

# Decision Support System Design for Cooperation in Emergency Situations at the Hellenic Center of Emergency Response (EKAB)

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**Abstract.** The paper is concerned with the design of a DSS (Decision Support System) for the Hellenic Center of Emergency Response (EKAB) based on information systems. The system will gather information from different sources, combining and displaying them in different terminals and user interfaces in the coordination centre at EKAB, the departments of urgent incidents at hospitals and ambulances and on handheld devices. The proposed DSS aims to decrease time of correspondence of ambulances, improve the conditions of work in EKAB, address the pointless use of some official resources, and in general to enhance the quality of service that EKAB offers to all citizens. A first final prototype application has been delivered to the operators of EKAB for trial and has created quite positive responses.

**Keywords:** EKAB, decision support system, emergency response, ambulance fleet management, communication/cooperation/collaboration in emergency situations.

## 1 Introduction

In Greece, the population in urban centers has been increased unproportionally the recent years due to urbanism, immigration from the north and the east and the improvement of life conditions. As a consequence the cases of emergency concerning the health field that the organization of the Hellenic Center of Emergency Respond (EKAB) has to face daily are increased. Taking into account the recent and current global economic crisis that obstruct the Hellenic government for employing more staff, a better management of the available means that EKAB possesses will significantly help to provide value added services to citizens and improve work conditions to workers.

Many systems have been developed for distance medical treatment until help arrives to the patients' location. Those systems measure patients' medical data, integrate and communicate them to the emergency center where doctors study them and provide medical instructions to the rescue crew. [2][4][5]

In order to formulate a rich picture of the emergency response system a multi-methodological approach was followed that was based on the methodologies of classic systems design [6] and contextual design [7]. The analysis of the current situation in EKAB has identified, among others, the following important issues: few telephone places for thousands of calls; handwritten recording of incidents in medical cards; delay in the choice of medical card emergency color code due to the study of symptoms; errors in patient data; long distances inside the operational centre for transporting the patients medical card in the radio center; the radio center has no knowledge about the precise location of ambulance; the navigation takes place in the coordinative center with the use of printed maps; a lot of precious time is lost for medical cards classification; the incidents history documents that have occurred are insufficient; the institutions of the radio center do not have a clue about road traffic and the conditions of the hospitals; the communication between centre and the ambulance crew outside the vehicle is non-existent; the information that is transmitted between ambulance and departments of urgent incidents is sparse; the transport of data is non-secure; the communication through radio is many times non-existent;

The most important parameter in the case of emergency is the reaction time of the system. The time of reaction is defined as the time interval between the call for help to the moment where the ambulance reaches the patient. The proposed design of the DSS aims to minimize this interval and as a consequence to allow the available field crew to deal with more emergency situations. The system is a mashup application based on Geographic Information System (GIS) [1] and it is designed in order to be installed in three different levels: the operational centre at EKAB, the departments of urgent incidents at the hospitals and the ambulances.

## **2 Functional Architecture of the proposed DSS**

The proposed DSS integrates information from different sources and displays it with different views and user interfaces at different people/roles involved in emergency response. All information is gathered and combined in a server at the coordination center of EKAB and then it is distributed in other terminals, to the ambulances and to the departments of urgent incidents at the hospitals.

The proposed system gathers information from the departments of urgent incidents of the hospitals which report on their requirements/constraints, such as: the number of patients waiting, beds availability, the operation of clinics, and so on. In addition it notifies the ambulance driver in real time with data from the management department of road network of Hellenic police for the road conditions, such as: road traffic, changes of directions in the road network, constructions, and so on. Furthermore, the system integrates with data from the Hellenic organization of telecommunications and the mobile telephony companies for that can identify the location of the caller in real time. Finally, the ambulances also transport information to the coordinating centre such as: the position of the medical vehicle, the crew and its condition and finally with the help of the patient, information such as medical measurements. At the operation of the proposed DSS, doctors located at the operating center of EKAB will be able to watch the rescue process and provide advice to the rescue crew of the

ambulance. Furthermore, they will also be able to monitor the rescue cabin of the ambulance and transmit audio and video data to the operation center.

The proposed system will make use of technologies such as TETRA (TERrestrial Trunked RAdio), GPS (Global Positioning System), GSM (Global System for Mobile communications), Bluetooth, patrol cameras, surveillance cameras, navigation software, caller identification software, devices for home medical measurements, PDA's, and tablet pc's.

Currently, the problem space of the emergency response system has been formulated and communicated with stakeholders involved. The functional architecture of the proposed DSS has been identified as well as first prototypes of the different user interfaces. Furthermore, these prototypes have been presented to stakeholders who have accepted the proposed system and subsystems rather enthusiastically.

### **3 Conclusions**

The paper presented the design of a DSS for EKAB – the Hellenic Center of Emergency Response, focusing on the systems functional architecture. The benefits from the proposed system are expected to severely reduce reaction time in emergency situations and operational cost as well as to add value to service offerings to citizens and improve work conditions for stakeholders involved in emergency response.

Further work for the development of the system includes the data & information infrastructure specification as well as further development and testing of user interfaces and system operation as well as the gradual installation and use of the system in real conditions.

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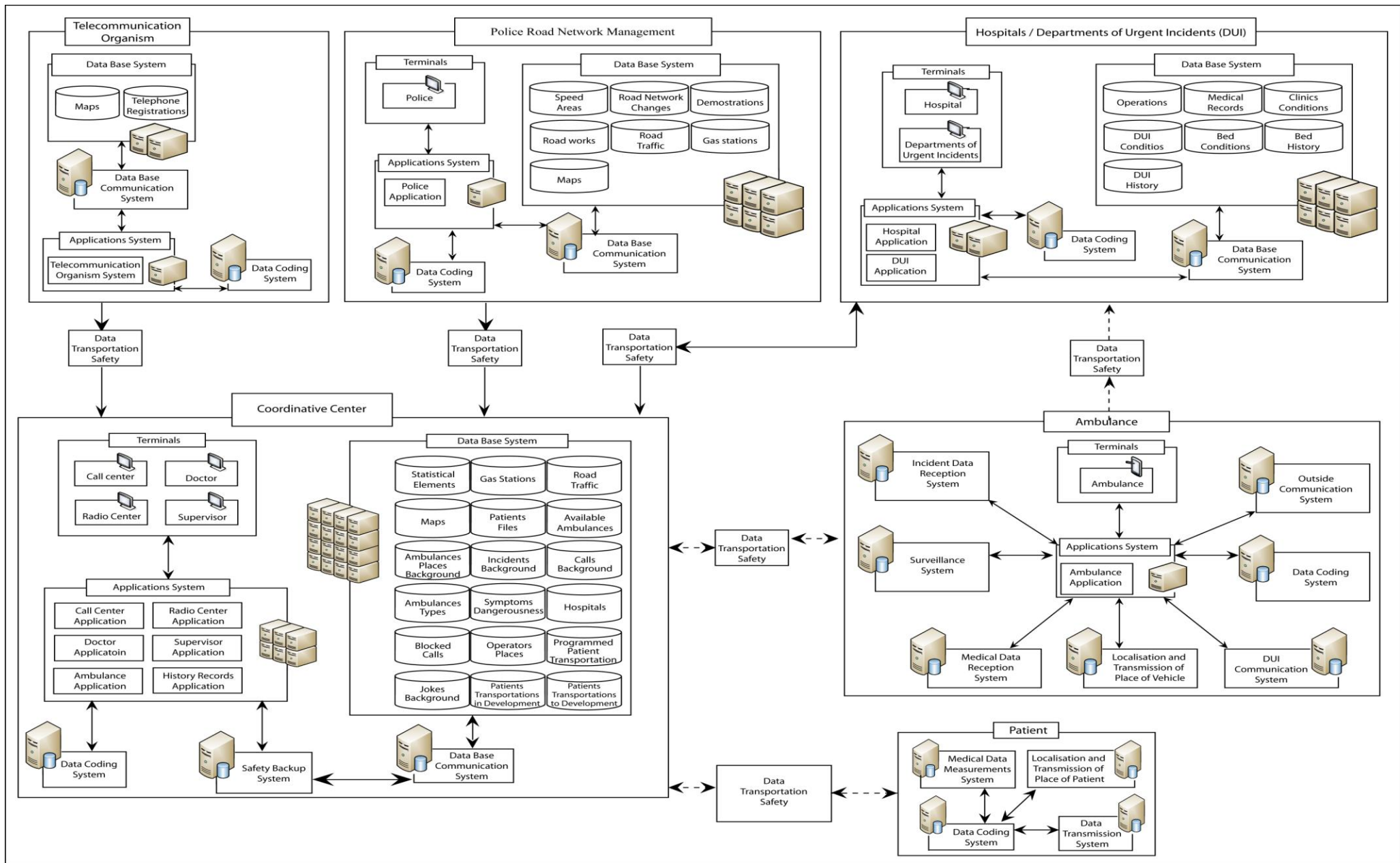


Fig. 1. Functional architecture of the DSS for emergency response