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Crisis Management System for Large-scale Disasters

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OVERVIEW: The Great East Japan Earthquake has prompted a widespread reevaluation of how to go about crisis management. The Japanese government incorporated the standardization of disaster response into its "Basic Policies for Economic and Fiscal Management and Reform." Progress on the standardization of "incident response" is also occurring at the international level, with the publishing of the ISO 22320/JIS Q 22320 standard. Meanwhile, the multilateral provision of international aid following major disasters has become commonplace, with the scope of assistance expanding beyond natural disasters to also include terrorist attacks or major accidents. This has made the use of standardization to improve crisis management essential. Hitachi utilizes its crisis management technologies and products and its know-how built up through its defense and disaster prevention businesses to make social infrastructure even safer and more secure, and it is also conducting studies aimed at supplying new standards-compliant social infrastructure security solutions.

INTRODUCTION

THE Great East Japan Earthquake posed a major challenge because it required a diverse range of organizations to work together in many different situations in response to the disaster. These included national and local government, the Self-Defense Forces, the US military, fire departments, police, healthcare institutions, and private companies. This has prompted a widespread reevaluation of how to go about crisis management, with the inclusion in the government's June 2013 "Basic Policies for Economic and Fiscal Management and Reform"[(1)] of a plan to improve national resilience by proceeding with "studies toward standardization of disaster responses to facilitate wide-area aid." Also, because international relief work with participation by multilateral organizations has become common during major disasters in recent years, the formulation of the ISO 22320/JIS Q 22320 international standard[(2)] ("Societal Security - Emergency Management - Requirements for Incident Response") has been a vital development. The introduction to the standard notes the need for an approach that encompasses multiple nations and organizations.

Because large and complex disasters that cover a wide area cause damage to numerous organizations and districts, resulting in varying degrees of impairment to those organizations and their functions, it is difficult for the people on the ground who are dealing with the situation to exchange damage information and establish mutual understanding. Problems reported during the Great East Japan Earthquake included delays in getting assistance and rescue work underway, delays in decision making, and lack of clarity in the command and control structure. Overcoming these problems will require an upgrading of capabilities during normal times, including the standardization of disaster response in a way that systematizes response know-how, and training exercises that follow the framework laid out by the standard.

This article describes a US crisis management system and the international standard for incident response, and gives an overview of a crisis management solution designed with reference to these.

CRISIS MANAGEMENT SYSTEMS IN USA

The terrorist attacks of September 2001 prompted the USA to establish a National Incident Management System (NIMS)[(3)] in 2004. The NIMS is a comprehensive crisis management system that covers the entire country and collates the concepts and principles of crisis management for different types of incidents and organizations. It includes the following stipulations.

(1) Preparedness

This expresses the necessity of improving preparedness for disasters before they happen by putting in place measures such as planning, procedures, training and exercises, and qualifications.

(2) Communications and information management

This expresses the importance of interoperability and the need for communication and information systems that can provide a common operational picture (COP) to everyone involved in the response to an incident.

(3) Resource management

This expresses the need for flexible and standardized mechanisms for things like typing, inventory, distribution, and management.

(4) Command and management

This expresses the need for providing a flexible and standardized framework for crisis management, and the importance of the concepts of command, coordination, and public information.

INTERNATIONAL STANDARD FOR CRISIS MANAGEMENT

The ISO 22320/JIS Q 22320 international standard was issued in November 2011 and adopted as a Japanese Industrial Standards (JIS) in October 2013. It stipulates the minimum requirements for mounting an effective response to a crisis. These requirements are summarized below.

(1) Command and control

Specifies command coordination, organizational structures and procedures, and resource management within an organization.

(2) Activity information

Specifies how to handle things like work processes and data capture and management to provide timely, relevant, and accurate information.

(3) Coordination and cooperation

Specifies command coordination processes as well as coordination and cooperation between organizations and between different parts of the same organization.

CRISIS MANAGEMENT SOLUTION

While the USA's NIMS provides a viable framework for the effective implementation of crisis management, its adoption is not enough on its own to provide complete crisis management. When the requirements of the international standard are considered as well, it is also essential to undertake preparations, such as conducting exercises based on a particular scenario, and to utilize information and communication technology that provides efficient support for these preparations. The following section describes a solution that supports the NIMS requirements.

Preparation: Improving Disaster Response Capabilities in Advance

Training exercises are particularly important for mounting an appropriate response when incidents occur.

Exercises include seminars for conducting basic training, skills exercises that use a training simulator or other resources to train people in system operation, table top exercises (TTXs) that involve discussing a problem around a table and devising solutions, command exercises using simulation-based role playing to provide training in decision making, and field training exercises (FTXs) that practice mounting an actual response on the ground. Along with having clear objectives, it is important that a framework be established for each exercise. These are then put together in the form of a separate scenario package for each objective. These scenario packages specify the scenario for the exercise and include the process to be followed during its execution.

It is recognized that there is currently a shortage of exercises intended primarily for command staff in particular (command exercises). By providing a more comprehensive range of this type of exercise, the intention is to foster leaders able to deal appropriately with unexpected events, and to optimize crisis management manuals and other plans or operational procedures by incorporating the lessons learned during exercises (see Table 1 and Fig. 1).

Table 1. Exercise Programs

There is currently a shortage of exercises intended primarily for command staff (command exercises).

Exercise type	Purpose	Example
Seminars	Basic training and knowledge acquisition	• Classroom training • e-learning, etc.
Skills exercises	Repetitive exercises such as training on operating procedures	• Driving simulator • Flight simulator, etc.
TTXs	Group exercise to discuss a problem and devise solutions	• Small group activities • OJT, etc.
Command exercises	Exercises based on role-playing for command staff	?
FTXs	Exercises at the actual site of an incident	• Civil defense exercises, etc.

TTX: table top exercise FTX: field training exercise OJT: on-the-job training

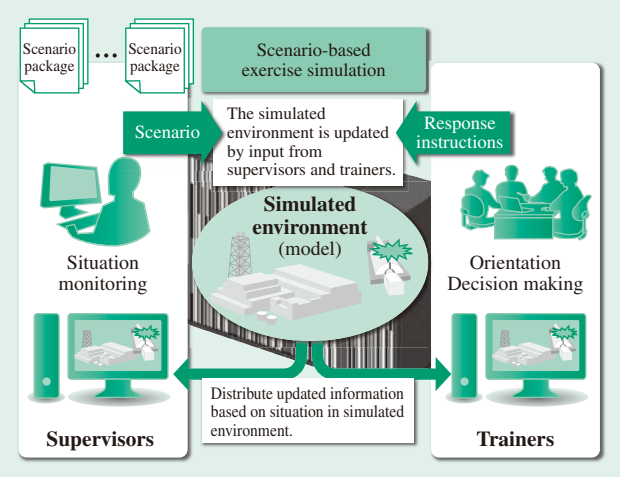

Fig. 1—Overview of Exercise Functions.
Exercises are made more effective by basing them on scenarios prepared for different objectives and conducting them in realistic simulated environments.

Communications and Information Management

(1) COP

It is essential that the people involved in the response to a large and complex disaster extending over a wide area share incident information. COP is a technology for achieving this. By allowing everyone involved to share in the evolving situation in realtime, command staff can issue appropriate orders instructing what to do next and people working on the ground can make assumptions about how to prepare for their upcoming tasks. When sharing information, only providing people with what is relevant to their role or duties saves them from being swamped by a flood of information.

The ways in which information might be displayed on a COP include showing incident information overlaid on a map, tasking lists (realtime display of tasks, events, and progress based on groupings formed during an emergency), and aerial or satellite images of the affected area (see Fig. 2).

(2) Interoperability

Incident response utilizes radio, information, and other systems belonging to the organizations involved in the response; government agency systems; and local civil defense, police, or firefighting radio systems or other audio disaster prevention systems. It also requires the wide-area coordination of the many information systems belonging to relevant agencies. Because of the diverse range of systems that manage the required information, an important role is played by the communications infrastructure that implements this wide-area coordination and provides a base for ensuring the interoperability of different systems (see Fig. 3).

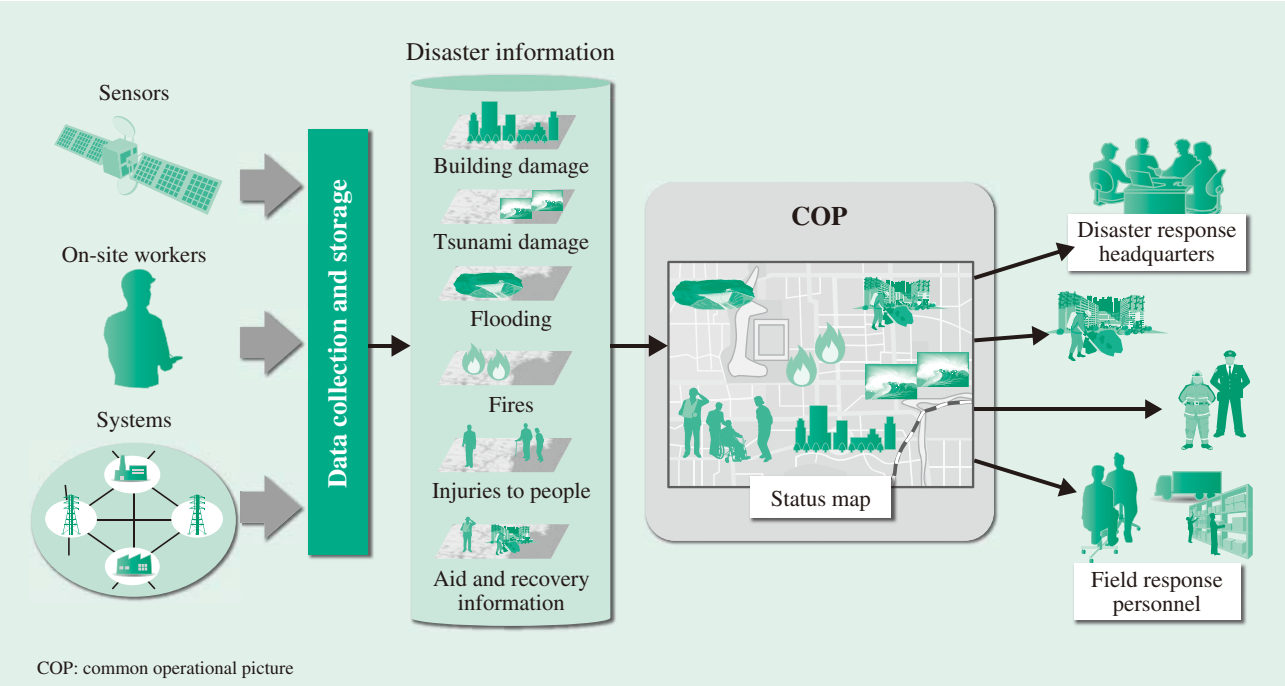

Fig. 2—COP.
COP technology is used to classify and combine information required for incident response so that information can be shared between the people involved in realtime.

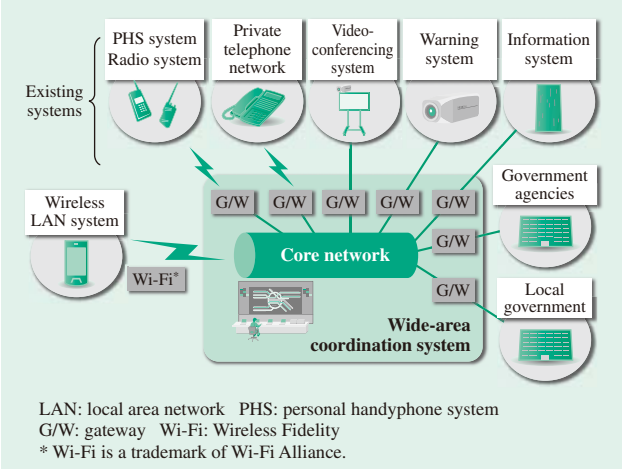

Fig. 3—Wide-area Coordination System.
It is important to have communications infrastructure that can provide wide-area coordination and act as a base for ensuring interoperability between different systems.

Resource Management: Flexible Mechanisms

Emergency logistics management supports the management of inventorying, procurement, and distribution of relief supplies; the presentation of this information on a map; and the dispatching of requested supplies. It provides flexible resource management, including the use of functions such as the forecasting of demand for supplies so that those in charge can decide to dispatch relief supplies to areas that have suffered so much devastation that they are not in a position to issue their own requests (see Fig. 4).

Command and Management: Flexible and Standardized Framework for Crisis Management

The observe, orient, decide, and act (OODA) decision making methodology devised by the US military for use in emergencies involves the use of a COP to help commanders orient themselves, identify and understand confused activity at an early stage, and shorten the time taken for decision making. Working through this OODA loop as quickly as possible in response to an unexpected event or severe accident can mitigate damage and prevent it from spreading. The plan, do, check, and act (PDCA) process is widely used for responding to events. However, whereas PDCA involves a slower paced cycle of steps suited to putting countermeasures to an incident in place beforehand, the OODA cycle is an emergency measure for dealing with unexpected events and is suited to the response needed immediately after an incident has occurred (see Fig. 5).

CONCLUSIONS

This article has described a US crisis management system and the international standard for incident response, and has given an overview of a crisis management solution designed with reference to these.

Hitachi is utilizing its know-how in fields such as command and control (C2), exercises, and cyber-security obtained through experience in its defense and

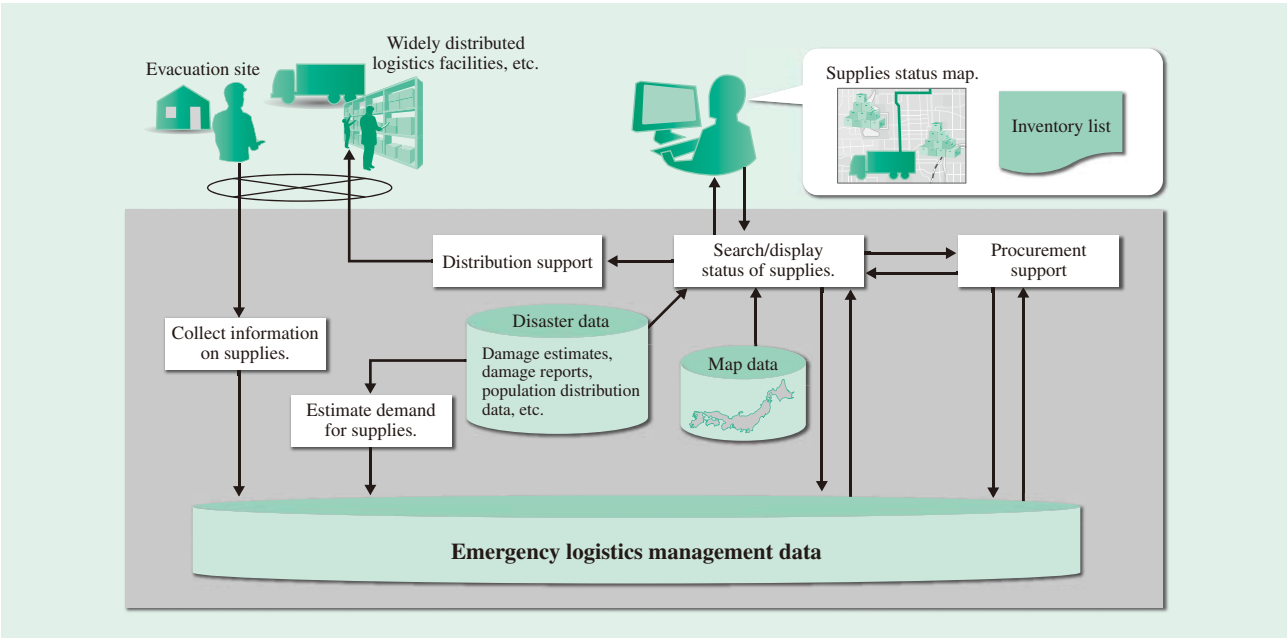

Fig. 4—Flexible Emergency Logistics.
This manages warehousing and distribution of relief supplies during a disaster.

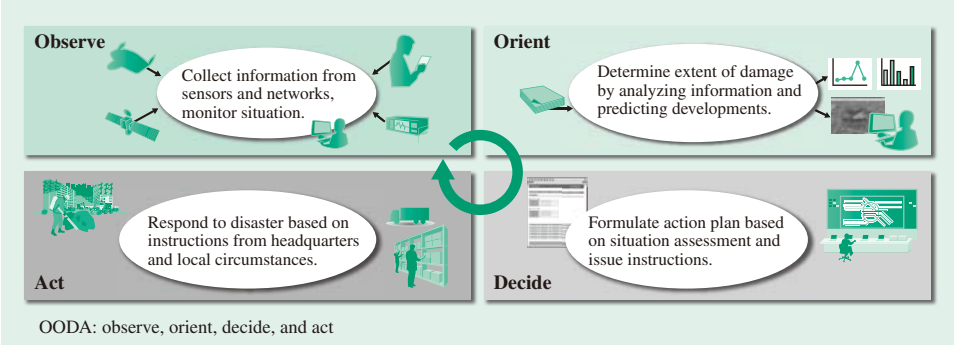

Fig. 5—OODA Loop.
The OODA loop implements command and control as a cycle of observation, orientation, decision, and action.

disaster prevention businesses to investigate new social infrastructure security technologies with reference to developments in international standardization.

Utilizing an approach like the C2 concept from defense systems is an effective way to mount an efficient operation in response to a severe accident. Conducting routine exercises is also important, and these should be used as guidance when actual incidents happen or in other situations such as demonstrations relating to public safety and security. In addition to the solution described in this article, Hitachi also has numerous other technologies applicable to crisis management. Among these are enterprise asset management that includes techniques for using sensor information for anomaly prediction or detection and preventive maintenance, wearable devices, containerized data centers, and disaster response robots.

Through its ability to supply one-stop solutions that extend from control systems to the information systems used for social infrastructure, Hitachi is seeking to further improve safety and security throughout the infrastructure of society.

REFERENCES

(1) Cabinet decision, "Basic Policies for Economic and Fiscal Management and Reform" (Jun. 14, 2013).
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