Kaleido Intelligence

Continuing to support PTT (push-to-talk) use cases will be vital for many IoT deployments, as these are typically connected to safety functions. Implementing VoLTE will enable these to continue to function beyond the 2G/3G sunsets, with additional clarity from the change in transmission technology. Wi-Fi is frequently considered as an alternative for these systems, particularly where they are internal, but such systems are reliant on existing electrical power networks being always available, and so may not be as reliable in the event of a system failure, where they will be most needed. VoLTE will provide a persistent emergency call functionality in many scenarios, which can be supplied with simple on-device battery power. This is also vital in a security situation, where malicious actors will look to disable centralised systems. With independent connectivity over LTE, these systems can continue to operate when any enterprise network is disrupted.

It will also be important for SMS support to continue, as many IoT devices manage system messages through SMS. While not as problematic as voice, the precise mechanisms for SMS transmission change between LTE and CS networks, with many options becoming available that are compatible with LTE networks. Of these, SMS over IP and Diameter-based messaged over the SGd interface are the most promising, as other options tend to rely on some degree of CS fallback. SGd messaging will be more immediately usable as it has a large range of devices that will support it with relatively little modification. However, it relies on LTE profiles, and so is not as future-proof as SMS over IP. This latter technology does require that the endpoint devices have an IMS (IP Multimedia Subsystem), which is not guaranteed even over LTE networks and devices. As a result, LTE-based SMS will lag even behind voice, until it is no longer an option. Enterprises and network managers need to make preparations for the changeover now, which means a conscious choice to include IMS within the network architecture in the short term.

In-building cellular connectivity be extended further using a private cellular network for communications, which has become far more accessible in recent years. The use of LTE technology in this situation can be potentially deployed as-a-service thanks to the expanding ecosystem of private network players looking to supply cellular connectivity to enterprises, thus lowering Capex investment requirements. It can also enhance connectivity within buildings through the use of FWA (fixed wireless access) to boost broadband speeds and as a dedicated communications channel to enhance voice services delivery in cases like elevator emergency calls and internal security voice communications. An enterprise can then use this private cellular network to transition to other technologies at their own pace as required rather than adjusting to the requirements of network operators and other technology players.

LTE and 5G

With 5G standalone networks now deployed in approximately 30 countries, some companies may wish to make the move directly to 5G. This is particularly the case if LTE-M or NB-IoT are plausible for business use cases, as these technologies are now incorporated directly into 5G standards, ensuring continuity of operation for the duration of the 5G and, most likely, 6G eras. Businesses will need to make decisions around whether to utilise traditional LPWAN technologies or move over to the new 5G Reduced Capabilities (RedCap) specification, but at this point in the market, the 5G device ecosystem for IoT is not large, making several end users hesitant to adopt because it will mean making compromises on the devices for some time to come. As an established technology, LTE has no such constraints, and will be in place for the foreseeable future, thanks to its fallback status. Even where it is not the primary technology, this would mirror several uses for 2G and 3G, where they provide fallback connectivity for low-powered devices.

The primary limiter for 5G technology at present is cost. Many devices are not offered using 5G because the components have not reached levels device OEMs (original equipment manufacturers) are confident will sell in sufficient volumes. As a mature market, LTE components and devices have already reached economies of scale, and many more options are available.

Note that for sub-1GHz platforms, LTE is still cheaper than 5G for the most part. Many of the use cases affected by the sunset of CS networks will not require the 5G-specific speeds or latency of 5G so LTE will suffice for many of these replacements. 5G NSA will still be able to support these devices, as it will contain LTE eNodeBs alongside 5G gNodeBs. This will continue as LTE will then serve as a fallback technology for 5G once the CS networks are deactivated.

LTE forms the ideal platform for a smooth transition into 5G, and Kaleido Intelligence expects both technologies to coexist for some time. Dynamic spectrum sharing means that networks will not need to be totally depopulated of older cellular technologies before newer technologies are used, giving LTE a far longer active life. It will persist into the 5G era, with VoLTE being a component of the 5G NSA and SA specifications, which includes an LTE core and architecture. Even as 5G SA begins to be rolled out, LTE will be needed as a fallback technology, as 5G does not include CS fallback as standard. This will ensure that LTE connections have more longevity than CS technologies, allowing enterprises to rely on the technology for many years to come.