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SERIES J: CABLE NETWORKS AND TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

Cloud-based converged media services for IP and broadcast cable television

Specification of a cloud-based converged media service to support Internet protocol and broadcast cable television – Requirements

Recommendation ITU-T J.1301

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Summary

Recommendation ITU-T J.1301 specifies functional requirements for a cloud-based converged media service (CBCMS) to support Internet protocol (IP) and broadcast cable television (TV). With the development of cloud-native technology, CBCMS can be quickly deployed by cable TV operators. This Recommendation forms part of a series and specifies requirements for function, architecture, interface and security for CBCMSs to support IP and broadcast cable TV.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.1301	2021-01-13	9	11.1002/1000/14585

Keywords

CBCMS, converged media, requirements.

FOREWORD

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Introduction

This Recommendation is part 1 of a multi-part deliverable covering the requirements for cloud-based converged media service to support IP and broadcast cable TV, as identified below:

Part 1: Requirements.

Part 2: System architecture.

Part 3: System specification on collaboration between production media cloud and cable service cloud.

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Specification of a cloud-based converged media service to support Internet protocol and broadcast cable television – Requirements

1 Scope

This Recommendation specifies requirements for cloud-based converged media services (CBCMSs) to support Internet protocol (IP) and broadcast cable television (TV). The CBCMS is intended to be deployed in the service cloud of cable TV operators, which enables rapid innovation and deployment of new services, flexible expansion of online services, smart adaptation of service origins or paths to meet the distribution needs for different terminal types and network status.

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 J.205]   Recommendation ITU-T J.205 (2012), *Requirements for an application control framework using integrated broadcast and broadband digital television.*

[ITU-T J.295]   Recommendation ITU-T J.295 (2012), *Functional requirements for a hybrid cable set-top box.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 infrastructure as a service (IaaS) [b-ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is an infrastructure capabilities type.

3.1.2 platform as a service (PaaS) [b-ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is a platform capabilities type.

3.1.3 software as a service (SaaS) [b-ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is an application capabilities type.

3.1.4 integrated broadcast and broadband (IBB) DTV service [ITU-T J.205]: A service that simultaneously provides an integrated experience of broadcasting and interactivity relating to media content, data and applications from multiple sources, where the interactivity is sometimes associated with broadcasting programmes.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 cloud-based converged media service (CBCMS): A service intended for deployment by cable television operators and to support the requirements of rapid service innovation and deployment, which enables media services to be developed by separate vendors according to standard application programming interfaces, where appropriate.

3.2.2   microservice: An architectural and organizational approach to software development where software is composed of small independent microservices that communicate over well-defined application programming interfaces. Microservice architecture makes applications easier to scale and faster to develop, enabling innovation and accelerating time-to-market for new features.

3.2.3   cloud digital video recorder (DVR): A recorder that saves television (TV) shows in the cloud data centre of a service provider rather than in the DVR or set-top box near the TV. Cloud DVRs enable customers to store more content and record more shows that are broadcast at the same time.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AI	Artificial Intelligence
API	Application Programming Interface
CA	Conditional Access
CBCMS	Cloud-Based Converged Media Service
DevOps	Development and Operations
DRM	Digital Rights Management
DTV	Digital Television
DVB	Digital Video Broadcasting
DVR	Digital Video Recorder
IaaS	Infrastructure as a Service
IBB	Integrated Broadcast and Broadband
PaaS	Platform as a Service
PPV	Pay Per View
QAM	Quadrature Amplitude Modulation
SaaS	Software as a Service
TV	Television
VOD	Video On Demand

5   Conventions

In this Recommendation:

The phrase "**is required to**" indicates a requirement that must be strictly followed and from which no deviation is permitted if conformity to this Recommendation is to be claimed.

The phrase "**is recommended**" indicates a requirement that is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformity.

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The phrase "**can optionally**" indicates 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 or service

provider. Rather, it means the vendor may optionally provide the feature and still claim conformity with this Recommendation.

In the body of this Recommendation and its annexes, the words *shall*, *shall not*, *should*, and *may* sometimes appear, in which case they are to be interpreted, respectively, as *is required to*, *is prohibited from*, *is recommended*, and *can optionally*. The appearance of such phrases or keywords in an appendix or in material explicitly marked as *informative* are to be interpreted as having no normative intent.

6 Overview

CBCMS is a service that provides various capabilities according to practical development requirements, including service abstraction, encapsulation, registration, control and open methods of various services. CBCMS will be deployed by cable TV operators and is intended to support rapid service innovation and deployment of interoperable IP-based cable TV systems. The general architecture of CBCMS is depicted in Figure 1.

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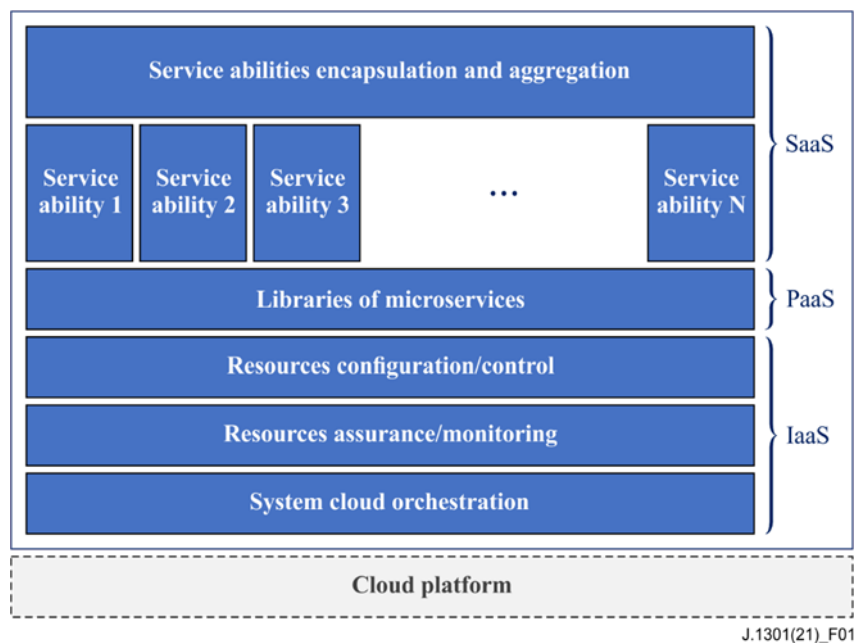
Figure 1 – Cloud-based converged media service general architecture

Based on the cloud platform, the CBCMS has three layers: IaaS, PaaS and SaaS.

The IaaS layer is required to do system cloud orchestration, virtual and physical cloud resources configuration, and assurance.

The PaaS layer is required to provide libraries of CBCMS microservices that implement the key building blocks to be used by CBCMS service abilities.

The SaaS layer is required to be composed of various service abilities that comprise all aspects of the IP-based video service. The SaaS layer also includes service abilities encapsulation and aggregation, which provide a common application programming interface (API) for use by all IP-based video devices.

The details of the standard microservices that comprise the PaaS layer and especially all TV services that are included within the SaaS are under study.

7 General requirements

7.1 Functional requirements

This Recommendation includes IP and broadcast cable TV services known at the time of drafting; however, this Recommendation is a framework that allows new services to be easily added in the future.

7.1.1 Cable digital television service

A CBCMS is required to support playback of the content provided by broadcast digital television (DTV) services as specified in [ITU-T J.295]. See also [b-GB-SEP] and [b-ETSI EN 301 192].

7.1.2 Integrated broadcast and broadband digital television service

A CBCMS is required to support playback of the content provided by IBB DTV services as specified in [ITU-T J.205]. See also [b-ETSI TS 102 809].

7.1.3 Internet protocol linear and time-shifting service

A CBCMS is required to support live and time-shifting TV programming and other video content using the IP.

7.1.4 Video-on-demand service

A CBCMS is required to support playback of the content provided by IP-based video on demand (VOD) and pay-per-view (PPV) services as specified in [ITU-T J.295], and shall support playback of the content provided by IP VOD services based on quadrature amplitude modulation (QAM).

7.1.5 Cloud digital video recorder service

A CBCMS is required to support a cloud DVR that saves TV shows in the cloud data centre of a service provider rather than in the DVR or set-top box near the TV. Cloud DVRs enable customers to store more content and record more shows that are broadcast at the same time.

7.1.6 Service integration

A CBCMS is required to support media services, such as linear, time-shifting, VOD or cloud DVR, with various capabilities according to practical development requirements, including service abstraction, encapsulation, registration and control.

7.1.7 Service adaptation

A CBCMS is required to support service coordination and adaptation to meet distribution needs for different service scenarios (e.g., different terminal types and different network conditions), which allows users to consume content both by terminal devices connected to a digital video broadcasting (DVB) cable distribution network and by terminal devices via an IP network.

7.1.8 Media content integration

A CBCMS is required to support the integration and enhancement of media content resources from different platforms, such as self-media and social media, which provide original material for service innovation.

7.1.9 Media processing

A CBCMS is required to support a variety of media processing tools such as non-linear editing, video rendering, special effects production, and video and audio transcoding, to facilitate media content production, integration and service release.

7.1.10 Media artificial intelligence service

A CBCMS is recommended to support media artificial intelligence (AI) services, such as intelligent processing, identification, analysis and decision making, which enable video tags, video fingerprints, video search, content moderation, etc.

7.1.11 Operating support capabilities

A CBCMS is required to support unified authentication, identity management, authorization management, business management and other back-end support functionalities that enable rapid service deployment with an open capability engine.

7.1.12 Data integration and analysis

A CBCMS is required to support data integration and analysis of services, products, customers, markets, services, management, etc., which assist the service design, deployment, operation and decision-making process.

7.1.13 Security

A CBCMS is required to support security mechanisms, such as content encryption, digital rights management (DRM) and conditional access (CA) and comply with security requirements of systems deployed in the cloud. CBCMS is recommended to support multi-dimensional data analysis to strengthen security.

7.1.14 Scaling

A CBCMS is required to support secure auto-scaling and resource optimization. Each service scales independently.

7.1.15 Test environment

A CBCMS is recommended to support management systems, such as an application development test environment and developer community on an open platform.

7.2 Architecture requirements

The deployment of CBCMS is required to refer to the cloud-native architecture designed as loosely coupled microservices, the resiliency core, lightweight orchestrated containers and agile development and operations (DevOps). Typically, it consists of five layers devoted to: application, ability, infrastructure, management and security.

The application layer provides a high-level architecture listing all converged media services, corresponding functionalities and APIs which fulfil the aforementioned requirements.

The ability layer provides the core capabilities of converged media services. It includes functions such as content aggregation, content processing, content distribution, load balancing, big data, AI and DevOps support.

The infrastructure layer is required to support elastic computing, storage, network and security sources, which are able to be quickly expanded or decreased to meet changing demand.

The management layer is composed of a series of components, which is required to register and orchestrate microservices, and manage basic functions and other components for the whole architecture.

The security layer is required to comply with clause 7.4.

7.3 Interface requirements

To provide ease of service development and extension, CBCMS is required to include APIs and capability interfaces. CBCMS APIs are used to provide a common application environment for the

implementation of various services. CBCMS capability interfaces are used to expand microservice capabilities. Protocols used for APIs are required to be lightweight.

7.4   Security requirements

CBCMS security is required to provide the following security aspects: security architecture, fundamental security capabilities and basic functionalities.

CBCMS security architecture should determine how CBCMS fundamental security capabilities can be built and expanded based on the CBCMS software architecture and security mechanism.

CBCMS fundamental security capabilities shall include hardware security, software security, network security and data security. The hardware security capability shall include a secure storage area.

CBCMS basic functionalities shall include content security, service security and payment security. CBCMS basic functionalities shall also include a secure upgrade. CBCMS basic functionalities shall be able to continuously be enhanced and expanded through the improvement of fundamental capabilities and addition of more secure functional components.

Bibliography

[b-ITU-T Y.3500]   Recommendation ITU-T Y.3500 (2014), *Information technology – Cloud computing – Overview and vocabulary.*

[b-ETSI EN 301 192]   European Standard ETSI EN 301 192 V1.6.1 (2015), *Digital video broadcasting (DVB); DVB specification for data broadcasting*.

[b-ETSI TS 102 809]   Technical Specification ETSI TS 102 809 V1.3.1 (2017), *Digital video broadcasting (DVB); Signalling and carriage of interactive applications and services in hybrid broadcast/broadband environments*.

[b-GB-SEP]   GB/T 28160-2011, 数字电视广播电子节目指南规范 [Specification of electronic programme guide for digital television broadcasting].

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