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IPTV multimedia services and applications for IPTV – Digital Signage

Digital signage: Service requirements and a reference model on information services in public places via an interoperable service platform

Recommendation ITU-T H.785.1

ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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Recommendation ITU-T H.785.1

Digital signage: Service requirements and a reference model on information services in public places via an interoperable service platform

Summary

Digital signage (DS) services treat information of relatively common interest. Audiences in public places are typical targets of DS services. An interoperable service platform for DS services plays a key role for content dissemination to large numbers of DS terminal devices.

Recommendation ITU-T H.785.1 addresses high-level requirements, a reference model, push-based distribution methods and relevant metadata of DS services in public places via the interoperable service platform. This Recommendation is expected to enhance interoperability for DS services in public places for efficient and effective system operation.

History

Edition	Recommendation	Approval	Study Group	Unique ID[*]
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Keywords

Digital signage, distribution method, interoperable service platform, metadata, public place, reference model, requirement.

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Digital signage: Service requirements and a reference model on information services in public places via an interoperable service platform

1   Scope

This Recommendation addresses high-level requirements, a reference model, push-based distribution methods and relevant metadata of digital signage (DS) services in public places via an interoperable service platform. This Recommendation is expected to enhance interoperability for DS services in public places for efficient and effective system operation.

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*.

[ITU-T H.781]   Recommendation ITU-T H.781 (2015), *Digital signage: Functional architecture*.

[ITU-T H.782]   Recommendation ITU-T H.782 (2018), *Digital signage: Metadata*.

[ITU-T H.785.0]   Recommendation ITU-T H.785.0 (2014), *Digital signage: Requirements of disaster information services*.

[ITU-T X.1058]   Recommendation ITU-T X.1058 (2017), *Information technology – Security techniques – Code of practice for personally identifiable information protection*.

[ITU-T X.1303 bis]   Recommendation ITU-T X.1303 bis (2014), *Common alerting protocol (CAP 1.2)*.

[IETF RFC 6455]   IETF Request for Comment 6455 (2011), *The WebSocket Protocol*.

[W3C HTML5]   W3C Recommendation HTML5.2 (2017), *HTML5.2*.

[W3C XML]   W3C Recommendation XML Schema Part 2 (2004), *XML Schema Part 2: Datatypes Second Edition*.

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   availability [b-ISO/IEC 27000]: Property of being accessible and usable upon demand by an authorized entity.

3.1.3 cloud computing [b-ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

NOTE – Examples of resources include servers, operating systems, networks, software, applications, and storage equipment.

3.1.4 cloud service [b-ITU-T Y.3500]: One or more capabilities offered via **cloud computing** (3.1.3) invoked using a defined interface.

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

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

3.1.6 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.

3.1.7 confidentiality [b-ISO/IEC 27000]: Property that information is not made available or disclosed to unauthorized individuals, entities, or processes.

3.1.8 distribution [b-ITU-T Y.1910]: Sending the content to appropriate intermediate locations to enable subsequent delivery.

3.1.9 delivery [ITU-T H.780]: Sending contents to terminal devices.

3.1.10 information security [b-ISO/IEC 27000]: Preservation of **confidentiality** (3.1.7), **integrity** (3.1.11) and **availability** (3.1.2) of information.

NOTE – In addition, other properties, such as authenticity, accountability, non-repudiation, and reliability can also be involved.

3.1.11 integrity [b-ISO/IEC 27000]: Property of accuracy and completeness.

3.1.12 interoperability [b-ITU-T Y.101]: The ability of two or more systems or applications to exchange information and to mutually use the information that has been exchanged.

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

3.1.14 personally identifiable information (PII) [b-ISO 29100]: Any information that (a) can be used to identify the PII principal to whom such information relates, or (b) is or might be directly or indirectly linked to a PII principal.

NOTE – To determine whether a PII principal is identifiable, account should be taken of all the means which can reasonably be used by the privacy stakeholder holding the data, or by any other party, to identify that natural person.

3.1.15 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 may or may not operate a network. A service provider may or may not 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 the end-user.

3.1.16 symbols, pictograms and icons [b-ITU-T E.121]: are graphical representations that convey information with a minimum of reliance on language.

Pictograms are typically said to be simplified pictorial representations, used to guide people and tell them how to achieve a certain goal. Pictograms are, as far as possible, self-explanatory, and require little or no learning on the part of users.

Symbols, on the other hand, are usually defined as abstract representations that stand for something but that require learning on the part of users to take on their meaning.

Symbols and pictograms can be considered to lie at opposite ends of a continuum defined by the degree to which they are pictorial representations of the things they represent. As a practical matter, many of the symbols and pictograms in use today, including many of those found in this Recommendation, lie some distance from either end of that continuum. That is, they may contain some degree of abstraction combined with a degree of pictorial representation.

Icons are similar representations that have become widely used as objects of manipulation in graphical user interfaces for computer applications. They may be entirely abstract, like symbols, or pictorial, like pictograms, or fall at some point between those extremes. The use of this term is growing beyond its origin in computer user interfaces.

In this Recommendation, the terms "symbol", "pictogram" and "icon" will be used as far as possible in the spirit of the definitions given above. However, it must be realized that the choice of one term or the other is, to some considerable degree, arbitrary in many cases. No effort has been made here to adhere strictly to clearly delineated distinctions between these terms, as distinctions have proved impossible to draw reliably.

3.1.17 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.

3.2   Terms defined in this Recommendation

None.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Program Interface
CSC	Cloud Service Customer
CSP	Cloud Service Provider
DS	Digital Signage
HTML	HyperText Markup Language
ICC	Integrated Circuit Card
LAN	Local Area network
PII	Personally Identifiable Information
SaaS	Software as a Service
SLA	Service Level Agreement
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
XML	extensible Markup Language

5   Conventions

In clause 7 of 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.

In clause 9 of this Recommendation:

– The notations for requirement level are M for mandatory and O for optional.

– Element/attribute names in Tables 9-1 and 9-2, which are relevant to content distribution, use lower camel case (i.e., only the first word starts with a lower case letter and each of the following words starts with an upper case letter (e.g., "lowerCamelCase").

– Element/attribute names in Table 9-2, which are metadata of content management, use upper camel case (i.e., every word starts with an upper case letter (e.g., "UpperCamelCase")).

Table 5-1 also shows data types used in this Recommendation and their explanations.

Table 5-1 – Data types used in this Recommendation

Type	Name	Notes/Reference
xs:dateTime	Date and time	Used to specify date and time. The format of dateTime is YYYY-MM-DDThh:mm:ss.s+zzzzzz Defined in [W3C XML].
xs:int	Integer	Used to specify a numeric value without a fractional component. Defined in [W3C XML].
xs:string	String	Used to specify string value which contains characters, line feeds, carriage returns, and tab characters. Defined in [W3C XML].

6 Overview

6.1 Information services in public place

Digital signage (DS) aims to provide information services of relatively common interest. Pedestrians in public places are typical targets of DS services (i.e., audiences of the services).

A public place is a social space that is generally open and accessible to people (i.e., unspecified individuals). Roads including the pavement, public squares, libraries, museums, schools, railway stations, parks and beaches are considered as typical public places. A privately owned public place can be also included in public places if the private area is generally open to the public (e.g., a place owned by a commercial property developer). From this viewpoint, shopping malls, hospitals, theatres and hotel lobbies are categorized as public places as well.

Interoperability generally means that a system can access to and work together with other systems without any restriction. It is necessary to set a minimal guideline for interoperability of public

services, for their effectiveness and efficiency, which are provided by different venders, service providers and content providers.

Study items relating to the interoperability point include but are not limited to the following aspects:

– System aspect: common application program interface (API), service discovery;

– Data aspect: data format, metadata;

– Presentation aspect: colour, intensity, brightness, size, layout, audio, volume, multi-language support for foreign visitors;

NOTE – For references regarding real-time multi-language support, [b-ITU-T F.745] and [b-ITU-T H.625] address requirements and the architecture of network based speech-to-speech translation individually.

– Communication aspect: network interfaces, interactions between DS systems and personal devices including mobile phones;

– Operational aspects: update frequency, treatment in emergencies;

– Security aspects.

In addition, under the current situation wherin global trade, travel and tourism continuously grow, a common method of communication in services in public places using pictograms (i.e., graphic representation) will help both service providers and users, including those with disabilities.

NOTE – Global standards related symbols and pictograms such as [b-ITU-T E.121], [b-ITU-T F.910] and [b-ISO 7001] can be used as references.

6.2 Domain model

This clause describes an overview reference model of DS services via an interoperable service platform in a public place. Figure 6-1 shows an overview of the reference model for the DS services using an interoperable service platform. This Recommendation mainly covers distribution processes where the platform receives contents from a content provider or other business system and sends the contents to DS service operators.

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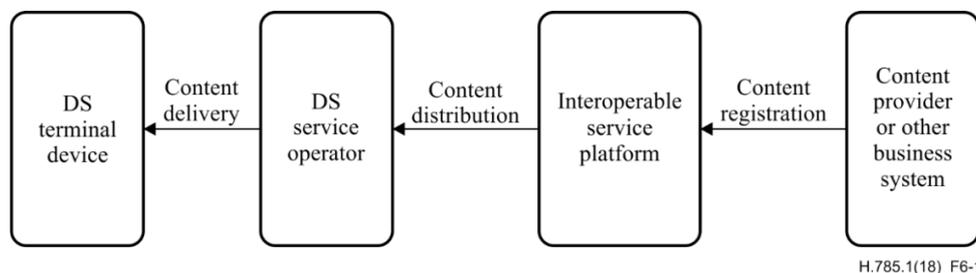
Figure 6-1 – Domain model with interoperable service platform

There are several entities in DS services via the interoperable service platform that include but are not limited to the following:

– **DS terminal device**: The device that displays contents received from a DS service operator and its behaviour is controlled and managed by the DS service operator. In this Recommendation, audience's own devices can be treated as this type of entity;

– **DS service operator**: The business operator that provides DS services. It manages DS terminal devices for displaying contents received from a content provider or other business system via the platform. A DS service provider is a kind of a DS service operator;

– **Interoperable service platform**: The platform performs a role for distribution of contents and pre-processing such as item selection and data format changes of original contents;

–   **Content provider or other business system**: This entity provides contents to the DS service operator via the platform for a particular purpose such as advertisement, information, alerting, etc.

6.3   Types of services

Information services considered as typical DS services for public interest, include but are not limited to:

–   Place information: guidance facilities including direction finding and tourist information;

–   Event notification: announcement of current or forthcoming concerts/events;

–   Live feed: video streaming of local or nationwide events such as concerts and sport events;

–   Warning: traffic accidents information, natural disaster information, crime prevention and sanitation;

–   Advertisement: for commercial purposes;

–   Others: news, time signals and weather forecasts.

Enhancements of the following urban services are also introduced from another viewpoint:

–   Special guidance for foreign visitors, aged persons and persons with disabilities in accordance with universal designs;

NOTE 1 – The appearance of an aging and aged society is a serious universal issue as is the increasing numbers of domestic and foreign visitors (a.k.a. exchange of population).

–   Space decoration for presenting the attractive aspects of a town. For example, a unified design may be applied to outer package cases of DS terminal devices or to displayed contents or to projected images as interior or exterior decollations of buildings in a town.

NOTE 2 – These services can be categorized based on information characteristics: i) general announcements, (news, advertisements), ii) tourism information, public information, etc., iii) interactive information (discovery locations, etc.) and iv) warning/alerting information (disaster information, etc.).

The usage of audience's own terminal devices and personal information can enhance DS services in public places:

–   Cooperative use with the audience's personal devices: a particular DS system enables audiences to browse information on a DS terminal device along with his/her own personal devices according to the recent worldwide popularization of mobile devices such as a smart phone. The personal device can be also receive the information directly from service operators. In the cooperative case, DS services are requested to support various kinds of the personal devices. Acquiring and management of attributes of the personal devices play a key role for this functionality.

–   Information provision associated with a personal property: a particular DS system will provide information based on a personal property (e.g., spoken language, dietary habits). Multi-language support is a typical method for providing contents for foreign visitors. The necessity of this support grows ever bigger in light of recent global trends in human mobility. For example, when a tourist asks something of a DS terminal device, the service support function recognizes his/her spoken language by using the language setting in the tourist's terminal device and automatically translates reply contents into the tourist's language. Management of audience's information is key for the personalization.

NOTE 3 – [b-ITU-T HSTP.DS-UCIS] also introduces several personalized services such as a tourist support based on individual request. Management of audience's information is key for the personalization. Another example is a way finding entrances and exits adapted for physically disabled persons. This can best be achieved by using the disabled person's personal information.

6.4 Interoperable service platform

Content exchange among DS service operators in standard ways are a key feature in DS services in public places. However, an appropriate set of international standards for the data exchange in DS services have not yet been defined. For example, translation of contents is frequently requested before sending or after receiving contents from different systems.

The public interest information presented in public places within a specified local area should be immediately processed by an interoperable service platform for realizing interoperability among different DS systems.

Figure 6-2 shows a model of the interoperable service platform for DS services. The platform mainly executes data handling including content distribution and delivery (a.k.a., dissemination). In addition, the platform can cooperate with other cloud services, which are deemed to be information sources for the services, in order to provide a wide variety of DS services in public places.

The interoperable service platform provides:

i)   Key functionalities: are dissemination (i.e., support for content delivery to a large audience), client management (i.e., audience information management, device management and log management), service management, etc.

ii)   Common interface: gives common methods for accessing the platform and for using the platform functions supporting DS services.

NOTE – In the case of using an interaction among terminal devices, a method linking each terminal device (shown in Figure 6-2 as iii) Link with other devices) is another important study point, but is for further study.
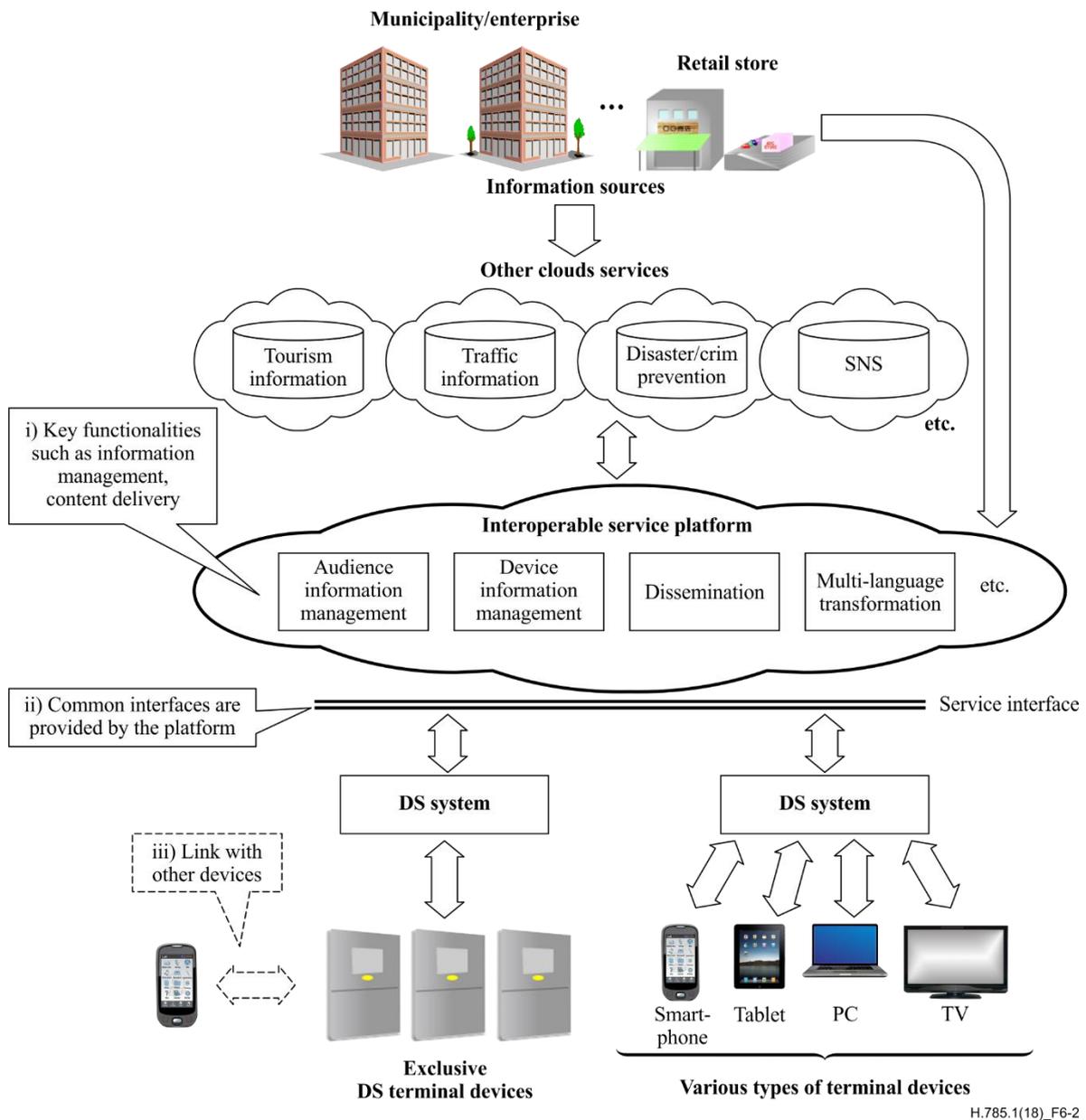
Figure 6-2 – Interoperable service platform for DS services

The dissemination processes are i) important information such as the disaster warning information is registered and stored in the platform, ii) the information is distributed to multiple DS systems by the platform and iii) the systems deliver the information to a large number of DS terminal devices installed in public places. An abstract platform model for dissemination of emergency information is already shown in [ITU-T H.785.0]. Generic functions of DS systems for content delivery are also described in [ITU-T H.780] and [ITU-T H.781].

The interoperable service platform has capabilities for not only distributing contents in the common format (e.g., XML [W3C XML]) but also for converting the content for handling by certain DS systems, which can deal with only their defined content format. For example, a given text in XML format is converted into the form of an image file if the systems are not equipped with a XML parser.

This Recommendation focuses on specifications for the distribution described in clauses 8 and 9.

6.5 Quality of DS services

For considering requirements of information services in public places, knowledge of the necessary qualities of DS services in a broad sense is useful:

NOTE – Some examples of necessary aspects of public services are listed below:

–　　　Reliability: fault tolerant of the systems and services;

–　　　Security: prevention of system and service hacking;

–　　　Visibility: font size, brightness, contrast, duration of presentation and colouring of contents and minimization of optical reflection of display;

–　　　Understandability: multi-language support, consideration of regional expressions or technical terms, avoiding terms that may be difficult to read;

–　　　Health: brightness control, prevention of unnecessary intense blinking and non-healthy patterns;

–　　　Public order and morality: public nature of contents, prevention of uncomfortable feelings and juvenile protection;

–　　　Respect of content rights: respect of privacy rights, portrait rights and copyright;

–　　　Content quality in a narrow sense: attractiveness;

–　　　Image quality: spatial resolution (high-definition), temporal resolution (frame-rate), colour gamut, dynamic range and image size.

7　　Requirements

7.1　　General

This clause describes general requirements of DS services in public places.

–　　　DS systems, which offer disaster information services, are recommended to have the capability to deliver contents in push mode, which means that commercial DS servers send the contents to DS terminal devices.

NOTE – See clauses 6.3 and clause 7.1 of [ITU-T H.785.0].

7.2　　Interoperable service platform

This clause describes requirements of an interoperable service platform.

–　　　The interoperable service platform is required to transform/transcode original contents/data generated by content providers into general formatted contents for enabling DS terminal devices to display the contents.

NOTE 1 – See relevant requirements on the platform in clause 6.1 of [ITU-T H.785.0]. A well-known content format standard is HTML5 [W3C HTML5].

–　　　The interoperable service platform is required to provide content information including locations of contents (i.e., URI/URL) for DS systems by using metadata.

–　　　The interoperable service platform is recommended to provide the latest content information if contents are updated.

NOTE 2 – See clause 6.1 of [ITU-T H.785.0].

7.3　　System

This clause describes requirements of DS systems on the aspects of a system such as common API, service discovery.

–　　　DS systems, which connect to an interoperable service platform to provide dissemination services, are required to have an interface to the interoperable service platform.

–　　　DS systems, which receive contents from the interoperable service platform, are required to deliver the contents to the specified DS terminals according to the delivery rules decided by the content provider and the service operator in advance.

NOTE 1 – See clause 6.1 of [ITU-T H.785.0] regarding scalability.

–   DS systems, which receive contents from an interoperable service platform, are required to have a mechanism to deliver the contents immediately to the DS terminals according to their emergency levels.

NOTE 2 – The usage of push mode is a good candidate for meeting this requirement. See clause 8.3.1 of [ITU-T H.780] and clause 6.1 of [ITU-T H.785.0].

–   DS systems, which support interaction with an audience's own device, are required to provide a way to communicate with the device over a wireless-network.

NOTE 3 – Wireless LAN [b-IEEE 802.11] is easily deployed for this communication.

–   DS systems are recommended to have the capability to acquire audience information via input devices of exclusive DS terminal devices (e.g., touch panel, video capturing) in order to provide personalized services.

–   DS systems can optionally have the capability to acquire audience information from an audience's own personal device in order to provide personalized services.

NOTE 4 – Personal information can be obtained by using other input methods such as communication with a smart phone. Integrated circuit card (ICC) is another way to acquire the information. Change of language or character size, etc., can be assumed to be personalized services.

–   DS systems can optionally have the capability to send contents directly to the audience's own personal devices in order to be presented on the personal devices.

–   DS systems, when they can communicate with audience's own devices, are required to have the capability of service discovery, which provides a way to find services.

NOTE 5 – A captive portal is a well-known technique in Web services. A Web browser is redirected to a specific web page (e.g., a login page). Communications between exclusive DS terminal devices and the audience's own devices are mainly assumed in this context.

7.4   Network communication

This clause describes requirements of DS systems concerning aspects of network communications such as network interfaces and interactions among DS systems and personal terminal devices including mobile phones.

–   DS services are required to provide unspecified large audiences in their service areas with equal and sufficient network connectivity.

7.5   Data

This clause describes requirements of an interoperable platform and DS systems concerning aspects of data handling such as data formats and metadata specifications.

–   An interoperable service platform is required to handle domestic or regional alert standards on data format.

NOTE 1 – See general requirements in clause 7.1 of [ITU-T H.785.0].

–   DS systems are recommended to treat international standards on content formats for interoperability of DS services in public places.

NOTE 2 – Appendix II of [ITU-T H.780] lists candidates of standards on media formats. In addition, the markup language HTML5 can be included as a contents format standard for multimedia presentation applicable to a wide variety of device specifications and/or language usages.

–   DS systems, when contents are directly sent to an audience's own device, are recommended to adapt contents design (e.g., layout, media attributes) to the device's specifications.

NOTE 3 – Refer to the content adaptation use-case in clause 8.10 of [b-ITU-T HSTP.DS-UCIS].

7.6 Presentation

This clause describes requirements of DS systems concerning aspects of contents presentation such as colour, size and layout.

– DS systems are required to have an ability to show contents received from an interoperable service platform on DS terminal devices in the specified geographic areas.

– DS systems are required to have a capability to alter presentation methods according to emergency levels/categories or importance of contents.

NOTE 1 – See clause 7.7 of [ITU-T H.785.0].

– DS systems are required to show disseminated contents according to indicated timing (e.g., immediately present the contents by interrupting the current program, show the contents after the end of the current program.

NOTE 2 – See clause 8.1.5 of [ITU-T H.780].

– DS systems are required to show disseminated contents based on an instructed size and area (e.g., using the whole or part of a display, overlapping contents by the ticker).

– DS systems, are recommended to have the capability to prohibit from presenting expired contents when contents have their expiration date explicitly set.

NOTE 3 – There is a type of DS system that is equipped with a specific contents update function to manage contents expiration.

– DS systems, when the system permits acquiring audience information from audience's own personal devices, can optionally have the capability to alter contents according to the information.

– DS systems, when the system directly sends contents to audience's own personal devices in order to be presented on the personal devices, is required to avoid inconsistency among contents displayed on each of the screens of the devices including exclusive DS terminal devices.

– Contents, which aim to call audience's attention to alert information such as disaster information, are recommended to include a siren sound (e.g., the noise of fire engine siren) and/or voice guidance.

– Contents, which aim to prompt a reminder such as disaster information, are recommended to conform to an official design guideline (e.g., layout, colour scheme, which is the choice of colour for certain purposes and a set of pictograms).

– Designs of pictograms are recommended to be easy to understand and uniformly interpreted among audiences without difference based on country of origin.

NOTE 4 – Refer to clause 5.2 of [b-ITU-T E.121].

7.7 Information security

This clause describes security requirements of DS systems in public places. Personally identifiable information (PII) should be carefully taken into account.

– DS systems are recommended to control personally identifiable information (PII) according to [ITU-T X.1058].

7.8 Operation

This clause describes operational requirements of DS systems in public place such as update frequency and treatment in emergencies.

– DS systems installed within a certain area (e.g., in the same street), regardless of either single vendor or multi vendors, are recommended to have the ability to simultaneously update contents' presentation.

NOTE – Refer to an interruption method described in clause 7.2 of [ITU-T H.785.0]. Another method is to use the same polling period.

7.9   Terminal device

This clause describes requirements of DS terminal devices in public places.

–   DS terminal devices are required to have a function to show the dissemination of contents immediately by interrupting the current program.

NOTE 1 – See clause 8.1.5 of [ITU-T H.780] and clause 7.2 of [ITU-T H.785.0].

–   DS terminal devices are recommended to have a function to resume the last program after the end of interruption.

NOTE 2 – See clause 8.1.5 of [ITU-T H.780].

–   DS terminal devices are recommended to have a function for treating push-mode content delivery in order to show the dissemination of contents immediately.

–   DS terminal devices are recommended to keep full-time connections with DS servers via a network for receiving the notification and the dissemination of contents.

–   DS terminal devices can optionally have the capability to interact with each other by means of direct communication methods among terminal devices.

NOTE 3 – [ITU-T H.785.0] limits use this capability to only sharing disaster information; however, the capability can be used for variety of types of services. Communication between exclusive DS terminal devices and audience's own devices are mainly assumed in this context. Wireless LAN [b-IEEE 802.11] is easily deployed in this communication.

–   DS terminal devices, when the terminal devices can communicate with an audience's own devices, can optionally have the capability to continue a communication in the case of a communication breakdown between server-side equipment and the terminal devices.

NOTE 4 – The requirement level of an exclusive DS terminal device treating disaster information services may be higher. For example, an exclusive DS terminal device may directly send contents to an audience's devices.

–   DS terminal devices, when the terminal devices can communicate with audience's own devices, it can optionally have local storages in order to continue DS services in the case of a communication breakdown between server-side equipment and the terminal devices.

NOTE 5 – The requirement level of an exclusive DS terminal device treating disaster information services may be higher.

7.10   Accessibility

Accessibility requirements of DS systems in public places are for further study.

NOTE – [b-ITU-T F.901], [b-ITU-T F.902], [b-ITU-T F.910] and [b-ITU-T F.921] provide useful information for consideration on accessibility of information services in public places.

8 Data transfer interface

8.1 Interfaces for content dissemination
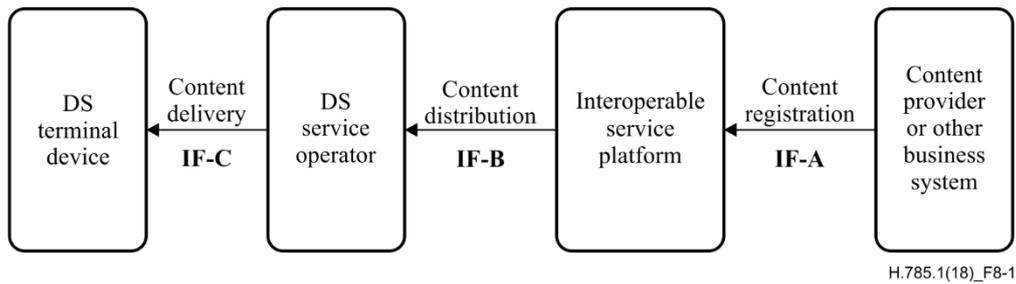
Figure 8-1 – Interfaces between each entity in the reference model

The interfaces between each entity in the domain model described in Figure 8-1 are defined as follows:

– **Interface-A (IF-A)**: The interface that enters the contents from the content provider or other business system to an interoperable service platform;

– **Interface-B (IF-B)**: The interface through which the DS service operator receives notifications and the contents from the interoperable service platform;

– **Interface-C (IF-C)**: The interface with which the DS service operator provides the contents to DS terminal devices.

This Recommendation hereafter describes details of interfaces relevant to the interoperable service platform, IF-A and IF-B.

NOTE – IF-C is the same as the reference point between the DS service operator and DS terminal devices described in [ITU-T H.781] and [ITU-T H.782].

8.2 Interface for content entry (IF-A)

This interface is for sending contents from the content provider or other business system, which include an information provider such as a municipality or an emergency services provider, to the interoperable service platform. Each provider or system provides the public information including urgent information for the interoperable service platform in order to disseminate the information over DS systems in a targeted area related to the information. The interoperable service platform can create/transform the contents into specific formats such as HTML5 [W3C HTML5] based on the received data for displaying on the DS terminal devices.

The interface may provide Web APIs for inputting the data from the content provider or other business system. The specification for sending data is described in Table 8-1.

Table 8-1 – Interface specification of IF-A

Item	Specification
Communication protocol	HTTP
Data Format	XML
Direction	PUSH (content provider or other business system to interoperable platform)

The data flow is shown in Figure 8-2.
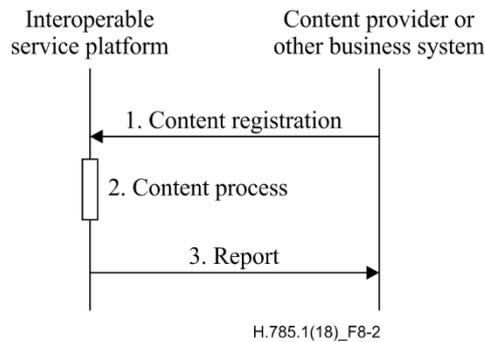
Figure 8-2 – Data flow in IF-A

Step 1: Content provider or other business system enters (i.e., requests registration of) i) the content which is being delivered to the DS terminal devices and ii) the information on delivery areas, emergency level and importance as metadata.

Step 2: An interoperable service platform registers and processes the content and the platform may transform the content into a general format such as HTML5 or into an image adapted to the DS terminal devices.

Step 3: The interoperable service platform reports the result of registration of the content.

8.3 Interface for content distribution (IF-B)

This interface is for notification of dissemination from the interoperable service platform to DS service operators. The data may include the contents for displaying the DS terminal devices and the presentation timing. Considering the DS systems used by the DS service operator, there are PUSH and PULL types of receiving data from the interoperable service platform.

–   PUSH type: the DS service operator can receive the notification immediately when the interoperable service platform prepares the message for the dissemination. The DS system should have the mechanism to receive PUSH data transfer.

–   PULL type: the DS service operator should check the notification of the interoperable service platform by polling it periodically.

The specification sending data is described in Table 8-2.

Data flows of each type are shown in Figures 8-3 and 8-4 respectively.

Table 8-2 – Interface specification of IF-B

| Item	Specification	
	PUSH type	**PULL type**
Communication protocol	WebSocket [IETF RFC 6455]	HTTP
Data Format	XML	XML
Direction	PUSH (interoperable platform to DS service operator)	PULL (DS service operator to interoperable platform)
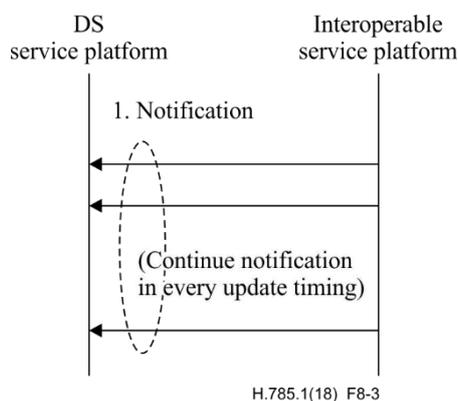
Figure 8-3 – Data flow of PUSH type in IF-B

Step 1: A DS service operator receives the notification from an interoperable service platform at the timing when the dissemination content is registered to the interoperable service platform.
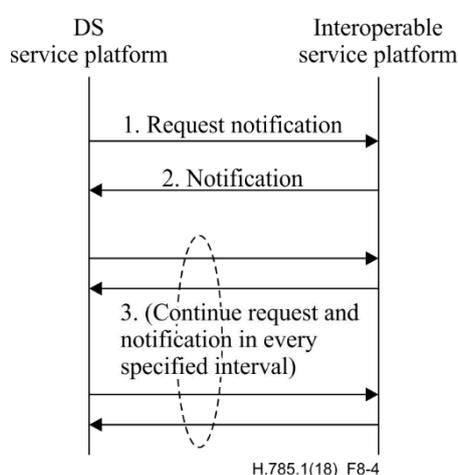

Figure 8-4 – Data flow of PULL type in IF-B

Step 1: A DS service operator requests the notification.

Step 2: This DS service operator receives the notification if the dissemination content is registered to the interoperable service platform.

Step 3: The DS service operator continues to request notification in every specified interval.

9   Metadata

This clause describes an overview of metadata treated between an interoperable service platform and DS service operators.

Types of pertaining element/attribute are assumed to conform to the following simple rules:
–   Time-relevant element/attribute: xs:dateTime;
–   Numerical-relevant or sentinel element/attribute: xs:int;
–   Other element/attribute: xs:string.

NOTE – A major difference between [ITU-T H.782] and this Recommendation is the assumed usage of metadata. Metadata in clause 9 aims to be primarily used between the platform and service operators for content distribution. On the other hand, [ITU-T H.782] aims to be mainly used for content delivery from the service operators to audiences.

9.1   Contents distribution

Metadata in this clause is used for contents distribution between an interoperable service platform and service operators. The term "document" is used for contents for distribution via the platform in order to differentiate from contents for delivery controlled and managed by DS systems.

In this clause, several elements/attributes marked with an asterisk (e.g., xxx *) are in compliance with [ITU-T X.1303 bis].

Table 9-1 – Metadata elements/attributes on contents distribution

Elements/Attributes	Description	Level	Type
distribution ID*	The identifier of the content document distribution	M	xs:string
senderID*	The identifier of the content document distributor	M	xs:string
dataTimeSent*	The time and data of the content document distribution	M	xs:dateTime
distributionStatus*	The code denoting the appropriate usage of the distributed content document	M	xs:string
distributionType*	The code denoting the type of the distributed content document.	M	xs:string
areaName	The text denoting the target area for distribution.	M	xs:string
areaCode	The code denoting the target area for distribution (e.g., postal address).	O	xs:string
contentDescription	The explanatory description of distributed content document.	M	xs:string
additionalContentInfo	The supplementary information for conducting the process of content distribution.	O	xs:string
documentRevision	The revision of the content document.	M	xs:int
documentID	The identifier of the content document.	M	xs:string
category*	The code denoting the category of the subject event of the content document.	M	xs:string
urgency*	The code denoting the urgency of the subject event of the content document.	M	xs:string
severity*	The code denoting the severity of the subject of the content document.	M	xs:string

NOTE 1 – Metadata in Table 9-1 starts with thelower case character distinguished from the other metadata in Table 9-2 used as the envelop data for contents distribution.

NOTE 2 – There is assumed to be two types of identifiers and versions of contents: one is managed by the interoperable service platform (i.e., documentID in this Recommendation) and another is managed by systems of a DS service operator (i.e., contentId [ITU-T H.782]).

9.2   Contents

Metadata in this clause is used for attributes of distributed contents. It is assumed that these metadata are treated by an interoperable service platform.

Table 9-2 – Metadata elements/attributes on contents

Elements/Attributes	Description	Level	Type
Text	The text information of the contents (e.g., Headline text)	M	xs:string
TickerText	The text of the contents for the ticker	O	xs:string
Advertisement	The information whether the contents include advertisement	O	xs:int
Language	The language used for the contents	O	xs:string
Title	The title of the contents	M	xs:string
URI	The URI of the contents	O	xs:string
MimeType	Description of encoding used for the contents	O	xs:string
OfficeName	The name of office of content publisher.	M	xs:string
OrganizationName	The name of organization of content publisher	M	xs:string
CreateDateTime	The date and time of production of the contents	M	xs:dateTime
TargetDateTime	The date and time of publishing the contents to audiences	M	xs:dateTime
ValidDateTime	The date and time of expiration of the contents	O	xs:dateTime
FirstCreateDateTime	The date and time of the first creation of the contents	M	xs:dateTime
ReportDateTime	The date and time of the publication of the contents	M	xs:dateTime
documentID	The identifier of the contents document (See Table 9-1)	M	xs:string

Appendix I

Examples of cloud computing for DS services

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

I.1 Dissemination models by using cloud computing

Details of functionalities for contents dissemination, which deal with public notification, are reviewed in this clause. Generally, information sources for public notification services including disaster warning are managed by governments and/or public agencies (e.g., disaster information is gathered by a meteorological agency). It is expected that original contents are utilized in multiple information services including broadcasting and telecommunication services. The format of the original contents is not entirely suitable for DS services; therefore, contents transformation is usually indispensable and can be offered as cloud computing. The transformation consists of extracting information relevant to service situations and locations and changing of data format and layout of contents, etc.

Figure I.1 depicts one case for contents dissemination over cloud, in which both contents transformation and contents delivery are treated by a cloud service provider. In this case, the cloud service provider may need a relatively large amount of investment.
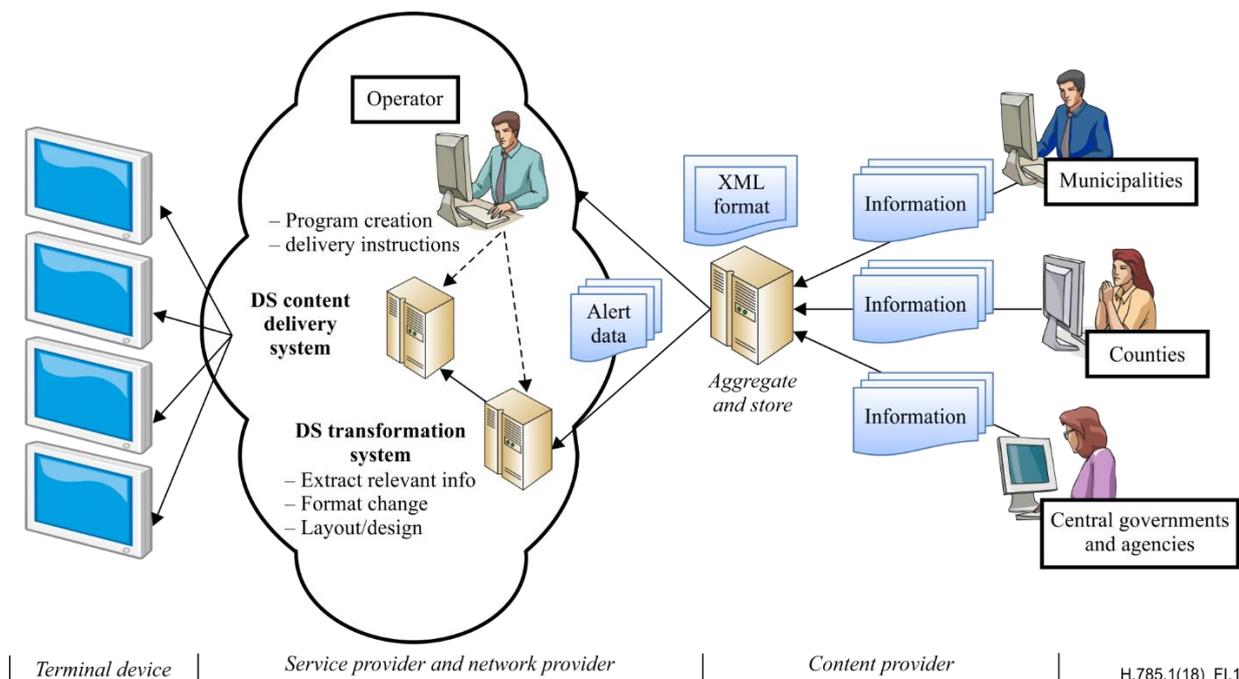

Figure I.1 – A cloud service provides both contents transformation and delivery

Figure I.2 illustrates another case where a cloud service provider deals with only contents transformation. The cloud service provider transforms original contents into specified formats based on specifications of DS systems. In the case of a common alerting service, including disaster alerting for DS, common alerting server functions act as a content transformation system within the cloud service provider. Detailed functional entities within the common alerting server functions have the role of extracting the terminal list for distribution, converting the original content into another format for accessibility and emergency evacuation and managing the playlist schedule and the presentation guideline.

DS providers respectively present formatted contents after receiving. As a matter of course, even in this case, common formats among the service providers should be used in order to enhance interoperability.
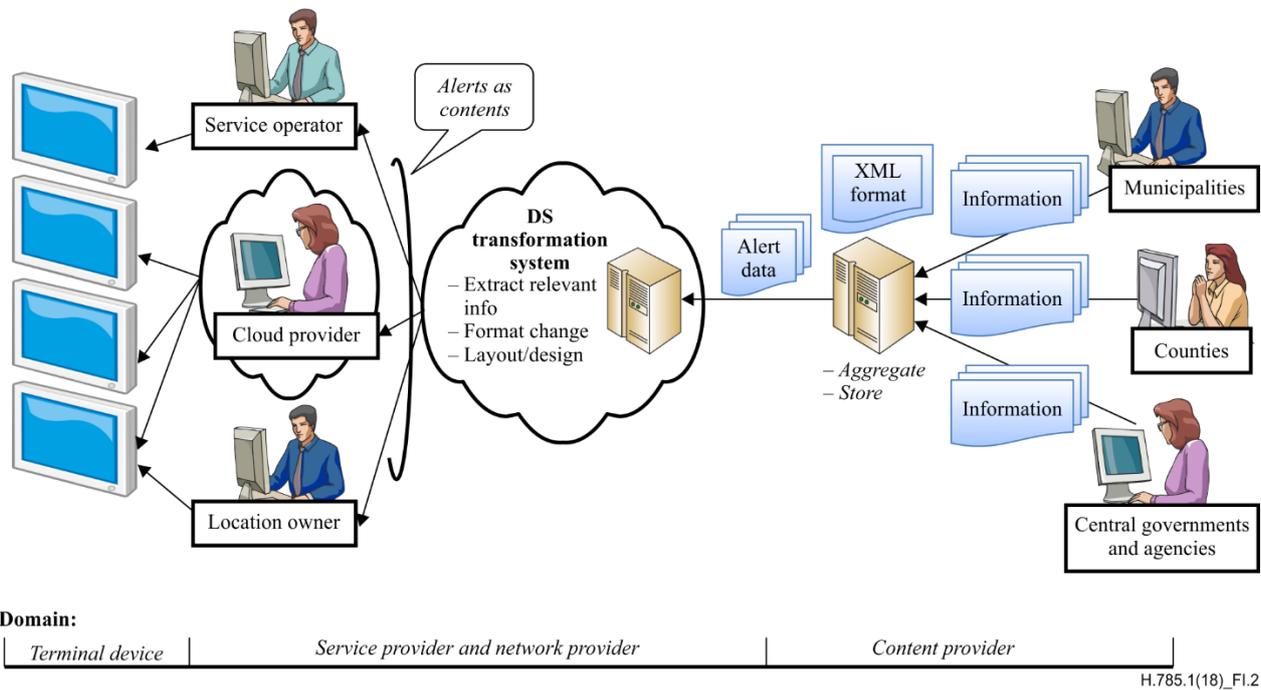

Figure I.2 – A cloud service provides only contents transformation

Appendix II

Introduction of requirements regarding cloud computing for DS services

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

II.1   Requirements on cloud computing

Cloud computing provides a way for easy implementation of a DS service in the form of software as a service (SaaS). It is therefore useful to introduce requirements if the deployment of cloud computing for DS in public places is considered.

[b-ITU-T Y.3501] addresses general requirements on cloud computing and cloud infrastructure, etc. The following requirements are applicable to DS services:

– **Service life-cycle management**: It is required that cloud computing supports automated service provisioning, modification and termination during the service lifecycle.

– **Regulatory aspects**: It is required that all applicable laws and regulations be respected, including those related to privacy protection.

– **Security**: It is required that the cloud computing environment be appropriately secured to protect the interests of all persons and organizations involved in the cloud computing ecosystem.

– **Accounting and charging**: It is recommended that cloud computing supports various accounting and charging models and policies.

– **Efficient service deployment**: It is recommended that cloud computing enables efficient use of resources for service deployment.

– **Interoperability**: It is recommended that cloud computing systems comply with appropriate specifications and/or standards for allowing these systems to work together.

– **Portability**: It is recommended that cloud computing supports the portability of software assets and data of cloud service customers (CSCs) with minimum disruption.

– **Service access**: Cloud computing is recommended to provide CSCs with access to cloud services from a variety of user devices. It is recommended that CSCs be provided with a consistent experience when accessing cloud services from different devices.

– **Service availability, service reliability and quality assurance**: It is recommended that the cloud service provider (CSP) provides end-to-end quality of service assurance, high levels of reliability and continued availability of cloud services according to the service level agreement (SLA) with the CSC.

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