EENA Operations Document

112 PSAPs Technology

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1 Introduction

The purpose of this document is to create a general overview of technological systems and services used within 112 systems today.

Depending on the mandate of the public safety answering point (PSAP), the main technological systems that are necessary are, for instance, call taking system, computer aided dispatch (CAD), Geographic Information System (GIS) and the radio network. Calls are received, recorded and answered through call taking facilities and events are created, dispatched and tracked through the CAD. By use of GIS it is possible to visualize caller location and also positions of mobile units. Advanced layers of GIS make it possible to, in real time, have supplementary but important information for the intervention. Additionally, radio network is used to communicate with mobile units. All those systems are supposed to be seamlessly interconnected and interworking one with another.

The level of complexity and degree of implementation of those systems depend on many factors. Some of them are: emergency services organisation (national, regional or local), procedures in place, historical development of the 112 service and budget. One of the main aspects to be taken into account is what 112 model applies[1] as it will explain for example what organisation is responsible for handling the calls and/or dispatching the units.

This document will try to refer to all technological systems that might be part of PSAPs from a high level perspective trying to outline the functionality of each system. The main goal is that readers can understand the importance of each system and why it should be included inside the PSAP.

For the correct understanding of this document it is inevitable to relate individual systems and services used within 112 systems to their role and place within the PSAP primary process and that is to provide high quality service to the customer (in this respect person/people in distress). This relation practically determines the status of an individual technology system/service as being mandatory or being optional.

It is important to bear in mind that good technology alone cannot make a good PSAP. The procedures and the way the business process is organised are the essence; technology can only help. Here are some simple "rules" that attempt to describe the relations between the technology and human practice.

- The technical solution must not affect at all the operating procedures but must adapt to them.
- The technical solution has to be able to accommodate any procedure and not impose the creation of new ones.
- Anyhow, migrating towards a 112 type of emergency response, the emergency agencies must review their existing procedures and eventually create new collaborative ones.

2 Abbreviations and Glossary

All definitions of terms and acronyms related to 112 are available in the 112 Terminology EENA Operations Document.[2]

[1] 112 Service Chain Description Operations Document
http://www.eena.org/ressource/static/files/2011_06_10_1_1_1_servchain_v1.0.pdf
[2] www.eena.org/view/en/Committees/112operations/index/generalframework.html

3 General overview

3.1 112 service chain process and technology

Systems and services inside a 112 PSAP are used to fulfil the primary process within a standardised PSAP (1st/2nd level). For this purpose, inspired by the 112 service chain process[3], a simplified PSAP process (see figure 1 below) will be used in order to demonstrate relevant systems and services for each step. Obviously, this process is narrowed down to steps/activities solely related to getting help to the caller and/or providing help to where it is required.

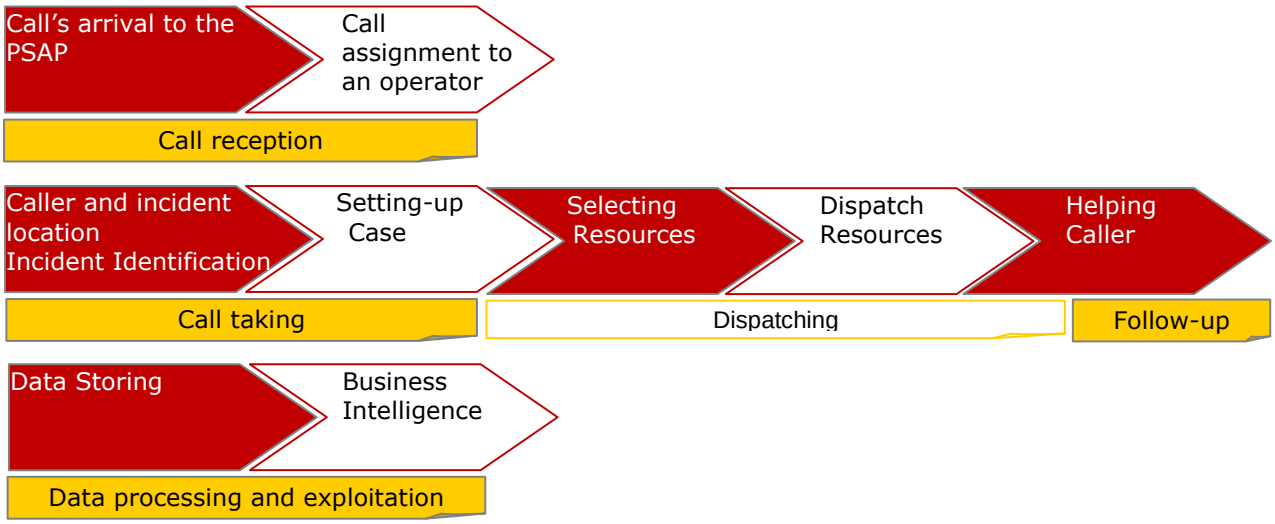

Figure 1: Simplified PSAP process

This simplified 112 process consists of the following information needs to be supported through various technologies that will automate (as much as possible) the transformation of data into information:

- **Call reception**
  - Process of accessing the 112 PSAP
  - Process of assignment of the call to an operator
- **Call taking**
  - Getting caller number and location: Process of identifying an accurate position
  - Incident Identification
    - Is it real incident or false alarm?
    - Is it already saved in the system?
    - What has happened?
    - Who has been affected?
  - Set-up of case priorities
    - Set-up of case priorities by demanding process of more detailed information
- **Dispatching (PSAP or Agency in charge)**
  - Selecting Resources
  - Localise the most suitable human and technical resources
  - Dispatch own resources
  - Involve other agencies (interoperability)
- **Help the caller and follow-up**
  - Help the caller with information, what he should do in the meantime
  - Follow-up the status of the intervention

3 For more details see the EENA Operations Document – 112 Service Chain Definition

- **Data processing and exploitation**
  - Storing the historical data
  - Use of data for future studies and decision taking

3.2 Technological equipment and 112 service chain

To describe the relevant systems and services in more detail, this matrix is to give a pictorial insight into relations among systems, services and the individual steps within the simplified PSAP process as well as systems and services that are relevant for all steps what naturally makes them essential in all respects.

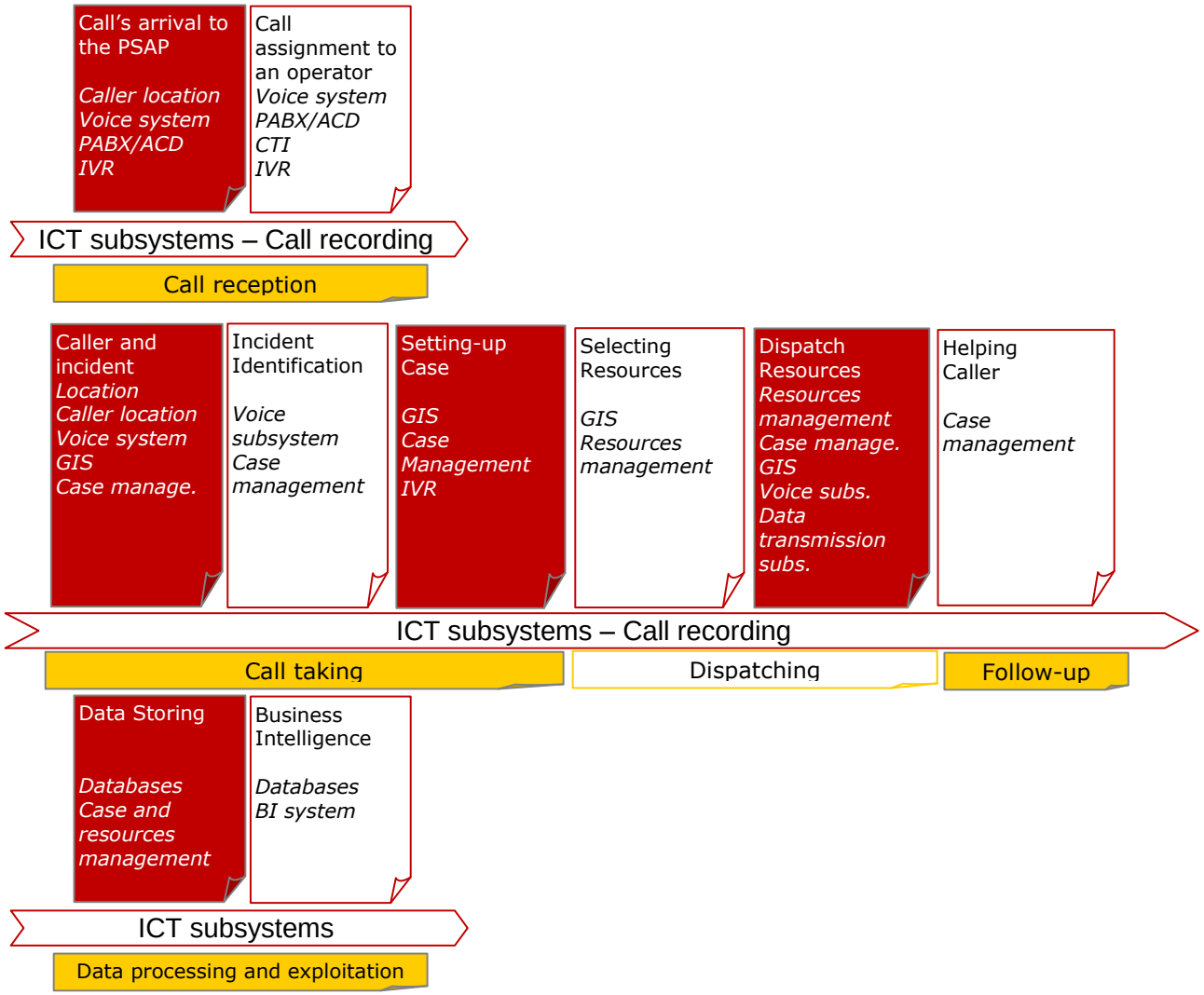

Figure 2: List of related 112 systems and services to relevant process steps

4 Requirements regarding Availability and Reliability of Technical Equipment

4.1 Availability and Performance

Systems and services within PSAPs are critical and, therefore, it is mandatory to include high availability and performance criteria.

Availability is calculated as ratio of the total time a system is capable of being used during a given interval to the length of the interval.
It is normally expressed as a percentage. For example 99,999 % (famous "five nines") availability during a year time period means that the system is not available 0,001% i.e. 5 minutes in total during the year. There is no 100% available system, especially considering complex PSAP infrastructure integrating lot of different subsystems. Reaching availability values close to 100% bring extremely high, even exponentially increasing price tag. This is the reason why, same availability criteria should not necessary apply to all subsystems inside a PSAP. Depending on damage level there is usually certain decrease of performance and/or level of functionality accepted.

Meeting high levels of availability and criticality requires critical systems to be proactively managed. High availability solutions should provide fully automated failover to a backup system so that users and applications can continue working without disruption.

A management software tool that keeps tracks of defined parameters can help measuring the availability and performance of the system. This kind of tool usually gives, for example, the following information:

- Visibility of business process performance
- Visibility of certain systems or services not available and its impact on the business process
- Better operational overview of the systems and services running within a PSAP

4.2 Business continuity and disaster recovery

Business continuity can be defined as the ability to endure all kind of non-availabilities and to provide continuous processing for all important applications. Even if a system could achieve 99,99% - 99,999% uptime values, there is still a certain probability of downtime.

Consequently, it is important for PSAPs to prepare and be ready to execute business continuity and disaster recovery plans. Disaster recovery describes the process of restoration to return back to standard operation mode.

Main tasks to of the business continuity and disaster recovery preparation and verification process are for example:

- Analyse the criticality of subsystems.
- Create written business continuity and disaster recovery plans and distribute them to all parties concerned.
- Test the plans periodically to verify them and to verify preparedness level of the operational staff.
- Update the plans after each change of the system that could affects the plans or based on plans testing outcome.

5 112 system services overview

5.1 Telephony subsystem

5.1.1 Connection to the public telephony network

The main means of accessing the PSAP is via the telephone network, regardless if the call is being made from public phone, fixed phone, mobile phone or PABX (private telephone exchange). The PSAP telephone facility in most of the cases is own PABX with some advanced functionality and computer integration. This equipment is connected to the PSTN (Public Switched Telephone Network) by using different methods (analogue lines, digital lines with various signaling types including ISDN PRA, SIP Trunking etc). The common denominator for all these connections is that the capacity must be calculated and realised in a way to minimise queuing or losses of incoming calls. PSAP designers should also consider business continuity plans in case of various possible failures of the connections to public operators and must provide the resilient and redundant (including Geo-redundancy) network.

5.1.2 Functionality of the PSAP PABX - CTI

Besides the basic call and other regular PABX functionality, the PSAP telephone equipment must provide some additional functionality or, at least, perform specific operations in more advanced way compared to the ordinary PABX. Furthermore, in order to provide all requested functionality, a form of CTI (Computer Telephony Integration) is mandatory. Computer telephony integration is a common name for any technology that allows interactions on a telephone and a computer to be integrated or coordinated. The term is predominantly used to describe desktop-based interaction for helping agents be more efficient, though it can also refer to server-based functionality such as automatic call routing which, although a standard PABX feature, is realised in much more advanced way through CTI. CTI applications will also help agents to quickly identify caller and its location (through database enquiry or integration with GIS (Geographic Information System). Common protocols that are used for CTI among others are CSTA (Computer-supported telecommunications applications), TAPI (Telephony Application Programming Interface), TSAPI (Telephony Server Application Programming Interface) and JTAPI (Java Telephony API).

Among the most important requested features of a PSAP telephone system are: Automatic Call Distribution including Skills-based Routing and Interactive Voice Response.

5.1.3 ACD

Automatic call distributor (ACD) or automated call distribution system, is a device or system that distributes incoming calls to a specific group of terminals that agents use. The ACD queue allows incoming calls to be placed in a queue and distributed to agents based on the configured routing policy. Originally, the ACD function was internal to the Private Branch Exchange. However, the closed nature of these systems limited their flexibility. A system was then designed to enable common computing devices, such as server PCs, to make routing decisions. For this, generally the PBX would issue information about incoming calls to this external system and receive a direction of the call in response. Furthermore, the ACD systems should also handle the overflow of calls, no answering by agents, and other distribution cases.

There are multiple choices for distributing incoming calls from a queue, for example:

- Linear/Terminal Call Distribution – Calls are distributed in order, starting at the beginning each time.
- Circular/Rotary Call Distribution – Calls are distributed in order, starting with the next in order.
- Uniform Call Distribution – Calls are distributed uniformly, starting with the agent who has handled the least calls.
- Simultaneous Call Distribution – Calls are presented to all available extensions simultaneously.
- Weighted Call Distribution – Calls are distributed according to a configurable weighting.

Skills-based routing (SBR), is a call-assignment strategy used in call centres to assign incoming calls to the most suitable agent, (e.g. who speaks the caller's language) instead of simply choosing the next available

agent. The skills needed for a particular call are often assessed by the calling number or caller's identity, as well as choices made in any associated IVR system or even automatically (speech recognition e.g.). The opinions about a real efficiency of an SBR system are so far very much divided.

Supported by the data exchange capabilities between all systems in the PSAP CTI can be used more and more to widely adapt the call distribution functionality and the built-in routing patterns in the ACD to specific needs. Based on specific events in the PSAP or current status of open incidents, any new incoming contact may be dynamically judged regarding its priority and relevance to support current situations. Consequently, any incoming call can promoted to a higher priority to bypass current queues, or re-routed to an IVR system or even another PSAP in case of a crisis situation exists and local resources shall be off-loaded and kept available. These specific routing decisions can be influenced by the incoming call's number, the call's associated caller location, or specific report data coming from system internal or external databases (e.g. ACD reports, CAD case data, GIS information).

5.1.4 Interactive voice response (IVR)

Interactive voice response (IVR) is a phone system technology that answers a call and allows the caller to interact with the machine choosing options from a menu. Additionally, outbound IVRs are used to broadcast messages. That means that IVR technology can also be used in cases of "reverse 112" when groups of citizens must be quickly informed about the problem in their geographic area (e.g. hazardous conditions).

IVR systems can respond with pre-recorded or dynamically generated audio to further direct users on how to proceed. IVR systems deployed in the network are sized to handle large call volumes. IVR can be a very powerful tool to fight hoax coals by introducing short but firm announcements for relevant 112 calls and also to inform the callers about cases currently being processed by the respective PSAP to lower the load of calls during crisis. But, generally speaking, in emergency call receiving system, extensive usage of IVR, especially travelling through several levels of menus, should be avoided.

Some of the most important characteristics of an IVR system that should be taken into account are:

- Features adapted to the needs of the PSAP
- Simple to use interface
- Multiple telephone line support
- Can be integrated with the PSAP's database
- Capability (inbound/outbound)
- Redundancy
- Reliability
- Text to Speech

5.2 Radio voice communication

5.2.1 Introduction

Radio communication is the solution for flexible and efficient communication with (and among) the units in the field thus being the essential means within 112 systems to contact the first responders. Radio enables instant communication between two or more people simply by pressing a button. This push to talk feature and the ability of people to communicate in groups is fundamental for authority communication. Radio-communication systems for professionals are often referred to as PMR systems (Professional Mobile Radio).

Key features of professional mobile radio systems can include:

- Point to multi-point communications (as opposed to cell phones which are point to point communications)
- Push-to-talk, release to listen — a single button press opens communication on a radio frequency channel
- Large coverage areas
- Closed user groups
- Certain (technology dependent) level of security of communication
- Use of VHF or UHF frequency bands

Most PMR systems are intended almost exclusively for voice communication; some of them have limited data transfer capabilities (up to the wide-band speeds). The solutions for broad-band wireless data transfer for use by public safety organisations are currently under examination.

5.2.2 Radio Communications Systems and Technologies

From technology point of view (and also historically) the following PMR systems (and corresponding standards) can be identified and found in emergency response agencies:

- **Simple analogue radio networks**
  These networks consist of a number of repeaters and mobile or portable radios. They don't provide much more than simple group calls, although some rudimentary data transmission can be supported. They are still widely used throughout Europe. Major difficulty for 112 centers is the reality that each public safety agency was, by default, building such networks independently, working on their own frequencies and, sometimes even using different proprietary standards, which made impossible direct communications between them. Thus 112 centres must generally provide corresponding equipment in order to communicate with each of the agencies.

- **Trunked analogue radio systems (MPT1327)** are systems that better and more efficiently utilize frequency spectrum and can be built as a national networks. They are still used in Europe but, due to the encryption capabilities and other features of newer digital networks, they are not widely used anymore by public safety agencies.

- **Digital trunked radio systems (TETRA, APCO-25, TETRAPOL)**. These systems provide the best functionality for public safety users and are therefore present (especially TETRA) in most European public safety agencies. Besides the basic voice capabilities, they provide individual, full duplex telephony calls, connectivity with other telecommunication equipment, short messages service, slow packet data transmission, encryption of air interface, end to end encryption and are very efficient regarding spectrum utilization. The systems can be built as nationwide systems, subdivided in closed user groups and as such can be used by different emergency responding agencies providing them with the possibility to talk to each other if and when it is needed. The functionalities of TETRA and other digital trunked systems (besides voice communication) that are very useful for fleet management in dispatching centers are Status Messages and Transfer of GPS coordinates of the radio via Short Data Service. With those functionalities and by using graphical work stations with appropriate maps and software, PSAP dispatchers can in every moment have the position of every tracked vehicle or person as well as its status (free, going to intervention, busy etc.). Furthermore, radio controls may also be integrated in the CAD system through the CTI.

- **Digital mobile radio (DMR)**. The ETSI DMR standard is targeted at those users who need spectral efficiency, advanced voice features and some IP data services in licensed bands for high-power communications. ETSI DMR specifies two voice slots in 12.5 kHz channels. It is an efficient way of relatively low cost upgrading of existing analogue networks. It is not feature rich as TETRA especially when building big systems and so far is not very widely present in emergency services.

5.2.3 PSAP Radio Communications Equipment

PSAPs need the equipment which can manage radio communications with emergency services in efficient way and which can provide a convenient way to use other features offered by radio-communication system. So this equipment varies from simple, multichannel radio consoles to sophisticated integrated solutions.
The main tasks of a dispatcher are:

- keep track of operations, the active members in the operations and preferably, the location of the units participating in the operations
- guide the field operations in order to optimise the performance of the field force
- follow and participate in intra- and inter-group communications and individual calls
- allocate the most suitable units or groups for each task
- exchange status and textual information with the radio users participating in the operations
- create groups dynamically for special incidents
- if entitled, coordinates the activities during multi-agency operations.

Modern technology provides nowadays IP based Multifunctional Communication Consoles which integrate telephony, digital radio, analogue radio, paging and other communications. They provide possibility to combine different conversations in 2-way or conference calls thus enabling all participants in the incident to

talk to each other. They also typically provide the technique to operate video surveillance systems. Such consoles are part of (or can be connected to) graphical work stations where GIS data are represented and their functionality can be extended to calling or sending messages by pointing and clicking on the map. When radio system supports wide band data (like TETRA TEDS), these consoles are also capable of dispatching (broadcasting) different graphical information to radio users (pictures of missing or wanted persons, stolen vehicles, maps and similar).

When broad-band data over radio networks become available and widely used in Europe (almost certainly based on LTE technology), the corresponding equipment will be used in PSAPs enabling dispatcher to send and receive all kinds of high speed data, like live video streams, that can help to provide more efficient and effective emergency response.

5.3 Voice recording

Due to legal requirements (that may differ from country to country), PSAPs can be obliged to record the calls they receive and store these records during a certain period of time. A recording and storage system is therefore needed in all PSAPs and should be integrated, at least, with the voice system (telephony and radio). Some of the most important characteristics of a voice recording system that should be taken into account are:

- Types of media that can be recorded (for example analogue, digital, VoIP)
- Number of input channels
- Ease of use (for example easy search of records)
- Storage capability
- Redundancy
- Reliability

The integration of the recording system can be done in different degrees:

- Basic integration with the PBX and the radio system. This allows the recorder to store in its internal database the call data for each record (caller, called, original number called, etc).

- Integration with the Emergency Management Software. This integration has also several degrees, depending on the case. It is usual that the Emergency Management Software can add information to the recorder database, adding for example the Incident ID on each record. Some Emergency Management Software also allows the user, by searching an incident to listen all the recordings related to that incident, instead of using the recorder player.

In addition to the central recording functionality, a short term recording capability should also exist. By means of this, the operator can replay the recent conversation (last 5-10 minutes) in order to better understand the caller's demands. It can often be the feature of the operator's console itself.

5.4 Case management

It is a software tool or group of tools dedicated to the management of emergency case/cases with functionalities that enable the operator/operators to handle the case in real time and follow the standard operating procedures. Examples of functionalities included in these systems are:

- Integrated Call Handling
- Identification of caller details and position[4]
- Gathering information from caller about the incident
- Classify the type of incident
- Help to identify duplicate calls for same incident
- Help the operator to provide advice to caller using pre-defined information structures related to type of the incident
- Allows seamless cooperation with other operators on same incident using real-time incident data sharing among all involved operators and voice conferencing as well

[4] Caller location in support of emergency services EENA Operations Document: www.eena.org/ressource/static/files/2011_05_27_2.2.2.cl_v1.3.pdf

5.5 Resource management

It is a software tool or group of tools dedicated to management of emergency resources necessary for solving case/cases following the standard operating procedures. Resource management provides overview of all resources, including type, competence, availability, location and even evidence of staff members and intervention status. Together with extended GIS support, Resource management subsystem can significantly improve dispatching performance – decrease dispatching time and increase quality of dispatch process. The main functionalities included in this system are:

- Dispatch support: software tool providing real-time support for the operator to find, allocate and track proper resources for the incident
- Mobile unit applications: instant information about where are the resources located in relation to the location of the respective case/cases
- Incident data interchange with the resources – allows transmission of incident related data to the mobile terminal and back-wards update of incident status from the field, thus shortening time needed to inform resources about incident.
- Real-time video transmission from the resource allows PSAP to visually verify resource reaching incident place and status on the incident place as well.
- Remote alarm warning solution for the bases/stations and mobilising for rescue staff

5.6 GIS

A geographic information system is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographically referenced data. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology.

A GIS can be thought of as a system—it digitally creates and "manipulates" spatial areas that may be jurisdictional, purpose or application-oriented for which a specific GIS is developed. Hence, a GIS developed for an application, jurisdiction, enterprise or purpose may not be necessarily inter-operable or compatible with a GIS that has been developed for some other application, jurisdiction, enterprise, or purpose. Therefore, in a general sense, the term describes any information system that integrates, stores, edits, analyzes, shares and displays geographic information for informing decision-making.

In emergency scenarios GIS is an essential tool for visualizing the information necessary for correct and swift emergency response such as caller location, location of resources, targeted area, neighboring relations, etc.

5.6.1 GIS engine

GIS subsystems use widely available GIS engines that provide basic GIS features and data storage for the GIS application.

5.6.2 GIS map data

GIS map data are data used by GIS engine to provide overview for the operator. It can be different map layers like Orthophoto maps, vector maps, roads, but also list of different objects and locations like address data of the houses, street names, location names. Map data can be stored locally or accessed through web services (also used for updates of local data).

5.6.3 GIS functions

GIS functions are specific feature that using GIS engine and GIS map data provides operator with extended support for their process. Example of such a functions are – visualization of the mobile/fix caller location, finding best resource for the incident based on the time of the arrival and the availability, location of point of interests (e.g. hospitals, hydrants, helipads) or even highly sophisticated calculation of the time arrival based coverage of the area by available resources and proposal to move resources to another place to improve overall coverage.

5.7 Non-voice communications system

5.7.1 SMS

Short Message Service (SMS) is data component of mobile communication systems which uses standardised communications protocols that allow the exchange of short text messages between mobile phone devices.[5]

SMS is the most widely used data application in the world. In 2010, 6.1 trillion SMS text messages were sent. This translates into 193000 SMS per second. SMS sending is quick, efficient (does not require lot of resources) and simple. It can be the only choice of communications in some cases (silent communication is needed for safety reasons or for hearing and/or talking impaired persons)
On the other hand SMS message delivery is not guaranteed, and many implementations provide no mechanism through which a sender can determine whether an SMS message has been delivered in a timely manner. SMS messages have lower-priority than voice, and various studies have shown that around 1% to 5% of messages are lost entirely, even during normal operation conditions, and others may not be delivered until long after their relevance has passed.
Concerning the use of SMS for emergency there are some additional difficulties: location of the sender is not so easy to determine, SMS messages cannot be prioritized, it is difficult to provide SMS messaging to a certain number free of charge, SMS may not work if the phone is out of credit. Roaming (national and international) works in different way compared to emergency voice 112 calls.

Therefore, the use of SMS as an emergency service notification in particular in many countries is limited to the preregistered population of mostly hearing impaired people. Preregistration has been introduced also because of the possibility of malicious sending of SMS messages and possible spamming of PSAPs.

The technical equipment needed in PSAPs and its level of complexity varies depending on the type of PSAP and strategy of emergency SMS messages handling. Some of the possibilities may be:

- Single SMS PSAP contact point receives all messages through data links with mobile operators and distributes them to the regional PSAPs, based on the location of the sender.
- Single SMS PSAP contact point receives all messages through data links with mobile operators, messages are read, events are created and distributed to regional or local level for dispatching of units.
- Mobile operators route the messages to the nearest PSAP via direct link or over the air.

Generally speaking: direct communication link to the SMS server of mobile operators is needed and client/server solution should be installed capable of doing the following tasks:

- Accepting messages from the numbers of registered subscribers and rejecting the others
- Sending back a confirmation receipt
- Determining the sender location
- Providing the possibility for the operator to interactively request additional information ("chatting")
- Perform the routing of the message to another PSAP (if needed)
- Seamless interconnection to CAD and other communication systems.
- Maintaining the database with information on all the events and actions taken.

5.7.2 eCall[6]

PSAPs have to adapt their equipment to be able to receive eCalls. They need to communicate with the in-vehicle equipment (IVS) using an in-band modem and they have also to ensure that their software makes the MSD information available for PSAP operators. The PSAP in-band modem has relatively low complexity. It can be implemented as software running on standard computing equipment. Before updating the technological equipment of the PSAP, the amount of eCalls that will be handled has to be estimated.

[5] SMS access to 112 EENA Operations Document:
http://www.eena.org/ressource/static/files/2012_06_18_2-1-1_sms_v1.0.pdf
[6] eCall EENA Operations Document http://www.eena.org/ressource/static/files/2012_04_04_3_1_5_ecall_v1.6.pdf

Currently, the technical equipment of 112 PSAPs may be very different. Some European 112 PSAPs are equipped with very advanced technology and others only have very basic communication tools. It is highly recommended that PSAPs are equipped to be able to handle the location of the 112 calls automatically.

PSAPs receiving eCalls will have to be equipped with a server with an in-band modem and have it connected to the public switched telephone network via a digital interface.
Additionally, a PSAP receiving eCalls is required to be equipped with a software application that could either be a special eCall application or integrated within the PSAP's interface software. It should provide at least these functionalities:

- warn the operator about a new eCall
- display the minimum set of data
- decode VIN number
- warn the operator about the availability of the voice call
- provide a call-back capability
- request a new MSD
- hung up an eCall
- provide a geographical information system: display the location of the vehicle, direction and the last positions (if available)

5.7.3 Other sensors

Depending on the mandate of the PSAP, it should be able to receive other available emergency related information using different kind of sensors like fire-sensors, burglar alarm sensors, panic button or automated external defibrillators. Process of handling information from such kind of sensors is different compare to standard call-taking process related to voice call, but dispatch response to threats reported by such kind of sensors is quite similar.

5.8 Public Warning System[7]

Public Warning Systems are needed to protect the lives of people in case of major emergency by warning the public of impending disasters. Tornados, tsunamis, hurricanes, floods, natural volcanic, releases of deadly gas are dangerous situations where Public Warning Systems can save lives.

EENA published a specific EENA Operation document about Public Warning systems.

5.9 LAN/WAN IP infrastructure

Redundant LAN switches, redundant firewall, redundant routers, redundant IP WAN network are subsystem allowing any-to-any IP based communication.

5.10 Backup and archive infrastructure

Backup process ensures that there are always available copies of all important data created and used by the PSAP. In case of major failure it is possible to restore the data and return back to full operations mode. The backup strategy is part of disaster recovery and business continuity process.[8]
The archiving process defines the tasks and strategies to store information created on the PSAP for a certain period, usually to meet legal requirements.
The most typical media used for backup/archiving are combination of hard disks, optical storage and magnetic tapes.

[7] Public Warning EENA Operations Document: http://www.eena.org/ressource/static/files/2012_06_25_3_2_3_pw_v1.0.pdf
[8] Contingency Plans EENA Operations Document:
http://www.eena.org/ressource/static/files/2013_12_02_3.2.1._contingencyp_v1.0.pdf

5.11 IT management tools

IT management tools monitors all related ICT infrastructure to provide relevant support for IT operation processes. Typical examples these tools are HP OpenView, IBM Tivoli, CA Spectrum, Nagios, and others. IT processes are usually based on ITIL models.

Additionally, IT management tools provide information about the current status of the system and performance indicators. They warn IT operation staff in case of discrepancy from the pre-defined standard values.

5.12 Business Intelligence

Business intelligence (BI) mainly refers to computer-based techniques used in identifying, extracting, and analysing business data, such as number of calls, type of incidents and others.

BI technologies provide historical, current and predictive views of business operations. Common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, process mining, complex event processing, business performance management, benchmarking, text mining and predictive analytics.

5.13 Next Generation 112

Voice over Internet Protocol (VoIP) based devices and applications have become commonplace. Citizens use them to conveniently communicate, send and receive information. At the same time the existing legacy emergency services infrastructure (circuit-switched) is unable to embed the enhanced services and technology. In a few years, all mobile phones will be smart phones with an abundant choice of applications.

NG112 is defined by two major aspects:

1.- Interoperability between emergency services: NG112 enables the several Public Safety Answering Points to be part of a common emergency service IP-network, providing them with redundancy and interoperability features. This network should support data and communications needs for coordinated incident management between PSAPs and provide a reliable and secure environment for emergency communications.

2.- Communication between citizens and emergency services: NG112 is designed to enable citizens to reach an authority (e.g., PSAP) by calls using VoIP, text messaging, instant messaging, real-time text, pictures and videos. It could also provide emergency services with more data such as telematics and health data. NG112 enables the delivery of calls, messages and data to the appropriate Public Safety Answering Point (PSAP) and other appropriate emergency entities and makes call handling easier.

The EENA prepared the Next Generation 112 Long Term Definition standard ("NG112 LTD").
http://www.eena.org/ressource/static/files/2013-03-15-eena_ltd_v1-1_final.pdf

6 Recommendations

This section describes the critical and the recommended systems and services used within a 112 system. Each PSAP may provide the essential services to the customer through different systems or technologies, depending on the mandate the PSAP has. The main goal of the technology is to help PSAPs to ensure a high quality service.

System	Critical	Highly recommended
Connection to the public telephony network	x	
Functionality of the PSAP PABX - CTI		x
ACD		x
Interactive voice response		x
Radio voice communication	x	
Voice recording	x	
Case management	x	
Resource management	x	
GIS	x	
SMS		x
eCall	x	
Other sensors		x
Public Warning System	x	
LAN/WAN IP infrastructure	x	
Backup and archive infrastructure	x	
IT management tools		x
Business Intelligence		x

7 EENA Requirements

Requirements		
Emergency services / PSAP Management	Include all critical and highly recommended systems depending on the mandate the PSAP has	Compulsory