Panasonic
BUSINESS

TOUGHBOOK

MOBILE DATA NETWORKS
– PLANNING FOR THE FUTURE

FOREWORD

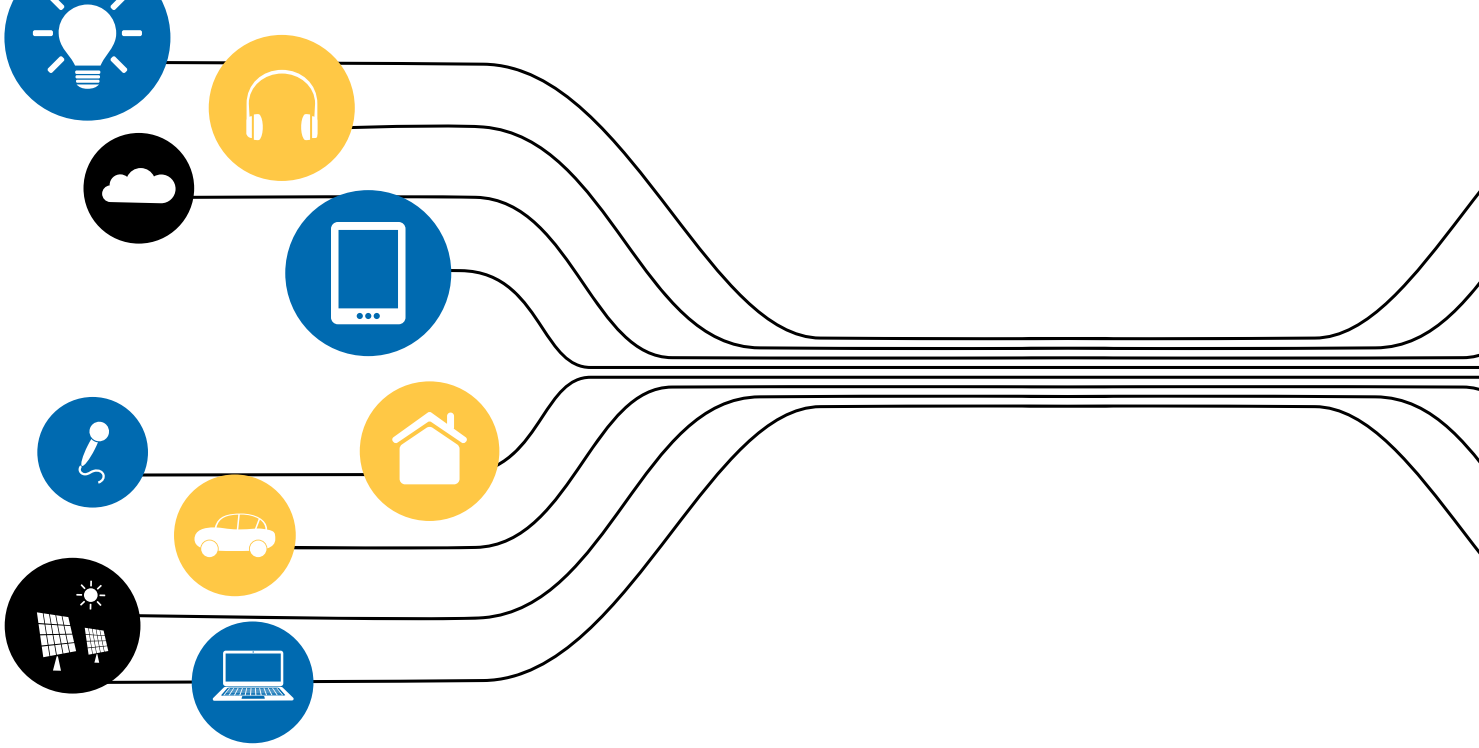
The rapid adoption of mobile devices and the increasing use of rich social media on those platforms by consumers is placing increasing bandwidth requirements on carrier networks. At the same time, the rise of the industrial internet is creating new opportunities for remote monitoring that requires support for emerging low latency low power network standards. As carriers adapt to these market factors they are making decisions about their existing networks that can affect solutions in the field. Understanding these changes and adapting to emerging standards presents challenges and opportunities for companies if they want to take full advantages of the advances in network technology, whilst at the same time minimising the risk of costly field visits to upgrade installed equipment in addition to replacement of their mobile estate.

INTRODUCTION

Throughout the history of Information Technology we have seen a repeated shift in the location of computational power in networks. From the centralised processing of the early mainframes through the departmental mini-computers and on to desktop computing and back to the centre with thin client computing. This ebb and flow is now mirrored in the cloud, with centralised cloud computing set to give way to the Internet of Things and Edge Computing, where intelligent devices combine varying levels of computing power and artificial Intelligence to both measure and process local data before transferring it back to a central point, or publishing it in a secure federated connectionless environment to support a range of new Big Data applications.

This evolution is driving fundamental changes in the technologies used both inside carrier networks and the edge devices that connect to them. Standards are emerging that seek to make the best possible use of the available radio spectrum, with new technologies offering better spectral efficiency and new frequency bands to support a broad range of next generation broadband requirements including secure connectivity, higher speeds, lower latency, improved range and low-power message-based data.

Planning for the ways that these changes will effect both current and future mobile line of business solutions is important for companies, covering a range of issues such as warranty and support contracts for an existing estate through creative designs of future solutions to maximise competitive advantage.



THE RISE OF THE INTERNET OF THINGS (IOT)

In a recent survey for Panasonic, Opinion Matters polled 250 UK mobile technology buyers, 51% of whom saw the Internet of Things (IoT) as an important technology trend to support the main technology drivers of improved business efficiency and productivity. The IoT is seen as a way improve process, services and product offerings and will clearly influence the future functionality of mobile devices.

Some of the key mobility priorities of these IT buyers who are looking to leverage IoT in the future will be faster data transfer and increased local processing power coupled with improved battery life.

With large numbers of edge devices collecting and transferring information, there is an important question of how mobile networks will evolve to support both the volume of data and number of connections, as well as the ability to operate at lower power levels in order to maximise the lifetime of the batteries in the remote devices.

For example, today it is possible to buy an IoT device containing a lithium battery and a universal SIM card that has a 10-year life without battery replacement, creating the possibility for remote IoT sensors to be widely deployed in a way that effectively requires no field service visits to maintain them.

According to the report "The Mobile Economy 2018" by GSMA Intelligence*, at the end of 2017, there were 30 commercial deployments of LTE-M and NB-IoT across 20 countries, including the US, China and across Europe. Looking out to 2025, licensed cellular IoT connections will reach 3.1 billion worldwide.

* https://www.gsma.com/mobileeconomy/wp-content/uploads/2018/05/The-Mobile-Economy-2018.pdf

REFARMING TO LTE AND NB-IOT

The global success of voice and data networks and the resulting increase in demand on operators to provide network capacity and bandwidth, coupled with the very high cost of acquiring radio frequency bandwidth from regulatory authorities, carriers are constantly working to improve the overall efficiency and use of the valuable network spectrum.

In addition to the bandwidth demands of consumer devices there are an emerging class of network-attached devices that come under the category of Internet of Things (IoT) installed in a wide range of network-aware equipment from electricity smart grids to parking sensors to vending machines. There are two broad classes: those within critical systems that require low latency coupled with secure and reliable connections (Industrial IoT and Critical IoT used, for example, in healthcare); and more passive devices such as sensors (Massive IoT) which operate on very low power with deep sleep modes and which require low bandwidth low power radios, allowing devices to be deployed in remote areas powered by long life Lithium batteries. These requirements are driving new wireless networks standards as Narrow Band IoT (NB-IoT) and key aspects of next generation 5G networks.

Initially, mobile licenses were technology specific for example the GSM directive in the EU which only allowed a network to carry GSM traffic, but these regulatory rules are gradually being relaxed, so the EU for example is now technology neutral. This opens the door for carriers to start re-allocating frequency spectrum to newer technologies, such as Long Term Evolution (LTE) through a process known as "refarming". Refarming allows different radio technologies to co-exist in certain spectrum ranges without interfering with each other. Carriers have invested in re-programmable network equipment "Software Defined Radios" which allow them to reconfigure their base stations remotely to support these emerging standards. However, with these transitions the network capacity for the legacy technology is necessarily reduced, and it also points the way to the eventual deprecation of these "legacy" networks.

As an example, according to a press release from Deutsche Telekom in 2017, 4000 base stations will be upgraded from GSM 900 to GSM 900 plus LTE 900. 5 MHz LTE 900 as chosen by Deutsch Telekom allows a download speed of 35 MPBS. In Germany, GSM 900 was primarily developed outside the towns and cities by Deutsche Telekom so it can be assumed that these 4000 rural base stations will also support NB-IoT. Because they are software configurable, these base stations can be further reconfigured to support LTE Cat-M in the future.

RETIREMENT OF NETWORKS

Despite the efforts of carriers to communicate their plans for the retirement of network technologies, sometimes the only point at which users realise they are using them at all is when networks are turned off. There are well documented examples in the United States, for example when AT&T switched off its 2G network and busses and trains disappeared from the San Francisco MuniMap. In another case Verizon advertised a date of the end of 2019 but ceased activating new devices on its CDMA network in July 2018 which for many users had the effect of rendering their technically capable devices unusable 18 months ahead of when they might have expected.

European network operators are generally being more cautious on retiring 2G networks, but in some cases more aggressive in their 3G timeframes. Telenor Norway, for example, has slated 2025 for the end of 2G support but an earlier date of 2020 for 3G. Swisscom and T-Mobile Netherlands, by contrast, have announced 2020 as their retirement dates on 2G and Airtel-Vodafone switched off 2G in Jersey in April 2018. In the UK, Vodafone has committed to 2G service at least until 2025, a timeline echoed by Telefonica.

3G is less arguably less suitable for Machine to machine (M2M) applications because its higher frequency bands have lower range and are not as efficient as penetrating buildings, or for use in rural locations compared to 2G, and carriers understand the need to retain support for the installed base of Machine to Machine devices in the field that rely on 2G such as smart meters.

For mobile devices running line of business applications that may have larger data needs, and in particular those deployed across different geographies, different carrier policies on the shutdown of networks and re-allocation of frequency bands are likely to affect users in ways that are not always going to be predictable, and which should certainly influence strategic planning by business.

The dates above would suggest that for some countries, current projects with an expected 5 year life could be developed utilising 2G rather than emerging IoT standards, but it would surely be more prudent to regard this as an opportunity to plan the sunset for existing deployments with a mixture of last time buys on equipment plus strategic spares and warranty services. It is clearly not in the interests of business to roll out a solution that will require an engineering visit in future purely because the device can no longer communicate.

CHIPSET MANUFACTURERS LOOK TO SUPPORT EVOLVING STANDARDS AT THE EDGE

Suppliers of radio chipsets and telecom equipment are responding to these emerging standards and market requirements with new products that focus on support for next generation mobile networks, whilst at the same time offering software-programmable radios to offer confidence for early deployment, because the chipsets can be updated with new firmware in the field as the transmission standards are developed and ratified by the relevant standards bodies.

These new chipsets from suppliers offer exciting new possibilities for solutions design, however it is important for end customers to be mindful of the fact that, as they add support for new wireless technologies, both network operators and chipset manufacturers are starting to drop older technologies such as 2G and 3G. This is particularly important where a current or planned deployment is across multiple countries, as operators' sunset policies will vary.

Having considered the support from operators across its active geography, it is important for a company to carefully plan the lifespan of their existing solutions, including the provision of spare devices and service and warranty contracts. Panasonic offers a range of extended warranty options and has a spare parts guarantee for 5 years after End of Life to support customers' long term in-field use of devices.

New applications and deployments should be planned to leverage the capabilities offered by the latest devices including higher data rates, improved processing power and longer battery life in order to gain maximum competitive advantage over their 3-5 year lifespan, as well as ensuring that operator connectivity will be available.

CONCLUSION

The shutdown of 2G and 3G networks is advancing worldwide. Carriers are sunsetting 2G or 3G networks to release frequency range for LTE or LTE-A. Others are refarming their frequency ranges, reducing the network capacity for 2G and 3G traffic. In the meantime, the capability of fast LTE has been extended by the LTE-M and NB-IoT standards which extend the range and battery life of IoT devices to support lifetimes measured in decades. The new base stations use Software Defined Radios and are therefore able to track standards development and add new functions via OTA updates.

Panasonic closely follows business and technology trends by working closely with our customers, market research organisations and our chipset suppliers to bring to market products that offer the best combinations of CPU power, wireless chipset technology coupled with Panasonic's in-house battery and radio design expertise, following the evolution of network standards.

Customers should be planning today for the sunset of 2G and 3G networks, managing the end of life purchases and warranties on their existing Panasonic estate and engaging with the Panasonic Engineering and Sales teams to design-in TOUGHBOOKs incorporating the latest technologies to give their new projects the maximum available competitive advantage.

GSM SUNSET SUMMARY – APPENDIX

Taiwan

2G is already switched off and the telecom regulator has announced that when its operators' 3G licenses expire and the end of 2018 that all 3G users will have to migrate to 4G.

AT&T / USA

In August 2012, AT&T announced plans to shut down 2G GSM/GPRS by 1 January 2017. By shutting down the 2G network, they released spectrum for future network technologies, including 5G. The same will happen with 3G (UMTS). As of June 2017, new 3G devices have not been licenced to enter the AT&T certification lab. This means that device manufacturers developing new devices for many American carriers were being pushed to support frequencies for LTE operation. In the meantime, AT&T activated LTE-M for IoT and M2M applications.

Verizon / USA

Verizon never operated a GSM network. They ran 2G on CDMA and added 3G on CDMA2000. Version announced to sunset of its 3G network and they will stop supporting 3G devices by the end of 2019. Potentially it may keep the network open for one extra year for specific customers through their control of registered devices.

T-Mobile / USA

T-Mobile has stated it will sunset its 3G network in 2019.

Sprint / USA

Sprint is presently committed until 2021 for its 2G (CDMA), however it was purchased in April 28 by T-Mobile for $28Bn.

Bell, Telus, Manitoba Telecom, SakTel / Canada

January 2017, Bell and SakTel shut down their 2G (CDMA) networks. Telus has turned off its CDMA network as well, as has Manitoba telecom.

M1, Singtel and StarHub / Singapore

In Singapore the three operators pulled the plug on GSM on 1 April 2017.

Japan

Japan never deployed GSM. All cellular operators in Japan sunset 2G services by April 2012. It was the first country to fully jump to 3G and 4G-only networks.

KT Corp / South Korea and Spark / New Zealand

KT Corp of South Korea and Spark of New Zealand also pulled the plug on 2G (CDMA) networks in 2012, while. South Korea was never on GSM.

Thailand

True Move and Digital Phone (DPC) shut down their 2G networks in June 2014, replaced by 4G networks. CAT Telecom of Thailand pull the plug in 2013.

Australia

Telstra in Australia powered off GSM in December 2016. Its domestic rivals will be joining it: Optus followed in April 2017 and Vodafone pulled the plug end of September 2017.

Swisscom / Switzerland

Announced GSM sunset end of 2020. Devices on roaming can still use other cellular operators.

Telenor / Norway

Telenor announced plans to completely shut down its 3G (UMTS) network in 2020, and 2G (GSM) in 2025.

T-Mobile / Netherlands

As a subsidiary of Deutsche Telekom they announced the sunset of GSM in 2020. They invited customers that still use phones that only support GSM technology to upgrade to a compatible 3G or 4G handset. The phase-out of GSM is expected to be completed by 2020. However other Dutch operators also likely to shut down 2G operations over this time period.

Deutsche Telekom / Germany

The 3G layer will be phased out by 2020. With their announcement they stated they have the freedom to pull the plug on 3G (UMTS) in 2021.

Chungwa, FET, Taiwan Mobile / Taiwan

All shut down their GSM networks in 2017.

DIGITAL 2G CELLULAR TECHNOLOGY AND STANDARDS BACKGROUNDER

In 1979, the frequency range around 900 MHz was allocated to a new as yet unnamed cellular radio system. This range was later expanded to include the 1800 MHz range in Europe plus 850 MHz and 1900 MHz in the USA. We now know the four frequency ranges as GSM quad band.

In 1982, the CEPT (Conférence Européenne des Postes et Télécommunications) set up a working group called "Groupe Spéciale Mobile" or GSM for short. Their goal was to develop a European cellular radio system. With the later worldwide spread of the technology, the meaning of the abbreviation GSM was changed to "Global System for Mobile Communications" and this technology has been in continuous use since 1987.

A memorandum of understanding of 13 network operators from 12 European countries led to the launch of this new digital GSM network. As early as 1992, 13 networks were launched in seven countries. These included the two networks D1 and D2 in Germany, now known as Deutsche Telekom and Vodafone. The reliable, technically well-engineered technology quickly spread successfully all over the world. At the end of 1993, GSM mobile networks had more than one million subscribers. By the close of 2000, this had increased to 400 million subscribers on 370 networks in over 140 countries.

In 1990, when the range around 1800 MHz was reserved for GSM, DCS 1800 (Digital Cellular System 1800) was developed on the basis of the GSM 900 specification. The new standard took into account the special features of frequencies around 1800 MHz for a cellular radio. Since the completion of standardisation in 1990, GSM has continued to evolve. In 1995, the second phase of GSM was specified. In addition to improving voice quality, features such as call waiting, fax transmission, Circuit Switched Data (CSD), Short Message Service (SMS) and many more features were added. CSD provided for a communication speed of 9600 bps, General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE) extended this to a theoretical 473 kbps. The original idea of a digital voice network had evolved into a parallel voice and data communications network.

On August 1, 2000, GSM standardization was handed over to 3GPP (3rd Generation Partnership Projects). 3GPP is a cooperation between different standardization authorities from Europe, USA and Asia. 3GPP also handles 3G (UMTS), 4G (LTE), NB-IoT and 5G.

Panasonic
BUSINESS

Take a look at our full range of exclusive white papers:

business.panasonic.co.uk/computer-product/whitepapers

Visit www.toughbook.eu

Computer Product Solutions (CPS) BU, Panasonic System Communications Company Europe (PSCEU), Panasonic Marketing Europe GmbH, Hagenauer Straße 43, D-65203 Wiesbaden (Germany).

TOUGHBOOK

11897/6 GSM Sunset Whitepaper_A4_AW_v04