TETRA Touch

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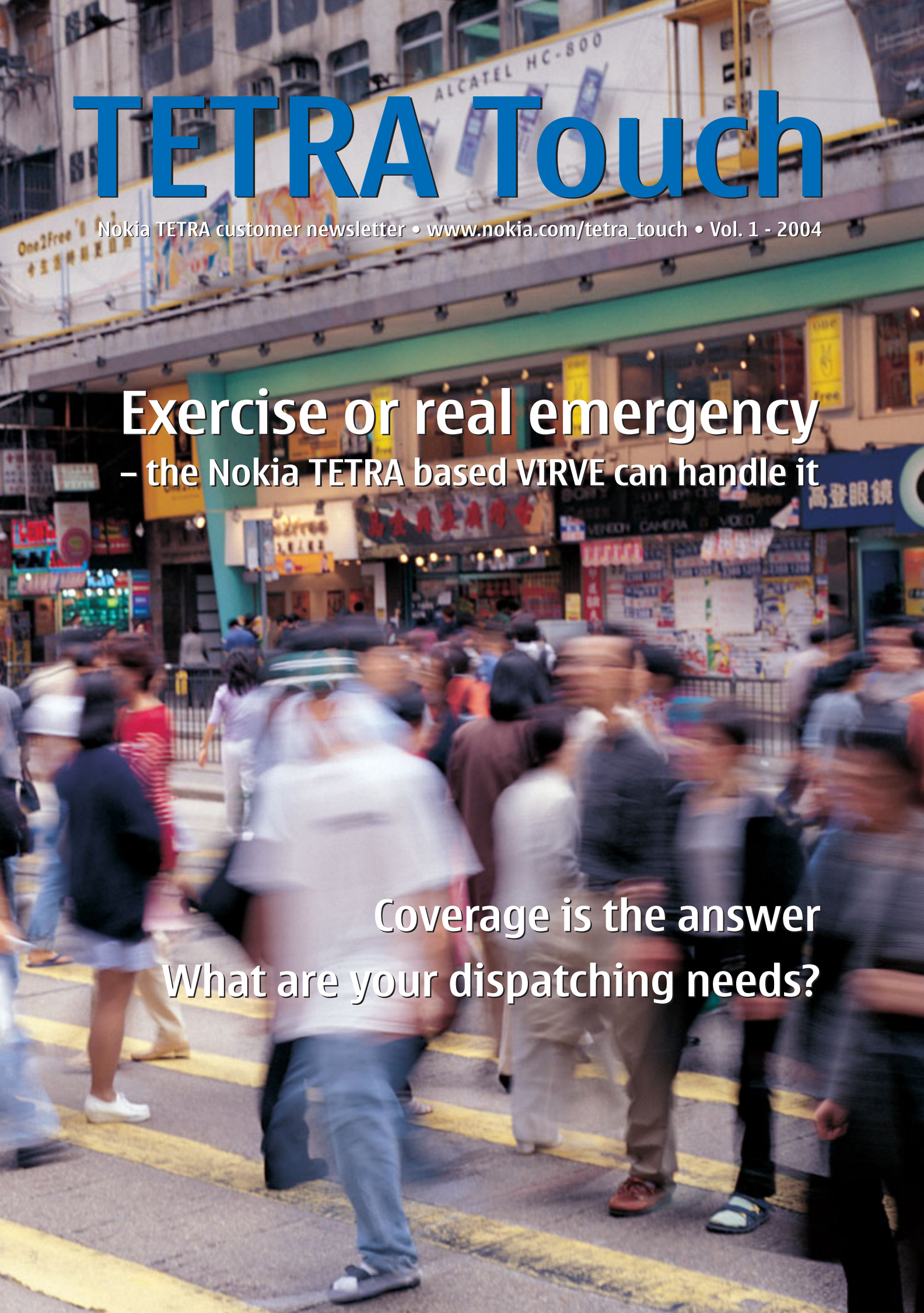

Exercise or real emergency
– the Nokia TETRA based VIRVE can handle it

Coverage is the answer

What are your dispatching needs?

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What are your dispatching needs?
With TETRA, today's dispatching is far more capable and efficient.

Seamless means no boundaries

Numerous TETRA networks have now been in operation for long enough to prove the many benefits that the technology has brought to users, user organisations and to the people – customers or citizens – that they serve. These benefits include non-congested communications, crystal clear voice quality, complete support for field operations, as well as rapid and secure data services. In addition, Nokia TETRA systems provide truly seamless services throughout the network, whether local, regional or nationwide.

A seamless network is transparent, which means that its technical structure is invisible to users. And this means that user organisations do not have to worry about any of the network's physical aspects when it comes to the planning of their operations and co-operative processes.

It's all about flexibility

This equates to flexibility. Freedom from artificial limits that older technologies place on operational planning. No longer does the radio network's infrastructure have to be considered when planning operational areas. With today's seamless Nokia TETRA, organisations are free to plan their operations without thinking about the technical limitations of the system.

Seamless TETRA services also mean that technical issues, such as numbering, the location of base stations, or the operating areas of the switches, do not limit multi-agency operations. The network is truly transparent – not only to the users, but also to the planners.

TETRA is flexible, giving users and planners further freedom in the way they adopt the technology. If an organisation does not want to change its established working methods, it does not have to. TETRA can be implemented as a straight substitution for an old analogue system, bringing better security. However, adopting TETRA can also offer much more when the organisation decides to develop better co-operative working processes. In other words, seamless TETRA services give new flexibility to migration from the old system to the new.

Clear benefits to transparency

TETRA services are transparent and the many success stories around the world clearly demonstrate its benefits. One success is especially indebted to TETRA technology – the revamping of the Finnish emergency response centres (described later in this issue of TETRA Touch). This overhaul would simply not have been possible in an analogue world. This is a perfect example of streamlining operations and changing the ways of working.

Yet it is most important to remember that adopting TETRA does not require drastic changes in operations. Adopting TETRA means freedom to choose.

Matti Peltola
Senior Vice President
Professional Mobile Radio

VIRVE in the hot seat

A quiet, bleak mid-winter morning at Helsinki's Vantaa Airport. Yet, the calm is about to be shattered by a catastrophic event.

At 10:20, an airliner with 75 passengers and five crew members is on final approach. Only moments from touch down, the aircraft suffers a serious structural failure and slams hard into the runway, the left wing crumpling. Fuel sprayed onto the engine catches fire and the aircraft skids to a halt, burning fiercely. In the stricken aircraft, one person lies dead, while 20 are injured. A fast, well co-ordinated rescue is their only hope.

As soon as the alarm is raised, a rescue plan swings into action. Rescue services and paramedics work to control the fire and recover the injured. In overall charge at the scene is a medical manager, co-ordinating triage, transport, paramedics and Red Cross personnel.

He also keeps the medical chief at the operational command unit up-to-date on the situation in the field, who alerts the hospitals in the area and order them to secure capacity. Within half an hour, capacity was reserved for 50 severely injured patients, more than enough to deal with the casualties.

Within 15 minutes of the first alarm at 10:02, the fire was contained and in just half an hour, all casualties had been removed from the aircraft. Only an hour and 15 minutes after the first alarm, even the air traffic was back to normal.

Luckily, the plane crash was an exercise, designed to test the operations and co-ordination of a number of different public safety organisations, co-operation made easier by using the Finnish public safety network VIRVE.

The bad old days

Only a few years ago, communications during a rescue incident were faced with several major challenges.

The conventional analogue communication systems used at the time were simply not geared to the needs of modern rescue operations. For example, the old radio systems did not support hierarchical incident management – all users shared the same channel, and everyone on one channel could hear everyone else on that same channel. These systems were also notoriously vulnerable to eavesdropping.

Even worse, the old communication systems used by police, fire services, and rescue services were usually not compatible, making it impossible for the different agencies to co-ordinate their efforts. To try to get round this, field officers would use public cellular services to communicate with other agencies. Yet, this allowed only one-to-one communication. What is worse, using public cellular networks during a real-life incident would have caused immense problems – because the same network is overloaded by numerous calls to the Emergency Response Centre and the large numbers of concerned people calling their relatives and friends, the network becomes blocked almost immediately.

Meeting the challenge

With responsibility for the medical needs of 1.3 million inhabitants and covering one fifth of the total area of Finland, the Hospital District of Helsinki and Uusimaa (HUS) needs excellent communications if it is to do its job well.

The key questions in managing medical rescue operations and hospital treatment are: How many casualties? How severe are their injuries? What kind of hospital treatment is needed? Where are there enough operating resources and beds for patients? Who decides where to send the casualties? And, how to ensure all involved have all the information needed for decision-making?

Adopting VIRVE has allowed HUS to bring in a new emergency management structure and emergency readiness procedures. VIRVE ensures that the operations at the scene are co-ordinated and that the medical chief and medical commander know the situation at all times. The network gives them the information they need to give the best care to incoming patients.

Each medical team at the incident has its own communication group. The team leaders share another talk group with the medical manager, who in turn communicates with the medical chief using SDS messaging.

Using Töölö Hospital as his Command Centre, the medical chief's duties are also twofold: he ensures that the local hospitals are prepared to receive the casualties, and, further up the chain of command, he keeps the medical commander at the strategic command unit up-to-date on the situation, both at the scene and at the hospitals. The medical chief uses a special talk group including all the hospitals in the Helsinki area, and the medical commander has his own group, shared with the next level of medical officer.

During the exercise, the rescue personnel at the scene could report the number of casualties in real time, as they themselves gained more information. The medical services structure the rescue effort so that casualties go through a number of stages – rescue from the plane, triage (analysing the severity of a patient's injuries) and transportation, followed by hospital treatment. During each of these stages, the person's level of injury is further clarified. The communication structure, combined with the data services enabled by VIRVE, supports this process by ensuring that this information is shared with the correct people – and only with them.

To handle the Vantaa Airport scenario, a fully operational command and control centre was put together in minutes using the basic VIRVE service and network equipment. Appropriate communication groups gave the commanding officer an overall view of the operation. With the Nokia Dispatcher Workstation, the commander had full access to all communication groups and their members and could easily monitor their locations, status and

current tasks. Even when things were at their most hectic, commands and instructions reached the right officers at the right time.

Lessons learnt

The exercise employed nine major hospitals and several ambulances, together with armed forces personnel and border guards, providing helicopter support for transportation. Explains Mr Koskinen: "We used SDS (Short Data Service) to send the most urgent patient information to the hospitals to improve the accuracy of the patient data, employed for the first time in the world in the previous year's exercise. A smooth IT network must obviously co-ordinate with the radio traffic."

Capable as VIRVE is, the exercise threw up new lessons about the way it is used: "The number of talk groups for each member of the rescue team has to be considered carefully – in particular, the higher you rank, the more groups you must follow and to keep everything under control, the number of groups must be kept to a reasonable level.

"We also learned that scanning other talk groups must be minimised. For instance, the medical commander at the scene had three different VIRVE radios – one handheld radio for traffic downwards, another handheld radio for traffic upwards and one office radio for traffic between the commanders of fire rescue, police and voluntary organisations."

Sharing promotes co-operation

More than 50 organisations took part in the rehearsal, with more than 600 professionals testing their ability to co-operate and communicate. "The co-operation between different public safety organisations was effective and hence very impressive," says Koskinen.

"In this exercise we concentrated particularly on the radio traffic culture – how to start speaking to identify yourself and your position, how to concentrate your message and how to end the session. It is vital to know with whom you are talking.

"Also, the voluntary rescue services were easy to manage with VIRVE. Because information security is top class, those not authorised for some of the information will not get it – they don't hear those calls or receive SDSs not meant for them," Koskinen continues.

"This kind of major catastrophe really shows us the importance of co-operation between different organisations. The exercise was as close to a real catastrophe as you can get. In real incidents every detail has to be in place and work perfectly – in this exercise, it really did"!

VIRVE can handle it

Because not all the organisations involved have used VIRVE for long, the exercise gave a chance to gather data about its performance and capacity during the exercise. For example, communication in the talk groups was recorded, and traffic load on the base station at the airport was monitored. It was found that the base station could handle even the heaviest traffic without difficulty. Across the different authorities, there were about 14–15 talk groups and approximately 75 VIRVE radios in use at any one time.

"I am very optimistic about using the Finnish VIRVE system more widely within our own organisation and between different authorities and voluntary organisations in the next two or three years," says Koskinen. "We will concentrate this year on examining the use of hand held radios in hospitals and how to minimise possible disturbances to medical equipment."

Exercise or real emergency – the Nokia TETRA based VIRVE can handle it.

Defending the border with VIRVE

Finland's Frontier Guard is charged with maintaining peace and safety in Finland's border areas. Its functions include guarding the borders, and carrying out checks to control entry and departure from the country at land borders, at sea ports and airports. As well as being in charge of maritime rescue services, the Frontier Guard also contributes to other rescue services and handles customs control in areas not covered by the Customs Administration.

The Frontier Guard also co-operates closely with the Police and the Customs, as well as working with the Maritime Administration and the Finnish Defence Forces.

The communications challenge

Before the advent of VIRVE, the Frontier Guard used a traditional analogue VHF system, with all the problems typical of conventional analogue networks: problems in network coverage, or limited network coverage; vulnerability to eavesdropping, preventing the exchange of confidential information via radio; and outdated technology.

To counter the vulnerability to eavesdropping, field officers had to use cumbersome add-ons to the analogue terminals. Slow and heavy, these were impractical for the field. In addition, the analogue network did not allow nationwide group communication.

There was also no facility for data communications, making access to registries and databases from the field impossible using regular terminals. Frontier Guards collect various surveillance data both on the land and sea borders, using electronic sensors, or surveillance photos and the network was incapable of transferring this information.

VIRVE has improved co-operation between the Frontier Guard and Police and Customs. Previously, GSM phones were used between these agencies and although communication was secure, group communication was not possible – it was all one-to-one. Some co-operation channels were allocated in the old systems, but people generally did not know the frequencies when they needed them.

Pioneers of VIRVE

The Frontier Guards were very much involved from the beginning – even before VIRVE, they were in the workgroup that planned the development of a common communications network for Finland's public safety authorities. Planning started as early as the late 1980s. The workgroup continued developing the ideas and the concepts until the VIRVE organisation was established in 1997.

Continuing in their pioneering role, the Frontier Guards were the first to bring VIRVE into operation during the summer of 2001. At that time, the southern sea areas and the southwestern areas of Finland started using the VIRVE network. The migration period was kept as short as possible, only a few months. This was a conscious choice. Firstly, the old analogue network had its limitations, and it only took a short time to realise how much better was the support offered by VIRVE.

A basic need of the Frontier Guard was to avoid being an operator of the radio communications network. They wanted the communications network as a service to them, and simply use the system, unlike the old system, which they operated and maintained. VIRVE was the perfect answer.

Since 2003, Frontier Guards all over Finland have been VIRVE users. The organisation has also purchased around 1500 terminals, the vast majority of which are supplied by Nokia. From the start, comments from the field have been positive. One reason for the easy adoption was that all Frontier Guards were informed of the change early on. In addition, the first adopters were told to expect some limitations and problems at the very beginning. However, the main reason was that the old system was so impractical and everyone was keen to adopt a new system that would clearly solve so many problems.

Bringing benefits

VIRVE offers flexible intra-agency communication and has no geographical limitations. For an individual, the most visible benefit is the

uncompromised communications security – what is confidential, remains confidential. In addition, the data transfer possibilities offer support for field officers on the move. For example, they can use various databases and even enter new data into them, all from their TETRA terminal. Surveillance information is also easy to transfer over the TETRA network.

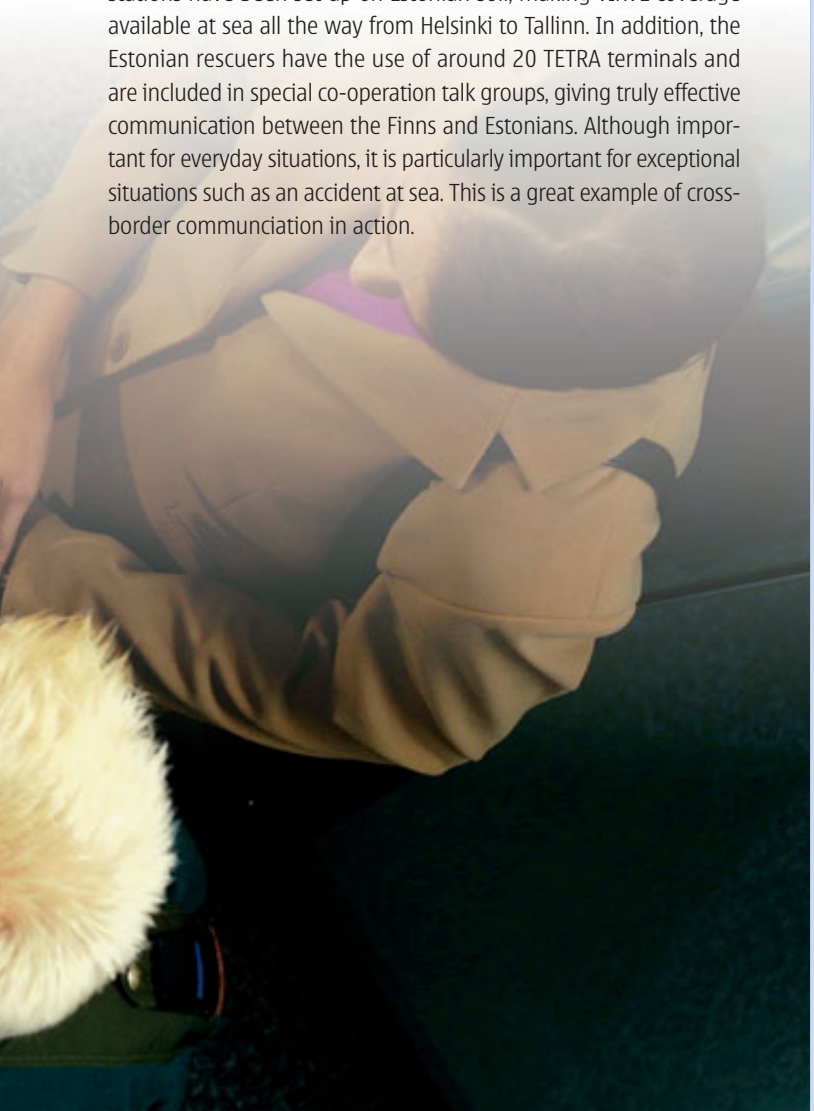
For the Frontier Guard, VIRVE makes everyday life easier, at every border control point. It makes for more effective operations and makes officers more capable and flexible.

Maritime co-operation between Finland and Estonia – a win-win scenario

The Finnish Frontier Guard, the Swedish Coast Guard and the Border Guard of Estonia cooperate in surveillance matters in the Northern Baltic Sea, in the Gulf of Finland and in the Gulf of Bothnia. What is unique about the Frontier Guards using VIRVE is that they have pioneered new ways of co-operating with neighbouring countries and with countries with a common sea border.

Right from the start, it was clear that coverage in the Baltic Sea area with its busy shipping was important. Base stations within Finland did not reach far enough out to sea, so an innovative form of co-operation was suggested to Estonia's Frontier Guard Marine rescuers.

The idea was surprisingly quickly embraced by Estonian decision-makers and frontier guards alike. As a result, several VIRVE base stations have been set up on Estonian soil, making VIRVE coverage available at sea all the way from Helsinki to Tallinn. In addition, the Estonian rescuers have the use of around 20 TETRA terminals and are included in special co-operation talk groups, giving truly effective communication between the Finns and Estonians. Although important for everyday situations, it is particularly important for exceptional situations such as an accident at sea. This is a great example of cross-border communciation in action.



Nokia wins Asia's biggest TETRA terminal contract

Nokia has landed the biggest TETRA terminal deal ever awarded in Asia. Nokia (China) Investment Co., Ltd. and Beijing Just Top Network Communications Company Limited are to supply Nokia THR850 and THR880 hand-portables and Nokia TMR880 mobile radios on the 800 MHz frequency band for the Beijing Government Shared TETRA Network.

The order comes as the network's first phase of construction nears completion. Operated by Beijing Just Top Network Communications, the network will serve up to 50,000 subscribers and covers the entire Beijing metropolitan area, nearby key counties and major parts of the main highways. Operations will start during the first half of 2004. The new Nokia terminals will be mainly used by Beijing municipal departments and the Beijing police.

The network uses a wide range of Nokia's TETRA IP equipment, including switching equipment, base stations, dispatcher stations and network management.

The Nokia terminals were chosen because they offer the latest, most advanced technology platform, says Kenneth Björklund, Director of TETRA terminals, Nokia. "Other factors in the choice include features such as WAP, IP packet data, easy-to-use user interface and voice feedback in the Chinese language."

Greece gears up with Nokia terminals

Over 20,000 Greek public safety personnel are to be equipped with Nokia THR880 hand-portable and Nokia TMR880 mobile terminals in time for this summer's big sporting event. Police, fire brigades, military and other security personnel will benefit from new terminal features including a user interface and voice feedback in Greek.

Nokia's TETRA radios will help to ensure the day-to-day security and safety of hundreds of thousands of visitors, reporters, athletes and spectators. The advanced features of TETRA technology, such as instant group calls, intelligent management of groups and pre-emptive emergency calls, help to improve the safety of public safety officers.

Terminals were chosen for both their functions and their reliability. Particularly important to the Greek authorities was the familiar and easy to use interface, which makes introduction and training for TETRA terminal users straightforward and efficient. Both Nokia terminals also have the same user interface, which further simplifies use and improves reliability. Advanced security and data features, such as class 2 and class 3 encryption, WAP and packet data allow the use of a wide variety of applications.

Great potential for more effective cooperation

Gun Hellsvik, Director General of the Swedish Patent and Registration Office, former Minister of Justice, chairman of the Swedish Parliament's justice committee and President of the Nordic Council shares her views on modern technology and the opportunities that public safety and security organisations have for more effective communication.

During her term as Minister of Justice, Gun Hellsvik saw how important modern technology is for police work. Access to modern technology, not least to communication and information systems, is a basic requirement for the police to be able to effectively fight crime.

"A tangible example comes from Blekinge, Sweden, where police at the ferry port need to stop cars that they suspect are loaded with stolen goods. However, without communication between the different police districts, the police at the border cannot get the information they need about goods that may be reported stolen in another district. Therefore, they cannot intervene. But with a system that can quickly provide the police in the field with information from all over the country, their work would significantly improve."

Why is it that systems do not work like this today?

"In the 1980s, when many organisations in the so-called blue light sector started discussing the need for more modern technology, every agency built its own system, with the result that the systems did not work together. The situation was far from being the most effective solution that could have been achieved for operations in the field, relative to the costs involved."

However, according to Gun Hellsvik, it is not only the police who would benefit from a shared communication system.

"Today, after the riots in Gothenburg and with the new threat to the community in the form of terrorism, for example, the discussions have been given fresh impetus. The focus now is on how different agencies can cooperate better, which requires communication between the agencies that is simple and secure. The need is already huge, with accidents requiring that the rescue services, police and, sometimes, even the defence forces are able to communicate with each other to be able to direct traffic, call in special experts and obtain military helicopters for fast transport.

"I believe that there is great potential for more effective cooperation between the agencies that are responsible for citizens' safety. With better communication and coordination, we could be reassured that the correct resources are present for every effort."

Is this a problem exclusively for Sweden?

"No, not every activity is confined within the country's borders. In crisis situations, it is important that the border areas and the coast have effective collaboration with the corresponding authorities in neighbouring countries."

Do you see any problems with the new communication systems?

"No, but it is important to consider the security of the system. From both a security and integrity point of view it is unbelievably important that the communications system can be protected against eavesdropping. The police must be able to direct their units and the ambulance services to transfer patient data without risk of the information reaching the wrong ears."

Sweden aims for national coverage

Several national projects ongoing in Europe aim to improve radio communications between different authorities. The Swedish government is next in line to make important decisions about the building of a shared authority network for its Public Safety organisations.

Procurement has proceeded efficiently since the RAKEL project organisation was formed in late 2002. The government budget of some 2.3 BSEK (250M€) has been allocated for the project, bid evaluation is ongoing and vendor selection is expected by the end of March 2004.

The nationwide network will be implemented in phases during 2004–2009 starting in Southern Sweden, followed by the Stockholm and Gothenburg regions.

Needs come first in fleet mapping and operations planning

Nokia Consultancy Services help organisations plan their TETRA network to get the best performance. Shared networks need to be set up carefully to cater for the different needs of user organisations. 'Needs' is the important word here.

In addition to problems in radio coverage, one of the most common problem that users of conventional analogue radio systems face is a stuck Push-To-Talk (PTT) button. In an analogue network, pressing the radio's PTT button reserves the communication channel. If it gets stuck in the "transmit" position, the whole channel is blocked and other users can't gain access to speak.

The worst nightmare for many officers in the field is that this happens during an emergency or other special incident, preventing them from calling for urgent help. This could be big trouble.

With a digital TETRA network, this cannot happen. Even if the terminal's PTT button sticks, other users will still be able to make that vital emergency call. In TETRA, emergency calls have the highest priority and the system will override all other calls to let the emergency caller connect.

How does this work? Pushing the PTT button on a TETRA terminal merely requests resources for communication from the network, it doesn't reserve the channel itself. It is the network that decides which terminal gets priority to speak. The network will automatically disconnect the calls and speech items that exceed the pre-planned time limit.

But what does all this have to do with how Nokia can help in the planning of a TETRA network?

Juha Tammela, Senior Consultant, Nokia, explains: "Effective planning starts with analysing the needs of the users and the network operator. This is fundamental. Part of this communications needs analysis is looking at problems caused by the existing system. The stuck PTT key is the most common nuisance we come across."

Tammela points to some other recurring problems, including poor voice quality and inconsistent coverage. "By solving these basic problems, we can meet most of the users' needs. Operations planning should be needs-led, not technology-led. Only when you have identified the needs of users can you properly plan the network."

The national network

The most successful networks are single nationwide networks like ASTRID in Belgium and VIRVE in Finland. One network used by multiple agencies can achieve unmatched efficiencies and cost savings. With incidents increasingly requiring a multi-agency response, a shared network enables officers from different agencies to communicate easily with each other when they need to, yet maintains the security that each agency demands.

But the planning has to be right. The needs of the different user organisations can vary widely and services cannot be implemented according to a single 'template'. Proper planning is needed to ensure that the most important communications can get the best resources at any time. There are other benefits too. For example, with a well implemented network, it is straightforward to add new user groups without tedious and costly re-programming of terminals and avoiding reworking the fleet mapping.

"It is easy for any organisation to get hooked by new capabilities and not fully appreciate what is involved in setting it up," Tammela says. "Existing communications procedures can evolve to make the most of the new network, otherwise why bother to change? This means changing the communications culture to meet needs now and into the future."

Before the VIRVE network was built, for example, several operational and technical committees comprising the network's owner, operator and end organisations established the detailed aims of the network. This information was then fed back to the technical network planners and equipment suppliers to ensure the final system met all the defined needs.

Training is a vital part of the process

Training the operator and users on how to get the most out of the new network needs equally thorough planning. "TETRA terminals are easy to use, but getting users to accept new ways can be tough. Talking directly to other agencies' officers is innovative for many and sometimes hard to appreciate. People have a natural reluctance to change and it is only by giving them hands-on experience of the new system that they will accept new procedures," says Tammela.

Training planning never stops. New features are coming in all the time and the training needs to be constantly updated. A user training course devised early in a network's life will be vastly different to one run a few years later.

A needs-driven approach to network planning is as important as getting the hardware right. Nokia has much experience and its consultancy services are helping organisations around the world to get the best from their TETRA investments.

Finnish response centres

As the overhaul of Finland's Emergency Response Centres reaches a mid-point, TETRA Touch looks at how applying the latest IP technology is making Finns safer in an emergency.

Picture this: You are walking in downtown Vaasa one Summer evening. It's busy with people enjoying the warm weather and relaxing in the restaurants and bars.

Suddenly, two cars collide. One is pushed onto the pavement and strikes a couple, then crashes into a wall, trapping the driver. The two pedestrians are sprawled across the pavement, clearly injured. This looks bad.

You dial the common Pan-European emergency number, 112, and tell the operator what has happened. You ask for police, ambulance and rescue services.

From this point on, the way that your emergency call is handled is completely different to how it would have been managed just a couple of years ago. That's because Finland is halfway through a revamp of its emergency response system.

Nearly 200 small, local Emergency Response Centres (ERC), each dedicated to a single emergency service, are being replaced by just 15 large, highly sophisticated centres nationwide.

In the old system, your emergency call would have been taken by a dispatcher in one of the several local ERCs or command centres. The dispatcher would have passed the incident details to the agencies belonging to his direct responsiblility first. After that he would have

go hi-tech

transferred the incident information to the other emergency services. Alternativilely the person who made the first emergency call would have been asked to dial the other – hard to remember – Emergency call number.

But with the new streamlined system, only one call is needed to alert the ERC that is responsible for the whole incident and its response. The same professional dispatchers taking the calls are now responsible for alarming all the proper resources in addtion to 112 call taking. The response is faster, more efficient and there is less risk of misunderstandings and incorrect information being created.

Apart from the better response procedure, running fewer centres will reduce operational costs and bring significant savings for the public purse.

Latest technology

By the end of January 2004, five of the new ERCs are operational, with two more due to start operations soon after. All 15 should be active by 2006.

The ultimate aim is for all the new centres to be equipped with the latest communications and control technology to improve incident response even more. Two key technologies are being implemented – integration with Finland's nationwide TETRA-based VIRVE network and the installation in each ERC of a new command control and communication (CCC) system from Germany's NOVOtec GmbH.

These two technologies are closely linked because it is only with the operational capabilities of TETRA that the ERC control system will achieve the full range of benefits possible. Indeed if the VIRVE network did not exist, the renovation of the ERCs would not have been possible because they would have had no effective way to communicate with all the emergency services operating in and serving large geographic areas.

A better incident response process

TETRA and the new CCC system bring significant benefits to all stages of the incident handling process.

The first stage is the handling of the emergency call. When a 112 call is made from a fixed line telephone, the phone's address is shown immediately, a feature that exists also in the old system. However, an increasing number of 112 calls are being made from mobile phones, which do not provide the immediate location information that is needed.

"The new CCC system interfaced to the mobile networks will provide the means to overcome this major limitation for the first time," explains Mr. Juha Tammela, Senior Consultant, Nokia. "Working with local GSM operators, the ERCs are developing a way to track mobiles on line. Testing is ongoing and a solution should soon be implemented."

When the emergency call has been taken, the next stage is to allocate available resources. Once again, location data is very important, but this time to provide the whereabouts of the available police and other emergency service units. The CCC system will for example provide a real-time view of the status of all units, equipment on-board, resources, and their location.

"Currently this is done by field officers using their TETRA terminals to send status and situation information as TETRA data messages to the CCC system which automatically updates its database. This is far more effective than before when field officers would call in and tell the dispatcher where they were, with the database being updated manually," Tammela explains.

Automatic location, automatic response

A further development in the near future, says Tammela, will be automatic location of field units by means of TETRA network based location services or by GPS receivers directly connected to the field units.

"With the ERCs being legally obliged to alarm the nearest propriate units, automatic positioning is a must," says Mr. Jari Juvonen, (System Specialist, Finnish Emergency Response Center adminstration). "And it will help to overcome any risk of an emergency service being sent to the wrong location."

With the CCC system knowing the type of incident and where it is, as well as the location and availability of field units and other pertinent preparedness information such as known risks from buildings or chemicals spills, it can automatically propose a full reponse to the ERC dispatcher. This response can be accepted or modified by the dispatcher as necessary.

Once the response set-up is decided, the relevant units need to be alarmed. The alarm is made by the operator calling the units on their TETRA terminals and telling them the incident details. This is backed up by a text message automatically sent by the CCC system via TETRA – written descriptions avoid misunderstandings or misheard addresses and other details. A third alarming method is to send a Unit Alerting (status) message to the TETRA terminals that will be switched from silent pager mode to normal radio reception. This functionality is well welcomed by senior off-duty supervisors and managers.

Technology is no limit

"The previous system had very limited and unreliable data signalling so this is a new capability for us," comments Juvonen. "Now, technology places no limits on what we can do."

Nokia's consultancy services had an important role in the design and implementation of the complete ERC communications and control system. "At Nokia we have gained considerable experience of integrating Computer aided dispatching systems with a TETRA network," explains Tammela. "From the physical cabling to operational management structures, we were able to guide the implementation of new ERC IT system on top of our TETRA Connectivity Server (TCS). Although not difficult, there are many aspects to interfacing with the TCS, it is a large and involved job. It is important to analyse the needs of the organisation first to enable the design of a system that will fulfill all expectations."

And although the ERC renovation project is in progress, the first real operational experiences demonstrate that emergency responses in Finland will be lifted to a new level of efficiency and effectiveness.

Coverage is the answer

Mountain ranges, buildings, underground areas such as subways, and even trees, can all affect the behaviour of radio signals. This alone can make planning a TETRA network a major challenge. The new Nokia TB3 TETRA base station has greater coverage and can help planners achieve the network they want.

Network implementation can be based on one of three possible approaches – minimise cost, maximise coverage or achieve the highest capacity and quality. Each has its drawbacks, but they all have one thing in common – implementation would be much easier if base stations reached further than before.

The level of network investment is a critical consideration. A typical TETRA network serves relatively few users, which often makes the cost of coverage per user substantial. Coverage is therefore planned to be satisfactory for higher-power mobile terminals, but there may be annoying gaps in coverage when handhelds are used.

It is possible to design a network to provide maximum coverage, leaving no gaps and most public cellular networks are planned this way. The drawback is high cost, but in the public cellular world, the huge number of subscribers justifies the financial investment to build any necessary density of base stations.

For public safety organizations, maximum coverage is also a key requirement – coverage is needed even in sparsely populated and remote areas. But with the relatively low subscriber numbers in the public safety world, funds are limited. Therefore, achieving optimum coverage within a tight budget is paramount.

The third approach is to build redundant coverage, to maximise the capacity and thus quality of service experienced by the users. This, again, is a costly approach and is not usually feasible for the relatively few users of a typical TETRA network, where capacity is not a problem.

Best of both worlds

Mainstream cellular networks have used sectorised base station sites, which provide service for allocated channels in each sector. This approach can provide maximum coverage and site capacity, but the hot-spot capacity (needed in incidents) of each sector is limited to one-third of total site capacity. A conventional omnidirectional base station site, on the other hand, provides maximum hot-spot capacity (for incidents) although its coverage is smaller.

The major innovation that the designers of the Nokia TB3 TETRA base station have made is to take advantages of the diversity gain and sectorised solutions from the mainstream cellular side while applying these solutions in a TETRA base station to achieve omnidirectional coverage. Nokia's research and development engineers have succeeded in creating the best high gain solution for radio access on today's market.

The Nokia TB3 TETRA base station combines the benefits of both omnidirectional and sectorised solutions. It has significantly wider coverage than a conventional omnidirectional site and has more hot-spot capacity with the same number of carriers than a sectorised site.

Facts about TB3 – once again!

When planning and implementing a TETRA network, any one of the three possible approaches – minimise cost, maximise coverage or achieve the highest capacity and quality – can benefit from the Nokia TB3 TETRA base station, a radio access solution offering more coverage. A network design that is driven by cost would give better coverage with the same number of sites. For a network designed for maximum coverage, fewer sites would be needed. Equally, a quality and capacity driven plan could achieve excellent indoor coverage as well as overlapping cells.

The new Nokia TB3 TETRA base station can provide up to 75% greater handheld coverage. It can fill gaps in outdoor coverage; it can provide better indoor coverage; and what's most important, it can provide better hand-portable coverage. Better coverage without gaps enables efficient, seamless and safe operations.

Better network coverage brings better public safety services, at lower cost.

Anytime, anyplace, anywhere, that's MOC

Should a sudden crisis or a special event threaten to overwhelm the existing capacity of Belgium's TETRA network in a particular area, ASTRID, the network's operator now has an almost instant answer. By deploying its new Nokia Mobile Operations Centre (MOC), ASTRID can rapidly boost local capacity or add extra coverage should the need arise.

The MOC is basically a Nokia TETRA Base Station mounted on a truck. The MOC can provide TETRA service in a specific area and with the same capabilities as the full ASTRID radio communications network.

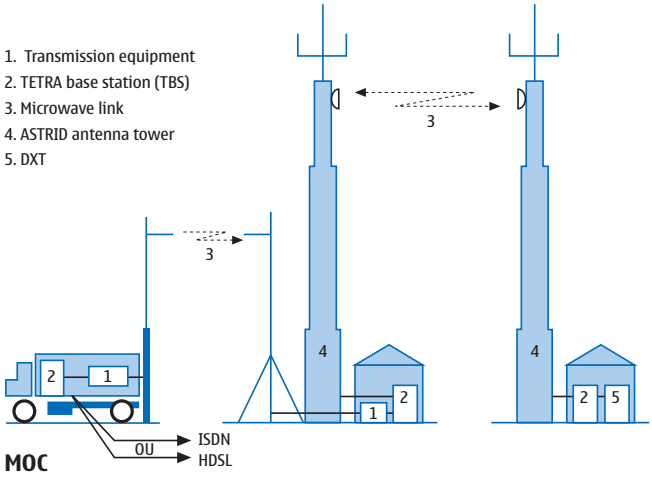
The MOC is on duty 24 hours a day, 365 days a year, so can be sent out to the required area straight away. It would link the ASTRID radio network to its deployment location. Interconnection with the Nokia DXT is achieved via a copper line (HDSL or ISDN interface) or a microwave E1 transmission link. The MOC features a 25m telescopic pole on top of the truck. A second, transportable, pole would be mounted near a fixed radio tower, establishing the wireless connection to the ASTRID radio infrastructure.

Under its own power

The truck's container has separate sections for the radio equipment and emergency back-up electricity generator, ensuring full operation during power outages or in remote areas. It can also operate a TETRA radio service without any connection to the Nokia switch. The Fallback Mode feature allows group communication for users operating under the MOC's radio 'umbrella'.

"All our customers operate in a Public Safety and Security environment. Availability and reliability of our TETRA service are crucial, and the MOC eases the management of unexpected or special events," says Christophe Gregoire, ASTRID Program Manager, Supplementary Systems & Special Projects. "The truck can be deployed anywhere, anytime, when necessary. The MOC would be used for major public events that are likely to have an impact on public safety, catastrophes or even to cover for planned maintenance on the ASTRID network."

Delivered by the KNT consortium, with Nokia performing transmission planning and supplying the TETRA network elements, the MOC was revealed to the general public at the Walloon festival in the City of Namur, Belgium, in September 2003.



The MOC can assure a TETRA service without connection to the ASTRID network (TBS Fallback option).

What are your dispatching needs?

It would be difficult to imagine a public safety and security organization being able to properly run its field operations without an effective system of fleet management, or dispatching. With TETRA, today's dispatching is far more capable and efficient thanks to its advanced dispatching tools, quick call set up and powerful group communications.

When an incident occurs, the public safety organisation's dispatchers and other command centre personnel quickly become the focus of any organised reponse. The dispatcher's role is to assign tasks to individual units or groups of units, to create and manage these groups, all while following how the incident is developing and deciding what new resources are needed. It's a tough job and dispatchers need the right tools.

Nokia offers a range of TETRA dispatcher solutions to suit the various needs of organisations. There are three dispatching solutions to choose from: DWSx, DWSi and DWSr.

Nokia DWSx for command and control rooms

The Nokia DWSx is aimed at dispatching centres with several dispatchers working together to manage the fleet. Information is automatically shared between the dispatcher stations, cutting the need for specific requests. Security is assured by the solution's optional end-to-end encrypted (e2ee) communication. The Nokia DWSx is connected to the infrastructure using either E1 or ISDN subscriber line.

Nokia DWSi for small dispatcher centers

A more economic solution, the Nokia DWSi meets the needs of small or single station dispatcher centres, yet still provides the highest levels of service, features and performance. The Nokia DWSi connects to a Nokia TETRA switch via dial-up ISDN subscriber lines, enabling it to be used in ways that are simply too expensive to set up using fixed, high capacity data connections.

Typical uses include remote single station dispatcher centres, temporary or movable dispatcher centres and back-up installations for command and control room applications. With an existing telephone line, an ISDN connection can be provided without additional wires or transmission equipment.

The latest version of the Nokia DWSi uses the same modern platform as the Nokia DWSx. Based on standard commercial components, this new version is even more cost-effective than its predecessor.

Nokia DWSr radio data dispatcher

The wireless Nokia DWSr enables dispatching on the move. With the Nokia DWSr, officers in the field can change aspects of the communications set up to suit the needs of the current situation, for example by amending priorities or group memberships. Delays and possible misunderstandings are avoided because a field officer in a command vehicle can make the changes immediately and without reference to the network's operational manager, as would be needed when using standard radio terminals.

Wireless solutions are the only choice when permanent fixed line dispatcher stations cannot be used. The wireless Nokia DWSr is also suitable for offices where advanced dispatching functions are not needed and when costs need to be kept low.

Customised dispatcher applications

For customised dispatcher applications, the Nokia TETRA system provides an easy-to-use Application Programming Interface (API) through the TETRA Connectivity Server (TCS). With the aid of the TCS API, customised applications such as Computer Aided Dispatching (CAD) or Automatic Vehicle Location (AVL) can become even more effective by combining system data with data from external computer systems.

The Nokia TCS is flexible: transmission options for third party applications include fixed line, dial-up PSTN/PABX, or wireless connection. One application can be used with different transmission types.

Dispatcher workstation variants...

Nokia TETRA provides three variants of the dispatcher application software, matched to dispatchers' needs:

- DWS Communication (voice and data communication services)
- DWS Management (subscriber, organisation block and group administration services)
- DWS Communication and Management (combining all the above services)

... and transmission options

Nokia TETRA dispatcher solutions provide several transmission options, enabling costs to be cut by selecting the best connection type for each location:

- Fixed line connections: TCP/IP 10/100Mbit/s or E1 2Mbit/s PCM
- Dial-up PSTN/PABX connections: ISDN 2B+D or ISDN 1B+D
- Wireless connections: TETRA IP packet data or GSM/GPRS data

Nokia dispatcher workstations (DWS) can be connected to the TETRA network in multiple ways, which helps to optimise transmission costs in each installation. The DWS application is identical for all connection options. This means the type of connection is hidden from the user enabling him to move easily from one dispatcher to another. In addition, third party applications can use all these transmission options.

Looks familiar – the harmonised dispatcher interface

All Nokia dispatcher solutions use the same graphical DWS user interface, based on Microsoft® Windows™. This makes it familiar and easy to use and means the dispatcher needs no additional training when moving from one dispatcher station to another.

The advantages of integrated dispatching

For the dispatcher's desk, the future lies in better ergonomics, achieved by integrating more functions into the dispatcher workstation. This will mean fewer pieces of equipment on the desk, allowing the dispatcher to choose the most comfortable working position, with the keyboard, mouse and display all most conveniently placed.

Integrated solutions bring other benefits. With fewer cables and pieces of equipment, hardware faults are less likely, making maintenance easier. This will save money, not only when buying the dispatching solutions, but also in the long term by reducing operational costs. Other benefits come along such as smaller power consumption, reduced cooling requirements and more silent office.

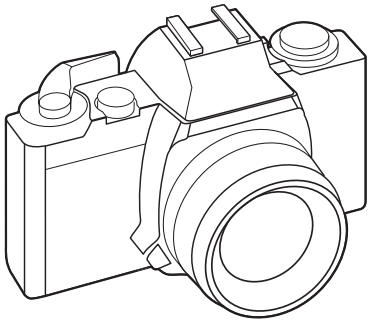
In the past, the environment around the hardware tended to be more carefully controlled than the work ergonomics for people. Today, with the highly integrated dispatching and connectivity products such as Nokia DWSx and Nokia TCS, people can again be put first.

1 Original high-definition surveillance image

2 Enlargement of a video frame

3 Enlargement of a high-definition image

Which would you rather have?



Coming into focus – TETRA-based surveillance

TETRA technology and special applications is improving the quality and cutting the cost of remote monitoring and surveillance

Video surveillance always entails a trade-off between bandwidth and image quality. Even the best video cameras lose the battle to professional digital cameras when it comes to image quality. Still images are much sharper than video.

A standard video image shows few details. Only with a high-definition surveillance system is it possible to see the level of detail that many organizations need. There is a high cost attached to building a high-definition video surveillance system that can automatically detect objects or people moving within the area being monitored.

As a rule, such a system would use one or more stationary video cameras. When a moving object is detected, the system redirects another narrow field of view camera mounted on an active platform to obtain high definition images of one or more of the targets. Images are displayed on monitors or recorded on video recorders. Such multiple camera platforms and their computer control units are usually very expensive.

TETRA is more cost effective

Better is to use a single high-definition still camera controlled by a computer. Such a professional digital camera will always produce much higher image quality than even the best video camera could achieve. A slow frame rate method is also very suited to TETRA environments. What's more, the price of this system is much lower than that of an automatic, multi-video camera system.

To make the most of digital imaging, GUIART, a pioneer in digital media, has developed its TETRA Image Communication Arena (TICA) solution for Nokia TETRA. The TICARobot software can control a digital camera to capture high definition surveillance images. These images are sent in a low-resolution format over the TETRA network, and then saved in high-resolution format on the local computer. This is a fast and reliable way of sending digital camera pictures between field units and Emergency Response Centres, for example.

At the other end of the TETRA connection, those responsible for the surveillance could ask for a detailed crop of the high-definition image, which can also be sent over the TETRA network. All original high-definition images are recorded on the computer. The surveillance system can be set to send images when anything in the picture changes, or to send a continuous flow of images.

Under surveillance, in practice

Imagine a situation in which a patrol has stopped a suspicious looking car on the road. Before talking to the driver, the officers switch on the TICARobot camera system. Images are saved and sent during the operation and if something unexpected starts to develop, and help is needed, the images can be sent easily to other patrols. Such advance information helps to decide the measures needed to handle the situation. Using TICARobot in fixed locations can also help to reduce vandalism and theft, improve staff security and limit the potential liability for damages.

→ www.guiart.com

Charleroi sets a good example

With its announcement of the commissioning of its ASTRID system, Charleroi became the biggest Walloon city to use Nokia terminals.

ASTRID News has reported a further extension of the ASTRID network's reach in Belgium, with the announcement of the commissioning of the system in the Walloon city of Charleroi.

Announcing the development at a press conference in December, Jacques Van Gompel, mayor of Charleroi, referred to the city's successful 'War Strategy against Delinquency', stressing that ASTRID would contribute to this by further improving the efficiency and effectiveness of the police force. The strategy has seen armed robberies and violence in small shops decrease from 234 in 2001 to 96 in 2003 and Van Gompel expects ASTRID to help make further dents in these figures. He also announced his aim to equip all regional fire brigades of the province of Hainaut with ASTRID.

A pioneer in ASTRID's development

Marc De Buyser, Managing Director of ASTRID, underlined the part that Hainaut will play as a pioneer during the development of ASTRID systems, while the area police chief, Francine Biot, detailed the advantages of digital communication to her force: "We have often find ourselves vulnerable to criminals. Our communications could be scanned and traced and very often the criminals knew about the arrival of the police or the police arrived too late. The Nokia THR880 TETRA handset allows us to organise our teams in a more efficient way and also improves the security of our personnel."

In 2004, all mobile forces will be equipped as well as five local police districts. The last to be equipped will be the local research department and the headquarters.

Dominique Guillaume, principal inspector and the officer in charge of the integration of ASTRID for the Charleroi Police Zone added: "We will share our knowledge on administrative as well as operational issues and have already been contacted by five police areas at district level."

Journalists attending the conference also got the chance to see the Nokia THR880 TETRA handset, as well a demonstration in which the old analogue system was compared with the digital TETRA system.

Only five days before the conference, the Charleroi police had a chance to test ASTRID and the Nokia THR880 TETRA handsets at a major football match. Both local and federal police and the Red Cross took part in the operation. "We linked everybody to ASTRID and created five communication groups," explained Jean-Hubert Nicolay, an officer in the Charleroi police football division, as well as operational contact for ASTRID. "The use of ASTRID was a considerable improvement to personal security and is the most suitable equipment for a quality police force."

Source: ASTRID News

Left to right. Mr Marc De Buyser: Managing Director of Astrid S.A., Mr Jacques Van Gompel: Mayor of the city of Charleroi, Mrs Francine Biot: Chief of the local police of charleroi, Mr Frédéric Kluyskens: Director of AEG Belgium S.A.

Dominique Guillaume, principal inspector and the officer in charge of the integration of ASTRID for the Charleroi Police Zone

Bringing together the control room and

Integrating the control room system with the TETRA network will bring a great improvement to the entire dispatch workflow process. TETRA Touch looks at a typical process involved in dealing with an incident and sees the benefits of the integrated set up.

The control room system is the heart of an emergency centre. Its functions include call taking, dispatching and command and control during field operations, all of which depend on effective radio communications. The control room is a busy place that needs a good system for recording and managing the dispatch process, to enable dispatchers to concentrate on their main task, which is to allocate resources to protect the public and agency personnel.

A typical dispatch process may proceed as follows:

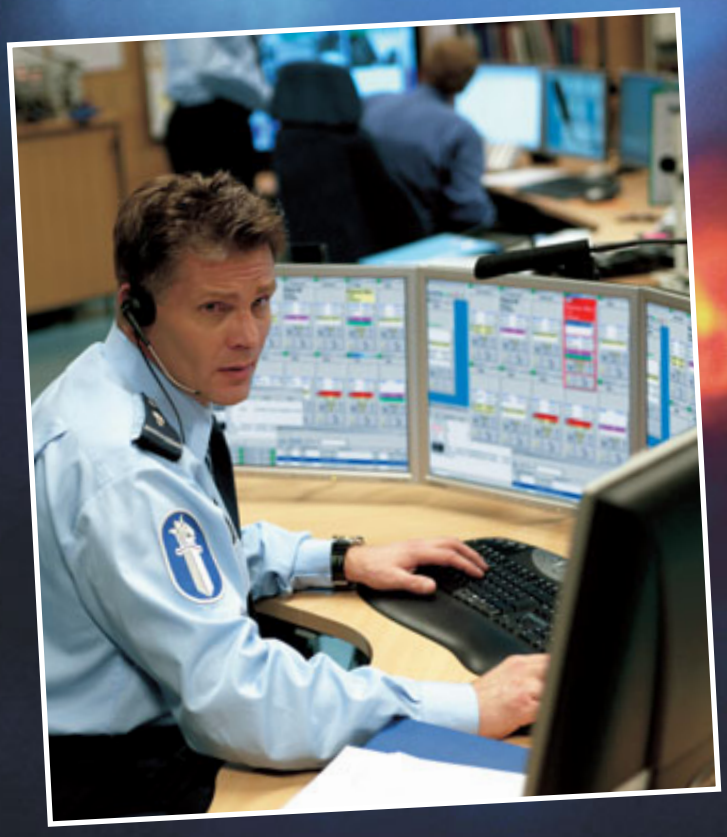
Call taking

When an incident arises, the first that the control room knows about it is via an incoming emergency call from the PSTN or other networks. At this call taking stage, all the information about the event is collected from the caller and databases.

Event response

The event response is defined according to the incident type, its location and the availability of suitable units. At this stage, the location and status of each unit in the field is essential information. With regard to location, the Nokia TETRA System offers different positioning methods for different user needs.

The identification (cell-id) of the base station that is serving a TETRA subscriber can be retrieved from the TETRA system. Greater location accuracy can be achieved by network based location, which is based on measuring the field strength of the TETRA terminals. However, not all needs can be met by these two methods and when even greater accuracy is required, the Nokia TETRA System can use these and GPS-based positioning in parallel to complement each other.



Dispatching

With analogue radio systems, the only means of delivering dispatching information to field units is by giving instructions verbally over the relevant talk group. However, dispatching in TETRA systems can be achieved with data messaging. This brings major benefits, including greater speed and efficiency, as well as assured accuracy of the assignment. With data, the risk of mispronounced or misunderstood names and numbers is eliminated. Voice can be restricted for use only when real urgency is needed, and will therefore get the immediate attention it deserves.

Event monitoring

Status messaging and voice communication are the main methods for monitoring the response to the incident. The dispatcher workstation displays “unit status monitor” windows that show online the various status changes given from the radio terminals that are logically linked to field units. A unit may have several radio terminals linked to it. Typically, a patrol car includes a mobile TETRA terminal linked to a Mobile Data Terminal (MDT) and the unit’s officers may also be carrying their personal TETRA terminals. A status change given from any of these terminals will be shown as a change on the unit status monitor window.

Field reporting and database access

This process may be carried out throughout the whole duration of the event. Typically this is achieved with a MDT connected to a TETRA radio in the field. Reporting comprises the sending of files, completing ready forms or sending digital pictures from the event with the TETRA IP data service to the command and control system.

Field forces can benefit from information push/pull services on site. Information can be retrieved directly from nationwide central databases as well as command & control system databases. Hand portable terminals with WAP browsers can access databases directly and no MDT is needed.

the radio

Event closure

Finally, this stage closes the active event in the event management system and releases the units and other resources that have been used to deal with the event. A release status may be delivered to all the relevant radio terminals and the dynamic group created for the event is deleted from the radios. The database records with all the relevant information from the event will be closed. These database records are then transferred to the back office system. All of which could be undertaken automatically.

How integration is achieved

The Nokia TETRA Connectivity Server (TCS) can be used to efficiently connect customer-specific command and control systems to the Nokia TETRA network. A major advantage of the Nokia TCS is that the customer can retain the existing, familiar command and control system. The connection between it and the Nokia TETRA network can be implemented in different ways, depending on operational requirements and any technical or economic constraints.

Nokia provides the most advanced interfaces and support services for control room integration and has supplied the world's leading integrated TETRA systems. Nokia has shown its ability to integrate third party command and control systems with Nokia TETRA Systems in two major nationwide Public Safety networks, ASTRID in Belgium (CCS by Intergraph) and VIRVE in Finland (CCS by Novotec), in addition to numerous regional networks worldwide.

Top security for Finland's VIRVE public safety network

Finland's VIRVE network has further improved its security by adopting two features of the Nokia TETRA system, Authentication and Air Interface Encryption.

For today's public safety users, high security is essential. In the past, analogue mobile communications systems were notoriously vulnerable, with communications being very easy to intercept. Nokia TETRA's Authentication and Air Interface Encryption features use dynamic encryption keys to protect the network from unauthorised radio users and make eavesdropping impossible.

With its TETRA Class 3 encryption interoperability certificate, the Nokia TETRA System provides the best communications security in mission-critical radio operations. TETRA Authentication and Air Interface Encryption are excellent examples of features that can bring operational benefits to public safety personnel in their demanding tasks.

In TETRA Authentication, the system checks that a radio terminal is authentic and not an illegal clone, preventing unauthorised radio users from accessing the system and its services.

TETRA Air Interface Encryption hides the contents of the calls and messages that are transmitted on the radio path. The signaling and coded speech sent on the radio path are ciphered using encryption keys and an encryption algorithm. Only authorized recipients have the cipher keys and only they can decode the encrypted speech and signaling. TETRA Air Interface Encryption protects the network against eavesdropping, analysis of traffic patterns, and unauthorised use.

Bordeaux goes TETRA

A Nokia TETRA System to serve 10,000 users in Bordeaux, France, has entered operation.

Implemented by AMEC SPIE Communications for the Communauté Urbaine de Bordeaux – the Bordeaux metropolitan area authority – the network will serve administrators in the city and its suburbs, replacing an analogue network. As the prime contractor, AMEC SPIE Communications will integrate the Nokia TETRA System with PABX systems and create a fully integrated communications network.

The system will greatly enhance the co-operation between the metropolitan authorities and their partners, allowing city administrators to react more effectively to exceptional events, such as floods or storms.

The Bordeaux metropolitan area authority is the fourth largest in France, administering 660,000 people in 27 nearby cities in the southwest of the country.

TETRA on track for Chinese transportation

Two Chinese public transportation companies have adopted Nokia TETRA as their professional mobile radio network.

Shenzhen Metro Co., Ltd. has already started accepting the TETRA equipment to serve the Shenzhen Metro train network, which carries four million commuters a year in the Shenzhen Special Economic Area. The end-to-end TETRA solution, which includes training and technical support, is being constructed by Nokia and Shenzhen SEG Communication Co., Ltd.

Nokia has also been chosen to provide Ningqi Railway Co., Ltd. with a TETRA professional mobile radio network for its new rail line between the cities of Nanjing and Qidong in Jiangsu province. Nokia and Shanghai Railway Communications Factory, the system integrator for the project, will jointly construct the TETRA network and provide applications for Ningqi.

The heart of both systems will be the Nokia DXTip exchange, which allows different Nokia TETRA components to be connected using an IP-based backbone in the public traffic area.

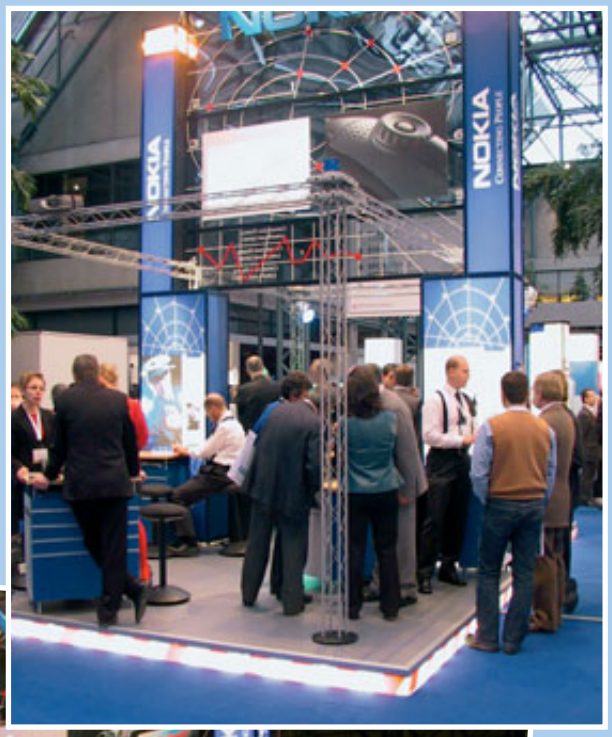
New Nokia launches at growing TETRA World Congress

The TETRA World Congress 2003 saw the launch of the new Nokia TETRA System release 4.0, designed to optimise network economy for governments, public safety organisations and operators. Also launched was the revolutionary new Nokia TB3 TETRA base station, which can provide up to 75% greater coverage.

In addition to these new products, a number of applications were shown at the Nokia stand, image communication and end-to-end encryption being the most popular with visitors. Delegates could also choose from 31 different user case study presentations, eight of which were given by satisfied customers of the Nokia TETRA system.

Held at the Bella Centre in Copenhagen, Denmark, the event saw a 42% increase in the total number of attendees, excluding exhibition stand staff, from 797 in 2002 to 1133. Most of the paying delegates were new, that is they did not attend as paying delegates in 2002.

Overall, the participants represented 49 countries, up from 47 countries in 2002.



TETRA Events Diary

Event	Date	Venue
VIRVE Day	2nd March	Espoo, Finland
A.S.T.R.I.D. user day	17th March	Antwerp, Belgium
CeBIT 2004	18–24 March	Hannover, Germany
Scandinavian TETRA Seminars	12–13 March	Oslo, Norway
European Union conference: Civil safety a great challenge fo IT technology	26–27 March	Poland
TELEXPO	March-April	Sao Paulo, Brazil
International Police Conference	1–3 April	Warsaw, Poland
BAPCO 2003	2–3 April	London, Great Britain
INTERDEFESA	6–9 May	Sao Paulo, Brazil
Fire Symposium	May	Germany
IIR TETRA China	4–5 September	Beijing, China
TETRA World Congress 2004	15th –18th November 2004	Vienna, Austria