



EELM 4GLinked INTEGRATED SOLUTION FOR SMART CAMPUS COMMUNICATIONS & SECURITY



INTRODUCTION

Mobile communications are developing incredibly rapidly, driven largely by consumer demand combined with new standards and features by smartphone and network vendors, seeking to gain a competitive advantage. As with all advanced technologies, it is essential that users select the most appropriate solution for their specific operational needs - now and in the future. Ideally, technology should be based on open standards which reduce the users' reliance on single vendors and increase functionality and competition.

TETRA has been the narrowband technology of choice for mission critical users over the past 15 years and this has also been driven by interoperability between subscribers and the fact that mission critical features and functionality were standardised for all vendors. However, although TETRA can provide limited data services, it will never be possible to offer broadband data services over its narrow 25KHz channel and therefore mission critical users are seeking options to access high speed mobile services and applications. LTE is one option and there is a major drive by emergency services and 3GPP to introduce more mission critical standards into LTE technology. However, the MC standards are at a relatively early stage of standardisation and it will take time for this functionality to be enhanced and implemented by vendors – timescales of five to seven years are anticipated for fully mature mission critical services – although certain features will be implemented sooner.

The advantage of using additional broadband services is that new streaming and advanced data applications can be introduced for situational awareness and essential services over the long term and gradually introduced based on demand. For remote monitoring requirements, there are several technologies for smart device communications including; LoRA, Zigbee, SigFox and LTE etc. The technology which becomes the dominant solution will be determined by market forces, however, private LTE is arguably the only solution that can match high QoS and the criticality expected by MC users, and in addition, LTE has the benefit of being able to add narrowband IoT services transparently as a 200KHz sub-band within the channel, or within the guard band. An LTE eNodeB base station will likely support NB-IoT services as standard.

ETELM's view is that LTE has a significant future for mission critical users and for smart services, however these services will take several years to be introduced and fully tested. For this reason, we have introduced a technology which allows established TETRA services to be implemented over the same LTE Core network. Professional users have the choice of using public operator based infrastructure, but certain secure establishments may desire (or need!) their own private system which can be managed and secured outside of the public network.

ETELM'S 4GLinked INFRASTRUCTURE SOLUTION

ETELM is a manufacturer of core mission critical infrastructure technology – initially focused on TETRA. It has recently developed a solution called 4GLinked which allows TETRA & LTE cell sites to be connected over a single LTE Core network – this coincides with the introduction of ETELM's own LTE eNodeB base station range. ETELM is focused on providing proven and reliable communications whilst giving access to new advanced and high-speed services as standards and functionality are introduced. Our principles are in the development of communications infrastructure based on open industry standards and we have, over the last 20 years, developed secure mission critical

infrastructure based on ETSI standards for TETRA and more recently 3GPP for LTE eNodeB and LTE Picocells.

TETRA is extremely successful in providing secure digital radio infrastructure for emergency services and other mission critical users globally. The technology has advanced due to its frequency efficiency, security, reliability, and the fact that prices have reduced as interoperability increased competition and made it more accessible to all mission critical users (not just public safety).

As a narrowband technology however, TETRA will never provide high speed mobile broadband and for this reason users are looking to LTE to provide all or some of the high data services and applications. However, LTE was initially designed for consumer communications - the implementation of professional user services is still in the early stages of standardisation so it will be several years before enhanced standards and device functionality is available.

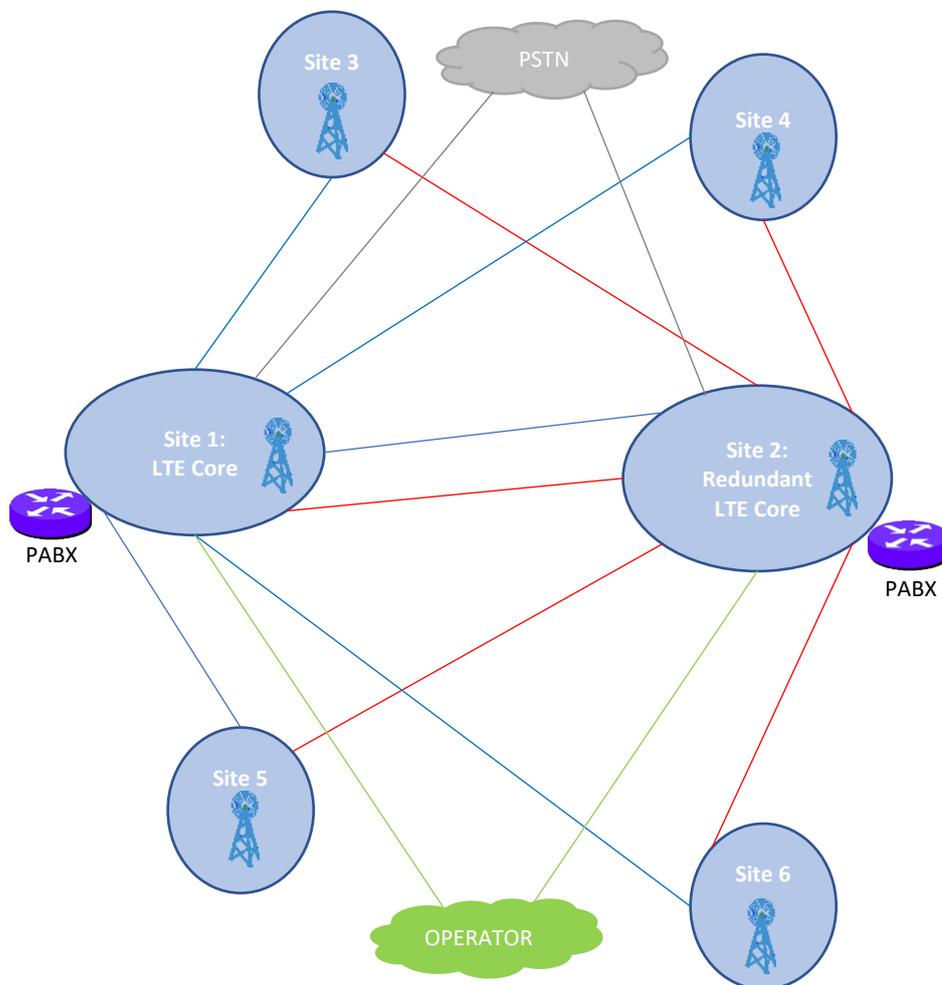


Figure 1 – Basic LTE CORE NETWORK SCHEMATIC

Recognising the need for both transition and interoperability between existing TETRA and LTE services, ETELM has developed a solution – 4GLinked – which integrates both standard technologies into a single core network – based on the LTE Standard Evolved Packet Core [EPC].

4GLinked allows interconnectivity between 4G and TETRA subscribers over the local core network and with wide area VPN connections to other locations and cell sites. Furthermore, a private LTE Core may be connected to a PSTN or Mobile Operator allowing connectivity to the outside world if required, for all or certain subscribers as determined by administration.

THE SMART CAMPUS SOLUTION

Most sites would achieve full outdoor coverage with a single TETRA BTS Site for reliable voice and narrowband data communications. For in-building communications, a detailed site survey would be required to determine whether additional RF design can be used to provide additional coverage (if required) or if additional BTS are required. Often RF techniques can be used by extending indoor antennas or leaky feeder cabling.

The TETRA base station will be connected directly to the LTE Core and therefore the system may be enhanced by adding LTE small cells for situational awareness applications, advanced data applications and eventually (when LTE MC Standards are more mature) full MC Voice & Data services. The TETRA system may be retained for certain users who would be able to communicate seamlessly to 4G/5G users, or retained as a back-up service. The deployment of LTE is highly dependent upon the frequency spectrum available and regulations of Ofcom – this may determine whether a private or public system will be possible.

PRIVATE SYSTEM OR OPERATOR SERVICE

Traditionally security and mission critical services have been implemented as private systems – this gives the user full autonomy in terms of subscriber management, reliability, and security. In some areas, due to frequency regulations, there may be no other choice to obtain LTE services than by working with a mobile operator. In the UK, the Home Office is engaging with EE to deploy an LTE network for emergency services. The ESN plans to completely replace the existing TETRA based Airwave network as its contracts expire on a regional basis. In some circles, this has been heavily criticised in respect of the rationale, timescales, and suitability. It is highly likely that, due to the immaturity of mission critical services over LTE, there will need to be a period where Airwave services are extended until LTE offers more enhanced mission critical services (estimated around 2022-24).

A PROPOSAL FOR 'SMART CAMPUS' SOLUTIONS

There is an increasing awareness of security issues within any campus area – whether a security establishment, hospital or school/university, management of on-site security is essential. One of the key issues is to ensure that the investment in any technology meets the immediate need and is ready to take advantage of future technology advances. ETELM's 4GLinked solution offers many implementation options which allow for implementation today, based on proven technology, with full compatibility with future technology standards and advances:

Stage 1: Single site TETRA Systems using ETELM e-TBS – providing secure voice and narrowband data services for interfacing to security and intrusion detection alarms using TETRA modems.

Stage 2: LTE Core network – IP based interconnection between sites, connecting all e-TBS TETRA base stations for wide area communications. As with any wide or local area network, cyber security should be built-in and the user will benefit from security measures available to the LTE market.

Stage 3: LTE Small Cell - connection of LTE eNodeB base stations at each site, providing a private/secure LTE service.

Stage 4: Deployment of Smart IoT based sensors for security – intrusion detection, vehicle monitoring, Smart applications, and devices for security personnel. Additional IoT based services for base monitoring and services.

In addition to the above options based on a private system, the LTE Services may be provided by a network operator (or ESN), the TETRA systems may be added by the operator as a MVNO arrangement, or the TETRA system may be separate with the LTE Core connected to the public operator network by arrangement.

LTE NB-IoT Services and Sensors

Clearly there are many initiatives worldwide for smart cities and IoT technologies. Some aspects are being implemented today, however many solutions are still at the conceptual stage. The introduction of sensors and actuators based on IoT control and monitoring are increasing on the market.

ETELM's expertise is related to the overall infrastructure so integration of specific devices would be by other contractors, however there are new low power, NB-IoT devices appearing for every sector, including:

SECURITY

- Access Control & Monitoring
- Intrusion detectors
- Geo-Fencing Alarms for restricted areas
- Guard Tour
- Smart Parking
- Vehicle Tracking
- Video Surveillance
- Smoke Detection

Lower Priority Services

Building Services/Energy Management
Campus Lighting
Waste Management
Catering Services

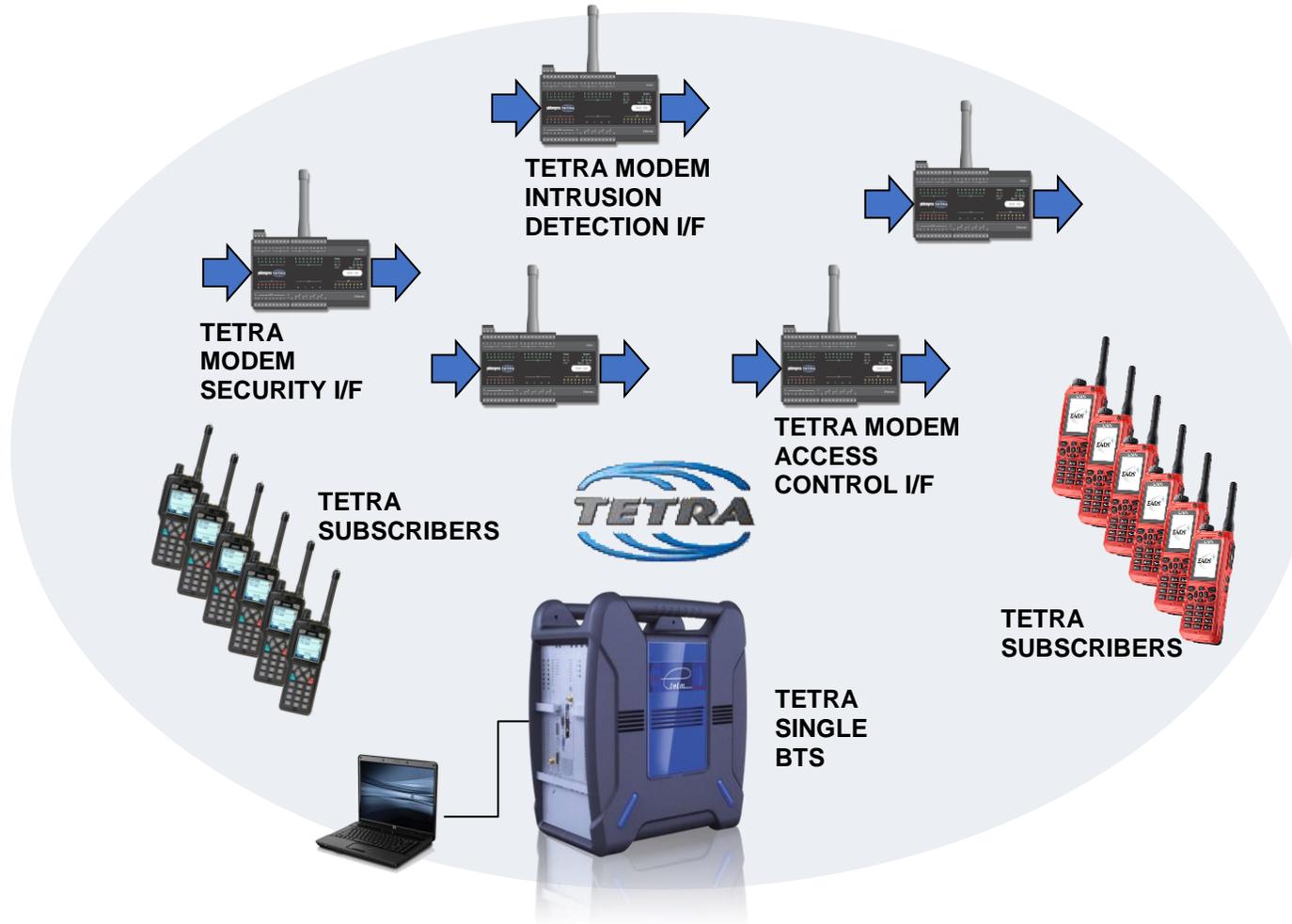


Figure 2 – SITE n: TETRA ONLY, SYSTEM MONITORING & COMMUNICATIONS

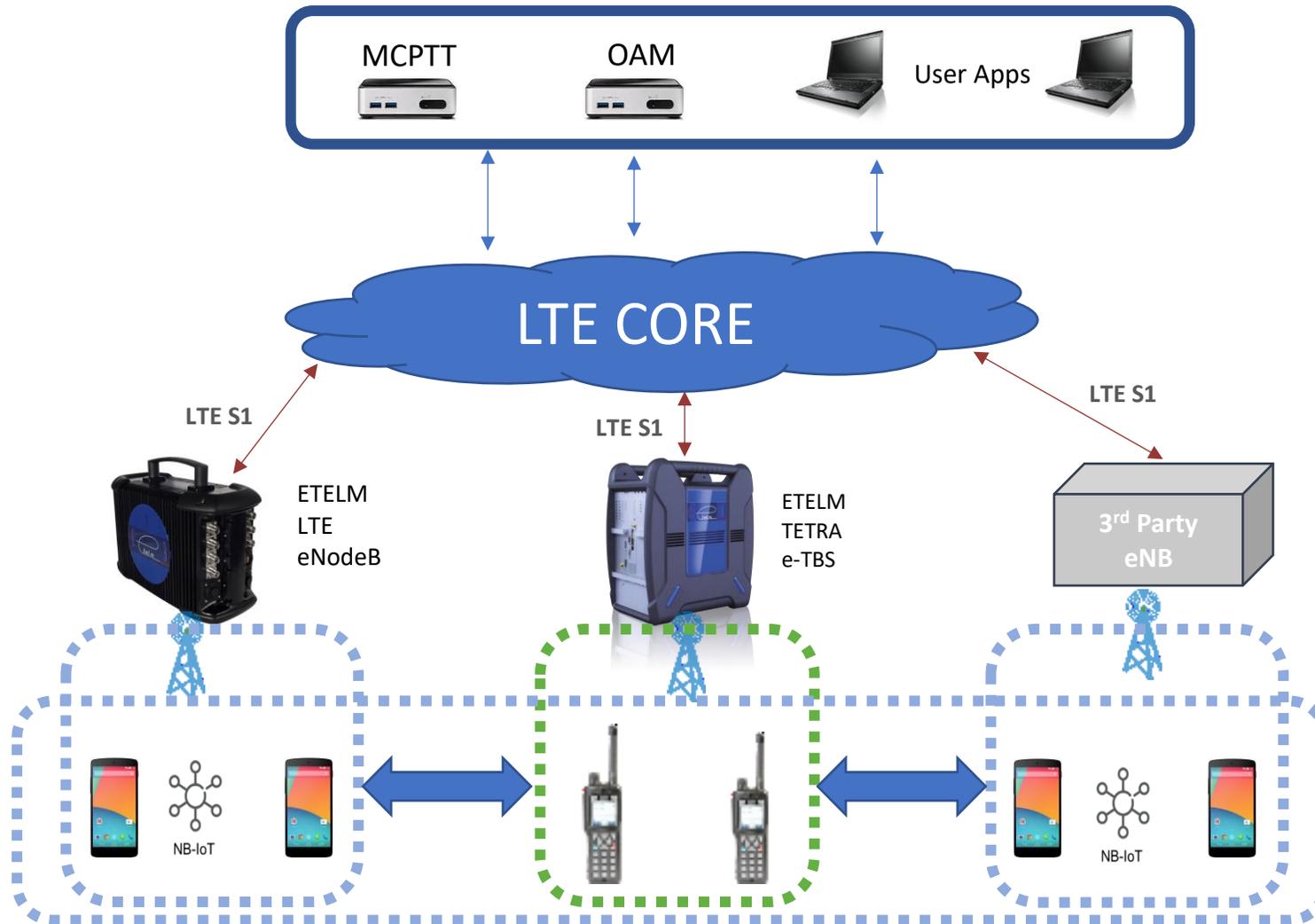


Figure 3 – 4GLinked TETRA + LTE – SEAMLESS CALLS BETWEEN SUBSCRIBERS AND IoT SENSOR COMMUNICATIONS



CONCLUSIONS

The key issue for any technology investment is to avoid obsolescence and ideally choose a technology that has a long-term future based on non-proprietary technology and one which is introducing new and advanced functionality. ETELM believes the ideal approach is to develop a solution based on LTE standards, but the solution must be proven and reliable from inception.

ETELM's 4GLinked solution offers the unique ability to implement a fully flexible solution based on proven technologies available today, with the flexibility to adopt new technologies over the same network in the future. This allows a high level of security today and a gradual implementation of new advanced technologies as and when they become available and are tested on a pilot solution basis.

Additionally, as ETELM's solution is based on full integration with LTE technologies, it ensures that the initial investment is based on a long-term technology solution and can be expanded based on advances in international standards and benefits from rapid development in the consumer mobile communications market.

For more information, or to find out how ETELM's 4GLinked solution can address specific site security issues, contact:

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