



# ***MEETING THE FUTURE COMMUNICATIONS REQUIREMENTS OF PUBLIC SAFETY AGENCIES***

CURRENT LOCAL TIME: 4:27:19 PM CST

LATITUDE: 34 DEGREES 22 MINUTES

LONGITUDE: 108 DEGREES 42 MINUTES

ELEVATION: 1,329 FEET

LAND AREA: CITY

AGE: 32

GENDER: FEMALE

SENTENCED: NEVER

RECORD: 2 CONVICTIONS

IN PAST YEAR





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## Foreword

I write my foreword to our annual Technology Guide as the governments worldwide plan curbs on excessive risk-taking among banks: a strange place perhaps to begin discussing public safety communications. But stay with me – for the turbulence in global economies has some way to go before it stabilizes. And while legislation may head off similar crises, public safety agencies face an uncomfortable truth: the budget belt is tightening as governments focus on slashing deficits.

Financial uncertainty comes at a difficult moment. The worldwide security situation remains toxic with the specter of terrorism omnipresent. Meanwhile, organized crime is increasingly cross-border in nature. People and drug trafficking rackets are managed by ever more professional gangs and require regional and global initiatives to curtail their activities. In short, as budgets fall, demands on agencies are rising. These conflicting trends ensure we're aware of the need to help agencies do more for less. With this in mind, the Guide focuses on current and changing operational demands, and how technology is evolving to help address them. It's designed to stimulate discussion and build knowledge, with the overall objective of assisting agencies in understanding, planning, and budgeting to enhance existing, and deploy new, technology to support officers in advancing their safety, performance, and efficiency. The discussions are divided as follows:

- **Section one – the changing demands of public safety agencies, page 6:** Here, we briefly touch on the progress of public safety communications to date. We also highlight changes to the way agencies are working, which we believe technology must adjust to if communications systems are to ensure teams have the tools required to successfully manage their missions. The analysis concludes by pinpointing the three key expectations that we believe customers have from public safety communications systems.

First is the demand that the benefits delivered by databases such as the PNC and Home Office Large Enquiry System (HOLMES and HOLMES 2) should be extended by enabling officers to update these systems while mobile, as if they were in the office. So increasing the amount of time teams spend on the beat and directly addressing the need to optimize resources.

Second is the increasing need to access applications across borders – regional, national, or international: wherever teams go, including beyond their usual jurisdiction, technology must deliver the information and services operatives require to successfully conclude missions.

Third, customers are increasingly interested in how the latest technologies delivering wireless broadband for public use can be applied in public safety. This development will support accelerated data enabling the transmission of video and the faster accessing of databases.

- **Section two – How technology is evolving to address the operational demands of public safety agencies, page 12:** Technology comes under the spotlight as we touch on the technical enhancements that help meet agencies' changing requirements. Mindful of the need to keep the lid on costs, the analysis touches on the ongoing importance of TETRA as the cornerstone of public safety networks, systems that advance application connectivity including TETRA Enhanced Data Services (TEDS), and innovations to improve radios and devices. Furthermore, we discuss the opportunities – and the challenges – offered by new 4G wireless broadband technologies to support field teams with faster access to applications.
- **Section three – Meeting future communications needs – Why Motorola? Page 20:** We understand that investing in technology should improve agency performance and not divert manpower to overseeing its deployment. We're here to help, offering the know-how to help you evolve communications networks in a cost-efficient and structured way, ensuring teams remain concentrated on the principal mission: protecting the public.

We endeavor to convey our views in simple and clear terms. The narrative signposts how, by making better use of current systems and with astute investments in technology, teams have everything they need to conclude tasks safely and efficiently against the backdrop of an increasingly testing environment.





## **SECTION ONE: THE CHANGING DEMANDS OF PUBLIC SAFETY AGENCIES**

Based on insights into Motorola's continual discussions with public safety customers, this section of the paper reviews how technology will need to evolve to address the changing demands of public safety teams. It covers the following areas:

- The challenges faced by public sector teams – both nationally and internationally.
- How should communications technology better assist field teams?
- How will public safety communications networks evolve in the future?

### **The challenges faced by public safety teams – nationally and internationally**

Development of databases such as the UK's PNC, HOLMES, and HOLMES 2 has made a huge contribution to fighting crime. Agencies are increasingly keen to ensure that the benefits of these systems are optimized through enabling them to be accessed and updated from the field by officers as if they were in the office. In short, the objective is to free officers to spend more time doing what they find rewarding – tackling crime – and less time tackling paperwork.

The availability of a secure, robust, and dedicated communications system in the form of TETRA has opened the door to mobile database interaction. But while there are some highly innovative and sophisticated applications in operation across Europe, a key focus for vendors moving forward is to enhance the range of data services available to field teams.

Motorola believes that, moving forward, more work is required to develop standard database forms for data entry and enquiry mechanisms. This will support officers in efficiently creating high-quality records that can be immediately accessed and used as soon as they are created in the field. If the application development work is conducted at a national level, as is the case in some countries, and rolled out to regional teams, added benefits will accrue. For instance, national training programs can be created for officers, while the duplication of effort and costs synonymous with individual forces developing their own applications are bypassed. This is especially important given looming financial restrictions.

Looking at the broader picture across Europe, technology must evolve to assist the fight against international crime. Drug and people trafficking are truly crimes without borders that are growing in prominence. Agencies are looking for technology to support not just national, but international roaming; providing personnel with fingertip access to the communications and applications they need to operate safely and effectively. As the range of applications available increases,

and becomes more advanced and complex, the devices operated by teams must likewise be refined to provide a strong user experience.

### How should communications technology better assist field teams?

In future, communications networks will provide faster data speeds. While this is an important improvement, vendors must not allow the design of users' radios to lag behind network and applications improvements. The problem is that, as the range of applications expands, the usability of the device can be impeded.

It's clear from discussions with customers that the ease of use of the device is non-negotiable; officers working in high-pressure situations must have instinctive access to key functions. This is critical to ensure that they continue to view their radio as an essential companion to safely and efficiently completing missions. In relation to this, Motorola expects to see some of the features developed for smartphones in consumer markets, such as touch-screens and voice commands, become available on public safety radios and terminals.

### The drive for spectrum

Aside from the technical issues addressed in this paper, perhaps the most fundamental issue facing public safety communications is the scarcity of dedicated radio spectrum for the sole use of first-response teams. Jeppe Jepsen, director government relations, Motorola, represents the views of Motorola's customers and the wider industry to lobby European legislators to reserve segments of the radio spectrum for public safety use. He comments: "Spectrum is of course a limited and valuable commodity which makes competition for it that much more intense. To date, the mobile communications sector has been more aggressive and effective in pressing the case for spectrum to be set aside for commercial use in Europe. This in mind, public safety organizations at a local and EU level must continue efforts to press the critical case of the benefits of society of protecting spectrum for the sole use of first-responders to effectively manage emergencies. We're seeing progress in this area – most notably with the European Council agreeing to work to define more bands for public safety and we will continue to work alongside other vendors and customers to see this commitment become reality. Successfully addressing this issue is vital to the future availability of robust, high-performance communications networks."



Motorola is also focused on advancing one of the most prized assets of TETRA networks: the ability to support team communication. Whenever discussions take place with customers about key features, time and again the value of teamwork and real-time collaboration is underlined. Understanding this imperative, the company's designers are always looking for ways to build on the group-calling and collaboration features offered by devices. And in the future, there will be scope to add features such as video communication between teams as access to higher speed data increases.

#### **How will public safety communications networks evolve in the future?**

Perhaps the most important technical advance is that the speed of data communications networks is set to accelerate. TETRA's data capability is set to be updated through TEDS, while broadband wireless systems designed for public use also have applications across public safety. Motorola believes that the core voice and data services accessed nationwide by public safety teams will continue to be serviced by TETRA for the foreseeable future. But technology is changing very fast. And agencies seek clear guidance about not only the capabilities of new technology such as broadband on-the-go, but its costs and when operational demands dictate the deployment of high-speed networks.

Motorola is also working with agencies to understand how applications will change to enhance services available to field teams as IT systems become ever more interconnected, and the speed of networks improves. For instance, if a crime is committed and a person has been released from jail recently in the area with a history of similar offences, analytical back-office systems could proactively flag possible suspects to field teams.

There's also much debate in the industry about the potential of using streaming video collected from fixed, vehicle and body-mounted cameras to provide operational "eyes" over a situation. Firefighters for example see huge value in using infrared helmet cameras to send pictures back to control rooms and help locate people inside smoke-filled premises. And video certainly looks to have a role to play in the policing of crime hotspots, city centers, and major events. Indeed, we expect deployments of video systems to gather pace over the next few years.

Based on the above analysis, Motorola believes that the primary demands that agencies have for public safety communications can be categorized into three areas:

- **Mobilizing information – the office on the beat:** Providing fast, reliable and full-featured access to the applications which officers use in the station when mobile.
- **Removing the border barrier:** Borders must not be barriers that prevent users from accessing critical information and communications services as they cross from one region to another or one country to another. As teams increasingly fight crime on international fronts, they should be able to rely on the radio lifeline wherever they go.
- **The potential for future broadband services:** 4G broadband systems developed for the consumer sector have the potential to enhance existing and distribute new services to teams including video. But agencies need to fully understand the ideal deployment scenarios, limitations, and costs of broadband systems to optimize the technology's potential to advance operational performance.

The following section analyzes how technology can help deliver against these expectations.



## **SECTION TWO: HOW TECHNOLOGY IS EVOLVING TO ADDRESS THE OPERATIONAL DEMANDS OF PUBLIC SAFETY AGENCIES**

### **Mobilizing information**

TETRA has made progress in enabling teams to access information in the field, from vehicle checks to the electoral roll and missing person's register. But, as discussed in the previous section, there's a definitive need for officers to have more scope to file reports and update or amend database entries from the field. As enhanced mobile interaction with resources such as HOLMES and HOLMES 2 becomes available and is deployed to a wider number of users, a number of technical building blocks are needed to support a strong user experience. These building blocks – as detailed below – include enhanced capacity networks, collaborative devices, device ergonomics and design, and flexible applications.

- **Enhanced capacity networks:** TETRA provides the cost-effective, resilient network capable of accessing data nationwide. The deployment of TEDS (part of Release 2 of the TETRA standard) ensures that many current systems can be upgraded, and new TETRA infrastructure installed by Motorola is usually specified to be fully TEDS capable. TEDS offers a range of advantages. It provides the same cost-efficient coverage footprint as TETRA, but with faster data speeds. Across very wide areas, TEDS enables enhanced information access and data input. So officers can query systems, report from the field, access images, and potentially be sent small CCTV clips to assist in suspect identification. Also, short audio clips (e.g. witness interviews) can be recorded and sent to the office from the field.

In metropolitan regions, there's increasingly greater pressure on network capacity. This is because of the higher number and density of users. There's also a larger concentration of vehicles in the locality equipped with powerful in-car terminals capable of managing complex tasks and inputting more information. And, more advanced data-hungry applications will be available in cities. Motorola therefore expects to see new 4G network technologies being used alongside TETRA networks.

Where 4G services are available, they may be used to manage day-to-day data applications. But as users move beyond the range of the 4G network, applications will automatically utilize other available bearers such as TETRA – without the user's input – with the applications adjusting to the available data rate accordingly.

- **Collaborative devices:** Devices will increasingly provide flexible connectivity to enable collaboration between different terminals. In the immediate future, it is likely that public safety radios will also include Wi-Fi and Bluetooth® compatibility for data communications. With Bluetooth, officers can easily send data from their radios to other devices such as computers back at base to enable the simple download of information, or to print information in the field.

As 4G networks become available, Bluetooth will also support the transfer of data between, for example, a handheld device and a vehicle terminal equipped with 4G connectivity; within the public safety field the first devices for 4G networks will be in-car terminals, simply because there are fewer space and power limitations when designing the units. In this scenario, an officer can take a witness or crime statement using their TETRA radio or PDA. When they get back into the vehicle, Bluetooth will automatically sync the officer's personal device to the in-car terminal. This will then communicate the information back to base using the high-speed 4G network.

In the future, if an agency has access to TETRA and 4G networks, it might mean that users need to carry two devices. However, feedback from Motorola's design team, which continually engages with end users, is that, providing products are compact, there's no issue with this. The challenge for designers is to ensure that the devices are "collaborative" – seamlessly interacting as described above to provide a seamless experience for the user. Over the longer term, there is a possibility that a single radio will enable connectivity over both TETRA and 4G networks. However, this development is currently some way off.

## 4G networks overview

4G is the generic term for next generation mobile networks and also wireless technologies that deliver broadband-on-the-go.

The new mobile technology that's set to be installed in some mobile networks this year is called LTE. While LTE has the potential to provide services to public safety users, it will be some while before the networks are commercially proven and enhanced services developed to meet the needs of public safety agencies. Over the next few years, the 4G technology that holds most promise for public safety is WiMAX. WiMAX, a wireless broadband technology, is deployed widely across the globe.

For the vast majority of agencies, TETRA (with TEDS) will continue to be the cornerstone communications network. This said, in city centers where there's a need to support advanced applications, e.g. video, or provide the capacity for large numbers of users to access information and services, WiMAX networks can be built to complement TETRA.



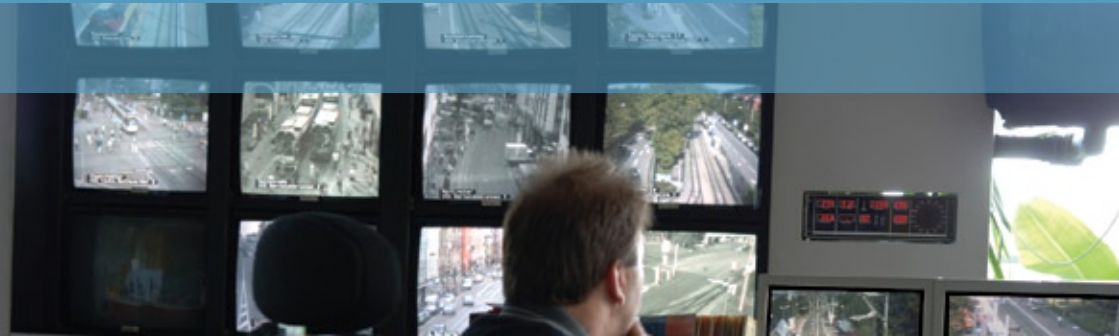
### Can 4G be deployed nationwide?

It's technically viable to build 4G coverage for nationwide public safety use. But financial considerations and limited spectrum availability currently make such an option unlikely. The technology is therefore best suited to complementing TETRA in specific areas, supporting officers in policing city centers, crime hotspots, and major events.

Motorola is developing "hardened" 4G networks. This specialized equipment provides the resilience and ruggedness demanded by public safety teams who cannot have communications falling over for any reason.

### Public or private 4G networks?

Agencies weighing up 4G should evaluate whether they rent access to networks run by commercial operators or build their own systems. Commercial networks are not constructed to the same resilience as public safety infrastructure. As seen with mobile networks in the past, public systems are liable to failure in the event of a crisis due to the high volume of emergency-related traffic. Indeed, while installing a private system requires significant investment, there are significant benefits; by controlling their own equipment, agencies can guarantee the communications, performance, security, and high-availability that's the prerequisite of successful public safety operations.



- **Device ergonomics and design:** There's a clear expectation from end users that, as applications used by officers become more advanced, radios must remain very easy to use. Motorola expects to see more PDA-style products coming to market with touch-screen capabilities and full QWERTY keyboards to aid data entry. Screens will also become larger and capable of displaying more detail to prepare for video communication. Motorola will also maintain its focus on developing specific devices for different types of users, including covert radios for surveillance, devices capable of capture and transmission of video, and more powerful in-vehicle terminals with command and control functionality.

Also, research continues at pace to develop clever ergonomic accessories including discrete microphones and lightweight body-mounted video surveillance systems. As devices change, so will application design.

- **Flexible applications:** Motorola believes there is a clear cost benefit in creating common applications at a national level that can be used locally. For this to happen, the different devices and IT systems in use by the broad range of agencies mean that any application platform must meet two key requirements: it must be flexible enough to provide access to national services and it must seamlessly integrate local applications (such as resource management, local intelligence, etc.).

Consequently, in Motorola's view, it will be necessary to adapt and optimize existing client/server architectures deployed in the enterprise sector for use over the wireless radio system. Motorola already makes Application Programming Interfaces (APIs) available so a wide range of partners can develop services on its TETRA networks and devices. And it's pressing for common interfaces to be shared by vendors to make it simple to develop standard applications that can be easily customized for use on mobile devices and integrated within local IT systems.

Furthermore, the application itself must be able to understand over what network it's being accessed and by which type of device: for instance, whether an officer is working on a radio with a small screen across TETRA, or is using an in-car laptop in a city connected over a high-speed 4G system. Based on these variables, the application can decide if it's necessary to restrict some features and how information is presented to deliver a strong user experience – or to restrict the type of information sent over each bearer.

### Removing the border barrier

As users roam across borders, their radios must automatically connect to the network within the country they're visiting. Motorola is working with other vendors under the auspices of the TETRA Association to define Inter-System Interface (ISI) standards with the objective of ensuring that equipment from different manufacturers can support continuous operation.

Technology also needs to be built into the device itself with the primary role to authenticate the "visitor" as they "sign on" to the new

network. Also, discussions are under way to agree protocols, again managed through the device, to validate user requests. This will allow visitors to use not only radio communications, but access databases and applications available to local law enforcement agencies. While this may sound a complex process, once standards are defined for cross-border TETRA connectivity, the physical connection of different networks is a relatively straightforward task.

In the future, cross-border connectivity may also entail enabling officers to connect to 4G networks that will increasingly be deployed in a public safety context to deliver broadband data services to field teams.

### **The potential for future broadband services**

As outlined, TETRA will remain the cornerstone network for public safety voice and data communications. But 4G networks offer the potential to enhance capacity where large numbers of officers may be simultaneously using communications and data services. There is also much debate in the industry about the option of using broadband to support video applications.

But it's important to understand how video will be used by teams to properly evaluate its operational impact. Fixed video security systems are widely used in city centers and Motorola believes that there's only a clear operational case for investing in broadband if mobile video capabilities are required. Mobile video means the streaming of video to control rooms

to provide a comprehensive "eye" across an area or operation, including images shot by officers using handheld wireless or body-worn cameras, footage collected from body-worn video kits, and video taken from cameras in patrol cars. In this context, video can support:

- **Preemptive action:** Commanders can see where trouble spots are brewing and defuse them.
- **Crime reduction:** Awareness that an area is covered by video surveillance can reduce crime. Indeed, a Motorola deployment of video security for the Los Angeles Police Department has seen incidents of criminal activity cut by 40 percent. This reduction in problems can also have a beneficial knock-on effect in terms of policing costs and post-crime activities that can help build a business case for a video system, in part, paying for itself.
- **Spotting suspects:** Facial recognition technology can be used in control rooms to identify suspects or troublemakers. Stills or video clips can be sent to field teams if needed – e.g. to pull suspects from a crowd.
- **Faster response:** Video clips or images in high-definition can be sent to field teams to assist in finding suspects or locating missing persons.
- **Resource allocation:** Enhanced situation awareness enables dispatchers to improve resource allocation and the safeguarding of teams. When a situation occurs, cameras can be quickly switched to focus on an incident – responding, for instance, to calls for help from an officer.
- **Evidence:** Video provides irrefutable evidence for prosecutions.
- **Training:** Video can be analyzed post operations, enhancing training by understanding how an event unfolded and the impact of decisions taken by dispatch teams.

Due to the cost of deploying 4G networks, along with the operational need that's focused on providing greater network capacity in busy areas, broadband technology for the foreseeable future will be deployed locally, in city centers, around stadiums, and transport hubs. As officers move away from the 4G coverage area, they will still be able to access data services but at reduced speeds over their TETRA device. The TETRA radio will also control all voice traffic.

Already Motorola is building video networks for public safety, a trend that will gather pace over the next 12-24 months. Assessing current and future communications needs for public safety agencies can seem a challenging task, especially as the range of applications and user requirements are changing so fast. Motorola is on hand to help.

### **Keeping Abu Dhabi's police officers in the picture**

Motorola is deploying a real-time video streaming system for the Abu Dhabi police force. Video is collected from mobile cameras in cars and wearable video cameras used by patrol officers. The images are streamed live, can be recorded in crystal clear high-definition (gone are the days of grainy CCTV images), and are made available in real time to five command centers across the Emirate. The video is complemented by Motorola's MotoLocator software. It details the position of teams and the skill sets of officers to provide commanders with the intelligence to take more effective decisions. The system can be connected to other applications used by the Abu Dhabi police, including fixed camera installations, automated speed tracking of vehicles, facial recognition, and automatic number plate identification. In future, National ID, electronic passports, and fingerprint reading capabilities will be added.



## **SECTION THREE: MEETING FUTURE COMMUNICATIONS NEEDS – WHY MOTOROLA?**

TETRA is uniquely qualified to remain the foundation communications network for public safety agencies. It provides exceptional security, reliability, and continuous operation with the advanced voice services that users require. TEDS capabilities will increasingly be introduced on TETRA networks to provide organizations with higher speed data over wide geographic areas. Similarly, Motorola expects mission critical broadband systems to be more frequently deployed to complement TETRA/TEDS coverage. Broadband will deliver video and rich media services to support operations in cities and oversee major events.

Initially, broadband will be provided by WiMAX, with mobile phone networks offering the potential to provide complementary high-speed data services in the longer term once the technology is proven in commercial markets.

Deciding if broadband coverage is required, whether to build a private 4G system or access public networks (with the issue of purchasing an operating license to address too), along with network deployment, integration, and management, can appear a challenging prospect. Motorola is here to make it easier.

Its experts are on hand to advise on network strategy and planning. Its knowledge in TETRA/TEDS is unparalleled, and the company provides specially designed “hardened” 4G WiMAX, and in the future LTE infrastructure, to deliver the ultra-resilient network performance mission critical users require.

Motorola's services division is also available to provide a range of support including building, operating, and maintaining networks to key performance indicators. Costs can be predefined, so agencies have a transparent view of budget requirements – especially important when systems are financed from the public purse.

Public safety agencies are focused on delivering quality services in the toughest of environments. And against the backdrop of reduced budget cuts, the expertise of Motorola enables professionals to focus on what they do best, fighting crime and protecting the public, rather than diverting the agency's attention and resources to the design, installation, operation, and maintenance of communications networks.

For further information about the communications needs of public safety users, how these are changing, and how technology will address them, please visit [www.motorola.com/publicsafety](http://www.motorola.com/publicsafety).

#### **Prominence in public safety**

Motorola has unparalleled experience in all of the technologies used by public safety agencies including TETRA, TEDS, radios and terminals, applications, and new 4G broadband systems including WiMAX and LTE for mobile networks. On the TETRA front, we implemented the world's first TETRA network at Oslo airport, have installed over 10 nationwide systems, and deployed many of the most high-profile systems including those of the London Underground, the UK's Airwave, Bangalore Airport (servicing 45 million passengers a year), and Beijing Police's TETRA networks used extensively over the recent Olympics.

In 4G networks, Motorola is similarly well qualified to help public safety agencies understand the operational value and costs of broadband services to help make the right decision about when and how to deploy the technology. The company has constructed 35 major WiMAX systems including the first nationwide network (for Wateen in Pakistan), with coverage supplied by 10,000 access points. Motorola is also heavily involved in the development of LTE technology that provides broadband over mobile networks; its technology is being tested in the field by a number of global network operators.

Motorola also leads innovation in video streaming, compression, access systems, and devices and is leading the design of rugged and resilient video applications for public safety users.





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