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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV – Digital Signage

Digital signage: Requirements for disaster information services

Recommendation ITU-T H.785.0

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Recommendation ITU-T H.785.0

Digital signage: Requirements for disaster information services

Summary

Recommendation ITU-T H.785.0 describes overall aspects and high-level requirements for disaster information services provided through digital signage. The main services expected to be applied are early warning to lessen damages, reports of up-to-the-minute situations and announcements of traffic status/evacuation sites. The requirements are categorized into eight areas: general, operational management, application/delivery, contents, security, network, terminal device/display and accessibility.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.785.0	2014-10-14	16	11.1002/1000/12247

Keywords

Digital signage, disaster information service.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Digital signage: Requirements for disaster information services

1 Scope

This Recommendation addresses the high-level requirements for digital signage services under disaster situations. Disaster informational services contain three aspects:

1) Early warning to lessen damages caused by a disaster
2) Reporting up-to-the minute situations on disaster
3) Announcements of traffic status or evacuation sites.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.780] Recommendation ITU-T H.780 (2012), *Digital signage: Service requirements and IPTV-based architecture*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 alert [b-ITU-T X.674]: A warning or alarm message concerning an impending danger or problem.

3.1.2 alert agency [b-ITU-T X.674]: A national, regional or international entity responsible for the management of alerts.

3.1.3 content [ITU-T H.780]: A combination of audio, still image, graphic, video, or data.

NOTE – A variety of formats are classified as "data" (e.g., text, encoded values, multimedia description language introduced by [b-ITU-T H.760]).

3.1.4 digital signage (DS) [ITU-T H.780]: A system that sends information, advertising and other messages to electronic devices (e.g., displays, speakers) in accordance with the time of day and the location of the display, or the actions of audience. Contents and their relevant information such as display schedules are delivered over networks.

3.1.5 multimedia [b-ITU-T T.174]: The property of handling several types of representation media.

3.1.6 service provider [b-ITU-T M.1400]: A general reference to an operator that provides telecommunication services to customers and other users either on a tariff or contract basis. A service provider can optionally operate a network. A service provider can optionally be a customer of another service provider.

NOTE – Typically, the service provider acquires or licenses content from content providers, and packages this into a service that is consumed by end-users.

3.1.7 terminal device (TD) [b-ITU-T Y.1901]: An end-user device which typically presents and/or processes the content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP terminal or an audio-visual media player.

3.1.8 universal design [b-ITU-T Y.1901]: The design of the products and environments to be useable by all people, to the greatest extent possible by including accessibility features in the original design to prevent the need for adaptation after deployment.

NOTE – The intent of universal design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal design benefits people of all ages and abilities.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 reconstruction phase: A later stage of disaster recovery, when definitive repair of the infrastructure affected by a disaster is done.

3.2.2 restoration phase: The earlier stage of disaster recovery, when the first steps to restore services to the population affected by a disaster are taken.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DS	Digital Signage
ETS	Emergency Telecommunication Service
ICT	Information and Communication Technology
IPTV	Internet Protocol Television
NFC	Near Field Communication
NGN	Next Generation Networks
PGP	Pretty Good Privacy
RFID	Radio Frequency Identification
S/MIME	Secure/Multipurpose Internet Mail Extensions
SVG	Scalable Vector Graphics
TD	Terminal Device
TLS	Transport Layer Security
UPS	Uninterruptable Power Supply

5 Conventions

In this Recommendation:

– The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

– The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

– The keywords "can optionally" indicate an optional requirement that is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6 Overview

6.1 General disaster information services

Information and communication technology (ICT) services treating disaster information are expected to deliver reliable content to people both swiftly and surely, and in a manner that may differ from usual delivery. The content delivered is based on the affected locations and/or damage-levels. From the viewpoint of disseminating content to a large number of people, it is desirable that ICT services be used daily and that they be well recognized by the masses. It is also preferable to provide the disaster information content through diverse communication methods (e.g., terrestrial broadcasting, cellular services, IPTV).

NOTE 1 – [b-TR-FG DR&NRR] presents a number of case studies of the performance of public telecommunication systems in recent disasters.

A variety of access methods gives an opportunity to fill gaps in individual information literacy and accessibility (e.g., an aged person may not be familiar with bi-directional Internet services such as social network services).

Digital signage (DS) services, which are usually provided as a method of presentation in public areas, are ideal for supporting disaster information services. A chief characteristic of DS services is the flexibility for selecting and controlling content delivery according to service timing and the location of the DS terminal device. Large DS screens are commonly set in public places, which as such are useful as a means to deliver announcements in disaster situations.

DS services deal with various aspects of disaster information: to provide early warning to lessen damage caused by disasters; to give up-to-date reports on disaster conditions; to provide the status of public infrastructure in and around affected areas; to give guidance on evacuation routes to shelters; and to report on the safety of victims. That is, DS services are expected to continuously provide disaster-relevant information over a period of time: before disasters, after disasters, in the restoration phase (i.e., an early stage of disaster recovery), and in the reconstruction phase (i.e., a later stage of disaster recovery). Hence, DS terminal devices may be also installed in locations serving as potential evacuation shelters/places.

Classifying service locations in times of disaster is necessary because the content may be altered depending on audience location, which can significantly relate to the degree of damage from the disaster.

The following types of service locations can be assumed for DS services at or during a disaster:

- in shelters, where information on the current situation of a disaster and announcements from the local government can be delivered to evacuees;
- in places close to residential areas, where information on disaster situations and on evacuation details can be delivered to terminal devices and targeted to people living in those areas;
- in public places, where information on disaster situations and on evacuation plans can be delivered to persons using public facilities;
- in tourist resorts, where information on disaster situations and on evacuation plans can be delivered to tourists;
- at work places, where information on disaster situations and on evacuation plans can be delivered to employees;
- on roads, where information on disaster situations and on evacuation plans can be delivered to persons in cars.

NOTE 2 – [b-ETSI TS 102 182] introduces some service scenarios in emergency telecommunications. The scenarios include a service to citizens in their own dwelling; this Recommendation especially pays attention, however, to outside-the-home services in public spaces including evacuation shelters/places.

In addition, it is useful to examine the requirements of DS services during disasters from four aspects: ensuring credibility of the information itself; scalability of data delivery; swiftness of data handling and availability of DS systems. Examples of these four aspects are as follows:

1) credibility: establishment of data flows from authorities to audience, ensuring security through data transport;
2) scalability: selection and grouping of DS terminal devices, usage of common information delivery platforms and multilingual support;
3) swiftness: preparation of data formats and presentation layouts for disaster information services, establishment of work flows for data handling;

   NOTE 3 – It is very possible that sudden surges in streaming video access and other rich content will cause congestion. Measures to counter expected traffic congestion in a disaster situation should also be taken into account; however, details are for further study;
4) availability: consideration of a DS terminal device specification that has a certain degree of resistance that enables it to withstand predicted disaster situations during and after the disaster, including the possibility of remote operation.

Requirements on robustness, resilience and related aspects of ICT systems and services are items for further study. Damage to utility infrastructures caused by a huge disaster can affect daily life and businesses in wide areas. Typical types of damage of ICT systems are:

- direct damage (e.g., destruction of aerial cables, collapse of telecommunication base or relay stations); and
- indirect damage (e.g., loss of electric power).

An interruption of electric power causes significant disruption as ICT systems, which may not have been damaged by the disaster itself, may become non-functional.

NOTE 4 – When long-term power outages occur, fuel for private electric generators in the affected area may be insufficient. Similarly, batteries may be in short supply [b-MIC Report]. Therefore, it is not an exaggerated specification for a DS terminal device to have a secondary power supply unit in order to maintain services. Reduction of power consumption in DS terminal devices is also an effective measure to mitigate the effect of power outages.

NOTE 5 – A DS terminal device may be equipped with an uninterruptable power supply (UPS) that includes storage batteries and/or a private power generator (e.g., a photovoltaic power generator).

Next, important requirements are derived relative to the gathering and delivery of the information. Figure 6-1 illustrates an image of disaster information services provided via DS platforms that aggregates information on disaster and evacuation plans from multiple information sources and delivers this information to various DS terminal devices. Details of the information should be processed according to the requests or the needs of the audience. For example, evacuees may request information about the nearest evacuation shelter or its location information.

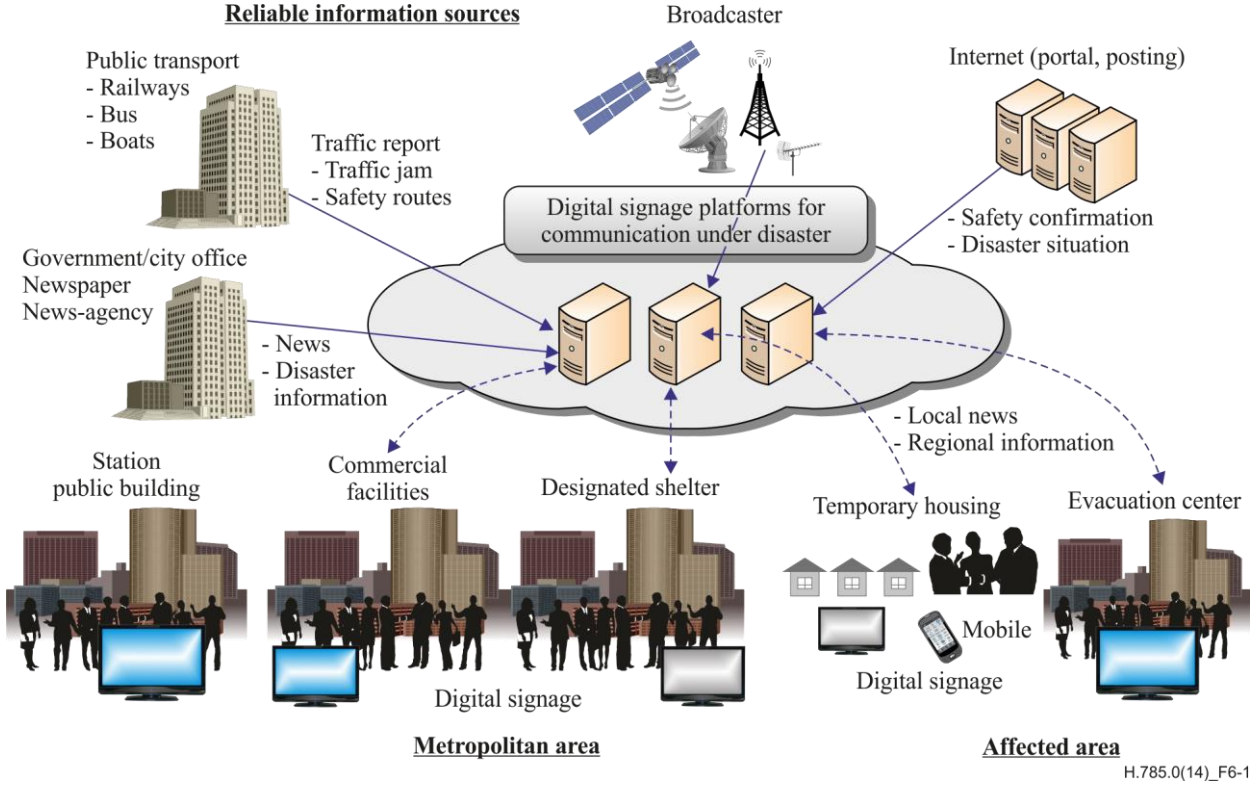

Figure 6-1 – A model of emergency information deliveries (as per [ITU-T H.780])

A deployment of this sort of service platform has several merits for treating disaster information:

– the audience can accept the information anywhere and anytime through the diverse means of communications to which the audience is accustomed to;

– if the platform provides a functionality that can transform/transcode original data generated by the information source to diverse media data formats, then the workload of information sources is decreased and the data can be quickly delivered;

– disaster prevention, recovery actions and their planning can be conducted efficiently because of information sharing amongst public organizations.

Details of information flows are provided in clause 6.2.

6.2 Consideration on content of disaster information

There are two types of information in terms of changeability depending on the disaster situation:

1) live information: news on a disaster, evacuation orders, traffic status, safety of victims, etc.;

2) static information: evacuation routes, maps, contact points for help, etc.

Organizations doing work in disaster information services should prepare static information in advance of predictable disasters. There are a variety of information sources relevant to digital signage services; therefore, reliability and controllability of information are important points for treating live information. Standard routines on handling both live and static information among organizations should be carefully examined and established in advance.

According to the timeline of the disaster (e.g., before, at or during the disaster, or in the restoration or reconstruction stages), the content of disaster information in digital signage services can be categorized as follows:

– Early warning to prevent or lessen damages:

  Early warning services provide advanced notice of a disaster to lessen or avoid damage of the coming disaster.

  NOTE 1 – [b-UNISDR terms] defines that an early warning system is a set of capacities needed to generate and disseminate timely and meaningful alert information to enable individuals, communities and organizations threatened by a hazard to prepare for and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

  NOTE 2 – To some extent, modern technology can predict a disaster before it causes harm to humans. For example, an earthquake generates primary waves (P-waves) and secondary waves (S-waves) simultaneously: P-waves run faster than S-waves, and P-waves cause less damage than S-waves. The effectiveness of earthquake early warning systems therefore, depends on the accuracy of detection of P-waves.

– Reporting disaster situations by the minute:

  Victims wish to receive the latest information on their situation in time of a disaster, such as current status, rescue actions, relief supply delivery, etc.

– Announcements of evacuation plans comprised of information such as traffic situations and evacuation shelters/locations:

  Information on evacuation shelters/places/routes is important. Traffic information is required to consider any required rerouting for evacuation and transportation of aid and supplies. Remote areas that are not affected directly can suffer from electric power outages or water disconnection. Especially in metropolitan areas, there is a high possibility that a large majority of commuters may be unable to return home due to such indirect effects; therefore, evacuation plans under several disaster situations should be considered in advance. Victims also wish to know how to obtain supplies.

– Safety confirmation for victims:

  Confirmation of the safety of friends and family members is highly sought after information. Information services should provide the communication between these individuals even under heavy traffic congestion times or during shortage of network capacity.

It is also important to prepare a framework for disaster information services based on the varying levels of damage because people in safe areas might be affected remotely because of huge damage on social infrastructures (e.g., electric power, gas and water). Damaged areas can be categorized as follows:

– disaster area: area where a disaster affects people's life;

– slight/mild disaster area: area where people can continue normal life in the aftermath of a disaster;

– non-disaster area: area where people are not directly involved in a disaster.

Paying attention to disaster response, showing the following types of content to an audience at or during a disaster should be at least considered:

– General information on the disaster:

  When a large-scale disaster occurs, it is necessary to grasp the whole situation of the disaster. In this case, it is better to provide official or authorized information such as government announcements.

– Information on public infrastructure:

  Specific information should be provided to locations where people directly or indirectly affected gather, e.g., to convey traffic information and damage situation around the locations.

– Information on specific facilities:

  Information should be provided to facilities where DS terminal devices are installed: evacuation routes; announcements to cancel events; special support announcements (e.g., handing out blankets for those who have difficulty returning home), etc.

Table 6-1 shows a mapping of disaster information services from the viewpoint of timeline and spatial relations of a disaster.

Table 6-1 – Examples of disaster information provided by DS services

	Timeline			
Location	**Before disaster**	**At or during disaster**	**Restoration phase**	**Reconstruction phase** (Note 1)
Disaster area	Early warning: Information on evacuation plan	Information on: – evacuation – disaster (local/national)	Information on: – safety confirmation – contact points of public/private support	(Note 2)
Slight/ mild disaster area	Early warning: Information on evacuation plan	Information on: – disaster (local/national) – traffic – return home/temporary accommodations	Information on: – local infrastructure (e.g., traffic ban, power cut, water outage, public health) – prevention of rumour	(Note 2)
Non-disaster area	Information on evacuation plan prepared	Information on disaster (national)	Appeals to support victims (e.g., donations, volunteers)	(Note 2)
NOTE 1 – The reconstruction phase is assumed to start when there is no major risk of life. NOTE 2 – The effectiveness of DS needs to be further studied. It may be expected that DS services be used as tools for information sharing amongst affected and non-affected people.				

ITU-T/ITU-R and other standards development organizations have studied standardization of early warning in social infrastructures such as digital broadcasting and mobile phone services.

NOTE 3 – [b-ITU-R BT.1774-1] provides characteristics of satellite and terrestrial broadcasting systems used for disaster mitigation and relief operations, and [b-ETSI TS 22 268] describes requirements of public warning systems over cellular phone networks. [b-ITU-T H.740] shows a framework for application event handling which includes emergency alert for IPTV services.

Safety confirmation services are also required to take into account scalability, reliability, and bi-directional behaviours of communication services like social infrastructure. These two types of content in DS services are treated mainly by means of linking with other independent early warning systems and safety confirmation systems rather than by a DS system alone. On the other hand, DS services can separately provide effective measures to disseminate other types of content: prepared evacuation plans, reporting disaster information and announcement of regional information.

Finally, another aspect of content is considered. At or during large-scale disasters, sudden surges in the use of streaming video and other rich content as well as large amount of voice calls for safety confirmation will substantially interfere with all IP traffic. DS services usually use rich content like high-definition video. If the content is delivered during or even after a disaster, the altered data format or the data itself should be considered in advance.

NOTE 4 – Examples of expected methods are replacement of large volume data with small volume data, the usage of pre-stored graphics or representations such as scalable vector graphics (SVG) [b-W3C SVG 1.1]).

If disaster information is planned to be delivered to a multitude of differing mobile terminal devices, it is also important to study methods to put services into practice.

NOTE 5 – Content adaptation is the technology for converting formats of content in order to adapt content to device capabilities. The technology is especially effective on mobile terminal devices because of their limited capabilities such as computational power, memory, and screen size. Content adaptation provides a way of one source, multi-use without preparation of content to fit each kind of device.

NOTE 6 – Profile management of DS terminal devices may be key to handling unspecified kinds of DS terminal devices. Details are for further study.

6.3 Flows of disaster information

Flows of information can be classified from the viewpoints of information resources:

- straightforward delivery: from public information sources to audience via DS services;
- indirect delivery: from public information sources to audience through intermediate processes, which may select and convert data;
- information sharing: from individual information sources to audiences.

Public information sources include national/local governments and public agencies (e.g., traffic agency, meteorological agency), public utilities (e.g., electric power, transportation), and news organizations, which conduct on-the-ground reporting activities. On the other hand, individual information is created and registered by an individual person (e.g., the usage of social networking services on the Internet).

This Recommendation focuses on the provision of information coming from reliable public information sources.

The following diagrams show basic data flows of disaster information from a public information source to audience.

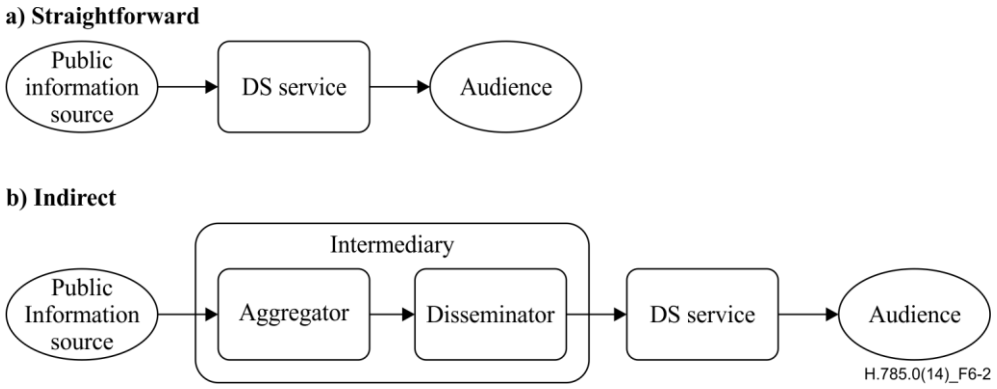

Figure 6-2 – Flow models of emergency information

The intermediary in Figure 6-2 contains two functional entities: an aggregator that gathers disaster information from multiple information sources; a disseminator that sends the information to a large number of people through various communication methods. For example, a government warning system functioning as an aggregator gathers information relevant to disaster, and a disseminator (e.g., a news organization) delivers the information to the audience by simultaneously using a wide variety of communication channels (such as broadcasting, mobile networks and DS services).

NOTE 1 – Figure 6-2 assumes the platform contains both an aggregator function and a disseminator function.

When communication facilities of a DS system suffer massive damage from a disaster, indirect delivery cannot be pursued (e.g., destruction of underground cables or malfunctioning of communication equipment). In cases such as these, DS services may quickly change from indirect delivery to straightforward delivery, if possible.

Typical information delivery methods assumed according to [ITU-T H.780] are as follows:

– Push mode:
  - commercial DS servers deliver the information to DS terminal devices;
  - disaster-service-specific information servers, which are administrated by public agencies, deliver the information to DS terminal devices;

– Pull mode:
  - DS terminal devices request the information directly from commercial/official DS servers.

6.4 Types of DS terminal devices

Various types of terminal devices can be used as digital signage terminal devices for disaster information services. See [ITU-T H.780].

7 Requirements

When digital signage systems provide disaster information services, requirements of [ITU-T H.780] are superseded by this clause.

7.1 General

This clause describes general requirements of DS systems providing disaster information services.

– When a government/public agency establishes an official guideline for providing disaster information services, DS systems are required to align with the guideline.

NOTE 1 – See [b-ITU-T E.107].

NOTE 2 – The guideline may contain levels of emergency, sample texts for emergency messages and official scripts for presentation, etc.

– When a government/public agency establishes an official criterion for the installation of DS terminal devices for disasters, DS systems are required to obey the criterion.

NOTE 3 – The criterion depends on predictable disaster situations such as waterproofing, earthquake-resistance, etc.

– When DS systems support early warning services, the systems are required to communicate with alerting agencies.

NOTE 4 – A national broadcasting service, which has an infrastructure for public warning, is a good candidate in which to be connected as an alert agency [b-ITU-R BT.1774-1].

– DS systems are recommended to be prepared against the outcome of a disaster from the viewpoint of hardware issues (e.g., spare parts, emergency power supply) and software issues (e.g., provisioning of an operation manual, situational emergency training).

NOTE 5 – See [b-ITU-T E.106].

NOTE 6 – Power outages are a critical issue for ICT systems. The preparation against a power outage includes the usage of electric facilities being available in the locations of the terminal devices and the displays.

– DS systems, when displays are installed in public spaces, are recommended to immediately provide emergency alert information in the case of a disaster (e.g., earthquakes and weather hazards).

NOTE 7 – See [ITU-T H.780].

– DS systems are recommended to use established international standards on disaster information services.

NOTE 8 – There are several well-known multimedia data format standards. [ITU-T X.1303 *bis*] specifies generic message formats for alerting services. Appendix II of [ITU-T H.780] introduces video/audio formats. Also, [b-ITU-T H.265] can be used as video coding.

– DS systems are recommended to ensure interoperability according to international guidelines in times of multi-national disaster (e.g., when international traffic can be affected at or during disaster in a distant area).

NOTE 9 – See [b-ITU-T E.106].

– DS systems are recommended to rotate the presentation of disaster information to the audience during a predetermined period.

– DS systems are recommended to support multiple communication interfaces.

NOTE 10 – For example, if landline facilities in affected areas suffer huge damage, it is expected that telecommunications carriers provide temporary wireless equipment for DS systems.

– DS systems are recommended to regularly announce that DS terminal devices of the services will provide disaster information when disasters happen.

NOTE 11 – See [b-UNISDR HFA].

– DS systems are recommended to regularly show evacuation plans of the places from where individual DS terminal devices resides.

NOTE 12 – See [b-UNISDR HFA].

– DS systems are recommended to be able to stop delivery and/or presentation of the information in order to avoid confusion based on some reasons (e.g., delay, incorrect information).

NOTE 13 – Key resources for handling disaster information services are system operators, equipment, electrical power, networks and contents. The lack of resources can cause trouble with the services. Especially, in the case that a service provider (e.g., a public transportation or a large-scale commercial facility) plans to gather and deliver disaster information, if a pre-determined system cannot be fully realized, the information should not be dealt with. A style of information flow like this is involved in "straight forward delivery" described in clause 6.3.

NOTE 14 – Clause 7.2 describes a requirement for cancellation of presentation of contents.

– If DS services use disaster information from external sources, DS systems are recommended to show the latest information in the sources.

– DS systems are recommended to update disaster information according to predetermined renewal periods to be used in the case of disasters.

7.2 Operational management

This clause describes operational requirements of DS systems providing disaster information services.

– DS systems are required to have the ability to switch presentation of normal content to that of emergency content at or during a disaster, and in a simplified manner, or vice versa.

NOTE 1 – In a general way, it is difficult to change operational modes of systems (e.g., changing configurations from normal mode to emergency mode and vice versa). Details of the operational modes such as timing of alteration are for further study.

NOTE 2 – It is necessary to carefully consider equipping with the functionality to change content automatically because it is assumed that national/local governments request certain content depending on disaster situations.

NOTE 3 – Operators are expected to be busy at or during disaster; therefore, it is important to provide an easy way to switch operational modes.

– DS systems are recommended to have the ability to grasp geographical relations between locations of DS terminal devices and affected areas.

– DS systems are recommended to support remote control functions that enable operations of DS terminal devices from a non-affected area.

– DS systems are recommended to provide the capability to force a cancellation of a specific message and/or data already delivered.

NOTE 4 – [b-ITU-T X.1303 *bis*] prepares a code value "Cancel" of the element "msgType". Implementation details are out of the scope of this Recommendation.

– DS systems are recommended to be equipped with a function to administrate the status of DS terminal devices in times of disasters.

– DS systems, which have multiple streaming channels re-transmitting broadcasting services such as satellite, terrestrial and cable TV services, are recommended to have the ability to select a streaming channel as a disaster information service.

– DS systems having multiple display screens are recommended to have the ability to select the appropriate display screen to show disaster information.

– DS systems can optionally enable DS service providers to use a mechanism to interrupt playing groups of content (e.g., regularly scheduled advertisements and programs) in order to allow for the delivery of alert warning messages and associated emergency messages.

– DS systems can optionally control DS terminal devices remotely as an entire group, as a subgroup, or individually.

NOTE 5 – See clause 8.1.5 of [ITU-T H.780].

– DS systems can optionally have the ability to manage terminal device information (e.g., capabilities of DS terminal devices, status of the devices) by way of receiving information from DS terminal devices.

NOTE 6 – When the systems provide services to unspecified kinds of DS terminal devices or the systems provide services under fluctuating network conditions, this registration method regarding terminal information can be used for content adaptation and/or for adjustment of content delivery [b-ISO/IEC 23009-1].

NOTE 7 – For examples, [b-ETSI TS 102 822-3-3] and [b-ISO/IEC 21000-7] specify details of metadata regarding capabilities of terminal devices.

7.3 Application/delivery

This clause describes requirements on the aspects of applications of DS systems including content delivery abilities.

– DS systems are required to have the ability of delivering disaster information to multiple DS terminal devices according to the proximity to the disaster.

– DS systems delivering real-time content for disaster information services are required to take measures against electric power failures in locations where DS applications are relevant to content delivery installations.

NOTE – Data centres, large-scale commercial facilities and buildings are equipped with electric power sources such as power storage units and generators. The measures against power outages include the installation of servers in these locations.

– DS systems are recommended to have duplication of their facilities for content delivery, which are installed in different places.

– DS systems, when disaster information is expected to be directly provided by operators (i.e., operators aggregate and/or summarize the information), are recommended to have duplex facilities for content creation, which are installed in different places.

– DS systems are recommended to have the ability to create and maintain metadata specific to disaster information services.

– DS systems, when disaster information is expected to be directly provided by operators (i.e., operators aggregate and summarize the information), can optionally have the ability to use templates, which have placeholders to insert text and/or image, to create content in a timely manner.

– DS systems can optionally support multi-vendor terminal devices in an integrated manner.

7.4 Content

This clause describes requirements of DS systems on the aspects of content handling.

– DS systems are required to show the time when disaster information was updated.

NOTE 1 – Development of measures for preventing confusion based on old information should be taken into account. DS systems are recommended to present disaster information in multiple languages according to the assumed language of victims (foreigners in particular).

– DS systems are recommended to treat metadata regarding sources and senders of disaster information.

NOTE 2 – See [ITU-T X.1303 *bis*].

– DS systems are recommended to display clearly the source from which the information originated.

– DS systems can optionally deliver content specific to a disaster to DS terminal devices in advance, and present the content at times of assumed disaster situations.

NOTE 3 – See [b-ETSI TS 102 182].

7.5 Security

This clause describes security requirements of DS systems handling disaster information.

– DS systems are required to prevent unauthorized access to the systems and any associated resources.

– DS systems, when the systems are directly connected to other service systems, are required to provide protection mechanisms for interconnection with non-authorized systems.

– DS systems are recommended to verify the integrity of content in case of receiving disaster information prior to display.

NOTE 1 – See [b-ITU-T Y.2205]. Verification can prevent unauthorized modification, deletion and creation.

– DS systems are recommended to establish secure channels with the sources of disaster information.

NOTE 2 – Transport layer security (TLS) [b-IETF RFC 2246] is one of many standards addressing secure communications.

– DS systems can optionally use digital signature schemes for preventing modification of disaster information during transmission.

NOTE 3 – Pretty good privacy (PGP) [b-IETF RFC 4880] and Secure/Multipurpose Internet Mail Extensions (S/MIME) [b-IETF RFC 5751] are well-known standards relevant to digital signatures.

7.6 Network

Continuity of information services in damaged areas depends in a large part on disaster relief and network resilience, which is the ability to provide and maintain an acceptable level of service in the face of fault situations (e.g., re-routing in the case of troubles of network facilities in a relay point).

NOTE – ITU-T has studied emergency telecommunications service (ETS); requirements; technical specifications on ETS over NGN are described in [b-ITU-T Y.2201], [b-ITU-T Y.2205] and [b-ITU-T Y.2705]. These requirements and specifications include essential network requirements of disaster information services, and it is better to provide disaster information services over networks fulfilling generic requirements.

– When DS services deliver information to broad areas, DS systems are required to provide services over networks that have abilities of disaster relief and network resilience (e.g., public networks provided by telecommunications carriers).

7.7 Terminal device/display

This clause describes requirements of DS terminal devices.

– DS terminal devices are recommended to alter presentation methods according to emergency levels/categories or importance of content (e.g., overlapping disaster information by using marquee text).

– DS terminal devices can optionally have the ability to receive information other than from IP networks (e.g., receive terrestrial broadcasting directly).

– DS terminal devices can optionally have light adaptable capabilities to display information regarding disaster events during electrical power outages (e.g., display information regarding evacuation areas/shelters/routes information).

NOTE 1 – Light adaptable capabilities have the following characteristics. DS terminal devices in very dark or very bright environments can automatically adjust their brightness in order to help people easily see the content regarding the disaster. If the DS terminal device is in an electrical power outage situation, the display can show the latest disaster information for a certain period of time.

- Outdoor DS terminal devices can be optionally equipped with their own power supply units consisting power storage and/or generators.
- DS terminal devices can optionally have the capability to recognize a disaster situation (e.g., temperature change during fire) through various sensing devices and deliver such information to the digital signage server.
- DS terminal devices can optionally have the capability to interact with each other by means of direct communication methods among terminal devices in order to share disaster information.

  NOTE 2 – In case of network failures in times of disasters, residents in the affected area need to share information. Alternative communication methods implemented in DS terminal devices such as radio frequency identification (RFID) or near field communication (NFC) can be used [b-ISO/IEC 18092].

- DS terminal devices can optionally manage and transmit their own profile information, including static information (e.g., identification of terminal device, terminal capabilities) and/or dynamic information (e.g., terminal status) of the devices, to device management functionality.

7.8 Accessibility requirements

This clause describes accessibility requirements of DS systems including DS terminal devices.

- DS terminal devices, applications and content for disaster information services are recommended to be designed using principles of universal design.

  NOTE 1 – Important disabilities relevant to universal design include hearing, sight, aging and cognitive disabilities, lack of controllability of man-machine interfaces and difficulty of use of terminal devices [b-ITU-R BT.2207-2].

  NOTE 2 – See [b-ITU-T F.790].

- DS terminal devices can optionally have specific presentation functionality for disaster information for those who need accessibility support in times of a disaster. (e.g., narration functionality for a person who is visually impaired, sign language functionality for a hearing-impaired person or translation for foreigners).

  NOTE 3 – Some accessible broadcast service technologies may be applicable to digital signage services (e.g., speech rate conversion, real-time closed-captioning) [b-ITU-R BT.2207-2].

- DS terminal devices can optionally have accessible means related to emergency calls and confirmation of personal safety for those who needs accessibility support in times of disaster (e.g., voice recognition functionality for a person who is visually impaired or sign language (motion, gesture, etc.) recognition functionality for a hearing-impaired person).

Appendix I

A sample workflow in disaster situations

(This appendix does not form an integral part of this Recommendation.)

There are some checkpoints when disaster information is provided over digital signage: readiness of services, preparedness of content, returning to normal operation etc. When service environments, including human resources, are not fully ready, stopping delivery of disaster information services should be considered because the information may have negative impact on human lives.

The following steps are assumed in the workflow displayed in Figure I.1:

1) Environment checks: readiness of entire service resources should be checked before starting the services. Basic check points are: sufficient number of operational staff; network connections; electric power; and conditions of the network/computer equipment;

2) Content checking: content and relevant data are updated and sent to a digital signage system. The content and data are provided by reliable sources such as governments or broadcasters;

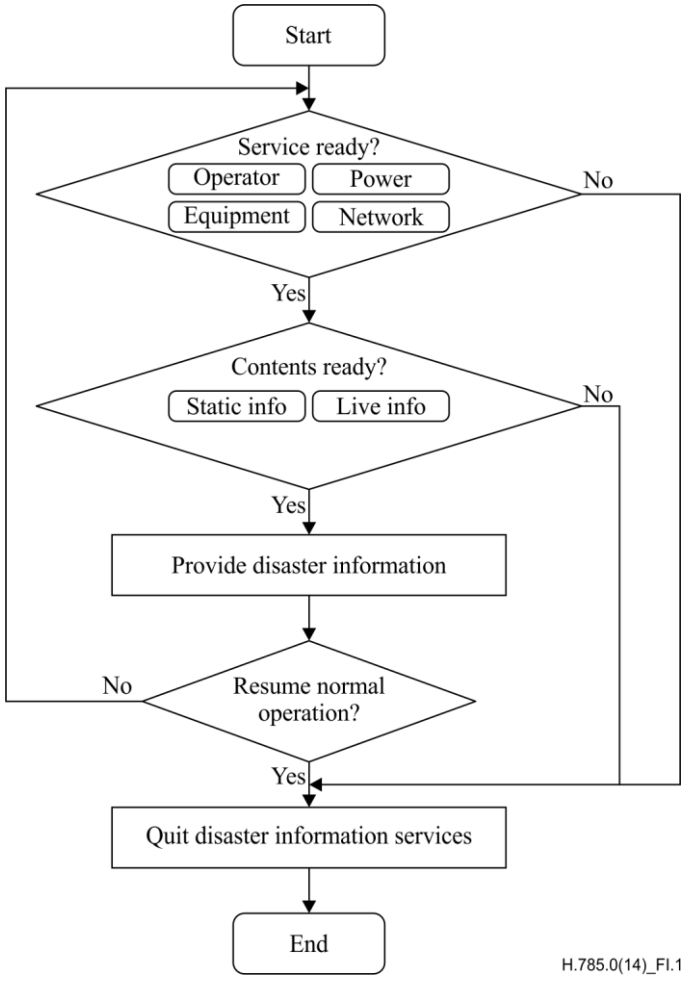

Figure I.1 – Sample flow of operations of disaster information services

3) Content delivery: content is sent to DS terminal devices;

4) Situational decision: the digital signage service can resume normal services when disasters are considered to have calmed or ended;

5) Service termination: disaster information services are stopped when pre-conditions are not fully ready or when disasters has ended.

Reliability of the information regarding readiness of content is an item for further study. It is generally desirable that information regarding a disaster is provided by reliable sources such as governments/public agencies On the other hand, from the point of view of swiftness of evacuation and effectiveness of information limited in a narrower area, information from individuals is also useful in disaster situations.

Appendix II

General overview of terminology based on the United Nations International Strategy for Disaster Reduction

(This appendix does not form an integral part of this Recommendation.)

An overview of terminology used to describe disasters and hazards is useful in order to develop a common view to help show the variety of areas where digital signage services may be applicable to disaster information services.

One well-known concept in disasters is "Natural disasters are the consequences or effects of natural hazards. They represent a serious breakdown in sustainability and disruption of economic and social progress" [b-UNESCO]. In this way, the meaning of disasters and hazards is different.

United Nations International Strategy for Disaster Reduction (UNISDR) defines the term "disaster" based on the following concept [b-UNISDR terms]:

> ***[Disaster]****: A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.*
>
> *NOTE – Disasters are often described as a result of the combinations of: the exposure of a hazard; conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative sequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.*

Natural hazards are naturally-occurring physical phenomena caused either by the rapid or slow onset events having atmospheric, geologic and hydrologic origins on solar, global, regional, national and local scales. They include earthquakes, volcanic eruptions, landslides, tsunamis, floods and drought [b-UNESCO].

On the other hand, [b-UNISDR terms] uses a more general definition of "hazard" including aspects concerning human-factors as follows:

> ***[Hazard]****: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.*

A classification of hazard according to [b-UNISDR terms] is as found in Table II.1.

When digital signage systems for disaster information services are deployed, appropriate information sources should be selected depending on types of hazards mentioned-above.

For instance, common alerting protocol (CAP 1.2) [ITU-T X.1303 *bis*], which standardizes a general message format for exchanging all-hazard emergency alerts and pubic warning over network, has already prepared to an element "category" to fit with these categorization. For example, code values of the element include "Geo": Geophysical (e.g., landslide); "Met": meteorological (e.g., flood); "CBRNE": Chemical, Biological, Radiological, Nuclear or High-Yield Explosive threat of attack. [b-ITU-T H.740] also introduces a use-case of CAP specifications for emergency notifications.

Table II.1 – Hazard classification

Type	Description	Examples
Biological hazard	Process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic microorganism, toxins and bioactive substances that may cause serious damage.	Outbreaks of epidemic diseases, plant or animal contagion, insect or other animal plagues and infestations.
Geological hazard	Geological process or phenomenon that may cause serious damage.	Earthquakes, volcanic activity and emissions, and related geophysical processes such as mass movements, landslides, rockslides, surface collapses and debris or mud flows. NOTE – Tsunamis are difficult to categorize; however, they are essentially an oceanic process that is manifested as a coastal water-related hazard.
Hydrometeorological hazard	Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause serious damage.	Tropical cyclones (a.k.a. typhoons and hurricanes), thunderstorms, hailstorm, tornados, blizzards, heavy snowfall, avalanches, coastal storm surges, floods including flash floods, drought, heat-waves and cold-spells.
Socio-natural hazard	The phenomenon of increased occurrence of certain geophysical and hydrometeorological hazard events that arise from the interaction of natural hazards with overexploited or degraded land and environmental resources. NOTE 1 – This term is used for the circumstances where human activity is increased the occurrence of certain hazards beyond their natural probabilities. NOTE 2 – This is an emerging new concept that is not in widespread use but is of growing professional relevance.	–
Technological hazard	A hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities that may cause serious damage.	Industrial pollution, nuclear radiation, toxic waste, dam failures, transport accidents, factory explosions, fires, and chemical spills.

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