

**Emergency Communications (EMTEL);
Basis of requirements for communications between
individuals and between individuals and
authorities whilst emergencies are in progress**



Reference

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Foreword

This Technical Report (TR) has been produced by ETSI Special Committee Emergency Communications (EMTEL).

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

- TR 102 180: "Basis of requirements for communication of individuals with authorities/organizations in case of distress (emergency call handling)";
- TS 102 181: "Requirements for communication between authorities/organizations during emergencies";
- TS 102 182: "Requirements for communications from authorities/organizations to the individuals, groups or the general public during emergencies";
- TR 102 410: "Basis of requirements for communications between individuals and between individuals and authorities whilst emergencies are in progress".**

Introduction

When communities are faced with crisis, e.g. caused by dramatic weather conditions, terrorist attack or traffic accidents there is a demand for assistance and information communications services from the individuals. A diverse set of requirements are already published in three first documents referred to in the foreword. The present document concentrates on means of communication between affected individuals in an emergency situation and establishes a basis of requirements for the corresponding communication functions.

A state of emergency as such may have coverage of a city, a valley or a district, or it might be more concentrated to a single point (e.g. a piece of a motorway, a city block, etc.).

In the first case we have to take into consideration that the normal infrastructure of the affected area may be in a very bad state.

In a less severe case, the communication network in the surroundings of the accident may technically be in order, but may experience blocking and overloading due to the increased traffic.

In both cases there might be an urgent need for individuals to learn about the state of relatives and friends (and property); and to coordinate mutual actions.

The present document establishes a basis for requirements for communications facilities under such circumstances. This also includes recommendations for emergency power supplies for the access equipment.

1 Scope

The present document addresses the requirements for communication facilities among individuals and to authorities/organizations, Non Governmental Organizations (NGO) and media while emergencies are in progress, not including alerting communication. The proposals given here complement the facilities specified in TR 102 180, TS 102 181 and TS 102 182. Although many suggested requirements collected from network operators, service providers (e.g. emergency response organizations) and users 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. Standardized solutions may foster increased user awareness and better utilization of the services.

The present document identifies potential areas needing particular attention from the experts and refers to identified documents in preparation in Standards Development Organizations.

The scope of the present document covers aspects from small scale to large scale incidents.

The present document outlines the basis for technical, network operational, network organizational and regulatory requirements which could be applied to existing as well as future networks and infrastructure.

2 References

For the purposes of the present documents the following references apply:

- NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.
- [1] Greater London Authority, June 2006 ISBN 1 85261 878 7: "Report of the 7 July Review Committee".
 - [2] Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications).
 - [3] ETSI EG 202 067: "Universal Communications Identifier (UCI); System framework".
 - [4] IETF RFC 2486: "Network Access Identifier".
 - [5] ETSI EG 202 325: "Human Factors (HF); User Profile Management".
 - [6] ETSI EG 202 421: "Human Factors (HF); Multicultural and language aspects of multimedia communications".
 - [7] ETSI TS 102 164: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Emergency Location Protocols [OMA-TS-MLP-V3_2-20051124-C]".
 - [8] C(2003)2657: Commission Recommendation of 25th July 2003: "Recommendation on the processing of caller location information in electronic communications networks for the purpose of location-enhanced emergency call services", published on O.J.E.U. L 189/49 the 29.7.2003.
 - [9] Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (Framework Directive).
 - [10] Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).
 - [11] ETSI EG 202 116: "Human Factors (HF); Guidelines for ICT products and services; "Design for All"".
 - [12] ETSI ETR 333: "Human Factors (HF); Text Telephony; Basic user requirements and recommendations".

- [13] ITU-T Recommendation V.18: "Operational and interworking requirements for DCEs operating in the text telephone mode".
- [14] ETSI ETS 300 381: "Telephony for hearing impaired people; Inductive coupling of telephone earphones to hearing aids".
- [15] ETSI ETS 300 488: "Terminal Equipment (TE); Telephony for hearing impaired people; Characteristics of telephone sets that provide additional receiving amplification for the benefit of the hearing impaired".
- [16] ETSI TR 102 133: "Human Factors (HF); Access to ICT by young people: issues and guidelines".
- [17] ITU-T Recommendation E.115: "Computerized directory assistance".
- [18] ISO/IEC Guide 50: "Safety aspects - Guidelines for child safety".
- [19] ETSI TS 101 109 (V7.2.0): "Digital cellular telecommunications system (Phase 2+); Universal Geographical Area Description (GAD) (3GPP TS 03.32 version 7.2.0 Release 1998)".
- [20] ETSI SR 002 299: "Emergency Communications; Collection of European Regulatory principles".
- [21] ETSI ES 202 076: "Human Factors (HF); User Interfaces; Generic spoken command vocabulary for ICT devices and services".
- [22] ETSI EG 202 132: "Human Factors (HF); User Interfaces; Guidelines for generic user interface elements for mobile terminals and services".
- [23] ETSI EG 202 423 "Human Factors (HF); Guidelines for the design and deployment of ICT products and services used by children".
- [24] ETSI EG 202 487: "Human Factors (HF); User experience guidelines for Telecare solutions".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 102 180, TS 102 181, TS 102 182 and the following apply:

declared emergency state: a state of emergency declared by a recognized authority of the area or region for the site in question

NOTE 1: There may be different levels of emergency (e.g. "yellow", "orange", "red") according to the situation, the size of the area as well as the level of the authority (local, regional or national) may also vary.

NOTE 2: A declaration (and corresponding changes) of an emergency state may invoke changes in the functions of communication facilities, e.g. in traffic priority, routing, logging or security schemes, etc. This may influence the individual user.

emergency database: database to handle large amount of information about distressed persons and items

NOTE: The database can be widely used within and between organizations and individuals as a coordination mechanism. This database can also be consulted by the authorities.

emergency information services: networked information services, which can be contacted through different types of networks with different terminals types

NOTE 1: The service or site may provide voice services (also with "real" persons).

NOTE 2: This is exploited and reflected in all the different types of services presented (see clause 7). Three main types of services should be offered: assisted-, deferred- and self-services. Commercially available call center solutions may be applied to implement these.

NOTE 3: This kind of service may have personnel assisting individuals without functional terminals or without access to the registration function.

individuals emergency communication functions: set of resilient functions (designed to work in an emergency situation) or fallback solutions to be embedded in communication networks, designed to work, for the benefit of the individuals also in situation of partial network breakdown (caused e.g. by overload or power outage or physical damage)

NOTE: One example could be the ability to establish connections in a local area when disconnected from central network nodes, which normally control the network.

registration function: function for registration of affected individuals and concerned individuals in an emergency database

NOTE: A registration function can also facilitate a possibility to assign temporary addresses to individuals. (Mr. N can now be reached at No. Y, - which not his usual telephone number.)

3.2 Abbreviations

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

ADSL	Asymmetrical Digital Subscriber Line
ASR	Automatic Speech Recognition
EIS	Emergency Information Services
GNSS	Global Navigation Satellite Systems
ID	IDentity
ISDN	Integrated Services Digital Network
NGN	Next Generation Networks
NGO	Non Governmental Organization
PSAP	Public Safety Answering Point
PSTN	Public Switch Telephone Network
WiFi	Wireless Fidelity

4 Involved participants and their communication needs

This clause describes the different participants in the given context and their (most probable) communication needs.

4.1 Situations of Individuals

During an emergency or disaster, the situations of individuals can be classified mainly as follows:

- **Individuals within the emergency area**
During larger emergencies the telecommunication infrastructure may well be overloaded and/or not working properly. In this sense different needs arise. There will always be a perceived need to give your friends and family a message one way or another. Involved individuals within the area will have a need to get in contact and coordinate their actions. Further, the following types of individuals should be distinguished:
 - **Involved individuals** - being directly hurt/influenced by the circumstances, e.g. by being injured.
 - **Affected individuals** - being present in the emergency area, but not directly involved or hurt/influenced.

- **Individuals outside the emergency area**

- **Concerned individuals** - which may be relatives or friends, travellers (that may have to change their plans), business people, etc.

There are two kinds of information that concerns close relatives and friends:

- a) Information about the accident (why it did happen, the consequences and the current situation).
- b) Information about the status of named persons.

In the early phase of an emergency, many people will not know whether they have close relatives involved and therefore also ask for the second kind of information.

During the emergency, the relatives will not be satisfied until they have talked to or seen their nearest. How and where to access this information should therefore be well known before the emergency occurs.

In case of a larger incident the network operators or the authorities may disable some services in order to increase the network availability. There may be regulatory reasons to restrict the services.

There is also an urgent need to get the latest news. This often leads to people making phone calls over and over again, which does not help the already strained infrastructure.

4.2 Entities and organizations

Some individuals can also belong to entities and organizations that have a role to play in order to facilitate the return to the normal situation; their communications needs may also differ in relation to their location (within or outside of the emergency area):

- **Authorities.** The authorities may have a need for updated information from the emergency area, in order to manage their resources to serve the individuals efficiently. Such information may be retrieved or compiled from data or statistics from e.g. the emergency database.
- **Non Governmental Organizations, NGOs** ("professional" or trained volunteers) - may have the skills and experience to contribute to the rescue action (e.g. Red Cross and Red Croissant, and several associations with humanitarian object). Some of them can even have a local presence prior to the emergency, due to their own plan of assistance activities.

NGOs and civic organizations may have a supporting role in handling emergencies/disasters. Volunteers may have a role in contributing in emergency situations. Their efficient involvement will highly depend upon their liaisons with the authorities organizing and steering the overall rescue plan. Providing them with tools to report their field observations or get the optimal information on the status of the crisis, they are involved in, can be crucial. Some may have only their individual terminal when the emergency event occurs.

- **Site owner and site staff**

- **Site owner** - The owners of the site, vessel, etc. where the emergency occurs have certain obligations to fulfil. Examples of site owners in this case are a factory owner of a plant, a ferry company. Relevant phone numbers and web pages, etc. will normally be provided.
- **Site staff** - Site staff (or personnel) are supposedly fit to manage the site/plant. Site staff may participate in the rescue and clearance, as well as being affected individuals.

- **Utilities and their staff**

Assistance in logistic coordination and utility provisioning may be provided by providers of gas, electricity, electronic communication services and water supply.

- **Utility owner** - usually outside the emergency area, may represent control and control its action from a control centre.
- **Utility staff** - may be directly working within the emergency area (or nearby) with the manual operations needed.

- **Media**

During larger emergencies the media (journalists, radio/TV news reporters) play an important role in spreading information from the emergency scene and from the authorities to other affected individuals. Broadcasting can also be used for recruiting and coordinating new people to volunteer.

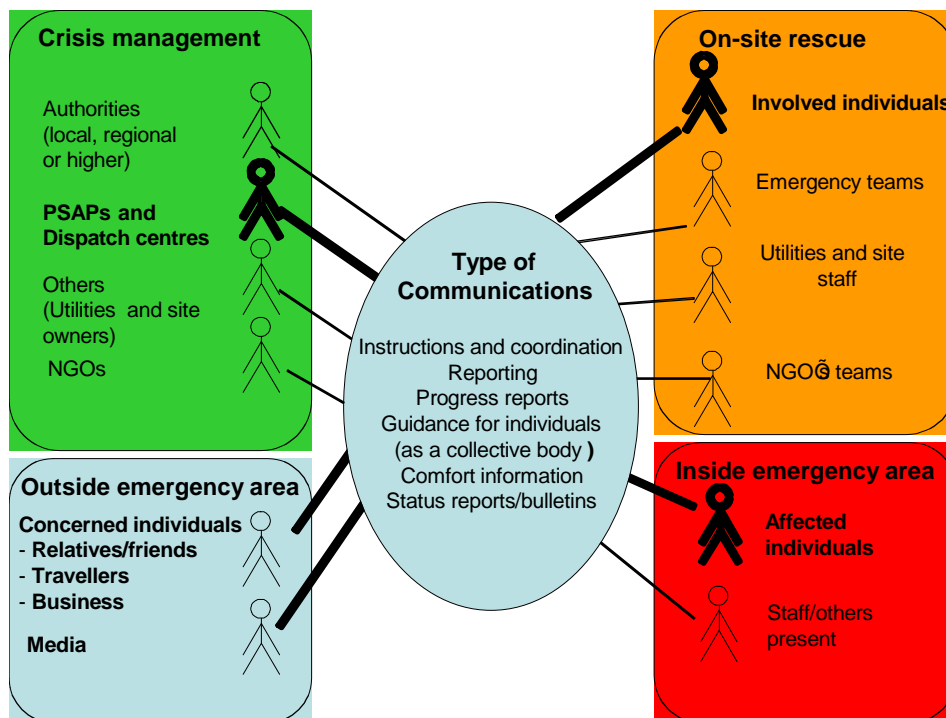
On the other hand they also spread information for selfish reasons - it makes their headlines. Hence they will exploit every option they have to get information. As a consequence the media have to be considered when designing new services since they compete for the very same communication means available to individuals (at least within and near the emergency area).

4.3 Possible scenarios

The scenarios proposed hereunder have been prepared mainly for the context of an important event (disaster-like). Due to, the variety of situations, it was not possible to fix "a priori" the characterization of such events.

It is often assumed that terms like area and duration of the emergency, or population affected, will be practically defined when an authority (local or regional or national) publishes a declared emergency state.

The real situation is a combination of the different elements described in the previous points; the use case depicted in figure 4.1 is provided to illustrate in a synthetic way one possible scenario and the corresponding communication needs.



NOTE: Bold lines illustrate the main communication needs, thin lines supporting communication.

Figure 4.1: "Use case" representing the most important communication participants and their needs

5 Potential user requirements

Potentially, the user requirements will differ according to situation, but some general aspect may be observed. They are listed in table 5.1. Within each entry the order is arranged according to priority. The most important requirement is put on top for each user group. (The communication services may be restricted.) The user requirements listed here, should not be regarded as ETSI specification, but establish a basis for the requirements of communication facilities (see clause 6).

In an emergency situation degradation of quality of service and lack of security may be experienced. Degradation in service availability and performance can be accepted in such situations.

Table 5.1: Potential requirements for individuals emergency communication services

User groups	Potential user Requirements - communication related
General for all the groups	Technology and procedures used under normal circumstances should be applied as far as possible.
	It should be possible to communicate the emergency to authorities and to other individuals.
Involved and affected individuals within emergency area	Supply of means to contact and coordinate actions with other persons involved.
	Provision of information from the site (one-way, e.g. by messaging) to family and/or friends about the situation.
	Two-way communication with family and friends for assurance and coordination.
	Options to register at a temporary address/communication service.
	Provide/retrieve location information.
Concerned individuals outside emergency area	Get access to relevant (emergency) information.
	Need for updated information: - reliable information about named persons; - reliable information about specific locations.
	Options for obtaining the information by using different types of terminals or technologies.
	Possibility for communication with a named person, even though his/her regular terminal is not available.
NGOs (and other volunteers)	Communication means in order to implement coordination functions with other entities dealing with the same task and with the authorities.
	Information distribution system (because of their role as a mediator, they should be able to get and spread authorized, clarified, information fast).
	Easy way of relating incoming information with found people.
	Way of addressing persons in charge according to their role/function (without knowing their name).
Site owner/personnel	Internal service availability: suitable (dependable, unblocked) communication paths in order to control own equipment/plant and for the benefit of the rescue operation.
	Access to relevant information made available from other participants as soon as possible.
	Information services/contact point and trained personnel for communication with employees and other individuals within and outside the site (also with the public in general), see note 1.
	Provision of relevant information to PSAP, see note 2.
Utility owner/personnel	Internal service availability: suitable (dependable, unblocked) communication paths in order to control own equipment/plant and for the benefit of the rescue operation.
	Access to relevant information made available from other participants as soon as possible.
	Provision of relevant information to PSAP and site owner/personnel (see note 3).
Authorities	Access to relevant information available as soon as possible.
	Information services/contact point for communication with individuals with a special emphasis on those who are directly involved/concerned (see note 3).
PSAP/Dispatch centre	Access to relevant information available as soon as possible/ be updated on the accident at all time.
NOTE 1: The responsibility for such information services may vary according to local jurisdiction and practice. It is important that the traffic generated by the emergency information services do not block the communication facilities needed for rescue operations.	
NOTE 2: This is (kind of) communication from individuals (or from a private authority) to officially recognized authority.	
NOTE 3: This is (kind of) communication from an authority to an authority.	

6 Capabilities of communication facilities

Contingency plans have to be prepared to handle emergency situations. However, the contingency plan will never be able to cater for all situations affecting the capabilities of communications facilities during emergency situations. This chapter describes specific features recommended when the network is subjected to decreased capacity and functionality.

National authorities have a set of preparedness and contingency plans to handle emergency situations. The communication operators have to support these plans. The plans should be tested regularly. Special operational modes may be predefined in a "policy-based" network management scheme and invoked in emergency situations. This could be e.g. rerouting calls to an answering point. This may ensure resiliency.

For a normal paid service there are QoS requirements. The provider can choose to shut down the service if the requirements cannot be met. In an emergency situation the most important thing is to keep communication channels uninterrupted, therefore the provider should preferably allow for a best effort (degradation of) service in preference to shutting the service down. During an emergency situation there should be a possibility for the service provider also to grant services, give extended credit to subscribers with accounts running empty. Under some circumstances (e.g. the terrorist attack in London on the 7 of July in 2005 [1]), overload access control may be invoked giving access only to authorities or a predefined set of users. It is up to national authorities define and implement such schemes.

Since the resources in a telecommunication infrastructure are limited, there may be a need to share the resources forcefully. Introducing time limits on the services can do this. In this case a warning may be issued to the caller before the connection is terminated. Interrupting calls based on time limits may, however, not be legal in all countries if it can be seen as pre-emption. It may also become necessary to introduce priorities. Some countries have defined lists with persons that should be prioritized in an emergency situation. These people may be granted access at the expense of regular customers. Care should be taken in this case to assure that other important emergency calls are not interfered.

Resilience/availability

It is very important that those who are organizing, or have the responsibility for some of the services have enough resources and resilience capacity to deliver a continuous service.

The services provided should be based on the basic facilities, which means that the terminals used will be commercial available equipment. This implies that the GSM/UMTS - wired telephone - and Internet infrastructure should be specified and implemented with a planned resilience capability.

Ad hoc networking is an important part of the resilience of the infrastructure. The communication systems should be able to utilize alternative routes and transmission systems, if the regular path does not function properly.

It should be possible to block/control access to the network.

The functions described in the next two clauses might not be easy to realize in systems today, but may be options in the future.

If technically and economically feasible it should be possible to communicate locally inside the emergency area, even in situations where there is no connection with the outside world. It is understood that in most communication systems today this function is not available.

For the emergency squad it could be desirable to see who is where, by polling cell phones for location (e.g. GNSS coordinates). Then unconscious persons with a cell phone could also be located.

If we allow the services to be accessed by different terminal technology and a lot of services to be accessed by one specific terminal type, this will give some sort of resilience.

Back-up power supply solutions that allow the equipment to function for a limited time period are needed, in case of service interruptions from the utility. Note: Power supply solutions to Base Stations (GSM/UMTS), Access Points (WiFi), ADSL and Cable modems in homes and the corresponding "central equipment" (DSLAMs and equivalent).

National roaming for selected-user groups

During an emergency, base stations that belong to different service providers could co-operate. The GSM/UMTS traffic could be handled by base stations without considering which provider the subscriber belongs to.

NOTE: Restricting the access to a limited set of users may be considered, e.g. to:

- "authorized" rescue personnel;
- involved and affected individuals, e.g. based on location information derived from mobile phones.

Table 6.1: Summary of recommended properties of (local) communication facilities in case of emergency

Emergency Services should be well known to the users (individuals).
Accounts running empty should not block usage – may take hold in some defined emergency states.
Best effort QoS, (reduced quality) is preferred to service denial.
The option of allowing a time limited connection time for certain groups of users could be catered for (may be invoked at a change in the defined emergency state). The callers should somehow be notified before the call expires.
It should be possible to prioritize traffic for specific groups of subscribers (e.g. rescue personnel, authorities).
The services should be resilient.
Resilience at the premises of an organization (e.g. schools, hospitals, etc.) should also be catered for.
It should be possible to implement address schemes based on functional roles (titles), e.g. to be able to address "the person in charge of ...". In order to implement this, mapping/gateway functions between different networks may be necessary.
The system allowing for general information to the public should be disseminated in an efficient way (more efficient than answering individual calls). This also holds for updates.
The system should allow efficient information sharing among those who are involved in the rescue process.
It should be possible to block/control communication access to the network.
System solutions that in future will allow authorized individuals (and authorities) to poll the (cell) phones for their geographical coordinates should be planned for.

7 Requirements for Emergency Information Services (EIS)

7.1 General description

The general public should know how to address communication services in case of emergency. However there may be a need for a set of publicly well known addresses (call number, web addresses) to serve as contact address in case of emergency. The purpose of an EIS is to satisfy primarily the individual's emergency communication functions but also to facilitate some missions of general interest.

7.1.1 Architecture

The idea in this context is to define the prerequisites of an emergency information service or centre, allowing operators and service providers to establish a template and maybe "an nearly empty" framework for the service to be populated and parameterized under declared emergency states. Some functions may also be in daily use (e.g. for Salvation Army which provide means of finding "lost" relatives). Communication facilities among individuals and to authorities/organizations could also be supported by centralized functionality.

An emergency information service can be contacted through different types of networks with different terminals. This is exploited and reflected in all the different types of services presented. Three main types of services should be offered: assisted-, deferred- and self-services.

Assisted services are services that are dependent on real time interaction with agents. Examples of this are phone calls initiated by the user and text chat sessions.

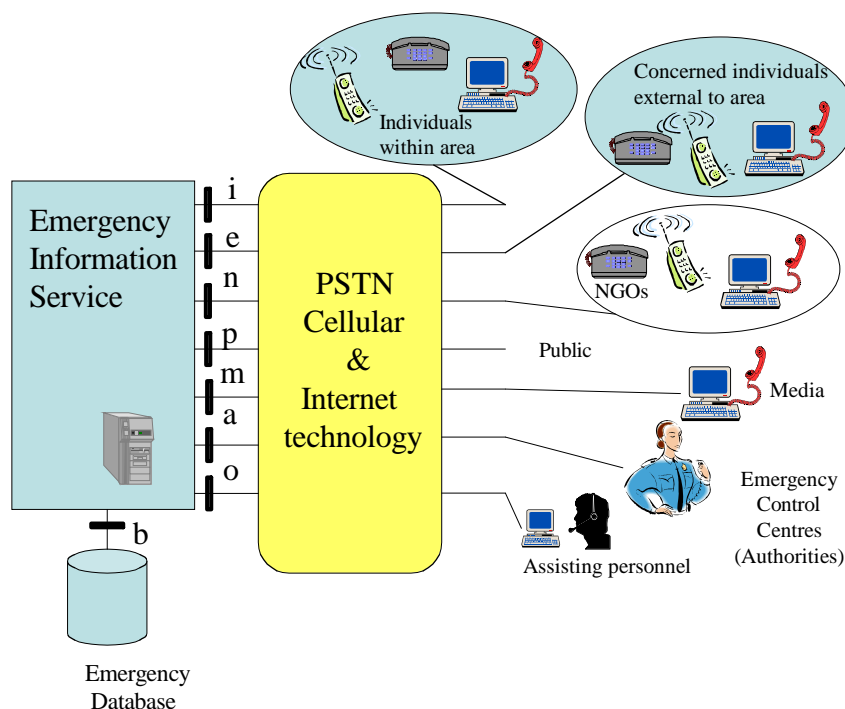
Deferred services do not need to be handled right away; they can be scheduled to be processed later. This means that better load balancing for the agents and less pressure on the infrastructure can be achieved.

Since users do not have to call over and over again to get through, which will only overload the infrastructure more, they can be called back. The user can send an e-mail, SMS, voice mail or fill out a form on a website where it is specified when and how they want to be contacted.

Guidance on how to operate the different services and the information given by the services should be available in languages understood by the affected persons.

Self-services can be reading the latest news on the web, search engines and video streams.

A diagram illustrating the context of emergency information service is given in figure 7.1.



Legend (for the interfaces):

- i = involved and affected individuals inside the emergency area
- e = concerned individuals outside the emergency area (e.g. relatives and friends)
- n = NGO user (and other volunteers)
- p = public users
- m = media
- a = authorities
- o = operator
- b = database

Figure 7.1: Emergency information service system architecture

The interfaces i, e, n, p, m, a and o do not necessarily represent different technologies, but may have different access rights. Requirements to data management are to be treated below.

An emergency information service has several advantageous qualities that can be useful during a crisis. Basically operators trained to handle emergency communication will assist the service. This would create a virtual organization, operators with different skills can be added to take part in the operations disconnected when their task is done. This means for example that a owner of a property where a big accident is taking place can be connected to the Emergency information services and be in charge of the information distribution without making an ad-hoc call centre solution at their office site. The Emergency information services should also be able to connect to the authorities and get updated verified information without human interactions.

An overview of how the communications services covered by an "Emergency information service" can implement requirements for the different group of participants is given in table 7.1.

7.1.2 Relevance of EIS towards different user categories

One of the problems with today's solutions is the limited ways of getting access to information. Current solutions are based on calling the published phone numbers, monitoring the news and the owner of the property/plant of accident may publish some information on the web. With an emergency information service and their three types of information retrieval, there are other options on how to get updated information. Also, everything can be reached at the same phone number, fax number, e-mail address and web address as always - it does not change for each emergency. The distribution of updated information happen mainly trough broadcasting media today, but with the emergency information service new ways of spreading information will be available. An SMS message or e-mail will be sent to the registered users when any information is updated. This service will ease some of the pressure on the telecommunication infrastructure by reducing the number of users that call to hear if something new has happened.

Table 7.1: Potential requirements covered by emergency information service

User group	Requirement Covered	Implementation
General	The services should be well known	The emergency information service should have a common well known lasting address (not an address that changes according to circumstances).
	Arrangements should be made to allow Services to be provided free of end user billing at the point of use during emergency	By having a common "free" number that people call. The call for free function could be initiated/put into force depending on policies of the national authorities or by the service provider.
	Resilient services	It should be possible to access the services by a number of different technologies (cellular, PSTN/ISDN/ IP telephony and Data terminals).
	Efficient distribution of general information (inefficient to give general info in individual calls)	Web pages and e-mail technologies are widely used for this purpose.
	Distribute updated information efficiently	Enable SMS and Email alerts.
	Data privacy/integrity	Some authentication and authorizations measure has to be put in order not to generate fake/false information. Concerning the use however, this measure has to be realized in a way that does not hinder efficient use. (Better simple and somewhat not completely secure, than a very secure, but cumbersome procedure.) It is also important that personal data is managed as specified in Data Privacy Act (data should not persist in this type of database longer than necessary) [2].
Individuals within emergency area	Individuals to provide information e.g. to a "I Am Alive list"	Allow individuals in the Emergency affected area to post information on a notice board.
	Map individuals to a current terminal and location	The emergency information service centralizes the information, which can be used for identification and coordination purposes.
	Be able to volunteer and help out others in the same area	The service can manage incoming registrations and distribute information to appropriate parties.

User group	Requirement Covered	Implementation
Concerned individuals outside emergency area	Retrieve information about relations	The service gives access to information provided by individuals in an emergency area.
	Get updated information as fast as possible	They have an information source that is updated in real time.
	Input relevant information	Relatives or friends of victims within the area, can supply valuable information about the person's general health status and capabilities (prior to the event), and also give information of how they are equipped.
	Be alerted when new information has been released on nominated individuals	An notification is sent when the web page is updated by an individual that I request information about.
NGO	Coordinate between their sections	To some extent the different groups of an NGO may use the main emergency service as a mediator, but this may not be optimal.
	Be updated with the latest news	The service should always be up to date, and the emergency database is used for this.
	As a mediator, they should be able to get and distribute information approved by the authorities quickly	The service gets updated information from the authorities, this service may act as a supplement to the distribution channels of the authorities (see also TR 102 182)
Authorities	Be able to organize and monitor the contribution from volunteers	Communication between emergency information service and emergency control centre.
	Be able to learn the status of people and property at scene	Retrieve information by using the database.
Site owner/staff	Be able to have updated relevant information available, also responsible to provide information on the Co-ordinates on people and geography of the site.	Partly realized by letting the owner retrieve information from the emergency information service, this information can probably be combined with own information in relation to communication with employees and their relatives.
	Be able to offer trained personnel to handle the contact with the relatives	This can probably be realized by supporting/funding the local emergency information service.
Utility owner/staff	Be able to have updated relevant information available	Partly realized by letting the utility retrieve information from the emergency information service, this information can probably be combined with information of own plant.
Media	Get information in an organized way that needs to be checked	Since the information service is updated all the time Have access to appropriate information that they can cross-check.

7.2 Individual emergency communications functions

7.2.1 Mapping of persons/resources to communications facilities

In case of emergency both individuals and authorities may need to know who is where. The following functions may be helpful and be provided by the emergency information services. The features described here establish (a temporary) address for the people in the area (in order to be able to reach them). It is not meant as a lasting database for medical information

It should be possible to send a concise message containing an ID to register oneself, preferable with a condition/availability status (e.g. "I am alive and fine", "I am alive and taken care of", where and how to be reached, etc.) to an emergency communications database. This database could then be used for addressing purposes (contains associations between personal ID and a given terminal. There might be more than one person registered on a terminal. The format of these ID is up to consideration (see e.g. [3] and [4].) Setting up such a database and providing access need considerations on personal integrity.

It should be possible to publish inquiries for resources in order to assemble local "task force", this could be of the form: "Is there any medical doctor in area X?" (The registration of personal skills/abilities could also be combined with the initial registration process (see above) or be handled through an additional registration.).

7.2.2 Access to geographical information

It should be possible to derive the geographical position of the terminal. This could be accomplished by a presence functionality or by requesting the location of specific terminals on a need basis. The benefits of the presence functionality could be more or less continuous tracking of the location of all or some terminals in the emergency area, but the drawback is the anticipated traffic load and the uncertainty about the availability of communication links. Such difficulties also create doubts about the validity and age of the presence information. Some user interaction may be needed to keep the presence updated in some scenarios and such user interaction is not always possible.

It is anyhow useful and necessary to know the location of specific terminals, or terminals belonging to identified users as far as technically possible. The location information may be quite accurate in case the terminal is equipped for satellite navigation but such location information may only be available if the terminal is outdoors. The location information for wireless terminals may be based on the location of the used base station or access point and the accuracy of such location information varies with the size and shape of the used radio cell.

The location information of terminals within the emergency area should be made available to the authorities and is necessary for coordinating the rescue work. The location information is also useful for individuals within the emergency area.

NOTE: This feature should not be restricted to wireless terminals, but is of great use also to wired ones (the user may be new to the place, and unaware of her/his position within e.g. a large building complex).

It is noted that national regulations may apply regarding the privacy of location information and the storage of such information and that such regulations also may apply, or be overruled, for emergency situations.

7.3 Specification of an emergency database associated with the EIS

The network (in order to handle communication needs as illustrated in figure 4.1) could realise some means to address individuals as well as groups of people (according to their role in the situation). People may have lost their normal terminals or the network services they normally subscribe to may not be working. It is assumed that this could be remedied by a registration and database service; therefore an Emergency database is suggested as a part of the proposed system. In the context given, it is supposed that this database is managed by the Emergency information service. As web based search machines prove themselves more and more efficient, it is not a requirement that the underlying data necessarily should be stored in a formal real database structure, it may as well be a virtual one. But it has to work as a real one, with secured management of registration features and access rights. It should be possible to access the information by a number of ways (telephone calls, SMS, web browsers, etc.). The resulting architecture is illustrated in figure 7.1.

One of the most important characteristics of a database is its ability to handle a large amount of information and store it in a systematic way. Such a database implicitly supports coordination of the users due to its characteristics, because coordination becomes necessary among those who work on divided tasks. A database is a coordination facility because those who access it can work together to achieve a common goal without even needing to talk to each other or be in the same place. They can just access the different material stored there by other co-workers. This has been taken advantage of by organizations, and the database is widely used within and between coupled organizations as a coordination mechanism.

Another advantage with the database concept is that multiple search keys exist without any extra effort. For example in a name - social security number association in a filing cabinet, the information will be stored in either alphabetical order by name or in numerical order, both keys can not be used without introducing extra work. A database is also capable of giving quick access to stored information to a large number of users at the same time. As an example of the coordination mechanism and number of users that a database can handle is the Amadeus database in Germany. In 2001 Amadeus coordinated 386 million bookings.

The Emergency database will provide different functionality for each of the affected groups, but general technical details can be determined. As seen in table 7.2, different terminals and networks can be used to store new information, thus the information will be of different types of media: pure voice and text or multimedia. By being able to take advantage of the different types of access networks, the service becomes more robust. The retrieval of information should not be bound to the technology used during registration. How to retrieve the information is of course restricted by the technology used, but with some extra functionality messages can be delivered on a different format than stored. With a Speech Synthesis System, information stored as text can be converted to speech, and with Automatic Speech Recognition (ASR), speech can be converted to text.

7.4 Database information entry and retrieval alternatives

Table 7.2: Registration and Retrieval technologies and Media Formats (see note)

Registration/Retrieval Technology	Access Network	Registration Media Format	Retrieval Media Format
PSTN/ISDN telephony	PSTN/ISDN	Voice (recording may be guided by announcements)	Voice and recitation of information stored as text (Speech Synthesis System)
IP-telephony	Wired/Wireless broadband Access Solutions (e.g. WiFi/ADSL)		
Mobile phone telephony	GSM/UMTS		
SMS	GSM/UMTS	Text	Text and transcribed voice messages by ASR
E-mail	Wired/Wireless broadband Access Solutions (e.g. WiFi/ADSL) and GSM/UMTS	Text	Text and written voice messages by ASR
MMS	GSM/UMTS	Multimedia	Multimedia
Web Based	All	Multimedia	Multimedia
Instant Messaging Services	All	Text	Text

NOTE: Other options also exist. The table tries to illustrate most natural ones.

For involved persons, the Emergency database can be used as an alternative way of giving their relatives messages when person to person communication is not possible and as a coordination mechanism with other involved persons. By mapping involved people to resources, the Emergency database can also be used for those who can and want to volunteer. Therefore, the registration process should include (some of) the following information: how he or she can be contacted, health status, location and which resources are in the person's possession. Personal information could be added if necessary.

The mapping of a person to a communication terminal is especially important during smaller incidents, where the direct contact problem may be more likely due to loss of a terminal than network failure. Also, several persons can be mapped to the same terminal. By having this possibility a group of people can for example share one cell phone and save battery capacity on other available cell phones, so that the contact with the outside world can be maintained for a longer period of time.

Health status and location are important information not only for the relatives, but also for other groups. The just mentioned data and the resources (i.e. is a medical doctor, has a car available, etc.) of which the person is in possession, can be utilized by both the rescue teams and other involved persons. By including this information, other involved persons can come in contact with each other and offer help to each other if necessary.

For the relatives, a voice message would be the most reassuring information type, since they can recognize the voice of close family members.

If using a telephone to register at a temporary address (telephone number) by telling one's name, automatic speech recognition (ASR) could be used to capture the name. The name could then automatically become associated with the number of the calling telephone. It should be an option to register a forward command from the individual's "normal" telephone number to the number associated with him/her now. Health status should also be registered (probably with a rather limited number of options) as this will facilitate rescue work and also simplify the efficient creation of messages to individuals concerned. It should also be possible to register resources and capabilities of the individual as mentioned in the previous clause.

If SMS is used then the short message could contain e.g. the name, the birth date and the mobile phone number of the person in question, and possibly new terminal information and health status. Possession of useful resources could be added if necessary. MMS can be used to send the same information, but also include voice and pictures. As adherence to a template is deemed impossible, the information has to be processed by a human before it is entered into database.

The web-based option is implemented as an Internet solution for those terminals connected to the Internet. The same just mentioned information should be stored by writing information into a template given on web page the Emergency database. Voice, video and images can be added. This functionality will be extensively used for the information distribution within and among rescue teams.

Personal mobile telephone numbers and names could become the main search keys for the relatives, while location and possession of useful resources will be more interesting search keys for other groups. Also attributes like profession, authorization etc. may be also be useful.

7.5 Relevance of EIS for general interest

The Emergency database can be utilized by the rescue teams and be an important part in the information sharing process. When they access the Emergency database it is most likely through some internet connected device that can handle multimedia stored information, which implies that important information probably can be stored in a format that is suitable for the purpose. A video of the emergency area, an interactive map, and procedures of how to handle certain types of injuries with a possible video clip is just some of the functionality that an online centralized storage system can provide. By having all the information centralized, coordination can be done much simpler, since multiple groups can add new information at any time. This gives more consistent information at any time for each group and among geographically spread groups.

Since involved and volunteers can store information about their abilities and resources, the rescue teams can easily and persons with abilities and resources needed - is there medical doctor in the area?

The information stored by groups which are a part of the rescue team will have access restrictions and will have to explicitly be made available for access by the general public if necessary.

In the future, the functionality of the database could be extended to include picture and fingerprint recognition, as this technology is getting more common.

As can be seen from the above descriptions, the database has the following main characteristics: delivering messages, coordinating information between and within groups and mapping persons to resources/facilities, which concurrently covers many of the needs that the affected individuals have during an emergency.

But the EIS can also be used by authorities and/or emergency control centres.

The communication services for individuals and other parties may inter-work with the authorities in the following ways:

- The authorities may retrieve updated information about "lost and found", current status of individuals and property within the site. This function may be implemented by a means to read information from the emergency database. The authorities may have authority read all the information registered (may depend on local legislation and rules).
- The emergency information service as described may also be used by the authorities as a channel of information to address specifically the individuals within the site or the individuals concerned (excluding general public).

8 Recommendations for areas of study

It can be observed that many of the features and functions of an emergency information service resemble a "presence" service as implemented e.g. in many chat services and voice over IP service. If such a service could be extended to cover a heterogeneous set of technologies and be safe/secure enough for an emergency situation it could serve the purpose described in the present document.

It should also be mentioned that such services may prove valuable as a day to day tool for families, close friends, colleagues etc. The individual would then probably be proficient in its operation, and will just have to adjust to the situation of the emergency. There is probably a business case for such services (in heterogeneous environments) also under normal circumstances.

It is recommended that standardization bodies specify emergency information service requirements, e.g. in the context of IMS and NGN. This could include:

- Non-functional specifications (resilience, etc.).
- Security rules including rules for handling privacy (e.g. made more open to authority) and data integrity (e.g. the tradeoffs between secure authentication and immediate use) in emergency situations. Such rules may differ according to local legislation.
- Specifying interfaces between coexisting "presence" services that enables such systems to exchange information with the emergency information services. (This could be reduced to means and procedures to export user data from a number of such systems into a "common well defined" system for presence service when entering a declared state of emergency.).
- Further specification on the use of User Profile Management as cited in [5] and on Multicultural and language aspects of multimedia communications [6].

History

Document history		
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