Coastal Emergency Response System

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1. Introduction

Coastal areas are one of the countries prime sources of ecological, social and economic activities. It is hence natural to make every effort for protection and nurturing of coastal areas. This proposal describes an integrated system for managing the emergencies and coordinating effective responses. This emergency response system includes automated coastal data collection systems, mobile reporting and response deployment units, a secure an expandable information base and an integrated communication system. This system provides the technological means to the management team for effectively undertaking the task of responding to emergencies and disaster management.

2. System Overview
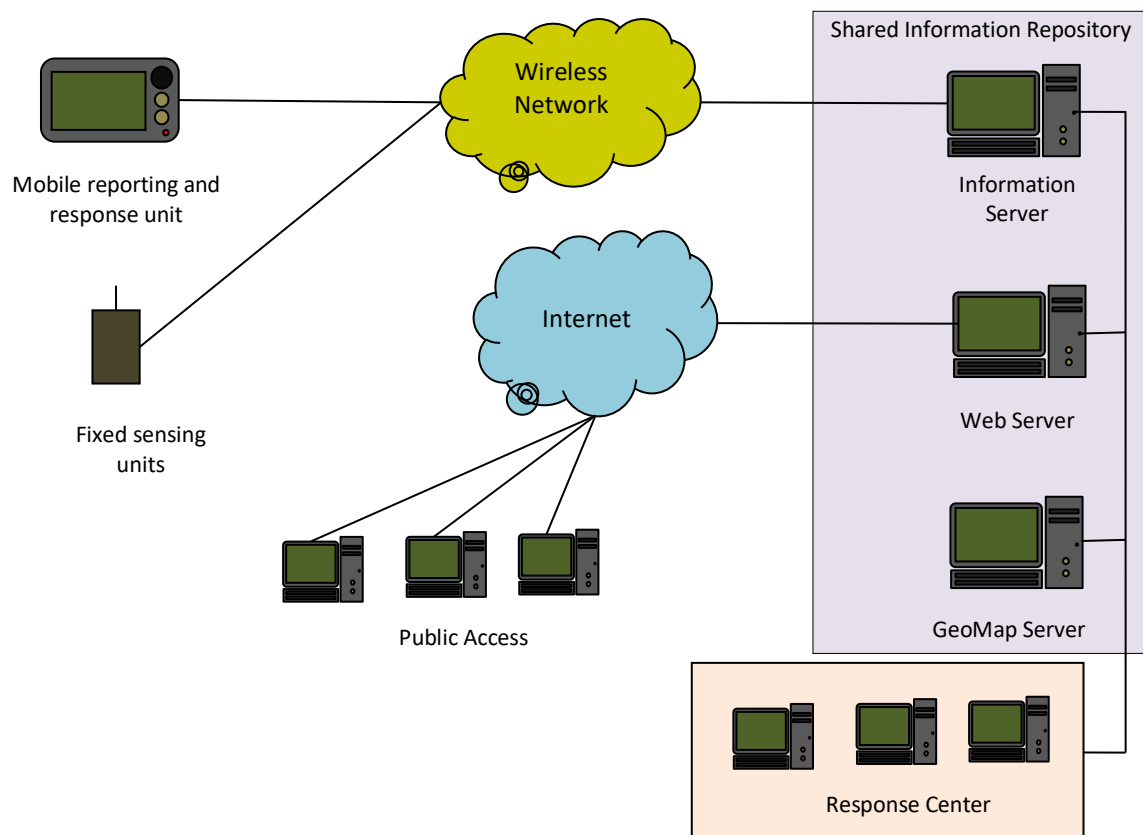
The solution consists of number of mobile units which are mounted in vehicle of field staff. It has a display screen with a wireless broadband connectivity to the servers. The mobile device also has mobile hotspot for the devices in the vehicle to connect to the mobile device. The reporting and work order deployment software on the device enables the field staff to interactively work in coordination with the response control center. The mobile unit has interactive maps and flexible applications for coordination of location based services.

The solution also consists of a number of fixes units which are equipped with a number if sensing interfaces. This is a self contained unit with rugged housing, network interface and solar power operated with battery backup. The unit can also recharged using ocean current with a small current turbine. This is unit is flexible to accommodate various sensors. The proposed sensors are as follows:

- Wind speed and direction

- Ocean water average level

- Ocean water average peak level (shows the intensity of the waves)

- Water salt and sediments level

- Water pollutants level

- Air pollutants level

- Air and water temperature

- Seismic sensors

The mobile and the fixed units are connected to the servers via HSDPA/HSPA/GPRS/EDGE wireless connection depending upon the cellular coverage available. This provides enough bandwidth and access latency to provide real time data to and from servers.

a. Backup Wireless Coverage (Hopping Network)

There are often areas where the cellular signal footprint is non-existent or has poor cellular coverage. This may be especially true in coastal areas where population is low and there is little economic interest for providing the cellular coverage. In such cases a proprietary hopping network is provided using the fixed units (as described above) which can also function of wireless repeater nodes. This hopping network has both permanently fixed or pseudo stationary (mobile vans or trucks) nodes. This arrangement helps to extend the connectivity to far and wide areas where wireless connectivity is not present. Both 915 MHz and 5.8 MHz options are available depending upon the terrain and line of site conditions.

b. Shared Information Repository

An integral part of the system is the shared information repository. As the system matures more and more data is populated and is massaged into usable information. This information is used for research, analysis, prediction and operations. Key components of this are:

- Information Server: This server stored the historical from the field sensing units, operation data and processed information. It also contains the access control information.

- Web Server: This is the server to make available the information for public use. However, it will also be use for internal information sharing with access control. Public in general and report emergency situation by logging onto this web site.

- GeoMap Server: This server hosts the geographic maps, GIS information and provides upoort for location based serves related coastal management activities.

3. System Operations

The system functions by interaction between the field staff, response center and the public in general. The field staff perform their routine monitoring and reporting activities using the mobile device which

instantly uploads their data into the server. Instruction and work deployment from the response center is also given to the field staff using the mobile units.

In case of an emergency an adhoc working wireless network can be created instantly by deploying mobile (on trucks or cars) wireless hopping nodes.

Public alerts, instructions and reporting can be done through the web site.

4. Implementation Methodology

The implantation of the system is easy considering the capabilities and the flexibility of the wireless sensing nodes. The following steps are required:

- Identification of key sensing parameters

- Identification of prime sensing locations

- Identification of cellular coverage at the sensing locations. If cellular coverage if not available then design of the hopping network to the nearest location where network connectivity is available.

- Identification of the number of field staff

- Deployment of task related apps on the mobile devices

- Setting up the Information server with the database engine

- Setting up the GeoMap server with location based services and applications

- Setting up the Web server with connections to the Information Server and the GeoMap Server

- Setting up the Response Center with call Center and access to Information base