RADIO COMMUNICATION FOR PUBLIC SAFETY IN EUROPE, AND THE ROLE IN DISASTER RELIEF

Hans Borgonjen
Vts Police Netherlands – ISC[1]

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Abstract

Schengen has done a lot of work to realize cross border radio communication. The goal was to have a harmonized frequency band and a common technology. The frequencies were realized by the CEPT (European frequency body) decision on the 380-400 MHz band. This realisation was a unique result; for the first time there was harmonization in Europe for all Public Safety organisations.

Common technology was reached through ETSI (European Telecommunication Standardisation Institute). With participation from Public Safety organisations and industry the TETRA standard was developped. This standard is based on the Schengen requirements and is ”tailor made” for the command and control type of radio communication within Public Safety. A special target was to prove that it was possible to have a better operational cooperation between Public Safety organisations from different countries. This was done in the Schengen 3-country pilot some years ago.

At this moment many European countries have national Public Safety radio networks (almost) finished or in the project phase. Most are based on the TETRA standard. An other technology that is used, e.g. in France, is Tetrapol. The 3-country pilot now also includes France, making it a 4-country initiative, to achieve (beside interoperability between TETRA networks) possibilities for cross border cooperation between a country with a TETRA network and a country with Tetrapol.

Disaster relief is not a national problem. Many disasters involve more countries. For coöperation between the different Public Safety organisations good radio communication is a vital instrument in such circumstances. The work done by Schengen, the experiences from the 3-4 country pilot, and the fact that there is a high level of standardisation between the European Public Safety organisations, can help solving disaster relief.

1 Hans Borgonjen Vts Police Netherlands - ISC
Zeisterweg 1
3984 NH Odijk Netherlands
Tel : +31653164538
Mail : hans.borgonjen@isc.nl

References

This paper is referring to the Schengen developments, in particular to Schengen Telecom.
My experience is that some people want to know the original background. The most relevant official Schengen documents are mentioned in the reference list.

Why a standard?

Schengen:
The European Schengen Agreement in 1985 had many different objectives, not least that of opening borders and abolishing of systematic border controls. One of the aspects that this involves, is that of cross border co-operation between public safety organisations - Article 44 of the Schengen Agreement states that cross-border communication between control centres, etc must be made possible. *(Ref 1)*

To work this out in more detail and to come with proposals, a special group was created: 'Schengen Telecom', with in a later stage a subgroup 'crypto', chaired by the Netherlands. The chairmanship of Schengen Telecom changed each half year in conjunction with the country which was the chair of Schengen. *(Ref 2)*

This was the basis on which, already some years ago, a lot of work has been done within Schengen Telecom to realize cross border radio communication. The mandate was to realize a 'short term solution' and a 'long term solution'. *(Ref 3)*

Short term solution: For the short term solution there has been a workshop in Helsinki in September 1999. Goal was to decide on practical solutions in a situation where there is no common solution in 2 neighbouring countries. *(Ref 4)*

Long term solution:
Main focus was the long term solution. This should be based on digital radio technology and not the old analogue.
The big question was: "how to realize cross border radio communication". A European wide radio network was not realistic, so the approach was to have an agreement on those aspects which are necessary for making it possible to come to cross border radio communication.

The goal was to have a harmonized frequency band and a common technology; with these two strategic focus points, it is possible to have radio projects in the different countries which are so common in the fundamental technical approach that they can work together. Important advantage of this approach is, that the different countries can have their own individual planning. If e.g. in the Netherlands there is a need for replacing the old analogue radio networks, a digital radio project can be started (based on the 2 criteria!) and when Germany starts some years later (but also based on the same 2 criteria!) the common technique and frequencies are making it possible to have cross border radio communication.

Frequencies
The first goal was to have the same solution for the frequencies. Frequencies are like the fundaments under a house. Without a harmonized frequency band it is impossible to realise radio networks which can communicate among each other. A lot of work has been done to make frequency plans, calculations on sharing models (most frequencies are used for different purposes; some can be shared, most are creating problems) and political lobby to make clear that Public Safety in Europe needs a harmonized frequency band.

The frequencies were realized by a CEPT (the European frequency body) decision in 1995 where in the 380-400 MHz band, 2x3 MHz was allocated for Public Safety with an expansion to 2x5 MHz. This was a unique result, because for the first time there was harmonization European-wide for all Public Safety organisations.
At the moment all European countries that have been implementing a digital radio network, or are starting radio projects, are using this 2x5 MHz.

Technology
The second goal: common technology was also very complex. One of the ideas within Schengen Telecom was to develop a specific technology for Public Safety by them self. Because the 'core business' of Public Safety is not 'making standards', and while there is an official body in Europe, this idea was left and Schengen Telecom approached ETSI (the European Telecommunication Standardisation Institute).
ETSI is recognized by the European countries and has e.g. developed the GSM standard.

Schengen Telecom created functional requirement documents for the radio infrastructure, the terminals and security aspects. Those documents have been used within the ETSI process, where a special Technical Committee (RES-6, later TC-TETRA) was created to develop a new standard. This standard was optimized for professional users; not only Public Safety, but also transport, utilities, airports etc. Advantage of this approach is that the market is bigger than only Public Safety, which causes lower prices, more functionalities and a bigger selection of terminals.
In 1995 Schengen Telecom asked ETSI to evaluate, how close the TETRA standard meets the Schengen requirements (Ref 5). The answer was almost 100% positive.

Some Schengen countries directly participated in the ETSI working groups. Finland, Belgium, UK and the Netherlands were the most active Public Safety representatives in this process. The director of ETSI once said in a presentation that is was the first time that an ETSI standard was developed with such a strong participation from the potential users.
In this way in the second half of the 90ties the TETRA standard was developed with participation from Public Safety organisations, industry and administrations. The standard is based on the Schengen requirements and is "tailor made" for the command and control type of radio communication within Public Safety. Specific functionalities, which are e.g. not available in GSM are group communication (reaching 20 police and fire cars within half a second is impossible with GSM), Direct Mode (terminal to terminal communication without using the infrastructure) and several security functionalities (air interface encryption, end-to-end encryption).

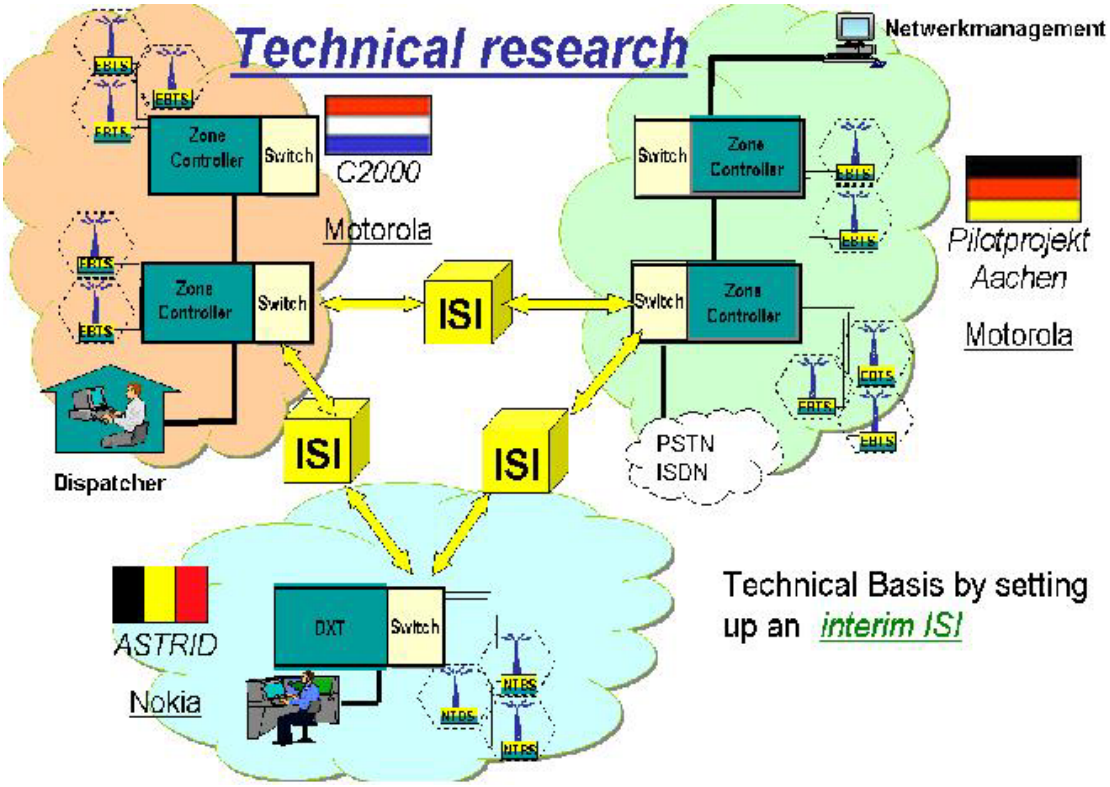
Police Cooperation
In 1999 the mandate was formally included in the Schengen Acquis by decision of the Central Council of Schengen and taken over by the European Union with the coming into force of the Treaty of Amsterdam. *(Ref 6)*
The responsible body was, and still is, the working group Police Co-operation (third pillar from the EU).
The most relevant decisions from Schengen were adopted in the so called 'Schengen Acquis documents'. *(Ref 7)*

3-country pilot

A complexity for the acceptation of the outcome of Schengen Telecom by all countries was that the proposed solution was not yet implemented, and the standard was even still in development. A special target within the Schengen Telecom mandate was therefore to prove that with the proposal from the harmonized frequencies and a common technology, it was indeed possible to have an improvement of the operational cooperation between Public Safety

organisations from different countries. Germany, Belgium and the Netherlands volunteered to organize these tests. *(Ref 8)*. This was called 'the Schengen 3-country pilot' which was done some years ago.

The picture below shows how the 3 TETRA networks (ASTRID in Belgium, Pilot system in Aachen Germany and C2000 in the Netherlands) were connected.
The ISI (Inter System Interface) was during the pilot 'an interim ISI'. ETSI has already finished the standard for the complete ISI.



The 3-country pilot is now also including France , making it a 4-country initiative, to get beside interoperability between TETRA networks also possibilities for cross border cooperation between a country with a TETRA network and a country with Tetrapol.
This is tested between Belgium and France.

Situation at the moment

This section describes the TETRA market today and the situation within Public Safety in Europe. As already mentioned in section 1, the TETRA standard is not only for Public Safety, but also for other professional users like public transport, utilities, military etc. 10 years ago the TETRA MOU was founded. It is an organisation which has as a goal to make TETRA a world wide success. Industries, users, operators, agencies, consultants etc are members. Beginning 2007 the MOU had a good 140 members in about 80 countries.

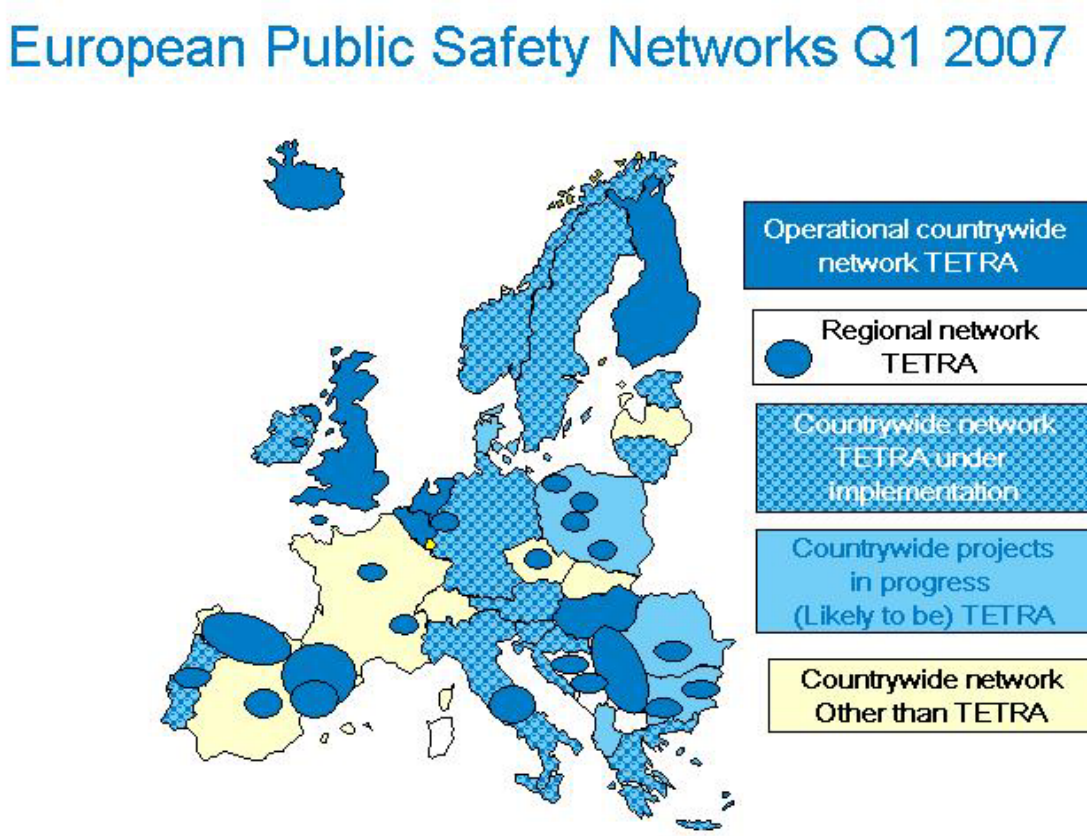
Main task, besides organizing marketing events like the TETRA World Congress, is to keep TETRA a 'multi vendor' market. There is a complete 'Inter Operability Process' (IOP) in place, where an Italian governmental test body checks if e.g. a TETRA terminal from EADS is 100% working on a Motorola TETRA infrastructure. If so, a certificate is published, so potential buyers can be sure that every thing works as they expect.

The 'pie diagram' below, shows how the different markets are divided. Public Safety is the biggest by far.

Public Safety radio in Europe: the 'PSS Europe map'

At the moment many European countries have national Public Safety radio networks (almost) finished or in the project phase. Most are based on the TETRA standard. In Finland (the Virve network), UK (Airwave), Belgium (ASTRID) and the Netherlands (C2000) the networks are fully operational. In Sweden (RAKEL), Italy and a lot of countries in Eastern Europe, networks are being built. In Norway, Denmark, Ireland and Germany there has been, after a technical neutral tender procedure, a decision for TETRA. The projects are preparing the roll-out. An other technology what is used, e.g. in France, is Tetrapol.

In the map below you can see which countries already have a TETRA network fully operational (dark blue), regional TETRA networks, Countrywide networks under implementation (dotted blue) and where it is expected to implement TETRA (light blue)
Other technologies like Tetrapol (light cream). Status is Q1 2007.



Role of radio communication in disaster relief

Disaster relief is not a national problem. Many disasters involve neighbouring or even more countries. Good cooperation between the different Public Safety organisations at such a moment is essential. Good radio communication is a vital instrument under such circumstances. A similar role is to be expected in the future for 'broadband data communication'; besides a technical solution, the frequency aspect has to be solved, like in the past for TETRA.

The work done by Schengen, the experiences from the 3-country pilot and the recent 4-country initiative, and other lessons learned from the new digital radio networks, can help solving disaster relief. As described in section 2, there is a high level of standardisation between the European Public Safety organisations. For cross border disaster relief, this is essential for the coordination between the involved Public Safety units.

Lessons learned from the 3-country pilot
If cross border communication is so important during disaster relief, how is this done?
The experiences from the 3-country pilot are very useful in this respective. The different operational tests were completed with a 'multi agency, multi country' disaster scenario, where police, fire, ambulance services from Belgium, Germany and the Netherlands were working together.

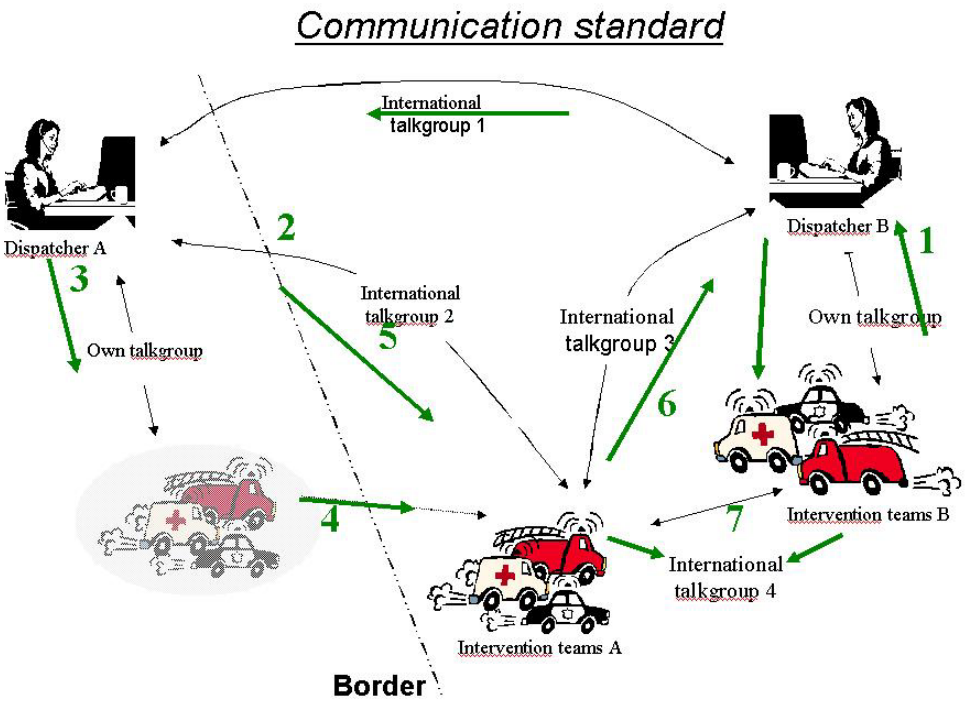
Lessons learned are:

- Cross border cooperation should always be coordinated by the control rooms from the different countries. Reason is that at the start it is important that the involved control

rooms in the different countries coordinate amongst each other what actions to take and by whom.

- During the dispatch of the disaster event, óne control room should be in charge, also of 'the visiting units'.This is for keeping an overall view, short decision lines, sending extra other units etc.
- Radio backup to the 'own national control room' is still necessary, e.g. for asking advise regarding legal issues if jurisdiction is different in the countries.
- For international pursuit the situation is different: this is mostly done by 'self supporting teams'. Status messages are useful.
- There are many 'talkgroups' involved. Those talkgroups have to be (partly) programmed in advance. Careful considerations are necessary on how the operational communications lines and procedures have to be, in situations of international cooperation (see diagram below). 'International fleetmaps' with international groups are necessary.
- Beside group communication, individual call and phone call is also desirable.
- Language misunderstandings are a problem (can be improved by using NATO alphabet and status messages). International 'communication terms' are important.
- Use of DMO (Direct Mode Operations: radio communication without using the radio infrastructure) has to be coordinated in advance (there is an 'international DMO model' adopted by most West European countries)
- International training (dispatching units from the control rooms as well as 'field units' are very important).
- Emergency call handling and Automatic Vehicle Location in foreign countries are important functionalities to realize in future.
- Terminal equipment recommendations are: display has to show active network in roaming conditions, preferential network to be selectable by units themselves, and identification of group members.
- A 'full ISI' (Inter system Interface) is necessary to enable the radio networks to have all the above-mentioned functionalities.

The diagram below shows the different talkgroups during the above mentioned 'multi agency, multi country' disaster test scenario. Detailed information at www.3countrypilot.com.



Biography

Hans Borgonjen, is from vts Police Netherlands, a governmental organisation responsible for all information technology for Public Safety in the Netherlands including the C2000 network. He is responsible for international standardisation, knowledge exchange etc.

He is also Director and Board member of the TETRA MOU and one of the founders of the Tetra standard (also as result of my Schengen Telecom activities). Chairs the PSRG (Public Safety Radiocommunication Group) an informal platform of governmental people responsible for a national radio project.

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