# White paper: migration to LTE

## Minimise disruption, achieve seamless integration and enable a smooth migration

Migrating from TETRA to LTE can reduce communication costs, introduce greater openness, and deliver increased functionality to organisations in safety-critical industries. In particular, it boosts productivity by enabling field operatives to work more independently in secure environments.

However, adopting LTE is complex, challenging, and costly. It requires organisations to coordinate a multi-supplier environment across back-end and front-end services, and to run it alongside legacy technology during the transition. Careful thinking about end-to-end processes is needed to determine the optimal migration strategy that minimises both disruption to business operations and the need for connections between LTE and TETRA.

In addition, LTE's support for broadband data communication opens up a new world of functionality options, demanding an open and extensible architecture. The temptation to introduce too much too soon can also impact this migration; organisations should focus on carefully matching the technical migration with potential new workflows.

By choosing an open approach to migration and taking into account existing best practices, organisations can avoid the most common migration pitfalls, reduce disruption, and reap the rewards of LTE sooner.

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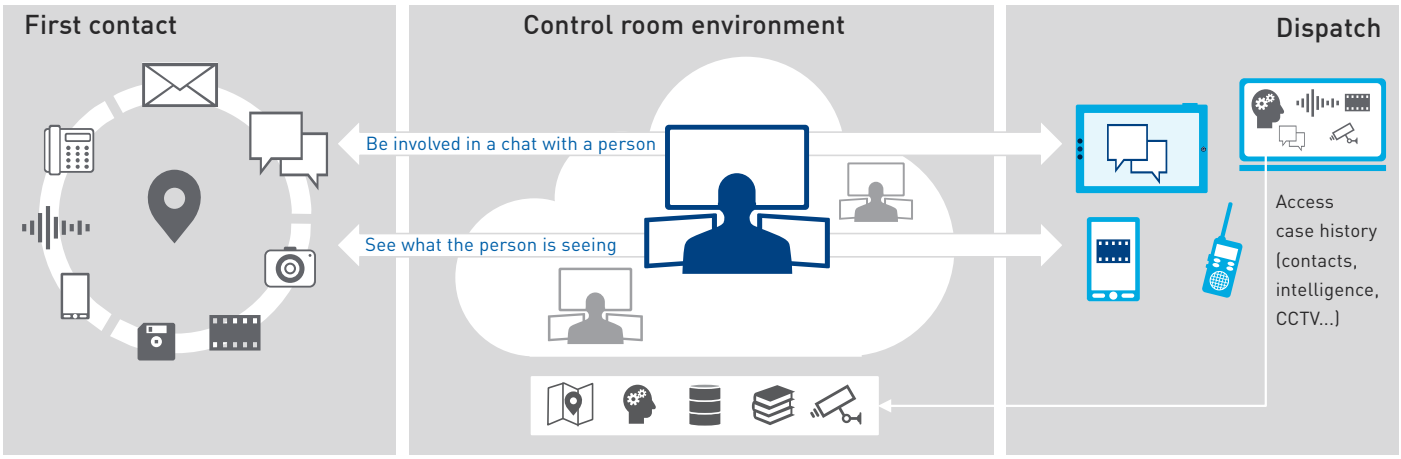
## LTE: challenges and benefits

As the standard to replace TETRA, LTE should reduce communication costs, improve interoperability with other organisations, enable greater choice in technology, and significantly increase functionality. It is not just another voice communication system: rather, this more open and flexible platform is the future for all voice, data, and video going into and out of the control room—in particular, boosting accessibility and productivity in the field.

However, the assumption that simply deploying the technology will solve all challenges is a common pitfall. Converging voice and data suddenly opens up integration challenges that have never really been dealt with before. During the transition and beyond, organisations will need to coordinate a multi-system, multi-supplier environment spanning Command & Control systems (C&C), TETRA, UHF/VHF, LTE, telephony, call centre, Customer Relation Management (CRM), Record Management Systems (RMS), Geographical Information Systems (GIS), Automatic Resource Location Systems (ARLS), and Management Information Systems (MIS)—to name but a few—and bring them together in an integrated way for both operators and front-line staff.

This technical transition will be accompanied by major changes in operational systems, roles and processes. The new functionality enabled by LTE will ultimately introduce more tools and complexity, and it will be necessary to create a single, flexible interface to ensure efficiency and effectiveness in front-line services. For a truly user-centric experience, technology choices must be dictated by operational practices, and not vice versa. This solution-based approach will only work if all stakeholder voices in both the control room and in the front-line environment are heard and involved in the decision-making process.

### Figure 1: Media and information systems in control room environment and novel usages



As LTE will impact every aspect of technology and operations, and will evolve significantly over time, it is vital to plan comprehensively before undertaking the migration. To help organisations address the LTE challenge, Frequentis has compiled a set of best-practices and pointers based on direct experience with ongoing client engagements and transition projects.

## Deployment model

The first practical step is to select the deployment model for LTE. Broadly, organisations have three options here:

1. Create a virtual private network on infrastructure owned and managed by a third party.
2. Create a hybrid model in which they manage their own subscribers internally but re-use third-party infrastructure.
3. Own and run the entire infrastructure internally

To strike a workable balance between cost and control, most organisations will choose the hybrid option.

## Open architecture and extensibility

When choosing technology, organisations are strongly encouraged to consider openness and ease of integration. Given that LTE will depend on an evolving multi-supplier environment, technology should be based on true industry standards, and not on any one vendor's interpretation of those standards. Equally, extensibility will be a key quality: organisations should look for extensible technology through software development kits (SDKs), enabling other partners to add functionality.

## Governance framework

The next step is to set up a rigorous governance framework, including well-defined escalation procedures to support effective work and collaboration in the future multi-supplier environment. This must also include support for rapid changes, particularly during the deployment phase, when it may be necessary to rapidly fall back to old technology in the event of growing pains.

## Testing and security

Within hybrid solutions, end-to-end performance and conformance testing are vital elements, and organisations should put in place a continuous testing regime. A smooth transition will depend on the ability to conduct frequent and efficient end-to-end testing across multiple systems from multiple suppliers. Automation is key to doing this effectively. On that note, organisations must consider security from the outset. As LTE ushers in new opportunities to expose internal systems to external operatives, the attack surface will increase in size. Often overlooked is the need for continuous security patching across the whole end-to-end chain. In safety-critical environments, this is both an organisational, as well as technical challenge: the organisational impact has to be managed and the systems used must support patching without interrupting the business.

## Planning a phased migration

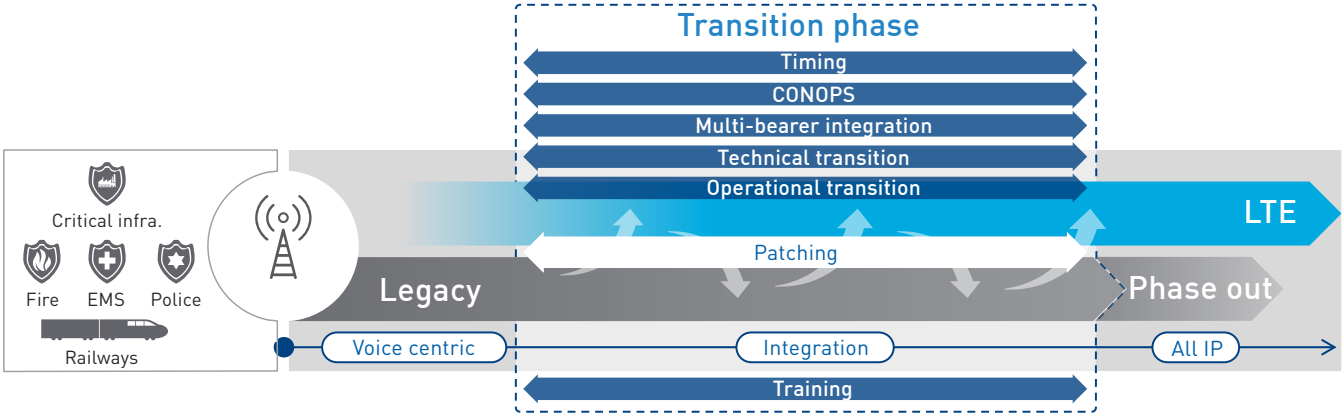
As major change always implies risk and potential disruption, organisations will undoubtedly choose a phased transition in which LTE will run alongside TETRA for some time. During the rollout, there will be varying levels of coverage on each network, both above and—not to be forgotten—below the ground. Organisations will need to consider the potential operational impact of having different functional or geographic teams using different networks. This will form part of a broader analysis of how best to migrate people from TETRA to LTE.

Each point of connection between TETRA and LTE will add to the overall cost, risk and complexity, so organisations should plan the rollout to limit the degree of integration required. This means examining existing working practices across units and hierarchies of units, and also potentially looking at links with partner organisations.

Where units communicate directly with each other only at certain clearly defined points in a workflow, it may be practical to migrate them at different times and just build in a few technical connections. Where units are more interdependent, it may be better to ensure that they are migrated at the same time. Organisations will need to take a flexible approach: some operational roles may require parallel access to both old and new technologies.

When creating connections between TETRA and LTE networks, organisations will also need to take into account various technical constraints around capacity and functionality. For example, the small delay that is introduced when retransmitting TETRA messages to an LTE network (and back again in the other direction) can lead to the loss of the first 200 milliseconds or so of speech. This can happen because each party will receive the ´line open´ signal and may start speaking before the line is truly ready for communication.

### Figure 2: Migrating from legacy systems to LTE



In practice, this is resolvable by buffering and retransmitting the first part of speech, but it provides an example of the danger of assuming that the technology will work as expected in all scenarios. This is especially important to consider in emergency call scenarios.

## Maximising acceptance by minimising new functions

A successful rollout will depend heavily on user acceptance. Front-line operatives often work in stressful, time-sensitive situations, and are likely to have very low enthusiasm for adopting any new technology that takes their focus away from existing workflows and priorities or provides solutions to non-existing problems. Frequentis recommends that organisations focus on successfully completing the technical migration to LTE and laying the groundwork for new functionality before they introduce new workflows.

Natural excitement about new features, such as live video communication, should be combined with practical thinking about what the organisation actually needs, and what degree of change employees will accept. For example, organisations need to consider whether video will really improve decision-making, or rather overwhelm and distract control room staff. By making a conscious decision to replicate existing functionality in the first phase of LTE adoption, organisations can avoid operational disruption and simplify training. A smoother, faster transition will help keep stakeholders on side and lay the foundations for easier introduction of new functionality in the future.

## The road to LTE excellence

To achieve a successful migration to LTE, organisations should choose open and extensible technologies and treat the process as an ongoing evolution rather than a one-off adoption. Careful attention should be paid to operational considerations during the rollout, and functional change should be limited and applied to solve immediate problems. Indeed, the technical migration is really just the first step in what will be a much bigger organisational and cultural change as the full capabilities of LTE are unlocked.

With a seven-decade track record of building control room solutions for safety-critical industries, Frequentis takes a solutions-led approach to LTE transition that is firmly grounded in practical experience rather than just theory. Backed by numerous successful projects around multi-bearer integration, Frequentis understands the challenges of transition within a complex, multi-supplier environment. Whether you are just at the planning stages and wondering where to start, or already actively engaged with the challenges of transitioning to LTE, Frequentis can help you take an open, flexible, evolutionary approach that will continue to deliver benefits beyond the initial migration.

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