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# Global Emergency Telecommunication Service on Global Emergency Telecommunication Platform with Global Crisis Management Scheme

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## 1. Introduction

Recent years have been marked by catastrophic natural disaster, terrorism and infectious disease in the world and crisis management and emergency telecommunication service for a large-scale or widespread disaster has been one of vital political issues for many countries. Here, emergency telecommunication services (ETS) is defined by four patterns of the relationship between senders and recipients of information (i.e., Government to Government (G to G), Government to Citizen (G to C), Citizen to Government (C to G) and Citizen to Citizen (C to C)).<sup>(1)</sup>

The issues regarding response to such a kind of disaster in crisis management and emergency telecommunication have been highlighted in the wake of 9/11 terrorist attack in 2001. In this incident, more than four hundred fire fighters and police officers who had been involved in rescue effort at the afflicted sites of World Trade Center (WTC) were sacrificed due to the collapse of the WTC buildings damaged by the attack. It is said that this tragedy happened because first responders who initiated rescue effort at the disaster site of WTC couldn't establish effective Incident Command System (ICS) and emergency calls couldn't reach many fire fighters and police officers at the site due to the lack of interoperability among the wireless communication systems used by different first responders.

In response to this, crisis management and incident management framework have been re-examined and the specification and standardization of emergency telecommunication services have been developed particularly in the U.S.A and EU. However, in the Hurricane Katrina crisis which brought devastating damage over the area around Gulf of Mexico in 2005, the response of the U.S. federal government to this crisis was delayed and coordinated rescue and relief activities couldn't be conducted by federal, state and local governments.

From this disaster, the issues of incident management and emergency telecommunication have surfaced again and the White House was heavily criticized by the various sectors for the ill-preparedness and improper response to the Hurricane Katrina. Responding to this criticism, the federal government formulated and implemented important measures to improve

the incident management and strengthen the emergency telecommunication with the point of view of homeland security.

In Japan too, the people has become aware of crisis management in the wake of 9/11 terrorist attack. The policy for the improvement of Japanese crisis management has been extensively discussed in Council for Science and Technology Policy, Cabinet Office accompanied by the occurrence of consecutive big earthquakes in Japan from 2004 to 2007 as well as other crises such as bird flu and swine flu. In fact, it is anticipated that several consecutive catastrophic earthquakes will hit the broad area of Japan within 30 years and Japanese government has been very concerned with crisis management including the response to catastrophic earthquake and emergency communication with people in the disaster areas. Based on this situation, many efforts for the enhancement on crisis management and emergency telecommunication are underway in Japan.

For example, a national project referred to “The development of information communication system to provide detailed information on disaster risks to each and every individual and to contribute to the effective response to disaster” has been conducted under the supervision of Council for Science and Technology Policy in Japan. This project is designed to visualize the integrated information on natural disasters and their associated risks in any areas of Japan in a GIS map in an integrated fashion and to develop the communication system to reach the information on the risks to any individuals definitely.

Though many efforts have been done for the improvement of individual national crisis management with emergency telecommunication in the U.S.A, EU, Japan and other countries, there are very few of cooperative and integrated efforts to build a global crisis management scheme with common emergency telecommunication platform internationally. The development of “global crisis management scheme” will be necessary since growing numbers of the people on the earth will be at stake due to regional and world wide catastrophic disasters envisioned in near future caused by Climate Change and other physical phenomena.

In this paper, based on the results of the R&D by the author and other literatures on crisis management and emergency telecommunication services, the definition of emergency telecommunication services, the relationship between crisis management and emergency telecommunication services, the issues of emergency telecommunication services, and the examples of the development of emergency telecommunication services for four patterns are discussed. <sup>(2)</sup><sup>(3)</sup> Based on these discussions, a concept of global emergency communication service on global emergency telecommunication platform with global crisis management scheme is proposed.

## 2. Definition of Emergency Telecommunications Services

Emergency Telecommunications Services (ETS) is designed to facilitate the use of public

communications capabilities by authorized users for effective communications during emergency response, disaster relief and mitigation operations. <sup>(4)</sup> ETS is a national implementation utilizing the features, facilities and applications available in national public networks and service offerings. <sup>(5)</sup>

The requirements and functional specifications for ETS have been examined by international telecommunication standardization bodies such as ITU (International Telecommunication Union), TIA (Telecommunications Industry Association) and ETSI (European Telecommunications Standards Institute) after 9/11 terrorist attack.

ETS is classified as four types by the patterns of relation with sender and receiver of information as follows:

- Government to Government (G to G)
- Government to Citizen (G to C)
- Citizen to Government (C to G)
- Citizen to Citizen (C to C)

	<b>Role of ETS (shown as examples)</b>	<b>ETS System (shown as examples)</b>
<b>G to G</b>	<ul style="list-style-type: none"> <li>* Information sharings on emergency situations among national and local governments</li> <li>* Mutual communications among first responders such as fire fighters, police offices and emergency medical teams for resque and disaster relief operation</li> </ul>	<ul style="list-style-type: none"> <li>* Central Disaster Management Radio Communications System (in Japan)</li> <li>* Preferectual Government Disaster Management Radio Communication Network (in Japan)</li> <li>* Fire Radio System</li> <li>* TETRA system</li> </ul>
<b>G to C</b>	<ul style="list-style-type: none"> <li>* Provision of information on disater preparedness and prevention to public</li> <li>* Emergency communication for early warning and evacuation to public</li> </ul>	<ul style="list-style-type: none"> <li>* Disaster Information System (web system)</li> <li>* Public car with loud speaker</li> <li>* Municipal Disaster Management Radio Communication Network (in Japan)</li> <li>* Boadcast Mail at emergency</li> </ul>
<b>C to G</b>	<ul style="list-style-type: none"> <li>* Provision of information from resident to authority at emergency (witness of disaster, SOS and others)</li> </ul>	<ul style="list-style-type: none"> <li>* Emergency Number (119 (Japan), 110 (Japan), 911(USA))</li> <li>* e-mail to authority at emergency (in Japan)</li> </ul>
<b>C to C</b>	<ul style="list-style-type: none"> <li>* Safety registation and confirmation of family members and relatives at emergency</li> <li>* Communication with mutual care and support in community (in Jpan)</li> </ul>	<ul style="list-style-type: none"> <li>* Emergency Messaging Service (in Japan)</li> <li>* Disaster Message Board (in Japan)</li> <li>* ε -Ark (Emergency/Electronic Army Knife) (in Japan)</li> </ul>

**Fig 1 Roles of ETS and its representing system with 4 types of ETS**

The G to G shown in Fig 1 is called as Telecommunications for Disaster Relief (TDR).

3. Telecommunications for Disaster Relief (TDR)

As was described earlier, many fire fighters and police officers at the site of World Trade Center (WTC) lost their lives by 9/11 terrorist attack due to the lack of interoperability among the wireless communication systems used by different first responders. There were many occasions that rescue and disaster relief operations couldn't be coordinated among different first responders in the Hurricane Katrina crisis due to catastrophic damages of

telecommunication infrastructure at disaster areas and the heavy losses of their communication equipment.

In fact the needs for advanced ICT (Information, Communication and Technology) systems which can support first responder's disaster relief operation with safety in the very dangerous and harsh environments had been discussed in EU and U.S.A., too. The R&Ds on TDR have been conducted targeting on standardization of ubiquitous wireless networking, broadband applications and other critical technology areas looking ahead 5 to 10 years by international telecommunication standardization organizations with the support of vendors and research institutes. These R&Ds have been planned and conducted based on the needs of first responders with Incident Command System (ICS) and US-EU collaborations on the R&D in these areas have been actively conducted for many years. In the U.S.A, the field exercises with implementations of TDR systems and applications and with participation of various first responders and residents are actively performed as part of crisis management training.

#### 4. Issues on Emergency Telecommunication System and associated R&D

The Issues on emergency telecommunication system for 4 patterns (G to G, G to C, C to G and C to C) and the examples of associated R&Ds are discussed here.

##### (1) G to G and G to C

For a large or catastrophic disaster, the initial responses and disaster relief operations by first responders and emergency communications from the emergency management authorities to the communities who may face potential disasters are keys for successful mitigations of disaster.

The issues on emergency communication for G to G and G to C are as follows.

- Development or creation of TDR systems and their operational environment contributing to not only quick situational awareness and decision-making on disaster response, but also effective and quick response to disaster with collaboration among various emergency management organizations.
- Development of technology and its operational environment contributing to fast, accurate and timely communication to the people in the afflicted areas.

Project MESA (Mobility for Emergency and Safety Applications) lead by ETSI & TIA and RESCUE (Responding to Crises and Unexpected Events) project lead by California Institute for Telecommunications and Information Technology are included in the representing R&D projects regarding to G to G and G to C.

The goal of Project MESA was to develop advanced mobile broadband technical

specifications that could be used to support the communications requirements of the PPDR (public protection and disaster relief) community.<sup>(6)</sup> This project was promoted to develop the specifications for advanced ubiquitous networking system and broadband applications contributing to rescue and disaster relief activities of first responders and to make market deployment for their products. Various emergency management agencies, municipal organizations, law enforcement agencies and NGOs such as Red Cross as well as ICT and electronics companies were participating in the project.

The goal of the RESCUE project is to radically transform the ability of responding organizations to gather, manage, use, and disseminate information within emergency response networks and to the public. The RESCUE project is an interdisciplinary effort that brings computer scientists, engineers, social scientists, and disaster science experts together to explore technological innovations in order to deliver the right information to the right people at the right time during crisis.<sup>(7)</sup>

The results of these R&Ds will make it possible for first responders to do in the context of G to G and G to C as follows:

- To communicate anywhere, anytime and consistently with each other and to transmit or receive multimedia information contributing to the quick and correct judgment of the situation and decision support for the response to disaster.
- To provide necessary, accurate and timely information to individuals depending on their locations, level of current and predicted risks and other factors.

## (2) C to C

There are some safety registration and confirmation systems utilized at emergency such as Emergency Messaging Service and Disaster Message Board in Japan. However, there is no guarantee that the residents in and out of disaster areas can quickly confirm their safeties each other and the residents in disaster areas can effectively communicate in the community for mutual care and support.

Even though the use of mobile network has become popular utilizing high-speed wireless network systems covering wide areas, many residents might lose the means of communication including cell phone and they would be isolated from other areas if catastrophic disasters occurred over broader regions and the telecommunication infrastructure were destroyed in the regions. Therefore the development of mechanism of securing alternative communication means for mutual help in the community will be one of the issues to be examined in the future.

There is a study conducted focusing on this issue. This study is called as “R&D on ICT environment based on  $\varepsilon$ -ARK (Electronic/Emergency ARmyKnife)\* device for securing the safety of community at emergency” lead by professor Hiroyuki Ohno of Kanazawa University.<sup>(8)</sup>

This study sponsored by Ministry of Internal Affairs and Communications in Japan started in 2009.

\*  $\varepsilon$  - ARK means that an electronic version of folding tool with multi-functions to realize various necessary functions and services with compactness at emergency situation.

$\varepsilon$  - ARK is a set of small information communication devices including a small mobile printer that people can carry easily to get and provide the useful functions of many which are necessary for the emergency. The main functions of  $\varepsilon$  - ARK are equipped from the point of views of "Self-Help", "Mutual-Help" and "Public-Help" in various emergencies and crisis.<sup>(9)</sup>

$\varepsilon$  - ARK can establish ad hoc wireless LAN access points using cell or smart phones and secure communication means at the site and navigate the vital information such as evacuation sites and emergency situations and deliver necessary information such as his/her own safety confirmation mail to the family or local authority if the local information network infrastructure was damaged at the disaster areas.

### (3) C to G

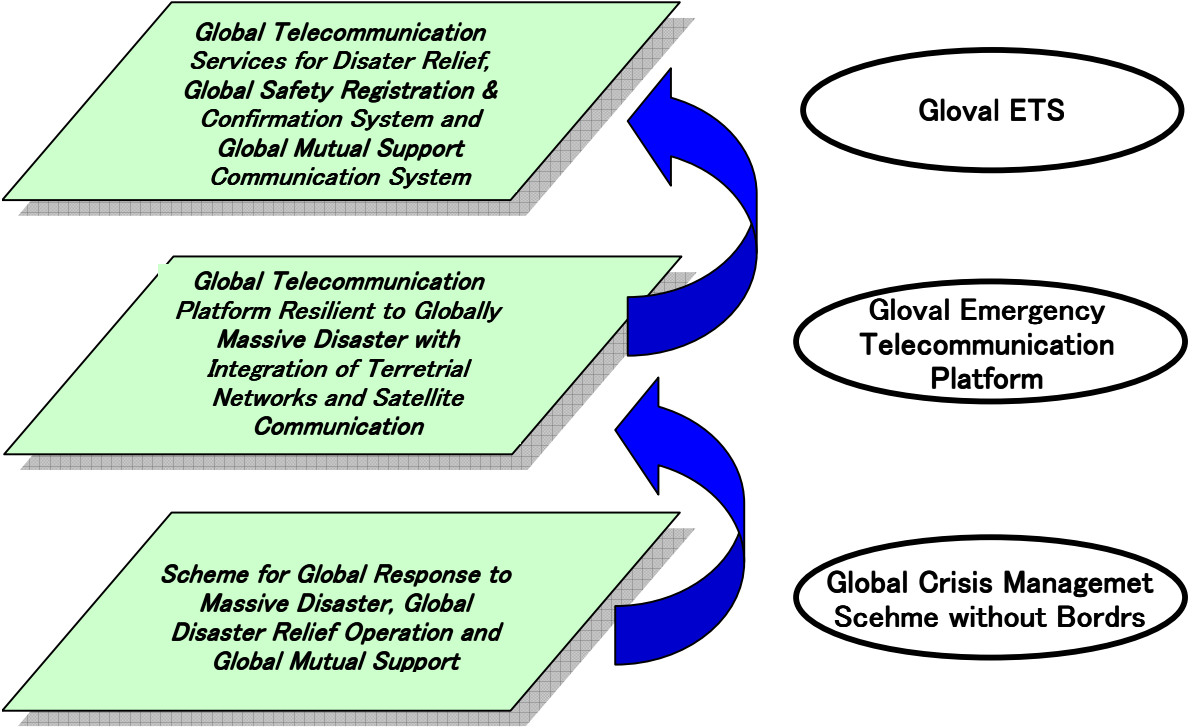
The information such as person buried in an earthquake and a road block caused by a landslide witnessed by local resident will greatly contribute to the effective rescue & disaster relief activities by first responders. Some local governments in Japan have implemented web system which local residents can send witness information to local authority via e-mail on cell phone, but it will be necessary for the residents to have a means to send SOS messages to local authorities if the cell phone network infrastructure was destroyed by disaster. This issue is considered within  $\varepsilon$  - ARK project.

## 5. A Proposal for Global Emergency Telecommunication Service (ETS) with Resilient Communication Platform

On March 11, 2011 Japan was hit by massive earthquake and tsunamis that probably Japanese had never experienced in the past 1,000 years. The frequency of occurrence of massive and catastrophic disaster at the global level has greatly increased in the last 15 to 20 years. It is still not easy for human beings to predict the occurrence of such a disaster accurately in advance. We humans as a whole are facing various global catastrophic disasters and we may confront more severe and gigantic disasters in near future. In this sense, ETS has to be a vital lifeline to response to an unanticipated disaster for the public as well as first responders and national/local authorities in any nation.

Because of this, it will be necessary for us to establish Global ETS on Global Emergency Telecommunication Platform resilient to global and massive disaster under Global Crisis

Management Scheme. The relationship of Global ETS, Global Emergency Telecommunication Platform and Global Crisis Management Scheme is shown in Fig 2.



**Fig 2 Global ETS on Global Emergency Telecommunication Platform under Global Crisis Management Scheme**

Global Crisis Management Scheme can be embodied as a collaborative emergency management mechanism without borders which may include a global response to massive Disaster, global disaster relief activities and global mutual support. Global Emergency Telecommunication Platform being built on the integration of terrestrial networks and satellite communication networks may be defined as a communication platform with a common global interface which can be accessed from networks in any nation.

It may be crucial for our future to establish a global ETS initiative before it will be too late.

**6. Conclusion**

Global ETS on Global Emergency Telecommunication Platform resilient to global and massive disaster under Global Crisis Management Scheme is proposed based on the issues on ETS and the discussions on some of the associated R&D projects.

It will be one of the great achievements for human being to transform an old concept based on global competition to a new concept based on global collaboration and mutual support.



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