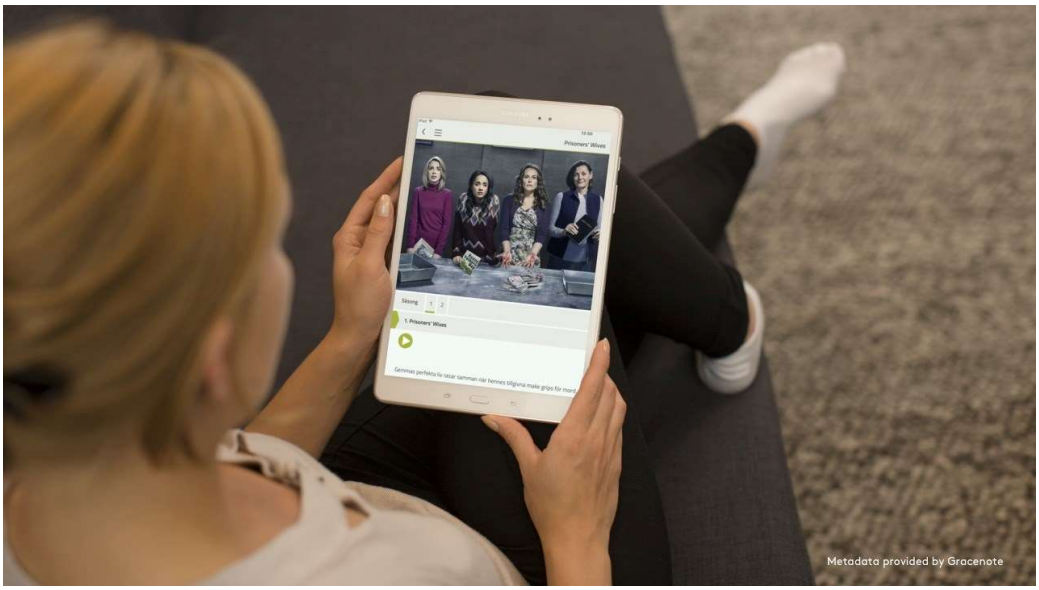
DIGITAL ADS IN A DISTRIBUTOR'S TVE SERVICE



Revision H

Technical specification for ads in a TVE service

1 Introduction

The purpose with this specification is to enable broadcasters and TVE distributors to reuse technology investments for the technical integration between a broadcaster and a TVE distributor. The scope of this specification is to specify:

- How the signaling of commercial breaks is transported from the broadcaster and to the TVE distributor for Linear Channels and VOD.
- How online video ads from the broadcaster are requested by the TVE distributor.

And as per-country addendums to this specification:

- How implementation of country-specific tracking needed for measuring institutes (e.g MMS in Sweden) must be implemented.

1.1 CHANGELOG

VERSION	CHANGE	CHANGED BY
REV H	1. Clarified where contentId is available. 2. Added persistent devide ID in VAST request if applicable by measurement addendum. 3. Added user agent in VAST request 4. Clarified privacy-related wording	Jonas Birmé (TV4), Gabriel Ashman (TV4) and David Rasmusson (Viaplay)
REV G	1 Replaced word Operator with the word Distributor throughout the document 2 Update of GDPR flags to match IAB standards 3 Ad Server Endpoint can be either a proxy or directly to ad server and clarification regarding query parameter names 4 SCTE-35 signaling to support pre-fetch in dynamic ad insertion 5 The param deviceType always provided whether GDPR consent is given or not	Jonas Birmé (TV4) and David Rasmusson (Viaplay)

2 System description

Measurement of ad views takes place from the TVE distributor client applications to the Broadcaster's ad server or server with a third party as per the information that is in the answer from the ad server (VAST). In addition to ad measurement to Broadcaster, the Distributor also sends to a country-specific tracking institute (e.g MMS in Sweden) measurement of program and ad views. This specification is provided as addendum to this document.

3 Logistics and distribution

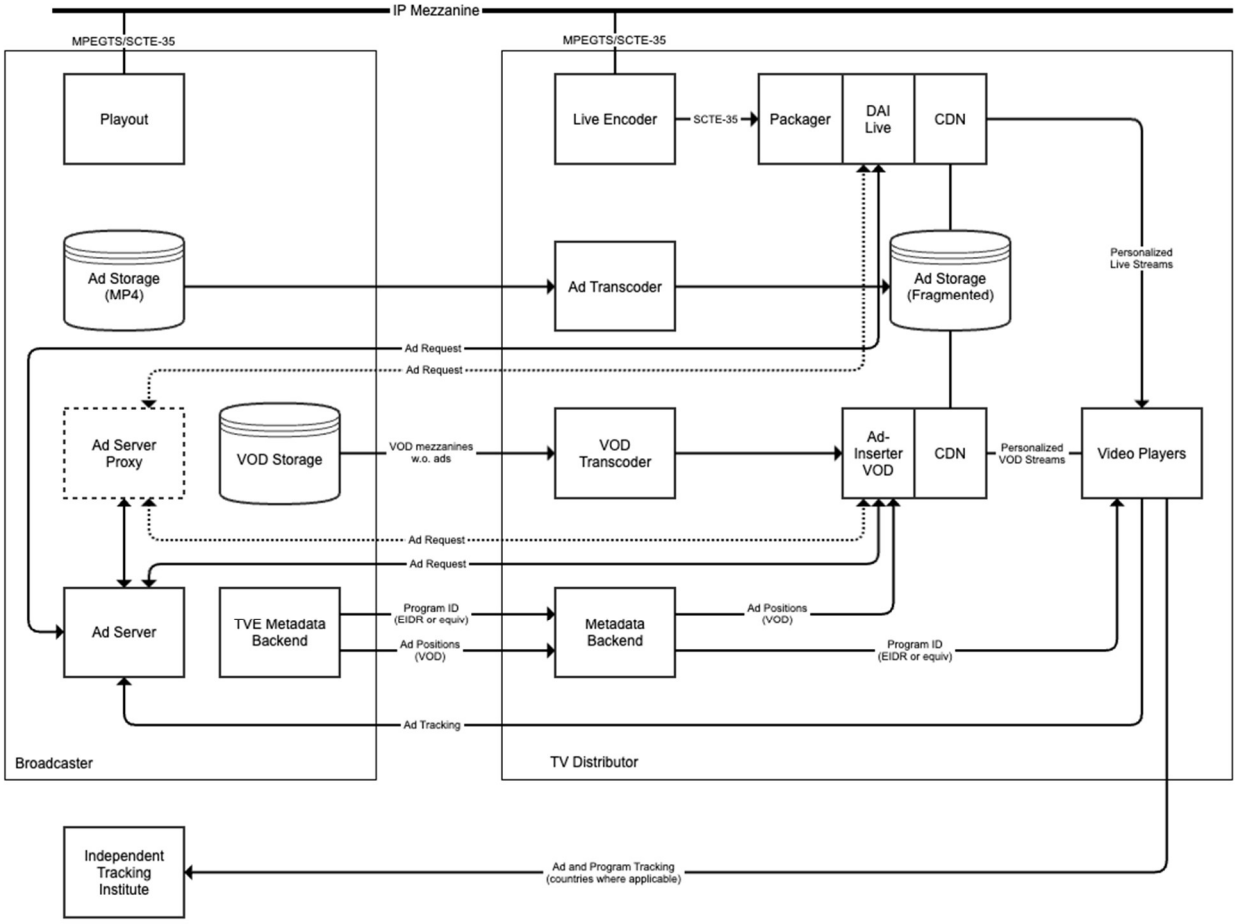


FIGURE 1: LOGISTICS AND DISTRIBUTION (REFERENCE ARCHITECTURE)

3.1 REPLACE LINEAR ADS WITH DIGITAL ADS

In the video stream for every channel from the Broadcaster, there are markers according to the SCTE-35 standard. These markers mark when the commercial break begins and how long it is. The Distributor transcodes the video stream to ABR streams (adaptive bitrate streams for distribution over the Internet) and makes sure the markers are still present in the various ABR formats the Distributor uses.

The use of an Ad Server Proxy is optional and not mandatory. Throughout this specification we will be using the term Ad Server Endpoint which can either be an Ad Server or an Ad Server Proxy.

When a user wants to consume a Broadcaster channel, the following essentially happens:

1. The user submits a request to the Distributor's servers for an ABR stream for the Broadcaster channel
2. The Distributor's DAI (dynamic ad insertion) server creates a unique session and a unique manifest for this user that is based on the ABR stream for the Broadcaster channel
3. The user receives a link to this unique manifest that the DAI server has created
4. The user's video player receives this link and begins to play the video segment that is in this unique manifest. The video segments are distributed over the Distriubtor's distribution network.
5. If the DAI server discovers in the ABR stream that there is a commercial break, the DAI server sends a request to the Ad Server Endpoint. The request contains a unique user or session ID and the length of the break.
6. The Ad Server Endpoint gives the DAI server a response according to the VAST protocol (VAST 3.0 or later version). The response contains a list of commercials that are to be shown to the user.
    a. If a commercial is not adapted to the Distributor and the DAI server has not previously served this ad, the commercial is retrieved and transcoded to a compatible format with the ABR stream and no ad replacement occurs.
    b. If the commercial is adapted to the Distributor or already transcoded, the video segments in the ABR stream's manifest are replaced with the commercials' video segments.
7. The user's video play receives this updated manifest, which contains commercial segments and plays the stream as usual and for the user, it is not noticeable that this replacement occurred on the server side.

SCTE-35

The SCTE-35 standard, developed by the Society of Cable Telecommunications Engineers (SCTE), provides a robust framework for achieving precisely that. In this specification, we delve into the utilization of SCTE-35 cues to enable dynamic ad insertion, ensuring optimal ad delivery while maintaining program continuity.

- SCTE-35 messages are carried in MPEG-2 transport streams and other formats (e.g., MPEG-DASH, HLS, CMAF).
- SCTE-35 signals are used to signal ad splicing and ad insertion opportunities.

Technical specification for signal distribution

- SCTE-35 markers in IP-mezzanine signal distribution (for example output PID 35)
- SCTE-35 markers are inserted according to SCTE-104 (spliceStart_normal) with the duration attribute set. This results in an SCTE-35 splice_insert() with out_of_network_indicator=1, duration_flag=1 and auto_return=1 **(deprecated)**

  OR

  SCTE-35 markers using time_signal() with a segmentation_descriptor. See time signal specification below for details.

Deprecation notice

The use of splice_insert() command will be replaced with time_signal() to facilitate for signaling in advance of the actual ad break. This allows for implementation of pre-fetch logic downstream, a mechanism used to meet large scale demands with dynamic ad replacement in streaming distribution. Phasing out use of splice_insert() is coordinated between the Broadcaster and Distributor for existing integrations.

Time signal specification

Identify ad-breaks using time_signal with a segmentation_descriptor:

- 0x01 (Content Identification) – a signal a few minutes before the upcoming ad break (Prebreak signal) containing the upid value and duration.
- 0x30 (Provider Advertisement Start) – frame accurate signal signifying the start of the ad-break. The signal also contains the duration and upid of the ad break which should match the value sent in the prebreak signal.
- 0x31 (Provider Advertisement End) – frame accurate signal signifying the end of the ad break. The signal also contains the duration and upid of the ad break which should match the value sent in the prebreak signal.

Fallback scenarios

To guarantee the best possible customer experience, a fallback scenario is needed when it is not possible to fill an entire commercial break in the stream for various reasons. This may be due to the specific commercial not being transcoded in time.

The Distributor's ad insertion solution can expect that the entire commercial break is filled to 100% with commercials from Ad Server Endpoint, but there may be scenarios where the ad insertion solution cannot fill it with all the ads. If this scenario arises, the following shall occur:

1. If a commercial from the Ad Server Endpoint is not imported and transcoded, the ad insertion solution shall choose a commercial from the extra commercials (fallback) that are included with the response.
2. The ad insertion solution retrieves the missing commercial and transcodes it so that it is in the system for the next time it shows up.
3. If commercials are still missing to fill out the entire break, the ad insertion solution shall have the possibility of adding a "filler" that the Distributor has received from the respective Broadcaster. The filler is among the extra commercials and is indicated with the name "filler".
4. If the response from the Ad Server Endpoint is timed out or broken, the distributor should let the linear ads to be shown for live, and for VOD the ad break will be ignored if no ads are received.

3.2 INSERTION OF DIGITAL ADS IN "ON-DEMAND" WATCHING

In order for the Distributor to be able to insert digital ads in content that a viewer can watch afterwards on his/her mobile or tablet, the Distributor needs access to an ad-free video file for the program content in advance. The Broadcaster may either provide this file, or request that the Distributor creates it via recording or rolling buffer from the channel. If Broadcaster provides a file, they may also deliver a text file with ad points for the program. When playing the program content, the following happens:

1. Alternative:
    a. The DAI server sends an ad to the Broadcaster's Ad Server with information on all ad points that need to be filled for the entire length of the program, and the Broadcaster responds with ad pods for all breaks, or
    b. The DAI server sends an ad request to the Broadcaster's Ad Server for every ad point for the program akin to ad request for live broadcast.
2. The Broadcaster's Ad Server Endpoint gives the DAI server a response according to the VAST protocol (VAST 3.0 or later for individual breaks, or VMAP 1.0 for multiple breaks). The response contains a list of commercials that are to be shown to the user. Alternative:
    a. If a commercial is not adapted to the Distributor and the DAI server has not previously served this ad, the commercial is retrieved and transcoded to a compatible format with the ABR stream and no ad insertion occurs, or
    b. If the commercial is adapted to the Distributor or already transcoded, the DAI server puts the commercials' video segments in the ABR stream's manifest at the times for ads.
3. The user's video player receives this updated manifest, which now also includes commercial segments and plays the program as usual.

VMAP for VOD

Ad markers and ad placements in on demand content (VOD) are retrieved through the Ad Server Endpoint according to VMAP specification[1]. In this case, on an ad request, the Ad Server Endpoint responds with information on where the ad breaks are and what ads to place (alternative 1a).

In the scenario where the VOD is a recorded live stream (catchup / non-linear start-over) an ad request is sent by the Distributor when a cue point is found in the recorded stream (alternative 1b) but it is still the Broadcaster's ad server (via the Ad Server Endpoint) that defines the length of the ad break.

Both methods mentioned for handling on demand content are accepted by Broadcasters however the VOD alternative is the preferred method by the Broadcasters.

3.3 AD REQUEST – version 5

The ad request from the Distributor's DAI server to the Broadcaster's Ad Server Endpoint shall include the following information:

	Data	Since version
1.	Unique ID for specific users (pseudonymized) [e.g. userId]	1
2.	Program/Content ID [e.g. contentId, available in EPG or SCTE]	1
3.	Channel ID [e.g. channelId]	1
4.	Device type [e.g. deviceType]	1
5.	Screen size (e.g. 1920x1080) [e.g. screenSize]	1
6.	Location (IP address with last octet anonymized) [e.g. geolocation]	1
7.	Duration of ad break (only for live) [e.g. duration]	1
8.	Version (if omitted, version=1 is assumed)	4
9.	Project/operator name [e.g. project]	4

[1] https://www.iab.com/wp-content/uploads/2015/06/VMAP.pdf

10. GDPR: 0 (gdpr does not apply – only for viewers outside the jurisdiction of the gdpr) or 1 (gdpr applies) [e.g. gdpr][2] 4
11. GDPR Consent String: as provided by distributor´s CMP [e.g. gdpr_consent] 4
12. Ad break points: Break points in on-demand program [e.g. abp] 5
13. User segments: Comma-separated list of segment labels (see 2.4.1) [e.g. useg] 5
14. Device Id: persistent device identifier [e.g. device IFA or fpid]] 6
15. User Agent: The device´s user agent string, provided as a request parameter or request header 6

This specification does not specify the name of the query parameters in the request to the Ad Server Endpoint and parameter names above and in examples below should be considered only as examples.

See Appendix A for a detailed requirement specification on the DAI server and appendix E for Ad Server Endpoint request parameter specification.

The users must be given the option to opt out to IAB purposes 1 and 4 and if the users choose to opt out to those purposes, parameters 1, 6 and 14 may be omitted.

*User segments (13) shall be considered separate from Technical Identifiers (1, 6, 14)and shall be transferred to broadcasters in segmented and non-user identifiable form irrespective of the transmission or availability of Technical Identifiers, provided the end user has not opted out from personalized advertising.*The above parameters are sent in the HTTP request to the Ad Server Endpoint at the Broadcaster in the form of HTTP query parameters.

Reference example:
http://<adserverendpoint.example.com>/ads?p7=[duration]&p1=[userId]&p3=[channelId]&p4=[deviceType]&p5=[screenSize]&p6=[geolocation]

Example:

http://<adserverendpoint.example.com>/ads?duration=120&userId=23412313&channelId=TV4&deviceType=ipad&screenSize=1920x1080&geolocation=193.14.163.194

Example when using VMAP for VOD:

http://<adserverendpoint.example.com>/vod?userId=23412313&contentId=1341155&deviceType=ipad&os=ios&sceeenSize=1920x1080&geolocation=193.14.163.194&abp=600,1010

[2] gdpr and gdpr_consent parameters are to pass TCF (https://iabeurope.eu/transparency-consent-framework/) information for ad server and downstream ad tech vendors. These are standard parameter names for passing this and used here for consistency with other ad tech systems. Passing gdpr=1 and a correct TCF String in the gdpr_consent parameter ensures all other data is handled in accordance with the user's privacy choices, hence no need to suppress data in the request (e.g. geolocation can be a full IP).

Example of no consent string is available

http://<adserverendpoint.example.com>/ads?duration=120&channelId=TV4&gdpr=1&gdpr_consent=

Ad Server Endpoint Responses

200 OK – Response includes ads in body

302 – Redirect to downstream ad server

400 – May be used if version number is not supported

5XX – Invalid request, ad selection not possible

3.4 USER INFORMATION

Information regarding personal data processing (related to ad request, ad tracker and measurement) shall be displayed in the Distributor´s TVE service and such user information shall be produced and provided by Broadcaster.

2.4.1 User segment labels

- Gender: gmale, gfemale
- Age: a15-19, a20-24 and so forth in 5-year intervals
- Post code: pxxxxx where xxxxx is the post code*

Segment codes should only be provided if the population represented by their combination is more than the smallest population allowed by operator's privacy terms.

* If a population with Post code is below the smallest allowed, digits may be removed from the end until the user becomes part of a large enough population, e.g. send p923 instead of p92331 if the Distributors' customer base in Storuman isn't large enough.

3.5 ROUTINE FOR HANDLING OBJECTIONS/QUESTIONS FROM USERS

User´s first point of contact regarding personal data processing related to the ad request, ad measurement and ad tracking should be the Broadcaster. Thus, Distributor shall provide relevant contact information to the users within the TVE service.

In case of objections to Broadcaster´s personal data processing, Broadcaster shall swiftly provide user with a response explaining the legal ground for the processing. Should a user continue to claim opt out from Broadcaster's personal data processing after receiving the response or if other questions (or comments) appear from user as a reaction to Broadcaster´s response, the Broadcaster shall handle the communication.

Note: Distributor and Broadcaster shall always act swiftly when handling requests or questions related to personal data processing hereunder.

3.6 PERSISTENT DEVICE ID

For panel recognition in distributor environments a persistent identifier must be available in the measurement data. See measurement addendum if this is applicable.

A persistent, anonymous device identifier must be generated and maintained within the distributor's app environment. Acceptable identifier types include:

- Platform-provided IDs (IDFA on iOS, Android ID, etc.) – Preferred.
- First-party generated UUIDs stored in local storage

Critical requirement: The Persistent ID must be **exactly identical** across all data touchpoints (ad requests, tracking pixels, ID-Ping). Any mismatch in hashing, salting, case, or formatting will result in failed panel matching.

4 Measurement and reporting

Measurement of ad views takes place from the Distributor's TVE client applications to the Broadcaster's ad server or server with a third party as per the information that is in the answer from the ad server (VAST). In addition to ad measurements in countries where applicable, the Distributor also sends to country-specific tracking institutes (such as MMS in Sweden) measurements of ad and program views.

See addendums for details regarding measurement and reporting for country-specific tracking institutes.The measurement of ads to the Broadcaster's ad server takes place through tracking links defined in the VAST on the positions these link elements define, e.g. "impression". All tracking events in the TrackingEvents element should be tracked.

Excerpt from a VAST xml:

```
<AdTitle>S1UYAR2011</AdTitle>
<Error>URL</Error>
<Impression>URL</Impression>
<Impression>URL</Impression>
<Creatives>
  <Creative id="video">
  <Linear>
    <TrackingEvents>
      <Tracking event="fullscreen">URL</Tracking>
      <Tracking event="firstQuartile">URL </Tracking>
      <Tracking event="start">URL</Tracking>
      < racking event="thirdQuartile">URL</Tracking>
      <Tracking event="midpoint">URL</Tracking>
      <Tracking event="mute">URL</Tracking>
      <Tracking event="unmute">URL </Tracking>
      <Tracking event="complete">URL</Tracking>
      <Tracking event="pause">URL</Tracking>
  </TrackingEvents>
  </Linear>
  </Creative>
</Creatives>
```

The impression URLs are tracked with an HTTP GET when the first frame of the ad is displayed, and for video ads the tracking event URLs are tracked on each of the different event types. For example, the tracking event Start URL is tracked when the video ad starts and tracking event firstQuartile when 25% of the video ad has played. A complete list of events that publisher may track is in Appendix D, though distributor's player may not support each interaction type. Any interaction supported must be tracked by triggering URL if tracking event is provided in VAST.

VALIDATION

For a Broadcaster to be able to claim and capitalize on the ad measurement, Broadcaster should validate the Distributor's reporting implementation. This should take place before going live with an application and usually occurs by sharing with Broadcaster the beta versions of the app and the web clients one intends to go live with. One is then provided a validation protocol with the results whether or not one has been approved or given points to resolve before being able to go live.

DAI TELEMETRY

Distributor shall supply access to the specific endpoints of the ad stitching supplier's telemetry API to enable monitoring of the DAI solution's metrics and performance. Distributor needs to make sure the telemetry data only include data for Broadcaster's streams, and not streams from any other broadcaster that could be active in the distributor´s ad stitching account.

5 Metadata

For the Distributor to be able to request ad and for the reporting to country-specific tracking institutes, a Broadcaster needs to provide the Distributor with the following metadata (but not limited to).

- Content ID (program or channel) to be used to request ad and reporting to country-specific tracking institutes
- Metadata that country-specific tracking institute requires
- Position of ad breaks for a program (for the file distribution)

In the metadata the Broadcaster sends to the Distributor, there is a unique ID number[3] for each Broadcaster program. This ID number needs to be preserved when the metadata passes a metadata broker such as Gracenote so that this ID number can reach the client application. With this ID number, the client retrieves through a standard format defined by the program companies the parameters that need to be send on to tracking institutes in reporting. This unique ID is owned and issued by the Broadcaster or a global registry such as EIDR.

[3] Public Schedule XML: `<ns2:contentId>se.Programbolag.content.5913494</ns2:contentId>`

6 Appendix A: Dynamic Ad Insertion Requirements

Dynamic Ad Inserter component is referred to as DAI.

ID	PRIO	Requirement
DAI1.1	MUST	The DAI **must** provide a per-user unique LIVE stream where ads are inserted just-in-time based on the response from the ad server.
DAI1.2	MUST	The DAI **must** provide a per-user unique VOD stream where ads are inserted based on the response from the ad server
DAI2	MUST	The DAI **must** ingest and transcode the ad videos in the response from the ad server. Ingested and transcoded ads must be cached by the DAI.
DAI3	MUST	The DAI **must** support that before an ad break in a live channel a request to the ad server is sent as specified in ad request section.
DAI4	MUST	The DAI **must** support and handle ad responses according to VAST.
DAI5	MUST	The DAI **must** handle that the VAST response can include interactive ads and other ad formats that cannot be inserted in the stream.
DAI6	MUST	The DAI **must** support VAST wrapper ads.
DAI7	SHOULD	The DAI **should** support VAST passback and if the DAI does not support VAST passback it **must** support that an ad request to the ad server can take up to 5000 ms to process.

DAI8	MUST	The DAI **must** support that the requested duration not always can be fully filled with ads by the ad server and that a filler loop is inserted for the remainder of the ad break.
DAI9	MUST	The DAI **must** provide a way for the video player to get the VAST payload that was the base for the inserted ads. This is to enable clientside tracking.
DAI10	MUST	The DAI **must** provide a way to signal to the video player that an ad is being played. This is to make it possible for the client application to disable scrub and pause, but also for client-side tracking.
DAI11	SHOULD	The DAI **should** support server side ad-tracking.
DAI12	SHOULD	The DAI **should** support server side ad-inserted pre-rolls.

7 Appendix D: VAST Tracking Events

As per IAB VAST 3.0 specifications, https://www.iab.com/wp-content/uploads/2015/06/VASTv3_0.pdf, section 2.3.1.7

- creativeView: not to be confused with an impression, this event indicates that an individual creative portion of the ad was viewed. An impression indicates the first frame of the ad was displayed; however an ad may be composed of multiple creative, or creative that only play on some platforms and not others. This event enables ad servers to track which ad creative are viewed, and therefore, which platforms are more common.
- start: this event is used to indicate that an individual creative within the ad was loaded and playback began. As with creativeView, this event is another way of tracking creative playback.
- firstQuartile: the creative played for at least 25% of the total duration.
- midpoint: the creative played for at least 50% of the total duration.
- thirdQuartile: the creative played for at least 75% of the duration.
- complete: The creative was played to the end at normal speed.
- mute: the user activated the mute control and muted the creative.
- unmute: the user activated the mute control and unmuted the creative.
- pause: the user clicked the pause control and stopped the creative.
- rewind: the user activated the rewind control to access a previous point in the creative timeline.
- resume: the user activated the resume control after the creative had been stopped or paused.
- fullscreen: the user activated a control to extend the video player to the edges of the viewer's screen.
- exitFullscreen: the user activated the control to reduce video player size to original dimensions.
- expand: the user activated a control to expand the creative.
- collapse: the user activated a control to reduce the creative to its original dimensions.
- acceptInvitationLinear: the user activated a control that launched an additional portion of the creative. The name of this event distinguishes it from the existing "acceptInvitation" event described in the 2008 IAB Digital Video In-Stream Ad Metrics Definitions, which defines the "acceptInivitation" metric as applying to non-linear ads only. The "acceptInvitationLinear" event extends the metric for use in Linear creative.
- closeLinear: the user clicked the close button on the creative. The name of this event distinguishes it from the existing "close" event described in the 2008 IAB Digital Video In-Stream Ad Metrics Definitions, which defines the "close" metric as applying to non-linear ads only. The "closeLinear" event extends the "close" event for use in Linear creative.
- skip: the user activated a skip control to skip the creative, which is a different control than the one used to close the creative.
- progress: the creative played for a duration at normal speed that is equal to or greater than the value provided in an additional attribute for offset. Offset values can be time in the format HH:MM:SS or HH:MM:SS.mm or a percentage value in the format n%. Multiple progress events with different values can be used to track multiple progress points in the Linear creative timeline.

8 Appendix E: Ad Server Endpoint Request Parameters

Field	Request parameter (examples)	Format
Unique User ID	userId	String
Program ID	contentId	String
Channel ID	channelId	String
Device Type	deviceType	String, one of: iphone ipad android_phone android_tablet desktop_mac desktop_windows desktop_linux appletv android_tv smart_tv chromecast console stb
Screen Size	screenSize	[0-9]+x[0-9]+ (width x height)
Location	geolocation	[0-9]+.[0-9]+.[0-9]+.[0.9]+ (IPv4 address. IPv6 addresses not supported.)
Duration of ad break	duration	[0-9]+
Version	version	[1-4]
Distributor name	project	String
GDPR applicability	gdpr	[10]
GDPR consent string	gdpr_consent	String
Ad break points	abp	Comma-separated list of integers
User segments	useg	Comma-separated list of strings
Device ID	deviceId	string
User Agent	userAgent	string