# Global Standardization Activities

# ICT Standardization Trends for Disaster Relief, Network Resilience, and Recovery by ITU-T

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### Abstract

The Great East Japan Earthquake in March 2011 led to standardization of resilient information and communication technology (ICT) such as disaster relief systems, network resilience, and recovery measures by the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T). Additionally, use cases of resilient ICT services/systems in several countries have been summarized and reported in ITU-D (ITU Telecommunication Development Sector). This article reports on the recent progress in standardization related to resilient ICT in the ITU.

*Keywords: ITU-T, disaster relief, network resilience*

## 1. Introduction

Over seven years have passed since the Great East Japan Earthquake struck in March 2011, and since then, various natural disasters have occurred in Japan and around the world, including the Kumamoto earthquake in April 2016. Since the Great East Japan Earthquake, research and development of disaster-response information and communication technology (ICT) has been promoted in collaboration with academia and industry, and a disaster-resistant ICT research center was established in Japan by the National Institute of Information and Communications Technology.

In line with the proposal by Japan in 2012, the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) established a time-limited investigation group called the Focus Group on Disaster Relief Systems, Network Resilience and Recovery (FG-DR&NRR) that studies standardization of disaster relief systems and ways to achieve resilient ICT during disasters.

The focus group created eight deliverables between 2012 and 2014 [1]. The deliverables include many research and development results on disaster-tolerant ICT from Japan. Disaster relief services and disaster tolerant ICT and their requirements that need to be newly standardized are indicated in the deliverables, and some of them are discussed in the ITU-T Study Groups (SGs) that result in new ITU-T Recommendations. In addition, a use case document was produced, in which case examples from Japan and around the world were collected, and the information was also shared with the ITU Telecommunication Development Sector (ITU-D), which is highly relevant for developing countries, and is utilized as a technical report [2].

This article reports on the recent progress in standardization related to ICT for disaster relief systems, network resilience, and recovery by the ITU.

## 2. Progress in relevant Recommendations by ITU-T SG2

ITU-T SG2 (operation aspects and numbering) is a lead study group on disaster relief systems, network resilience, and recovery in ITU-T, and it approved the following Recommendations based on the deliverables transferred from FG-DR&NRR.
- E.108: Requirements for disaster relief mobile message service
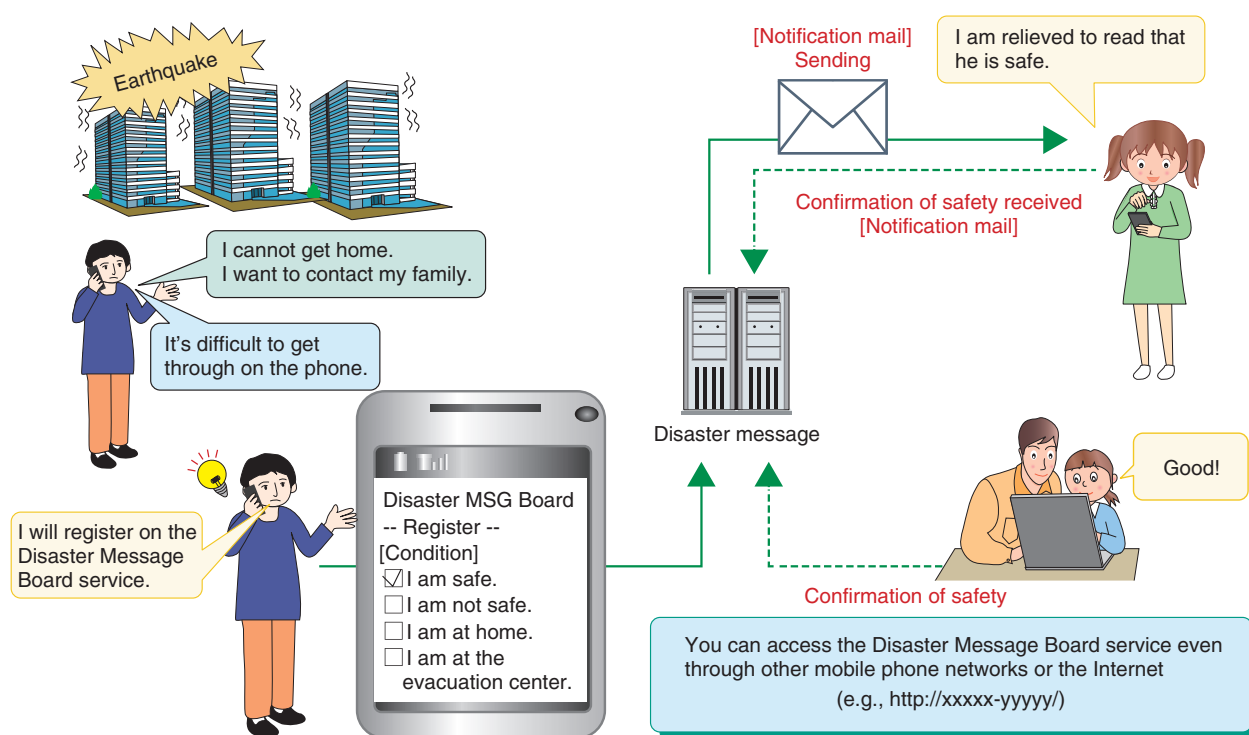- E.119: Requirements for safety confirmation and

Fig. 1.   Outline of disaster relief mobile message service.

broadcast message service for disaster relief

A new draft Recommendation on terms and definitions for DR&NRR and the supplementary document on framework of disaster management for disaster relief systems are also being studied.

### 2.1   Disaster relief mobile message service

The new Recommendation ITU-T E.108, which was proposed by Japan, was approved in January 2016. The functions described in this Recommendation are already being offered by NTT DOCOMO in the Disaster Message Board service, which can be used to check on the safety of family and friends via mobile phones and smartphones in the event of a disaster [3]. An outline of this service is shown in **Fig. 1**. In the event of a large-scale disaster, users in the affected areas can register their own situations and check the registered safety information through the Internet. It is possible to send notifications by email to predesignated family members and friends, or to request users in a disaster area to register their safety information.

Recommendation E.108 provides requirements for safety information required for disaster message board services, requirements for search and display functions, and requirements for mutual provision of services by different mobile phone operators. It also describes the interface requirements of the voice message board service that can be used by foreigners and people with disabilities.

### 2.2   Safety confirmation and broadcast message service for disaster relief

The new Recommendation ITU-T E.119, which was also proposed by Japan, was approved in April 2017. This Recommendation describes services that support the business continuity plan of important organizations such as local governments, public institutions such as police and fire departments, telecommunications carriers, medical facilities, and other organizations at the time a disaster occurs as well as after the disaster. It is very important for the full implementation of disaster relief activities.

This service is mainly divided into two functions: safety confirmation and message delivery. Outlines of the safety confirmation service and the message delivery service are respectively shown in **Fig. 2** and **Fig. 3**. Safety confirmation is carried out automatically by optimal means such as email, fax, mobile phone, and the Internet so that information about staff
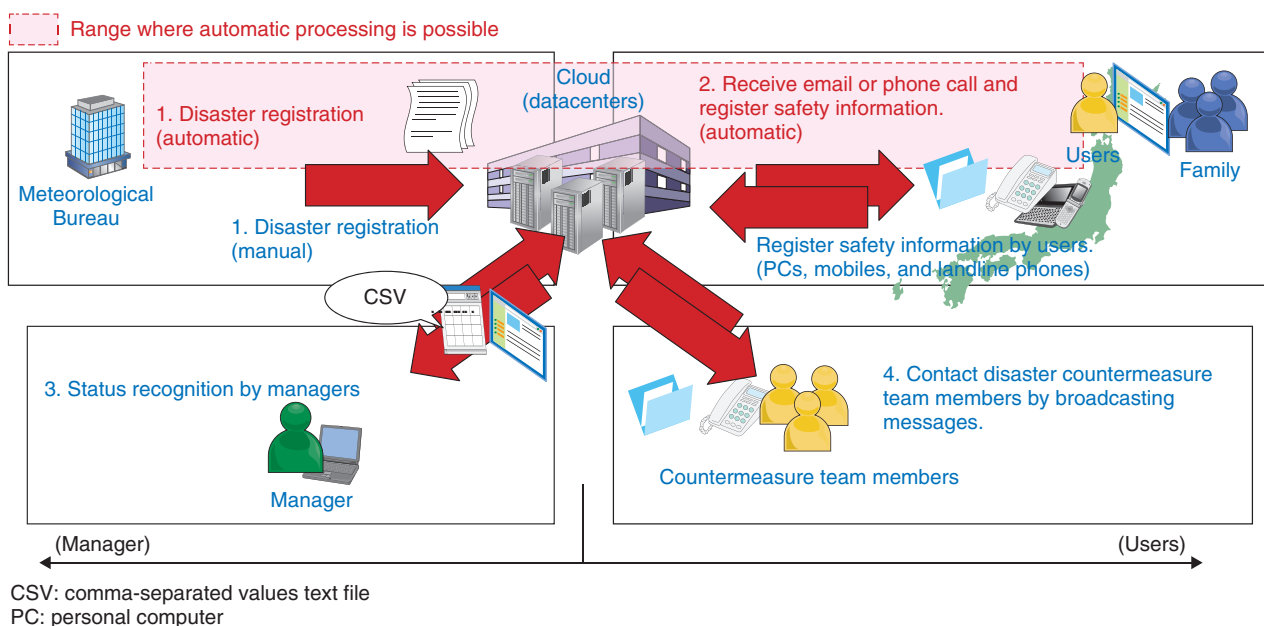
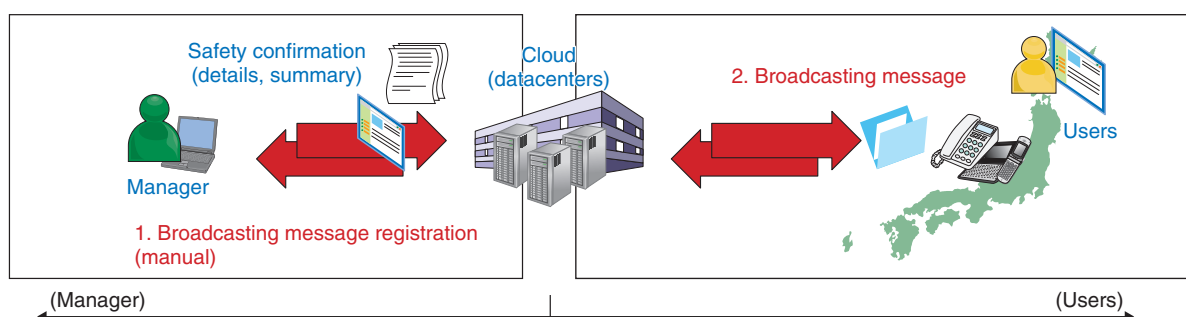Fig. 2.   Outline of safety confirmation service.



Fig. 3.   Outline of message delivery service.

members can be exchanged in the event of a disaster. Then messages to the designated team members and/or employees are broadcast so that they can be dispatched to the appropriate workplaces and work sites. This Recommendation states requirements related to system reliability, security, language, and operability.

## 3.   Progress in relevant Recommendations by ITU-T SG15

In ITU-T SG15 (transport, access and home networks), the following Recommendation and a Supplement have been respectively approved and agreed, based on the deliverables transferred from FG-

DR&NRR via ITU-T SG2.
- L.392: Disaster management for improving network resilience and recovery with movable and deployable information and communication technology (ICT) resource units
- L.sup.35: Framework of disaster management for network resilience and recovery

### 3.1   Disaster management with movable and deployable ICT resource units

The new Recommendation ITU-T L.392, which was proposed by Japan, was approved in April 2016. L.392 proposes a means of early recovery of communication facilities and provides application
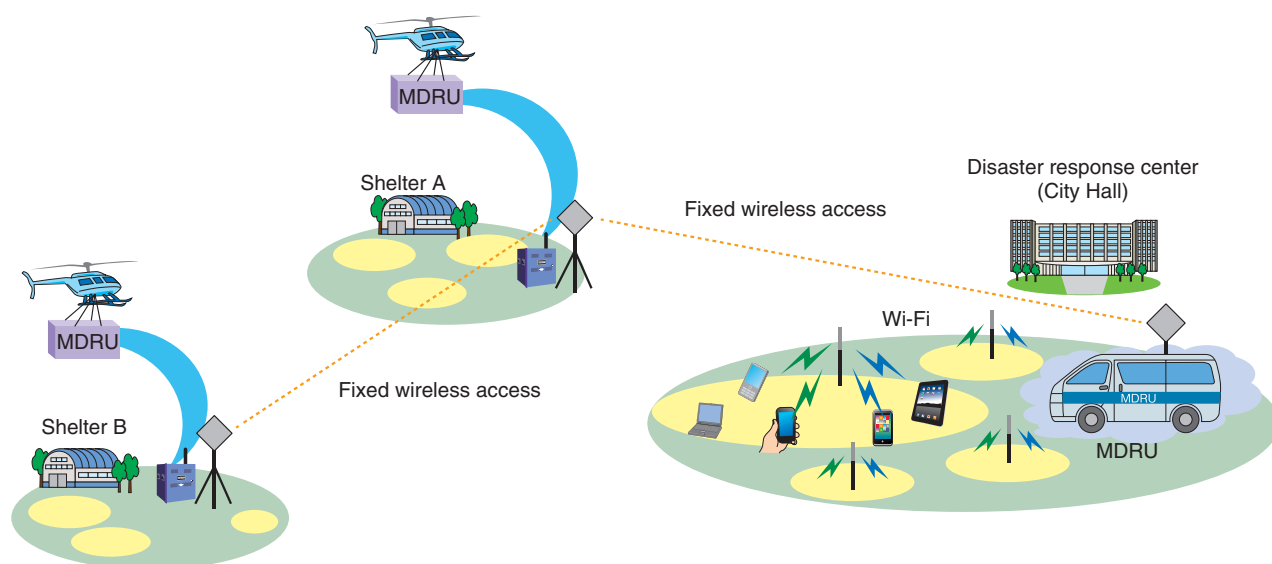
Fig. 4. Example of MDRU implementation.

guidelines to enable the immediate provision of ICT services by transporting, installing, and setting up movable and deployable ICT resource units (MDRUs) [4] to disaster areas. An example of MDRU implementation is shown in **Fig. 4**.

The MDRU is a portable unit that houses equipment necessary for providing ICT services. In the event of a disaster, the MDRU is transported to the affected area and quickly installed. It is possible to construct a local Wi-Fi network in a short period of time and to immediately provide minimum necessary ICT services in the affected area. Also, by using the remaining optical fiber cable and satellite communication line, the MDRU can connect to the wide area network and function as a network hub in the disaster area. The Appendix to this Recommendation introduces as an example information on ITU demonstration experiments using an MDRU conducted in the Philippines, which suffered tremendous damage caused by high waves in November 2013.

This technology was used as a communication tool in some affected areas after the Kumamoto earthquake in Japan in April 2016 and was utilized to support restoration work. Also, in cooperation with the Ministry of Internal Affairs and Communications of Japan in 2017, the ITU decided to introduce the MDRU as a disaster emergency communication system in disaster areas around the world for the purpose of promptly restoring communication services during a disaster [5].

### 3.2 Framework of disaster management for network resilience and recovery

The new Supplement ITU-T L.sup.35, which was proposed by Japan, was agreed in June 2017 and gives countermeasures and guidelines for each phase of disaster occurrence, that is, preparation before disaster occurrence, response/relief immediately after the disaster strikes, and restoration/reconstruction in the short and long term after the disaster.

This document recommends network redundancy and congestion control and application of alternative networks specialized for disasters as countermeasures against disasters (**Fig. 5**). The MDRU mentioned above is also cited as an alternative network at the time of a disaster. Also, effective technologies and network forms/functions for disaster response are listed in the Appendix.

### 4. Progress in ITU-D

ITU-D is a development sector within the ITU and has issued a technical report on the utilization of telecommunications/ICT for disaster preparedness, mitigation, and response in various countries including information described in the FG-DR&NRR deliverables [2]. This report describes the fundamental approaches to disaster risk management using ICT, the formulation of a disaster countermeasure strategy, and country use cases that are not standardized but are considered to be useful for disaster relief, and also
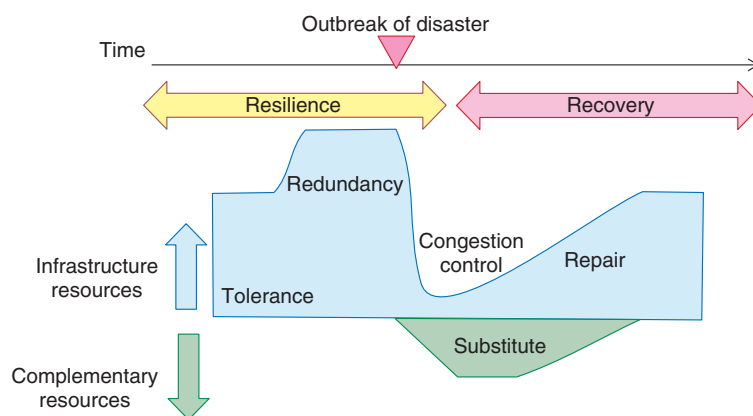
Fig. 5.   Disaster phases and relevant approaches for network resilience and recovery.
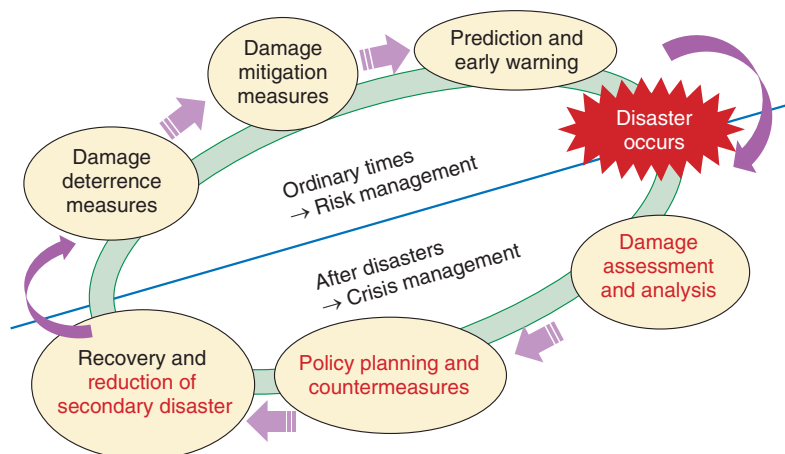


Fig. 6.   Disaster risk management flow.

useful for improving the tolerance (resilience) of communication facilities and reducing damage in the event of a disaster (**Fig. 6**). The report also provides as an example Japan's use of MDRUs after the Kumamoto earthquake in April 2016. This report is a document on disaster response guidelines mainly for developing countries and is considered useful for devising disaster countermeasures.

## 5.   Future activities

The ITU continues to make progress in standardizing ICT for disaster response. Disaster countermeasures vary depending on the kind of disaster, the infrastructure situation of the country/region, and the environmental conditions due to the topography and climate, and the technical field is very wide. Nevertheless, we believe that the Recommendations and the Supplement, which summarized the common requirements for disaster response ICT, will be useful in the future to minimize the damage caused by disasters.

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He received a B.E. and M.E. in electrical and electronic engineering from Sophia University, Tokyo, in 1993 and 1995. He joined NTT Access Network Service Systems Laboratories in 1995, where he researched and developed operation and maintenance systems for optical fiber cable networks. He has been contributing to standardization efforts in ITU-T SG6 since 2006. He was the rapporteur of Question 6 in ITU-T SG6 from 2006 to 2008 and the rapporteur of Question 17 in ITU-T SG15 from 2008 to 2012. He also served as the chairman of the ITU-T Focus Group on Disaster Relief Systems and Network Resilience and Recovery. He has been a vice-chair of ITU-T SG15 since 2013. He also contributes to the activities of IEC (International Electrotechnical Commission) TC86 (Technical Committee 86: Fibre optics). He received the ITU-AJ Award from the ITU Association of Japan in 2012. He is a member of the Institute of Electronics, Information and Communication Engineers.