Critical Communications Networks

Fail-safe, secure, reliable, and efficient communications for the emergency services, public sector, and businesses


POLICE

DEFINITION OF TERMS

Throughout this guide, there is reference to "Mission Critical" and "Business Critical" networks:

Mission Critical communications:

This term is applied to describe the networks specifically designed for public safety teams (e.g. police, fire and rescue, and the ambulance service) to guarantee robust, fail-safe, and secure voice and data communications.

Business Critical communications:

The technology is also increasingly used by businesses. Termed "Business Critical communications," companies are investing in dedicated private networks to oversee the safety of field workers, increase productivity, and maintain business continuity should unforeseen incidents occur.

This guide reviews recent enhancements to the TErrestrial Trunked RAdio (TETRA) standard for Mission Critical and Business Critical communications. It discusses new applications and services. And, with reference to innovative installations of the technology, explains how these are enhancing operational efficiency in both public and private sectors. It also illustrates why new business models are ensuring that networks are more cost-efficient to build, access, and operate.

The analyses provide informative guidance for both public safety/government organizations and businesses, assessing the case for investing in "no compromise" Mission Critical and Business Critical systems. There are three sections:

OVERVIEW

Section One: TETRA – Advancing Applications and Services

The first part of this guide reviews recent amendments to the TETRA standard. With insights into leading installations, the analysis explains how new applications and services are empowering public safety organizations to improve service delivery and crisis management. The spotlight also focuses on private enterprises; demonstrating how networks provide employees with an extensive set of communications and data tools to enhance their safety and efficiency in the field.

Section Two: Growth in TETRA Networks

As well as the technology, business models have evolved too. Together, these developments have seen TETRA networks deployed on a much wider scale in recent years. Both in terms of the range of sectors beyond public safety (including transportation, mining, utilities, and oil and gas markets) that the technology is used in and geographically: a number of nationwide systems are now up and running in Western Europe while the market for TETRA technology is also expanding in Eastern Europe, Asia, Africa, and Latin America. Factors behind the increased cost-efficiency in build and maintenance of TETRA networks can be found in section two.

Section Three: Evolution of Data

With a view to "what's coming next," the final part of the guide discusses the future for Mission Critical and Business Critical networks. It explains how the new extension of the TETRA standard, "TETRA Release 2", will provide a key advance for the future of Mission Critical and Business Critical communications networks; the specification includes the availability of higher data rates that will support a wide range of enhanced applications and services. For many customers, TETRA and TETRA2 with its TETRA Enhanced Data Service component (TEDS), will meet their needs for secure and available voice and data communications.

In parallel to TETRA's evolution, new technologies such as next generation "4G" wireless broadband solutions are becoming available. For some customers, for example those requiring broadband data rates, these technologies can be used to complement their existing voice and data services, although the vast majority of communications are still likely to continue to take place over TETRA (due to its unparalleled security, robustness, breadth of coverage, and flexible voice and data services). However, where a voice or data transaction is non-sensitive and complementary coverage is available via other technologies, services can be handled by these systems. Which network is accessed will be seamlessly managed by radios and terminals based on the type of information being communicated (its importance and level of security required) and, in the case of data, the size of the file.

SECTION ONE:

TETRA – ADVANCING APPLICATIONS AND SERVICES

At the start of the 1990s, Motorola was part of the consortium that initiated moves for a pan-European network standard designed for the unique demands of Mission Critical communications. The European Telecoms Standards Institute (ETSI) undertook to promote the cause of the TErrestrial Trunked RAdio (TETRA) system. In 1995, ETSI published the first TETRA standards.

The TETRA Association was founded around the same time. Among its duties are product testing and certification: processes that validate both the quality and interoperability of all approved TETRA equipment.

TETRA provides interoperable, secure, and fail-safe networks complemented by an extensive range of voice and data services. These features are also vital to businesses in industrial markets. And recognizing this demand, regulators allocated protected radio spectrum for both public safety and civil networks.

TETRA – Release 2

The TETRA standard has been injected with renewed impetus in recent years. There are several reasons for this: the availability of advanced multifunction end-user devices; increased interest from third party companies in developing applications and services for TETRA networks; and the publication of the enhanced TETRA Release 2 standard.

Motorola is already building networks that will support TETRA Release 2. Key features in the TETRA 2 standard include support for packet data at substantially higher speeds; improved spectrum efficiency and network capacity; extended reach (to 58 km radius) for increased coverage and low-cost deployments, and backward compatibility with TETRA Release 1.

Much of the interest surrounding TETRA Release 2 concerns the TETRA Enhanced Data Service (TEDS) component. Radio transmitters will be available in the 25 kHz, 50 kHz, 100 kHz, and 150 kHz range with initial deployments taking place using the 50 kHz version. These base stations will support data speeds up to 157 Kbits/s. With faster data, a wider range of field applications and services can be provided. These enhance the remote capabilities of officers and employees while improving the deployment and real-time management of field resources.

With reference to new applications, services and devices, and examples of leading TETRA networks, the following section looks in more detail at the technology's application and the benefits it delivers to users in both Mission Critical and Business Critical markets.

Radio Frequencies

Dedicated radio frequencies are protected by legislation for public safety use. Emergency services in Europe operate in the 380-385 MHz and 390-395 MHz ranges. Frequencies have also been allocated for private commercial networks in the 410-430 MHz, 870-876 MHz / 915-921 MHz, 450-470 MHz, and 385-390 MHz / 395-399 MHz ranges.

Although there are regional variations in the allocated spectrum (such as 350 MHz set aside for the public safety sector in China), the protection of radio frequencies is a key factor in ensuring equipment interoperability.

Airwave: 1.5 Million Calls in Five Days

An excellent example of the resilience and interoperability of TETRA systems is provided by Airwave's UK nationwide Mission Critical network. During the July 2007 London bombings the network came into its own. At the time, the G8 Summit was taking place in Edinburgh, Scotland, and many of London's police officers were seconded to the event. When the incident occurred, officers in Edinburgh could immediately liaise over their TETRA radios with colleagues in London to provide advice and agree on the personnel to be sent to the capital. The Motorola Dimetra IP TETRA network seamlessly moved from overseeing day-to-day conversations to supplying thousands of simultaneous calls: Between 2am on July 4 and 2am on July 9, it provided instant connectivity (in milliseconds) for over 1.5 million person-to-person and group conversations, with users operating a variety of handsets and terminals.

TETRA: KEY FEATURES, APPLICATIONS AND SERVICES

TETRA is designed through dialogue with end users to provide key features spanning interoperability and availability, enhanced voice services, security, data communications, and effective dispatch. These areas are reviewed in more detail below:

Interoperability and availability: TETRA delivers true interoperability and exceptional capacity. So single networks can accommodate all emergency services who communicate securely across their own partitioned areas of the system. And should an unexpected problem arise, these channels are connected to support instant collaboration between services locally, nationally, and with new developments such as the TETRA ISI specifications, even internationally across different networks. Such real-time cooperation optimizes the deployment, interaction, and ongoing control of the entire range of field resources that are able to work as one; ensuring that routine or crisis situations are resolved with utmost professionalism.

Voice quality: With TETRA, call clarity is exceptional thanks to digital technology and special coding algorithms that screen out background noise. So users can be heard, even against raucous backgrounds. In addition, individual or group calls can be activated at the touch of a button (Motorola's Dimetra IP TETRA network connects users nationwide in less than half a second). This feature supports the efficient allocation of field resources by automatically tailoring talk groups to match the needs of public safety teams as they tackle different phases of operations. These benefits are critical, too, to users in industrial markets. Employees working on industrial sites such as refineries, factories, and power stations can hear one another using rugged TETRA terminals. And, if the unexpected happens, networks remain working and call priority can be handed to emergency teams. This guarantees that contingency plans are instigated immediately and effectively: a feature that negates the possible impact of the crisis both on-site and in the surrounding environment.

Security: Communications security is a prerequisite for public safety organizations. TETRA networks deliver with a range of security measures covering information security, network access, and privacy.

TETRA: No Compromises

TETRA is unique in its ability to meet the needs of industrial users. Radios and terminals are extremely robust, are designed for safe operation in hazardous environments, and, with exceptional call clarity, conversations can be conducted between individuals or groups against even the noisiest of backgrounds. Moreover, facilities are often located in far-flung regions where there are no existing networks, and fail-safe, robust communications are required over extensive areas. The technology also provides a no-compromise approach to worker safety: employees can be tracked using GPS while workers can also use the "distress" feature of their radios to call for help should they need to.

Information security: In Mission Critical markets, operational activities may be severely compromised if voice or data messages can be intercepted – a problem that TETRA resolves. Unlike analog networks, scanning the transmission channels of Mission Critical networks produces no intelligible messages; thus ensuring an individual's privacy and safety. Motorola's Dimetra IP network also deploys "Class 3" encryption – the toughest level of defense for the air interface. For additional peace of mind, it also has an overlay option that applies end-to-end encryption – from the terminals and handsets to base stations – through the application of advanced Air Interface Encryption techniques. These measures deliver the strongest levels of protection available – ensuring the privacy of conversations and, just as importantly, the secure transmission of sensitive data – especially important for sensitive police and security operations.

Network access: A potential security loophole in networks – devices – is also addressed by TETRA. Authentication at the connection between device and network controls traffic to ensure that transmissions are from approved users. Moreover, if a terminal is misplaced or stolen it can be immediately disabled. Clearly, this is a central requirement for the emergency services. It's also a key advantage for enterprise users of TETRA, which can prevent unauthorized personnel listening to private conversations or viewing sensitive corporate information.

Privacy: TETRA allows networks to be partitioned. This ensures that different organizations have access to private communications for routine operations over their own Virtual Private Network (VPN) securely tunneled across the system. If interoperability between agencies is required, this can be immediately and securely provisioned.

Security and Safety at Barcelona Airport

Barcelona Airport has recently invested in a local TETRA network to provide secure and reliable communications throughout the facility. The system is based on Motorola's cost-efficient Dimetra IP Compact TETRA switch and base stations. A key factor behind the decision to install the network is based on its exceptional call clarity – clearly a key demand in a busy airport – which will enable employees to be in instant contact to optimize passenger services. A range of data services are also being customized to support fleet freight and logistics services provided by the airport.

Business Critical Security

The security of commercial information is, of course, critical for businesses too. This is especially true in markets such as oil and gas. Most core areas of companies' operations in this sector, from exploration to site performance, pricing, revenues, and reserves, are hugely sensitive. Indeed, communicating such valuable information is truly a Business Critical requirement. It must therefore be ring-fenced with impregnable security – a demand that's defined in regulation in many countries. Only TETRA provides the level of assurance that can provide robust operational integrity for all site-based voice and data communications.

Data communications

Mission Critical and Business Critical data is intelligence provided over dedicated, secure, reliable, IP-based networks; the information is delivered quickly with speeds that support a rich range of applications. The intelligence can be shared by all responders who benefit from its collective value, whether they're based in the control room or the field. Organizations are already benefiting from data solutions utilizing existing TETRA data services such as Short Data and Multi-Slot Packet Data, and the enhanced data rates which will be provided by TEDS in the TETRA2 standard will provide added capacity to support an evolving array of rich applications. At the same time, the availability of new multifunction radios and terminals is further extending the capabilities of employees to enhance productivity in the field.

Forewarned is forearmed: Dispatch teams can monitor situations and send information to emergency response officers about a call they're about to attend. The intelligence may include, for paramedics, statistics on likely injuries and the number of casualties. For fire teams it can include information on the possibility of hazardous substances being present in a building. In other situations police dispatch teams can assess the records of a suspect and review the types of officers available to judge the best way to approach the individual. These insights ensure that personnel are properly prepared for situations, improve detection, and can help predict and prevent illegal activity.

Keeping employees and officers in the picture: New devices such as the Motorola MTC100 TETRA PDA bring new capabilities to the TETRA market (such as larger displays and an operating system based on Windows Mobile®). For instance, in Business Critical sectors, train mechanics can be sent an image of a damaged tube train to advise them on the problem they'll face, and utility engineers can send site images back to base to ask for advice on how to repair a damaged component. In public safety markets, firefighters can transmit images to control centers for assistance in identifying symbols on chemical storage drums; police officers looking for a suspect for a street robbery can be sent real-time pictures of the individual from security cameras while paramedics can provide pictures of a casualty's injury to a remote specialist to seek treatment advice.

Advanced field-based detection: TETRA's data capabilities are supporting the development of a new range of advanced applications that enhance remote operations. For instance, in public safety markets, real-time field-based biometric systems are being launched. So officers can capture fingerprints for example and transfer

this data over the TETRA network during routine operations – such as a traffic stop – and immediately verify the person's identity against the remote database. The details are captured and checked in a matter of seconds. The facility saves time (officers don't need to spend hours transporting a person to a police station for identity checks), and puts more information in the hands of field teams to make more informed decisions that support safer environments for themselves and the general public.

Productivity and customer service: By applying TETRA's two-way data communication channel, field-based employees and public safety officers can also manage administration. New applications to improve device-based reporting while mobile include voice to text recognition, tablet and stylus data entry, and drop-down forms complemented by innovative on-screen keyboards. All forms can be customized to comply with audit procedures.

In private networks, field engineers can use their handhelds to log service requests and complete reports on work conducted. Couriers can also record customer signatures and remotely update central control systems to verify when packages have been picked up or dropped: an application that improves service by providing customers with real-time delivery status.

In public safety environments, officers can log incidents and update records on the fly so they spend more time patrolling rather than managing paperwork back at base. The administrative capabilities of TETRA systems are further advanced by Global Positioning Satellite (GPS) technology.

Enhancing Emergency Response in Zagreb

The Emergency Medical Center Zagreb (EMCZ), Croatia, is efficiently coordinating response services through TETRA. It applies the TETRA network built by Motorola (covering 3,000 square kilometers in the greater Zagreb, Split, and Rijeka areas) to provide voice and data communications to first-response units. These services are complemented by Geographic Information Systems (GIS) fitted to the fleet of 70 ambulances that enable vehicles to be tracked and consequently more effectively deployed. On receiving a call, EMCZ's doctors determine the nature of the incident and enter their assessments into an application that's accessed by the dispatch team. Analyzing this feedback and cross-referencing it with the position of paramedics, dispatchers can make informed and rapid decisions about which response unit can reach the emergency first. The system accelerates response times and ensures the efficient application of resources for an organization that manages 150,000 emergency calls a year.

Effective dispatch and user safety

With GPS-enabled radios and terminals, TETRA advances emergency response and the coordination of mobile teams.

With public safety, officers and their vehicles can be viewed by location. This data is complemented by integrated applications presenting a real-time overview of operational intelligence (such as officers' specialist skills) to recommend the most appropriate resource to send to incidents.

GPS can further aid policing as patrolling officers can use the location facilities to log incidents. For example, if a driver is not wearing a seat belt, the officer can send a code for the offence, along with the license plate details, back to base and, when he or she returns to the station, all of the required information will be ready, including location, date, name of car owner, and type of offence; all the officer needs to do is sign the paperwork and pass it on.

Alongside managing personnel efficiently, officers can attend situations secure in the knowledge that their exact position is tracked by the control room. If they encounter trouble, they can request immediate back-up using voice channels or by triggering their radio's distress signals.

This capability is similarly essential in private TETRA networks and supports a wide range of applications across industries:

Utility firms: Utility firms have to deploy engineers to work in remote regions on infrastructure such as pylons and substations. Should they encounter trouble, they can instantly contact base for assistance.

Transport: TETRA can be integrated with vehicle-tracking GPS systems to provide real-time timetable feeds to customers at bus stops. With fleet management systems, controllers can also amend services based on the progress of services – perhaps by adding more vehicles – to meet unexpected spikes in demand.

Given that only TETRA truly meets the exacting demands of Mission Critical and Business Critical communications, it's perhaps not surprising that networks are increasingly being installed across both markets throughout the world. But technology is only part of the story behind the growing interest in TETRA. Importantly, provisioning access to network coverage has become more cost-effective.

Keeping Passengers Informed and Safe in Copenhagen

TetraNet has deployed a TETRA network in Copenhagen that provides the communications for the capital's train, Metro, and bus services. The terminals provide the capability to send and receive data, conduct immediate calls (including group conversations), and make standard telephone calls. They are also equipped with GPS technology.

The Metro is a driverless transport system. The TETRA network provides video surveillance of trains while personnel who patrol the services are equipped with radios and terminals to keep in touch with controllers, check databases to efficiently respond to passenger enquiries, report incidents, and request help when needed.

On the train system, drivers use their radios for traditional voice calls and can also send and receive data. Their devices are equipped with a WAP browser for internet access while GPS ensures that, in case of an incident or issue, the control center can quickly and easily see who's in the best location to solve it. The technology provides similar services across the city's fleet of 1,200 buses and delivers the real-time data feeds that support "minutes-to-arrival" information at bus stops, through SMS and on the Internet.

TETRA enables Copenhagen's transport authorities to improve service delivery while enhancing the safety and security of both passengers and employees.

The World's Largest Public Safety System Uses the TETRA PDA

Airwave is the world's largest public safety system with over 200,000 users. It connects all 54 UK police forces, which previously used different radio systems. National fire and rescue and ambulance organizations are also switching to Airwave. They'll join over 200 public services agencies using the network including emergency planners, the Prison Service, the Immigration Service and CCTV teams. It's also the first network to use Motorola's rugged MTC100 TETRA PDA. The PDA uses the flexible Windows Mobile operating system and, with its large 3.5-inch screen, the pocket-sized productivity device provides remote access to a powerful range of customizable services. The operating system is available in a wide range of languages and the device also offers optional Bluetooth and WLAN connectivity. With Wi-Fi, users can surf the Web or securely interact with corporate databases and use Bluetooth to synchronize their PDA with desktop PCs.

Motorola liaised closely with Airwave and police users to develop the PDA. It enables officers to remotely access criminal intelligence databases such as the Police National Computer, issue penalty notices, and submit crime reports. Users will also benefit from rapid information transfer delivered by the MTC100 through the use of TETRA Multi-slot Packet Data capability (MSPD).

Commenting on the data applications, Philip Crawley, Major Projects Support Officer, Lancashire Constabulary, says: "The use of mobile data has given us the opportunity to not only improve officer visibility to the public on the streets, but while they're out there they use their time more efficiently."

SECTION TWO: GROWTH IN TETRA NETWORKS

Standards compliant TETRA products – certified by the TETRA Association – enable customers to purchase devices and infrastructure from a range of manufacturers. This has created the competitive market to drive down acquisition costs. Also, Motorola has pioneered the integration of Internet Protocol (IP) technology at the core of TETRA networks to deliver a range of operational and commercial benefits. IP is a flexible and highly scalable technology so capacity can be efficiently added as demands grow. An open standard, IP also makes it easier to develop and launch new applications for TETRA. As a result, a greater range of third party companies are now designing services for the networks. Moreover, as IP will be the backbone of communications systems for the foreseeable future, new developments can be easily integrated to upgrade networks, providing long-term protection for legacy investments.

As well as the downward pressure on infrastructure costs, new business models have emerged to ease the process of purchasing and maintaining TETRA networks. The most important of these is the concept of managed services.

Managed services

With managed services, a company, or more typically a consortium of businesses, builds the network. It also usually commits to running all or part of the infrastructure, too, for a set period of time: on average around 10 to 20 years.

Some countries have opted to have their networks run entirely by third parties while others retain control of elements of the infrastructure. There is no "one-size-fits-all" approach to managing the systems. However, in Motorola's experience, there is usually a blend of responsibilities. For example, networks may use their own teams to handle first-line help-desk calls and rely on companies like Motorola to provide monitoring and maintenance of remote infrastructure such as base stations. The exact profile of how the network is managed ultimately depends on the size of the systems, key objectives, and its funding.

Managed Services in Austria

Motorola and Alcatel are joint owners (Motorola owns 65 percent and Alcatel 35 percent) of Tetron, the Austrian network operator set up to provide nationwide secure, robust, and continuous communications to the country's public safety organizations. Tetron – recommending TETRA as the core network – was selected in a competitive tender to build the system. It will also operate, manage, and, where appropriate, enhance the infrastructure for 25 years. With this business model the Austrian Federal Government can focus its resources appropriately while, from a cost point of view, access to the network and its benefits has been made easier for Austria's states.

Cost savings

What's certain is that opting to deploy managed services provides significant cost savings.

Generating optimum returns from major nationwide build projects in the case of public safety systems requires a long-term commitment. In fact, over the duration of the working life of the network its maintenance and enhancement will cost more than the initial build. This is one of the reasons why managed service agreements often underpin major build programs: Tapping into the existing expertise of companies such as Motorola, who have the knowledge, capability, and proven experience of generating optimum returns from networks, will help maintain tight financial controls. The company defines long-term cost projections coupled with detailed service level agreements to provide the financial assurance of total cost of ownership commitments – commitments that ensure costs will not spiral out of control and which reduce the risk associated with major public build projects.

With the infrastructure in place, a wide range of public agencies can gain access to it. Flexibility can be built into agreements too, so that if large numbers of new users need to be supported, or services added, this can be easily achieved by scaling the TETRA network. All the services and maintenance provided to these organizations is overseen by a single consolidated management structure. This extends cost savings as all agencies don't need to maintain their own network teams and control facilities.

The managed services concept is also extending into business critical networks. Service providers can use infrastructure constructed for national public safety systems to offer secure dedicated network space to private businesses. Companies can rent access to coverage and work closely with the service provider to devise a custom range of applications; services that will enhance the capability of remote teams and employees to fulfill their tasks, improve safety, and advance collaboration with colleagues. Also, Motorola can provide complete installation and maintenance services for any company considering the provision of TETRA coverage.

Scalable IP-based TETRA solutions

While Motorola has broad experience of delivering nationwide public safety systems, the company also installs and maintains TETRA coverage over smaller regional areas and for private companies across facilities such as manufacturing plants, mining operations, and oil and gas refineries. Motorola's Dimetra IP solutions are fully featured yet cost-efficient TETRA networks that are also highly scaleable; once deployed they can be easily expanded in line with demands. The systems are also designed to accommodate future advances to applications and services: advances that are reviewed in the following section.

SECTION THREE: EVOLUTION OF DATA

With current TETRA solutions, and in particular with devices such as Motorola's MTC100 TETRA PDA, users are able to wirelessly manage a range of day-to-day tasks; for example, performing database enquiries or submitting field reports. As working practices evolve to maximize the benefits gained from wireless data, data needs and data traffic are likely to increase.

For many private users of Business Critical networks and public safety organizations in Mission Critical environments, TETRA Release 2, with its enhanced data rates, will provide sufficient bandwidth to meet the increased demand for data. The networks will enable a rich range of powerful and uprated services and applications to be delivered to the field. However, for some customers, wireless broadband networks that are now becoming available will provide a complementary channel to TETRA's data services.

The capability to offer users access to a range of networks in a TETRA radio or terminal is being achieved through IP technology: the communications standard which underpins the Internet and which provides simple, robust interfaces to connect separate networks with each other. Think of it as the glue that makes it possible to provide a single device that can make calls across the cellular or TETRA network and also provide access to new wireless broadband networks. Wireless broadband is provided by technologies such as WiMAX and mesh systems and coverage is set to be increasingly available in large urban areas providing high-speed access to data and voice services.

Public Safety: Fluid Access to Services

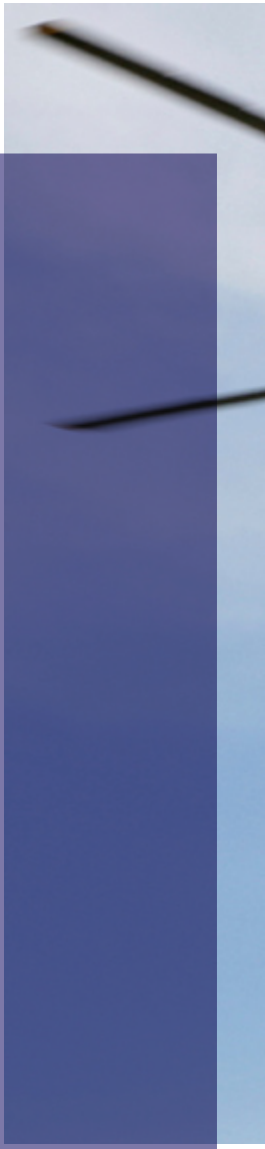
Equipped with a MSPD TETRA PDA, a police officer can use wireless data for a range of day-to-day tasks. These include accessing police databases for information, searching the internet to answer an enquiry from a member of the public or filing reports.

As working practices evolve to maximize the benefits gained from wireless data, data traffic is will increase. Additionally, higher bandwidth applications will emerge. In this case, TETRA2 (TEDS) with its higher data rates is likely to be the ideal solution for many users. For some users however, for example where broadband data rates are required, multi-mode devices that provides connectivity to TETRA and new broadband networks will be the ideal solution.

Which network is accessed by the multifunction device will depend on the service requested by end users and their location. For example, in remote regions, TETRA is likely to be the only access system available. Similarly, operating procedures will classify transactions; where communication involves Mission Critical voice or data transactions, such as interrogating criminal records databases where a high degree of data protection is required, the device will recognize this and apply the secure TETRA infrastructure

Multi-network access through a single device will help protect the capacity of the TETRA network by removing non-essential traffic from it. It could also extend the range of systems available to remote teams to use applications on-the-fly more efficiently to enhance field-based productivity and the delivery of services.

Given TETRA's unprecedented level of coverage, security, and reliability, it's likely that the majority of voice and data transactions in public safety environments will still be managed over the critical communications infrastructure. However, with access to new broadband networks, high-bandwidth applications that require lower levels of security could be enhanced through integrated network packages spanning TETRA, Wi-Fi, cellular, WiMAX, mesh, and other wireless technologies



Business Critical Applications

So what could the facility to consolidate access to a range of networks in a single device mean for Business Critical markets in the future? In applications where mobile engineers and teams on remote sites are using TETRA, it will continue to handle virtually all voice and data communications. And with enhanced data services coming online, TETRA provides a strong foundation to offer new applications to advance collaboration and productivity throughout organizations.

But companies will also be able to offer mobile executives greater flexibility to connect to networks. For example, traveling employees will be able to securely link to corporate systems using mesh and wireless broadband coverage where available. And when on remote sites, they can link to the facility's communications system – which is increasingly likely to be managed by TETRA – to reach colleagues in the area and also connect with the head office using a satellite link. The mobile device of the future – complete with cellular, wireless broadband, mesh, and TETRA capabilities – assesses the networks available and automatically delivers the optimum service experience as users move across office locations, airports, cities and remote facilities. With this flexible connectivity, remote and mobile workers can operate as if working in a fixed office.

The technology also provides the opportunity for IT teams to reduce the multitude of devices they supply to employees to a choice of a PDA or laptop that delivers the complete array of corporate applications – reducing the costs associated with supporting the mobile workforce.

TETRA and Complementary Networks: Why Motorola?

Providing access to a range of networks requires an innate knowledge of wireless systems, multimode devices, and a broad collection of security, license, and encryption requirements. It's knowledge that, from both a technical and experience standpoint, Motorola is uniquely positioned to provide.

The company markets the complete range of wireless access networks, services, and applications, complemented by an extensive managed services organization that has built, and operates and maintains many of the world's largest TETRA networks. To date, Motorola has installed over 300 TETRA networks and is responsible for well over a quarter of the world's TETRA systems. From the emergency frontline to the production line to the engineer on the power line, Motorola is one of the most trusted brands in the provision of Mission Critical and Business Critical communications networks.


USCG

GLOSSARY OF TERMS

AI: Air Interface

Air Interface Encryption: Encryption on the air interface – the vulnerable link between base station and terminal

AMR: Adaptive Multi-Rate Codec. A codec that, in the low-error environments, operates at a higher bit rate to give higher quality speech, while in higher-error environments, when higher speech quality cannot be sustained, the codec reduces its operational bit rate

Downlink: The transmissions from the base station to a radio terminal

Differential Quadrative Phase-Shift Keying: DQPSK is the modulation applied to each carrier in a digital radio ensemble

Encryption: Encryption method for coding/ scrambling the information (voice or data) so that it cannot be understood or deciphered without special equipment or software

ETSI: European Telecommunications Standards Institute – www.etsi.org – involved in ratifying TETRA standards

FDMA: Frequency Division Multiple Access. The use of multiple carriers within the same transponder where each uplink has been assigned frequency slot and bandwidth

Infrastructure: Base stations, switches, links, and various management equipment – the components that enable mobile radio terminals to operate over a particular geographical area

IP: Internet Protocol. A packet-based protocol for delivering data across networks

ISI: Inter-System Interface. ETSI specification for the design of interfaces to allow connection between different TETRA networks, from one or more manufacturer.

ITU: International Telecoms Union is responsible for adopting international treaties, regulations, and standards governing telecommunications

Mesh networking: Mesh networking is a way to route data, voice, and instructions between nodes. It allows for continuous connections and reconfiguration around blocked paths by "hopping" from node to node until a connection can be established

MHz: One MHz is equal to one million hertz. Hertz: A measurement of frequency in cycles per second. One hertz is one cycle per second.

MSPD: Multi slot packet data is an enhancement to TETRA that enables up to 4 timeslots to be allocated to one data call, thereby quadrupling the maximum data rate obtainable.

Quadrature Amplitude Modulation (QAM): A modulation technique that uses amplitude as well as phase for encoding data for higher data rates

PMR: Public Mobile Radio

Spectrum: The range of frequencies available for wireless communications

TDMA: Time Division Multiple Access. A method of digital wireless transmission that allows a large number of users to share access (in a time ordered sequence) to a single radio frequency channel without interference

Terminal: Also radio terminal or a mobile radio terminal or a TETRA mobile station (MS) – a hand-held, mobile or fixed radio unit connected to the TETRA system via air interface

TETRA: TErrestrial Trunked RAdio is a set of standards developed by the European Telecommunications Standards Institute (ETSI) for a common mobile radio communications infrastructure for both private networks and public safety systems

TETRA MoU Association: The TETRA MoU Association founded in 1994 to support promotion of the ETSI TETRA standard worldwide, now known as the TETRA Association

TETRA Voice + Data: The suite of TETRA standards normally referred to as "TETRA"

TIA: Telecommunications Industry Association. The US standardization body – www.tiaonline.org

Wi-Fi: A wireless local area network that uses high frequency radio signals to transmit and receive data – also called 802.11 in technical parlance

CRITCOMMS/BRO-ENG(06/07)

www.motorola.com

Motorola, Ltd. Jays Close, Viables Industrial Estate,
Basingstoke, Hampshire, RG22 4PD, UK