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Addressable TV Guidelines

Version UK 2.0.6 - SNPTV -AFMM

Validation of participants

Name	Company	Validation	Comment
	BeIn Sports		
	Canal+ Edition		
	France Télévisions		
	Lagardère		
	L'Equipe		
	M6		
	Next		
	TF1		
	Viacom MTV		
	Bouygues Télécom		
	Canal+ Distribution		
	Orange		
	SFR		

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1 Introduction

1.1 Foreword

This document is the English translation of the French document 'Service de TV Segmentée', issued and validated in September 2019 by both the SNPTV and AFMM.

The SNPTV ('*Syndicat National de la Publicité Télévisée'*) is a French association, regrouping television broadcasters, responsible for the television advertisement strategies in France.

The AFMM ('*Association Française du Multimédia Mobile'*) is a French association, regrouping French Telcos and mobile operators distributing on their network IPTV services or OTT services for their subscribers.

Note: the reference document is the French version.

1.2 Object of this document, and content

This document is the result of a common work undertaken by SNPTV and AFMM from 2018 until 2019. The application domain of this work concerns the TV broadcasters and Telcos and mobile operators on the French market.

The objective of this document is to specify the mechanisms implemented by the TV Broadcasters and the Distributors to allow one or more advertisements (from the linear TV feed) to be replaced by one or more addressed advertisements, i.e. contextualized according to criteria related to the consumer of the service.

These mechanisms are based upon:

- The signalling of the linear TV feeds by the broadcasters. This signalling allows to describe with great precision the different components of the feed,
- A call to the advertisement decision-making system of the Broadcaster (called Ad Server). This call takes advantage of the data collected in the signalling mentioned above,
- The replacement of one or more advertisements by alternative ones, as decided by the advertisement decision-making system, according to criteria linked to the consumer of the service. These alternative advertisements are provisioned upstream by the Broadcaster advertising agencies.

The signalling of the TV feeds follows the SCTE 35 standard, the calls to the Ad Server are made using https requests, and responses follow the VAST standard.

This document is structured as follows:

- This chapter provides background information, a glossary of the terms used in this document, and a list of reference documents,
- Chapter 2 describes the general principles used to implement addressable TV functionalities,
- Chapter 3 describes the signalling used by broadcasters for this purpose,
- Chapter 4 describes the mechanisms and exchanges implemented for Ad Server callss,
- Chapter 5 is an appendix detailing the fields and descriptors of the SCTE 35 standard used for the addressable TV,
- Chapter 6 is an appendix describing a typical timeline and shows the different messages associated with the different timeline events.

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1.3 Glossary

Addressable TV: capacity to address different advertisements to each individual terminal displaying the same broadcast TV feed.

Broadcaster: owner and broadcaster of the linear TV feed, responsible for the signalling of the feed to enable the addressable TV functionalities.

Distributor / Operator: operators distribute to their subscribers the TV feeds and are responsible to use the signalling and to replace the broadcast advertisements by alternative ones, according to the decisions taken by the Broadcasters' Ad Server.

SCTE-35 Message: such a message contains signalling data that may be composed of one or more different descriptors, inserted by the Broadcaster into the broadcast stream.

Descriptor: component of a SCTE-35 message, allowing to signal the segments of the TV stream. Descriptors bearing the '*segmentation_descriptor*' type typically occurs in pairs (Start / End of the segment). Other descriptors may just signal a special timing in the TV feed.

Descriptor Type: one of the fields of the descriptor, allowing to define its signification and role.

Segment: semantically coherent part of a TV feed, in the SCTE language (not to be confused with Audience Segment)

Event: occurrence of a marker usually indicating a beginning or end of a segment.

Commercial Break (or Advertisement Break, or Ad Break): a sequence of elementary video, during or between video programs, and composed as follows:

- A short video lasting a few seconds, called Commercial Break Intro.
- A sequence of advertisements, of various length.
- Optionally interstitial materials (videos) between the advertisements and /or the Commercial Break intro and outro,
- A short video lasting a few seconds, called Commercial Break Outro.

Commercial Break Intro or Outro: short branded sponsorship credits appearing either side of a commercial break.

Interstitial: short video sequence, of variable length (generally less than one second), either composed of black, fixed or animated images, which is not part of the advertisement as such, and added between the advertisements of an advertisement break.

Addressing: capacity to propose a different video content for each consumer of a same TV program.

Broadcast Advertisement: advertisement which is part of the linear TV feed.

Addressed Advertisement: advertisement replacing a broadcast advertisement, and different for each consumer.

AdSwitching: a method for replacing an advertisement, on a Set Top Box, through an actual switching of one feed (the linear feed) by another (the replacement feed).

AdStitching: a method for replacing an advertisement, through the manipulation of the manifest of the TV feed, at the server side.

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AdServing: method for delivering digital advertisements in the context of graphic and video display advertising.

VAST: (Video Ad Serving Template): specification published by the Interactive Advertising Bureau (IAB) that sets a standard for communication requirements between ad servers and video players. It is based on a data structure declared using XML.

IDR: (Instantaneous Decoding Refresh). Unlike an I image, when a decoder sees an IDR, it erases its memory to prevent the use of references to images preceding that IDR.

Arm Time or pre-roll: duration defined by the difference between the time the message is received and the time the event defined in the message actually happens.

Immediate: in immediate mode, messages do not bear any time information. In this case the event defined by the message will be at the nearest opportunity in the stream.

SDI: (Serial Digital Interface): a protocol for transporting baseband digital video and audio streams. The SCTE-104 is transported in the SDI VANC.

MPEG-TS: MPEG Transport Stream is a standard designed by the Moving Picture Experts Group, which defines multiplexing and transport of video, audio and associated data streams. SCTE-35 signalling is inserted in one PID (Packet Identifier) in the MPEG Transport Stream.

MPEG-TS Mezzanine: is a contribution MPEG Transport Stream, transmitted between a broadcaster and a distributor. This mezzanine stream has different characteristics from the final stream offered to devices. In particular, the video and audio components of such mezzanine stream may have much higher bandwidth than the final stream distributed to digital terminals. These mezzanine streams will have to be transformed by the distributor during a transcoding phase. With regards to SCTE signalling, it is not necessary to insert any IDRs into this mezzanine stream.

Final MPEG-TS: is a MPEG Transport Stream directly accepted by distributor digital terminals. For SCTE-35 signalling, these streams must include IDRs for those messages requiring IDRs.

PID: Packet Identifier (Packet ID) identifies uniquely a table of a media stream inside the MPEG Transport Stream.

Reconciliation Key: information found both in the signalling and in the response to the call of the ad server, allowing to perform a specific treatment on the broadcast spot (replace and/or count).

Anti-Ad-Skipping: for recorded content (nPVR or Start Over), this functionality prevents the fast-forward or the skip features within an advertisement Break.

1.4 Reference documents

#	Title	Reference
1	SCTE-35	SCTE-35-2019
2	SCTE-104	SCTE-104-2018
3	SCTE-67 guidelines	SCTE-67 2017
4	Video Ad Serving Template (VAST)	Version 3.0 - Released July 2012

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5	Television systems; Register of Country and Network Identification (CNI) and of Video Programming System (VPS) codes	ETSI - TS 101 231 Codes Register (2019-04)

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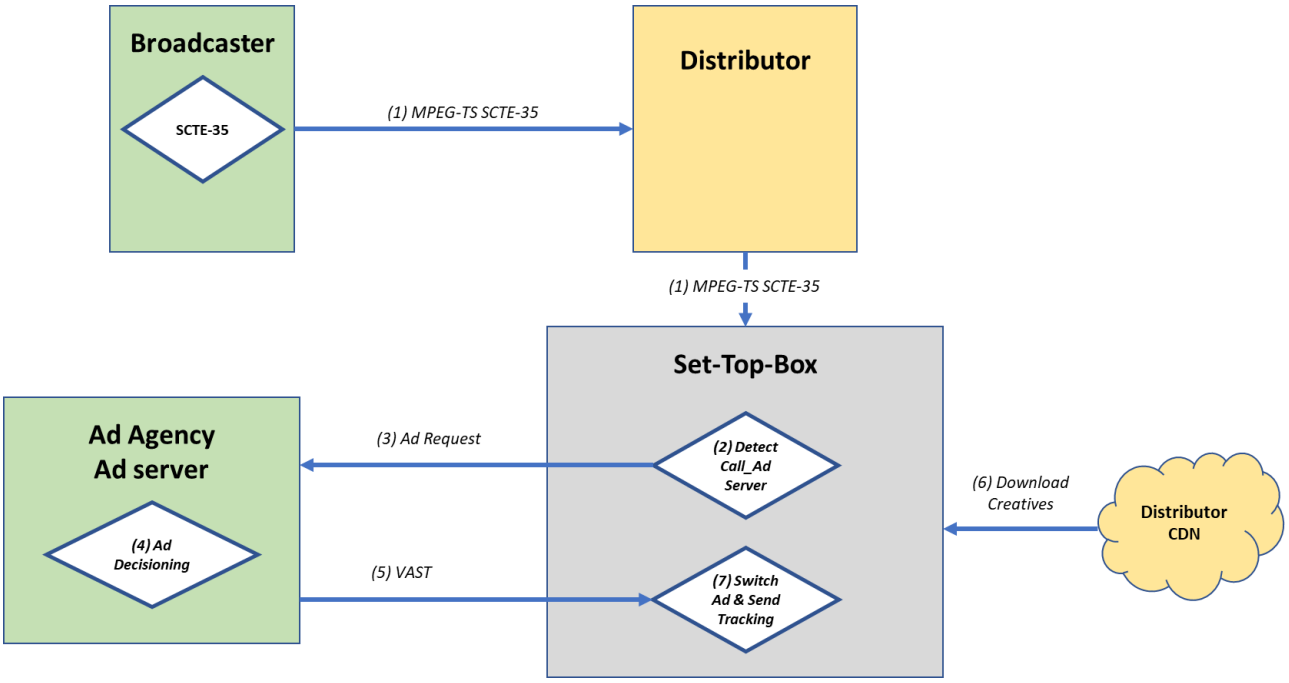
2 General description of the addressed TV mechanisms



The above diagram presents the main mechanisms and exchanges implemented by broadcasters and distributors, allowing the replacement of advertisements in Set Top Boxes.

These mechanisms are as follows:

- The broadcaster signals the linear TV feed using SCTE35 messages (the precise description of the messages is provided in the next chapter). These messages are inserted into the MPEG Transport Stream and propagated in the stream provided by the distributor to its network.
- The digital terminal (Set Top Box) processes the SCTE35 signalling and detects (2) a specific message (called *Call_Ad_Server*). This message, which can be sent by anticipation before the concerned Commercial Break, indicates that one or more advertisements of this Commercial Break may be replaced.
- The terminal uses the information contained in this message as well as information allowing the content personalization for this consumer, in order to exchange with the Broadcaster's advertisement decisioning system (Ad Server) (3). Note: In reality, requests received by the advertisement decisioning system may come from a distributor's gateway and not directly from the terminal.
- The Advertisement Decisioning system will then decide, according to the received information, the replacement of one or several advertisements from the Commercial Break (4).
- The Advertisement Decisioning system sends information to the digital terminal using the VAST protocol, specifying which advertisement(s) to replace and by which advertisement(s) to replace them (5).
- The Terminal uses this information to preload, from the Distributor's CDN (Content Delivery Network), the alternative advertising creation(s) (6). These advertisements will have been previously provisioned by the Broadcaster's Advertising Agency. Note: the advertising inventory is specific to each Advertising Agency. Replacement advertisements shall only be those provided by the Advertising Agency of the concerned Broadcaster. In order to implement audience measurement, watermarks may be implemented in these replacement advertisements. The

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stream containing these watermarks shall not be altered (except by a re-encoding operation, necessary for adaptation to networks and terminals).

- When the terminal analyses the SCTE message(s) corresponding to the advertisement(s) to be replaced, it 'plays' the replacement advertisement preloaded in step (6). Then at the end of this replaced advertisement, the terminal returns to the initial linear TV feed.
- Finally, the terminal sends the tracking information to the advertising tracking system (a function commonly performed by the advertisement decisioning system) (7).

3 Signalling implemented in the linear stream

3.1 Messages and Descriptors structure

3.1.1 MPEG Stream, Format, PIDs

The solution requires that Broadcasters and Distributors support an MPEG-TS stream with SCTE-35 signalling.

Two different implementations may occur:

- Either the Broadcaster provides the Distributor a mezzanine stream (see definition), i.e. a contribution stream, which must be transformed by the Distributor before being transferred on its network (to digital terminals),
- Or the Broadcaster provides the Distributor a final stream, i.e. directly in the format expected by the Distributor's digital terminals, without a need for any transcoding by the Distributor.

These two cases will bring different constraints on the insertion of IDRs:

- In the first case (contribution stream, without IDRs), it will be the responsibility of the Distributor to insert IDRs for these messages requiring such an insertion (this insertion will be done by the Distributor’s transcoding equipment).
- In the second case (final stream including IDRs), the Broadcaster has already inserted the IDRs, no change will be done in the insertion of messages or IDRs by the Distributor.

SCTE-35 messages must be carried in the MPEG Transport Stream on a dedicated PID.

The SCTE-35 standard specifies that descriptors must be indicated in the PMT of the concerned service. One of these descriptors is mandatory (*Registration_Descriptor*, and it must contain the ASCII value 'CUEI', which indicates that the service is SCTE-35 signalled). Other descriptors can be added to the PMT, refer to the chapter 'PMT Descriptors' of the SCTE-35 standard.

3.1.2 Content Protection

SCTE-35 Messages must not be accessible or operated outside the environments controlled by the Distributor. The Distributor MUST control the use of Messages even when they are not encrypted in the stream transmitted between the Broadcaster and the Distributor.

3.1.3 Message Type : *Time_Signal*

The SCTE 35 standard defines several message types. For implementations related to Addressable TV, it has been agreed between the AFMM and the SNPTV that only *Time_Signal* messages will be used.

3.1.4 Structure of a *Time_Signal* message

A *Time_Signal* message is composed of the following elements:

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- A header linked to any SCTE message (see Annex 1 for details),
- A header linked to the *Time_Signal* command (see Annex 1 for details),
- A sequence of segmentation descriptors. Each descriptor has a generic structure, composed of many fields, depending on the segments.

3.1.5 Timing management of messages

Two modes exist to indicate the actual moment of the occurrence of an event associated to a message:

- **Immediate**: the message does not contain any information of the timing for the corresponding event. In this case the event defined by the message will be at the nearest opportunity in the stream after the reception of the message. Such messages must have the *time_specified_flag* field of the *time_signal* header equal to '0'.
- **Non-immediate:** the message contains a timing information for the corresponding event, this timing is later than the reception of the message (based on the stream clock). Such messages must have the field *time_specified_flag* of the *time_signal* header equal to '1'.

For the latter (non-immediate messages), the timing information is given by the *pts_time* field of the *time_signal* header and can be modified by the value of the *pts_adjustment* field of the SCTE header. Nevertheless, it is strongly recommended that the *pts_adjustment* value be maintained at "0" for increased interoperability.

This timing of realization corresponds to a video frame in the stream which must be encoded as an IDR frame, in order to guarantee a seamless transition.

Details of those fields are given in Annex 1.

3.1.6 Messages and Descriptors

3.1.6.1 Segments

A linear TV stream is composed of segments. These segments may be:

- TV programs,
- Commercial Breaks (generally composed of a Commercial Break Intro, a sequence of Advertisements, potentially with interstitials between each of them, and a Commercial Break Outro),
- Placement opportunities (generally composed of several Advertisements).

3.1.6.2 Descriptors

Foreword: This document focuses only on the descriptors necessary for the implementation of addressable TV functionalities. The standard defines other descriptors that broadcasters may use for other purposes.

The descriptors are used to delimit segments as defined above. The following table lists the descriptors and their signification concerning the implementation of the addressable TV functionalities:

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Descriptor Type	Definition
Break Start	Defines the beginning of a Commercial Break, and the beginning of the segment for which the anti-ad-skipping feature must be active (i.e. starting at a Break Start, fast forward and skipping must not be possible anymore).
Break Stop	Defines the end of a Commercial Break, and the end of the segment for which the anti-ad-skipping feature must be active (i.e. at a break stop, fast forward and skip must be possible again)
Provider Advertisement Start	Defines the beginning of an advertisement
Provider Advertisement End	Defines the end of an advertisement
Provider Placement Opportunity Start	Defines the beginning of a placement opportunity segment. In such a segment, advertisements part of the linear feed may be replaced by addressed advertisements.
Provider Placement Opportunity End	Defines the end of a placement opportunity segment.
Call Ad Server	Dedicated descriptor used to pass information during calls to the Ad Servers of the Broadcaster's Advertisement agency.

Some descriptors (those associated to segments) are paired as follows:

- Break Start / Break End.
- Provider Advertisement Start / Provider Advertisement End.
- Provider Placement Opportunity Start / Provider Placement Opportunity End.

In the Start descriptors of these messages (Break, Provider Advertisement, Provider Placement Opportunity), a specific field gives the value of the duration of the segment to which these messages apply. As a result, as specified in the standard, the segment is considered complete in the following two cases:

- Either on reception of the message containing the End descriptor corresponding to the same segment,
- Or when the duration specified in the start descriptor has elapsed.

The specific descriptor *Call_Ad_Server* is a non-paired descriptor (no start nor end) and will appear several times for a same Commercial Break.

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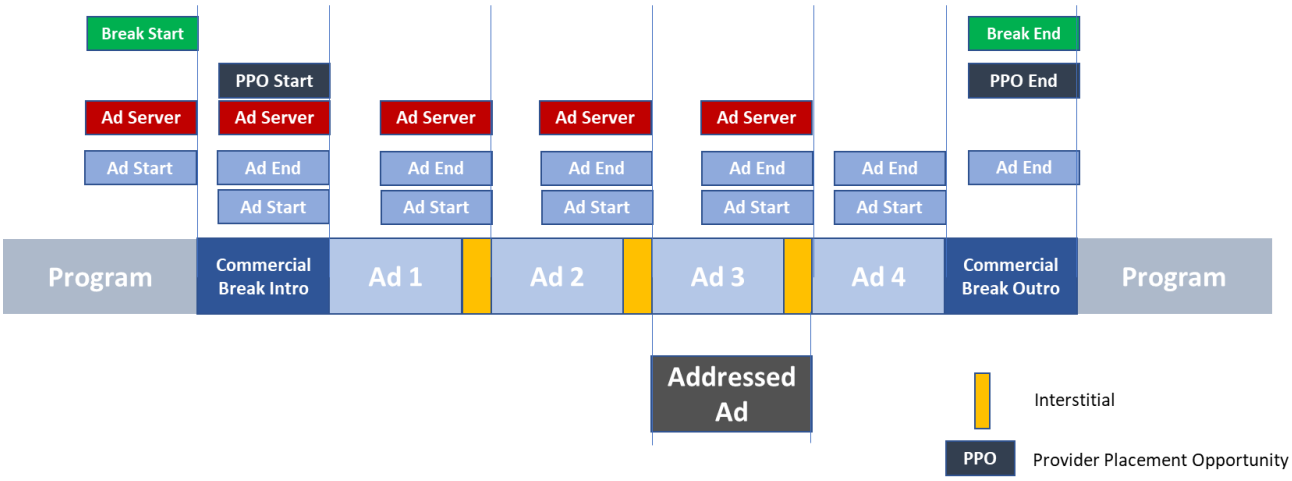
3.1.6.3 Segment diagram and use of descriptors

The following diagram presents a typical example of a Commercial Beak, composed of a number of advertisements, and the way the segments will be identified using the corresponding descriptors.

In this example, the Commercial Break segment is signalled from the start of the Commercial Break Introto the end of the Commercial Break Outro. This signalling enables the implementation of the Anti-Ad-Skipping functionality.

Each advertisement is signalled by a pair of descriptors Provider_Advertisement_Start / Provider_Advertisement_End. Note that the interstitials are not signalled, due to their very short duration. For this reason, the descriptors Provider_Advertisement_Start (advertisement i+1) and Provider_Advertisement_End (advertisement i) are collocated.

Finally, the segment Provider_Placement_Opportunity (PPO), which enables to define the place where all or part of the advertisements may be replaced, is signalled by the couple PPO Start / PPO End.



Reminder: in this diagram, the different messages are sent in advance of the beginning of the corresponding segment (pre-roll), except for the message containing the Break_Start descriptor (which may be sent in immediate mode).

3.1.6.4 Summary table

The following table explains the relationship between messages and descriptors. This table includes a timeline as shown in the diagram above, and describes, for each segment, the composition of the message in terms of SCTE descriptors. The table also specifies the mandatory / optional nature of the descriptors, as well as the requirement for frame accuracy.

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Message Associated to	Message Descriptors			Comments		
	SCTE descriptor	Descriptor Signification	Required	Frame Accuracy	Preroll	Comment
Start of the Commercial Break / first video (Commercial Break Intro or ad)	Break Start	Ad Break Start	Required	Not mandatory	Recommended	The first video of the break (Commercial Break Intro or ad) cannot be replaced
	Call_Ad_Server	Call Ad Server	Required			
	Provider Advertisement Start	Start of the first video (Commercial Break Intro or ad)	Required			
Videos from 2 to n-1	Provider Advertisement End	End of Ad i-1	Required	Required	Required	(*) Usually, the OTT replacement is done on the second video of the ad break, i.e. the first ad after the Commercial Break Intro (**) Warning: the PPO start must be present only once in the break.
	Provider Advertisement Start	Start of ad i	Required			
	Call_Ad_Server	Call_Ad_Server	Required			
	Provider Placement Opportunity Start	OTT Replacement Start (*)(**)	According to Broadcaster need.			
Start of Video n	Provider Advertisement End	End of Ad n-1	Required	Required	Required	(*) If the end of the OTT replacement is attached to this message, then it must correspond to an IDR. (**) Warning: the PPO end must be present only once in the break.
	Provider Advertisement Start	Start of last video (Commercial Break Outro or Ad)	Required			
	Provider Placement Opportunity End	End of OTT Replacement (*)(**)	According to Broadcaster need.			
End of last video (Commercial Break Outro or ad)	Provider Advertisement End	End of the last video (Commercial Break Outro or ad)	Required	Required	Required	(*) If the end of the OTT replacement is attached to this message, then it must correspond to an IDR. (**) Warning: the PPO end must be present only once in the break.
	Break end	End of the ad break	Required			
	Provider Placement Opportunity End	End of OTT Replacement (*)(**)	According to Broadcaster need.			

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3.2 Detailed content of the segment descriptors

Appendix 1 lists the elements of the standard and describes in detail the fields for the message headers and each of the segment descriptors.

3.2.1 The different descriptors, and their SCTE type

The SCTE standard defines for each of the descriptor, a field (called *Segmentation_Type_Id*), allowing to specify the typology of each descriptor.

The following table lists the descriptor types (only those descriptors linked to the addressable TV functionalities are listed below):

Descriptor Type	**Value of the *Segmentation_Type_Id* field**
Call_Ad_Server	**0x02 (*)**
Break_Start	**0x22**
Break_End	**0x23**
Provider_Advertisement_Start	**0x30**
Provider_Advertisement_End	**0x31**
Provider_Placement_Opportunity_Start	**0x34**
Provider_Placement_Opportunity_End	**0x35**

(*): This value is today noted as 'reserved' in the SCTE standard. The SNPTV will talk with SCTE to reserve this descriptor type value, dedicated to the *Call_Ad_Server*.

3.2.2 Segmentation_Event_ID

Each descriptor has a *segmentation_event_id* field, which must be unique for the segment validity duration.

The standard states that the *segmentation_event_id* field values of the paired segments (Start / End) must be identical.

A *segmentation_event_id* becomes active with a Start descriptor and is inactive either upon receipt of an End descriptor of the same type or after the (optional) duration specified in the Start message has elapsed. Thus, if a duration is specified in a Start segment, then the end of the segment must be considered when the duration has expired, unless the corresponding End segment is received before the end of that duration.

Call_Ad_Server descriptors corresponding to a same Commercial Break shall use an identical *segmentation_event_id*. Such implementation prevents the actual call to the AdServer to be done more than once.

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Broadcasters may even (as the standard allows) use the same value for *segmentation_event_id* in the *Break Start* and *Call_Ad_Server* descriptors.

3.2.3 UPID field and possible values for this field

Each descriptor may contain a field called UPID (Unique Program Identifier), associated with the segment. Broadcasters can choose to use this possibility to identify segments, for their own purposes.

This UPID is characterized by the 3 following fields in each descriptor:

- **Segmentation_UPID_Type**: this field allows to define the type of this identifier. Among all possible values as stated in the standard, the 3 most used values are the following:
  - UPID_Type = 0x00: indicates that there is no UPID attached to this descriptor,
  - UPID_Type = 0x08: 'Airing Id': in this case, the UPID is 8 bytes long, and must contain a unique information defining the segment (as an example, this value may be defined by the Broadcaster automation),
  - UPID_Type = 0x0C: MPU (Managed Private UPID). Allows to define a private field. As an example, in the case of addressed TV, the *Call_Ad_*Server descriptor has been defined with a private UPID, having a length of 16 bytes (see § 3.2.4).
- **Segmentation_UPID_Length**: UPID field length: in our case, this length may be 0, 8 or 16 bytes.
- **Segmentation_UPID**:
  - If UPID_Type = Airing Id: the UPID must contain a unique information defining the segment (identification of the program, for example),
  - If UPID_Type = MPU (applies to the *Call_Ad_Server* descriptor): the UPID value contains all relevant information which will be passed to the AdServer, in order to enable advertisement replacement.

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3.2.4 *Call_Ad_Server* descriptor

This descriptor is intended to indicate the arrival of a replacement opportunity and thus to generate an Ad Server call. The descriptor must be present in the Break Start message and must be repeated in all messages corresponding to the following Provider Advertisement Start messages of the same Commercial Break.

It may be inserted in a message generated by the Distributor or the Operator *before* the Commercial Break. In this case, the use of the Immediate mode will be preferred.

Only one actual call to the Broadcaster AdServer will be done for one Commercial Break. All *Call_Ad_Server* descriptors of a same advertisement break bear the same *segmentation_event_id* value (see § 3.2.2), which prevents multiple calls to the AdServer for the same commercial break.

Private UPID field for the *Call_Ad_Server* descriptor: in the absence of an adequate field for the information to be transferred to the AdServer, the SNPTV / AFMM working group decided to standardize a private UPID. This private UPID field is composed of sub-fields as described in the table below:

Sub-Field name	Length	Value
Format Identifier	4 bytes	Character string : 'ADFR'
Version Number	1 byte (between 1 and 99)	1 for the moment
TV Channel identifier (CNI)	2 byes	This unique code is managed by EBU
Date	4 bytes, format YYYYMMDD	Example : 20190620
Commercial Break Code	4 digits on 2 bytes	This code must be unique for the day and identifies the Commercial Break
Duration of the break (including Commercial Break intro and outro)	3 bytes in ms	Range between 0 and 16,7 million ms, corresponding to 279 minutes.

The following diagram represents the private UPID used for the *Call_Ad_*Server descriptor:

'ADFR' 4 bytes	Version 1 byte	CNI (Channel Id) 2 bytes	Date 4 bytes	Ad Break code 2 bytes	Ad Break duration 3 bytes

Example of a typical value in hexadecimal:

- Bytes from 1 to 4: ASCII code for 'ADFR' = 0x41444652
- Byte #5: version number: by default 1 = 0x01
- Bytes 6 to 7: TV channel ID - CNI: example for TF1 = 0x33F1
- Bytes 8 to 11 (4 bytes): YYYYMMDD = 0x01341403 (20190211 in decimal)
- Bytes 12 and 13: Ad break code: example = 0x0462 (break 1122)
- Bytes 14 to 16: duration of the break in ms = 0x01C070 (duration: 114800 ms, meaning: 1minute, 54secondes and 20 frames).

Note: the date in the field is the date of the broadcast conductor, which may not correspond to the range 0h-24h. Consequently, for a Commercial Break broadcast at 5am on January the 1st 2010, the date in the field may be December the 31st 2019.

The TV channels identifiers (CNI) are defined by the EBU. See https://tech.ebu.ch/publications/ts101231.

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The *Call_Ad_Server* descriptor contains the following fields:

SCTE fields	Role	Value	Comment
segmentation_type_id	Type of the descriptor	0x02	Use of a reserved value (not used by SCTE today).
segmentation_upid_type	Type of the UPID field	0x0C	Definition of a private UPID, with all the necessary information for Adserver calls.
segmentation_upid_length	Length of the UPID field	16 bytes	
segmentation_upid	Contains all information to define uniquely the channel and the advertisement break	MPU	See above for detailed description
segmentation_event_id	Event identification		As a reminder, the same value is used for each occurrence of the Call_Ad_Server within the same ad break and potentially for the Break Start / End corresponding to the same ad break.
Segment_num	Segment number	0	Not used, value must be 0
Segments_expected	Number of expected segments of the same type	0	Not used, value must be 0

3.2.5 *Break Start* Descriptor

This descriptor is intended to signal the beginning of a Commercial Break (composed of several advertisements).

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x22	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Break End
segmentation_duration_flag	Gives the duration of the segment, and enables to secure the detection of the end of the commercial break	1	Indicates that the duration is given
segmentation_duration		Variable	Duration of the segment (expressed in 90KHz frequency ticks)
segment_num	Segment number	1	The value 1 is fixed by the standard for this descriptor
segments_expected	Number of expected segments of the same type	1	

Note: the Break_Start and Break_End descriptors signal the activation of the Anti_Ad_Skipping functionality.

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3.2.6 *Break End* Descriptor

This descriptor is intended to signal the end of a Commercial Break (composed of several advertisements).

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x23	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Break Start
segment_num	Segment number	1	The value 1 is fixed by the standard for this descriptor
segments_expected	Number of expected segments of the same type	1	

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3.2.7 *Provider Advertisement Start* Descriptor

This descriptor is intended to signal the beginning of an advertisement.

A replacement can take place if the replacement key corresponds to one of the keys contained in the VAST answer.

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x30	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Provider Advertisement End
segmentation_duration_flag	Gives the duration of the advertisement, excluding interstitials	1	In case of a corruption of this information, the distributor will use the corresponding Provider_Advertisement_End to stop the replacement. Duration expressed in 90KHz frequency ticks.
segmentation_duration		Duration	
segment_num	Segment number: identifies the position of the advertisement in the commercial break (allowing to make a correlation with the VAST response).	0	If the video is a Commercial Break Intro or Outro
		i	This value must correspond to the position of the advertisement in the commercial break (same value as the one known by the AdServer
segments_expected	Number of expected segments of the same type	0	If the video is the Commercial Break Outro
		N	Total number of the advertisements contained in this commercial break (even for the Commercial Break Intro)

3.2.8 *Provider Advertisement End* Descriptor

This descriptor is intended to signal the end of an advertisement.

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x31	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Provider Advertisement Start
segment_num	Segment number: identifies the position of the advertisement in the commercial break	0 or i	The values must be identical to the corresponding Provider Advertisement Start
segments_expected	Number of expected segments of the same type	0 or N	

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3.2.9 *Provider Placement Opportunity Start* Descriptor

This descriptor is intended to signal an opportunity to replace a complete commercial break. By convention between the broadcasters, the Commercial Break Intro is not included in this segment.

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x34	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Provider Placement Opportunity End
segmentation_duration_flag	Gives the duration of the segment, until the Provider Placement Opportunity End	1	This field gives the information of the duration of the segment which can be replaced. Duration expressed in 90KHz frequency ticks.
segmentation_duration		Duration	
segment_num	Segment number	1	Values fixed by the standard
segments_expected	Number of expected segments of the same type	1	

Note : for this descriptor, the version 2016 of the standard has added two additional fields, *sub_segment_num* and *sub_segments_expected*. These fields will not be used for the time-being thus it is proposed to make them optional. For these fields being placed at the very end of the descriptor, two implementations may be done by the Broadcaster:

- Either they are present, and their value is set to 0, and their length is taken into account in the *descriptor_length* field (which adds 2 bytes to the length of the descriptor). The *descriptor_length* must be then: 30 bytes.
- Or the fields are totally ignored, and thus must not be present. In this case, the *descriptor_length* must be: 28 bytes.

The broadcasters may implement one of the two alternatives, according to the nature of their insertion and video coding equipment (not all of which take into account the 2016 SCTE standard).

3.2.10 *Provider Placement Opportunity End* Descriptor

This descriptor is intended to signal the precise moment when the replacement of a commercial break must stop and when the terminal must get back to the live stream.

SCTE fields	Role	SCTE Value	Comment
segmentation_type_id	Type of the descriptor	0x35	
segmentation_upid_type	Type of the UPID field	0x00 Or other value	The broadcaster may define a UPID for this descriptor. This value being of no usage for the addressable TV functionalities, this UPID may be totally ignored by the distributors.
Segmentation_upid	UPID value		Defined potentially by the Broadcaster
segmentation_event_id	Event identification		The value must be the same as for the Provider Placement Opportunity Start
segment_num	Segment number	1	Values fixed by the standard
segments_expected	Number of expected segments of the same type	1	

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3.2.11 Summary for the values of the *segment_num* and *segments_expected* fields

The following table summarizes the values of the *segment_num* and *segments_expected* fields, for each of the descriptors as listed in this document.

Segment	Segment_Num	Segments_Expected
Break Start / End	**1**	**1**
Provider Advertisement Start (for the Commercial Break Intro)	**0**	**N (Number of ads, excluding Commercial Break Intro and Outro)**
Provider Advertisement End (for the Commercial Break Intro)	**0**	**N**
Provider Advertisement Start Ad i/n	**I**	**N**
Provider Advertisement End Ad i/n	**I**	**N**
Provider Advertisement Start (Commercial Break Outro)	**0**	**0**
Provider Advertisement End (Commercial Break Outro)	**0**	**0**
Provider Opportunity Placement Start / End	**1**	**1**
Call_ Ad_Server	**0**	**0**

By convention, the *segment_num* field for the first actual advertisement of a commercial break bears the value 1, and the *segments_expected* field concerns only the actual advertisements of the commercial break (excluding Commercial Break Intro and Outro).

Special case of dual advertising screens:

Broadcasters may implement two commercial breaks in certain circumstances.

In such a case, between the two commercial breaks, only one Commercial Break Outro is inserted (instead of one Commercial Break Outro followed by one Commercial Break Intro). The following diagram details the messages for this case:

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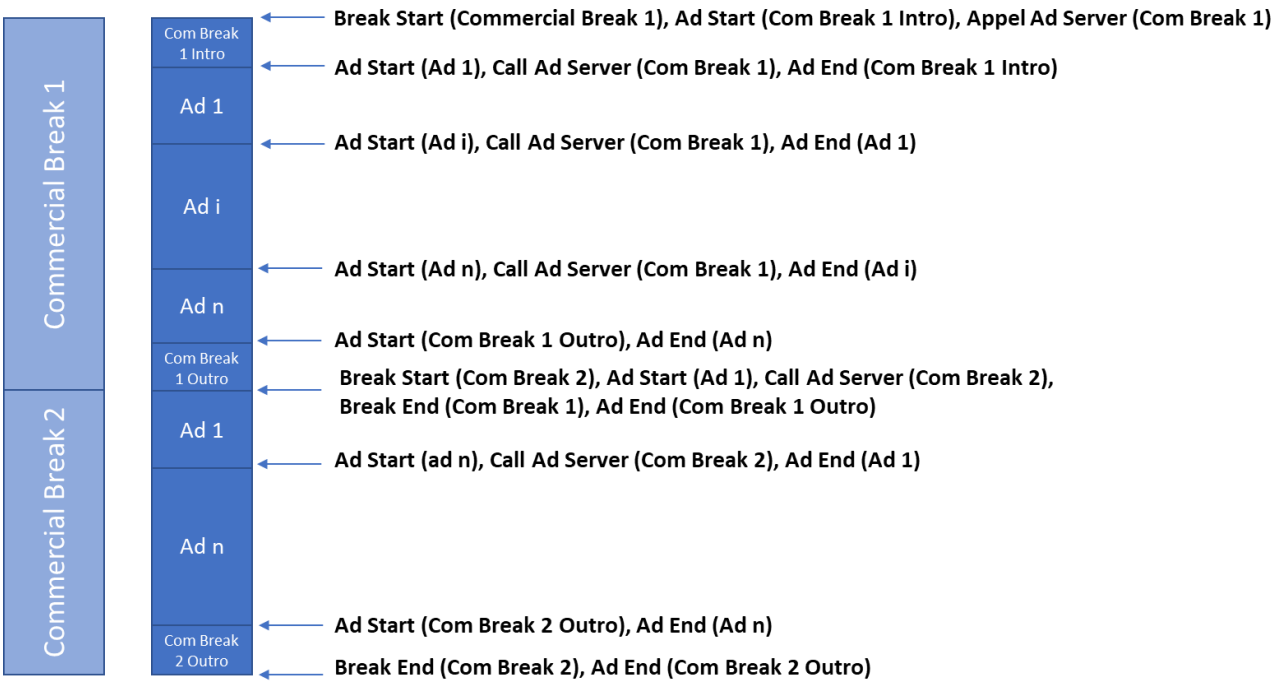

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4 AdServing

4.1 Call to the AdServer

The call to the advertising decision system is triggered by the presence of the descriptor *Call_Ad_Server* (*Segmentation_type* = 0x02) in a SCTE35 message. For a given commercial break, this descriptor is repeated several times and has the same values for the *segmentation_event_id* and *segmentation_upid* fields.

The call to the advertising decision system must be done only once for one specific commercial break, at the first detection of this descriptor *call_ad_server*, except if no answer from the advertising decision system has been received after a previous call.

As stated above, this descriptor must be present:

- In the message at the beginning of a commercial break, also containing a *Break_Start* descriptor.
- In the messages at the beginning of each advertisement, also containing the *Provider_Advertisement_Start* descriptor.

This descriptor may be inserted in a dedicated message, before the commercial break, in order to maximize the coverage rate (enabling even the terminals with reduced bandwidth to preload the replacement advertisements), and to optimize load balancing in a peak period. The Broadcasters and the Distributors may implement such a call anticipation mechanism. The different methodologies will be at the discretion of the publishers and distributors.

4.2 AdServer call format

4.2.1 Protocol and method

The call must be done in **HTTPS**, using the **GET** method.

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4.2.2 URL parameters

Common name	Key in the URL	Value (example)	Comment
DAI Version	dai_version	1.0	Necessary for the ad server and the STB player to understand each other on the successive evolutions of the DAI functional.
Transaction ID	transaction_id	789456123	Necessary for tests and debug on the Distributor side
Response Type	response_type	Commercial Break or Spot	This value defines the type of answer (replacement of the complete Commercial Break or just one Advertisement)
TV channel	Channel	33F1	Unique identifier (CNI) for each TV channel (*)
Commercial Break Code	break_code	2030	HHMM (*)
Commercial Break Date	break_day	20200101	AAAAMMJJ(*)
Commercial Break Duration	break_duration	480 000	Expressed in milliseconds (*)
Advertising identifier	advertising_id	13930449400	This field allows to manage the data offer
Distributor platform	Platform	Example: tv_box tablet_ios_app mobile_android_web	
Distribution context	Context	ENUM live startover npvr timeshift	Enables to precise the context in which the replacement is done. (StartOver, Live, nPVR, etc.)
Current Advertisement	current_spot	4	This value indicates that the call was made on the AdStart of the 4th ad. This value corresponds to the replacement key of the current ad. If the value is 0, this indicates that the call is done at the beginning of the commercial break (break start message). On the anticipated Call_Ad_Server message, the value must be -1

(*): these 4 fields are directly extracted from the private UPID of the *Call_Ad_Server* descriptor (see §3.2.4)

4.3 AdServer response format

4.3.1 Response code

A valid answer must send back the http code 200.

4.3.2 Response format

In the live broadcast context, the answer must be in XML format, compliant with the VAST schema, with a version greater than or equal to 3.0.

4.3.3 Response Content

In the live broadcast context, the answer must contain a list of Ads to be addressed by the Distributor.

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4.3.4 Key information for each Ad to be replaced

Common name	Role	Required / optional	Position and type	Value example	Comment
DAI Version		Optional, already present in the URL call		1.0	Necessary for the ad server and the STB player to understand each other on the successive evolutions of the DAI functional.
Replacement key	Enables to identify the broadcast spot in relation with the <Ad> present in the VAST	Required	This fiels is stored as a sequence.	5	This value is the one that is present in the Ad Start Descriptor to indicate a replacement to be made. Represents the spot(s) to be replaced in the break. Location and Format to be finalized
Duration of the addressed Spot	Enables a potential control of the durations of the broadcast spot and of the VAST spot	Required			Field expressed in milliseconds
Print tracking link	Enables the Broadcaster to count the print of the beginning of an ad	Required			**(1) + (2) For the first implementation, only the first one will be processed**
Tracking link for the first quartile	Enables the broadcaster to know an ad has been displayed at 25% of its duration	Optional			**(1) + (2) For the first implementation, only the first one will be processed**
Tracking link for the second quartile	Enables the broadcaster to know an ad has been displayed at 50% of its duration	Optional			**(1) + (2) For the first implementation, only the first one will be processed**
Tracking link for the third quartile	Enables the broadcaster to know an ad has been displayed at 75% of its duration	Optional			**(1) + (2) For the first implementation, only the first one will be processed**
Tracking link for the completion	Enables the broadcaster to know an ad has been displayed at 100% of its duration	Optional			**(1) + (2) For the first implementation, only the first one will be processed**
Tracking link error		Required			Only the errors managed by the standard VAST 3.0 will be implemented.
Spot identifier	Gives the Broadcaster the identifier (in its CDN) of the spot to be loaded and displayed in replacement of the broadcast spot.	Required	URL format in http or HTTPS		This identifier should be unique and given by each Distributor during the provisioning by the Broadcaster of a spot.

Note (1): The tracking URL, inserted in the VAST response is sent without any modification by the Distributor.

Note (2): the tracking URLs will be called by the Distributors within ½ hour after the adswitching and the distribution order will not be guaranteed.

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5 Appendix 1. Messages and Descriptors in the SCTE35 standard

5.1 Introduction

A *Time_Signal* message is composed of

- A SCTE header (present in every type of SCTE message),
- A header specific to the *Time_Signal* message,
- A sequence of one or several descriptors, signalling segments.

5.2 SCTE Header

The following table lists the different fields, their signification and possible values, for the SCTE Header:

Field Name	Description / Value
Table_Id	0xFC
Section_Syntax_Indicator	0 (short MPEG sections)
Private_Indicator	0
Reserved	Not used
Section_Length	Number of bytes of the global section (command + descriptors): length of what follows this field, until the end of the message.
Protocol_Version	0 at this stage
Encrypted_Packet	0 at this stage, the message is not encrypted
Encryption_Algorithm	0, the message is not encrypted
PTS_Adjustment	Optional: time offset which is added to the PTS_Time found in the following command.
Cw_Index	0, Not used
Tier	0x0FFF (to ensure backward compatibility, field not used)
Splice_Command_Length	Length in bytes of the following command (number of bytes following the *Splice_Command_*Type). For a *Time_Signal* command, this length is 5 bytes.
Splice_Command_Type	**0x06** for a *Time_Signal* command
Descriptor_Loop_Length	Number of bytes of the descriptors loop which follows the *Time_Signal* command.

5.3 Time_Signal Header

The following table lists the different fields of the *Time_Signal* Header. It is reminded that most of these commands must be inserted with a preroll.

Field Name	Description / Value
Time_Specified_Flag	Immediate (0) or Non_Immediate (1)
Reserved	Not used
PTS_Time	This field contains the time of realisation of the event associated with this *Time_Signal* command

The *pts_time* field given in the header can be modified by the value of *pts_adjustement* field of the SCTE header. Nevertheless, it is strongly recommended that the *pts_adjustement* field be left at 0 for an improved interoperability.

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The *Time_Signal* header is then followed by a sequence of segments descriptors, associated to the same event.

5.4 Generic content of the descriptors

Field Name	Description / Value
Splice_descriptor_tag	0x02
Descriptor_Length	Length in bytes of what follows in the descriptor
Identifier	ASCII value 'CUEI'
Segmentation_Event_Id	Unique identifier for the segment (see § 3.2.2).
Segmentation_Event_Cancel_Indicator	Enables to signal the cancellation of a previously announced segment.
Program_Segmentation_Flag	Flag indicating that all elements of the program are segmented.
Segmentation_Duration_Flag	Flag indicating whether a duration is given or not for this segment.
Delivery_Not_Restricted_Flag and Restriction_Flags	Flags indicating whether restrictions apply on the segment, and which ones (example: geographic occultation)
Segmentation_Duration	Gives the duration of the segment (if the corresponding flag is set to 1)
Segmentation_UPID_Type	UPID: Unique Program Identifier type. This field gives information about the type of UPID if any: Airing_ID (value 0x08: unique identifier of a program), or MPU (value 0x0C: Private Id), or no UPID (value 0x00)
Segmentation_UPID_Length	Length in bytes of the UPID (0, 8 or 16)
Segmentation_UPID	Value of the UPID, if any (8 or 16 bytes)
Segmentation_Type_Id	Defines the segmentation type (see § 0)
Segment_Num	Number of the segment in the sequence (example: position of an advertisement in a commercial break)
Segments_Expected	Number of similar segments expected in the sequence (example: number of advertisements in the commercial break)
Sub_Segment_Num	Optional field, only in place for the Placement_Opportunity_Start descriptor
Sub_Segments_Expected	Optional field, only in place for the Placement_Opportunity_Start desriptor

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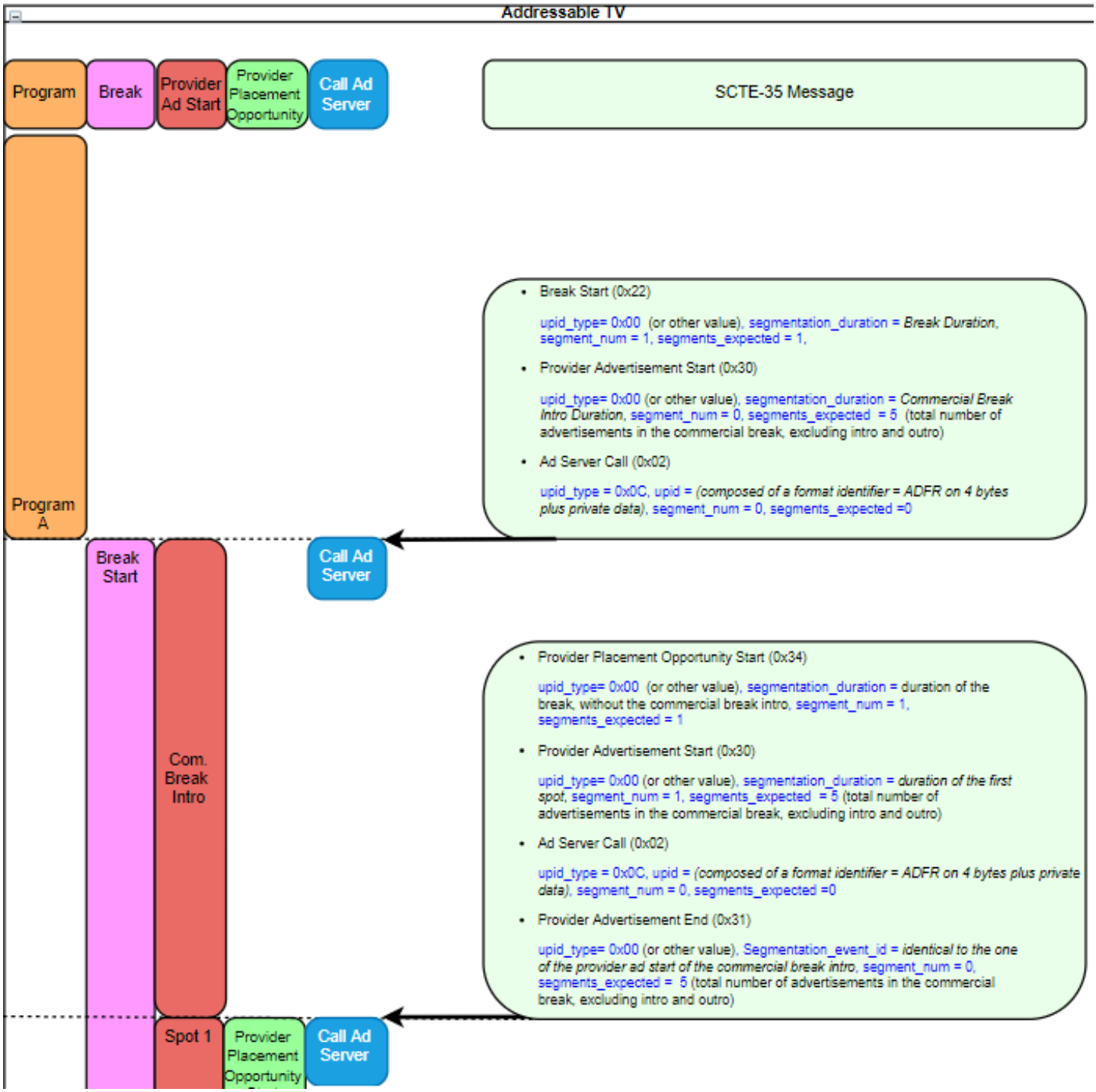
6 Appendix 2 – example of a full signalling of a timeline

The following diagram shows the SCTE35 signalling in a video stream containing commercial breaks.

Each block on the right (in green) represents a single message, composed of several descriptors, and inserted at the foreseen location (as a reminder, these messages are usually sent with a preroll before the time of the event they signal).



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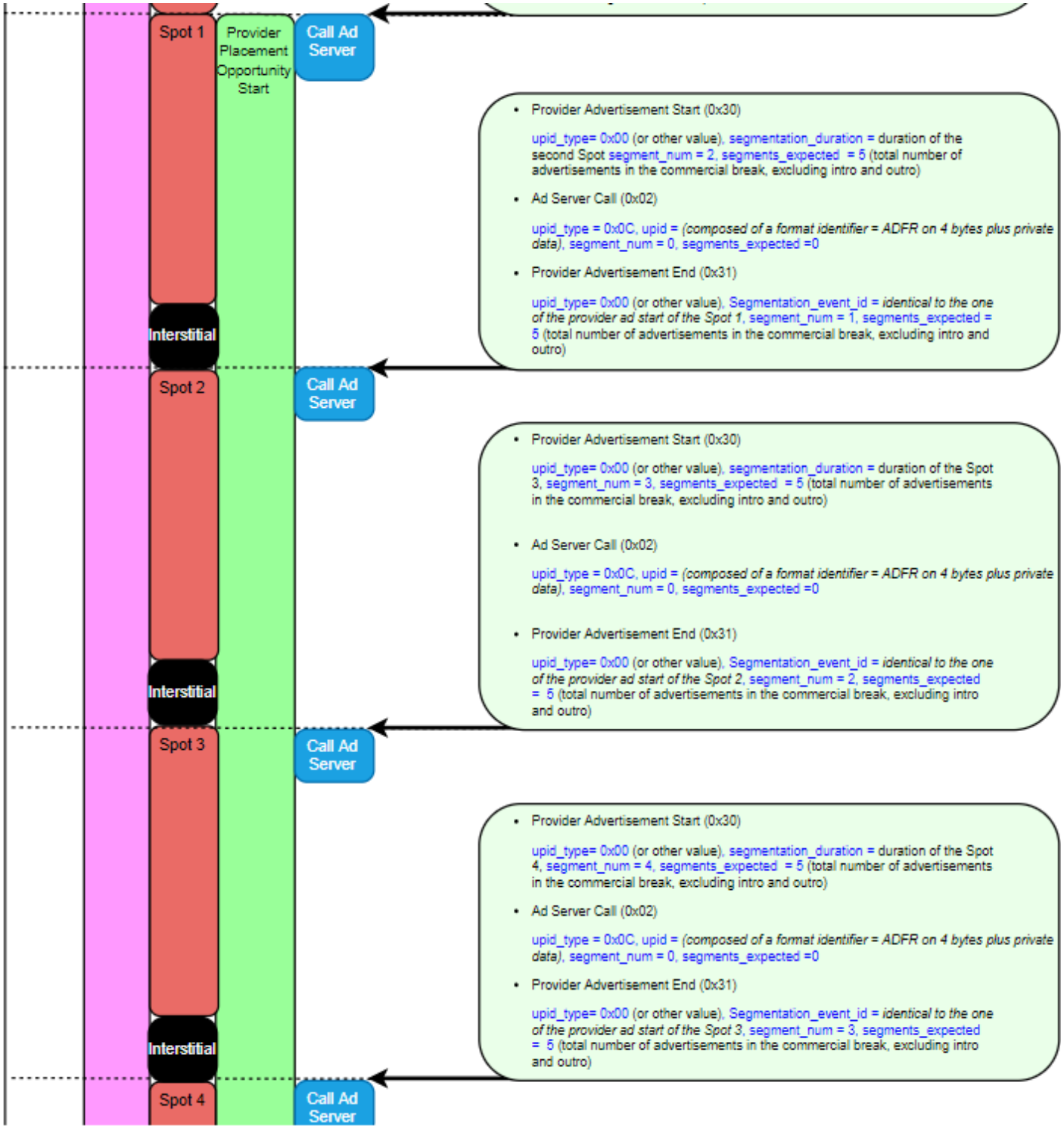

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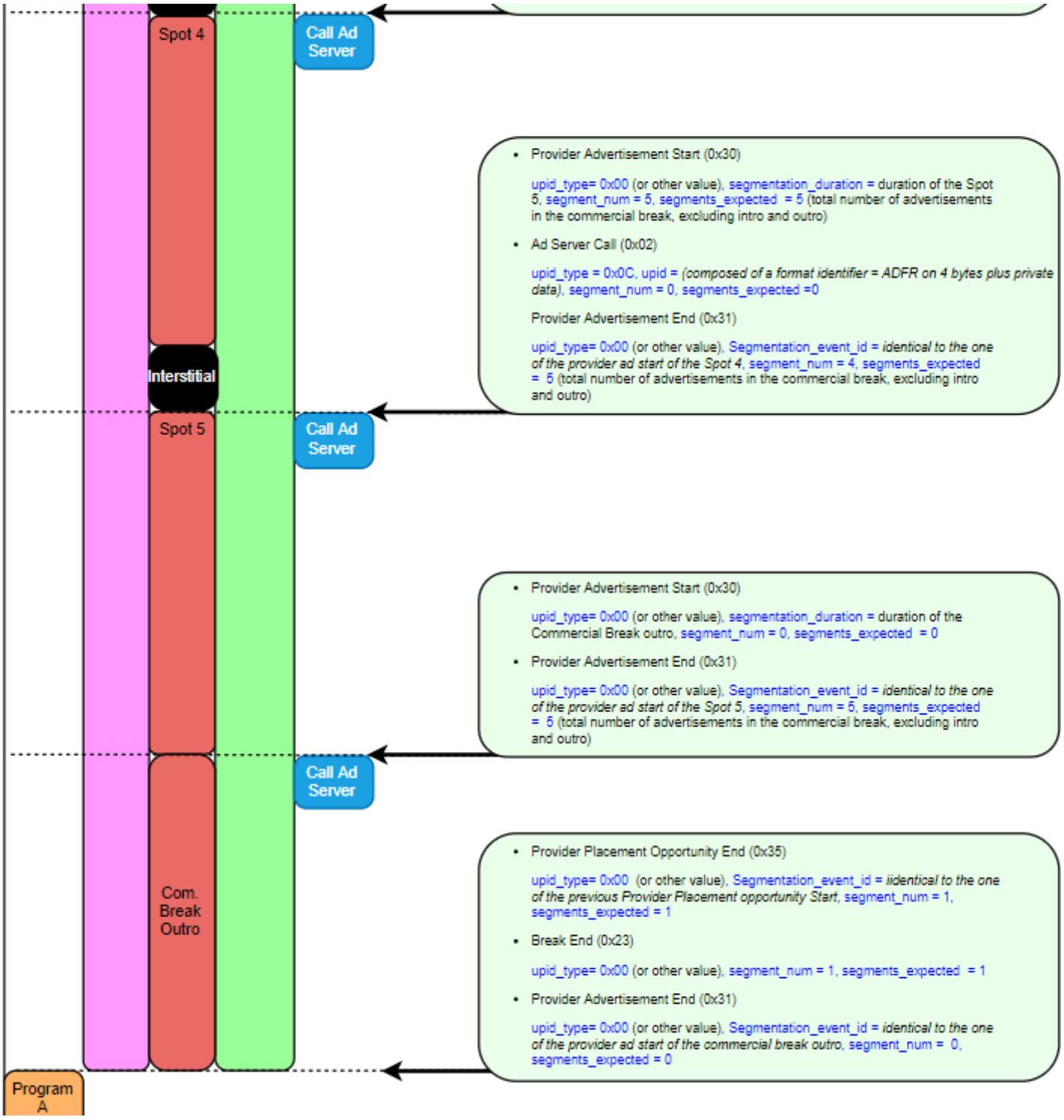

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