

SET eXPerience 2021

**Response to TV 3.0 project
CfP Phase-1 and 2
Application Coding**

DiBEG/Japan

Proposal on Application Coding by DiBEG

1. General Description

We, DiBEG, or Digital Broadcasting Experts Group, of Japan, proposed Ph-1 and Ph-2 of Application Coding in response to the TV 3.0 CfP (Call for Proposal) issued by the SBTVD Forum. We describe the outline of our technical proposal of Ph-1 and Ph-2 for the application coding.

2. Outline of Application Coding

4K and 8K satellite services with datacasting has already started in Japan. Some parts of application coding have been incorporated into the standard of these 4K and 8K satellite services, including Hybridcast.” Our proposal is based on HTML5 with Giga architecture. The required architecture is based on Giga-HTML5 and Giga CC Web Services. Additionally, some of the parts, such as Hybridcast, Advanced BS and the web standard of W3C, are compliant with the Japanese standards.

Ph-1 Proposal on Application Coding

We submitted the statement based on the CfP requirement.

The following is the outline of the statement for Application coding.

AP1.1: SFD_09 Ginga receiver profile application re-use/interoperability

Our proposed AP coding complies with the requirements, based on Ginga-HTML5 and Ginga CC Web service.

AP2.1: SFD_09 Ginga receiver profile middleware components

Our proposed AP coding complies with the requirements, based on the above Ginga architecture.

AP3.1: SFD-09 Ginga receiver profile use cases support

Our proposed AP coding complies with the requirements, based on the above Ginga architecture.

AP4.1 to 4.4: Support of TV3.0 transport layer, video, audio and captions

Application with transport layer, video, audio and captions are included in the Advanced ISDB-T. It is considered to be implemented in the Advanced ISDB-T.

Ph-1 Proposal on Application Coding

The following is the outline of the statement on the application coding.

AP5.1 & 5.2: Access identification of TV network and receiver front-end

Our proposed APIs comply with the specifications of Ginga CC Web service.

AP5.3: Geolocation API with multiple sources of data

Our proposed APIs comply with the specifications of Ginga CC Web service.

AP6.1: Application-oriented user experience with TV

Our proposed AP coding execution environment complies with the requirements, based on PWA.

AP6.2: Handling presentation of all audiovisual content

Our proven technologies of handling videos via broadcast and broadband comply with your requirements, as defined in "ARIB STD-B62".

AP6.3: Application switching delay

The standard that smoothly switches applications by multi-process processing by using the functions of web apps comply with your requirements, based on AP6.1.

Ph-1 Proposal on Application Coding

The following is the outline of the statement for Application coding.

AP7.1 & 7.2: Voice and Gesture interaction

Our proposed AP coding requires to improve for Voice and Gesture interaction.

AP7.3 & 7.4: Multi-touch and multimodal interaction

Our proposed AP coding requires to improve for Multi-touch and multimodal interaction.

AP7.5: Multi-device support

Our 'Companion application specification' complies with the requirements, as defined in "IPTVFJ STD-0013".

AP7.6 & 7.7: Multi-user identification and Multi-use interaction

Our multi-user identification and multi-use interaction by using the communication protocols and APIs of 'Companion application specification' is defined in "IPTVFJ STD-0013".

Ph-1 Proposal on Application Coding

The following is the outline of the statement for Application coding.

AP8.1: Standardized audience measurement API

Our proposed audience measurement specification by the background JavaScript execution is defined in the Ginga CC Web Services .

AP9.1: Machine-learning APIs

Our proposed specifications, based on standards such as WebGL / WebGPU, means to use GPGPU on the browser.

AP10.1: API-based user privacy

Our proposed specifications that take into account the latest trends such as W3C "Improving Web Advertising BG" and various APIs are under consideration.

AP10.2: Compliance with Brazilian general personal data protection Act

Our proposed specifications meet this requirement, as it is based on web standards.

Ph-1 Proposal on Application Coding

The following description is outline of the statement for Application coding.

AP11.1 to 11.4: Full IP convergence, Internet mechanism, IP-based application, push delivery and Low-latency content forwarding

Our proposed AP coding requires to improve for IP issues.

AP12.1: Audio description stream to Smart TV

Our proposed 'Interface for control of synchronized playback of the broadcast content and a communication stream' is defined in IPTVFJ STD-0011.

AP12.2: Closed caption streaming to Smart TV

Our proposed method to cooperate with companion devices and automatic translation / automatic sign language generation servers by using "CaptionListener" and 'Companion application specification' is defined in IPTVFJ STD-0011.

Ph-1 Proposal on Application Coding

The following is the outline of the statement on the application coding.

AP12.3: Sign language gloss streaming for a client-side application

Our proposed AP coding requires to improve for sign language services.

AP12.4: Sign language video streaming to a smart TV

Our proposed 'Interface for control of synchronized playback of the broadcast content and a communication stream' is defined in IPTVFIJ STD-0011.

AP13.1: Emergency warning information interactive application

Our proposed delivery of emergency information using the WPA-based push delivery is based on AP6. Regarding broadcast waves, the offered distribution of emergency information is called “EWBS”.

AP14.1: Sensory effects (lighting, temperature, wind, scents, vibration)

Our proposed AP coding requires to improve for the Sensory effects.

Ph-1 Proposal on Application Coding

The following is the outline of the statement for Application coding.

AP14.2: Sign language gloss streaming for a client-side application

Our proposed AP coding requires to improve for the sign language.

AP14.2 & 14.3: 3DoF and 6DoF video interaction

Our proposed cooperation method with 3DoF and 6DoF-enabled companion devices is defined in the AP7.5 proposal.

AP14.4: 3D object-based immersive audio interaction

Our proposed support format is defined by the AC1.2 in HTMLMediaElement.

AP14.5: 3D media positioning and interaction

Our proposed AP coding requires to improve for the positioning and interaction.

AP14.6: VR/AR/XR support

Our proposed cooperation method with XR-enabled companion devices is defined in the AP7.5 proposal.

Ph-1 Proposal on Application Coding

The following is the outline of the statement for Application coding.

AP15.1: Inherent compression support

Our proposed AP coding requires to improve for the Inherent compression.

AP15.2: Multi-sourced application delivery

Our proposed AP coding requires to improve for this delivery.

AP16.1: Multi-sourced scalable content API

Our proposed AP coding requires to improve for this API function.

AP17.1: Extensibility

Our proposed original method to switch the processing by edge or cloud for each API by adding reverse proxy mechanism is defined in Ginga CC WebServices (ABNT NBE 15606-11).

Ph-2 Proposal on Application Coding

1. Specifications of the technical proposal

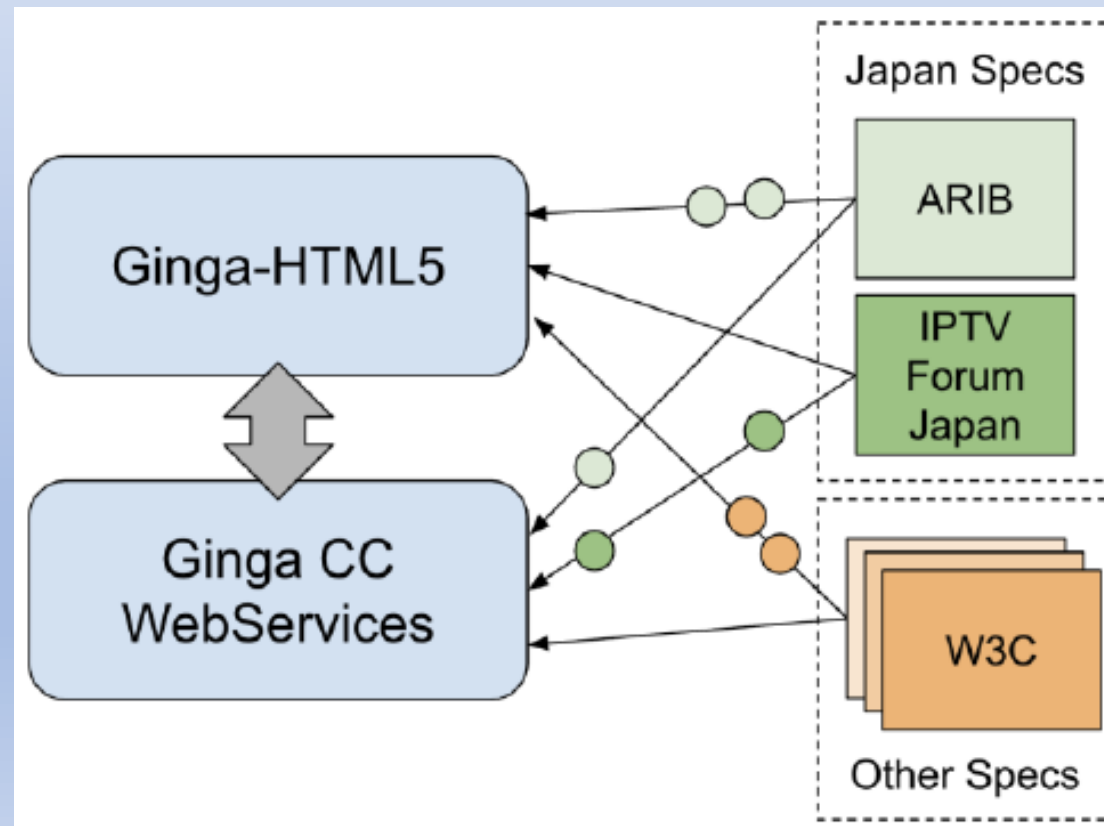
DiBEG submitted the Informative Document which is based on Japanese standardization. This document describes the outline of Informative one.

2. Comments on the technical proposal

The Datacasting Service based on HTML-5 in Japan has already been in the actual operation phase for 4K/8K satellite broadcasting; and the independent equipment that existed in the development phase is no longer available. For the same reason, this response does not include Software Prototypes, Use-case applications, Additional hardware and Proponent's testing report. However, as explained at the meeting, our proposal is focused on how to realize CfP use-cases, and it adopts the Ginga architecture to follow the CfP expectations.

AP1-3: Compatibility with “Ginga receiver profile”

We have prepared this proposal based on the architectures of [ABNT NBR 15606-10] and [ABNT NBR 15606-11]. It uses the Japanese standardized components and other web technology components to apply to each use case. This satisfies the requirements of the interoperability to “FSD_09 Ginga receiver profile”.



AP1-3: Compatibility with “Ginga receiver profile”

Related Standardization Activities

Organizations	Explanations and References
W3C	<p>The standardization body to promote web technology standardization used in the World Wide Web .</p> <p>[References] https://www.w3.org/</p>
ARIB	<p>The Japanese standardization body to define Japanese standardization activities in the communication/broadcasting industries as well as international coordination with standardization bodies abroad.</p> <p>[References] https://www.arib.or.jp/english/</p>
IPTV Forum Japan	<p>The Japanese standardization body to define specification of transmission of TV signals, receivers and related technologies, and operation for open IPTV services</p> <p>[References] https://www.iptvforum.jp/en/</p>

AP4: Support for the new technologies to be adopted in the TV 3.0 project

W3C HTMLMediaElement is assumed for media control. From the Application Coding Layer viewpoint, the media control interface does not depend on specific video/audio codecs. It enables the latest codecs adopted in TV 3.0.

For caption support, there is a referenceable interface defined in the Japanese standard. We will describe it later.

Finally, we describe the interworking between the Application Coding Layer and the Transport Layer. In Japan, we have started Advanced BS Digital Broadcasting (4K/8K Broadcasting) in December 2018. It adopts MMT for transmission. It deploys interworking between MMT and HTML5-based Application Coding.

We describe the related standards and specific description locations in those documents.

AP4: Support for the new technologies to be adopted in the TV 3.0 project

Interaction between Caption and Application Coding Layer

Related Technologies	Explanations and References
BroadcastVideoObjectElement	<p>BroadcastVideoObjectElement is an HTMLObjectElement for managing Broadcast Video/Audio on HTML5 applications.</p> <p>[References] ARIB STD-B62 Volume2 Version 2.2-E1</p> <ul style="list-style-type: none">- Chapter 2: Apply HTML5 to Television- 2.2.2 Broadcast audio/video object definition- https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html
ARIB-TTML	<p>ARIB-TTML is a description language for closed caption and super-impose which is based on the W3C Recommendation "Timed Text Markup Language 1 (TTML1) (Second Edition)" and SMPTE ST 2052-1:2013 "Timed Text Format (SMPTE-TT)".</p> <p>[References] ARIB STD-B62 Volume1 Part 3 Version 2.2-E1</p> <ul style="list-style-type: none">- Chapter 3: Description Language for Closed Caption and Super impose- 3.3 Structure of the ARIB-TTML Document- https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html

AP4: Support for the new technologies to be adopted in the TV 3.0 project

To register an event listener used to obtain the closed caption that is transmitted by MPEG-2 TS or MMT.

Related Technologies	Explanations and References
Transmission of Application via MMT	<p>Explanation of Application file transfer method in MMT.</p> <p>[References]</p> <p>ARIB STD-B60 Version 1.13-E1</p> <ul style="list-style-type: none">- Chapter 10: Transmission of Application- https://www.arib.or.jp/english/std_tr/broadcasting/std-b60.html
APIs for Transport Layer	<p>Definition of the APIs related with EPG, caption, event information, channel selection, broadcasting signals, etc. which are transmitted via MMT.</p> <p>[References]</p> <p>ARIB STD-B62 Volume2 Version 2.2-E1</p> <ul style="list-style-type: none">- Chapter 3: Procedure Description Language- 3.3 Extension function for broadcasting- https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html

AP5: Enabling accessing lower-level information.

It is appropriate to use REST APIs defined in "Ginga CC WebServices (ABNT NBR 15606-11) 8.2 DTV context access APIs" as basic components. It is better than the extension of browser functions because it enables new functions without modification of a browser.

Related Technologies	Explanations and References
DTV context access	REST API specifications to access DTV functions. APIs ABNT NBR 15606-11 - Ginga CC WebServices - 8.2 DTV context access APIs - https://forumsbtvd.org.br/legislacao-e-normas-tecnicas/normas-tecnicas-da-tv-digital/english/
Extension function for broadcasting	API extension to access the DTV information (JavaScript Extension) in ARIB ARIB STD-B62 Volume2 Version 2.2-E1 - Chapter 3: Procedure Description Language - 3.3 Extension function for broadcasting - https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html
HTML5 Extended API Specification	API extension to access the DTV information (JavaScript Extension) in ARIB in IPTVFJ IPTVFJ STD-0011 Version 2.6 HTML5 Browser Specification - Chapter 3 Extended Technical Specification - 3.1 Extended API specification - https://www.iptvforum.jp/download/input.html
Web GPIO API	Functions for Web applications to access GPIO (General Purpose Input/Output) W3C Web GPIO API - Draft Report 25 January 2016 - https://browserobo.github.io/WebGPIO/#GPIOAccess-interface

AP6: Enabling application-oriented TV.

AP6.1: application-oriented user experience with TV

Related Technologies	Summary and reference to details
PWA(Progressive Web Apps)	Technology to use HTML5 applications similar to native applications https://web.dev/progressive-web-apps/

AP6.2: handling the presentation of all audiovisual content

Related Technologies	Summary and reference to details
BroadcastVideoObjectElement	BroadcastVideoObjectElement is a kind of HTMLObjectElement for managing Broadcast Video/Audio on HTML5 applications. [References] ARIB STD-B62 Volume2 Version 2.2-E1 - Chapter 2: Apply HTML5 to Television - 2.2.2 Broadcast audio/video object definition - https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html

AP6.3: application switching delay

Related Technologies	Summary and reference to details
PWA(Progressive Web Apps)	Technology to use HTML5 applications similar to native applications https://web.dev/progressive-web-apps/

AP7.5: Multi-device support, synchronous and asynchronous modes

The Hybridcast specifications of IPTV Forum Japan define the Hybridcast-Connect, which applies to APIs and communication protocol specifications for multi-device interworking. In this section, we introduce the Hybridcast-Connect mechanism for (a) technology to control external devices using broadcast signals, (b) in a reverse manner, an external device initiating control of a receiver.

AP7.5: Multi-device support, synchronous and asynchronous modes

(a) technology to control external devices using broadcast signals

Related Technologies	Explanations and References
Multi-device Interaction APIs	<p>IPTV Forum Japan and ARIB define APIs for communicating between receiver and other multi-devices. [References] IPTVFJ STD-0013 Version 2.8</p> <ul style="list-style-type: none">- 7 Companion application specification- 7.1.6.1 Companion device HTML application API specification- https://www.iptvforum.jp/en/download/IPTVFJ STD-0011 Version 2.5- Chapter 3 Extended Technical Specification- 3.1.23. Interface for coordinated operation of the receiver with a - terminal- https://www.iptvforum.jp/en/download/ARIB STD-B62 Volume2 Version 2.2-E1- Chapter 3: Procedure Description Language- 3.3.16 Coordinated operation of the receiver with a terminal function- https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html
Multi-device Interaction Protocol	<p>IPTV Forum Japan defines communication protocols for communicating between a receiver and other multi-devices. [References] IPTVFJ STD-0013 Version 2.8</p> <ul style="list-style-type: none">- 7 Companion application specification- 7.2 Companion device communication protocols- 7.2.3.1 Communication originating from the receiver- https://www.iptvforum.jp/en/download/

AP7.5: Multi-device support, synchronous and asynchronous modes

(b) in a reverse manner, an external device initiates control of a receiver.

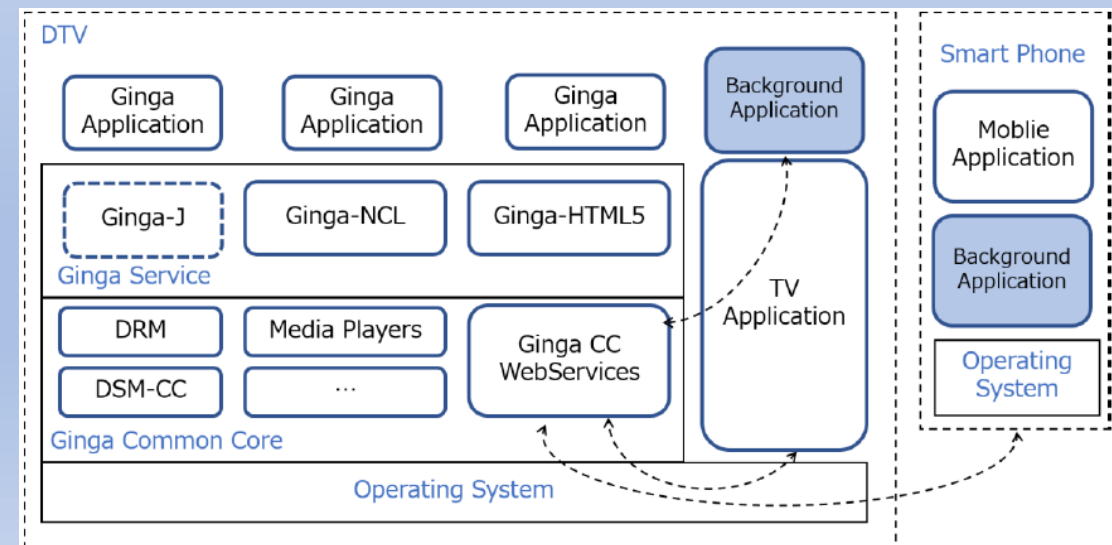
Related Technologies	Explanations and References
Multi-device Interaction APIs	<p>IPTV Forum Japan defines APIs for launching any Hybridcast applications on a receiver from other multi-devices.</p> <p>[References] IPTVFJ STD-0013 Version 2.8</p> <ul style="list-style-type: none">- 7 Companion application specification- 7.1.7 Operation of an external launcher- https://www.iptvforum.jp/en/download/- https://www.arib.or.jp/english/std_tr/broadcasting/std-b62.html
Multi-device Interaction Protocol	<p>IPTV Forum Japan defines communication protocols for launching Hybridcast applications on a receiver from other multi-devices.</p> <p>[References] IPTVFJ STD-0013 Version 2.8</p> <ul style="list-style-type: none">- 7 Companion application specification- 7.2 Companion device communication protocols- 7.2.3.2 Communication originating from a companion device- https://www.iptvforum.jp/en/download/

AP8: Providing audience measurement common interface

We propose to study a viewing measurement standard by JavaScript executed in the background, based on Ginga CC WebServices (ABNT NBR 15606-11).

Related Technologies	Summary and references to details
DTV context access	<p>REST API specification to access DTV functions APIs ABNT NBR 15606-11</p> <ul style="list-style-type: none"> - Ginga CC WebServices - 8.2 DTV context access APIs - https://forumsbtvd.org.br/legislacao-e-normas-tecnicas/normas-tecnicas-da-tv-digital/english/

We assume an application that uses Ginga CC Web Services (ABNT NBR 15606-11) like other applications, but does not display and operate in the background, and performs processing to acquire information necessary for viewing measurement. Regarding the operation of viewing measurement, it is necessary to consider it after confirming the user and obtaining permission according to the security regulations of Ginga CC WebServices (ABNT NBR 15606-11).



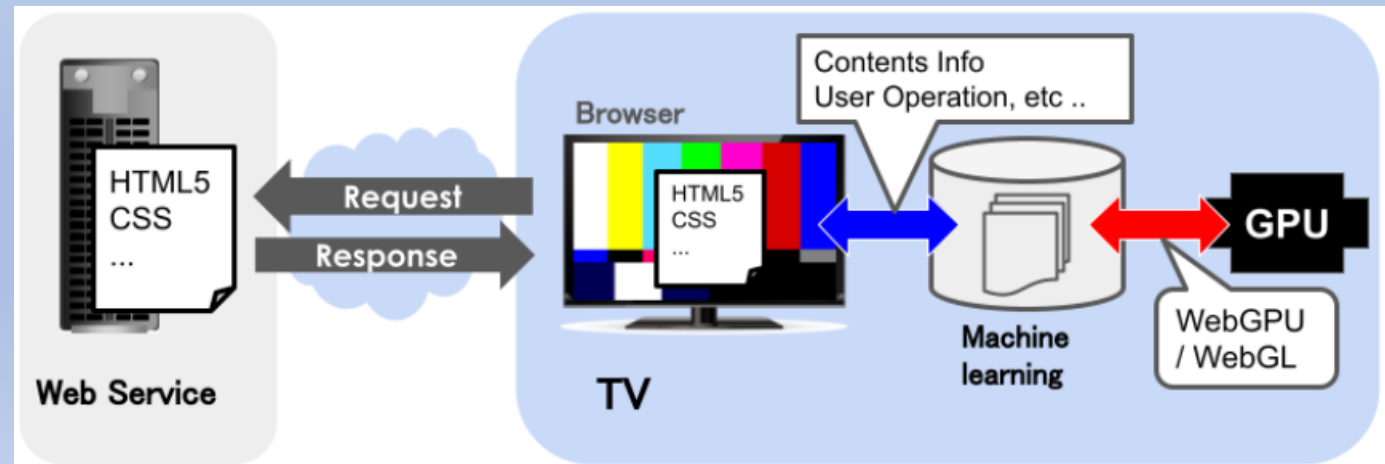
AP9: Machine-learning support for context-awareness

We propose a machine learning by utilizing GPU using WebGL / WebGPU.

Related Technologies	Summary and references to details
WebGL	JavaScript APIs for rendering 2D/3D graphics which Khronos Group designs and maintains https://www.khronos.org/registry/webgl/specs/
WebGPU	APIs for a browser to use GPU, which W3C is developing https://www.w3.org/TR/webgpu/

In the right configuration, machine learning is performed using content information / user operations, etc. on the browser in the TV.

Calculation is performed by GPU via WebGPU / WebGL on the browser.



AP10: Protecting user privacy

W3C has proposed “Improving Web Advertising Business Group” and Google has proposed “Privacy Sandbox” as an alternative to cookies, and web advertising is under consideration.

We believe it is necessary to consider standards in consideration of the situation in these industries.

Related Technologies	Summary and References
Improving Web Advertising Business Group	Web advertisement group in W3C https://www.w3.org/community/web-adv/
Privacy Sandbox	Web advertisement technology proposed by Google https://www.chromium.org/Home/chromium-privacy/privacy-sandbox
Privacy Preserving Ad Click Attribution For the Web	Web advertisement technology proposed by Apple https://webkit.org/blog/8943/privacy-preserving-ad-click-attribution-for-the-web/

AP12: Enabling the streaming of accessibility services to a Smart TV or companion device app

As one of the approaches to realize AP12.1 and AP12.4, we introduce "Interface for control of synchronized playback of the broadcast content and a communication stream" defined in IPTVFJ STD-0011. This specification has not been operated in Hybridcast service yet as of June. 2021.

Related Technologies	Explanations and References
BroadcastVideoObjectElement	<p>BroadcastVideoObjectElement is a kind of HTMLObjectElement for managing Broadcast Video/Audio on HTML5 applications.</p> <p>[References] IPTVFJ STD-0011 Version 2.5</p> <ul style="list-style-type: none">- Chapter 3 Extended Technical Specification- 3.1.17. Interfaces for synchronized control of playback- https://www.iptvforum.jp/en/download/

We propose a method to cooperate with companion devices and automatic translation/automatic sign language generation servers by using "CaptionListener" and 'Companion application specification' defined in IPTVFJ STD-0011 and ARIB STD-B62 for AP12.3. In this section, we introduce how to send the caption data to the server; and the detailed technologies about automatic translation/automatic sign language generation are out of scope.

AP13: Enabling emergency warning information delivery using an interactive application

Regarding the handling of emergency warnings on broadcast waves, we propose to follow the emergency warning broadcasting (EWBS: Emergency Warning Broadcast System) specified in the ISDB-T system (ARIB STD-B31) used as one of the Japanese standards. This section introduces the outline of the standard and the reference technologies.

Related Technologies	Summary and references to details
Emergency Warning System (EWS)	<p>Emergency Warning System is used for disaster broadcasts.</p> <p>[References]</p> <p>ARIB TR-B14 Version 6.5 E-1</p> <ul style="list-style-type: none">- Vol.2 Function Specification for the Receiver- 6.11.4 Reception of Emergency Warning Broadcasting (under the Emergency Warning System (EWS))- Vol.7 Provisions for Carrier Operations- 7.9 Use of Emergency Warning Broadcasting (Emergency Warning System (EWS)) <p>- https://www.arib.or.jp/english/std_tr/broadcasting/tr-b14.html</p> <p>- http://www.arib.or.jp/english/html/overview/doc/8-TR-B14v6_5-1p5-E1.pdf</p>
Transmission and Multiplexing Configuration Control (TMCC)	<p>Control signals for transmission data</p> <p>[References]</p> <p>ARIB STD-B32 Version 2.2 E-1</p> <ul style="list-style-type: none">- 3.15 TMCC signal (Transmission and Multiplexing Configuration Control) <p>- https://www.arib.or.jp/english/std_tr/broadcasting/std-b31.html</p> <p>- http://www.arib.or.jp/english/html/overview/doc/6-STD-B31v2_2-E1.pdf</p>

AP14.2/14.3 : 3DoF/6DoF video interaction and AP14.6 : VR/AR/XR support

We propose a cooperation method with 3DoF/6DoF/xR-enabled companion devices based on the AP7.5 proposal.

Related Technologies	Explanations and References
OpenXR	<p>OpenXR is promoted by a working group managed by the Khronos Group consortium. It is a royalty-free standard interface for accessing VR (virtual reality) and AR (augmented reality) functionality which are provided by platforms and devices.</p> <p>[References] OpenXR 1.0 https://www.khronos.org/openxr/</p>
WebXR	<p>WebVR is promoted by “Immersive Web Working Group”. It enables XR (VR/AR) content on web browsers.</p> <p>[References] WebXR Device API W3C Working Draft, 24 July 2020 - https://www.w3.org/TR/webxr/</p>

AP14.4: 3D object-based immersive audio interaction

We propose to support the format defined by the AC1.2 in HTMLMediaElement.

Related Technologies	Explanations and References
HTMLMediaElement	<p>The HTMLMediaElement is an element based on a HTMLElement for managing Video/Audio on HTML5 applications. The HTMLVideoElement and HTMLAudioElement elements both inherit the HTMLMediaElement.</p> <p>[References] HTML Living Standard (Last updated on 10 June, 2021) - 4 The elements of HTML - 4.8.12 Media elements - https://html.spec.whatwg.org/#htmlmediaelement</p>
MSE	<p>MSE (Media Source Extensions) extends the HTMLMediaElement to allow JavaScript to generate media streams for playback.</p> <p>[References] Media Source Extensions™ W3C Recommendation 17 November 2016 - https://www.w3.org/TR/2016/REC-media-source-20161117/</p>

AP17: Enabling future extensions to the middleware

We propose an original method to switch the processing by edge or cloud for each API by adding a reverse proxy mechanism to Ginga CC WebServices (ABNT NBR 15606-11). And we introduce technologies of embedded servers and script engines for gateway devices from the IoT industry.

Related Technologies	Explanations and References
Reverse Proxy	<p>Reverse Proxy is to receive a connection request as a proxy server for a specific server and relay access to the original server.</p> <p>Reverse means in the opposite direction, and if the Proxy Server that relays the connection from the corporate network is forward, it is called a reverse proxy because it mediates access from the Internet to the internal server.</p> <p>[References] Reverse proxy - https://en.wikipedia.org/wiki/Reverse_proxy</p>
WoT Servient	<p>WoT Servient is an entity that integrates a web server and a web client. By taking such a form, devices can share their own information to other web clients, and can also take in the information of external devices to themselves by the same mechanism.</p> <p>[References] Web of Things (WoT) Architecture W3C Recommendation 9 April 2020 8. Abstract Servient Architecture - https://www.w3.org/TR/wot-architecture/#sec-servient-implementation</p>

Muito obrigado!

**ARIB / DiBEG extend technical cooperation to Brazil
adopting Next Generation Broadcasting Standard!**

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