

Design considerations for a virtual information center for humanitarian assistance/disaster relief using workflow modeling

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Abstract

There are innumerable human and organizational circumstances when free flowing information is essential for effective decision-making. In a closed system with limited boundary scanning, information handling is a fairly manageable task [School Library Journal, 39 (1993) 146]. However, where sources of data and/or decisions are high volume encompass a large geographic area and cover a gamut of organizational entities, information gathering and fusing can be daunting [FEMA, Publication No. 229 (4) (1995)]. This paper analyzes the workflow typical in a disaster scenario and discusses the design considerations for a virtual information center (VIC) that can both efficiently and effectively coordinate and process a large number of information requests for disaster preparation/management/recovery teams. The proposed design is domain independent, uses a net-centric approach and can be readily exported to many other governmental and organizational decision environments. The prototype version of the system uses the object-oriented model in connecting to multiple databases across the Internet and has all the essential features that can readily be cloned to enlarge the system's scope. © 2001 Elsevier Science B.V. All rights reserved.

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1. An example scenario

A quiet Friday on a July afternoon was slowly settling towards what was promising to be a sunny three-day weekend over San Francisco Bay. The city was gearing for the annual Independence Day celebrations coming up on the following Monday. In his office at the CalTech Seismic Lab in Pasadena, John continued to monitor the earthquake measuring instruments with concentration. The seismograph had

never been quiet but that was normal for the region. The city had been warned of the 'big one' for years but nothing major had occurred over the last 6 years. Since that time, the city had been planted with hundreds of sensors across the San Andreas Fault (Fig. 1). These sensors had been linked by an intricate emergency management system interconnecting several governmental and non-governmental agencies over the cyberspace.

At 3:46 pm, the monitors started picking up earth movements on a scale that was unusual and indicative of a major shake. The seismograph began swinging wildly. The emergency system issued out warnings to all. An adrenaline rush struck John. A big one indeed was coming. He knew it would reach the

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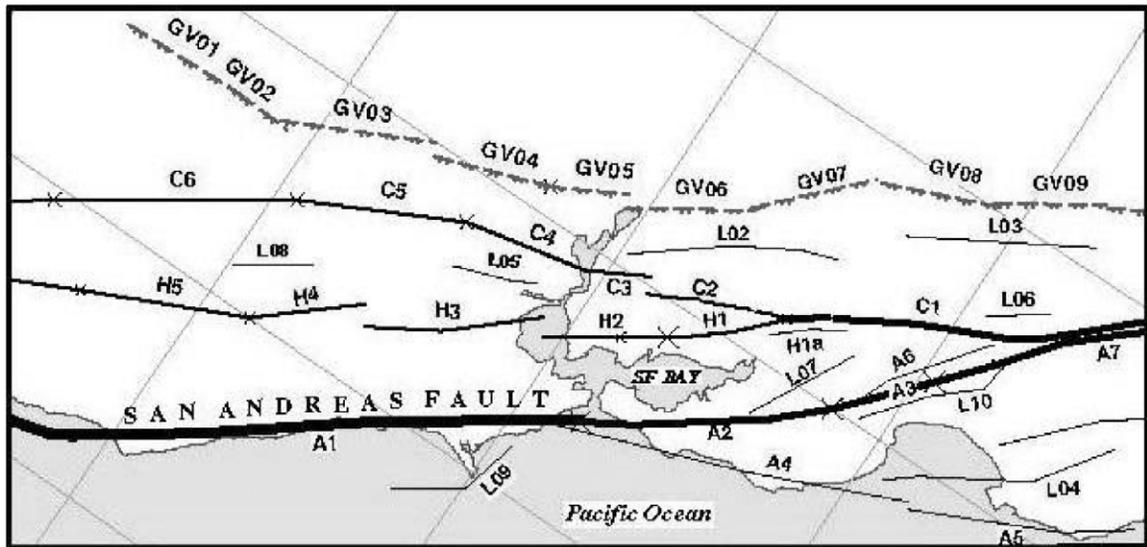


Fig. 1. Map showing the San Andreas Fault along the Californian coast (USGS).

city in minutes. He collected himself and instantaneously activated the virtual information center (VIC) he had been trained to operate for just an emergency. In nanoseconds, all the information centers working under it were on standby to take a barrage of information requests from the disaster management team. The system itself was proactively searching for life-saving information to be passed along as potential warnings to the team. Years of effort in designing the workflow for the dream VIC and building the system were now paying off.

The above scenario may well sound futuristic. But the technology for implementing such systems is already beginning to evolve. The explosion of telecommunications technology, the ever expanding Internet, the availability of inter-platform connectivity software and theoretical progress made in group decision and negotiation are all making the concept of the VIC for humanitarian assistance/disaster relief a reality more than ever before.

2. Toward a global VIC

Given the cosmic design or lack of design of the universe and the inevitability of human errors, disas-

ters are a distinct reality of everyday life. Disasters—both natural and man-made—can strike anytime and anywhere. Perrow [12] advocated that disasters are non-preventable and even argued they can be considered a ‘normal’ occurrence. Some organizations tend to believe disasters do happen but that they only happen to other people [1]. Experience shows that today for their very survival both organizations and nations should design and implement disaster preparedness systems.

There are two ways to overcome disasters: the first is to avert them from occurring through disaster prevention programs, and second to have an emergency system and a plan of preparation and operation [6]. In either method, communication plays an important role in disaster management. In most of the disasters in recent history, at some level or another, information was available which could have prevented or minimized the destruction [7]. But the information was either possessed by those with authority to act upon it but who did not act; or it was possessed by those who did not have the power to act but who did not share them with those who could have. In other cases, information even when received was discounted by the bureaucracy [9]. Hence, in the future, any system devised to manage disaster emergencies should ensure information flows freely and

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