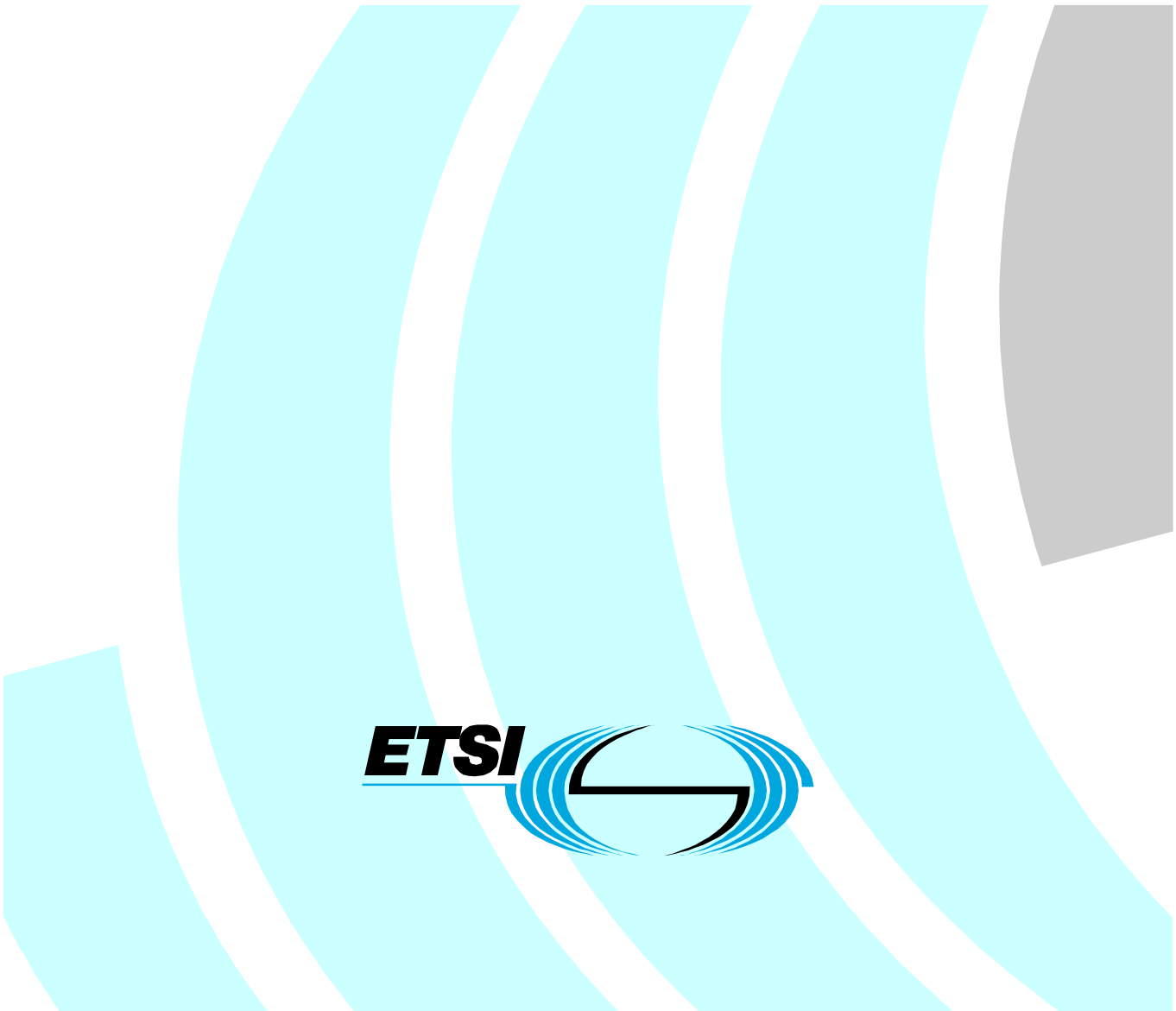
ETSI TS 102 182 V1.2.1 (2006-12)

Technical Specification

**Emergency Communications (EMTEL);
Requirements for communications from
authorities/organizations to individuals,
groups or the general public during emergencies**



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Special Committee Emergency Communications(EMTEL).

The present document is the third of a set of deliverables covering the communication needs of individuals and authorities in emergency situations, as identified below:

SR 002 180 [5]: "Emergency communications Requirements for communication of citizens with authorities/organizations in case of distress (emergency call handling)";

TS 102 181 [6]: "Emergency Communications (EMTEL); Requirements for communication between authorities/organizations during emergencies";

TS 102 182: "Emergency Communications (EMTEL); Requirements for communications from authorities/organizations to individuals, groups or the general public during emergencies";

TR 102 410: "Emergency Communications (EMTEL); Requirements for communications between individuals and to authorities whilst emergencies are in progress".

Introduction

Recent world events have created a heightened social focus on public protection and general public safety. Actions such as the Universal Service Directive requiring the European emergency call number (112) be enhanced with the provision of caller location and the Seveso II Directive aimed at the prevention of major accidents involving dangerous substances highlight this focus. Special consideration may have to be given to the elderly, the disabled and the young people. An annotated bibliography of documents dealing with human factors can be found in SR 001 996 [4].

The provision of effective communication is one of the most important duties of a public authority towards its citizens. An important component required to meet this duty is the ability for Authorities to communicate with citizens during times of emergency. Authorities and emergency response teams need to warn and inform the public in times of crisis and therefore is required to have effective, high quality communication methods and systems to meet this need.

The responsibility for emergency response or disaster-related communications is addressed differently from country to country. In most cases, the parties responsible for warning and informing the public follow the country's administrative structures with coordinators at both the local and national levels, as well as across multiple disciplines and departments.

The present document catalogues the requirements on warning and informing the public as seen by the Emergency Services Community and looks at the technologies and methods available to do this.

1 Scope

The present document gives an overview of the requirements for communication from authorities/organizations to citizens in all types of emergencies. It collects operational and organizational requirements as a basis for a common notification service, including targeting of the area to be notified. Although many of the requirements relate to national public policies and regulation, there are a number of service and technical aspects which are better dealt with on the European level to ensure harmonized access and services over Europe and service effectiveness through increased user awareness by using standardized solutions.

The present document also collects already established requirements for notification and gives guidance on how to find the standardization work published or ongoing. The document identifies the areas needing particular attention from the experts and refers to identified documents in preparation in SDOs.

The present document is a collection of technical requirements and recommendations.

The present document is applicable to ETSI technical bodies for the defining of services and specifying technical solutions.

It is clear that the present document will not present a solution for every scenario.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

[1] ETSI EN 300 401: "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[2] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[3] UK Civil Contingency Act 2004, chapter 36, http://www.opsi.gov.uk/acts/acts2004/20040036.htm.

[4] ETSI SR 001 996: "Human Factors (HF); An annotated bibliography of documents dealing with Human Factors and disability".

[5] ETSI SR 002 180: "Emergency communications Requirements for communication of citizens with authorities/organizations in case of distress (emergency call handling)".

[6] ETSI TS 102 181: "Emergency Communications (EMTEL); Requirements for communication between authorities/organizations during emergencies".

[7] ITU-T Recommendation E.106: "International Emergency Preference Scheme (IEPS) for disaster relief operations".

[8] ITU-T Recommendation E.105: "International telephone service".

[9] ETSI TS 122 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1 (3GPP TS 22.228)".

[10] ETSI TS 123 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228)".

[11] World Telecommunication Development Conference 1994 (WTDC-94): "Resolution No.7 (Disaster Communications)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in SR 002 180 [5] and the following apply:

citizen: any individual (resident, visitor, passer-by), present in the vicinity of an emergency situation (from the first notice till the complete clearance) and subject to be affected by it, but who has no identified role in the actions of rescue and of restoration of normal conditions

NOTE: Depending on his situation, the citizen can send alerts or provide information to the emergency services, but in many cases is either passive or a potential victim.

common emergency communication and information system: system to enable communication and sharing information between the monitoring and information centre and the designated contact points

emergency notification systems: general category for any systems used to notify persons of an emergency

Emergency Telecommunication Service (ETS): service capability that exhibits the following characteristics:

1) ETS is a national implementation utilizing the features facilities and applications available in existing national public networks and service offerings. As such it could be said to resemble a supplementary service since it can only exist if there is an underlying telecommunications service.

2) As a national capability, ETS is specifically designed to serve the telecommunications needs of nationally authorized users. This might include issues such as priority access to telecommunications in a secure mode operation.

3) Nationally authorized ETS users may be given access to TDR facilities for disasters occurring in other countries or indeed within the national environment. The development of this and other aspects are a national matter.

emergency telephone notification systems: specific category for a system that uses the telephone, in conjunction with other elements, including computer hardware and software to notify persons of an emergency

NOTE: May include changeable message signs, sirens, telephone and other media.

originating network: access network from which the emergency call was originated

telecommunications for disaster relief: the provision of telecommunications with and within the region affected by the disaster, including international communications to and from the disaster area and local communications at the disaster area

NOTE: Where feasible TDR would be provided by the use of existing public telecommunications services and facilities. This might include for example invoking the preference scheme described in ITU-T Recommendation E.106 [7] for the International Telephone Service E.105 [8].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BSC	Base Station Controller
CBCH	Cell Broadcast CHannel
CBS	Cell Broadcast Service
COMAH	Control Of Major Accident Hazards
DAB	Digital Audio Broadcasting
EC	European Commission
ECC	Emergency Control Centre
ENS	Emergency Notification System
ETAS	Emergency Telephone Alert System
ETS	Emergency Telecommunication Service
EU	European Union
GIS	Geographic Information System
GSM	Global System for Mobile telecommunications
HLR	Home Location Register
HTML	Hyper-Text Markup Language
IMS	IP Multimedia Subsystem
IVR	Interactive Voice Response
MBMS	Multimedia Broadcast / Multicast Service
MBS	Multimedia Broadcast Service
MMI	Man-Machine Interface
MMS	Multimedia Messaging Service
NGO	Non-Governmental Organization
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
QOS	Quality of Service
RDS	Radio Data System for VHF/FM broadcasting
RNC	Radio Network Controller
SDCCH	Stand-alone Dedicated Control CHannel
SDO	Standards Development Organization
SMS	Short Message Service
TDR	Telecommunications for Disaster Relief
TETRA	TErrestrial Trunked RAdio
USSD	Unstructured Supplementary Service Data
VBI	Voice Break-In
VLR	Visitor Location Register

4 Nature of communications from authorities to citizens

In the basic and routine case of an emergency situation the number of affected individuals is limited; the victims, endangered persons, the person reporting the emergency, the operator at the ECC/PSAP and the personnel deployed to the incident. The fact that the Emergency Authority reaches the victims and provides assistance is the expression of the relationship between the authority and the citizen.

There are several situations where this simple model does not apply; in general they correspond to mass phenomena (flooding, hurricane) forecasted or not, to the combination of several risks (a fire of toxic products, a snow storm at peak traffic hours) or the evolution of an apparently limited incident (the rescued person is recognized as a bearer of a contagious disease).

It may also be necessary to mobilise private organizations, charities and NGOs to participate in the rescue actions. These services and organizations may be required on a priority basis at the incident location.

To maximize efficiency, authorities need to reach as many citizens as possible present in a given area (inhabitants, passers-by, travellers and tourists etc.) or entering the area or in close proximity to the area during the emergency. They shall be able to present the citizens with an appropriate message. It should be noted that this is not a one shot scenario. It may be necessary for the message to be repeated and/or updated on a number of occasions. In addition the transmitted message could be of a general nature or it maybe necessary to target the message to a specialized audience.

The priority of the authorities is to assess the extent of the incident, the resources required and availability of remaining facilities. In addition authorities will require timely and accurate information as to the capabilities and performance of telecommunications infrastructure in the affected area. It is assumed that during such situations the local, regional or national authorities would establish an emergency operations centre, in line with pre-planned and regularly tested procedures.

The information contained within the present document explains how systems would function and the performance that could be anticipated to support the communications requirements of the authorities towards the citizens.

When trying to make use of the present document in a specific case, the attention of the reader is drawn on the following:

- It would be vital to conduct a risk analysis of the various scenarios along with an associated plan dealing with the mitigation and control of the high likelihood and/or high impact risks.
- The fact that a system or a service is convenient for a situation does not mean that it would be easy or quick to make use of it, especially when a mass usage is needed or when a specific area is targeted.
- An inadequate emergency warning or notification system causes deterioration of public confidence in authorities and poor public relations. Most importantly, lack of prompt, complete information flow can cause loss of life and property.

Therefore any possible usage of communication services should be the subject of an agreement with the concerned operators, and a description of the related procedure for its entry into force should be prepared.

5 Objectives and guidelines for an emergency notification service

The vision is of a European Union where, when facing an emergency or disaster situation, citizens can get hold of adequate information, when needed, and even in the desired language in order to protect citizens more effectively. When travelling, working or studying in a Member State, citizens need to be able to understand information given i.e. signals, signs and other ways of warning and information. If in danger, whether it is an earthquake, a flood or an avalanche, citizens need to be able to understand what authorities and the people of the country want to tell them - in order to be able to take care of themselves and those dependent on them.

There are differences in the geography, risks, culture and legislation in the Member States -but there are also similarities. We can learn a lot from the existing, good examples in the EU, and, in co-operation, we can find ways of using existing and new methods and technology to move towards a safer Europe.

5.1 Service objectives

Emergency Notification Systems need the ability to provide communications in support of many different types of scenarios. Communication shall be possible within the following contexts:

- Citizens in their own dwelling.
- Citizens at their place of work.
- Citizens in public venues (e.g. sports complexes, shopping malls, etc.).
- Citizens travelling on foot.
- Citizens travelling using other transportation facilities.

An effective Emergency Notification system will be capable of disseminating information to a large number of individuals within specifically affected areas. Emergency Notification systems shall:

1) Provide high speed message delivery.
2) To deliver messages within a planned specified time.

3) Offer sufficient details of the emergency situation.

4) Provide sufficient instructions regarding actions to be taken by the public.

5) Allow strategic information delivery to specific targeted audiences or geographies.

6) Be fully accessible to the right people.

7) To deliver messages simultaneously to a large audience.

8) Be intrusive, but only service-interrupting in the case the same service is required for the notification.

5.2 Service features

There are numerous methods available for emergency notifications. A heterogeneous strategy is commonly required, offering a number of available channels through which the public can receive the emergency messages. This strategy helps to ensure quick and efficient notification.

Regardless of the technological solution, such systems shall have the features as described in the remainder of this clause.

5.2.1 Capacity

Emergency notification systems shall be capable of delivering alerts in a short predictable period of time, to a target audience of reachable citizens on the technology that is available to them at that time. The engineered capacity of a system is ultimately a user defined parameter. However, to be effective emergency notification systems shall be designed with a view to supporting large metropolitan areas.

It shall be possible to provide an alert:

- to 50 % of the citizens in the relevant area within 3 minutes; and
- to 97 % of the citizens in that area within 5 minutes.

The period of three minutes is the period between the moment when the message is submitted to the notification system and the moment the message is provided to the citizen.

NOTE: These times may not be applicable in the case of very rapid emergencies e.g. earthquakes and tsunamis. Such cases require notification to as many citizens as possible in the defined affected area in the order of seconds (e.g. 10 seconds for an earthquake).

As the emergency progresses, the authorities may want to send their citizens updated information that is crucial to save lives and to mitigate losses. Events can follow each other quickly and disseminating alert messages shall not be the limiting factor in the decision taking process of the emergency management authorities.

5.2.2 Delivery

a) Emergency notification systems shall support both pre-planned and dynamic notification events. This allows agencies to prepare in advance for situations that may be likely to occur within their regions of responsibility. At the same time, the system allows for notification scenarios that must be planned dynamically in the moment of need.

b) Multiple methods of message delivery shall be supported. Methods that allow delivery of important message content provide a greater value for those receiving the message and can include instructions regarding the desired or appropriate response for the recipient. Use of telephone voice, voice mail, FAX, SMS, paging, broadcast radio, TV, and email allow an increased level of content delivery in the notification message. In some instances it might be useful to include diverse methods of delivery in the same terminal (such as DVB-H to 3G phones).

c) In networks that support a "message delivery acknowledgement" facility, notification systems shall be able to retry until acknowledgement is received. In systems that do not support delivery acknowledgement, the message shall be repeated at a regular interval for as long as the message is valid.

d) Emergency notification systems shall support delivery of notification messages to those with special needs, such as hearing and vision impaired.

e) The ability to deliver messages in government authorized languages and national official scripts shall be supported.
Additionally, the systems should provide the capability to deliver messages in other languages and scripts where the authorities want to be able to warn visitors from other countries and provide them information in their desired language.

f) Emergency notification systems generally affect a specific geographic area, hence systems shall be able to deliver messages to citizens within the affected area.
Citizens need to have relevant information that is specific to their location and the location of the emergency.
A reference indication for the grid of the coverage area could be:

- 1 km inside community boundaries;
- 5 km outside community boundaries;
- 30 km in rural areas;
- 60 km over sea or desert.

In the area where the emergency actually happens, the information (e.g. "evacuate the area") might be quite different from the information that is relevant in the area a bit away from the emergency (e.g. "go indoors and close doors and windows").

NOTE: This delivery feature involves the use of additional information or systems such as GIS or mapping systems, subscriber records, opt-in functions, and network coverage data such as cell site coverage.

g) Emergency notification systems shall provide identification of the message/notification originator.

h) Emergency messages shall be specifically recognisable as being an emergency message that cannot be mistaken for an ordinary message.

i) Systems intended to deliver high volumes of notifications shall be capable of addressing congestion management across the various networks used.

j) Emergency notification systems shall be intrusive. Therefore:

- the reception of emergency notification shall be enabled by default;
- the warning shall be distinguishable from a regular message;
- in case the message is received on a portable device carried by the user, the user shall be able to cancel the indication of the emergency message. It shall not be necessary for any response to be sent over the network.

5.2.3 Auditing

Emergency notification systems shall be capable of tracking, capturing, and reporting performance criteria associated with individual notification events.

5.2.4 Access

Emergency notification systems shall provide multiple means for authorized users to launch a notification event.

5.2.5 Security

Emergency notification systems shall provide protection of data used for operation of the system. This includes management of user authentication, authorization, and access. Appropriate protections shall also be established regarding data privacy associated with subscriber/citizen records potentially stored as part of the system. For certain services data protection is not possible and those services could be used for spoofing purposes e.g. sending commercial messages in a format mimicking an emergency notification. All such un-authorized use of emergency notifications has malicious intent.

5.2.6 Performance

Emergency notification systems shall be engineered for high availability. It is recommended that geographic redundancy be considered for both system and data components of an emergency notification system. Systems operators shall be required to provide recovery plans for events that might effect their primary operations environment. In addition there should be an aim to minimise any single points of failure within an ENS (including power supplies and leased lines).

5.2.7 Coverage

Emergency notification systems shall be engineered to cover a specified significant proportion of the affected population and land mass of a nation.

5.2.8 Multiple languages

Increased migration and multi-lingual societies have led to increased need for information concerning emergency situations. Hence, the ability to deliver messages in relevant languages shall be supported. Many media support language specific communications.

Many service providers collect linguistic preferences from customers. This may be used to select the language for communication with citizens when user specific media are employed e.g. HTML web pages, SMS. Many regions are served by broadcast services in multiple languages where language preference is implicit in the station viewed/heard. Some TV broadcasts support multiple language audio channels, with the viewer pre-setting their preferred language.

Translation services are readily available to operate in real-time or non-real time. In some instances, e.g. broadcast translation capability may be embedded within the service provider.

5.2.9 MMI requirements

5.2.9.1 Recognizing the emergency message

An emergency alert message should be immediately recognisable. See clause 5.2.2.

5.2.9.2 Displaying the message on mobile phones

The emergency warning message should stay on the display regardless of the user setting, until the message indication is cancelled by the user. It shall be possible for the user to review the message at a later time. See clause 5.2.2.

6 Requirements versus technologies

The requirements from clause 5 and the technologies from annex B are summarized and made comparable in tables 1 to 3.

Table 1: Broadcast (radio and TV)

Emergency notification systems shall	Analogue	RDS	DAB	DigTV	Legend
be able to reach citizens in their own dwelling	V	V	V	V	V = compliant
be able to reach citizens at their place of work	X	X	X	X	X = non-compliant
be able to reach citizens in public venues	X	X	X	X	X = non-compliant
be able to reach a citizen citizens on foot	X	X	X	X	X = non-compliant
be able to reach a citizen citizens in a vehicle	V	V	some	X	V = compliant X = non-compliant
provide sufficient instructions regarding actions to be taken	V	X	V	V	V = compliant X = non-compliant
provide identification of the message/notification originator	V	V	V	V	V = compliant
deliver messages within a planned specified time	V	V	V	V	V = compliant
allow simultaneous delivery to targeted, large audiences or geographies	0	V	0	0	V = compliant 0 = non-compliant to geographies
offer sufficient details of the emergency situation	V	0	V	V	V = compliant 0 = message length inadequate
be able to retry delivery when the initial message delivery fails	0	0	0	0	0 = messages can be repeated
support delivery of notification messages to those with special needs and unique devices, like terminals of hearing and speech impaired persons	0	0	0	0	0 = broadcast is not specific for covering all specific needs
have the ability to deliver messages in multiple languages	V	0	V	V	V = compliant 0 = message length inadequate
be capable of addressing congestion management across the various networks used	V	V	V	V	V = compliant

Table 2: Mobile terminals

Emergency notification systems shall:	Paging	CB	SMS	TV	MBMS	MMS	USSD	Email	Legend
be able to reach citizens in their own dwelling	V	V	V	V	V	V	V	V	V = compliant
be able to reach citizens at their place of work	V	V	V	V	V	V	V	V	V = compliant
be able to reach citizens in public venues	V	V	V	V	V	V	V	V	V = compliant
be able to reach a citizen citizens on foot	V	V	V	V	V	V	V	V	V = compliant
be able to reach a citizen citizens in a vehicle	V	V	V	X	X	V	V	V	V = compliant X = watching video while driving a vehicle is not desired
provide sufficient instructions regarding actions to be taken	V	V	V	V	V	V	V	V	V = compliant X = non-compliant
provide identification of the message/notification originator	V	V	0	V	V	0	0	0	V = compliant 0 = compliant, but no certainty. Could be a spoofed identity
deliver messages within a planned specified time	V	V	0	V	V	0	0	V	V = compliant 0 = non-compliant for large audiences
allow simultaneous delivery to targeted, large audiences or geographies	V	V	X	0	V	X	X	0	V = compliant 0 = non-compliant to geographies X = non-compliant
offer sufficient details of the emergency situation	V	V	V	V	V	V	V	V	V = compliant
be able to retry delivery when the initial message delivery fails	V	0	V	0	V	V	V	V	V = compliant 0 = messages can be repeated
support delivery of notification messages to those with special needs and unique devices, like terminals of hearing and speech impaired persons	V	0	V	0	0	V	V	V	V = compliant through terminal capability 0 = partly-compliant
have the ability to deliver messages in multiple languages	V	V	V	V	V	V	V	V	V = compliant
be capable of addressing congestion management across the various networks used	V	V	X	V	X	X	X	V	V = compliant X = non-compliant

Table 3: Other

Emergency notification systems shall	ETAS	Siren	Web	Email conventional PC based	Legend
be able to reach citizens in their own dwelling	V	0	V	V	V = compliant 0 = siren not always heard
be able to reach citizens at their place of work	V	0	V	V	V = compliant 0 = siren not always heard
be able to reach citizens in public venues	X	V	X	X	V = compliant X = non-compliant
be able to reach a citizen citizens on foot	X	V	X	X	V = compliant X = non-compliant
be able to reach a citizen citizens in a vehicle	X	0	X	X	0 = siren not always heard X = non-compliant
provide sufficient instructions regarding actions to be taken	V	X	V	V	V = compliant X = non-compliant
provide identification of the message/notification originator	0	V	X	X	V = compliant 0 = compliant, but no certainty X = possibly spoofed address
deliver messages within a planned specified time	0	V	X	X	V = compliant 0 = non-compliant for large audiences X = no guarantee
allow simultaneous delivery to targeted, large audiences or geographies	0	V	0	0	V = compliant 0 = non-compliant to geographies
offer sufficient details of the emergency situation	V	X	V	V	V = compliant X = non-compliant
be able to retry delivery when the initial message delivery fails	V	0	V	V	V = compliant 0 = messages can be repeated
support delivery of notification messages to those with special needs and unique devices, like terminals of hearing and speech impaired persons	V	X	X	X	V = compliant X = not specific for covering all specific needs
have the ability to deliver messages in multiple languages	V	X	V	V	V = compliant X = non-compliant
be capable of addressing congestion management across the various networks used	X	V	X	X	V = compliant X = non-compliant

Annex A (informative): Challenges associated with authority to citizen communication

A.1 Need for clear statutory responsibilities

There is evidence to suggest that some responsibilities for warning the public are clear but there is a need for significant improvement in the arrangements for warning the public. An example of this is the identification of the UK Environment Agency as being the responsible agency for the provision of flood warnings, but requiring people to "opt-in " to receive the warnings. Doubts, in some countries, over the potential liability of responding agencies have acted as a deterrent against them becoming involved in warning the public.

A.2 Transient population

Depending on the location and time of the incident there could be a large percentage of the population in transit, either on public transport, in their own vehicles or on foot at the time. The ability to alert these people to the need to take shelter or evacuate is an essential component to any successful handling of the incident.

A.3 Business/Retail population

Chemical sites are often located next to other industrial or commercial premises, a number being sited near to large out of town shopping complexes.

Some of these may have their own on-site public address systems but there needs to be a process of alerting the site management to the problem. Whilst out of town shopping complexes may have internal public address or voice evacuation systems, they rarely have effective external communications within their large car parking areas.

A.4 Night hours

Communicating with the population during the late evening, overnight and early morning periods when most people are sleeping needs to be addressed.

A.5 Transport or site based incidents

Where there is a known problem such as at top-tier COMAH sites there is an off-site plan, which indicates how the public is to be warned. Information on this is distributed to residents within the public information zone to produce a general awareness of what actions to take on hearing a particular warning sound or message.
However, accidents involving the transportation of dangerous substances can take place practically everywhere and it may well be that the affected public have no, or little, awareness of the risk.

A.6 Privacy and data protection issues

The Tampere Declaration was annexed to the unanimously adopted Resolution No. 7 (Disaster Communications) [11] of the first World Telecommunication Development Conference (WTDC-94, Buenos Aires, 1994). The resolution urges all administrations to remove national regulatory barriers in order to allow the unhindered use of telecommunications in disaster mitigation and relief.

A.7 Service availability

In many types of emergency it is quite possible that some of the networks will suffer severe disruption. This could be due to damage to the network infrastructure and/or from congestion from an overload of traffic. This has been the experience in a number of disaster situations i.e. Madrid, New York.

It is therefore proposed that solutions should ideally be based on technologies that use duplicated equipment, do not suffer from reduced QOS due to single points of failure, and can be disabled for use by the public. It is also proposed that the solution should not rely on a single technology. Thus if one network is disrupted then communications are still possible using the other types of network (see figure A.1).

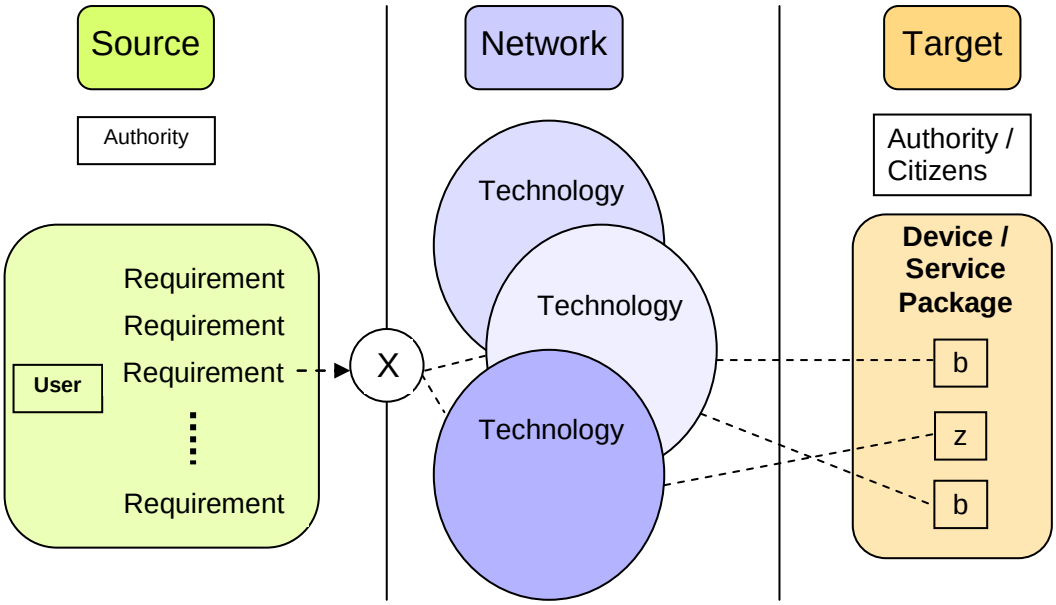

Figure A.1: Communication in case of emergency

Such a solution has many advantages, as well as being more reliable, users can choose the technology that best suits their normal operational needs, and new technologies may be added as they are developed. The component parts of this sort of solution are all available now and nothing has to be invented or developed to realize it.

A.8 Information to the citizens

The Cheshire Fire and Rescue Service in the UK has distributed a leaflet to all households in Chester: "In case of Emergency" (see bibliography.) This leaflet explains how the local industry and the authorities work together to make Cheshire a safe place to live. It provides instructions to the citizens what to do in case of an emergency.

The leaflet is based on UK legislation, the Civil Contingency Act 2004, which can be found in [3].

A.9 Media plan for major incidents

The authorities of the county of Cheshire in the UK have designed a media plan that details how the authorities shall communicate with the media during an emergency (see bibliography).

Annex B (informative): Methods of communicating from authority to citizen

B.1 Use of the media (Broadcast Television and Radio)

Whilst the value of the media in informing the public should not be underestimated, not everyone is listening to either TV or radio when they need to be alerted to an emergency. Research in the UK has shown that the combined channels of TV and radio only reach approximately 50 % of the population. Another consideration is that often the immediate alerting phase has been passed before the media have had an opportunity to broadcast the warning information. The increasing numbers of digital TV and radio stations will increase the problems associated with using the media as a means of quickly alerting the population to an emergency. However developing the use of digital broadcasting technology to selectively address warning messages to viewers or listeners is an advantage for targeted messages.

RDS, digital radio (DAB) and digital television are other services that make use of the media and are covered in the following clauses.

B.1.1 RDS (Radio Data System for VHF/FM Broadcasting)

RDS (Radio Data System) is mainly used to send data to car radios concerning traffic information, and other simple information pertaining to that particular station. The use of an RDS emergency code has been identified as a potential route for sending emergency information, such as a public warning, into an individual's car. The benefit of RDS emergency codes is that the individual driving the vehicle cannot switch this element of the system off. However, the radio would need to be tuned into that radio frequency and the equipment would need to be switched on.

B.1.2 "Voice Break-In" facilities within radio rebroadcast systems

Radio rebroadcast systems can be used to rebroadcast AM (LW/MW), FM and DAB broadcasts in areas where RF signals from terrestrial transmitters are blocked, for example in road tunnels. Such rebroadcast systems often incorporate "Voice Break-In" (VBI) facilities to enable the local traffic control centre to make emergency information announcements to the public over radio broadcast channels.

VBI for AM and FM is relatively simple and has been installed in many road tunnels across the world. VBI for DAB is more complicated due to the complex nature of the encoding and multiplexing scheme and so is DAB. VBI installations are rare at present.

RDS is also used in conjunction with VBI in some installations. In the event of an emergency announcement the appropriate RDS signal is broadcasted. This can interrupt non-radio audio, such as CD or tape playback.

The same RDS signal can also overcome the difficulty with VBI for DAB transmissions. When the appropriate RDS signal is broadcast, the car radio switches from DAB to FM reception and receives the emergency announcement via the VBI for FM.

B.1.3 Digital Audio Broadcast (DAB)

At present digital radios are not common in households across Europe and, until there is increasing evidence of this medium becoming common, then it is only an ENS for the future.

This could be implemented in systems using the Emergency Warning Systems feature (see EN 300 401 [1], clause 8.2.3).

B.1.4 Digital television

There is a growing proportion of the population that has access to digital television and there is evidence that there will continue to be an increase in take-up of this medium for it to become a viable ENS. Messaging access would be through smart cards, fitted in current set-top boxes and, in this way, warnings could be targeted. There is also the possibility of utilizing this platform with GIS systems, again giving the message sender greater focus. Message areas on television screens can be designed to order, and messages could be available on all channels, but in particular on those free available channels.

B.2 Siren systems

Modern siren systems offer:

- Low electrical current consumption and the ability to operate from integral batteries following disruption of utilities.
- Radio control and therefore independent of land line/utilities.
- Pre-recorded voice chip messages and live broadcast capability.
- Full time conditioning monitoring reducing the need for live testing.
- System controllers that can initiate individual, groups or all sirens.

They can also form part of an integrated system using external sirens and small alerting receivers for the inside of buildings.

B.3 Emergency Telephone Alert System (ETAS)

Using the PSTN for delivery of emergency notification messages is one method available for communicating from authorities to citizens. ETAS generally deliver recorded messages to geographically targeted areas, providing notification of danger, giving specific instructions on actions to be taken, or providing situational updates. ETAS allow audience specific messages to be delivered.

ETAS generally apply best-in-class data and database management protocols, communications, mapping, and Internet technologies to help public safety officials rapidly distribute critical information to citizens in a crisis. Each fixed line phone number is geo-coded to a specific physical location for maximum precision and stored in an outbound calling database. When an alert is needed, the appropriate officials use a GIS system to identify the geographic area that will be affected. The GIS system overlays the outbound calling database to identify the specific phone numbers to be called. A message is recorded (or a pre-recorded message is selected) and the outbound calls are initiated. ETAS recognizes engaged tones, unobtainable tones, no answer tones, and detects answer phone/voicemail systems and should therefore be able to implement pre-defined escalation procedures for each circumstance.

ETAS are often capable of delivering messages through any combination of telephone, pager (alpha or digital), SMS, fax and email. ETAS might also handle inbound calls and receive alert responses or escalation instructions via the telephone keypad or IVR. These features are normally utilized with pre-defined call lists (such as first responders), as opposed to a GIS based mass calling system launch.

B.4 Use of mobile devices

The following clauses cover the use of mobile devices.

Poor radio coverage may lead to delayed delivery or non-delivery of messages for all mobile devices covered in this clause.

In certain cases users may elect to receive messages on their mobile devices in their desired language.

B.4.1 Paging systems

Low cost alpha/numeric paging devices are very common and reliable. Paging services are based on broadcast technology. This technology is based on a worldwide standard that has been stable since 1984. Pagers and other paging based devices are very simple. They are easy to use, consume very little energy and there is little to go wrong with them. Paging functionality can be embedded into various types of terminals (e.g. messaging displays such as notice boards on highways, in shopping malls, on bus stops, at railway stations, and in various other public places). They have even be built into wrist watches, cellular and TETRA devices.

Once an emergency notification message has been received by a paging network it will be transmitted within 30 seconds or less using the paging networks broadcasting capability. Each message will be receivable throughout a nations population area (e.g. the paging networks in the UK, France and Germany each cover 98 % or more of their respective populations).

Paging devices can be programmed to respond to national alarms, regional alarms or local alarms. So messages can be targeted at people in the immediate vicinity of an emergency to do one thing, and people travelling to the vicinity to do another.

The cost of providing the service is minimal as paging networks already exist. The costs for including pager functionality into other devices would be negligible and costs for installing pager equipped devices such as notice boards throughout a nation would be relatively small considering their speed and reliability. In addition the costs could be easily offset by using the service for other purposes such as advertising in a shopping mall, estimated time of arrival of the next bus, traffic information etc. As a result an emergency notification message network could be largely financed by industry with only small amounts coming from the public budget.

Paging networks are still operational in many countries and using them to send messages to notice boards and other terminals has been done for a long time, so emergency warning systems could be operational in those countries within a few months.

B.4.2 Cell Broadcast Service

The Cell Broadcast Service (CBS) allows broadcasting of messages to the mobile phones of a large number of citizens in a specific location within the time frame as specified in clause 5.2.1.

Due to the nature of broadcast a single message can reach all mobile phones in the specified areas, including those of roamers. The area can be as small as one cell and as big as the entire country. Broadcast does not allow for detection of successful delivery, but messages can be repeated for those that enter the emergency area later or have missed previous messages.

In order for a CBS message to be received by the mobile phone, the cell broadcast functionality has to be enabled on the mobile phone and channels of interest (message identification) have to be activated.

Automatic enabling of the CBS functionality on a mobile phone on receipt of an emergency broadcast message would be advantageous.

Since many mobile phones can vibrate, the hearing impaired can also be warned. Text-to-speech conversion applications are available to warn the visual impaired.

It is possible to broadcast messages in various languages.

Cell broadcast uses a dedicated channel, so the functionality will generally be available, even if voice and data traffic in the network is congested. Use of the Cell Broadcast Channel (CBCH) reduces the number of available Stand Alone Dedicated Control Channel (SDCCH).

In view of an application using CBS to inform the citizens by the authorities, it should be noted that:

- Citizens should be informed of their need to activate the service.
- Use of languages and selection of coverage scheme requires co-ordination between authorities and the network operators.

More details can be found in TR 102 444 (see Bibliography).

B.4.3 SMS bulk messaging

Short Message Service or SMS messages can be sent to a mobile terminal without special options needing to be set on the handset. SMS is widely known and accepted and messages can contain detailed instructions for citizens on required actions to take.

Under normal conditions, delivery can be almost instantaneous, but a large number of messages require considerable time. Since the mobile terminal acknowledges successful reception of an SMS, the retry mechanism guarantees a very high rate of successful delivery. Severe network congestion may lead to a delayed delivery.

SMS in itself is not location specific. However, there are technical means to detect where mobile handsets are located. Active probing generates a lot of traffic on the signalling channels and passive probing requires expensive equipment to probe each BSC/RNC.

More details can be found in TR 102 444 (see Bibliography).

B.4.4 Video broadcast technologies to mobile phones

Video broadcast, such as Digital Video Broadcast - Handhelds (DVB-H), Multimedia Broadcast Service (MBS), MediaFLO and Multimedia Broadcast/Multicast Service (MBMS), to mobile terminals can be used just like radio or television. The service must be activated, but then a large audience can be reached in a short time with detailed instructions in various languages.

DVB-H and MBS use their own infrastructure, which makes the service non location specific, but without risks of congestion.

In Digital Video Broadcasting (DVB) systems, emergency messages can be identified by using the Announcement support descriptor (see EN 300 468 [2], clause 6.2.3).

B.4.5 MBMS

Due to the nature of broadcast, large audiences can be reached. The MBMS broadcast mode is a unidirectional point-to-multipoint transmission of multimedia data (e.g. text, audio, picture, video, etc.) to all users in a broadcast service area. The multicast mode allows the unidirectional point-to-multipoint transmission of multimedia data (e.g. text, audio, picture, video, etc.) to a group in a multicast service area. In the multicast mode there is the possibility for the network to selectively transmit to cells within the multicast service area, which contain members of a multicast group.

B.4.6 MMS

MMS messages can be sent to a mobile terminal without special options needing to be set on the handset. The message may include picture, voice, and text message, and can contain detailed instructions for citizens on required actions to take. Delivery may require pre-processing for individual phone specific features.

Under normal conditions, delivery can be almost instantaneous, but a large number of messages require considerable time. Since the mobile terminal acknowledges successful reception of an MMS, the retry mechanism guarantees a high rate of successful delivery. Severe network congestion may lead to a delayed delivery.

MMS in itself is not location specific. However, there are technical means to detect where mobile handsets are located. Active probing generates a lot of traffic on the signalling channels and passive probing requires expensive equipment to probe each BSC/RNC.

B.4.7 USSD

USSD provides a transaction based service between an application and a handset. USSD can provide a simple menu-type of interaction and it can provide unsolicited messages to the handset that appear directly on the handset's display. Communication can thus be initiated from both sides.

USSD is available on every GSM/UMTS phone.

USSD was initially designed to allow a mobile phone to interact with the mobile network operators HLR for interacting with supplementary services such as the mobile phone subscribers operational preferences. Very few USSD applications have been developed beyond the domain of the network operators HLR which would need to be the case for the broadcast of emergency messages.

Delivery of messages from an application to a handset is at least as fast, if not faster, than SMS, since a dialogue is built between the handset and the network. So, for subsequent messages, no additional HLR/VLR lookups are necessary.

USSD can also be used in scripting languages. USSD only carries (alpha)numerical characters. The messages are limited to a similar size as SMS.

USSD communication is point-to-point (handset-application) and has no location component. USSD works in home and in roaming networks. In the latter case, both applications in the home network as well as in the visited network can communicate with the handset.

The communication over the radio interface takes place on the signalling channels using short dialogues with peak data throughput rate capabilities of up to approximately 600 bits/s outside of a call and 1 000 bits/s during a call.

Other characteristics are similar to SMS and MMS.

B.4.8 IP Multimedia Subsystem

The IP Multimedia Subsystem (IMS), specified in TS 122 228 [9] (Stage 1), TS 123 228 [10] (Stage 2) and several Stage 3 specifications, provides several alternative means, including instant messaging, for person-to-person communication. Instant messaging in IMS guarantee real-time delivery of messages, where messages can carry any media (text, video, sound). Also messaging conferences between several UEs is supported. Further, IMS Emergency Session will be introduced as part of 3GPP Release 7.

IMS was introduced in 3GPP Release 5, but is not widely deployed.

B.5 Amateur radio

Amateur radio organizations provide a radio communications service, conducted by volunteer licensed amateur radio operators, for providing emergency communications support to State and local governments. These services are not meant to address the general public.

B.6 Web notification

Web notifications use services such as MSN, ICQ or Messenger and are capable of alerting persons that have activated the service on their (mobile) terminal. After registration, location specific messages can be sent that can give instruction on what action to take in the language of their choice. Distinct disadvantage is that there are numerous, non-compatible variants of the service. Messages to persons that are not active (on-line) can be suppressed, which guarantees a high rate of successful delivery.

B.7 email notification

As email addresses are not commonly available or stored in a national directory, such a service will be on an opt-in registration service option. Once a user has registered their email address with an Emergency service notification agency they can expect to receive emails notifying them of pending emergencies and suggesting the correct course of action to take at a particular time.

As email in not a guaranteed delivery service such messages cannot be relied on but when personalized and regularly sent the likelihood of this service having a high degree of specificity and usefulness is high. For real-time services a new guaranteed email service would be required.

Email is feature rich and graphical information maps etcetera may easily be attached. This is especially useful for foreseen emergency situations like slow rising floods. A variant of this may be Instant message Alerts of the user registers and is a user of instant messaging when the alert notification is disseminated.

Many mobile phones today have email capability and so email notification is not restricted to conventional PCs.

Annex C (informative): Bibliography

"In case of Emergency", Cheshire Fire and Rescue Service.

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Information on MediaFLO can be found in http://www.floforum.org/.

ETSI TR 102 444: "Emergency Communications (EMTEL); Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging applications; Emergency Messaging; SMS and CBS".

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History

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