What 5G could mean for mission-critical users - right now

5 examples of never-before-seen opportunities

AIRBUS

Contents

Executive Summary

Public safety and other professional users have been accustomed to using highly capable, secure communications systems such as TETRA, Tetrapol and P25 narrowband solutions. However, societies are facing a number of new security challenges, such as terrorism, climate change, increasingly sophisticated organized crime and geopolitical threats.

Also, big cities are becoming ever more complex and connected. At the same time, public safety budgets are being restricted, meaning that new challenges cannot be solved with increased spending.

To deal with these challenges, organizations need to find new and more efficient ways of working to improve the safety and security of both first responders and citizens. Overall, organizations must be able to do more with less.

5G – a revolutionary shift for critical communications
Critical communications users are increasingly meeting these challenges with the new capabilities offered by mobile broadband.

Airbus has over 20 years of experience in delivering mission-critical communication systems worldwide. Agnet from Airbus is the next-generation critical communication solution that is fully compatible with 4G/LTE and also future-proofed for 5G. It gives professional smartphone users reliable access to mission-critical services which deliver far more than push-to-talk over broadband, such as multimedia messaging and push-to-video features.

Several public safety organizations are already using Agnet or are bringing it into use, such as in RRF (Réseau Radio du Futur - France's pioneering case for security and emergency rescue forces) and

Virve 2 (Finland's new generation public safety network) projects. These projects will provide 4G/LTE broadband services, which will work seamlessly with existing narrowband services during the migration period.

5G will further enable new and significantly better ways for public safety and other professional organizations to manage incidents and emergencies. It can even help find new ways to prevent them.

The transition from 4G to 5G can take full advantage of existing investments in Agnet, meaning public safety and other professional organizations don't need to wait for 5G before getting started with broadband migration.

This paper describes several use cases for public safety and other professional users that demonstrate the new features of 5G technology and mission-critical services provided by Agnet.

5G for mission-critical use

5G is the fifth generation of cellular standard after 1G, 2G, 3G, and 4G networks – developed by the 3rd Generation Partnership Project (3GPP).

5G is substantially faster than 4G and with more capacity, thus creating never-before-seen opportunities for people and organizations, including public safety. These capabilities can be used to bring new services to users, such as video, Internet of Things (IoT), Artificial Intelligence/ Machine Learning (AI/ML) and versatile data and analytics services.
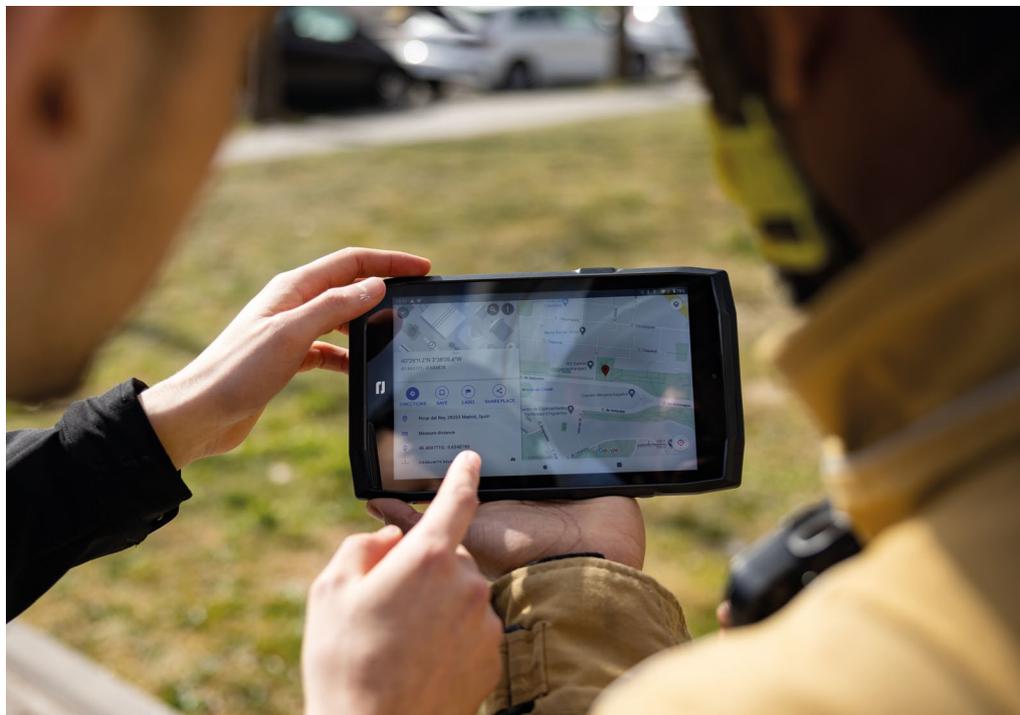
3 key requirements for mission-critical communications

Mission critical refers to anything that is essential to authorities or a business organization. This requires high availability and reliability of service and uncompromised security. A failure or disruption in a mission critical system or service would have a serious effect.

Usually, 4G/5G mobile networks in commercial use do not meet the mission critical requirements as such, but certain enhancements are needed. If, for example, mobile network operators (MNOs) serve public safety users, the coverage and capacity of networks must be extended to match the public safety use cases and the reliability and security must be hardened. Therefore, meeting the mission critical requirements requires significant investments in the network. These professionals also need mission-critical broadband services (MCX), such as voice, data and video, which Agnet from Airbus can provide.

Meeting these prerequisites for mission-critical communications opens up a new world of possibilities for public safety and other professional users.
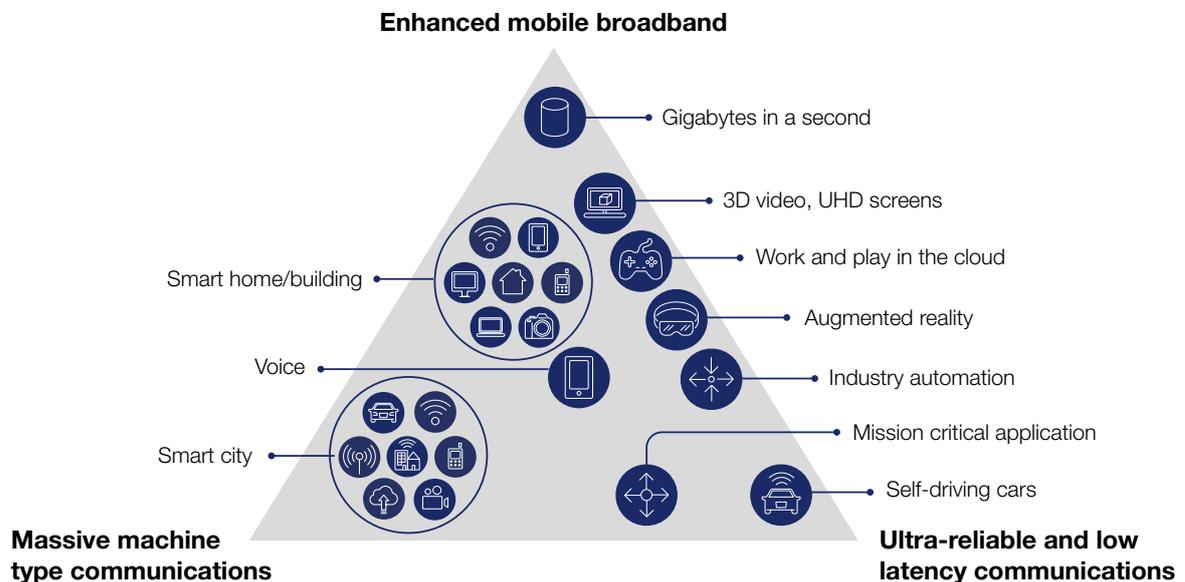
A wealth of new opportunities

Most critical communications services are still running on dedicated narrowband networks – digital or analogue. However, these technologies have limited data capabilities. Rich and abundant data can help make critical operations more efficient and deliver better situational awareness. A better picture of what is happening allows faster and better decisions, making citizens, societies and infrastructures more secure.

4G/LTE already provides a good basis for critical communications users to extend their current applications to broadband networks, as well as to adopt new broadband apps. While 4G/LTE focused on delivering much faster mobile broadband services than 3G, 5G is designed to be a unified, more capable platform. It not only elevates **enhanced mobile broadband experiences** (more broadband capacity and speed), but also supports new services such as **massive machine type communications** (Internet of Things) and **ultra-reliable and low latency communications** that greatly improve reliability for mission-critical services and reduces latency by an order of magnitude.

Enhanced mobile broadband

- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application
- Self-driving cars

Smart home/building

Voice

Smart city

Massive machine type communications

Ultra-reliable and low latency communications

The three dimensions of 5G services (source: ETRI graphic, from ITU-R IMT 2020 requirements)

To give some idea of the new 5G capabilities and Agnet in mission-critical use, five fascinating examples of new kinds of use cases are outlined below.

5 examples of 5G in mission-critical use

5G network slicing - a new opportunity for MNOs

Fast, reliable, and highly available connection is a must-have for mission critical communications. Imagine emergency services being called to a block of flats due to a noisy disturbance. As well as the police and paramedics, the incident attracts people who overload network capacity by sharing video on social media. This could prevent the public safety professionals from sharing their own video.

Critical communications users need to get a connection when they need it – even when consumers or enterprise users may experience congestion. Previously, governments and organizations had to set up dedicated communication networks to get availability. 5G offers new technologies that lets different groups of users with different requirements share the same physical network.

With network slicing technology, one network can be divided into several virtual networks with different priorities and capacities. Each network slice is an end-to-end network with dedicated resources, which meets the defined needs and requirements of a specific user and application – the performance of each slice has no effect on the performance of another slice.

This means that public safety users and apps can get the service they need even in a congested network. But this of course depends on the user organization's service level agreement (SLA) with the MNO or other service operator.

A strong MCX solution, such as Agnet, supports priorities for mission-critical communications.

Security is a top priority
In addition to uninterrupted availability, strict data security is an absolute necessity for critical communications users. Network slicing technology also ensures that cyber-attacks or other security flaws only affect one slice. This guarantees that private information related to one slice is not shared among other slices.

MNOs hold the key

Mobile Network Operators are key players in the evolution of critical communications to broadband.

MNOs already offer mobile subscriptions to enterprises and to the public sector – and now, with the new 4G/5G capabilities, they can offer mission-critical broadband services.

Critical communications users have very stringent demands for availability, reliability and security. When these requirements are met, other MNO customers can also benefit from better network coverage and network security. Governments also win when there is no need to invest in a dedicated public safety network.

Airbus works closely with MNOs on many projects to provide critical communications services for public safety and other professional users.

Mission-critical Internet of Things (IoT) – case: vast forest fires

The Internet of Things (IoT) is developing rapidly, with the number of connected objects expected to reach 5.5 billion by 2028[1]. While there are a number of factors contributing to this rise, one of the key enablers is the development of 5G networks. 5G supports a far higher number of connected devices than current 4G/LTE networks.

In addition to the very low latency, 5G networks offer more stable connections. This is extremely important for any IoT connected devices, such as sensors that send real-time updates. All this creates demand and interest for new use cases in different market segments.

In the future, sensors, cameras and other automatic devices will be a significant source of data also for public safety and other professional users for improving situational awareness, and thus providing better support for critical operations.

Better situational awareness
If we imagine a forest fire, field commanders will need to know they have the right resources in place before the fire starts to spread. They also need to know the health and condition of each firefighter, especially if the operation will take a long time.

Firefighters wear protective gear equipped with IoT sensors, which track their position and measure certain environmental conditions as well as the physical condition of the person. By displaying this collective data on a map, field commanders get a complete overview of the situation, including real-time video from the firefighters' wearable cameras and drones. This allows the field commander to make faster and more informed decisions and give firefighters better instructions or orders – thus minimizing damage and improving the safety of firefighters.
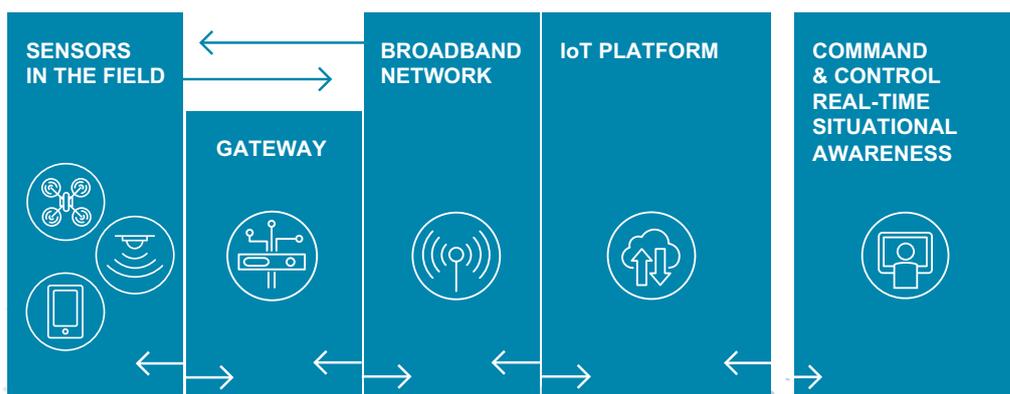
For example, the field commander can replace the firefighter with another team member and see on the display when the switch has taken place. Firefighters can also concentrate on their tasks, knowing that the system will alert them if it notices a risk to their personal safety, for example by warning of excessive carbon monoxide levels.

This is just one example among many of the use cases of mission critical IoT technologies in public safety. Airbus has showcased the use of mission-critical IoT in public safety, for example, by running a forest fire trial with Emergency Services Academy Finland and Suomen Erillisverkot Oy – the operator of the nationwide public safety radio network VIRVE in Finland.

Learn more, see the video
https://vimeo.com/657327288

Mission Critical IoT architecture

SENSORS IN THE FIELD		BROADBAND NETWORK	IoT PLATFORM		COMMAND & CONTROL REAL-TIME SITUATIONAL AWARENESS
	GATEWAY				

[1] Ericsson Mobility Report, November 2022

Private 5G networks – case: faster aircraft turnaround time

Private 5G is a mobile network reserved for an organization's exclusive use. These are ideal for facilities such as industrial sites, ports, sports stadiums and airports, which have a relatively large number of users and/or connected devices in a small area, with specific user needs.

For example, airports bring a lot of things together: passengers, airlines, airport security, check-in facilities, baggage handling, passport control, gates, ground handlers, authorities, and airport management. All these functions need to work together seamlessly to minimize aircraft turnaround time, while keeping customers satisfied.

Dealing with the unexpected
Turnaround teams must be able to deal with unexpected events quickly and reliably. Failing to do this can cause aircraft to miss their departure slots, which is costly.

To minimize delays, the right people need to be able to share the right information at the right time. With a modern collaboration solution, you will know how aircraft turnaround is proceeding, be aware of potential disruptions as they happen, and can contact the right people at the right time – no matter what technologies they are using.

In addition to timely communication between different teams, efficiency can be further improved by automating processes. While relevant data is automatically shared to all relevant parties without delay, required resources are available in the right place at the right time. This helps airports become more efficient, saving money and improving customer experience, as well as reduce environmental impact. In addition to efficient operations, air travel safety is of paramount importance and so security requirements are similar to those required in public safety.

There will be significant savings for those who get things right. Communications over private 5G broadband networks can improve efficiency and security and help optimize both capital expenditure and operating costs.

Agnet - when time really IS money

Agnet from Airbus makes it easy for airport operations partners to share the right information securely and efficiently, and cooperate seamlessly together. This speeds up turnaround times – thus saving time and money, as well as improving the airport's environmental footprint.

In addition to private 5G networks, Agnet supports MNOs' public 5G networks, for example with network slicing mechanisms, or hybrid networks combining private and shared networks with 4G and 5G technologies. Agnet can also work seamlessly in parallel with your existing narrowband system (TETRA, Tetrapol or P25), removing the need to modify existing processes and systems.
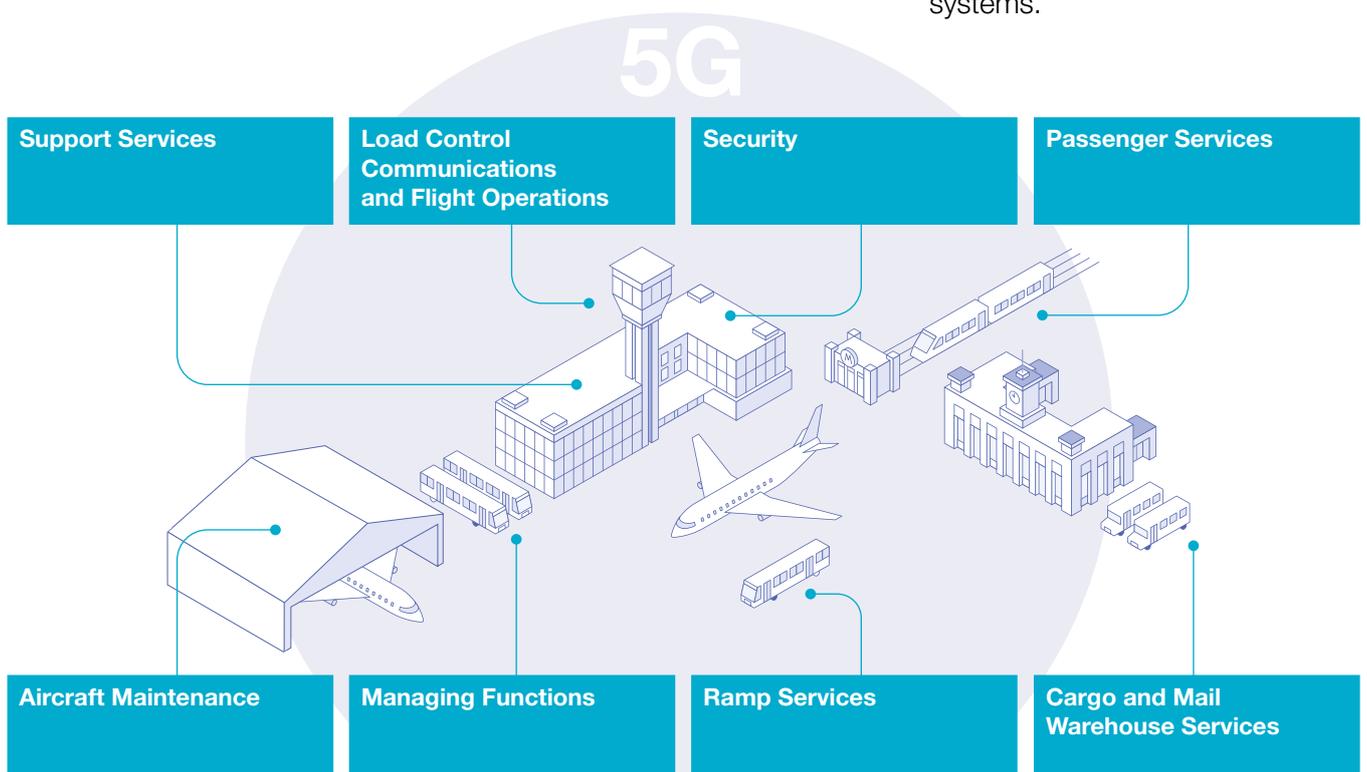
Deployable 5G networks and satellite communications

In mission-critical operations, fast, reliable, and available connectivity is essential whenever and wherever the operation takes place. Deployable networks, also called "tactical bubbles" or "Cells-on-Wheels", are a good choice, especially in rural areas, where coverage and capacity can be limited. Even with a good signal at the edge of a cell, there may not be enough capacity for real-time video apps, for example. Therefore, deployable extra coverage and capacity may be needed.

A deployable network may provide centralised services remotely via terrestrial 4G/5G networks or satellite services. Limited services can also be provided locally without connection to remote resources. In this case, local computing resources and application services, such as Agnet, are needed to provide mission-critical broadband services to professional users.

Although 4G is sufficient for deployable networks, 5G provides additional capacity. It can serve large, multi-agency operations, in a small geographic area with a lot of capacity. The low latency of 5G also allows effective control of drones.

**5G and satellites – the best of both worlds**
Combining 5G technology and broadband satellite services acts as an effective backup to terrestrial 4G/5G networks, such as MNOs' services.

Deployable networks with a satellite connection can be used to build coverage and capacity in areas where a terrestrial network is not economically viable, such as mountainous or coastal areas.

Alternatively, they can be used as a backup during communication breaks due to storms and power outages. They can also help overcome interruptions due to cyber-attacks, or to provide extra capacity in extensive missions like forest fires. Sport events or international summits can also be covered.

Deployable networks are usually installed on a transport platform, such as a vehicle, vessel, or drone. The deployable network must be quick to set up, with installation time of a few minutes rather than hours. Security is even more important, especially for deployable networks in public safety use.

Agnet has been successfully tested with the new Low Earth Orbit (LEO) satellite services, with the user experience found to be comparable to that of a terrestrial 4G network.
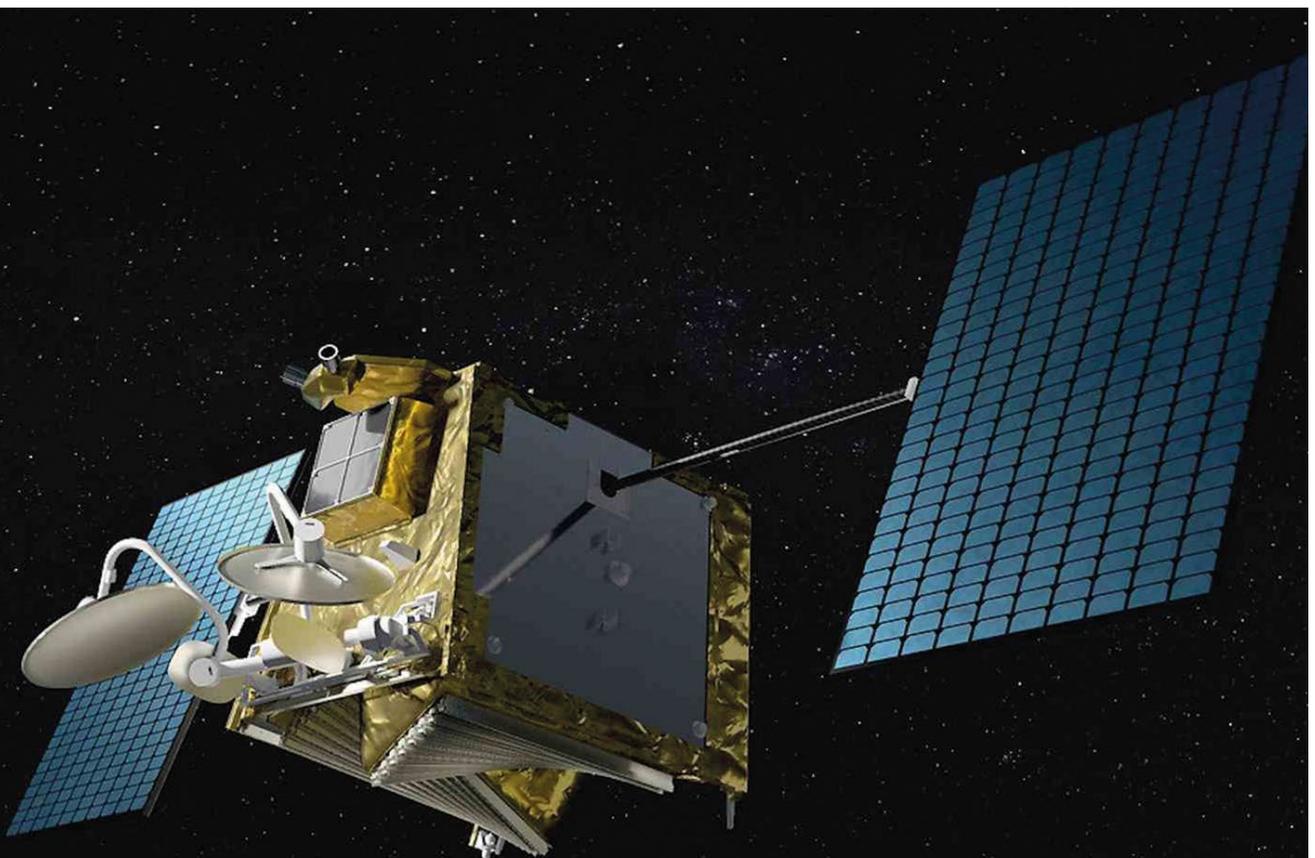
Cross-border operations – case BroadWay in Europe

In a global world, threats do not stop at the border. The importance of close cross-border cooperation is increasing, requiring seamless critical communications across borders.

Finland, Sweden and Norway are good examples of seamless cross-border cooperation. These countries' nationwide TETRA networks are connected to ensure different authorities can communicate with each other securely and reliably across borders.

Broadband capabilities enable new services also in cross-border communications, such as reliable access to video, multimedia, files, and location information. 5G technology will also enable new security measures. For example, in the roaming interface, which allows users to communicate regardless of the available network, 5G requires the encryption of signaling between visiting and home operators. This means that users do not have to think about the security of the network or the network they use, and can simply concentrate on their duties.

In addition, in 5G, user identity is encrypted and the authentication and authorization are done by the home network. This means that organizations and their 5G home operator can maintain their privacy and control regardless of the network they use, even in cross-border communication.

Better cooperation across borders

These new broadband capabilities help improve emergency response, and ultimately save lives. This has also been the motivation for the Broadway project, which aimed to create modern critical communications capabilities to improve cross-border cooperation for European public safety authorities.

A considerable number of organizations were involved in the project working side-by-side: 11 EU countries, 49 responder organizations from 14 countries, such as police, fire, emergency medical services, and 60 additional organizations who supported the project.

Airbus led a consortium that designed, developed and successfully demonstrated two full-scale field tests of cross-border operations – a forest fire in Ljubljana, Slovenia and a car chase of a drug dealer in the Kerkrade region on the border between Belgium, Germany and the Netherlands.

The Airbus consortium set up the entire field test networks to facilitate the real-life scenarios in different countries. Agnet's mission-critical services gave first responders reliable access to voice, data and video. These services were seamlessly available for the users regardless of the network connection, thanks to the common user interface. In other words, users were not restricted to stay within the range of their home network.

Vodafone, one of the members of the Airbus consortium in the Kerkrade field test, implemented mission-critical features, such as Quality of Service (QoS) and Allocation and Retention Priority (ARP) in their network. This allowed user applications such as push-to-talk and push-to-video to work seamlessly and without any capacity issues.

The next step will be the BroadNet project, which will further pave the way towards seamless cooperation across borders.

5G and Agnet – A solid future for professional users

Mission-critical push-to-talk (PTT), push-to-video, and data can be available as applications over 5G networks. These standardized application services (called MCX) are an essential part of the new broadband services for public safety and other professional users.

Agnet from Airbus is all about secure group collaboration. With it, professional smartphone users become part of the professional world – voice, data, video and location services are all at hand with the reliability and security that professional users expect. In addition, Agnet gives smartphone users easy access to a wealth of secure, professional features, such as dispatching and voice assistant.

Agnet is ideal for professionals seeking a modern, easy-to-use and flexible collaboration solution. It scales from simple mission-critical push-to-talk (MCPTT) to an extensive group collaboration solution, taking full advantage of smart device capabilities in a secure and controlled way. Agnet can be used over a 5G connection in the same way as 4G/LTE networks – either on commercial or private networks. In addition, Agnet supports Wi-Fi and satellite connectivity.

4G and 5G working together
Hybrid use of 4G and 5G

technologies is also possible with Agnet. Essential staff can be easily and securely connected, with no manual intervention from the users. The prerequisite is, of course, that smart devices and the network support both technologies.

5G technology can be introduced in areas where more capacity is needed for MCX functionalities, and the number of users is the highest and expanded gradually as needed.

Familiar 4G functions also work in 5G networks, such as traffic prioritization features that ensure high reliability and usability even in a congested network. That is why Agnet is a future-proof solution, as the transition from one technology to another is an easy step.

However, this requires planning, as well as new kinds of technical skills and resources that many organizations may not have. With professional services from Airbus, organizations could minimize risks, make full use of the new broadband features and minimize the project duration.

Transition from 4G to 5G also preserves the investments made in Agnet, so there's no reason for public safety or other professional users to wait before getting started with broadband migration.

Learn more about Agnet
https://www.securelandcommunications.com/agnet

Airbus offers the necessary expertise

Airbus has long-standing relationships with numerous customers, some spanning decades. This has given Airbus an excellent understanding of the requirements and needs of critical communications customers.

The five selected use cases show the various new possibilities for professional users by combining 5G technology and Agnet. These illustrate the solutions that meet the needs of Airbus customers.

Airbus is working with its customers in broadband projects to create flexible roadmaps that ensure a smooth migration by putting user needs at the center.

This, combined with technical expertise and a deep understanding of the opportunities offered by the latest technologies, makes Airbus an excellent partner in your migration project.

Contact Airbus experts and your broadband migration project will run more smoothly.

https://www.securelandcommunications.com/contact-us

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