Chapter 2. Context: e-Triage

2.1 Scenario: e-Triage

To understand the idea behind e-Triage it is vital to be aware of the concept of triage. Directly from Wikipedia [3]: "*Triage is a process of determining the priority of patients' treatments based on the severity of their condition. This rations patient treatment efficiently when resources are insufficient for all to be treated immediately. The term comes from the French verb trier, meaning to separate, sort, sift or select. [...] Triage may result in determining the order and priority of emergency treatment, the order and priority of emergency transport, or the transport destination for the patient. Triage may also be used for patients arriving at the emergency department, or to telephone medical advice systems,among others.*"

In other words, e-Triage (or electronic Triage) consists of a system to electronically determine and organise the priority of patients' needs based on the urge of their conditions. Thus, the main objective of e-Triage is the design, implementation and test of this electronic system for the correct registration of victims and affected citizens after a Mass Casualty Incident (MCI). The system is intended to be easily scalable in order to be used in case of disaster events, either natural or human-made, as well as in daily emergency situations.

Nowadays, organisation is achieved by means of index cards that are fixed to the affected citizens, typically by means of clips attached top their clothes. This complicates organisation and severely hinders prioritisation issues. For example, in a MCI with hundreds of victims, it is of vital importance to correctly see affected citizens according to the established patterns (e.g. degree of emergency, age, geographical position...). With the current way to do things, organisation requires a great amount of people (more as the amount

of affected citizens increases), it is highly time-consuming and, still, not totally reliable as new patients enter the system. e-Triage attempts to improve all these matters.

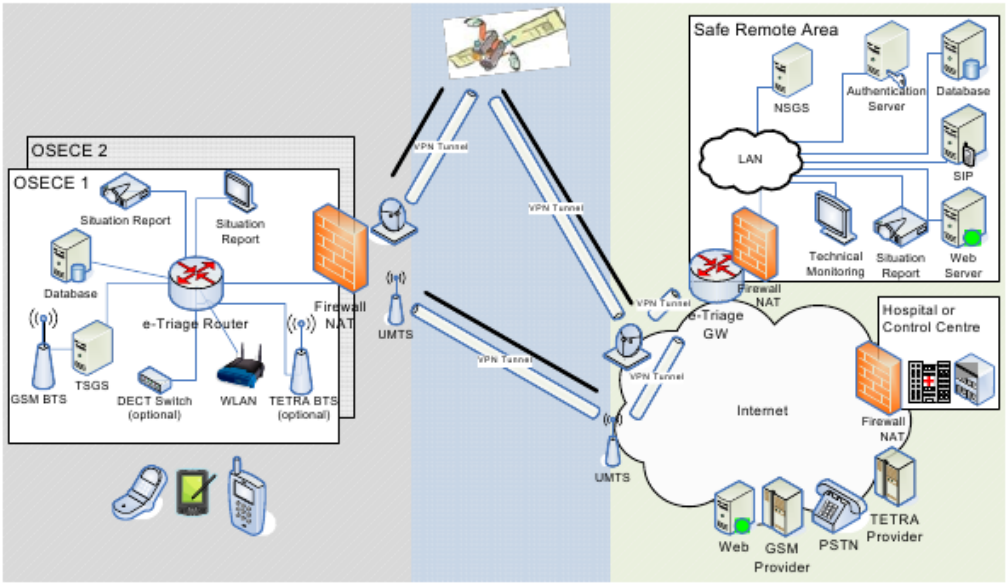

Figure 2.1. General architecture overview in e-Triage.

The technical approach of e-Triage consists of three main elements: autonomous communication infrastructure, electronic data recording, and a distributed database system. On top of that, the e-Triage system has some important extra requirements: rapid deployment to have the system operative as soon as possible; terrestrial radio cells that can be installed locally, so that the system is indeed distributed; matching end devices with dedicated application software for the registration of victims; and a distributed, self-synchronizing database system guaranteeing maximal availability without a single point of failure.

In order to facilitate the design of the entire system, the design procedure is broken down into three different parts: the on-site segment, which is the location where the MCI took place; the safe remote area, where rescue forces, hospitals and control center are located; and the transport domain, which comprises communication between the two previous parts. Figure 2.1 shows this separation with different colours (grey for the on site segment; blue for the transport domain; and green for the safe remote area).

Figure 2.2 shows the functional architecture, where a more detailed hierarchy of each part of the system has been outlined.

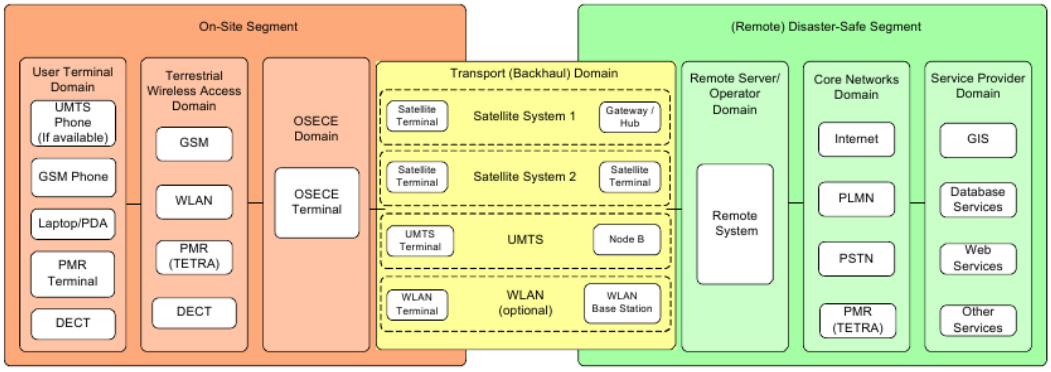

Figure 2.2. e-Triage functional architecture.

2.2 The on site segment

In a general scenario, two different elements can be found in the on-site segment: Mobile Actors (MA) and On-Site Emergency Communications Equipment (OSECE). A mobile actor is in general a member of the rescue forces who performs the tasks of looking for victims on the field, either to carry out the triage operation or to transport the victims to hospitals or relief camps, once they have already been registered and classified in the previous stage. Mobile actors must be attached to a particular OSECE in order to transmit their data regarding the victims' registration. In addition to this, voice and other types of data may be also sent to the OSECE by a mobile actor. In order to establish this voice or/and data connection, mobile actors can use heterogeneous user terminals, such as laptops or PDAs equipped with WLAN and GSM/GPRS interfaces, GSM/GPRS terminals or TETRA handhelds. OSECEs provide the radio interfaces (WLAN, GSM/GPRS and TETRA) in order to interconnect the different mobile actors (see Fig. 2.3). In case of having connection to the Disaster- Safe Segment, OSECEs will be in charge of providing the proper interface in order to backhaul the traffic using the corresponding transport technology. In a general case after an MCI, existing terrestrial infrastructure may be inoperative, if ever

existed. In a general approach, satellite backhauling and UMTS will be used in order to send voice and data to the Disaster-Safe Segment, depending on the availability of the latter.

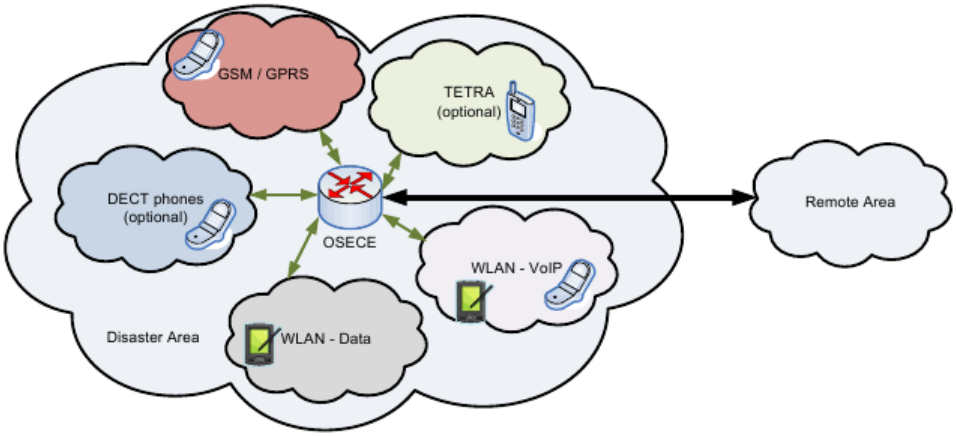

Figure 2.3. Technologies offered in the on-site segment.

The OSECE can be integrated in a communications suitcase or mounted on a command centre truck (some sort of van):

- ECS, Emergency Communications Suitcase: it offers GSM/GPRS and WLAN and it is connected to the remote area through either Inmarsat-BGAN or UMTS networks.
- CPCE, Coordination Point Communications Equipment: it offers GSM/GPRS, WLAN, DECT (optional), and TETRA (optional) and it is connected to the remote area through either VSAT or UMTS networks.

Therefore, in this document we will deal con CPCEs only since it is the only option where TETRA us present. See [5] and [6] (in German) for further information.

2.3 The remote area architecture

Fig. 2.4 shows a view onto the remote area, where its global architecture is depicted. One or more static OSECEs, Control Centres or Hospitals do have connection to the e-Triage Gateway, which is a router that control incoming and outgoing data to/from the

remote area. In any case, the architecture of this side of the system goes beyond the scope the present project.

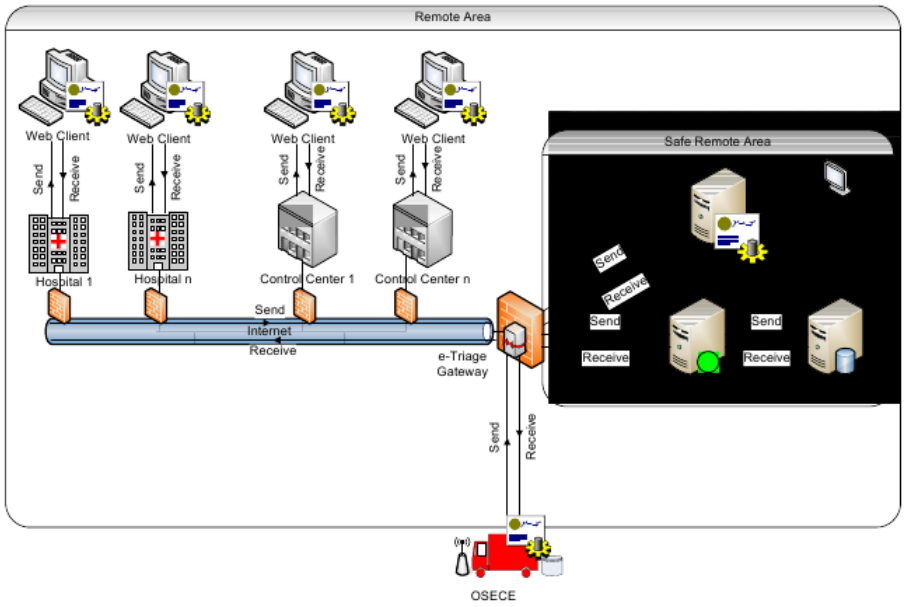

Figure 2.4. Architecture of the safe remote area.

2.4 TETRA's role in e-Triage: TETRA over satellite

TETRA's main role is to provide secure and reliable communications to first rescue teams (e.g. the fire brigade), police and medical services. The idea is not only to have TETRA assigned to these groups of users, but also to have the network fully operational in case any other technology fails (GSM/GPRS, WLAN...), ; if so, these users are to be prioritised over any others because of their respective tasks. And that's where TETRA comes into play.

In this sense, end to end communication between parties -that is, between the disaster and safe area- must be assured, and in order not to be dependent on earth infrastructure it is necessary to provide some sort of reliable communications means. This is a satellite link. In other words, TETRA over satellite means that communication between the on-site segment and the safe area can be achieved even if earth links are down. As a matter of fact,

testing this is one of the objectives of the present project, along with TETRA integration in the e-Triage project.