ATSC Standard:
Service Announcement

A/332:2025-07
17 July 2025

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1. SCOPE

The normative portions of this document define a standard for announcement of services in an ATSC 3.0 broadcast.

1.1 Organization

This document is organized as follows:

- Section 1 – Outlines the scope of this document and provides a general introduction.
- Section 2 – Lists references and applicable documents.
- Section 3 – Provides a definition of terms, acronyms, and abbreviations for this document.
- Section 4 – System Overview: Service Announcement and Personalization
- Section 5 – Service Announcement: Service Guide

2. REFERENCES

All referenced documents are subject to revision. Users of this Standard are cautioned that newer editions might or might not be compatible.

2.1 Normative References

The following documents, in whole or in part, as referenced in this document, contain specific provisions that are to be followed strictly in order to implement a provision of this Standard.

[1] ATSC: "ATSC-Mobile DTV Standard, Part 4 – Announcement," Doc. A/153 Part 4:2009, Advanced Television Systems Committee, Washington, DC, 15 October 2009.

[2] ATSC: "ATSC Standard: Signaling, Delivery, Synchronization, and Error Protection," Doc. A/331:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.

[3] IEEE: "Use of the International Systems of Units (SI): The Modern Metric System," Doc. IEEE/ASTM SI 10, Institute of Electrical and Electronics Engineers, New York, NY, 2002.

[4] IETF: "Hypertext Transfer Protocol – HTTP/1.1: Semantics and Content," RFC 7231, Internet Engineering Task Force, June 2014.

[5] IETF: "Augmented BNF for Syntax Specifications: ABNF," RFC 5234, Internet Engineering Task Force, January 2008.

[6] IETF: "UTF-8, A Transformation Format for ISO 10646," RFC 3629, Internet Engineering Task Force, November 2003.

[7] OMA: "Service Guide for Mobile Broadcast Services," Version 1.0.1, document OMA-TS-BCAST_Service_Guide-V1_0_1-20130109-A, Open Mobile Alliance, 9 January 2013.

[8] OMA: "Service Guide for Mobile Broadcast Services," Version 1.1, document OMA-TS-BCAST_Service_Guide-V1_1-20131029-A, Open Mobile Alliance, 29 October 2013.

[9] ATSC: "ATSC Standard: Video—HEVC," Doc. A/341:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.

[10] ATSC: "ATSC Standard: AC-4 System," Doc. A/342-2:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.

[11] ATSC: "ATSC Standard: MPEG-H System," Doc. A/342-3:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.
[12] ATSC: "ATSC Standard: Non-Real-Time Content Delivery," Doc. A/103:2014, Advanced Television Systems Committee, Washington, DC, 25 July 2014.
[13] ATSC: "ATSC Standard: Captions and Subtitles," Doc. A/343:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.
[14] ATSC: "ATSC Standard: Companion Device," Doc. A/338:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.
[15] ATSC: "ATSC 3.0 Interactive Content," Doc. A/344:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.
[16] ITU-R: "Recommendation Parameter values for the HDTV standards for production and international programme exchange," Doc. BT.709-6, International Telecommunications Union, Geneva Switzerland, June 2015.
[17] ITU-R: "Use of large screen digital imagery Recommendations in video information systems applications," Doc. BT.2000-0, International Telecommunications Union, Geneva Switzerland, January 2012.
[18] ITU-R: "Image parameter values for high dynamic range television for use in production and international programme exchange," Doc. BT.2100-2, International Telecommunications Union, Geneva Switzerland, July 2018.
[19] ATSC: "Audio Common Elements," Doc. A/342-1:2025-07, Advanced Television Systems Committee, Washington, DC, 17 July 2025.
[20] IETF: "RaptorQ Forward Error Correction Scheme for Object Delivery," RFC 6330, Internet Engineering Task Force, August 2011.
[21] W3C: "XML Schema Part 2: Datatypes Second Edition," W3C Recommendation, Worldwide Web Consortium, 28 October 2004. https://www.w3.org/TR/xmlschema-2/
[22] ATSC: "ATSC Standard: VVC Video," Doc. A/345:2025-07, Advanced Television Systems Committee, Washington, D.C., 17 July 2025.

2.2 Informative References

The following documents contain information that may be helpful in applying this Standard.

[23] ISO/IEC: 23090-3:2023 | Rec. ITU-T H.266 (9/2023), "Information technology — Coded representation of immersive media — Part 3: Versatile Video Coding," Geneva, Switzerland.

3. DEFINITION OF TERMS

With respect to definition of terms, abbreviations, and units, the practice of the Institute of Electrical and Electronics Engineers (IEEE) as outlined in the Institute's published standards [3] shall be used. Where an abbreviation is not covered by IEEE practice or industry practice differs from IEEE practice, the abbreviation in question will be described in Section 3.3 of this document.

3.1 Compliance Notation

This section defines compliance terms for use by this document:

shall – This word indicates specific provisions that are to be followed strictly (no deviation is permitted).

shall not – This phrase indicates specific provisions that are absolutely prohibited.
should – This word indicates that a certain course of action is preferred but not necessarily required.
should not – This phrase means a certain possibility or course of action is undesirable but not prohibited.

3.2 Treatment of Syntactic Elements

This document contains symbolic references to syntactic elements used in the audio, video, and transport coding subsystems. These references are typographically distinguished by the use of a different font (e.g., restricted), may contain the underscore character (e.g., sequence_end_code) and may consist of character strings that are not English words (e.g., dynrng).

3.2.1 Reserved Elements

One or more reserved bits, symbols, fields, or ranges of values (i.e., elements) may be present in this document. These are used primarily to enable adding new values to a syntactical structure without altering its syntax or causing a problem with backwards compatibility, but they also can be used for other reasons.

The ATSC default value for reserved bits is '1.' There is no default value for other reserved elements. Use of reserved elements except as defined in ATSC Standards or by an industry standards setting body is not permitted. See individual element semantics for mandatory settings and any additional use constraints. As currently reserved elements may be assigned values and meanings in future versions of this Standard, receiving devices built to this version are expected to ignore all values appearing in currently reserved elements to avoid possible future failure to function as intended.

3.3 Acronyms and Abbreviation

The following acronyms and abbreviations are used within this document.
ABNF – Augmented Backus-Naur Form
AAC – Advanced Audio Coding
AMP – Application Media Player
ATSC – Advanced Television Systems Committee
DNF – Disjunctive Normal Form
DRM – Digital Rights Management
HDR – High Dynamic Range
HEVC – High Efficiency Video Coding
HTTP – HyperText Transport Protocol
IMSC1 – Internet Media Subtitles and Captions 1
MPEG – Moving Picture Experts Group
OMA – Open Mobile Alliance
OMA BCAST – Open Mobile Alliance Broadcast Mobile Services Enabler Suite
PVR – Personal Video Recorder
RMP – Receiver Media Player
ROUTE – Real-time Object delivery over Unidirectional Transport
SDR – Standard Dynamic Range

SEI – Supplemental Enhancement Information
SG – Service Guide
SGDD – Service Guide Delivery Descriptor
SGDU – Service Guide Delivery Unit
SHVC – Scalable High Efficiency Video Coding
SL-HDR – Single Layer High Dynamic Range
VVC – Versatile Video Codec
XML – eXtensible Markup Language

3.4 Terms

The following terms are used within this document.

reserved – Set aside for future use by a Standard.

Content fragment – Portion of Service Announcement that describes ATSC program or content item, corresponding to Content fragment in OMA BCAST Service Guide model [7], with additions and constraints as described in this document.

Schedule fragment – Portion of Service Announcement that describes presentation scheduling of content in an ATSC service, corresponding to Schedule fragment in OMA BCAST Service Guide model [7], with additions and constraints as described in this document.

Service Announcement – Service Announcement is information regarding the ATSC services and content available.

Service fragment – Portion of Service Announcement that describes ATSC service, corresponding to Service fragment in OMA BCAST Service Guide model [7], with additions and constraints as described in this document.

Service Guide – Function of presenting Service Announcement.

3.5 Extensibility

The protocols specified in the present Standard are designed with features and mechanisms to support extensibility. In general, the mechanisms include:

- Use of "protocol version" fields
- Definition of fields and values reserved for future use
- Use of XML, which is inherently extensible by means of future addition of new attributes and elements, potentially associated with different namespaces

Receiving devices are expected to disregard reserved values, and unrecognized or unsupported descriptors, XML attributes and elements.

3.6 XML Schema and Namespace

This standard modified the baseline OMA Service Guide schema.

In addition, a number of new XML elements are defined and used in this Standard which are in a a new XML namespace. These elements provide various Service Announcement elements and attributes defined in this Standard. These new XML elements are defined with separate namespaces in schema documents that accompany this Standard. The namespaces used by various schemas are described in individual sections of the present document. The sub-string part of namespaces between the right-most two '/' delimiters indicate major and minor version of the

schemas. The schemas defined in this present document shall have version ‘1.0’, which indicates major version is 1 and minor version is 0.

The namespace designator, “`xs:`”, and many terms in the “Data Type” column of tables is a shorthand for datatypes defined in W3C XML Schema [21] and shall be as defined there.

In order to provide flexibility for future changes in the schema, decoders of XML documents with the namespaces defined in the present document should ignore any elements or attributes they do not recognize, instead of treating them as errors.

All element groups and attribute groups are explicitly extensible with elements and attributes, respectively. Elements can only be extended from namespaces other than the target namespace. Attributes can be extended from both the target namespace and other namespaces. If the XML schema does not permit this for some element, that is an error in the schema.

XML schemas shall use `processContents="strict"` in order to reduce inadvertent typos in instance documents.

XML instance documents shall use UTF-8 encoding.

In the event of any discrepancy between the XML schema definitions implied by the tables that appear in this document and those that appear in the XML schema definition files, those in the XML schema definition files are authoritative and take precedence.

The XML schema document for the schemas defined in this document can be found at the ATSC website.

4. SYSTEM OVERVIEW

The normative portions of this document define a standard for announcement of services in an ATSC 3.0 broadcast. The Service Announcement Specifications define the data formats and delivery mechanisms used to announce the content and services being delivered, or scheduled for delivery, in ATSC 3.0.

5. SERVICE ANNOUNCEMENT: SERVICE GUIDE

5.1 Introduction

In general, it is assumed that ATSC 3.0 services will be delivered by broadcast channel(s) and broadband channel(s) jointly leveraging the unidirectional one-to-many broadcast paradigm (either in fixed environment and/or mobile environment) and the bi-directional unicast paradigm in a broadband environment.

The Service Announcement function enables ATSC 3.0 Service providers to describe the ATSC 3.0 Services that they make available. From a user’s point of view, the Service Announcement function enables an on-screen Service Guide that can be seen as an entry point to discover ATSC 3.0 services and to select services. Service Announcement provides descriptions of the content offerings and also may provide a filtering capability based on user preferences and content properties, such as the presence or absence of captioning, interactive enhancements, video formats (3D, SD, HD, UD), audio formats (stereo, 5.1, immersive), caption formats (IMSC1 text or image), content advisory ratings, genre, accessible audio tracks, alternate languages, etc. In the case of scheduled services, Service Announcement also provides information about the date and time each offering is scheduled to be broadcast.

This specification comprises the Service Announcement data model, data delivery format, and delivery mechanisms used to announce ATSC 3.0 services and content now being delivered, scheduled for delivery, or available on-demand, over both broadcast and broadband channels. This

specification also includes the mechanisms for discovery of the Service Announcement data and mechanisms to signal updates to the Service Announcement data.

5.2 ATSC SG Data Model

5.2.1 Overview

The information available through the Service Announcement provides receivers with a robust description of the available services and content.

5.2.2 ATSC 3.0 Service Guide Data Model

This Section defines a set of constraints and extensions of the data model specified in the OMA BCAST Service Guide specification, Version 1.0.1 [7].

Service guide fragments used to announce information regarding ATSC 3.0 services and content shall conform to the data model described in this standard, which extends the OMA BCAST Service Guide specification, Version 1.0.1 [7] data model (and XML schema) in following distinct ways.

- The allowed values for existing OMA BCAST Service Guide elements are modified or constrained. Some of these changes are not conformant with the OMA BCAST SG schema.
- Additional data model elements not defined in the OMA BCAST SG are introduced. Some of these are defined within the PrivateExt elements provided for such extensions in the OMA BCAST schema, and some are not.

Service Guide data that include ATSC services is a collection of XML fragments whose syntax is described by OMA BCAST SG (using the OMA BCAST XML namespace), together with additional XML elements defined by this standard (using the ATSC 3 namespace).

Note: The following conventions apply to all tables in this Section:

- Metadata items which are represented as XML elements are shown in plain text.
- Metadata items which are represented as XML attributes are shown in *italics*.
- Additions to the data model from in OMA BCAST 1.1 [8] are **highlighted in gray and bold.**
- Additions to the data model specified in OMA BCAST (and therefore making use of the ATSC 3 namespace) are **highlighted in light gray and bold.**
- Meaning of "Type" and "Category" column is defined in OMA BCAST Service Guide specification, Version 1.0.1 [7].

The modified OMA Service Guide v1.0.1 schema is represented as an XML document using the same namespace as in OMA, and modified per this standard:

```
urn:oma:xml:bcast:sg:fragments:1.0
```

The definition of this modified OMA schema is in an XML schema file, *ATSC-OMA-SUP-XSD_bcast_sg_fragments-V1_0-20090212-A-20210804.xsd*, accompanying this Standard, as described in Section 3.6 above.

The new Service Announcement additions shall be represented as an XML document that conforms to the definitions in the XML schema that has namespace:

```
tag:atsc.org,2016:XMLSchemas/ATSC3/SA/1.0/
```

The definition of this schema is in an XML schema file, *SA-1.0-20210312.xsd*, accompanying this Standard, as described in Section 3.6 above. The XML schema xmlns short name should be "sa".

5.2.2.1 Service Fragment

Service fragment shall include elements as shown in Table 5.1. Use of the Service fragment of the service guide shall conform to the specifications in OMA BCAST Service Guide specification, Version 1.0.1 [7] with extensions as shown in Table 5.1.

Table 5.1 Service Fragment

Service
id
version
validFrom
validTo
globalServiceID
weight
emergency
ServiceType
Name
Description
AudioLanguage
languageSDPTag
TextLanguage
languageSDPTag
ContentAdvisoryRatings
OtherRatings [**Table 5.5**]
TargetUserProfile
Genre
BroadcastArea
PrivateExt
ATSC3ServiceExtension
Icon
MIMEType
width
height
dataSize
MajorChannelNum
MinorChannelNum
RatingRegionTables

The following constraints apply.

- The attribute `languageSDPTag` for the elements `AudioLanguage` and `TextLanguage` is changed from “required” to “optional”.
- The element `BroadcastArea` shall not contain attribute `Polarity`. If `lev_conf` exists in the Service fragment for a target area type (as specified by the `TargetArea` sub-element) other than `shape`, it carries no meaning.

The following adaptations and extensions apply.

- For use of `ServiceType`, see Section 5.2.2.1.1.
- For use of `Genre`, see Section 5.2.2.1.2.
- Elements `Name` and `Description` shall be replaced with extended elements in Section 5.2.2.1.3.
- The target level of confidence is confidence level that the terminal is indeed located within the indicated `TargetArea`. If the terminal is not located within the indicated `TargetArea`, it should not present the service. When `TargetArea` is set to `shape`, the target confidence level is 67%. When `TargetArea` is not set to `shape`, the target confidence level is 100%

5.2.2.1.1 Service Type

Two `ServiceType` element values in `ReservedProprietaryExtByteRangeType` are defined as follows:

- value 228 indicates that the Service fragment contains information regarding an ATSC 3.0 Linear service.
- value 229 indicates that the Service fragment contains information regarding an ATSC 3.0 App-based service with app-based enhancement.

5.2.2.1.2 Genre

The `Genre` element describes the genre category for a service or for content. The '`href`' attribute value selects a particular genre category and shall be set as follows:

<`classificationSchemeURI`> "`:`" <`termID`>

where

<`classificationSchemeURI`> is `http://www.atsc.org/XMLSchemas/mh/2009/1.0/genre-cs/` and <`termID`> matches a `termID` value from the classification schema in Annex B of A/153 Part 4 [1]. The `Genre` element content shall be an empty string.

5.2.2.1.3 Name and Description Elements Extensions

Elements `Name` and `Description` from the Service fragment are replaced with the speech phonetic information, as defined in Table 5.2.

Table 5.2 Replacement `Name` and `Description` Elements for the Service Fragment

Name	Type	Category	Card-inality	Description	Data Type
`Name`	E1	NM/TM	0..N	Extended Name element which has elements and attributes to indicate name and phonetic information about name as per `PhoneticInformationType`	`PhoneticInformationType` (Table 5.3)
`Description`	E1	NM/TM	1..N	Extended Description element which has elements and attributes to indicate description and phonetic information about description as per `PhoneticInformationType`	`PhoneticInformationType` (Table 5.3)

Table 5.3 Speech Phonetic Information Extensions

Name	Type	Category	Card-inality	Description	Data Type
PhoneticInformationType					
text	A	NM/TM	1	Name of the Service or Content.	String
xml:lang	A	NM/TM	0..1	The language of the text attribute expressed with XML attribute 'xml:lang'	String
SpeechInfoURI	E2	NM/TM	0..N	The URI address where SpeechInfo object for parent Name element is acquired. Speech file may be encoded in SSML format (http://www.w3.org/TR/speech-synthesis11/) or similar types of mark-up languages. Contains following attribute: content-type content-enc	anyURI
content-type	A	NM/TM	0..1	Content-type of SpeechInfo object referenced by SpeechInfoURI.	String
content-enc	A	NM/TM	0..1	Content encoding of SpeechInfo object referenced by SpeechInfoURI.	String
SpeechInfo	E2	NM/TM	0..N	Embedded Speech information object for parent Name element. Contains following attribute: content-type content-enc	anyURI
content-type	A	NM/TM	0..1	Content-type of SpeechInfo object.	String
content-enc	A	NM/TM	0..1	Content encoding of SpeechInfo object.	String

Additionally, the following constraints apply.

- When more than one SpeechInfoURI element and SpeechInfo element are present inside a parent Name or Description element in the service guide, the value of content-type attribute of each of the SpeechInfoURI element and SpeechInfo element shall be different.
- The semantics of content-type attribute for SpeechInfoURI element and SpeechInfo element shall obey the semantics of Content-Type header of HTTP/1.1 protocol RFC 7231 [4].
- When the content-type attribute is not present for SpeechInfoURI element or SpeechInfo element it is inferred to have a value of "application/ssml+xml" for that element.
- The semantics of content-enc attribute for SpeechInfoURI element and SpeechInfo element shall obey the semantics of Content-Encoding header of HTTP/1.1 protocol RFC 7231 [4].
- When the content-enc attribute is not present for SpeechInfoURI element or SpeechInfo element the associated speech information object for the corresponding SpeechInfoURI element or SpeechInfo is assumed to have no additional content encoding applied.

5.2.2.1.4 Content Advisory Ratings Information

This section describes content advisory rating information corresponding to a rating system defined by a Rating Region Table (RRT). RRT is defined in Annex of A/331 [2]. RRT RatingRegionTables element may be signaled in Service fragment as described in section 5.2.2.1.4. Content advisory rating not corresponding to defined RRT are described in section

5.2.2.1.5.The content advisory rating is indicated for each rating region. For each rating region, rating value is provided for one or more rating dimensions. The content advisory rating is indicated as listed in Table 5.4.

Table 5.4 Content Advisory Rating Information

Name	Type	Category	Cardinality	Description	Data Type
ContentAdvisoryRatings	E1	NM/TM	0..N	Content advisory rating - one for each rating region. Contains the following elements: RegionIdentifier RatingDescription RatedDimensions RatingDimVal	
RegionIdentifier	E2	NM/TM	0..1	Specifies the rating region for which the following rating description, rated dimensions, rating dimension, and rating value data is specified. If not present, the value of RegionIdentifier is inferred to be 1.	unsignedByte
RatingDescription	E2	NM/TM	1	Rating description text which represents the rating suitable for on-screen display. Contains the following attribute: xml:lang	string
xml:lang	A	NM/TM	0..1	The language of the RatingDescription expressed with XML attribute 'xml:lang'	string
RatedDimensions	E2	NM/TM	0..1	The number of region specific rating dimensions for which content advisory rating is specified.	unsignedByte
RatingDimVal	E2	NM/TM	1..N	Content advisory rating dimension and rating value for each rated dimension. Contains the following elements: RatingDimension RatingValueString	
RatingDimension	E3	NM/TM	0..1	Rating dimension index for which the rating value is specified.	unsignedByte
RatingValueString	E3	NM/TM	1	Rating value text string for the rating dimension specified in the associated RatingDimension element.	String

Additionally, the following constraints apply.

- The number of occurrences of the RatingDimVal element must be equal to the value inside the RatedDimensions element.
- The value of the element RatingDimension shall be less than or equal to the number of rating dimensions defined in the rating region table.
- The value of the element RatingValueString shall be equal to one of the values defined in the rating region table for the rating dimension indicated by the value of the associated RatingDimension element.
- When not present the value of RatingDimension is inferred to be equal to 0.

- When not present the value of `RatedDimensions` is inferred to be equal to 1.

The content advisory rating information can be indicated in service announcement at one or more of the following locations:

- Inside a Service fragment for a service
  The content advisory rating information (`ContentAdvisoryRatings` element) can be indicated inside a Service fragment.
- Inside a Content fragment for a program or content
  The content advisory ratings information (`ContentAdvisoryRatings` element) can be included in Content fragment instead of in the Service fragment or in addition to in the Service fragment. When content advisory information is included in both the Service fragment and the Content fragment then the information in the Content fragment over-rides the information in the Service fragment.

5.2.2.1.5 Non-RRT Content Advisory Rating

Content advisory rating not corresponding to defined RRT are carried as described by appropriate regional authorities using the structure described in **Table 5.5**.

Table 5.5 Non-RRT Content Advisory Rating Information

Name	Type	Category	Card-inality	Description

`OtherRatings`	E1	NM/TM	0..N	Content advisory rating – not corresponding to defined RRT.
				Contains the following attribute:
				`ratingScheme`
				Contains one of the following elements (inside XML schema `choice` element):
				`RatingInformationString`
				`RatingInformationData`

`ratingScheme`	A	NM/TM	1	Specifies the scheme URI for the rating described by `RatingInformationString/ RatingInformationData` element
`RatingInformationString`	E2	NM/TM	0..1	Rating information value string corresponding to the rating scheme defined by `ratingScheme`. The interpretation of this element is specified by appropriate regional authorities.
`RatingInformationData`	E2	NM/TM	0..1	Container element for rating information value data corresponding to the rating scheme defined by `ratingScheme`. The interpretation of the child element(s) of this element is specified by appropriate regional authorities. Contains xs:any element(s).

Additionally, the following constraints apply.

- Each `OtherRatings` element inside the Service fragment shall have a unique `ratingScheme` value.
- Each `OtherRatings` element inside the Content fragment shall have a unique `ratingScheme` value.

The non-RRT content advisory rating information can be indicated in service announcement at one or more of the following locations:

- Inside a Service fragment for a service
  The non-RRT content advisory rating information (`OtherRatings` element) can be indicated inside a Service fragment.
- Inside a Content fragment for a program or content
  The non-RRT content advisory ratings information (`OtherRatings` element) can be included in Content fragment instead of in Service fragment or in addition to in the Service fragment. When non-RRT content advisory information is included in both the Service fragment and the Content fragment then the information in the Content fragment over-rides the information in the Service fragment.

5.2.2.1.6 Service-Level Private Extensions

Elements from the ATSC 3 namespace are used within the OMA `PrivateExt` element, to indicate ATSC 3 service related elements and attributes, as listed in Table 5.6.

Table 5.6 Service Level Private Extensions

Name	Type	Category	Card-inality	Description	Data Type
`ATSC3ServiceExtension`	E1	NM/TM	1	Additional information about ATSC 3.0 service. Contains the following elements: Icon MajorChannelNum MinorChannelNum	
`Icon`	E2	NM/TM	0..N	URL pointing to icon used to represent the service in ESG. Multiple URLs could be used to point to icons of different width and height or different representation formats. Contains the following optional attributes: MIMEType width height dataSize	`anyURI`
`MIMEType`	A	NM/TM	0..1	The optional MIME type of the icon allowing receivers to preemptively ignore fetching image types they are not capable of presenting.	`String`
`width`	A	NM/TM	0..1	Width of the referenced image in pixels	`unsignedInt`
`height`	A	NM/TM	0..1	Height of the referenced image in pixels	`unsignedInt`
`dataSize`	A	NM/TM	0..1	Size of the image data in bytes.	`unsignedInt`
`MajorChannelNum`	E2	NM/TM	0..1	Major channel number of the service. The language is expressed using built-in XML attribute 'xml:lang' with this element.	`String`
`MinorChannelNum`	E2	NM/TM	0..1	Minor channel number of the service. The language is expressed using built-in XML attribute 'xml:lang' with this element.	`String`
`RatingRegionTables`	E2	NM/TM	0..1	Rating Region Table. Syntax of `RatingRegionTables` shall be as specified in Annex of A/331 [2]. The contents of this element in the service	

				announcement shall match those sent in the service signaling.	

Note: The attributes associated with the Icon element are optional. They can be provided as hints to allow the receiver ESG system to avoid accessing image data that it cannot process.

5.2.2.2 Schedule Fragment

Schedule fragment shall include elements as shown in Table 5.7. Use of the Schedule fragment of the service guide shall conform to the specifications in OMA BCAST Service Guide specification, Version 1.0.1 [7] with extensions as specified in this section.

Table 5.7 Schedule Fragment

Schedule
id
version
validFrom
validTo
ServiceReference
idRef
ContentReference
idRef
contentLocation
PresentationWindow
startTime
endTime
duration
id
TermsOfUse
PrivateExt

The following constraints apply.

- The attributes `defaultSchedule`, `onDemand`, of the element `Schedule` shall not be present.
- The elements `InteractivityDataReference`, `AutoStart`, `DistributionWindow`, `PreviewDataReference` shall not be present. When an element is not present all its sub-elements and attributes are also not present.
- The sub-element `PreviewDataIDRef` of the element `TermsofUse` shall not be present.

5.2.2.3 Content Fragment

Content fragment shall include elements as shown in Table 5.8. Use of the Content fragment of the service guide shall conform to the specifications in OMA BCAST Service Guide specification, Version 1.0.1 [7] and for elements **highlighted in gray and bold** to the specifications of OMA BCAST Service Guide specification, Version 1. 1 [8] with additional extensions as shown in Table 5.8.

Table 5.8 Content Fragment

Content
Id
Version
validFrom
validTo
globalContentID
baseCID
ServiceReference
idRef
Weight
Name
Description
AudioLanguage
languageSDPTag
TextLanguage
languageSDPTag
Length
ContentAdvisoryRatings [Table 5.4]
OtherRatings [**Table 5.5**]
TargetUserProfile
Genre
BroadcastArea
TermsOfUse
Popularity
Rating
noOfViews
noOfDiscussions
samplingDate
Freshness
releastDate
broadcastDate
PrivateExt
Components
AudioComponent
Language
VideoComponent
Language
CCComponent
Language
AppComponent
Language
Capabilities
ContentIcon
MIMEType
Width
Height
dataSize

Preview
- ***usage***
- **PreviewIcon**
  - ***MIMEType***
  - ***width***
  - ***height***
  - ***dataSize***
- **Description**
- **PreviewContent**
  - ***MIMEType***
  - ***width***
  - ***height***
  - ***dataSize***

The following constraints apply.

- The elements of `StartTime and EndTime` shall not be present.
- The sub-element `PreviewDataIDRef` of the element `TermsofUse` shall not be present.
- The attribute `languageSDPTag` for the elements `AudioLanguage` and `TextLanguage` is changed from “required” to “optional”.
- The element `BroadcastArea` shall not contain attribute `Polarity`. If `lev_conf` exists in the Content fragment for a target area type (as specified by the `TargetArea` sub-element) other than `shape`, it carries no meaning.

The following adaptations and extensions apply.

- Elements `Name` and `Description` shall be replaced with extended elements in Section 5.2.2.3.1.
- For use of `Genre`, see Section 5.2.2.1.2.
- The target level of confidence is confidence level that the terminal is indeed located within the indicated `TargetArea`. If the terminal is not located within the indicated `TargetArea`, it should not present the service. When `TargetArea` is set to `shape`, the target confidence level is 67%. When `TargetArea` is not set to `shape`, the target confidence level is 100%

5.2.2.3.1 Name and Description Elements Extensions

Elements `Name` and `Description` from the Content fragment are extended with addition of sub-elements and attributes related to speech phonetic information, as listed in Table 5.9.

Table 5.9 Replacement `Name` and `Description` Elements for the Content Fragment

Name	Type	Category	Card-inality	Description	Data Type
`Name`	E1	NM/TM	0..N	Extended Name element which has elements and attributes to indicate name and phonetic information about name as per `PhoneticInformationType`	`PhoneticInformationType` (Table 5.3)
`Description`	E1	NM/TM	1..N	Extended Description element which has elements and attributes to indicate description and phonetic information about description as per `PhoneticInformationType`	`PhoneticInformationType` (Table 5.3)

Additionally, the following constraints apply.

- When more than one `SpeechInfoURI` element and `SpeechInfo` element are present inside a parent `Name` or `Description` element in the service guide, the value of `content-type` attribute of each of the `SpeechInfoURI` element and `SpeechInfo` element shall be different.
- The semantics of `content-type` attribute for `SpeechInfoURI` element and `SpeechInfo` element shall obey the semantics of Content-Type header of HTTP/1.1 protocol RFC 7231 [4].
- When the `content-type` attribute is not present for `SpeechInfoURI` element or `SpeechInfo` element it is inferred to have a value of "`application/ssml+xml`" for that element.
- The semantics of `content-enc` attribute for `SpeechInfoURI` element and `SpeechInfo` element shall obey the semantics of Content-Encoding header of HTTP/1.1 protocol RFC 7231 [4].
- When the `content-enc` attribute is not present for `SpeechInfoURI` element or `SpeechInfo` element the associated speech information object for the corresponding `SpeechInfoURI` element or `SpeechInfo` is assumed to have no additional content encoding applied.

5.2.2.3.2 Content-Level Private Extensions

Elements from the ATSC 3 namespace may be used within the OMA `PrivateExt` element, to indicate ATSC 3 content components related elements and attributes, as listed in Table 5.10.

Table 5.10 Content-Level Private Extensions

Name	Type	Category	Cardinality	Description	Data Type
`Components`	E2	NM/TM	0..1	Component sub-element. Contains the following elements: AudioComponent VideoComponent CCComponent AppComponent	
`AudioComponent`	E3	NM/TM	0..N	Role of the component. Textual description intended for human consumption regarding role of the component. Strings which could be used to describe role of component of ATSC3.0 service include: "Complete main" "Music"	`String`

				“Dialog” “Effects” “Visually impaired” “Hearing impaired” “Commentary” Any other useful description for a viewer can be provided. Contains the following attribute: language	
language	A	NM/TM	0..1	This element declares for the end users that this component is available in the language represented by the value of this element. The textual value of this element can be made available for the end users in different languages. In such a case the language used to represent the value of this element is signaled using the built-in XML attribute ‘xml:lang’. See section 7 [7], Multi-language support.	String
videoComponent	E3	NM/ TM	0..N	Role of the component. Textual description intended for human and/ or application consumption regarding role of the component. Strings which could be used to describe role of component of ATSC3.0 service include: “Alternative camera view” “Sign language inset” “Quarterback Helmet Cam” “3D video” Any other useful description for a viewer can be provided. Contains the following attribute: language	String
language	A	NM/TM	0..1	This element declares for the end users that this component is available in the language represented by the value of this element. The textual value of this element can be made available for the end users in different languages. In such a case the language used to represent the value of this element is signaled using the built-in XML attribute ‘xml:lang’. See section 7 [7], Multi-language support.	String
CCComponent	E3	NM/ TM	0..N	Role of the component. Textual description intended for human consumption regarding role of the component. Strings which could be used to describe role of component of ATSC3.0 service include: “Normal” “Easy reader” Any other useful description for a viewer can be provided. Contains the following attribute: language	
language	A	NM/TM	0..1	This element declares for the end users that this component is available in the language represented by the value of this element. The textual value of this element can be made available for the end users in different languages. In such a case the language used	String

				to represent the value of this element is signaled using the built-in XML attribute 'xml:lang'. See section 7 [7] Multi-language support.	
AppComponent	E2	NM/ TM	0..N	Role of the component. Textual description intended for human consumption regarding role of the component. Strings which could be used to describe role of component of ATSC3.0 service include: "On Demand" Any other useful description for a viewer can be provided. Contains the following attribute: language	
language	A	NM/TM	0..1	This element declares for the end users that this component is available in the language represented by the value of this element. The textual value of this element can be made available for the end users in different languages. In such a case the language used to represent the value of this element is signaled using the built-in XML attribute 'xml:lang'. See section 7 [7] Multi-language support.	String
ContentIcon	E2	NM/TM	0..N	URL pointing to an icon (image) used to represent the content element in the ESG. Multiple URLs could be used to point to icons (images) of different width and height or different representation formats. Contains the following optional attributes: MIMEType width height dataSize	anyURI
MIMEType	A	NM/TM	0..1	The optional MIME type of the icon allowing receivers to preemptively ignore fetching image types they are not capable of using.	String
width	A	NM/TM	0..1	Width of the referenced image in pixels	unsignedInt
height	A	NM/TM	0..1	Height of the referenced image in pixels	unsignedInt
dataSize	A	NM/TM	0..1	Size of the image data in bytes.	unsignedInt
Preview	E2	NM/TM	0..N	The preview element provides a way to reference promotional content for a particular ESG content element. Examples include movie trailers, news promos and banner images. Multiple preview items can be included in a content element extension. It is expected that each item would provide different types of promotional material as described in the Description element. Contains the following elements: PreviewIcon Description PreviewContent Contains the following optional attribute: usage	
usage	A	NM/TM	0..1	The optional usage attribute describes how the preview item is intended to be used within the ESG. Preview items specifying usage values	String

				that are not known to the ESG implementation shall be ignored. The following values are defined: “promo” – The default value indicating that the preview is promotional and likely video content. “preface” – Indicates that the preview material is intended to be display during a channel change to the particular content element. See section 5.2.2.3.2.1. “banner” – Indicates that the preview element represents a banner ad and may be displayed in the appropriate area.	
PreviewIcon	E3	NM/TM	0..N	URI pointing to an icon (image) used to represent the preview element in the ESG. Multiple URIs could be used to point to icons (images) of different width and height or different representation formats. Contains the following optional attributes: MIMEType width height dataSize	anyURI
MIMEType	A	NM/TM	0..1	The optional MIME type of the icon allowing receivers to preemptively ignore fetching image types they are not capable of using.	String
width	A	NM/TM	0..1	Width of the referenced image in pixels	unsignedInt
height	A	NM/TM	0..1	Height of the referenced image in pixels	unsignedInt
dataSize	A	NM/TM	0..1	Size of the image data in bytes.	unsignedInt
Description	E3	NM/TM	1..N	Extended Description element which includes sub-elements to indicate description and phonetic information about description. Contains the following elements: SpeechInfoURI SpeechInfo Contains the following attributes: text xml:lang	
text	A	NM/TM	1	Description of the Preview	String
Xml:lang	A	NM/TM	0..1	The language of the text attribute expressed with XML attribute ‘xml:lang’	String
SpeechInfoURI	E4	NM/TM	0..N	The URI address where SpeechInfo object for parent Description element is acquired. Speech file may be encoded in SSML format (http://www.w3.org/TR/speech-synthesis11/) or similar types of mark-up languages. Contains the following attributes: content-type content-enc	anyURI
content-type	A	NM/TM	0..1	Content-type of SpeechInfo object referenced by SpeechInfoURI.	String
content-enc	A	NM/TM	0..1	Content encoding of SpeechInfo object referenced by SpeechInfoURI.	String
SpeechInfo	E4	NM/TM	0..N	Embedded Speech information object for parent Description element. Contains the following attributes: content-type content-enc	anyURI
content-type	A	NM/TM	0..1	Content-type of SpeechInfo object.	String

content-enc	A	NM/TM	0..1	Content encoding of SpeechInfo object.	String
PreviewContent	E3	NM/TM	0..N	URI pointing to content that can be displayed as preview data for the content element within the ESG. Multiple URIs could be used to reference content of different width and height or different representation formats. It is also possible to reference other types of data besides multimedia but it is expected that the URIs referenced here would reference similar semantic content with differing representations for example images of different encoding formats; i.e., png, jpg, or gif. Contains the following optional attributes: MIMEType width height dataSize	anyURI
MIMEType	A	NM/TM	0..1	The optional MIME type of the content specified by PreviewContent element allowing receivers to preemptively ignore fetching image types they are not capable of using.	String
width	A	NM/TM	0..1	Width of the referenced content specified by PreviewContent element in pixels	unsignedInt
height	A	NM/TM	0..1	Height of the referenced content specified by PreviewContent element in pixels	unsignedInt
dataSize	A	NM/TM	0..1	Size of the content specified by PreviewContent element data in bytes.	unsignedInt

Note: The attributes associated with the ContentIcon, PreviewIcon, and PreviewContent elements are optional. They can be provided as hints to allow the receiver ESG system to avoid accessing image and preview data that it cannot process.

5.2.2.3.2.1 Preview Usage Discussion

The preview element allows one or more previews to be associated with a content item. It is expected that, for ESG implementations that support promotional previews, when a content element is selected within the ESG, access to the previews would be provided in some way. It is further expected that the preview description and icon, if present, would allow the user to determine if they are interested in accessing the preview.

The usage attribute on each preview gives the ESG system a hint as to how the preview data is intended to be used. The default value, “promo”, would indicate that the preview contains audio and video content promoting the content item. Examples of these types of previews would be movie trailers, news promos, and other types of familiar promotional material.

The “preface” usage value indicates that the referenced preview data can be displayed during service changes. This would typically be an image slate or single frame that can be displayed when the user selects the particular content item for viewing—if the selection is going to take more than a receiver-defined time limit (e.g., 1-2 seconds).

The “banner” usage indicates that the preview material was created in an aspect ratio optimal for banner ads. In this case, the banner would simply be displayed when the user selected the content on the ESG. Note that a banner and various other preview items could be provided for the same content item within the ESG.

5.2.2.3.3 Device Capabilities

5.2.2.3.3.1 Device Capabilities Related Content-Level Private Extensions

Elements from the ATSC 3 namespace may be used within the OMA `PrivateExt` element, to indicate an ATSC 3.0 device capabilities related element, as given in Table 5.11. The `sa:Capabilities` XML element specifies the capabilities and capability groups[1] required in the receiver to be able to create a meaningful presentation of the content. Using this element, it is possible to express multiple alternate sets of required capabilities and capability groups, the support for any one of the multiple alternate sets is sufficient to create a meaningful presentation. This is done by using a logical or expression in the `sa:Capabilities` element. It is also possible to express decoder features to HTTP servers and A/344 [15] applications (see Table 5.12 Note 1) using the syntax described in this section (see also A/331 Section 7.1.2.4 [2], A/344 Section 9.13 [15]).

The `sa:Features` XML element specifies capabilities and capability groups, whether essential or optional, usable to create meaningful presentations of this Content, if supported by a receiver. This element can be used to provide content properties in the Service Guide or to filter content in accordance with user preferences. The `sa:Features` element is a logical expression of the form specified in Section 5.2.2.3.3.2 and is not constrained to use capability codes designated therein as "Required". When not already provided in disjunctive normal form[2] (DNF), this logical expression can be expanded into DNF, wherein each term indicates a set of capabilities usable in one or more meaningful presentations of this Content. A receiver can evaluate the entire `sa:Features` element to discern whether it can meaningfully present this Content, thereby duplicating the functionality of `sa:Capabilities`, but can analyze and evaluate each term of the DNF to discern whether any capabilities that are preferred or of interest are available for meaningful presentations of this Content.

[1] A capability group is a set of capabilities

[2] DNF is a canonical normal form of a logical formula consisting of a disjunction of conjunctions, wherein each conjunction is a "term". Compared to an expression in DNF, an equivalent expression that is not in DNF can be more compact.

Table 5.11 Device Capabilities Related Content-Level Private Extensions

Name	Type	Category	Card-inality	Description	Data Type
Content	E			'Content' fragment …	
…					
PrivateExt	E1	NO/TO	0..1	An element serving as a container for proprietary or application-specific extensions.	
sa:Capabilities	E3	NO/TM	0..1	Capabilities and capability groups required for decoding and presenting the content signaled using capability codes, capability strings and Boolean operators (and/or). This string shall conform to the normative syntax defined for capabilities described in Section 5.2.2.3.3.2	string
sa:Features	E3	NO/TM	0..1	Capabilities and capability groups usable when decoding and presenting the content signaled using capability codes, capability strings and Boolean operators (and/or). This string shall conform to the normative syntax defined for capabilities described in Section 5.2.2.3.3.2.	string

5.2.2.3.3.2 Device Capabilities Syntax and Semantics

This section defines the syntax for the required device capabilities and capability groups indicated by capabilities. The syntax is described using the Augmented Backus-Naur Form (ABNF) grammar defined in RFC 5234 [5], and UTF-8 as defined in RFC 3629 [6] (Section 4). Rules are separated from definitions by an equal "=", indentation is used to continue a rule definition over more than one line, literals are quoted with "", parentheses "(" and ")" are used to group elements, optional elements are enclosed in "[" and "]" brackets, and elements may be preceded with <n>* to designate n or more repetitions of the following element; n defaults to 0.

Syntax of capabilities shall be as specified below:

```
ccode                    = 1*4HEXDIG
capability_string_code   = ubyte "=" 1*utf8
ubyte                    = 1*3DIGIT
utf8                     = *( UTF8-char )

boperator                = and / or
and                      = "&"
or                       = "|"
expr                     = ccode
                         / capability_string_code
                         / expr WSP expr WSP boperator
capabilities             = expr
```

The semantics of capabilities shall be as specified below.

ccode – This terminal symbol represents a certain capability or capability group. This symbol evaluates as "true" if and only if the device has the capability or capability group identified. Values of ccode shall be a code point from Table 5.12.

capability_string_code – The first operand ubyte represents the capability category code. Values of ubyte shall be from Table 5.13 capability_category_code column. The second operand specifies the value of the capability. This symbol evaluates as "true" if and only if the device

has the capability identified. Characters chosen from UTF8-char shall not include Whitespace (WSP).

`boperator` – This nonterminal symbol represents a Boolean operator.

`and` – This nonterminal symbol represents the logical-and symbol.

`or` – This nonterminal symbol represents the logical-or symbol.

`expr` – This recursive nonterminal symbol represents a sequence of `ccode` symbols, `capability_string_code` symbols, and postfix logical operations. In an `expr`, when the `boperator` is "`and`", this symbol evaluates as "true" if and only if both the first and second operands evaluate as "true"; and when the `boperator` is "`or`", this symbol evaluates as "true" if and only if one or both of the first and second operands evaluate as "true."

`capabilities` – This nonterminal represents capabilities and capability groups required for decoding and presenting the content signaled. If this nonterminal evaluates as "true", capabilities and capability groups required to be able to create a meaningful presentation of the content are present. Using this nonterminal it is possible to express multiple alternate sets of capabilities and capability groups, the support for any one set of which is sufficient to create a meaningful presentation.

Table 5.12 Capability Codes

capability_code	Meaning	Reference	Required (See Note 1)	Supported (See Note 2)
0x0000	Forbidden		n/a	n/a
Capability Category: Download Protocols				
0x0100-0x01FF	Reserved for future ATSC use.			
Capability Category: FEC Algorithms				
0x0200	AL FEC Repair-only	Section 5.3.8	X	X
0x0201	STAGGERCAST	A/331 Sections 7.1.5.1 and 7.2.3.3 [2]		X
0x0202-0x02FF	Reserved for future ATSC use.			
Capability Category: Wrapper/Archive Formats				
0x0300-0x03FF	Reserved for future ATSC use.			
Capability Category: Compression Algorithms				
0x0400-0x04FF	Reserved for future ATSC use.			
Capability Category: Media Types (RMP – See Note 3)				
0x0500	[Reserved for AVC standard definition video]	Section 5.3.1		
0x0501	[Reserved for AVC high definition video]	Section 5.3.1		
0x0502	AC-3 audio	A/103 Section A.2.10 [12]		
0x0503	E-AC-3 audio	A/103 Section A.2.11 [12]		
0x0504	DTS-HD audio	A/103 Section A.2.18 [12]		
0x0505	HE AAC v2 with MPEG Surround	A/103 Section A.2.21 [12]		
0x0506	HE AAC v2 Level 6 audio	A/103 Section A.2.22 [12]		

capability_code	Meaning	Reference	Required (See Note 1)	Supported (See Note 2)
0x0507	Frame-compatible 3D video (Side-by-Side)	A/103 Section A.2.23 [12]		
0x0508	Frame-compatible 3D video (Top-and-Bottom)	A/103 Section A.2.24 [12]		
0x0509	ATSC 3.0 HEVC Video	Section 5.3.3	X	X
0x050A	ATSC 3.0 HEVC HDR Video	Section 5.3.4	X	X
0x050B	Dolby® AC4 Audio	A/342 Part 2 [10]	X	X
0x050C	MPEG-H Audio	A/342 Part 3 [11]	X	X
0x050D	IMSC1 Text Profile	A/343 [13]	X	X
0x050E	IMSC1 Image Profile	A/343 [13]	X	X
0x050F	4K Resolution	A/341 [9]		X
0x0510	ATSC 3.0 HEVC HDR with ST 2094-10	Section 5.3.6		X
0x0511	ATSC 3.0 HEVC SDR with SL-HDR1 SEI	Section 5.3.7		X
0x0512	ATSC 3.0 SHVC Video	Section 5.3.9		X
0x0513	HFR with one temporal sub-layer	Section 5.3.10		X
0x0514	HFR with unfiltered temporal sub-layers	Section 5.3.11		X
0x0515	HFR with filtered temporal sub-layers	Section 5.3.12		X
0x0516	ATSC 3.0 Fixed/Mobile 3D HEVC	Section 5.3.13		X
0x0517	ATSC 3.0 Fixed/Mobile 3D SHVC	Section 5.3.14		X
0x0518	ATSC 3.0 Wide Color Gamut	Section 5.3.15		X
0x0519	ATSC 3.0 HD Progressive Video	Section 5.3.16		X
0x051A	ATSC 3.0 Personalization Selection	Section 5.3.17		X
0x051B	ATSC 3.0 Dialog Enhancement	Section 5.3.18		X
0x051C	ATSC 3.0 Video Descriptive Services	Section 5.3.19		X
0x051D	ATSC 3.0 SD Progressive Video	Section 5.3.20		X
0x051E	ATSC 3.0 Legacy SD Video	A/341 Section 6.2.1 [9]		X
0x051F	ATSC 3.0 Interlaced HD Video	A/341 Section 6.2.2 [9]		X
0x0520	ATSC 3.0 VVC Video	Section 5.3.21	X	X
0x0521	ATSC 3.0 VVC HDR Video	Section 5.3.22	X	X
0x0522	ATSC 3.0 VVC HDR with ST 2094-10	Section 5.3.23		X
0x0523	ATSC 3.0 VVC SDR with SL-HDR1 SEI	Section 5.3.24		X
0x0524	ATSC 3.0 Multilayer VVC Video	Section 5.3.25		X
0x0525	ATSC 3.0 HFR VVC Video	Section 5.3.26		X
0x0526	ATSC 3.0 4K VVC Video	Section 5.3.27		X
0x0527	ATSC 3.0 3D VVC Video	Section 5.3.28		X
0x0528-0x057F	Reserved for future ATSC use.			
Capability Category: Media Types (AMP – See Note 4)				
0x0580	[Reserved for AVC standard definition video]	Section 5.3.1		
0x0581	[Reserved for AVC high definition video]	Section 5.3.1		
0x0582	AC-3 audio	A/103 Section A.2.10 [12]		
0x0583	E-AC-3 audio	A/103 Section A.2.11 [12]		
0x0584	DTS-HD audio	A/103 Section A.2.18 [12]		

capability_code	Meaning	Reference	Required (See Note 1)	Supported (See Note 2)
0x0585	HE AAC v2 with MPEG Surround	A/103 Section A.2.21 [12]		
0x0586	HE AAC v2 Level 6 audio	A/103 Section A.2.22 [12]		
0x0587	Frame-compatible 3D video (Side-by-Side)	A/103 Section A.2.23 [12]		
0x0588	Frame-compatible 3D video (Top-and-Bottom)	A/103 Section A.2.24 [12]		
0x0589	ATSC 3.0 HEVC Video	Section 5.3.3	X	X
0x058A	ATSC 3.0 HEVC HDR Video	Section 5.3.4	X	X
0x058B	Dolby® AC4 Audio	A/342 Part 2[10]	X	X
0x058C	MPEG-H Audio	A/342 Part 3 [10]	X	X
0x058D	IMSC1 Text Profile	A/343 [13]	X	X
0x058E	IMSC1 Image Profile	A/343 [13]	X	X
0x058F	4K Resolution	A/341 [9]		X
0x0590	ATSC 3.0 HEVC HDR with ST 2094-10	Section 5.3.6		X
0x0591	ATSC 3.0 HEVC SDR with SL-HDR1 SEI	Section 5.3.7		X
0x0592	ATSC 3.0 SHVC Video	Section 5.3.9		X
0x0593	HFR with one temporal sub-layer	Section 5.3.10		X
0x0594	HFR with unfiltered temporal sub-layers	Section 5.3.11		X
0x0595	HFR with filtered temporal sub-layers	Section 5.3.12		X
0x0596	ATSC 3.0 Fixed/Mobile 3D HEVC	Section 5.3.13		X
0x0597	ATSC 3.0 Fixed/Mobile 3D SHVC	Section 5.3.14		X
0x0598	ATSC 3.0 Wide Color Gamut	Section 5.3.15		X
0x0599	ATSC 3.0 HD Progressive Video	Section 5.3.16		X
0x059A	ATSC 3.0 Personalization Selection	Section 5.3.17		X
0x059B	ATSC 3.0 Dialog Enhancement	Section 5.3.18		X
0x059C	ATSC 3.0 Video Descriptive Services	Section 5.3.19		X
0x059D	ATSC 3.0 SD Progressive Video	Section 5.3.20		X
0x059E	ATSC 3.0 Legacy SD Video	A/341 Section 6.2.1 [9]		X
0x059F	ATSC 3.0 Interlaced HD Video	A/341 Section 6.2.2 [9]		X
0x05A0	ATSC 3.0 VVC Video	Section 5.3.21	X	X
0x05A1	ATSC 3.0 VVC HDR Video	Section 5.3.22	X	X
0x05A2	ATSC 3.0 VVC HDR with ST 2094-10	Section 5.3.23		X
0x05A3	ATSC 3.0 VVC SDR with SL-HDR1 SEI	Section 5.3.24		X
0x05A4	ATSC 3.0 Multilayer VVC Video	Section 5.3.25		X
0x05A5	ATSC 3.0 HFR VVC Video	Section 5.3.26		X
0x05A6	ATSC 3.0 4K VVC Video	Section 5.3.27		X
0x05A7	ATSC 3.0 3D VVC Video	Section 5.3.28		X
0x05A8-0x05FF	Reserved for future ATSC use.			
Capability Category: Internet Link				
0x0600	Internet link, downward rate 56,000 bps or better	A/103 Section A.2.25 [12]		
0x0601	Internet link, downward rate 512,000 bps or better	A/103 Section A.2.26 [12]		

capability_code	Meaning	Reference	Required (See Note 1)	Supported (See Note 2)
0x0602	Internet link, downward rate 2,000,000 bps or better	A/103 Section A.2.27 [12]		
0x0603	Internet link, downward rate 10,000,000 bps or better	A/103 Section A.2.28 [12]		
0x0604-0x06FF	Reserved for future ATSC use.			
Capability Category: Interactive				
0x0700	Interactive Content Environment	A/344 [15] (all)	X	X
0x0701	*WSPath*/atscVid	A/344 [15] 8.2.1	X	X
0x0702	*WSPath*/atscAud	A/344 [15] 8.2.1	X	X
0x0703	*WSPath*/atscCap	A/344 [15] 8.2.1	X	X
0x0704	*WSPath*/atscCD	A/344 [15] 8.2.1	X	X
0x0705-0x07FF	Reserved for future ATSC use.			
Capability Category: Other				
0x0800	DRM	Section 5.3.29.1	X	X
0x0801	Companion Device	Section 5.3.29.2	X	X
0x0802-0x08FF	Reserved for future ATSC use.			
ATSC Reserved				
0x001-0x00FF, 0x0900-0xFFFF	Reserved for future ATSC use.			

Note 1 - Codes marked with an "X" in this column are those codes that have use when signaling "capabilities and capability groups required in the receiver to be able to create a meaningful presentation of the content" (as described in Section 5.2.2.3.3.1 above).
Note 2 - Codes marked with an "X" in this column are those codes that have use when signaling the capabilities of receivers to HTTP servers (A/331 [2] Section 7.1.2.4) and A/344 Applications (A/344 [15] Section 9.13).
Note 3 – Required or supported without using an interactive environment; e.g., the real RMP only.
Note 4 – Required or supported using the interactive environment; e.g., the real RMP, HTML5 media stack, etc.

Table 5.13 Capability Categories and References

capability_category_code	Capability Category	Reference
0x00	Minimum HTTP Cache Size	Section 5.3.30.1
0x01	Minimum Broadcast Cache Size	Section 5.3.30.2
0x02-0xFF	Reserved for future ATSC use.	

5.3 Description of Code Points

The terms "RMP" and "AMP" as used in Table 5.12 and this section are not as commonly used in A/344 [15]. These refer to two separate environments within the receiver. The RMP is the native receiver environment. It is expected to support at least the essential capabilities to create useful presentations. The AMP is in the interactive environment intended to support broadcaster applications. As such, it can include additional functionality, which include support for a different set of capabilities. These different environments and their capabilities are separated into two similar sets of capability codes in the table above to cover the use cases where decoder capabilities exist in only one of the environments.

Other Code Points in Table 5.12 shall follow the description specified in the section referred in the column "Reference".

Note: User private data, including capability codes, can be added with user-defined-namespace elements or attributes.

5.3.1 Capability Codes 0x0500, 0x0501, 0x580, 0x581: AVC Video

The capability codes 0x0500, 0x0501, 0x0580, and 0x0581 are allocated to represent AVC standard definition video and AVC high definition video, respectively. These codes should not be used but might be usable if a future version of the ATSC 3.0 standard defines full specifications for the use of AVC.

5.3.2 Capability Codes 0x0507, 0x0508, 0x0587, and 0x0588: 3D Video

The capability codes 0x0507, 0x0508, 0x0587, and 0x0588 are allocated to represent various 3D video configurations. These codes should not be used but might be usable if a future version of the ATSC 3.0 standard defines full specifications for their use.

5.3.3 Capability Codes 0x0509 and 0x0589: ATSC 3.0 HEVC Video

The capability_code values 0x0509 and 0x0589 shall represent the receiver ability (using the RMP or AMP, respectively) to decode and display or output video (including at least the base layer of HEVC scalable video) encoded using HEVC in conformance with the ATSC specification A/341 [9] but not requiring ability to support the constraints related to HDR in A/341 [9].

5.3.4 Capability Codes 0x050A and 0x058A: ATSC 3.0 HEVC HDR Video

The capability_code values 0x050A and 0x058A shall represent the receiver ability (using the RMP or AMP, respectively) to decode and display or output video encoded using HEVC in conformance with the ATSC specification A/341 [9] including the aspects of A/341 describing HDR. That is, the receiver's ability to decode and display or output HEVC video encoded in conformance with all constraints including constraints regarding HDR in A/341 [9].

5.3.5 Capability Codes 0x050F and 0x058F: 4K Resolution

The capability_code values 0x050F and/or 0x058F shall represent the receiver ability (using RMP or AMP respectively) to decode and display or output video with spatial resolution greater than or equal to 3840×2160 (nominal), which is encoded per A/341 [9] with spatial resolution greater than or equal to 3840×2160. Note that this represents the ability to display or output at 3840×2160, not merely the ability to decode video encoded at 3840×2160 and create a meaningful output.

5.3.6 Capability Codes 0x0510 and 0x0590: ATSC 3.0 HEVC HDR Video with ST2094-10 SEI

The capability_code values 0x0510 and/or 0x0590 shall represent the receiver (using the RMP or AMP respectively) ability to decode HEVC video encoded in conformance with the ATSC specification A/341 [9] and specifically to utilize ST 2094-10 metadata. Note that this represents the ability to utilize the ST 2094-10 metadata in the decoding process, as described by the ST 2094-10 SEI messages as codified in A/341 Section 6.3.2.2.1 [9].

5.3.7 Capability Codes 0x0511 and 0x0591: ATSC 3.0 HEVC SDR Video with SL-HDR1 SEI

The capability_code values 0x0511 and/or 0x0591 shall represent the receiver (using the RMP or AMP respectively) ability to decode HEVC video encoded in conformance with the ATSC specification A/341 [9] and specifically to utilize SL-HDR1 metadata. Note that this represents the

ability to utilize SL-HDR1 metadata carried in the SL-HDR Information SEI messages as codified in A/341 Sections 6.3.2.1.1 and 6.3.2.1.2 [9].

5.3.8 Capability Code 0x0200: AL-FEC

The capability_code value 0x0200 shall represent the receiver ability to utilize AL-FEC data to perform error correction in conformance to the ATSC specification A/331 [2].

5.3.9 Capability Codes 0x0512 and 0x0592: ATSC 3.0 SHVC Video

The capability_code values 0x0512 and 0x0592 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output video enhanced by an SHVC enhancement layer in conformance with the ATSC specification A/341 Sections 6.3.1, 6.3.2.1, 6.3.3.3, and 6.3.4 [9] as applied to the context determined by the other conjoined capability codes.

5.3.10 Capability Codes 0x0513 and 0x0593: HFR with One Temporal Sub-Layer

The capability_code values 0x0513 and/or 0x0593 shall represent the receiver ability (using RMP or AMP, respectively) to decode and display or output high frame rate (i.e., a picture rate of 100, 120/1.001, 120) video encoded using HEVC with exactly one temporal sub-layer in conformance with the ATSC specification A/341 Section 6.3.4 [9]. A code from this section shall not appear in a conjunction with any code from Section 5.3.11 or Section 5.3.12.

5.3.11 Capability Codes 0x0514 and 0x0594: HFR with Unfiltered Temporal Sub-Layers

The capability_code values 0x0514 and 0x0594 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output high frame rate (i.e., a picture rate of 100, 120/1.001, 120) video using HEVC encoded with exactly two temporal sub-layers in conformance with the ATSC specification A/341 Section 6.3.4 [9] without the temporal filtering described in A/341 Section 6.3.4.1 [9]. A code from this section shall not appear in a conjunction with any code from Section 5.3.10 or Section 5.3.12.

5.3.12 Capability Codes 0x0515 and 0x0595: HFR, Temporal Filtering

The capability_code values 0x0515 and 0x0595 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output high frame rate (i.e., a picture rate of 100, 120/1.001, 120) video using HEVC encoded with exactly two temporal sub-layers and in conformance with the ATSC specification A/341 Section 6.3.4 [9] and with temporal filtering in conformance with A/341 Section 6.3.4.1 [9]. A code from this section shall not appear in a conjunction with any code from Section 5.3.10 or Section 5.3.11.

5.3.13 Capability Codes 0x0516 and 0x0596: ATSC 3.0 Fixed/Mobile 3D HEVC

The capability_code values 0x0516 and 0x0596 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output stereoscopic video using HEVC with independently encoded left and right views, subject to the constraints of ATSC specification A/341 Sections 6.2.3 and 6.3.3 [9] as described in Annex C [9].

5.3.14 Capability Codes 0x0517 and 0x0597: ATSC 3.0 Fixed/Mobile 3D SHVC

The capability_code values 0x0517 and 0x0597 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output stereoscopic video using HEVC having left

and right views further encoded using SHVC, subject to the constraints of ATSC specification A/341 Sections 6.2.3, 6.3.1, and 6.3.3 [9] as described in Annex C [13].

5.3.15 Capability Codes 0x0518 and 0x0598: ATSC 3.0 Wide Color Gamut

The capability_code values 0x0518 and 0x0598 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output video having colors outside the ITU-R BT.709 [16] gamut when encoded using HEVC with primaries and matrix coefficients (i.e., system colorimetry) of ITU-R BT.2020 [17] and ITU-R BT.2100 [18], subject to the constraints of ATSC specification A/341 Section 6.3.2. [9]

5.3.16 Capability Codes 0x0519 and 0x0599: ATSC 3.0 HD Progressive Video

The capability_code values 0x0519 and 0x0599 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output progressive video formats between 720 and 1440 lines, as constrained in Section 6.2.3 of ATSC specification A/341 [9] in the context of the other conjoined capability codes.

5.3.17 Capability Codes 0x051A and 0x059A: Personalization Selection

The capability_code values 0x051A and 0x059A shall represent the receiver ability, in the RMP or AMP respectively, to decode and reproduce or output audio subject to a personalization selection by the user, as specified in ATSC specification A/342 Part 1 [19], in the context of the other conjoined capability codes.

5.3.18 Capability Codes 0x051B and 0x059B: Dialog Enhancement

The capability_code values 0x051B and 0x059B, shall represent the receiver ability, in the RMP or AMP respectively, to decode and reproduce or output audio subject to a personalization control by the user to set a relative level of dialog, as specified in ATSC specification A/342 Part 1 [19], in the context of the other conjoined capability codes.

5.3.19 Capability Codes 0x051C and 0x059C: Video Descriptive Service

The capability_code values 0x051C and 0x059C shall represent the receiver ability, in the RMP or AMP respectively, to decode and reproduce or output video descriptive services subject to a personalization control by a user, as specified in ATSC specification A/342 Part 1 [19], in the context of the other conjoined capability codes.

5.3.20 Capability Codes 0x051D and 0x059D: ATSC 3.0 SD Progressive Video

The capability_code values 0x051D and 0x059D shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output progressive video formats having fewer than 720 lines, as constrained in Section 6.2.3. of ATSC specification A/341 [9] in the context of the other conjoined capability codes.

5.3.21 Capability Codes 0x0520 and 0x05A0: ATSC 3.0 VVC Video

The capability_code values 0x0520 and 0x05A0 shall represent the receiver ability (using the RMP or AMP, respectively) to decode and display or output video (including at least the base layer of Multilayer VVC video) encoded using VVC in conformance with the ATSC specification A/345 [22] but not requiring ability to support the constraints related to HDR in A/345 [22].

5.3.22 Capability Codes 0x0521 and 0x05A1: ATSC 3.0 VVC HDR Video

The capability_code values 0x0521 and 0x05A1 shall represent the receiver ability (using the RMP or AMP, respectively) to decode and display or output video encoded using VVC in conformance with the ATSC specification A/345 [22] including the aspects of A/345 describing HDR. That is, the receiver's ability to decode and display or output VVC video encoded in conformance with all constraints including constraints regarding HDR in A/345 [22].

5.3.23 Capability Codes 0x0522 and 0x05A2: ATSC 3.0 HDR VVC Video with ST2094-10 SEI

The capability_code values 0x0522 and/or 0x05A2 shall represent the receiver (using the RMP or AMP respectively) ability to decode VVC video encoded in conformance with the ATSC specification A/345 [22] and specifically to utilize ST 2094-10 metadata. Note that this represents the ability to utilize the ST 2094-10 metadata in the decoding process, as described by the ST 2094-10 SEI messages as codified in A/345 Section 5.2.6.2 [22].

5.3.24 Capability Codes 0x0523 and 0x05A3: ATSC 3.0 VVC SDR Video with SL-HDR1 SEI

The capability_code values 0x0523 and/or 0x05A3 shall represent the receiver (using the RMP or AMP respectively) ability to decode VVC video encoded in conformance with the ATSC specification A/345 [22] and specifically to utilize SL-HDR1 metadata. Note that this represents the ability to utilize SL-HDR1 metadata carried in the SL-HDR Information SEI messages as codified in A/345 Sections 5.2.5.3 and 5.3.2 [22].

5.3.25 Capability Codes 0x0524 and 0x05A4: ATSC 3.0 Multilayer VVC Video

The capability_code values 0x0524 and 0x05A4 shall represent the receiver ability, in the RMP or AMP respectively, to decode and display or output video enhanced by a Multilayer VVC enhancement layer in conformance with the ATSC specification A/345 Section 5.3 [22] as applied to the context determined by the other conjoined capability codes.

5.3.26 Capability Codes 0x0525 and 0x05A5: ATSC 3.0 HFR VVC Video

The capability_code values 0x0525 and/or 0x05A5 shall represent the receiver ability (using RMP or AMP, respectively) to decode and display or output high frame rate (i.e., a picture rate of 100, 120/1.001, 120) video encoded using VVC in conformance with the ATSC specification A/345 [22] including the aspects of A/345 describing HFR, as applied to the context determined by the other conjoined capability codes.

5.3.27 Capability Codes 0x0526 and 0x05A6: ATSC 3.0 4K VVC Video

The capability_code values 0x0526 and/or 0x05A6 shall represent the receiver ability (using RMP or AMP, respectively) to decode and display or output 4K video encoded using VVC in conformance with the ATSC specification A/345 [22] including the aspects of A/345 describing 4K resolution, as applied to the context determined by the other conjoined capability codes.

5.3.28 Capability Codes 0x0527 and 0x05A7: ATSC 3.0 3D VVC Video

The capability_code values 0x0527 and/or 0x05A7 shall represent the receiver ability (using RMP or AMP, respectively) to decode and display or output 3D video encoded using VVC in conformance with the ATSC specification A/345 Sections 5.3.1 and 5.3.3 [22], as applied to the context determined by the other conjoined capability codes.

5.3.29 Capability Category “Other” (0x08xx)

5.3.29.1 Capability Code 0x0800: DRM

The capability_code value 0x0800 shall represent that the Receiver supports Digital Rights Management, or that the service is encrypted and requires one. Note that this does not indicate a specific DRM system.

5.3.29.2 Capability Code 0x0801: Companion Device

The capability_code value 0x0801 shall represent that the Receiver supports a Companion Device as defined in A/338 [14], or that the service requires one.

5.3.30 Capability Category String Codes (ubyte)

This section identifies string “token” codes that can be used with the capability_string_code ubyte value and defines the syntax of the “value” (utf8) of that token.

5.3.30.1 ubyte 0x00: Minimum HTTP Cache Size

The ubyte value 0x00 shall represent that the service or content requires, or the Receiver has, an HTTP cache size in bytes of at least the value of the token, utf8. The syntax of utf8 shall be a decimal integer that represents a minimum cache size in multiples of 100,000 bytes; e.g., “00=5” signals that 500,000 bytes in HTTP cache is needed or supported. This cache is available for any Broadcaster Application signaled in the HELD. See A/331 [2]. The cache content includes HTTP content requested by the Broadcaster Application while executing. Broadcast content is not included in this number. See Section 5.3.10.2.

5.3.30.2 ubyte 0x01: Minimum Broadcast Cache Size

The ubyte value 0x01 shall represent that the service or content requires, or the Receiver has, a broadcast cache size in bytes of at least the value of the token, utf8. The syntax of utf8 shall be a decimal integer that represents a minimum cache size in multiples of 100,000 bytes; e.g., “01=2” signals that 200,000 bytes in broadcast is needed or supported. This cache is available for any Broadcaster Application signaled in the HELD. See A/331 [2]. All other cache content associated with non-executing appContextId’s can be flushed by the Receiver as needed to make up the signaled amount available to the currently executing Broadcaster Application. The cache content includes: the HELD HTMLEntryPackage, NRT content with the same appContextId, and storage of Broadcaster Application originated data.

5.4 SG Data Encapsulation

The Service Guide fragments specified in Section 5.3 of the present document shall be encapsulated in Service Guide Delivery Units (SGDUs), and the SGDUs shall be described in Service Guide Delivery Descriptors (SGDDs), as specified in Section 5.4.1 of the OMA BCAST SG specification [7]. The Service Guide Delivery Unit (SGDU) structure is the transport container for ATSC 3.0 service guide fragments. Broadcast Systems and the Reference Receiver shall support the Service Guide Delivery Unit structure as specified by Section 5.4.1.3 of the OMA BCAST 1.0.1 Service Guide [7], with the following constraints:

- The value of extension_offset field of the `UnitHeader` structure shall be equal to zero in SGDUs conforming to this version of this specification. The Reference Receiver shall be

able to process an SGDU with a non-zero value for extension_offset (e.g., by ignoring the extensions) field.

- The fragmentEncoding[i] field shall not take value of 1 or 2 or 3 for any value of i in the range 0 to n_o_service_guide_fragments in a SGDU. There shall be at least one value of i in the range 0 to n_o_service_guide_fragments for which value of fragmentEncoding[i] shall be equal to 0 in each SGDU conforming to this version of this specification. The reference receiver shall ignore fragment data associated with a non-zero fragmentEncoding[i] value for any value of i in the range 0 to n_o_service_guide_fragments.
- For any value of i in the range 0 to n_o_service_guide_fragments, when value of fragmentEncoding[i] is equal to 0, the fragmentType field shall not take value of 4, 5, 6, 7, 8, 9 for a SGDU. There shall be at least one value of i in the range 0 to n_o_service_guide_fragments for which fragmentType value shall be equal to 0 or 1 or 2 or 3 and fragmentEncoding[i] value shall be equal to 0 in each SGDU conforming to this version of this specification. The reference receiver shall ignore data in XMLFragment field with associated fragmentType field with value equal to 0 or greater than 3 for any value of i in the range 0 to n_o_service_guide_fragments when fragmentEncoding[i] is equal to 0.

5.5 SG Delivery

5.5.1 SG delivery over Broadcast

When SG data are delivered via broadcast, the SGDUs and SGDDs shall be delivered as specified in Section 5.4.2 of the OMA BCAST SG specification [7], except that a single LCT component of a ROUTE [2] session (called the Service Guide Announcement Channel) shall be used for delivery of the SGDDs. SGDUs are referenced from within SGDDs by means of the `ServiceGuideDeliveryDescriptor.DescriptorEntry.Transport` element. If AL-FEC coding is not employed, SGDUs shall be transported using the modified Compact No-Code FEC scheme defined in A/331 [3] where the FEC Payload ID is formatted as a 32-bit `start_offset`. If AL-FEC coding is employed, SGDUs shall be transported using RFC 6330 [20]. EFDTs shall be transmitted in the transport session delivering the Service Guide fragments.

5.5.2 SG delivery over Broadband

When SG data are delivered via broadband, the delivery shall conform to the specifications of section 5.4.3 of the OMA BCAST SG specification [7].

5.6 SG Data Update and Management

Update and management of the SG data shall conform to the specifications of Section 5.5 of the OMA BCAST SG specification [7].

– End of Document –