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Part 2: Mass casualty incident in public transportation

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is part 2 of a multi-part deliverable covering the reference scenario for the deployment of emergency communications, as identified below:

Part 1: "Earthquake";

Part 2: "Mass casualty incident in public transportation".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

Major emergencies or disasters may result in a need for additional resources in local telecommunications networks, especially if they are damaged or overloaded, in order to maintain or enhance the ability of emergency services to respond and coordinate their activities effectively. Satellites can play a role in replacing or supplementing terrestrial telecommunications links in these scenarios. For example satellite systems can provide:

- broadband and secure communication facilities anywhere/anytime in locations where no other facilities are available
- temporary replacement of broken/saturated infrastructures by means of backhauling
- fast deployment of temporary communication networks during emergencies/disasters

Hence a basis for requirements for such links needs to be established, and it is intended that the scenarios defined here may be used for this purpose at a later stage.

The present document also is a response to EC mandate M/496 [i.13], specifically dossier 9 "Disaster Management" part 2: "Emergency Telecommunication Services" which aims to support standardization for the optimal needs of the emergency responders.

The use of satellite communication in disasters is described in ETSI TR 102 641 [i.3].

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In the present document, clause 4 defines the scenario, what actions need to be taken by which actors (who will have communications needs) and what their tasks are. This definition constitutes a basis for clause 5, which defines the nature of information exchanges needed. Clause 6 defines the detailed parameters relating to positions and movements of scenario actors, which are intended to form a basis for modelling of the scenario response topology. These parameters are generic enough to be applicable or adapted to similar but different scenarios, and may eventually be used to model the requirements for actors' communication exchanges, and associated capacities.

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1 Scope

The present document defines a reference scenario for a mass-transportation accident (MTA) in a rural environment. The scenario includes definition of the responders involved and their gross communication needs without specifying the network technologies involved. Finally the topology modelling of the responders involved is defined, in terms of their disposition in the incident area, their time evolution and their movements (if any).

The scenario is not generic in the sense of representing all emergencies of this type, but is intended to be a "typical" example, and thus a reference in order to allow evaluation and dimensioning of required overall emergency telecommunications.

The regulations and operating procedures for emergency responses vary between countries; for example the organization responsible for the overall emergency management can be the police, the fire or rescue organization, a dedicated organization for this purpose (e.g. civil protection), or others.

The response services defined for these scenarios are limited to safety-related services (i.e. not security such as law enforcement).

Casualties and personnel not active in the rescue operations (e.g. the press) have been excluded, as their communications needs are not covered by the emergency communication systems considered here, but their needs are considered in ETSI TR 102 410 [i.2].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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2.2 Informative references

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 102 181: "Emergency Communications (EMTEL); Requirements for communication between authorities/organizations during emergencies".

[i.2] ETSI TR 102 410: "Emergency Communications (EMTEL); Basis of requirements for communications between individuals and between individuals and authorities whilst emergencies are in progress".

[i.3] ETSI TR 102 641: "Satellite Earth Stations and Systems (SES); Overview of present satellite emergency communications resources".

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[i.4] Recommendation ITU-T G.114. Series G: Transmission Systems and Media, Digital Systems and Networks. International telephone connections and circuits - General recommendations on the transmission quality for an entire international telephone connection. One-way transmission time.

[i.5] United Nations Disaster Assessment and Coordination UNDAC Field Handbook.

[i.6] European Union Handbook on Assistance Intervention in the Frame of Community Mechanism for the Cooperation of Civil Protection.

[i.7] Cabinet Office. UK Civil Protection Lexicon.

[i.8] Hamdi Monia, Franck Laurent and Lagrange Xavier: "Topology modelling and network partitioning: an application to forest firefighting". Radio science bulletin, 2013, pp. 8-20.

[i.9] Franck Laurent, Hamdi Monia and Giraldo Rodriguez Carlos: "Topology modelling of emergency communication networks: caveats and pitfalls". The International Emergency Management Society Workshop 2011, The International Management Society, 22-23 June 2011, Nîmes, France, 2011.

[i.10] Aschenbruck Nils, Gerhards-Padilla Elmar and Martini Peter: "Modelling mobility in disaster area scenarios". Performance Evaluation, 2009, vol. 66, n 12, pp. 773-790.

[i.11] Schwamborn Matthias, Aschenbruck Nils and Martini Peter: "A realistic trace-based mobility model for first responder scenarios". Proceedings of the 13th ACM international conference on Modeling, analysis, and simulation of wireless and mobile systems, Bodrum, Turkey, October 17-21, 2010.

[i.12] ETSI TR 102 643: "Human Factors (HF); Quality of Experience (QoE) requirements for real-time communication services".

[i.13] EC mandate M/496: "M/496 Mandate addressed to CEN, CENELEC and ETSI to develop standardisation regarding spaceindustry (phase 3 of the process)".

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

accident: unplanned, unexpected, unintended and undesirable happening which results in or has the potential for injury, harm, ill-health or damage [i.7]

casualty: individual in the incident area and requiring evacuation including those who are:

(i) non-injured, but affected,

(ii) injured and treated on site,

(iii) injured and needing treatment off-site (medevac), and

(iv) deceased.

Common Operating Picture (COP): single display of information collected from and shared by more than one agency or organization that contributes to a common understanding of a situation and its associated hazards and risks along with the position of resources and other overlays of information that support individual and collective decision making [i.7]

control centre: operations centre from which the management and co-ordination of the response by each emergency service to an emergency are carried out [i.7]

disaster: emergency (usually but not exclusively of natural causes) causing, or threatening to cause, widespread and serious disruption to community life through death, injury, and/or damage to property and/or the environment [i.7]

emergency: an event or situation which threatens serious damage to human welfare, environment, or security (based on [i.7])

Emergency Control Centre (ECC): facilities used by emergency organizations to handle rescue actions in answer to an emergency call ETSI TS 102 181 [i.1]

emergency service: service, recognized as such by the member state, that provides immediate and rapid assistance in situations where there is a direct risk to life or limb, individual or public health or safety, to private or public property, or the environment but not necessarily limited to these situations ETSI TS 102 181 [i.1]

emergency team (ET): the smallest group of actors (i.e. one or more) considered to be acting together.

Field Emergency Control Centre (FECC): facilities used by emergency service organizations to manage, command, coordinate, and control rescue works and logistics in the incident area

Geographical Information System (GIS): computer based system that supports the capture, management, analysis and modelling of geographically referenced data [i.7]

hazard area: area with obvious or supposed threats to physical/psychological health, properties, and/or environment

holding area: generic term for an area to which resources and personnel not immediately required at the scene or being held for further use, can be directed to standby [i.7]

incident: event or situation that requires a response from the emergency services or other responders [i.7]

incident area: area where the incident occurred, and/or the area which needs communication coverage to manage the response implemented ETSI TS 102 181 [i.1]

incident commander: the nominated officer with overall responsibility for management, command, coordination, and control of rescue and relief works in the incident area

Local Emergency Management Authority (LEMA): local organization within the public services fully or partly responsible for emergency preparedness and handling of incidents (based on ETSI TS 102 181 [i.1])

Mass Casualty Incident (MCI): incident (or series of incidents) causing casualties on a scale that is beyond the normal resources of the emergency services [i.7]

Non-Governmental Organization (NGO): organization that is neither run or controlled by a government nor a profit-oriented business

Personal Protective Equipment (PPE): protective clothing, helmets, goggles or other garment designed to protect the wearer's body from injury [i.7]

Public Safety Answering Point (PSAP): physical location where emergency calls are received under the responsibility of a public authority ETSI TS 102 181 [i.1]

Respiratory Protective Equipment (RPE): designed to protect workers from dusts, fumes, vapours or gases [i.9]

site incident officer: representative from the affected organization, when an incident occurs within the perimeter of an industrial or commercial establishment, public venue, airport or harbour, to liaise with the emergency management structures [i.7]

triage: assessment of casualties and allocation of priorities by the medical or ambulance staff (based on [i.7])

3.2 Abbreviations

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

CCP	Casualty Collection Point
CFECC	Coordinating Field Emergency Control Centre
COP	Common Operating Picture
DCP	Deceased Collection Point
EC	European Commission
ECC	Emergency Control Centre
EMTEL	EMergency TELecommunications
ET	Emergency Team
ETSI	European Telecommunications Standards Institute
FECC	Field Emergency Control Centre

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GIS	Geographical Information System
IC	Incident Commander
IPR	Intellectual Property Right
ISO	International Standardization Organization
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union Radiocommunications Sector
ITU-T	International Telecommunication Union Telecommunications Sector
LEMA	Local Emergency Management Authority
MCI	Mass Casualty Incident
Medevac	Medical Evacuation
MIC	Medical Incident Commander
MTA	Mass Transportation Accident
NGO	Non-Governmental Organization
PMR	Private Mobile Radio
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Point
SatEC	Satellite Emergency Communications Working Group
SECC	SubService Emergency Control Centre
SES	Satellite Earth Station and Systems
SQ	Scenario Quantity
STF	Specialist Task Force
TC	Technical Committee
TCC	Temporary Care Centre
TR	Technical Report
TS	Technical Specification

4 Disaster scenario

4.1 General

This clause firstly defines a mass transportation accident (MTA) scenario. Subsequently the response actions by emergency services to this scenario are defined in terms of the services involved, actors, roles, and organizational structures.

The main characteristics of an MTA in a rural environment are:

- Many casualties in the incident area.
- Accident is concentrated on a small geographical area.
- Access limitations (e.g. narrow roads or dirt tracks only).
- Limited available emergency services resources.
- Limited nearby hospital treatment capacities and/or treatment specialities.
- Sparse communication network coverage/capacities, both for private mobile radio (PMR) and commercial wireless services.

4.2 Scenario definition

The disaster scenario is a train crash due to a collision with a road vehicle at a level crossing located in a sparsely populated countryside environment. Some coaches of the passenger train overturn resulting in 170 casualties. The overhead line is not damaged.

120 casualties are not injured, 30 are slightly injured, 15 are seriously injured, 5 are dead, and 10 casualties are trapped. The accident happens in the evening of a cold winter day.

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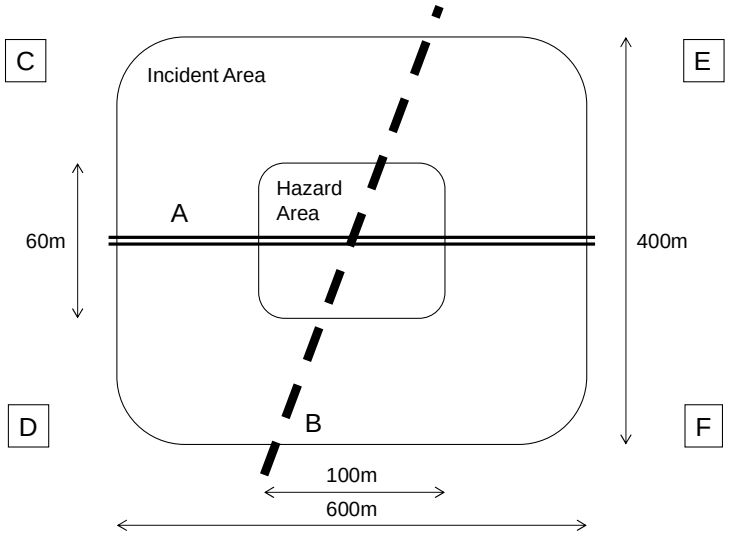

Figure 4.1: Geographical layout of the incident area

Figure 4.1 depicts the geographical layout of the MTA with zones and support areas:

The incident area has a dimension of 400 m by 600 m.

1) The hazard area includes the derailed/overturned coaches and the destroyed road vehicle and has a dimension of 100 m by 60 m.
2) "A" denotes the rail track.
3) "B" denotes the road with the level crossing.
4) "C" is the nearest ambulance station (25 km distance to hazard area).
5) "D" is the nearest fire station (15 km distance to hazard area).
6) "E" is the nearest shelter (15 km distance to hazard area).
7) "F" is the nearest hospital (25 km distance to hazard area).

The rear part of the train blocks the level crossing so that road traffic cannot pass any more. There is neither light nor heating in the coaches. Additionally, smoke emerges from one of the coaches.

Main consequence of the MTA is a mass casualty incident (MCI) requiring efficient casualty treatment and transport logistics.

4.3 Tasks and activities

This clause defines the response entities (i.e. actors) and their roles within the incident area in handling the accident. The main entities are emergency services and relevant authorities and/or NGOs supporting the emergency services. Depending on local/national organization of services and division of tasks/responsibilities, the entities involved, their responsibilities, and their individual areas of work may differ between countries.

In addition to their primary roles, actors may participate in other tasks. The roles will differ between countries, but a typical distribution of roles is given below:

1) Emergency management: setting up of management structures for all involved emergency services, coordination of emergency services, and reporting to the emergency control centre (ECC) and to the local emergency management authority (LEMA) [i.5], [i.6], leading the coordinating field emergency control centre (CFECC).
2) Fire-fighting: securing the hazard area, fighting fires.
3) Rescue: securing the hazard area, rescuing casualties.
4) Maintenance of public order: documentation, investigations.

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5) Provisions: supplies, shelters, transport.

6) Casualty logistics: triage, registration, and treatment of the injured, organizing and conducting medical evacuation out of the incident area, organizing and conducting evacuation of non-injured casualties out of the incident area.

The actions during the emergency response in the incident area of this particular scenario are further defined in the following clauses.

4.4 Accident response actions

4.4.1 General

The actions of the actors (defined in clause 4.3) in the incident area of this particular scenario are further defined below including overall duration for each action.

Figure 4.2 shows the general organizational hierarchy of the teams of actors (responders) involved.

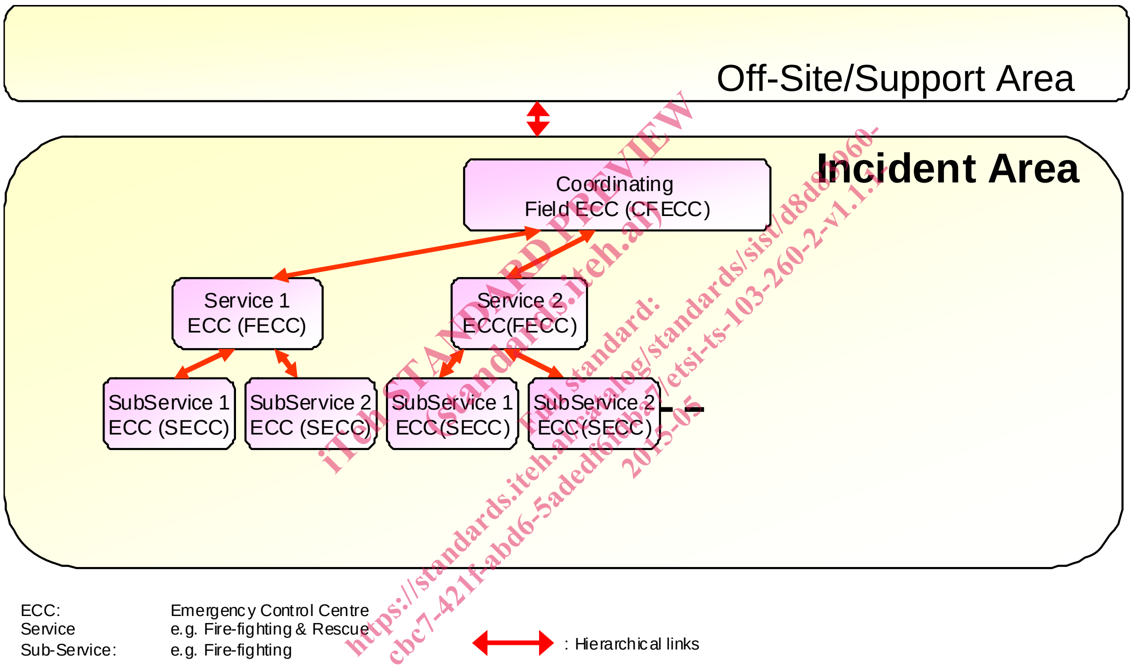

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Figure 4.2: Responder organizational hierarchy

4.4.2 Emergency management

Deployed emergency services set up their own management structure in terms of service field emergency control centres (FECCs) and SubService emergency control centres (SECCs), as shown in figure 4.2. The actions in table 4.1 are sorted according to their ideal occurrence. In fact, nearly all actions of all involved actors are conducted nearly simultaneously so that there is no distinct order.