January 2019

TCCA White Paper

PPDR Roadmap for evolution from LMR/PMR to 4G/5G

Important Note

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First issued by TCCA January 2019

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PPDR Roadmap for evolution from LMR/PMR to 4G/5G

Summary

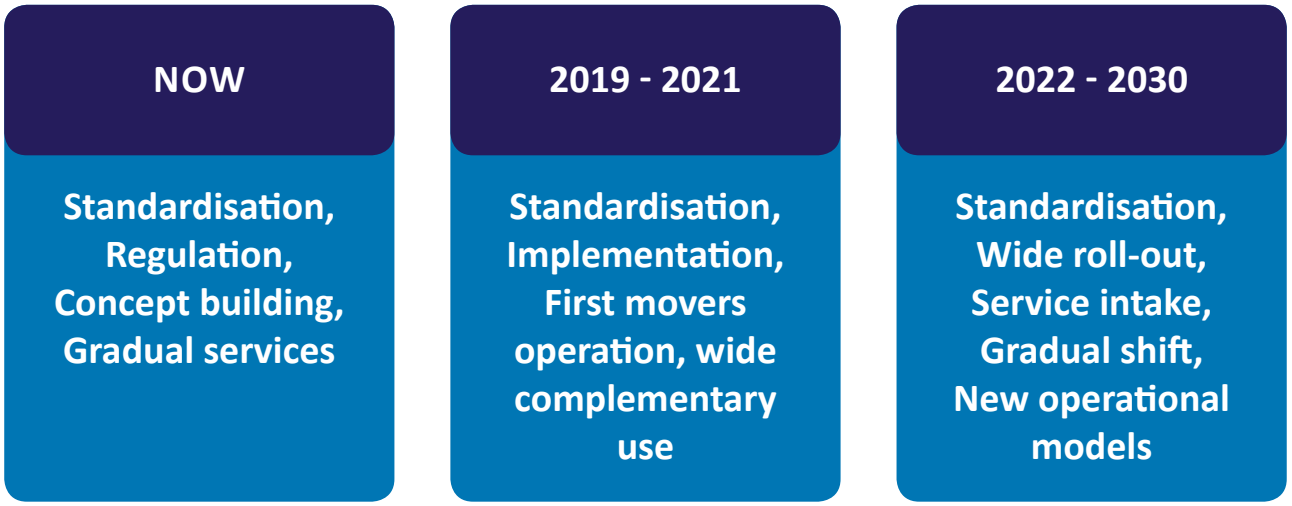
There has been much debate and discussion about the introduction of broadband into the Public Protection and Disaster Relief (PPDR) world. This paper presents the current roadmap to operational use of mission critical broadband for organisations looking to move away from narrowband networks. TCCA created the first critical roadmap some 10 years ago where the view was that sufficient dedicated spectrum would be allocated to PPDR agencies; that roadmap has now been updated and is explained in this paper. Some PPDR operators have plans for dedicated broadband in addition to their TETRA network; other PPDR operators are beginning a move from dedicated TETRA networks to mission critical broadband service, relying on partnerships with commercial operators.

It is worth mentioning that this roadmap is an agreed view of TCCA members. The roadmap highlights the standardisation progress; the procurement process and the possible window of opportunity to migrate.

This paper is primarily targeted at government organisations that are considering how to evolve from a trusted TETRA service to a trusted broadband service [1].

We consider the following three major phases:

Top level PPDR Broadband roadmap



Up until now the community has added specific mission critical features and functions to the LTE standard. With Release 15 from 3GPP we consider the majority of TETRA functionality to be standardised, but work will continue - also after 2021.

Some implementations of the new critical broadband standards are being tested and trialed and the first movers are expected to start operational trials in 2019-2021, while keeping their TETRA networks. From 2022 until 2030 we expect to see adoption of these new critical broadband services and organisational evolution towards their use; provided the underlying radio network is mission critical capable. The technology shift will provide the opportunity for new operational models that will then need to be institutionalised.

There will be a significant time period where both LMR/PMR/TETRA/P25 and broadband will operate in parallel, and a standard for interworking is currently being specified in 3GPP Release 15 and 16; note that proprietary solutions exist today in the market. A complementary TETRA standard matching the one from 3GPP is being worked on in ETSI – completion time frame not yet known.

1. A trusted service enables end-users to perform their operational roles as police, fire or rescue officers in a safe manner.

Timescales

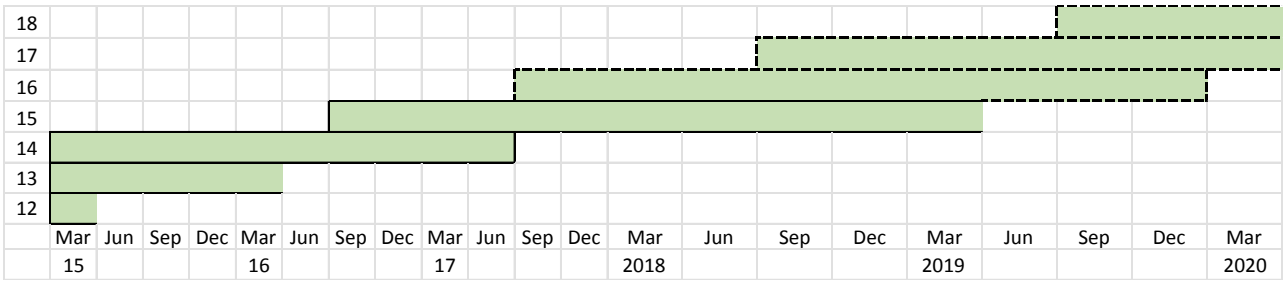
The initial work on mission critical features, catalysed by TCCA, started in Release 12. More functionality was added in Releases 13, 14 and 15, and standardisation work and maintenance of the standards will continue.

Timescales – 3GPP Releases

Based on practical implementation of a 3GPP standardised solution

Notes

- TETRA, Tetrapol, P25, GSM-R are already in use for mission critical voice, but have limited data functionalities
- Majority of national TETRA PPDR operators will continue until 2025 / 2030.
- European railways are investigating next generation solution.
- 3GPP have produced Mission Critical Specifications - called Releases - since March 2015.
- 3GPP Releases are issued every +/-18 months.
- Further work: Device2Device



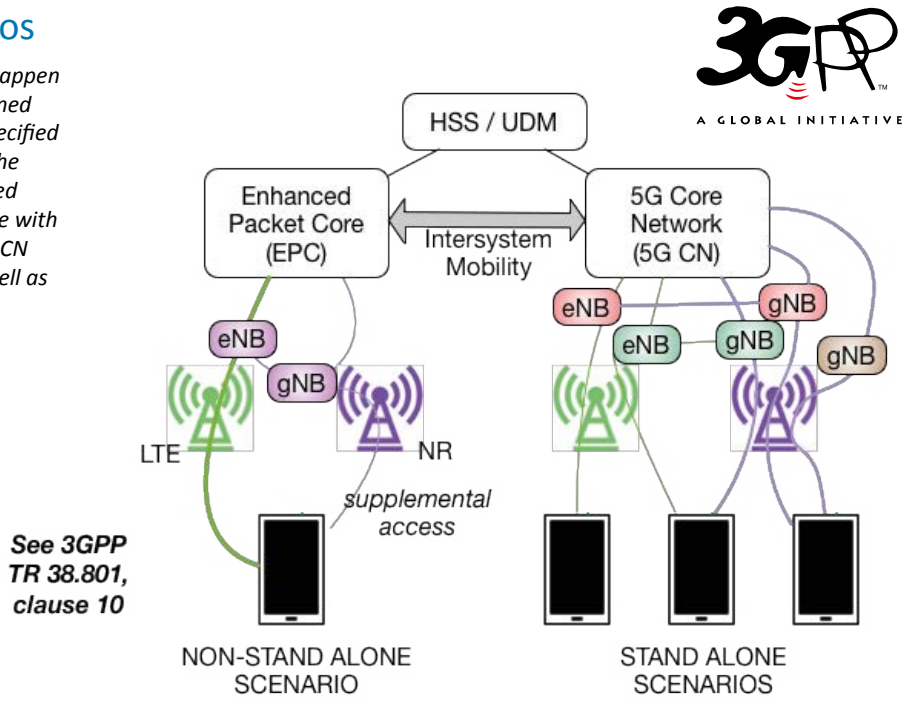
The general view is that device to device – or Proximity Services (ProSe) – which offers similar capabilities to Direct Mode Operation (DMO) in LMR/PMR networks – may need further enhancements. TCCA produced this white paper a few years ago and the situation remains unchanged.

That said, at least one device vendor has announced ProSe capability during 2018.

Release 15 is also the first 5G release and that brings further capabilities. With 5G there will be new user devices and base stations (gNB) – called 5G New Radio (NR) and in Release 16 new core – 5G Core Network (CN).

5G Deployment Scenarios

The shift from LTE to 5G is foreseen to happen in a number of ways – all to be determined by the individual operator. 3GPP has specified a number of options to accommodate the operators. That means that a LTE Evolved Packet Core (EPC) will be able to operate with 5G NR in addition to existing eNB; a 5G CN will be able to operate with 5G NR as well as LTE eNB.



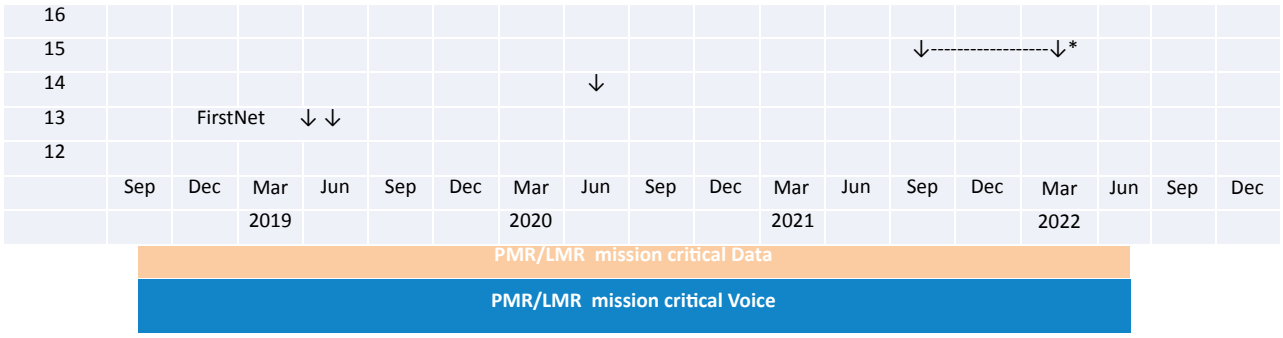
Source: 3GPP Workshop on IMT2020 submission Brussels, Belgium, 24-25 October 2018

Operational use

The big question is: when can a Release be taken into operational use? A Release is a specification on paper; vendors will then develop the equipment they believe they can sell and for which they can see a business case, and operators will also develop their business cases, procure the software, implement, integrate and test the new functionality. A benchmark is a statement from FirstNet saying that Release 13 MCPTT is expected to be ready for operational use in the Spring/Summer 2019 timeframe – so we can then predict when Releases 14, 15 and 16 can be taken into operational use.

Timescales – operational use

Based on practical implementation of a 3GPP standardised solution



New services can be taken into use in different ways:

- a gradual introduction of new services – in parallel with existing service; this will give users fast access to initial broadband services and still have a trusted narrowband service to rely on.
- waiting to introduce the new services until they roughly can replace the narrowband services; then the organisational change of processes can start.

Interoperability processes still need to be ironed out. TCCA has agreed with the Global Certification Forum (GCF) to certify Mission Critical Push-to-Talk (MCPTT) when 3GPP RAN5 has completed development of the code required for test cases. When those are ready they need to be implemented by test equipment manufacturers. When that has happened, GCF can certify MCPTT compliance.

It is a process that has hurdles. As of the end of 2018 the test Specifications for test equipment are not yet complete, and vendors of test equipment are reluctant to commit to implementing the scripts until completed in RAN5. So a formal Interoperability Process (IOP) – as we know it in TETRA – is uncertain at this point of time. Alternatives are being investigated.

PPDR Operator perspective

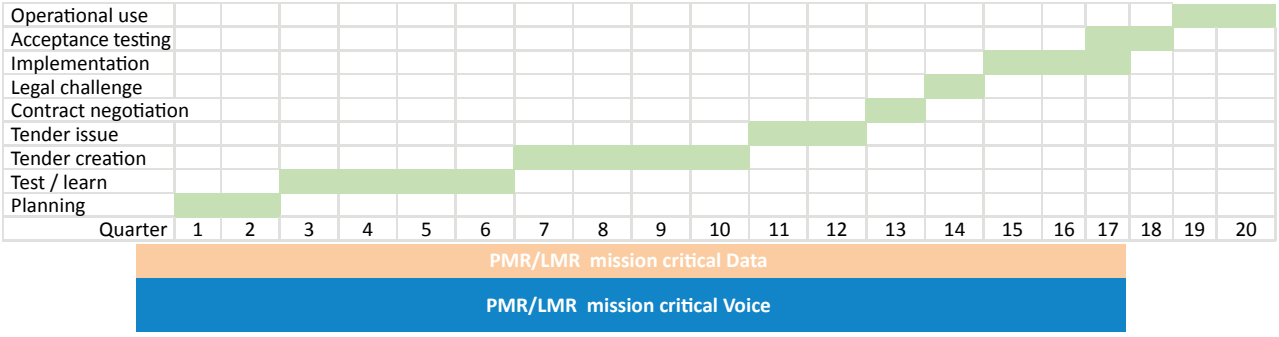
Until now we have analysed the timescales based on availability. A different perspective is from those governmental organisations that will be tasked to procure mission critical service from a commercial operator. A government organisation will have to go through a full procurement process including possible consultants, tender creation, contract negotiations and testing and validation. This can typically take four to six years – so our advice is, better get started now!

While all these activities are taking place the LMR/PMR/TETRA/P25 systems will keep on running. Release 15 can be considered to include the majority of TETRA/P25 functionality – clearly not all, but the upside is when implemented by the operators – commercial or PPDR - the users will have access to broadband voice, data and video capability.

Release 15 is expected to be implemented by vendors and operators by 2022, but that does not mean a mission critical service is available if this is done on a commercial network. Any commercial operator network will likely have to be hardened with extra coverage, resilience and security. On the other hand, networks that from the start are designed and implemented for mission critical use should be able to be taken into operational use by 2022.

Timescales – operational use (2)

Based on practical implementation of a 3GPP standardised solution



From 2022 one can then have a mission critical broadband network and a transition of users can start – leading to a situation where users trust the new network and the management is convinced it is in control of the service.

Trust and control are essential components in this process.

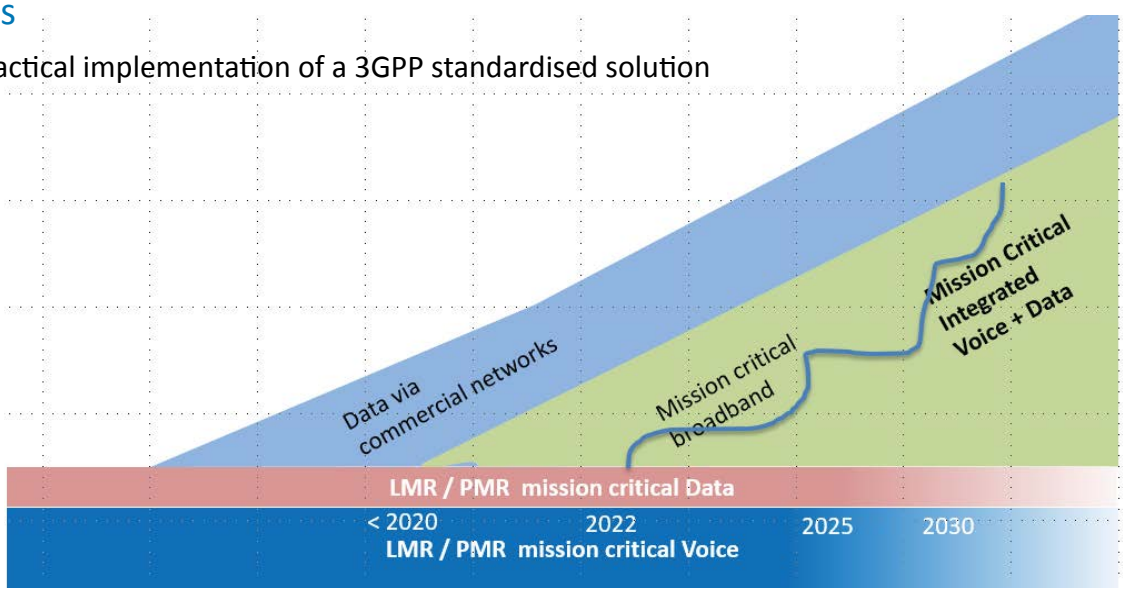
An organisational transition period of three years may be expected. Sometime after 2025 a decision may be taken to switch off an existing LMR/PMR/TETRA/P25 network.

However, we must stress that the narrowband services remain fully fit for purpose for organisations that do not need broadband capability.

Networks that are built to mission critical standards – with the required levels of resilience, reliability and security taken care of – and that only require point to point data services (IOT, M2M, etc.) and where standardised MCPTT voice services are not required can be implemented earlier.

Timescales

Based on practical implementation of a 3GPP standardised solution

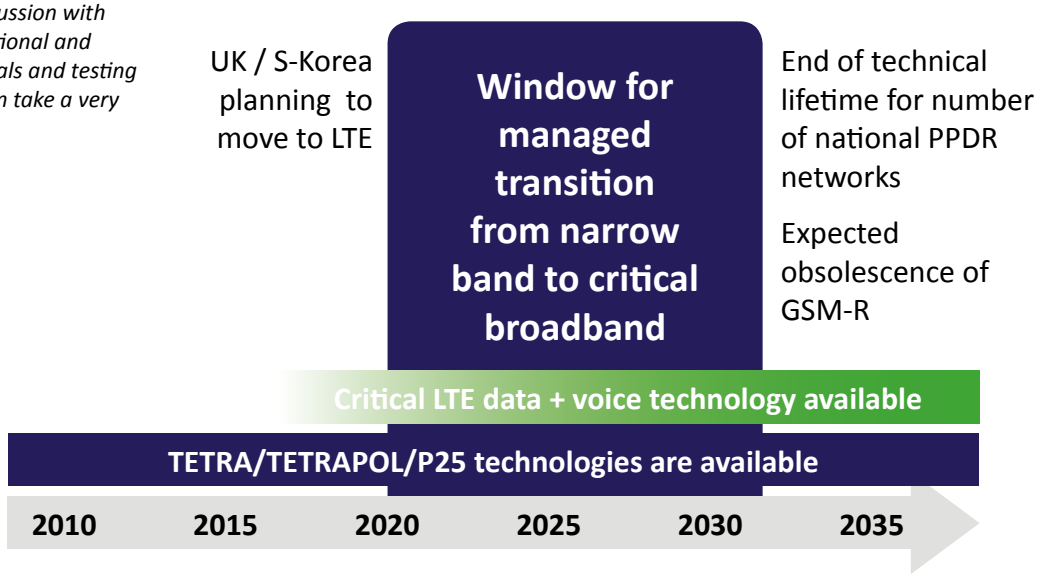


Window of opportunity

The window of opportunity for a managed transition is up to each country. For example, the UK and South Korea have been early in their planning, while other countries have just renewed their TETRA/P25 systems to have ample time for the transition.

2020 – Managed transition

Organisations responsible for PPDR operations should start early; planning, discussion with operators, organisational and legal discussions, trials and testing are all items that can take a very long time.



Executive Summary.

Replacing an existing PPDR network with a new broadband service involves standardised features and functions, trusted radio networks and service providers, procurement & operational processes and finally convincing the users and management that the new service is fit for purpose.

For governments and operators looking to eventually transition from TETRA or other narrowband networks to critical broadband services, TCCA recommends the process should be started as early as possible.