

TETRA Touch

Nokia TETRA customer newsletter • www.nokia.com/tetra_touch • Vol. 1 - 2003

Nokia TETRA assures
essential communications
during times of high crisis



Benefit from TETRA
voice services

Nokia THR880 handportable
– Best New TETRA Radio



TETRA ensures essential communications during major incidents.

Find out how.

→ Read more on page

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The benefits of TETRA voice services

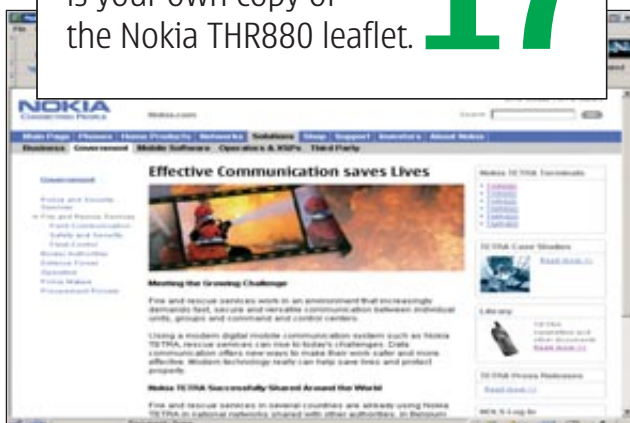
Learn how TETRA one-to-many communication, emergency communication, and telephony services help public authorities to help people.



Best New TETRA Radio in 2002!

Attached on the page is your own copy of the Nokia THR880 leaflet.

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There is an abundance of interesting TETRA-related pages in the Internet.

Learn how to find them.

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Speaking up for voice

For a number of years Nokia has been one of the leaders of the TETRA world in developing and promoting highly advanced digital radio communications solutions. There have been many innovative features introduced, such as IP packet data and professional WAP solutions that boost data transmission in TETRA networks. Such advanced data capabilities bring undoubted benefits to Professional Mobile Radio users.

So exciting are these developments and so much attention is focused on them, that it sometimes seems that advanced data is the main use for today's PMR. But of course, that's not true. Voice is still king. Voice is still the dominant "application". Speaking to each other is the most basic form of communication.

Let's pause amid the data whirlwind for a moment and reflect on the equally significant advances that have been made in voice communication.

When it comes to emergency communications it is a reliable and good quality voice service that the emergency services need in the heat of the action. Lives may depend on it. And who wouldn't appreciate truly private and secure conversations with no eavesdropping? Certainly, the police and security organisations do.

Nokia has worked closely with users to develop TETRA solutions that meet all the needs of today's authorities. With its digital technology, Nokia TETRA outperforms conventional radio communications systems by a big margin.

Fast and efficient group communications, crystal clear voice in noisy environments and an emergency call service that has practically no geographical borders within one network's reach are some examples of Nokia TETRA solution innovations. Radio terminals have also undergone a revolution in a short time. The latest and award-winning Nokia THR880 TETRA handset, for example, has unique features like voice feedback and a double-sided design.

This issue of TETRA Touch focuses on the unbeatable voice services that TETRA is bringing today to many authorities and other professional users. These services are not available on any conventional communications services.

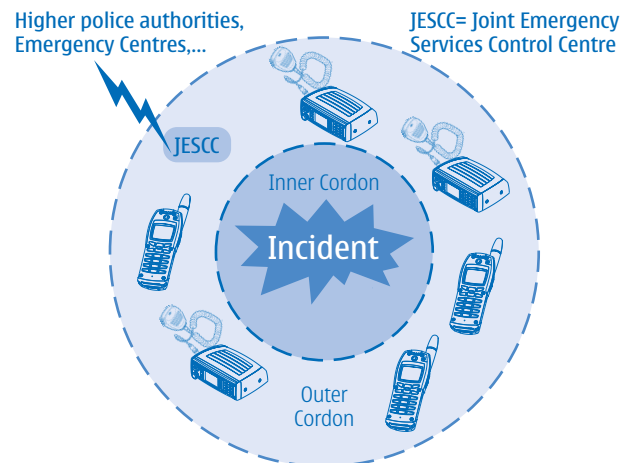
So please, sit back and enjoy reading through TETRA Touch. And I hope that you find it raises some interesting talking points.

Hans Holmberg
Vice President
Professional Mobile Radio

Cordon off your communications

When an authority declares an emergency as a major incident, things start to happen fast. one of the first measures is to cordon off the incident and move the general public clear of the danger area.

Most public safety forces around the world follow a standard procedure for placing cordons, or isolation areas, around incidents. First, there is an inner cordon in which the actual public safety operation takes place. An outer cordon is then established and cleared of the public and protects against the inevitable intrusion of media and other people eager to find out what is happening. In some cases, a traffic cordon may be additionally set up around the outer cordon to prevent unauthorised vehicles driving into the area.



Police tasks when there is an incident:

- Isolation
- Traffic control/co-ordination
- Investigations

These create pressure for communication. In addition, there is pressure for communication by the other authorities



Effective communication is essential for the smooth control of operations within this cordon system. Each cordon has its own communications and tactical demands, which are different to those of the other cordons and different to the needs of external communications.

By its nature, a major incident, such as a train or plane crash, hijack, big accident or terrorist incident, will involve many different agencies and organisations. The police, fire and rescue services, the ambulance service, local authorities and even volunteer organisations will all be involved.

With so many emergency people needing to be organised, congestion of the communications system used to be a clear danger, preventing essential communications getting through. In the early stages of an incident, radio traffic volumes will be very high and there will be a definite need to control communications within the cordon areas and between forces and headquarters.

Groups that stay in control

This is when the powerful group communication features of TETRA can really come to the fore. Following an agreed plan, talk groups, which are either ready-made or set up by the dispatch centre, are quickly implemented for each cordon area. Not only does this enable officers and rescuers within the cordons to communicate easily with each other, but communication between cordons, between the hierarchical incident management layers and with the central control room is securely assured.

Also with TETRA, priorities can be set for talk groups and even individual users. This ensures that the most important communications can always get through. And should a police officer or rescuer suddenly find himself in danger, TETRA's emergency communications facility can be used, which always has the highest priority of all.

Priorities and groups could also be set up in accordance with the incident's management structure which typically falls into three layers – gold (strategic control, normally from HQ), silver (tactical control of resources at the incident site) and bronze (operational control of the actual work team at the incident). Personnel arriving at the site will always be assigned to duties within the gold, silver and bronze structure.

During incidents, whether major or not, TETRA overcomes the difficulties that forces experience with old analogue radio systems. Such systems can quickly clog up, blocking urgent communications. In these situations it has been common for officers to use their GSM phones to talk with other emergency services and even their own colleagues. Not only can it be time consuming to call every member in a team to give them the same instruction, but in a major incident, members of the general public will also be using their phones to tell friends what is happening and this can cause congestion in the GSM network. Some GSM operators can be asked to provide special emergency channels for these situations, but this can take time to set up and is costly.

With TETRA, essential communications are assured, quickly and conveniently.

For any size of incident

The power of TETRA enables as many talk groups to be set up as is needed – there are practically no restrictions. In large incidents this can be vital as cordon management can be complex. For example, the Outer Cordon may contain a Marshalling Area in which survivors are moved for medical treatment, counseling and debriefing; there will be

a rendezvous point at which personnel coming onto the scene will be assembled and briefed. Each cordon will have its own access point through which personnel must be authorized to gain access to the cordon area. Communications is essential to help in this identification process.

There may also be a Joint Emergency Services Control Centre (JESCC) established in the Outer Cordon and this must have good communications with all groups within the cordons as well as the external headquarters.

Eliminate eavesdropping

In sensitive incidents, for example where terrorists or organised crime is involved, security of communications is vital. Many existing analogue systems can be easily scanned and conversations picked up by unauthorised personnel or the media. To overcome this, some officers have been forced to use their GSM phones to communicate more securely, until recently.

TETRA offers a much better way. The Nokia TETRA system uses air interface encryption, end-to-end encryption and authentication to achieve the highest levels of security in communications.

No matter what size of incident, police cordons are a common means of keeping people safe while allowing the emergency services to do their work securely and without distraction. The flexible and convenient features of TETRA mean that communications are always available when they are needed during times of high crisis.

{ TETRA overcomes the difficulties
that forces experience
with old analogue radio systems. }



Benefit from voice services in Nokia TETRA

Every day, people employed by a variety of public authorities – a Belgian police officer, a Catalanian fire fighter and many more – use Nokia TETRA System voice services in their duties. Group calls, emergency communication, telephony services within and beyond TETRA networks, as well as the new world-class radio terminal, the Nokia THR880, all help them to help people.

Group calls are fast and efficient

When a police officer wants to talk to his colleagues, he uses talk group communication to transmit his words to a group of people. He selects one of the talk groups visible on his radio's display or selects it with the group switch, hearing an audible confirmation of his choice. He then only has to key the push-to-talk button on his radio terminal and all his colleagues in the same talk group can hear him. When he is finished, he releases the push-to-talk button, allowing the other members of his group to speak – one at a time. Queuing for one's turn to speak is the key to avoiding congestion, which can easily occur in other mobile networks, such as GSM, when many users want to talk at the same time.

In group calls, the network resources are used very efficiently, as only one traffic channel is needed to serve several participants in the call. In other types of network, all participants need their own channel.

Public safety duties often depend on doing things quickly and one of the most critical delays is the time needed for the connection – the time from keying the push-to-talk button to being heard by all the members of the group, located anywhere in a possibly nationwide network. In Nokia TETRA, the connection time is always less than 500 milliseconds. Nokia TETRA group calls save time, helping to save lives.

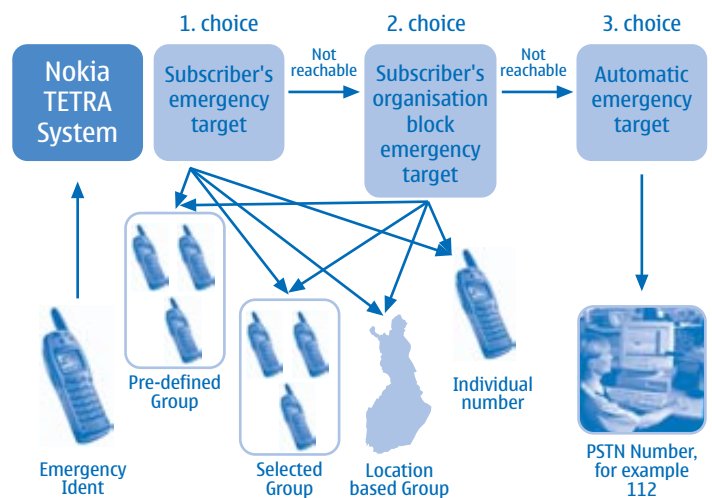
The Nokia TETRA System itself was developed from the user's point of view. It offers all the vital services that authorities need, as well as the ability to tailor them to the needs of each organisation. An example of such a service is the use of priorities. Some users can have a high priority and will be preferred if there is a queue of users waiting for their turn to speak. It can even be defined that a high-priority user may pre-empt resources, meaning that the call with the lowest priority will be released to allow the high-priority user to make his call. However, emergency calls are never released in this way. Thus, Nokia TETRA supports hierarchical management structures.

Talk groups can also be combined, meaning that the users see their own group and talk in it, but the communication is also relayed to other groups. This is particularly useful if there has been a major emergency incident and many organisations need to work together quickly. Combining groups saves network resources, because all members of the combined groups need only one channel to listen to this group. An authorised dispatcher can both combine and later separate the groups using a dispatcher workstation.

Emergency calls save lives

When a police officer's life is threatened, he can press the emergency button on his radio terminal. The system guarantees that there will be network resources for the emergency call, pre-empting other calls if necessary. The emergency call is clearly visible and audible at the dispatcher workstation and on the radio terminals of his colleagues, so they can react to the emergency immediately.

Emergency Ident – where does the emergency call go?



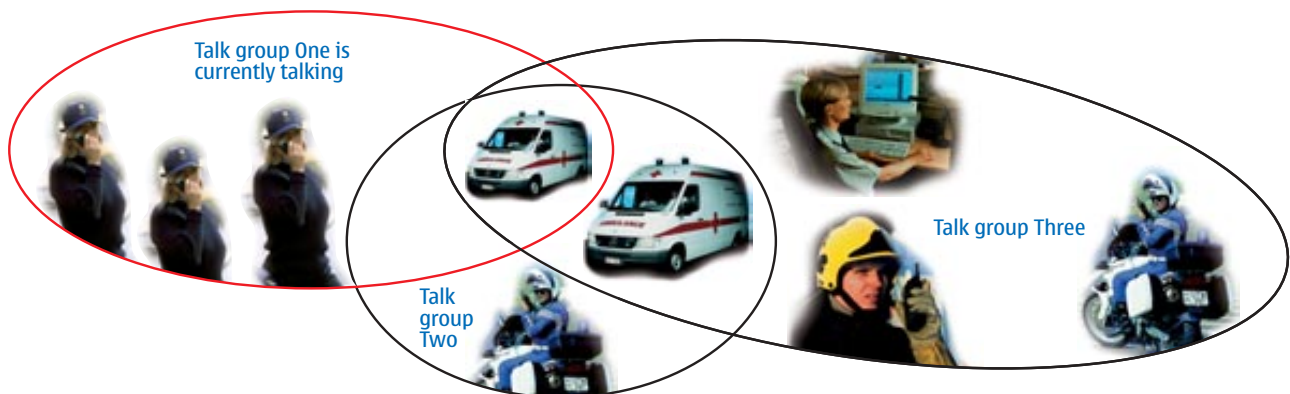
The three-level emergency target in the Nokia TETRA System ensures that emergency calls never go unnoticed. An authorised dispatcher will define the target(s) of emergency calls into the system. This saves money, because if the target needs to be changed, the radio terminal does not have to be re-configured.

Individual calls bring mobile telephony into the radio terminal

Nokia radio terminals can also be used to make normal telephony calls, both inside the TETRA network, or to any number in the fixed or GSM network – the TETRA phone is both a radio terminal and a mobile phone. Access to public networks can be defined separately for each user, making it possible to completely prohibit access.

Express call is a special Nokia TETRA service, allowing a call to be made by selecting the person's number, then pressing the push-to-talk button – what you say can then be immediately heard at the other

Talk group Communication basics



The police officer in the car in talk group One only has to key the push-to-talk button on his mobile terminal and all his colleagues in talk group One can hear him.

end, with no alarms and no waiting. This is the quickest way to give orders or directions to a person.

Nokia THR880 combines ease of use with cost-effectiveness and security

When authorities plan their radio communications, three things dominate their thoughts: ease of use, cost and security.

Ease of use stems from the fact that, in public safety duties, the radio terminal must be a tool, not a burden. Cost-consciousness requires that updating and re-configuring should be kept to a minimum – with large numbers of terminals in use, each round of updates is bound to be very expensive. From the security point of view, radio terminals should be failsafe and foolproof to meet the demanding working conditions faced by public authorities. This requirement is met when every terminal is configured in the same way – wherever a police officer needs to work, the terminal will have a familiar configuration.

Handling groups has been made easy in the Nokia THR880. Groups in the terminal are organised into folders, which can be defined according to geographical location, for example. In each folder, the groups are always in the same order. The group switch with voice feedback is the key to this easy to use terminal- when changing a group, the radio terminal announces the group name to the user.

Every radio terminal in the organisation can have all possible groups, as the Nokia THR880 can store up to 1300 of them. This way, there is practically no need for costly re-configuration of terminals – any terminal can be used by anyone in the organisation, aiding security.

Different encryption methods, controlled access to groups, authentication, ambience listening and other security related services all add to the security of the Nokia TETRA system.

Nokia TETRA voice quality helps in demanding working environments

Both digital telephone networks and TETRA networks convert the analogue voice into digital form. During the conversion, it is possible to filter out background noise and so greatly improve the quality of voice heard at the other end. Words spoken into the terminal in even a noisy environment can be clearly heard at the other end, as all the background noise is removed. This is a significant benefit, not only to authorities such as police, but to any professional user.

Advanced group call functions, easy selection of groups, audible confirmation of group choice from the terminal, clear, uncluttered voice quality and fast access to other users all make the Nokia TETRA System the answer for modern emergency services looking for exceptional voice services.

Use of Folders in NokiaTHR880 provides a new, efficient way to control multiple talk groups

Talk group 1

Talk group 2

Talk group 3

Talk group 4

Talk group 5



Organisation can define the Folders in various ways: geographical areas, functional units (police, rescue,...), co-operation between organisations. During major incidents, common Folders with police, fire brigades and other rescue persons can be activated.

REMOTE CONTROL ANTENNA to revolutionise network planning

A new award-winning TETRA antenna that can be adjusted and reconfigured remotely is set to revolutionise the way TETRA networks are planned.

The new iVET Macrocell Panel Antenna by Sigma Wireless Technologies incorporates an integrated control unit making it possible for the network operator to adjust the electrical tilt angle of the antenna RF pattern, to optimise local coverage. This adjustment can be accomplished either locally at the antenna site by means of a PDA (Personal Digital Assistant) or laptop or remotely from a central control centre. With no need to even visit the site, network downtime is minimised and re-rigging costs are eliminated.

The ability to fine tune the coverage of TETRA antennas after installation could allow operators to choose sites that might previously be thought unsuitable. Network planning will be quicker and easier when operators know that they can go ahead and build the network and get the best coverage once the antennas are in place.

The Sigma Wireless iVET panel antenna won the prize for the Most Innovative TETRA Product at the TETRA World Congress in November 2002. Making its award, the adjudicating board predicted that the iVET panel antenna could revolutionise the way network coverage is planned and deployed.

Joseph Moore, Managing Director of Sigma Wireless Technologies, explaining the background to the company's latest innovation, said: "Sigma Wireless has a strong commitment to R&D and to maintaining a world class edge in its engineering capability. The new iVET is unique because it uses 'next generation' tilt technology, is integrated as standard and is available in an affordable package."

TWISPed with Nokia

Sigma Wireless Technologies is a member of the Nokia TETRA Wireless Solution Programme (TWISP), and the company has been committed to TETRA since the inception of the standard, developing a range of omni-directional antennas for TETRA frequencies. Sigma Wireless manufactures a comprehensive line of base station, mobile, vehicle and built-in antennas for TETRA frequencies, such as:

- iVET directional panel antennas with integrated variable electrical tilt
- Omni-directional antennas
- Directional panel antennas that concentrate signals in a particular direction
- Sectorised array antennas
- Broadband antennas that process multiple frequency bands in a single antenna for both indoor and outdoor applications.

→ www.sigmawireless.ie



Calatrava Tower with TETRA antennas inside – Barcelona, Spain

Joseph Moore and Antony Giraud with their award at the TETRA World Congress.

City of Oslo chooses TETRA for emergency communication

The City of Oslo has chosen the Nokia TETRA service provided by Tele Danmark InterNordia for use by its Emergency Planning Unit (EPU).

Tele Danmark InterNordia has been operating the Nokia TETRA system since 1998, focusing on the Greater Oslo Area. Øivind Wold, TETRA Project Manager for the company, says: "I'm confident that the reliable service from our network will prove to be excellent for the tasks of the Emergency Planning Unit. The Unit will use the Nokia THR850 TETRA radios, which are very user friendly and packed with functionality."

"The EPU's task is to identify, prevent, and handle crisis situations," says EPU Higher Executive Officer Willy Olsen. "It reports directly to the City Government, and we will use the TETRA service for the political and administrative top level."

"We are mainly concerned with the issues of public safety and security, with the emphasis on life, health and the environment. We perform vulnerability analyses, and, if necessary, establish the crisis management organisation for the City of Oslo. This way we can supervise the overall readiness of the City of Oslo for emergency situations."

The Emergency Planning Unit played an important part in the smooth transit into the year 2000, and also handled the tasks related to possible terrorist strikes against Oslo after the WTC attacks on 11 Sept 2001.



Mr Øivind Wold and Mr. Willy Olsen in front of Oslo City Hall.

TECHNOLOGY

Why digital is better than analogue

Digital technology pervades our everyday lives, from our mobile phones, to the computers on our desks and even our homes with CDs, DVDs and digital television. The world has gone digital and with good reason. Digital enables intelligence to be built in, it brings higher quality and it has new features that are impossible with analogue technology. As the leading digital communications technology for public safety users, TETRA outperforms analogue radio systems in many ways. Here are just a few examples.

Efficient communication

Analogue radio systems offer no intelligent switching in the network. Users must tune their radio to the same frequency (channel) to hear each other in the same geographical area. In TETRA, groups of users are already defined in the radios. A user speaks to other group members by simply selecting the talk group and keying the press-to-talk button. Only those radio users who belong to the same talk group can hear and participate in the communication. At last, user organisations can plan their group communication structures without being limited by base station channels.

Secure communication

It is easy to eavesdrop on a conventional system with equipment that is bought in a shop. Police often have to use their GSM mobiles if they need to exchange confidential information. But making several calls to tell many team members the same thing is cumbersome and wastes time. TETRA is highly secure. Its over the air encryption meets the needs of most security services.

Available communication

In analogue systems, communication in a group call may be blocked if a participant keeps keying the push-to-talk button, or the button gets stuck. In the Nokia TETRA system, a dispatcher can override the ongoing group call and the person with the stuck button can be notified. If necessary, the misbehaving radio can even be barred from the network.

Clear communication

Analogue communications are easily drowned out. A police officer on a motorbike with its siren on, cannot hear conventional radio communications even when using an earpiece. But the Nokia TETRA system eliminates the background noise from the engine and siren, allowing the officer to clearly hear commands through his earpiece.

The benefits of modern digital technology would seem to be overwhelming. Yet many public safety authorities around the world are stuck with outdated analogue radio systems. Maybe it is time to catch up?

Award-winning TETRA application

Helps find missing

A TETRA application designed to help find missing people can capture pictures and other information about the absent person and distribute them quickly to police officers.

Winner of the Most Innovative TETRA Application at the TETRA World Congress 2002 and developed by UK based Infomatrix, the application can save the police time and effort –without it, the missing person's picture would have to be copied and distributed manually, or scanned into a computer system. Sharing the photograph in the computer system is fast, but until now, pictures have not been available to officers in the field as quickly.

Capture information

With the TETRA missing persons application, officers can use hand-held computers to take down the information from the person making the report. The application prompts the officer to ask all the crucial questions, ensuring that no important details are left out. Selection and drop down lists are used, avoiding the need to enter large amounts of text manually.

Share information

One of the key issues in finding the missing person is to share the information as quickly as possible. Using the TETRA IP packet data service, the TETRA missing persons application allows the reported

information to be distributed instantly to the relevant people, at the touch of a button. The system then sends this to other officers and organisations that may be able to help in the search.

Using the UniTech TurboNet data acceleration software by Infomatrix, a TETRA packet data link allows a good-quality photograph to be downloaded in a matter of seconds.

When a missing person's report is received, officers can be alerted by an alarm sound and flashing icon on-screen.

Inform the right people – automatically

It is not enough to share the information quickly – it also has to be shared with the right personnel, such as the officers on duty closest to the place where the person was last seen.

When information on the location of police officers is available, it is possible to define rules specifying who should be informed first, based on their current location, the elapsed time from when the person was last seen, and the officer's role. For example, it could be defined that, in a metropolitan area, all officers within a radius of five kilometres from the last known location will be alerted. In addition, transport police at main railway stations will be alerted. For a rural location, the radius could be defined as 50 kilometres, and the police officers located in the closest major cities could be notified if the person hasn't been found within 12 hours.

Being able to send alerts without the intervention of an operator, whilst preserving the flexibility to override the rules, can save valuable time and avoid human error.



Based in Cambridge, UK, Infomatrix has developed an innovative suite of mobile data applications built on a scalable middleware platform, designed to address the needs of the police and other public safety organisations. Infomatrix is a member of the Nokia TETRA Wireless Solution Programme (TWISP).

persons

TETRA missing persons application is an example of how time and effort can be saved by empowering the police with information and communication technology.

Cut down on paperwork

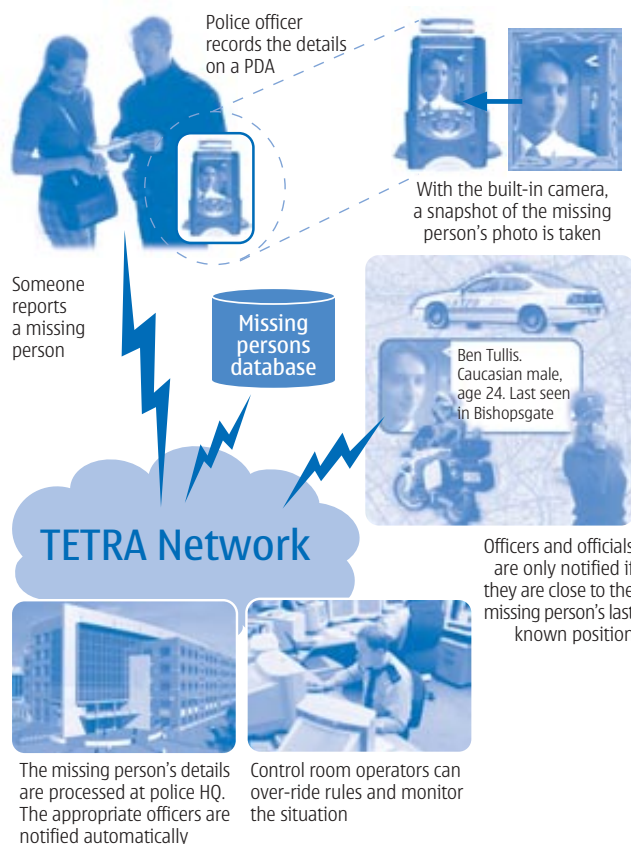
The TETRA missing persons application can help cut down on the scourge of every police officer - paperwork. It does this by automatically pre-filling forms, using contextual information such as the officer's details and the time and date. Even address information can be pre-filled, using GPS data complemented by a Geographical Information System (GIS). In addition, information retrieved from elsewhere, concerning a person or a vehicle, can be imported into the form.

Empower officers on the move

Research by the Home Office in the UK, for example, has established that uniformed officers spend between 35% and 40% and detectives between 60% and 65% of their time inside police buildings. As a rule, citizens would prefer officers to be more visible on the street. When the police can access information on the move, and when filling out forms is made easier using intelligent, electronic forms, these figures can be improved substantially.

The TETRA missing persons application offers an insight into what can be achieved now with TETRA mobile data. As well as adding significant value over and above the traditional voice services, the TETRA missing persons application is an excellent example of how time and effort can be saved by empowering the police with information and communication technology.

→ <http://www.infomatrix.com/>





The calculated location of the handset is marked on the map with squares; the actual position of the handset was on the main road. This example was provided by MS Location.

Until recently, locating the position of a mobile terminal has only been possible with special GPS devices. This all changed with Nokia's announcement at the TETRA World Congress 2002 of the world's first network based, hand portable assisted location solution for professional mobile radio use. TETRA Touch 4/2002 featured an article on the benefits of the solution, and now many readers have requested more information on how the solution works.

Inside the TETRA handset based location solution

The big advantage of the solution is that field personnel need only carry a Nokia TETRA radio to use the system, as no extra devices are needed.

When the dispatcher or the AVL/GIS application needs to know the position of a person with a Nokia THR880 or Nokia TMR880 radio, the location server sends a special status message to the radio. The radio measures the field strengths of the neighbouring cells and responds to the message automatically, sending the information back to the location server as a short data service (SDS) message over the Nokia TETRA System. The location server then calculates where the terminal is and forwards the information to the application.

The accuracy of the calculated location depends on the size of the cells near the location: the smaller the cells, the greater the accuracy.

The accuracy of hand portable assisted location is not high enough for all purposes. For more demanding users, the Nokia TMR880 radio can provide advanced, more accurate positioning by connecting directly to a compatible GPS receiver. The dispatcher can control the GPS receiver over the TETRA network, with no action required from the radio user. In this solution, location information can be transmitted

even during group voice communication, or during IP packet data transmission.

Nokia Partners

Locus Portal Corporation has developed the location system for the TETRA networks. Locus TETRA Location System can provide the accurate location of the TETRA handset for any application.

MS Location Ltd's versatile MSL Nexus™ Positioning Platform is used by teleoperators as well as logistics-, security and health care companies and organisations. MSL Nexus™ has now been extended to TETRA handset positioning, which offers a new and tested solution for public safety organisations using TETRA handsets.

→ www.locusportal.com
→ www.mslocation.com

LOCUS
PORTAL

MSLocation

The new Nokia TMR880 mobile terminal makes it easier than ever to implement value adding applications and connect auxiliary devices to a TETRA radio. On this page we take a look at the connectivity side of the new terminal: what possibilities does it offer?

Advanced Positioning

Featuring a direct interface for a standard GPS receiver, the Nokia TMR880 provides accurate vehicle location information to services and central command room systems.

This is particularly important in countries where authorities are required to allocate the nearest available unit to the scene of an accident. TETRA situation indicator messages can be used to inform the dispatcher that the unit is now 'free' or 'on duty' – combined with an automatic positioning system with all the units equipped with GPS, this allows the dispatcher to check the status of vehicles and to poll the location of a specific unit when needed. This ensures that the nearest available unit is always sent to the scene of an accident, reducing the waiting time for casualties.

The dispatcher can configure the GPS receiver functions over the TETRA network using SDS messages. For example, he / she can define how often the location information is sent, with no input needed by the radio user. Location information can be transmitted from vehicle dispatcher as and SDS message even during a voice call or a packet data transmission.

Direct connectivity

The Nokia TMR880 radio features 16 programmable input and outputs for connecting to application devices such as status panels, external emergency buttons, relays and external alarm equipment without the need for a separate connection box. For motorbike installation, external volume and group selection inputs are available straight from the radio unit. This direct connectivity reduces the cost of external applications as additional hardware components are kept to a minimum. It also makes external applications easy to install, further reducing installation costs.

A robust external control unit can be connected to the Nokia TMR880 in parallel, making it possible to install the radio wherever it fits best. For example, in a fire engine, this allows the radio to be used both from the driver's cabin and from the back seats.



The connectivity side of the Nokia TMR880 mobile radio

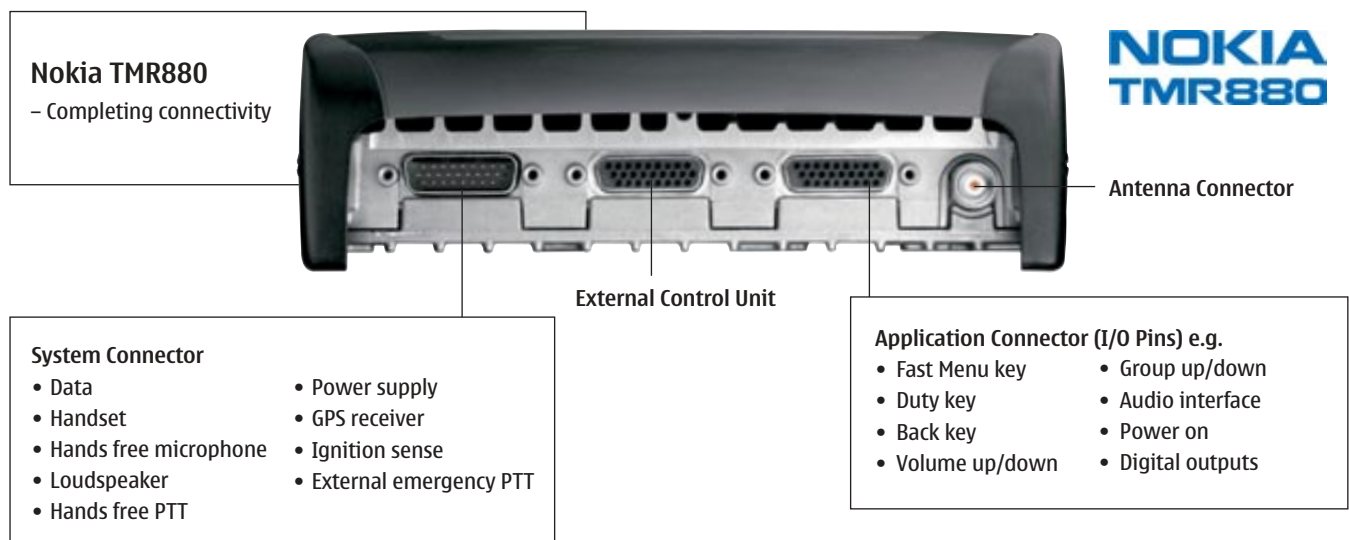
Advanced PEI, advanced applications

The Advanced PEI with extended AT commands allows the development of sophisticated mobile fleet management applications. The extended AT command set gives easy control of the radio through a compatible PC or PDA, giving a superb, lightweight solution for mobile fleet management, both in field operations and in an office.

Another useful feature is the ability to access short data messages while using an IP packet data connection. For example, in an ambulance, the co-driver can connect to a patient information database from the site of an accident while, simultaneously, the vehicle's location can be tracked by the dispatcher. Similarly, a commander in charge of an incident can stay at the heart of the action by following his team's status and text messaging while accessing the organisation's information system over an IP connection.

Detailed pin descriptions, voltage levels etc. are described in the product documentation which is available for 3rd parties from the extranet for registered application developers.

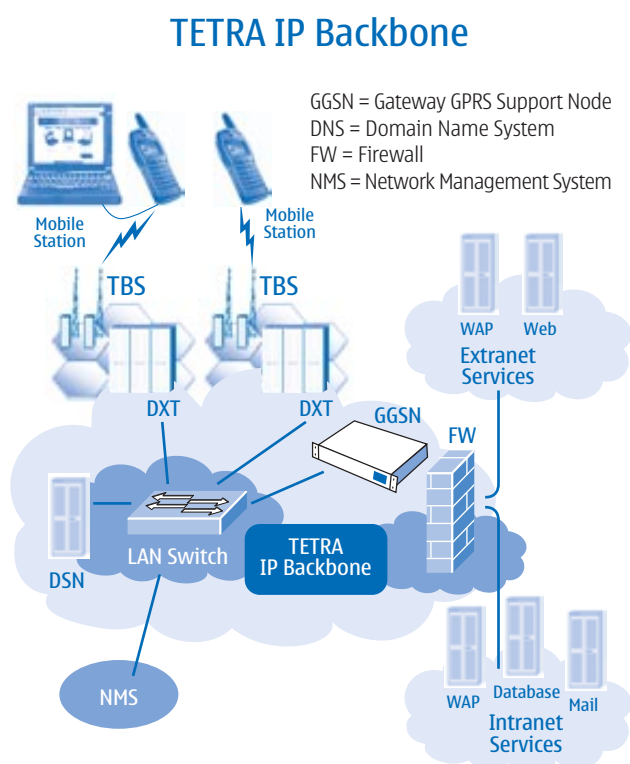
To be part of the application developer community, please contact twisp@nokia.com.



Providing IP security in TETRA networks

Security is a key issue for any network operator, but for TETRA users such as the police, security is paramount. With its powerful encryption and authentication features, the Nokia TETRA system already provides the highest level of protection against eavesdropping of voice communications. But what about the security of data applications such as database queries or mail services, that link to the Internet or an intranet?

There are two aspects here – security within the TETRA IP network itself and protection against external attack from outside the network. Security of the TETRA backbone network is based on physical separation (usually a dedicated network), IPSec tunneling, and on using firewalls at external interfaces.



TETRA IP Backbone Security

The TETRA IP Backbone provides IP connectivity between all the TETRA network elements. While internal IP connectivity is important for the network's operation, users only see the IP connectivity between the TETRA radio terminals and other IP-based networks, such as intranets and extranets.

For enhanced internal security and scalability, different types of IP traffic can be separated using virtual local area networks (VLAN) on the sites and virtual private networks (VPN) on the wide area links between the sites.

The TETRA IP Backbone also provides Domain Name Services (DNS) and DHCP (Dynamic Host Configuration Protocol) Services for Mobile Stations and DNS services for mapping logical names to IP addresses

in the NTS network. All TETRA IP Backbone components, such as multilayer LAN switches, IP routers, firewall routers and DNS servers, are deployed in resilient duplicated configurations.

Lower network layers are transparent to upper layer protocols and as such are considered secure. The management traffic of the network elements is usually isolated from the main traffic. In the IP protocol layer, security is guaranteed where needed by equipment providing an increased level of information protection using access lists and encryption. For example, IPSec based encryption can be used for the most vital traffic, like management messages.

Firewalls prevent external attack

The firewall between the TETRA network and the outside world is configured to reject all packets that are not part of a connection that has been properly initiated by a TETRA IP subscriber.

The principle of Firewall operation is that all traffic across an interface is vetted in the firewall and only allowed to pass if explicitly permitted by the defined security policy for that interface. The firewall can apply different security rules for incoming and outgoing traffic on that interface.

Firewalls are generally used at the boundaries of a network. They can also be used to implement network 'islands' and security domains within a wider network. The network islands need not be in one place, they can be interconnected securely using IPSec encrypted VPN tunnels.

In addition to the basic firewall functions, Nokia Firewalls can be configured to follow the state of the connections. This enables forwarding decisions for the IP packets to be made dynamically according to each connection state.

The Nokia Firewall includes a spoofing filter against forged IP addresses. This is important since many attacks use IP spoofing to hide the true identity of the attacker. A spoofing filter will stop such attacks before they reach their target. Implementation is simplified when the underlying network topology is known. For example an inbound message outside a security island cannot have a sending address that is inside the island.

Unlike many security methods which are too difficult to use and personnel tend to bypass them, Nokia's Firewall products have clear interfaces and easy to use management tools.

Nokia Firewall – the benefits

The Nokia Firewall used in TETRA networks is based on the Nokia IP530 device, which supports a comprehensive suite of IP-routing functions and protocols, including RIPV1/RIPv2, IGRP, OSPF and BGP4 for unicast traffic, and DVMRP for multicast traffic. Its integrated router functionality eliminates the need for separate Intranet and access routers in security applications. Nokia IP530 runs a proprietary hardened Unix based operating system – IPSO, Ipsilon Operating System.

The Nokia Firewall solution also provides auditing and authentication services. A real-time log can be used for monitoring and accounting information for all connections.

Poland's first Nokia TETRA system opens

Nokia and ComputerLand, a Polish software integrator and developer, have built a Command & Control system for the Police Academy in Szczytno, Poland.



Worth more than 1.125 MEUR, the system will be used to train the Academy's students and other public safety professionals. The system, one of the first such centres in Europe, was officially opened on 20th January 2003 and is already operating at full scope.

As well as being used for training, the C&C system is being used to control operations at the District Police Headquarters at Szczytno. There are also plans to use the system in future regional emergency response centres.

"We are very happy to be one of the first police academies in Europe to provide students with training based on the TETRA system. It is quite an exceptional situation: our officers can become acquainted with TETRA much earlier than many of their foreign colleagues", commented Professor Wiesław Pływaczewski, Commander Chancellor of the Szczytno Police Academy.

During the opening ceremony, Police officers demonstrated the capabilities of the Nokia TETRA system and CoLombo 2 C&C software with an exercise based on a simulated car theft. Immediately upon receiving the call, the officer on duty entered operational data into the system, located the nearest Police cars on the Szczytno map and asked them to intervene. The action was monitored by a TV monitoring system, and the police cars' locations were shown on a digital map using an AVL application displayed on the computer screen.

Fast information gathering

Such tools enable roadblocks to be set up very quickly. Then, using CoLombo 2's direct connection with the Police database (KSIP), it takes only seconds for officers to discover whether a stopped car is stolen and to check the personal data of any individuals. Each policeman has access to such data through the Nokia THR850 terminal using WAP data transmission. This is the first time that WAP data transmission has been used for such purposes in Poland.

The Nokia TETRA system in Szczytno includes a DXT exchange, dispatcher desk, base station and 10 terminals. It offers voice communication in both direct (DMO) and trunked mode (TMO), dynamic group management and secure access to Police databases with the help of the WAP protocol. Additionally, police patrols can be accurately located on the Szczytno map with the help of the GPS/AVL application; the town area can be monitored by TV cameras; and calls can be answered and recorded. All of which improves the management of the police forces.



Makes an impression

CoLombo 2 has been developed by Polish programmers from ComputerLand. The software is used to automate and record relevant police force processes; to visualise the status of an entire operation; to provide multimedia communication for system users; and to prepare analyses and reports. The system is accompanied by a case simulator, which enables the training of public safety professionals using real life situations.

The Police Academy system has already been seen by police authorities visiting from the Ukraine, Germany and France, who were all said to be highly impressed. The Police Academy has signed cooperation agreements with police schools in Germany and the Ukraine.

The system was created under the umbrella of the President of Poland Aleksander Kwaśniewski's special programme promoting new technologies in schools.

The Szczytno system was officially opened by Krzysztof Janik, Polish Minister of Internal Affairs and Administration, accompanied by Marek Siwiec, Head of the National Security Office, Antoni Kowalczyk, inspector general and Chief Police Commander, senior inspector Zbigniew Chwaliński, Deputy Chief Police Commander, Stefan Widomski, Senior Vice President of Nokia, Wojciech Pytel, General Director of Nokia Poland and Tomasz Sielicki, President of ComputerLand.

The Polish Government is currently working to introduce a nationwide TETRA system in Poland.

New Nokia TETRA terminal distributors onboard

KPN Business Radio Solutions b.v and Nokia have signed an agreement regarding the distribution of Nokia TETRA terminals in the Netherlands. KPN Business Radio Solutions b.v. will be the local interface for the Dutch TETRA customers regarding consultancy, tendering, sales and after sales of Nokia terminals. KPN BRS bv is a specialist in professional mobile business communications and offers all-round, tailor-made solutions, ranging from advice to project completion.

Telenor Connect AS and Nokia have signed a supply agreement regarding Nokia TETRA terminals. Telenor Connect acts as a distributor for Nokia terminals in Norway and Denmark. Telenor Connect is part of the Telenor Group, a Norwegian telecommunications group with extensive and fast growing business operations in a number of countries in Europe and Southeast Asia. The company is Norway's leading distributor of voice, information, knowledge, and entertainment through a broad range of modern communications services.

Nokia wins Finnish consultancy order

Nokia has won an order to supply TETRA consultancy to the Finnish Emergency Response Centre Administration.

Also known as Finland-112, the Administration plans to use the VIRVE network services and IT system in its new Emergency Response Centres.

Nokia will help Finland-112 specify its TETRA requirements and prioritise VIRVE related features used in Emergency Response Centre communication. The consulting services will include fleet mapping, defining the operational communication model and planning the migration to VIRVE.

During 2003–2005, a consortium of ElisaCom Ltd. and Siemens Osaakeyhtiö will deliver the information system and the related telephone and data storage systems to thirteen of Finland-112's emergency response centres, covering all parts of Finland.

Finnish users take Nokia THR880 into service

Users of the Finnish VIRVE Public Safety and Authority network, including Police, Rescue Services and the Civil Aviation Authority, were among the first customers to put the new Nokia THR880 radios into service.

First shipments of the radio started in late 2002 and will continue into 2003.



Getting more information to the field

Rescue workers will be able to get much more information on their TETRA handsets thanks to a new application developed by Novo Group. Working with the City of Helsinki Rescue Department, Novo has produced a system that dramatically increases the bandwidth available over TETRA networks, allowing users in the field to use many of the same tools enjoyed by their colleagues back at the command and control centre.

The technique uses a separate network abstraction layer that switches automatically between WLAN, TETRA IP packet data and GPRS, giving access to much greater bandwidth than with standard TETRA.

Using this method, mobile applications will be able to handle several content types from different sources simultaneously. Map data will be stored in the terminal, while dispatch information and automatic vehicle location (AVL) position information from other units will be received from the network. Additional content types such as operational procedures and shift information are accessed from central databases at the rescue centre or over the Internet.

The combination of TETRA IP packet data and GPRS should allow the system to function under most circumstances.





New terminal gets a rave review



Anyone who has used the new Nokia THR880 TETRA radio would surely agree with the jury at the TETRA World Congress 2002, who awarded it the award of 'Best New TETRA Radio.'

Receiving the award from Ray Ginman, Chairman of the TETRA MoU, Nokia Director Kenneth Björklund acknowledged the efforts of all who contributed to the development of the Nokia THR880: "The prize is a reward for Nokia's long-term commitment to TETRA. I'd like to address my words of thanks to our competent team for their achievements, and to our customers who have challenged us to develop this product for their needs."

Attached to this page is your own copy of a leaflet that tells you more about the award winning Nokia THR880, the Best New TETRA Radio.

Three steps to effective TETRA scanning

TETRA radio users can be members of several talk groups, from which they can select one active group to talk to and other groups that the radio terminal will listen to, or scan.

Used with appropriate priorities for each group, scanning means that the user will not miss a message on the most important groups, vital when people from several emergency services need to work together efficiently.

There are three key features that give a TETRA system the power of effective scanning.

Priorities

The most important criterion is the ability to set priorities for scanning. If there are no priorities, the radio terminal will select the first group call that is offered. This could lead to a radio user being stuck in a routine call and missing critical information in a higher-priority group. In priority scanning, the radio terminal will always select the most important group call, based on the priorities set for the talk groups.

Multiple Group Operation

It is not enough that the radio terminals themselves have multiple group operation: the system must also support it. In other words, the system should establish the group call to any cell where group members are located, not only to those cells containing members that have selected the group. If it does not, it is only by chance if the radio user receives the important information.

Scanning should not be based on assumptions

The radio terminal and network infrastructure should not be allowed to work on their own assumptions on things such as relationships between groups, preferences, or selections. If the radio terminal and network infrastructure do not exchange information in a dialogue, they will operate according to assumptions, which easily leads to conflicting information. If this happens, the user can only be certain of one thing: the radio terminal will listen to the selected group.

Of the three, priorities for scanning are the most important by far, allowing the user organisation to tailor its radio communication to suit its operational requirements and providing it with real value for its investment.



What is priority scanning?

Talk groups are groups of users that need to communicate with each other – when one person speaks, the other members of the group listen.

Talk groups are often set up for different purposes, for example for specific tasks, or to cover a particular geographical area, and, depending on what jobs they are assigned to, people may find themselves needing to listen to several talk groups. Nokia TETRA radios support this through scanning – they listen to the channel to which all the "invitations" to group calls are sent, joining in the communication when one of the talk groups on their scanning list is communicating.

In priority scanning, the user can give some talk groups a higher priority than others. While listening to one talk group, the Nokia TETRA radio terminal receives messages about other group calls and will select the highest priority call if the two communications are simultaneous.

Magdalene Telecom has a close association with Nokia and recently benefited from a transfer of competence from Nokia, making it one of the UK's most capable TETRA specialists.

For a prime example of a close working relationship between two companies, look no further than Nokia and Magdalene Telecom in the UK. In November 2002, the two companies signed a contract giving Magdalene the position of Nokia's Value Added Reseller partner for TETRA technology and sole UK distributor for Nokia TETRA terminals. This agreement covers terminals for the UK public safety market and to Dolphin, the leading commercial TETRA network operator.

With 85 employees on its payroll and a turnover currently around £8 million, Magdalene is a sizable operation able to fulfill the TETRA needs of almost any UK organisation.

"In an important move, Nokia has outsourced its technical care and support functions to us, strengthening the appeal of its TETRA solution to the UK market," says Mike Hopkins, Operations Director at Magdalene. "We have a wealth of telecommunications experience, we estimate over 900 man years, coupled with good local knowledge and a high visibility with the main UK customers."

Since it was established in 1996 to provide high quality resilient systems for network operators and private telecommunications networks, Magdalene has always had close dealings with Nokia. In addition to TETRA terminals, Magdalene offers Nokia TETRA infrastructure, radio access and transmission networks in conjunction with implementation and care services.

Local knowledge counts

In the UK one of Magdalene's main pushes is to provide Nokia TETRA terminals for the national Airwave public safety communications project. "The new Nokia THR880 has been well received by many police forces," says Andrew Dunkley, Senior Solutions Manager of Magdalene. "In particular, the similarity of the interface with Nokia's GSM phones is liked because it will mean users will need minimal training. The terminal's ruggedness and other advanced features, such as voice feedback, are also appreciated."

For Nokia, a knowledgeable local partner, like Magdalene, that has good contacts with end user organisations is important. The partner can act as a link between the user and manufacturer and help interpret local requirements in order to create new terminal features or to help find new ways of using existing features to meet specific demands.

Nokia delivery unmatched

Aside from its products' advanced features that are easy to use, Magdalene sees a strong advantage for Nokia in that the company can supply large quantities of terminals with short delivery times. "They can do this because the terminals use the same product lines as Nokia's GSM phones which, are geared for very high volume production. No other manufacturer can match this capability," says Mike Hopkins.

Outside the UK, Magdalene is pushing for TETRA infrastructure projects mainly in Africa and is currently being considered for projects in South Africa and Kenya. Africa shows much potential for TETRA, the company believes and many projects on the continent are likely to be available in the future.

With such an intense period of rapid expansion behind them, including a move into new offices, Magdalene is currently consolidating its position. Yet this is not stopping them pushing for substantial new business in the UK and beyond. And with such a deep knowledge of Nokia products and processes to help them, the outlook seems bright.



Close relationship boosts UK's Nokia TETRA supplier

Mike Hopkins, Operations Director,
Magdalene Telecom



TETRA Events Diary

Event	Date	Venue
TETRA Association Seminars	4–5 March	Dubai
Transport & TETRA Conference	4–5 March	London
Scandinavian TETRA Seminars	12–13 March	Oslo
CeBIT'03	12–19 March	Hannover
IDEX	16–20 March	Abu Dhabi
TETRA Association Seminars	26–28 March	Australia
TELEXPO	March–April	Brazil
BAPCO 2003	2–3 April	London
Trunked Radio International Summit	3–4 April	Beijing
TETRA Application Seminars	28–30 April	London
INTERDEFESA 2003	6–9 May	Sao Paulo, Brazil
TETRA Association Seminars	September	S. Africa
All Russian TETRA Conference and Exhibition 2003	7–9 October	Moscow
6th TETRA World Congress	24–28 November	Copenhagen

Current trends in TETRA interoperability

TETRA interoperability was once again well presented at last year's TETRA World Congress. As well as announcing that it is ready to start interoperability testing of the TETRA Inter System Interface (ISI), Nokia demonstrated terminals by all manufacturers working well with each other, including the Niro's intrinsically safe terminal and the Thales end-to-end encryption terminal.

Testing high-security Nokia TETRA System interoperability

Another milestone in interoperability was Nokia's recent test session to certify the Nokia implementation of the air interface encryption using dynamic keys – the highest, Class 3 encryption. Other new security features verified were end-to-end encryption and ambient listening, marking the first time that TETRA had been tested with such high-security features. Several other functions were also tested, including Automatic Vehicle Location (AVL) working simultaneously with voice communication and simultaneous MS-ISDN and FSN numbering.

Preliminary test results are very promising and ISCTI, the certification body is expected to issue the certificates this Spring, further proof of Nokia's leading position in TETRA features and its total commitment to interoperability and the openness of the market.

The test session was also important because it was the first time that the newly validated and extended TETRA interoperability test plans were used. Validated at the TETRA MoU Technical Forum in December, the plans, together with the TIP specifications, are now available to

TETRA MoU Members on the TETRA MoU web site, in the Technical Forum section.

A look at TETRA MoU activities

The TETRA MoU Technical Forum (TF) is an open meeting point for the entire MoU membership. Its main activities have been in technical interoperability, and other important topics are also discussed.

Its latest activities have involved the test plans, but new TIP specifications have also been addressed, including the TIPs for Multi-slot Packet Data and ISI Group Call. Comments are requested from the membership, especially from operators and users, to ensure that these fulfill the functional requirements.

Before the TIP specification for the Direct Mode Operation (DMO) repeater/gateway can be made available, a number of ambiguities between the standard and the real-life implementation must be resolved. The goal is to sort these out by this summer.

The TETRA MoU Operator/User Association (OUA) is a forum for TETRA customers. Its aim is to address the challenges that are common to both users and operators, not only in the public safety arena but also in sectors such as transportation and utilities. The OUA contributes to the TETRA community by preparing the annual prioritization proposals for TETRA interoperability. This guides the TETRA MoU Technical Forum and the TETRA industry in their efforts to satisfy the needs of TETRA end-users. Nokia recommends participation in the OUA by TETRA customers.

Intranet

→ Intranet is the term used to describe those web pages that only the company's own employees can access.

Extranet

→ Extranet is a secure web site that a company opens to users with specific usernames and passwords. Because the readers of extranet pages are identified, companies can share information that is confidential between them and the reader.

Internet

→ Information on the Internet is public: the web pages in the Internet can be accessed by anyone.

Stop fishing around for TETRA on the web

Just try this quickly: Type "TETRA" into your favourite web search engine and see what comes back. Almost certainly you'll get more than 100,000 hits - many of them about fish!

Well, despair no more! There are several quick and easy ways to find the most interesting TETRA-related pages on the World Wide Web.

TETRA on the Internet

When looking for information related to TETRA technology and products, the first and most obvious pages to try are the public ones.

The Nokia Web is located at www.nokia.com and is the gateway to all Nokia solutions, including those based on TETRA technology. As public safety organisations are the main market for TETRA, the TETRA pages are categorised under **Solutions -> Government**. You can also speed-dial using either of the addresses www.nokia.com/public_safety or www.nokia.com/TETRA - both of these will take you to the same government solutions page.

The TETRA Memorandum of Understanding (TETRA MoU) is an organisation dedicated to supporting and promoting TETRA, and it provides a forum to share information and ideas among those with a common interest in the success of the standard. The TETRA MoU maintains a comprehensive web site at www.tetramou.com, with a wealth of information on the TETRA standard. It has also put together a collection of TETRA-related press releases and other news.

Categorised under **TETRA MoU -> Signatories**, you can find a list of all signatories of the TETRA MoU, complete with links to their web pages. The signatories include TETRA vendors, TETRA Forums and organisations that use TETRA technology.

TETRA in the Nokia Extranet

Nokia TETRA System customers can access the Nokia Extranet, which goes by the name of **Nokia Online Services (NOLS)**. Located at www.online.nokia.com, NOLS is a secure site: a specific username and password is needed to allow you to browse its pages.

If you need general information on Nokia TETRA solutions, Dialog in NOLS is the place. On the NOLS main page, select **Dialog -> Systems & Solutions**. On the page that opens, the link to TETRA specific pages can be found in the list titled **Network Today and Tomorrow - Lower Cost, Higher Speed**.

Dialog includes an impressive collection of downloadable documents on Nokia TETRA, such as case studies, testimonials and other documents. Statistics are collected to determine which pages readers find most interesting, allowing the service to be improved through offering more information on those subjects.

In addition to the general TETRA-related information, NOLS contains information that is very specific to customers' Nokia TETRA Systems, such as technical documentation, a collection of solutions to network problems (the Resolution Database), and technical notes.

www.nokia.com



www.tetramou.com



www.online.nokia.com

