

Advertising and Alternative Content Technologies ESNI, ESAM and SCTE-35 in Adaptive Streaming

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Principal Engineer

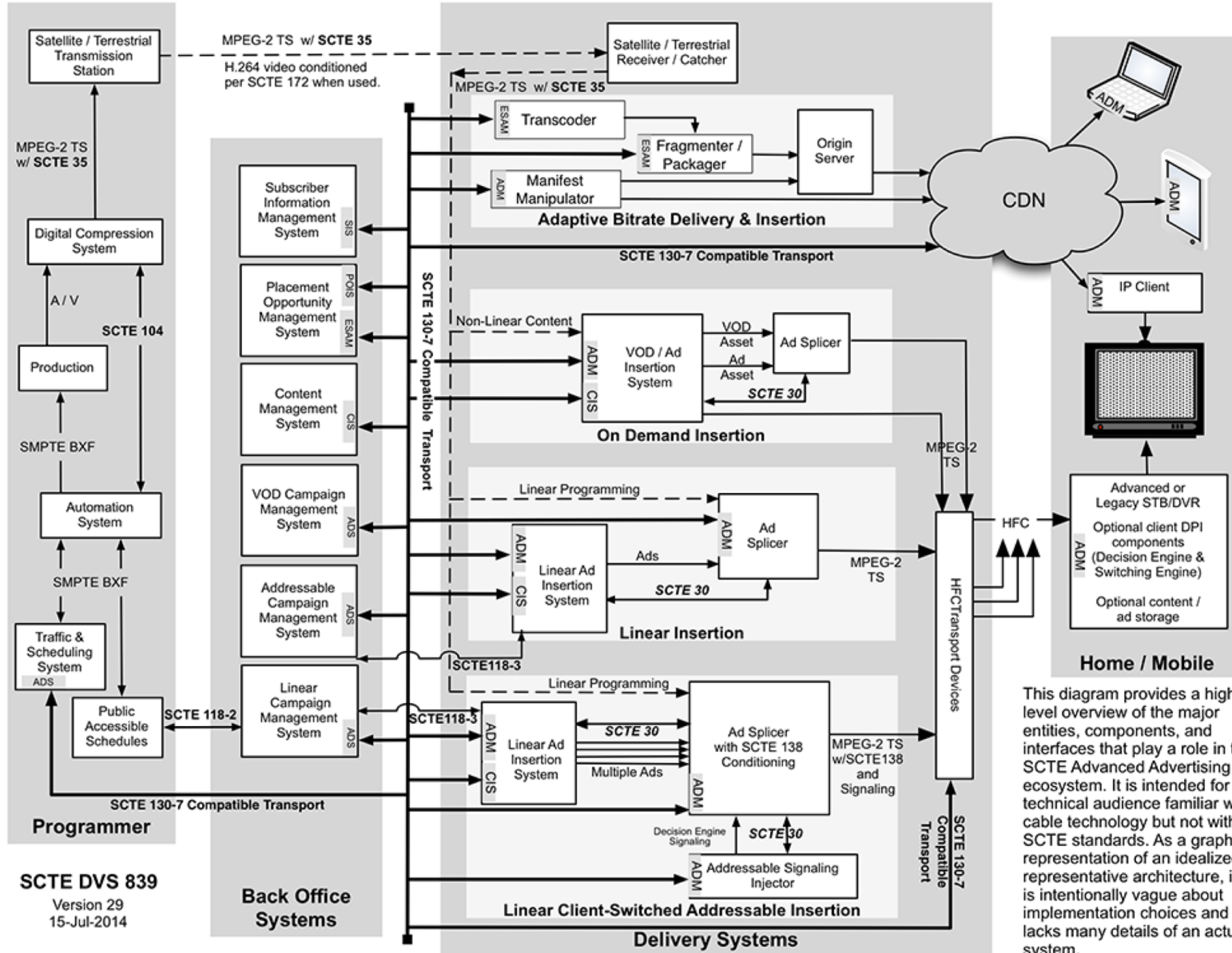
Charter Communications

Relevant SCTE Standards

SCTE Standard	Former CableLabs Specification?
SCTE-35 Digital Program Insertion Cueing Message for Cable	
SCTE-130 Digital Program Insertion – Advertising Systems Interfaces	
SCTE-214 MPEG DASH for IP-Based Cable Services	
SCTE-224 Event Scheduling and Notification Interface (ESNI)	ESNI
SCTE-236 Content Metadata	ADI / Metadata
SCTE-250 Event and Signaling Management API (ESAM)	ESAM
???	Content Encoding Profiles

https://www.scte.org/SCTE/Standards/Download_SCTE_Standards.aspx

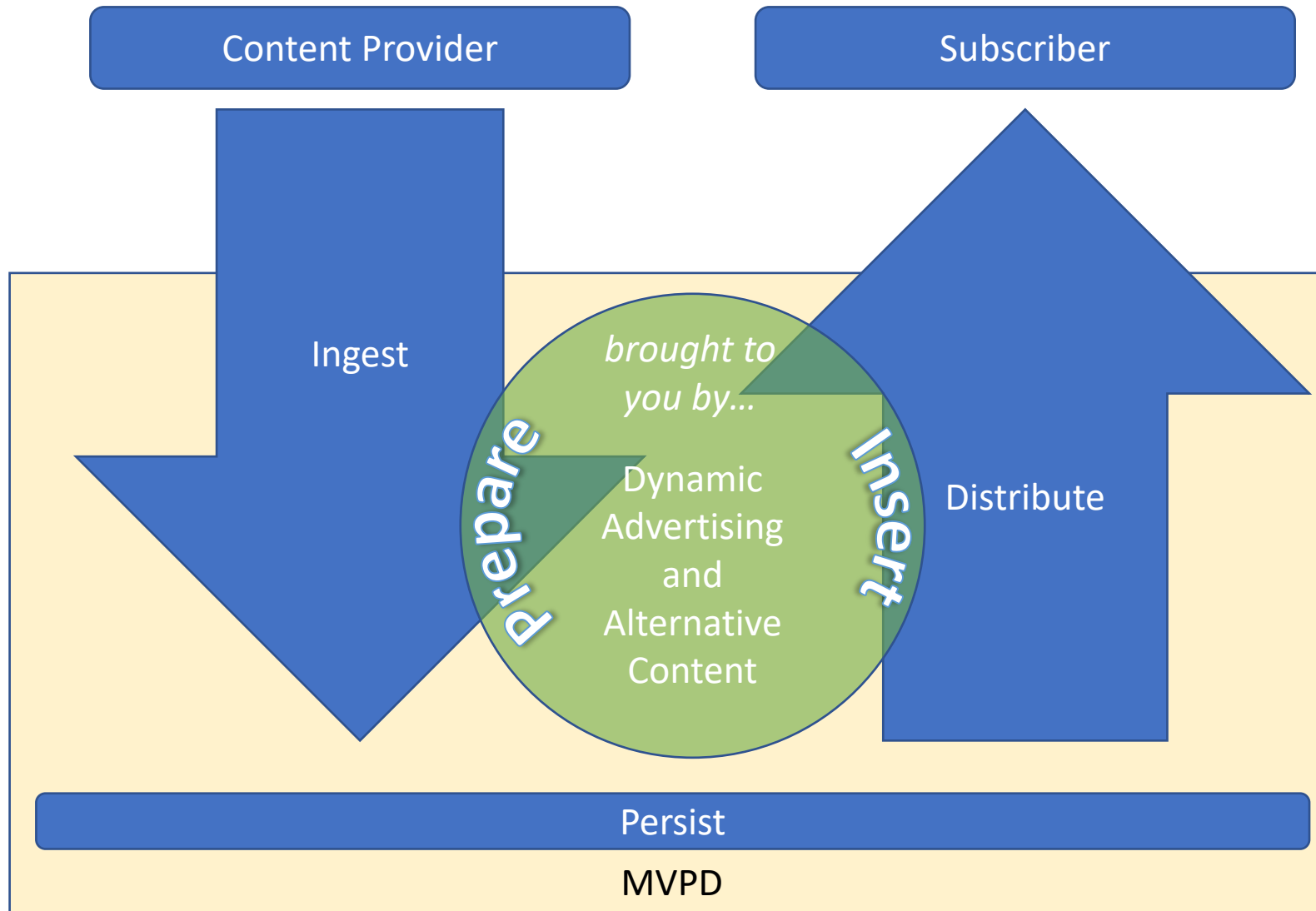
SCTE Interfaces for Advanced Advertising



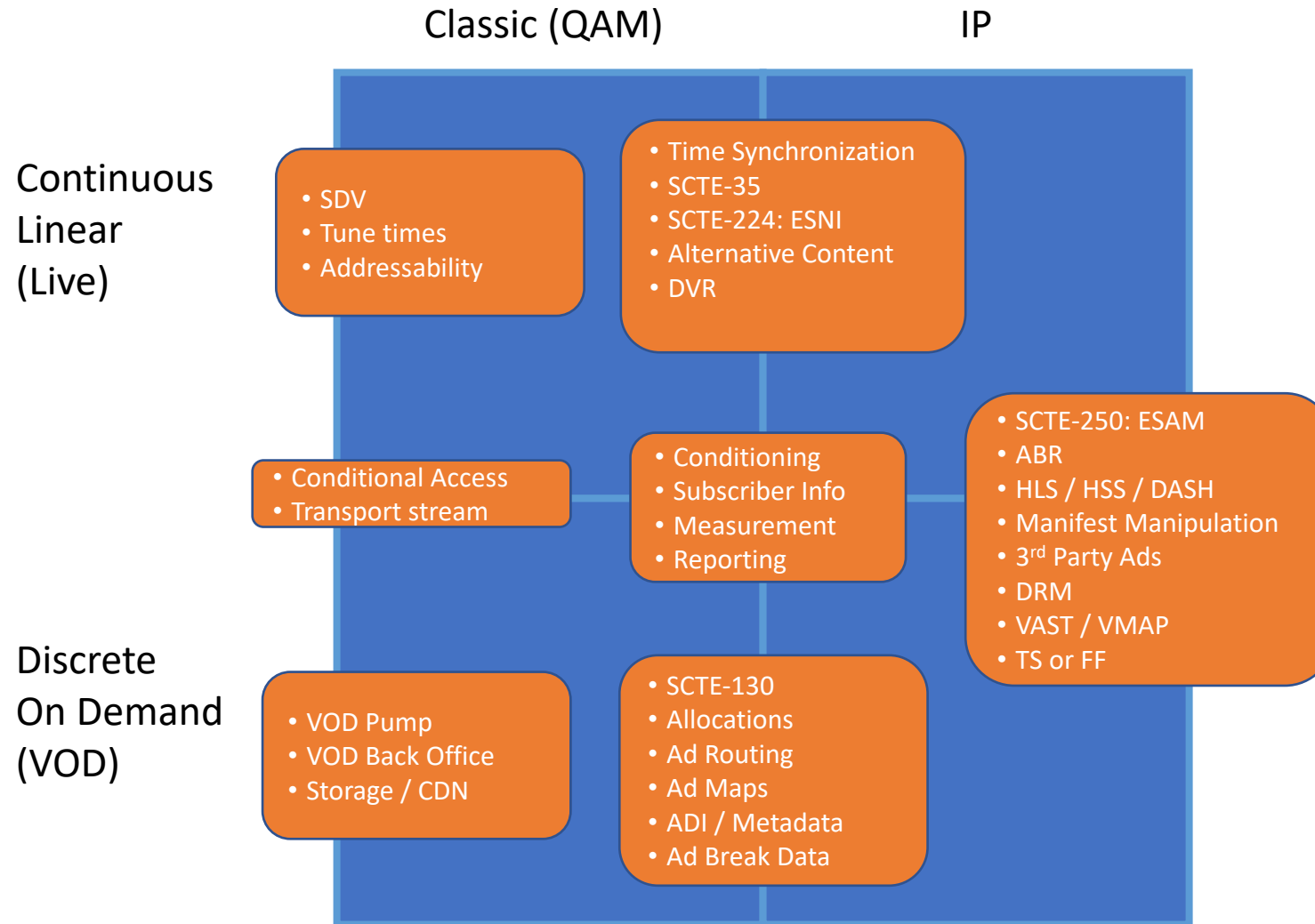
SCTE DVS 839
Version 29
15-Jul-2014

This diagram provides a high level overview of the major entities, components, and interfaces that play a role in the SCTE Advanced Advertising ecosystem. It is intended for a technical audience familiar with cable technology but not with SCTE standards. As a graphical representation of an idealized, representative architecture, it is intentionally vague about implementation choices and lacks many details of an actual system.

Generic MVPD Video Flow



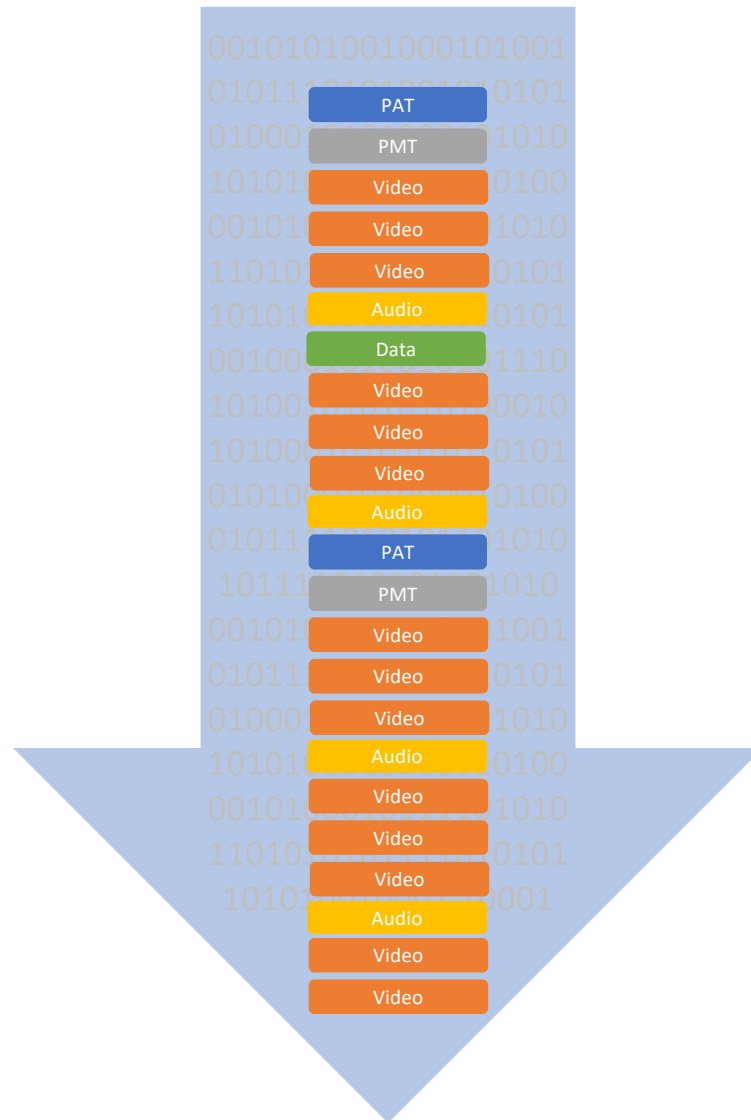
MVPD Video Distribution



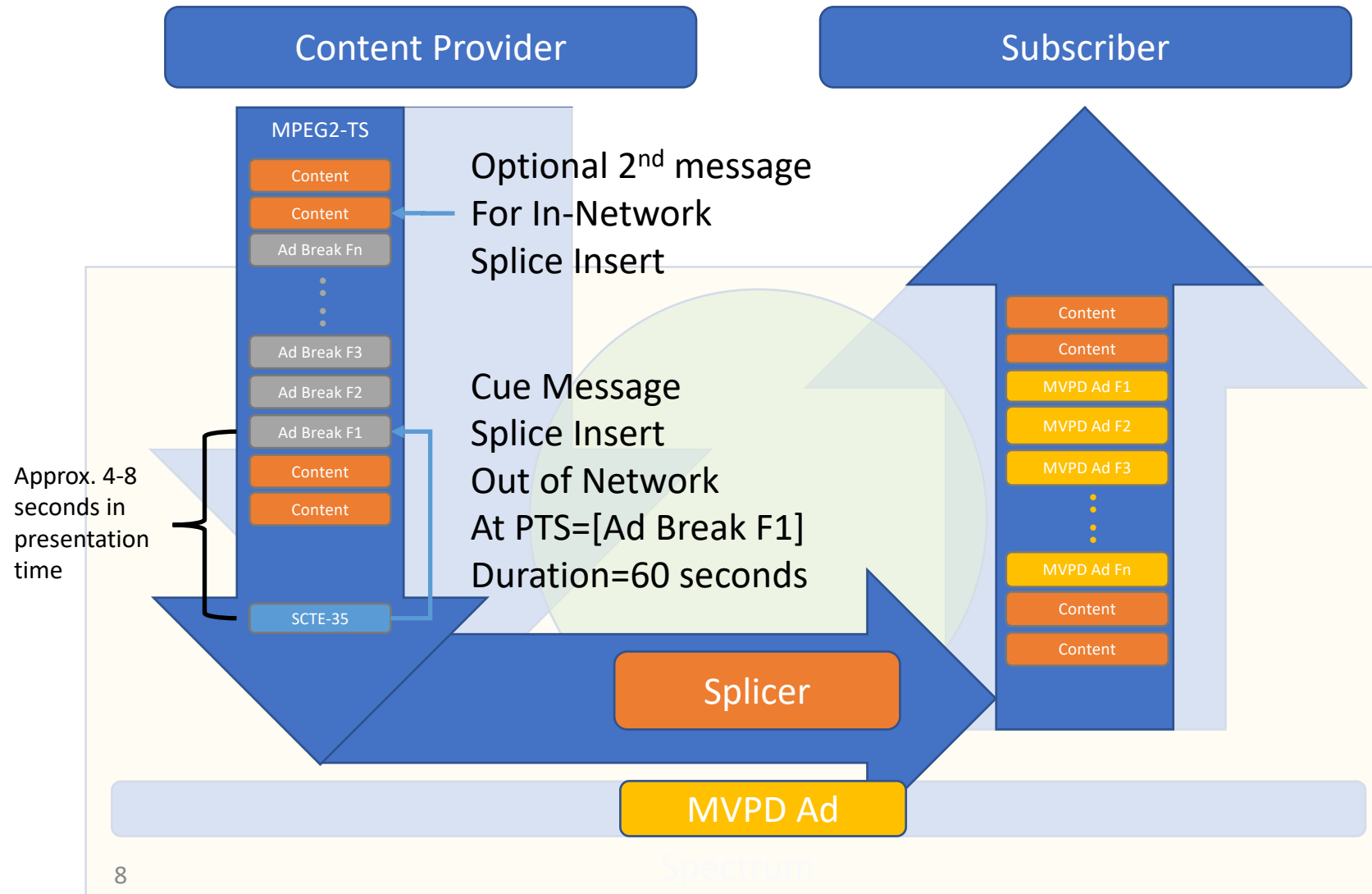
Ad Placement and Targeting

- Schedule-based
 - Occurs within or along-side a known scheduled program
 - Implicit targeting based on program, time of day and channel
 - Broad audience measurement (e.g. Nielsen ratings)
 - Typically allocated between programmer and MVPD by position
 - Using digital program insertion can be further targeted by
 - Market (DMA)
 - Sub-market (Zone)
- Impression-based
 - Narrow, focused audience
 - Targeting can be refined down to household / individual level
 - Flexible inventory allocations between programmer and MVPD
 - Measurement of actual views (impressions)

MPEG2-TS



SCTE-35 Cue

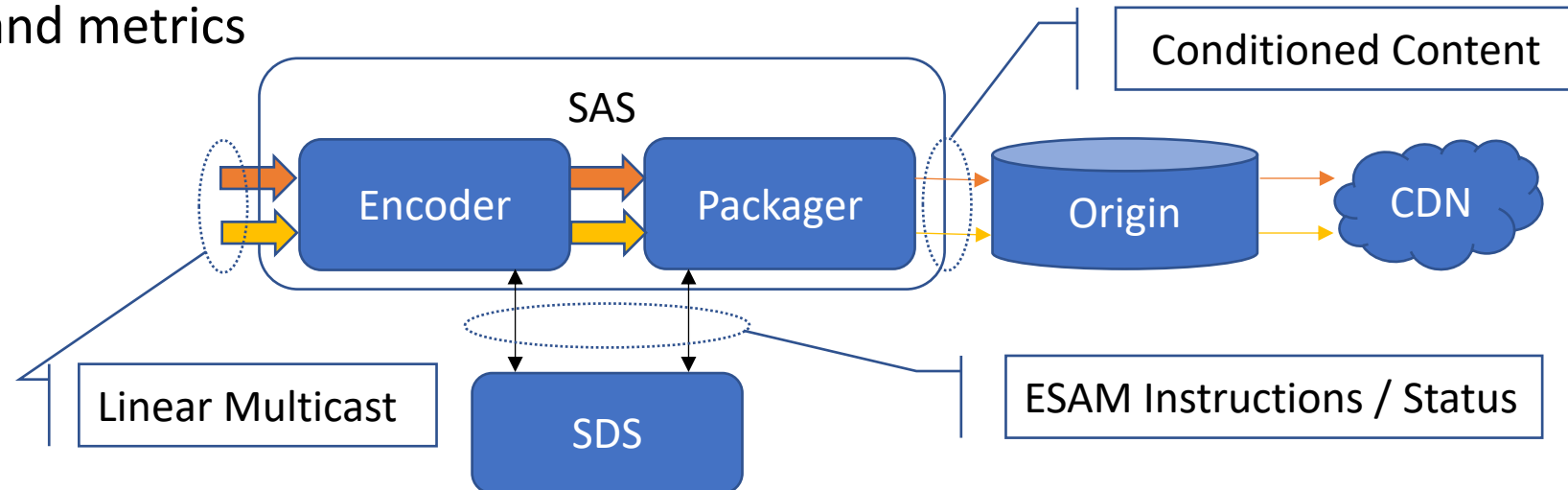


SCTE-35 Splice "command" types

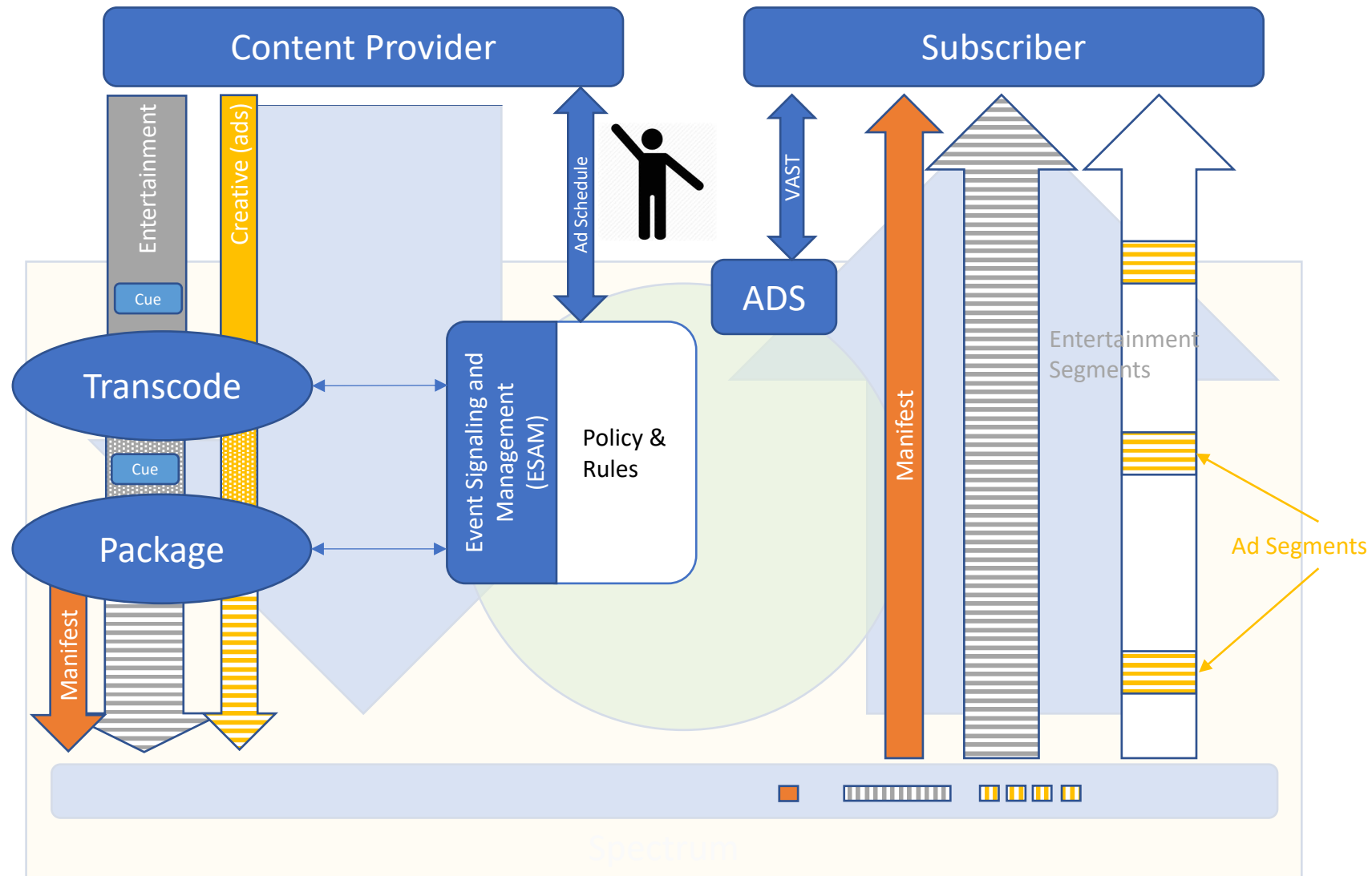
- Type 5: Splice Insert
- Specify direction
 - Out – Leave content
 - In – Return to content
- May be augmented by descriptors
- Type 6: Time Signal
- Meaning defined by descriptors
 - Avail descriptor
 - DTMF descriptor
 - **Segmentation descriptor**
 - **Context**
 - **Default restrictions**
 - Time descriptor
 - Audio descriptor

ESAM Concepts

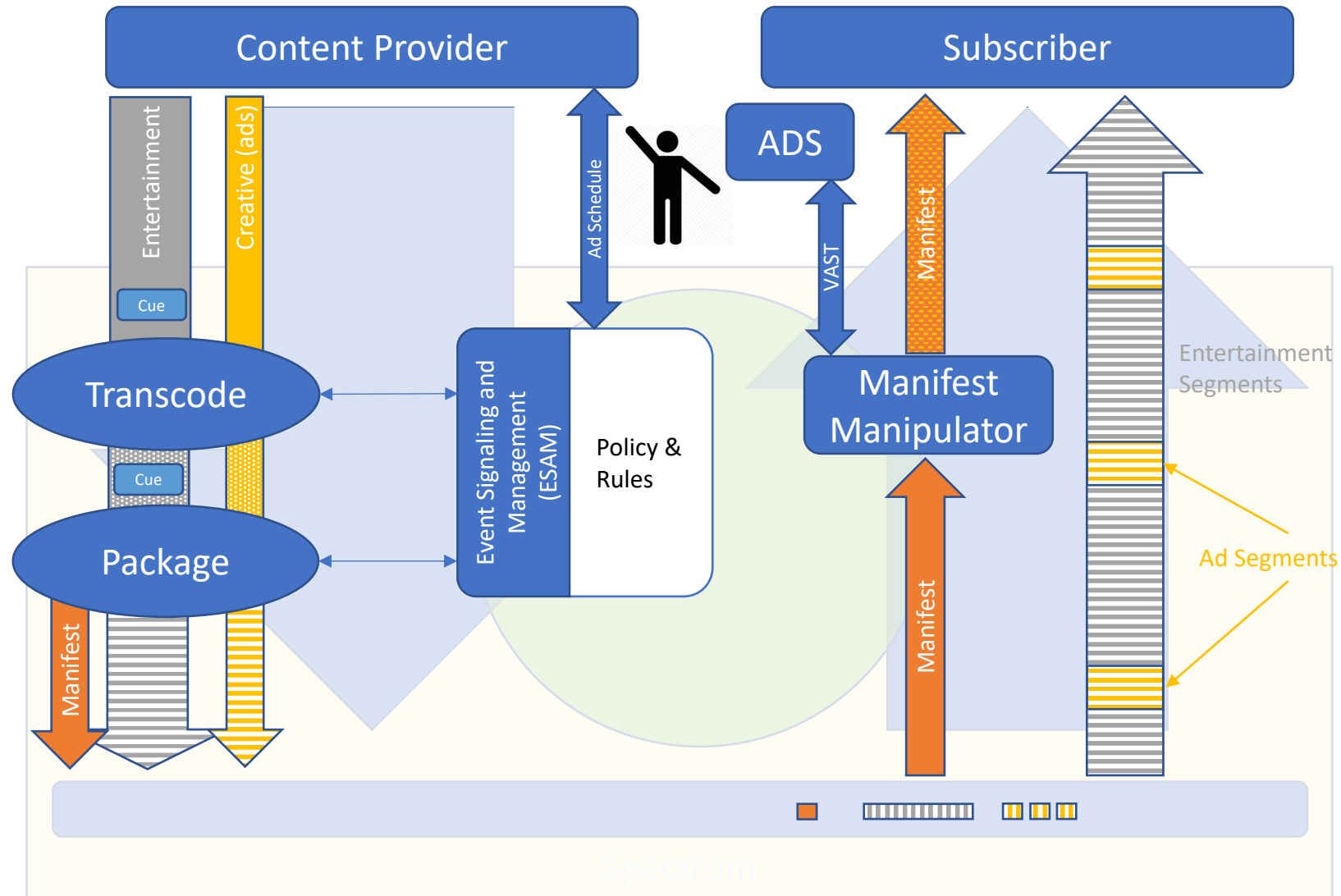
- Acquisition System (AS) – Acquires media streams and/or assets
 - Extracts in-band signals
 - Inserts in-band signals
 - Conditions media
 - Dynamically switches media
 - Generates / modifies ABR manifests
 - Transcoder (AS-T) or Packager (AS-P)
- Decision System (DS) – Applies business rules for media
 - Interprets signals
 - Provides instructions to AS
 - Aggregates outcomes and metrics



IP Linear Dynamic (Client-side) Ad Insertion



IP Linear Dynamic (Server-side) Ad Insertion



HLS Manifest (SCTE-35 2017)

```
#EXTINF:6.006  
#EXT-X-SCTE35:TYPE=0x34,DURATION=60.060,ELAPSED=30.030,CUE-  
#EXT-X-SCHEMATA:urn:mpeg:dash:scte35:2017,profiles="SCTE35-2017",ID="SCTE35-2017"  
#EXT-X-SCHEMATA:urn:mpeg:dash:scte35:2017,profiles="SCTE35-2017",ID="SCTE35-2017"  
#EXTINF:6.006,  
20170411T082111-600-191029.ts  
#EXTINF:6.006,  
20170411T082111-600-191030.ts  
#EXTINF:6.006,  
20170411T082111-600-191031.ts  
#EXTINF:6.006,  
20170411T082111-600-191032.ts  
#EXTINF:5.939,  
20170411T082111-600-191033.ts  
#EXT-X-SCTE35:TYPE=0x36,CUE="/DAhAAAAAAAAA//wAQZ/AA8CDUNVRUKAAAAAf75sAIPxLXY=",ID="4Ylv5d"  
#EXTINF:6.006,  
20170411T082111-600-191034.ts
```

HLS Manifest (IETF RFC 8216)

```
#EXT-X-PROGRAM-DATE-TIME:2010-02-19T14:54:22.021Z
#EXT-X-PROGRAM-DATE-TIME:2010-02-19T14:54:45.186Z
#
#EXT-X-PROGRAM-DATE-TIME:2010-02-19T14:55:03.204Z
#EXT-X-DATERANGE:ID="f6UrRd",START-DATE="2010-02-19T14:55:03.204Z",DURATION=60.060,SCTE35-
OUT="/DAmAAAAAAAAA//wAQZ/ABQCEkNVRUKAAAAAf/4AAKTLgGgCwDSw4Q=="
#EXT-X-DATERANGE:ID="4Ylv5d",START-DATE="2010-02-19T14:55:33.167Z",SCTE35-
IN="/DAhAAAAAAAAA//wAQZ/AA8CDUNVRUKAAAAAf75sAIPxLXY="
#EXTINF:6.006,
20170411T082111-600-191029.ts
#EXTINF:6.006,
20170411T082111-600-191030.ts
#EXTINF:6.006,
20170411T082111-600-191031.ts
#EXTINF:6.006,
20170411T082111-600-191032.ts
#EXTINF:5.939,
20170411T082111-600-191033.ts
#EXTINF:6.006,
20170411T082111-600-191034.ts
```

DASH MPD

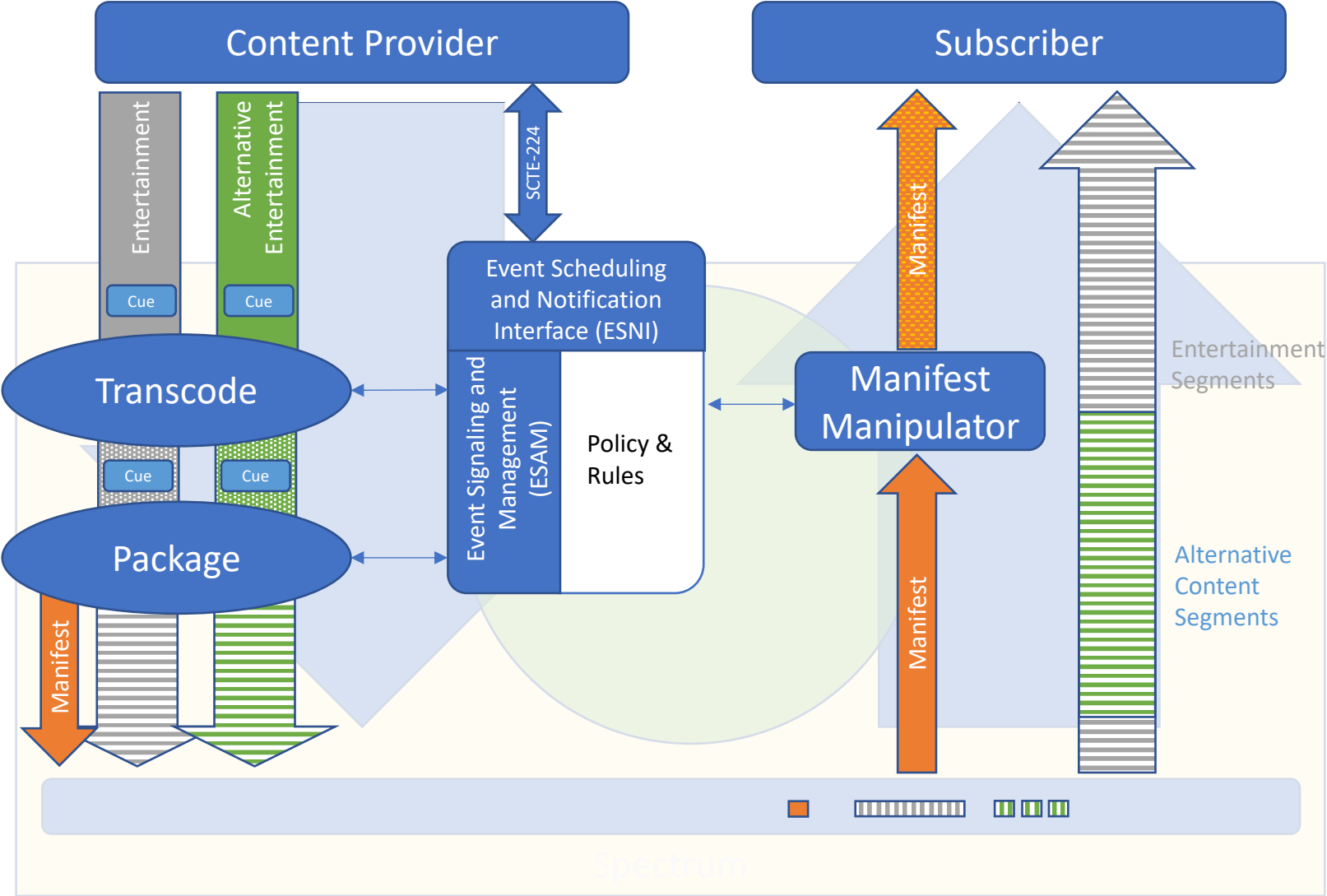
```
<MPD xmlns="urn:mpeg:dash:schema:mpd:2011" xmlns:scte35="urn:scte:scte35:2014:xml+bin" type="dynamic">
  <Period id="552833" start="PT89064.08S">
    <AdaptationSet mimeType="video/mp4">...</AdaptationSet>
    <AdaptationSet mimeType="audio/mp4">...</AdaptationSet>
  </Period>
  <Period id="553209" start="PT89813.395S">
    <EventStream schemeldUri="urn:scte:scte35:2014:xml+bin" timescale="90000">
      <Event>
        <scte35:Signal>
          <scte35:Binary>/DBLAAG8BsUA///wBQb+AAAAAAAA1AjNDVUVJQAHQ33//AADAQsAJH1NJR05BTDpIM
DI0QXpkWINwMjAxTnpJSzd6MUhnPT0yAACOTsRu</scte35:Binary>
        </scte35:Signal>
      </Event>
    </EventStream>
    <AdaptationSet mimeType="video/mp4">...</AdaptationSet>
    <AdaptationSet mimeType="audio/mp4">...</AdaptationSet>
  </Period>
</MPD>
```

DASH MPD

```
<MPD xmlns="urn:mpeg:dash:schema:mpd:2011" type="dynamic">
  <Period id="552833" start="PT89064.08S">
    <AdaptationSet mimeType="video/mp4">
      <InbandEventStream schemeldUri="urn:scte:scte35:2014:bin" value="1" />
      <SegmentTemplate timescale="90000" duration="180180" />
      <Representation id="video1" />
      <Representation id="video2" />
      <Representation id="video3" />
    </AdaptationSet>
    <AdaptationSet mimeType="audio/mp4">...</AdaptationSet>
  </Period>
</MPD>
```

SCTE-35 embedded as in-band XML in emsg

Blackouts and Alternative Content



ESNI Concepts

- Media – Any form of linear, time-shifted or on-demand content
- MediaPoint – A temporal point of interest within the media
 - MatchTime – Apply the policy at a given wall-clock time
 - MatchSignal – Apply the policy at an in-band signal (cue)
 - Metadata – Associate descriptive metadata with a program start
- Policy – A collection of viewing policies that apply to a MediaPoint
- ViewingPolicy – An association of one or more actions to a defined audience
- Audience – A set of characteristics, which define a set of users
 - Geography – e.g. ZipCode, DMA, address, geocoordinates
 - Device – e.g. Platform, OS, capabilities
 - Application
- Action – Usually blackout or switch content
- Audit – Used to query historical events

ESNI Examples

```
<Audience id="/audience/co/boulder" match="ANY">  
  <audience:Zip>80301</audience:Zip>  
  <audience:Zip>80302</audience:Zip>  
  <audience:Zip>80303</audience:Zip>  
  <audience:Zip>80304</audience:Zip>  
  <audience:Zip>80305</audience:Zip>  
</Audience>
```

```
<ViewingPolicy id="/viewingpolicy/2">  
  <Audience xlink:href="/audience/co/boulder"/>  
  <action:Content>urn:scte:224:action:blackout</action:Content>  
</ViewingPolicy>
```

```
<Policy id="/policy/1">  
  <ViewingPolicy xlink:href="/viewingpolicy/1"/>  
  <ViewingPolicy xlink:href="/viewingpolicy/2"/>  
  <ViewingPolicy xlink:href="/viewingpolicy/3"/>  
</Policy>
```

ESNI Examples

```
<Media id="/media/tbs" description="TBS" lastUpdated="2018-02-10T12:00:00Z">
  <!-- Network / Super -->
  <MediaPoint id="/network/1" description="TBS">
    <AltID>http://dx.doi.org/10.5239/C370-DCA5</AltID>
    <Apply><Policy xlink:href="/policy/6"/></Apply>
  </MediaPoint>
  <!-- Program Begins -->
  <MediaPoint id="/program/20997C44" description="World Cup Curling"
    matchTime="2014-11-05T12:00:00Z">
    <AltID>http://dx.doi.org/10.5240/9EF1-2DA2-5C1F-98B4-F784-E</AltID>
    <Apply duration="PT2H"><Policy xlink:href="/policy/5"/></Apply>
    <MatchSignal signalTolerance="PT12S" match="ALL">
      <Assert>//SegmentationUpid[@segmentationUpidType='8']="20997C44"</Assert>
    </MatchSignal>
  </MediaPoint>
</Media>
```

ESNI Examples

```
<Media id="/media/tbs" description="TBS" lastUpdated="2018-02-10T12:00:00Z">
  <!-- First Ad Break -->
  <MediaPoint id="/program/20997C44/pod/1" description="Ad Break #1"
    effective="2014-11-05T12:00:00Z" expires="2014-11-05T12:30:00Z">
    <Apply duration="PT90S"><Policy xlink:href="/policy/7"/></Apply>
    <MatchSignal match="ALL"><Assert>//SpliceInsert</Assert></MatchSignal>
  </MediaPoint>
  <!-- Potential Program Breakaway (may never happen) -->
  <MediaPoint id="/program/20997C44/breakaway" description="Breakaway"
    effective="2014-11-05T12:00:00Z" expires="2014-11-05T02:00:00Z">
    <Remove><Policy xlink:href="/policy/5"/></Remove>
    <MatchSignal match="ALL">
      <Assert>/SegmentationDescriptor[@segmentationTypeId='19']</Assert>
    </MatchSignal>
  </MediaPoint>
</Media>
```

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SCTE Digital Video Subcommittee
Working Group 5 – Digital Program Insertion