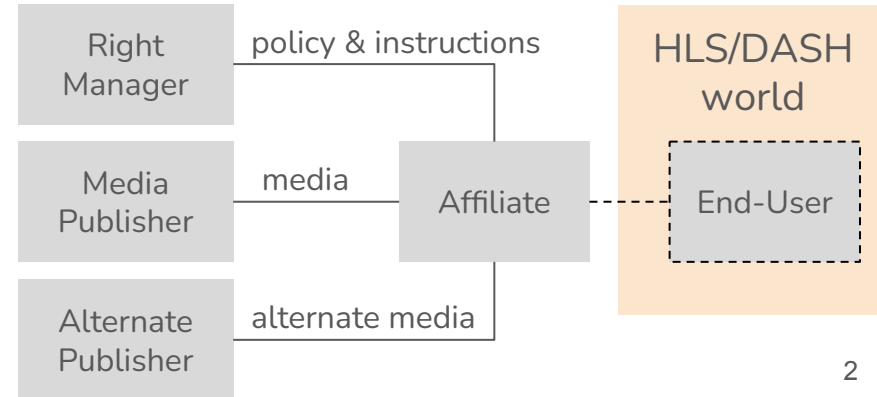
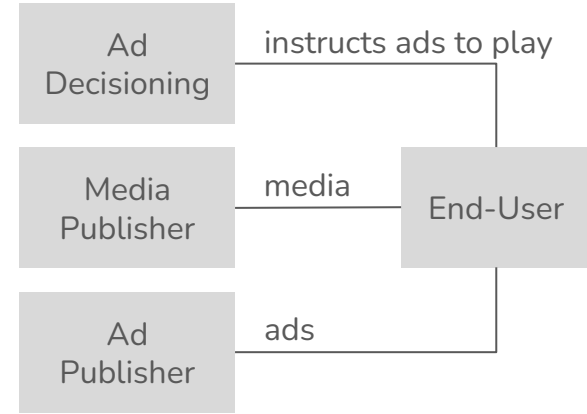


# Ad Insertion and Blackout Management in MOQ

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# Motivations

- Defines MOQ flows to implement
  - **Dynamic ad insertion**
    - Decoupled ad decision and ad delivery
    - Independent from media distribution
    - Scalable signaling
    - Standards-based control plane
  - **Blackout management**
    - Easy to integrate downstream
    - Decoupled orchestration and program
    - Dynamic policies
    - Compatibility with existing operations



# Background SCTE

- **SCTE-35 — Real-time signaling**
  - In-band **time-synchronized** signaling
    - Cues embedded or associated with media stream – aligned to media\_PTS
  - **Triggers** for ad insertion and content control
    - Placement opportunities, ad boundaries, program and content control events
- **SCTE-224 — Policy and automation**
  - **Out-of-band** policy description
    - Rules describing *what should happen* and *to whom* – delivered ahead of time
  - Audience-aware **control**
    - Explicit audience definitions (ZIP, region, device...) – enables specific blackout
- **SCTE-35 + SCTE-224 Complementary behavior**
  - SCTE-224 defines policy and context
  - SCTE-35 provides the real-time trigger that activate these policies

# Background MSF

- **Media Timeline track — Reference timeline for media tracks**
  - Explicit mapping between media time and objects
    - *media\_PTS, MOQ location, wall-clock time*
- **Event Timeline track – Metadata stream**
  - Carries application-defined events – indexed by *one* index from Media Timeline
    - `{t: 1756885678361,  
type:"com.livescore",  
data={"home": "FRA", "away": "UK", "home_score": 4, "away_score": 0, "scorer": "Mbappe"}}`
- **MOQ URL**
  - `moqt://example.com/relay-app/relayID?ns=customerID/broadcastID&t=video&c4m=gqhkYW`
    - Connection endpoint
    - Namespace
    - Track name
    - Token

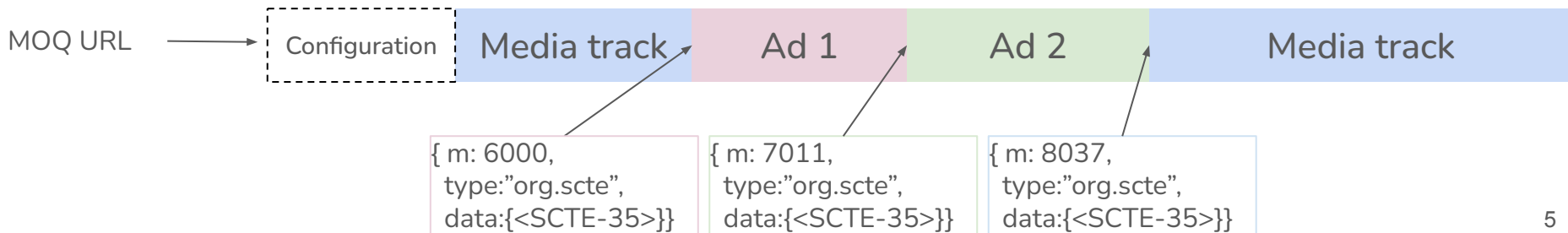
# Principles

## 1. Configuration

- Subscriber receives MOQ URL of Media Publisher **including ad token**
- Catalog includes an **Event Timeline track** at Ad Decision Publisher
- Subscriber subscribes **both**
  - i. Media track and Media timeline track at Media Publisher
  - ii. Event Timeline track at Ad Decision Publisher

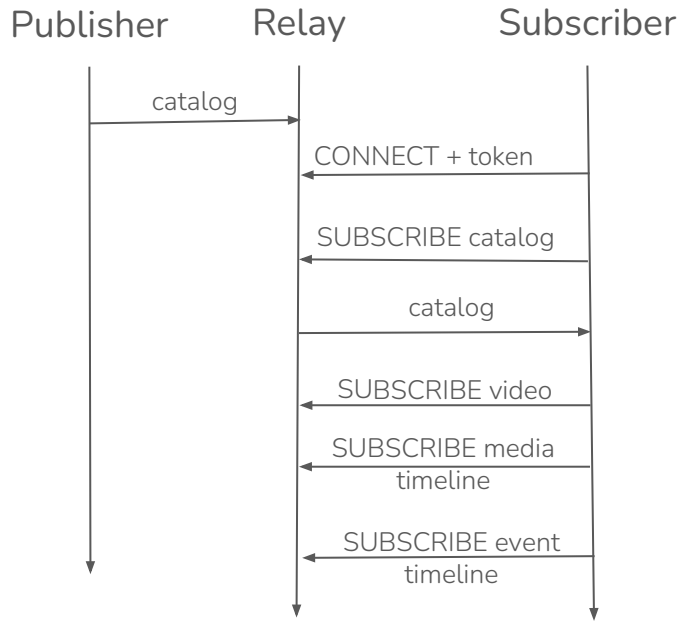
## 2. Ad Decision Publisher emits **SCTE-35 markers** on Event Timeline track

- Indicating **when** to switch from media track to ad track
- Indicating **what** ad track to FETCH



# 1- Configuration

Initialization: moqt://broadcaster/cdn/relay12:4433?ns=ch01/live&token=bob



## Catalog

```
{
  "version": 1,
  "generatedAt": 1746104606044,
  "tracks": [
    {
      "name": "ad-%token%",
      "namespace": "ad_decisioning",
      "packaging": "eventtimeline",
      "mimetype": "application/json",
      "role": "eventtimeline",
      "depends": "mediatime",
      "eventType": "org.scte.scte35.v1",
      "isLive": true
    },
    {
      "name": "video-hd",
      "namespace": "publisher",
      "packaging": "cmf",
      "isLive": true,
      "role": "video",
      "codec": "av01.0.08M.10.0.110.09",
    }
  ],
  {
    "name": "mediatime",
    "namespace": "publisher",
    "packaging": "mediatimeline",
    "depends": "video-hd",
    "role": "mediatimeline",
    "mimetype": "application/json"
  }
}
```

## 2- Signaling

- Event Timeline Type
  - `org.scte.scte35.v1`
- Record structure
  - `{ "m": <media_time>, "type": "org.scte.scte35.v1", "data": { <scte35_fields> } }`
- Core fields
  - `segmentation_type_id`
  - `segmentation_event_id`
- Optional fields
  - Follows SCTE-35 syntax

```
{ "m": 600000,
  "data": {
    "segmentation_type_id": "0x34",
    "segmentation_event_id": 1001}},
{ "m": 600000,
  "data": {
    "segmentation_type_id": "0x30",
    "segmentation_event_id": 2001,
    "segmentation_upid_type": "0x0F",
    "segmentation_upid_uri": "moqt://adserver.example?t=ad-1"}},
{ "m": 620000,
  "data": {
    "segmentation_type_id": "0x31",
    "segmentation_event_id": 2001}},
{ "m": 620000,
  "data": {
    "segmentation_type_id": "0x30",
    "segmentation_event_id": 2002,
    "segmentation_upid_type": "0x0F",
    "segmentation_upid_uri": "urn:moqt:trackid:example-ads--ad_2"}},
{ "m": 640000,
  "data": {
    "segmentation_type_id": "0x31",
    "segmentation_event_id": 2002}},
{ "m": 640000,
  "data": {
    "segmentation_type_id": "0x35",
    "segmentation_event_id": 1001}}
```

Placement opportunity start

Ad start

Ad end

Ad start

Ad end

Placement opportunity end

# Subscriber Behavior

- At reception of a **<Placement opportunity start>** record in Event Timeline
  - UNSUBSCRIBE video track (or SUBSCRIBE\_UPDATE video track forward=0)
- At reception of an **<Ad start>**
  - Extract `segmentation_upid_uri` field
  - If it is a MOQ URL
    - Connect to server
    - FETCH ad track
  - If it is a MOQ URN
    - Load ad
- At reception of a **<Placement opportunity end>**
  - SUBSCRIBE video track (or SUBSCRIBE\_UPDATE video track forward=1)

# Status

- Demo
- **MSF updates**
  - Definition of MOQ URL
    - Add a way to instruct a FETCH
  - Definition of Event Type `org.scte.scte35.v1`
  - Definition of relative track management in catalog (`"name: "ad-%%token%"`)
  - Create URN for MOQ
- Open questions about **blackout management**
  - Existing solution based only on SCTE-35 has limitations
    - A MOQ Subscriber affiliate video headend cannot apply complex policies downstream
  - Fix: Create another Event Timeline for SCTE-224 records
    - Poor matching with Event Timeline
      - SCTE-224 is out-of-band, stateful, declarative, updated ahead of time
      - Event Timeline is ordered, time-indexed, evaluated as playback progresses