Catalog Specification for MoQ compliant Streaming Formats
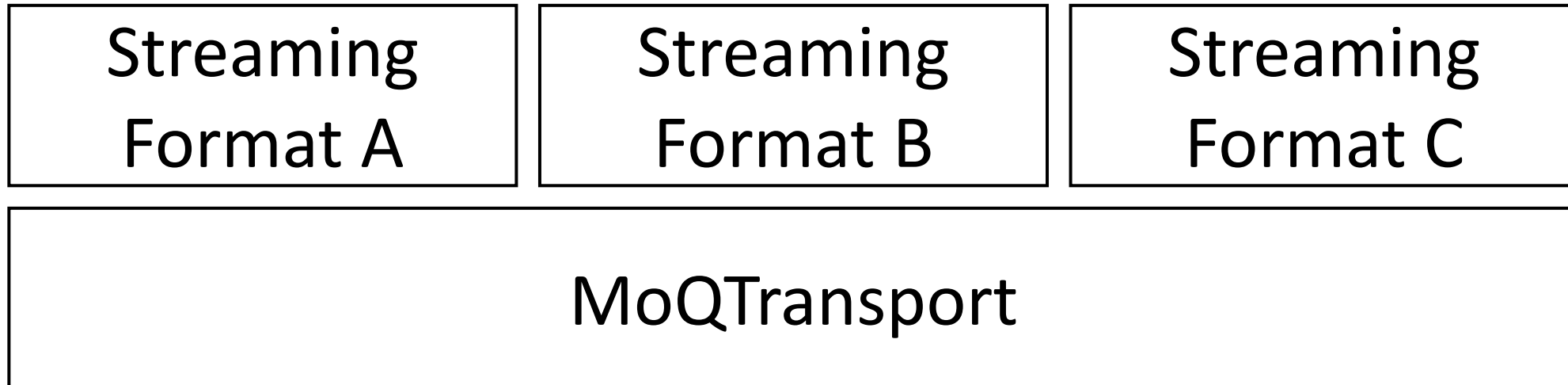
Will Law

Akamai

March 2023

Assumption #1

There will be a common **MoQTransport Specification** which is then utilized my multiple **Streaming Format Specifications**

Streaming Format A	Streaming Format B	Streaming Format C

MoQTransport

Assumption #1

To satisfy our charter we need to define the MoQTransport and at least one Streaming Format

Streaming Format A	Streaming Format B	Streaming Format C

MoQTransport

Separation of responsibilities

MoQTransport (1)

- Object model & structure (bundles, tracks, groups, objects)
- Addressing schemas
- Catalog requesting and type identification
- Rules for relays (priority, sendOrder, dropping)
- Carriage of MoQ over transport protocols (WebTransport and raw QUIC)

Streaming Format (N)

- Catalog format and serialization
- Media container (likely reference some other container spec such as CMAF)
- How media is mapped to the MoQTransport object model (GOP per object, frame per object, datagrams etc)
- Workflow logic including
  - bitrate adaptation
  - content protection
  - access control
  - error handling etc.
  - synchronization between tracks
- Streaming format type registration

Assumptions #2

- The subscribe-able entities within MoQTransport are **tracks**.
- There is an addressable **package of tracks** (name is TBD – could be bundle|emission|broadcast)
- One of the tracks is the "**catalog**" . It describes the other tracks and gives the client the data it needs to select, initialize and subscribe to these tracks.
- Tracks have an **identifier**
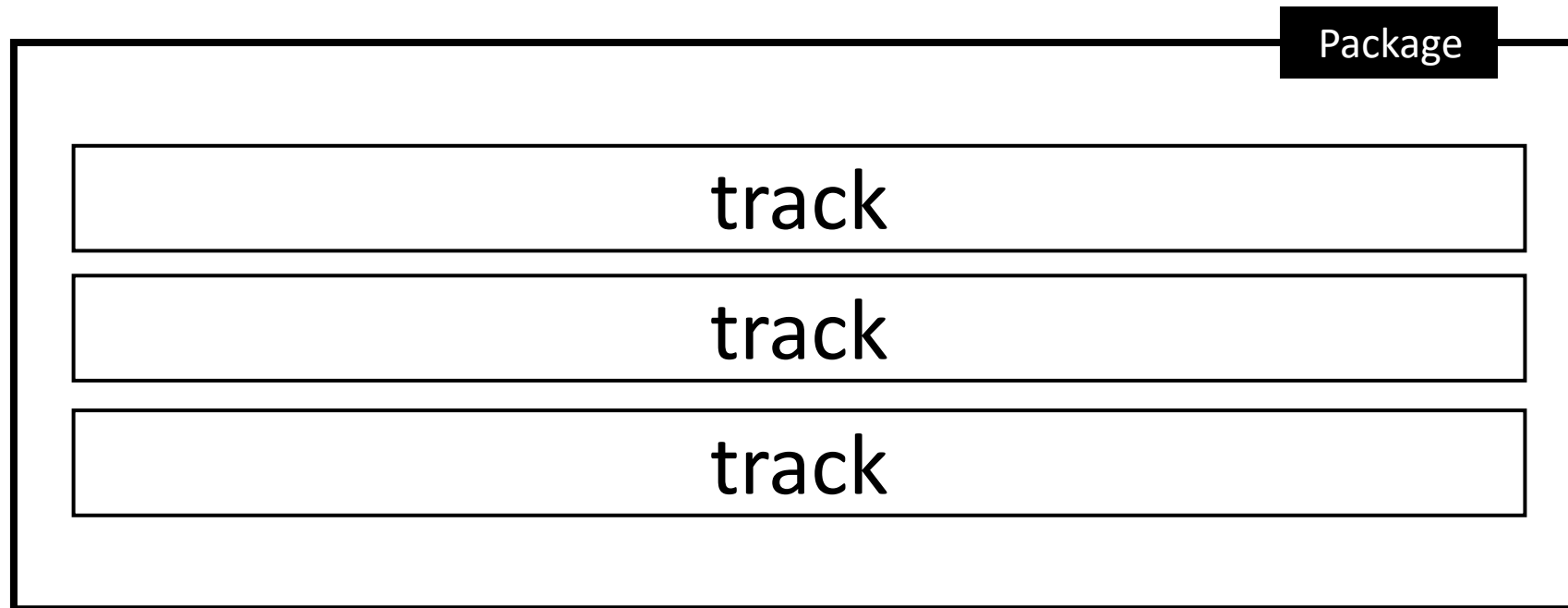
Problems

1. Given the address to a package of tracks, how does a client know how to retrieve the catalog?

2. Given that different streaming formats may use different binary serializations, how can a client know how to parse a catalog it has not seen before?

draft-law-moq-catalog-00 proposes solutions to these two problems.

Problem#1: Given the address to a package of tracks, how does a client know how to retrieve the catalog?

1. The catalog SHALL have a reserved track ID of 0 if we have numeric identifiers or "catalog" if string.

2. There can only be one track with an ID of 0 | "catalog" in a package.

3. If applications demand a multi-level catalog description, there must still be a parent entry-point at 0 | "catalog" that references the tracks .

Problem#2: Given that different streaming formats may use different binary serializations, how can a client know how to parse a catalog it has not seen before?
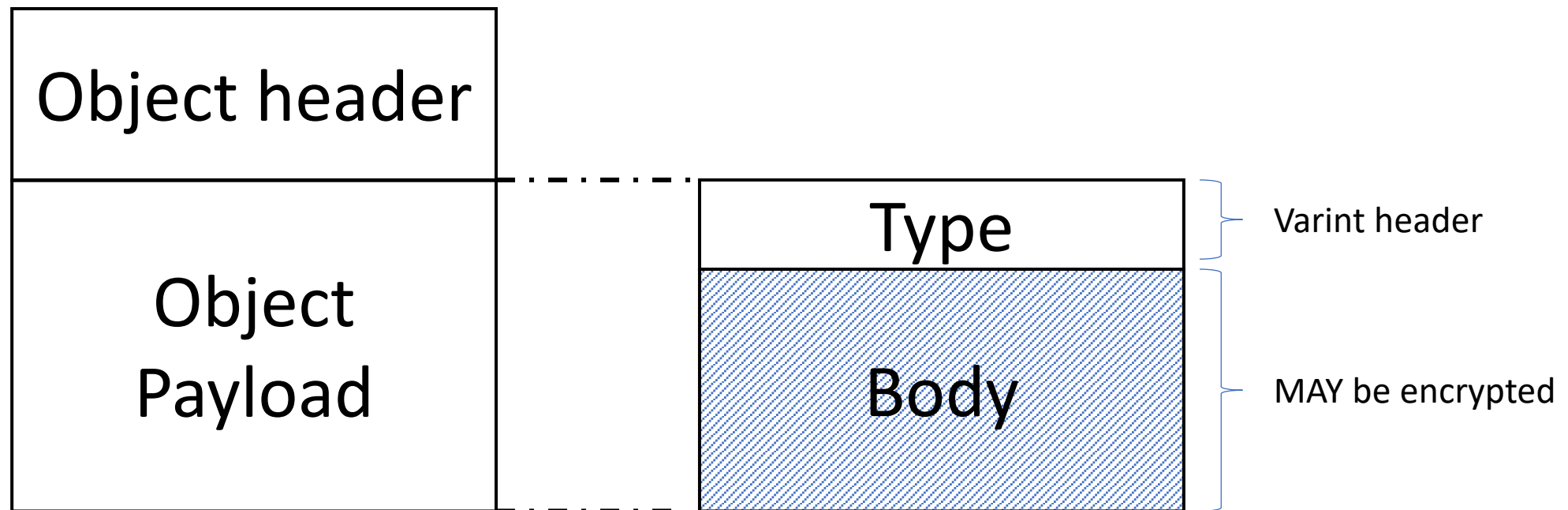
A Catalog is a MoQ object, meaning it has a header and a payload.

Object header
Object Payload

| Type	— Varint header
Body	— MAY be encrypted

Registration

We create a new IANA registry, "*MoQTransport Catalog Type*". The registry policy is "RFC Required". The Type value is varint. The range is 0x0000-0xFFFF.

Type	Name	RFC
0x0000	Reserved	
0x0001	*WARP*	*https://www.ietf.org/rfc/rfcXXXX.txt*
0x0002	*QUICR*	*https://www.ietf.org/rfc/rfcYYYY.txt*
0x0003	*VR special etc.*	*https://www.ietf.org/rfc/rfcZZZZ.txt*

Type 0 is reserved for experimentation. It allows a streaming format under development to be distributed by a delivery system without triggering behaviors associated with a registered type.

Dependency examples

The catalog at the start of a Group MUST be independent and represent the latest view of the content. Subsequent objects within that Group MAY hold delta-encodes of the catalog
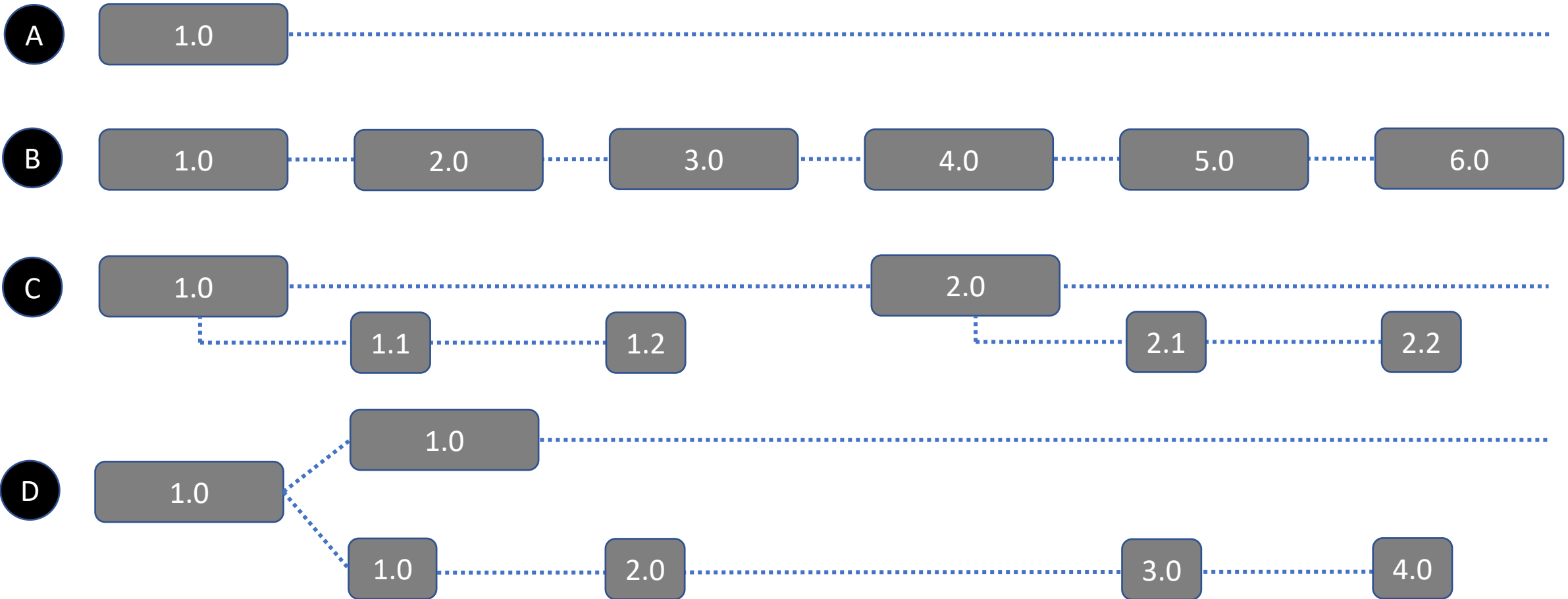
What might a catalog look like #1?

```
{
  "version":"1.00.68",
  "tracks":[
    {
          "id":1,
          "bitrate":2000000,
          "init":"HhyQJXIGpDv09tr0+0bzwlx16Av1yI4UDxHFfoP75/nGSOPmBlJU7raWKy578Jj8Xa5KeKFDbwuFhME8NQbVOKoGk/EX1
SPJRVkzNtuyaq/vruZav4SA4S+ImZ+hEQN2KvCm5itRy01LpZBsbnczQYgadHr3eQU/b0f1ihUjHM60uxq/FUMO/Oa5htNu67+nlLZMoe6dv6X
qKeY4zf39RLW9s1TXNnb3lcEs5ysQI8KiPwmgD0OJUmJCWVtcpBOfT0puIYUiOBauqjfG5xWYQUSMnHysgPO7wblDNNhC2vGg7CwVToACg
40haM3lHpRpKrxE7cMMhHrFhhtParil"
    },
    {
          "id":2,
          "bitrate":128000,
          "init":"iD9P8Ju1gIXa94QXE6mpMoC4j4pvB/7V9a35RyCTxJTrdR4qr0wN7OHtX6IRg7WnmHkK2pbrHmuWw+NH5pHhEFmoTL
L2X9iwSeI/jdLXEQcYCKqzeQf0Ar/HcHwCIo5LDP6ATDJCi6mBZmvJAqEUreVFSXz+7AH7UbG9QiCpvgNhYELA4VVGmsS13LZ39Pl3lPW6e1Q
3GRTYOXtcIpXZ5Bgny/Z36L743yn/R6bl2Lt42c5kC4WKeIPnolPjq61VavtXgb6ol5HXdPdQYSD5Bz8HWIay9SePlqaFmA0ezsGUZ7/vxFGJfyDg
m8tWbrZ2uUbP3KeV5U3SWZ6p/w4k"
    }
  ]
}
```

What might a catalog look like #2?

```
{
  "version":"1.00.68",
  "label":"RERUN: FaZe vs. NaVi - Map 1 - EPL S17 – Semifinal",
  "tracks":[
    {
              "id":gamestreaming.com/abc/12345/video,
              "bitrate":2000000,
              "mimeType":"video/mp4",
              "codec":"avc1.64001f",
              "width": 1920,
              "height":1080,
              "frameRate":30,
              "label":"Primary game video feed",
              "initTrackID":gamestreaming.com/abc/12345/video-init,
    },
    {

              "id": gamestreaming.com/abc/12345/audio,
              "bitrate":128000,
              "mimeType":"audio/mp4",
              "codec":"mp4a.40.5",
              "sampleRate": 48000
              "label":"English commentary",
              "initTrackID":gamestreaming.com/abc/12345/audio-init,
    } …
}
```

What might a delta catalog look like #3?

```
{
  "version":"2.4",
  "sequence": 214,
  "parent": 213,
  "removeTracks":[2,3],
  "addTracks":[{ "id":4,"bitrate":1000000,"type": "video","name":"Bob","dimensions":"1280x720"}],
  "changeTrack":[{"id":1,"bitrate":50000}]
}
```

What might a DASH catalog look like #4?

```xml
<?xml version="1.0" encoding="utf-8"?>
<MPD xmlns="urn:mpeg:dash:schema:mpd:2011" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
availabilityStartTime="1970-01-01T00:00:00Z" maxSegmentDuration="PT2S" minBufferTime="PT2S" profiles="urn:mpeg:dash:profile:ietf-moq:2023" publishTime="2023-03-30T07:25:34Z" timeShiftBufferDepth="PT5M" type="dynamic"
xsi:schemaLocation="urn:mpeg:dash:schema:mpd:2011 DASH-MPD.xsd">
<Period id="p0" start="PT0S">
    <AdaptationSet contentType="audio" lang="en" mimeType="audio/mp4" segmentAlignment="true" startWithSAP="1">
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main" />
      <SegmentTemplate duration="2" initializationTrackID="init/$RepresentationID$" mediaTrackID="audio/$RepresentationID$" />
      <Representation audioSamplingRate="48000" bandwidth="48000" codecs="mp4a.40.2" id="A48">
        <AudioChannelConfiguration schemeIdUri="urn:mpeg:dash:23003:3:audio_channel_configuration:2011" value="2" />
      </Representation>
    </AdaptationSet>
    <AdaptationSet contentType="video" maxFrameRate="60/2" maxHeight="360" maxWidth="640" mimeType="video/mp4"
minHeight="360" minWidth="640" par="16:9" segmentAlignment="true" startWithSAP="1">
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main" />
      <SegmentTemplate duration="2" initializationTrackID="init/$RepresentationID$" mediaTrackID="video/$RepresentationID$"/>
      <Representation bandwidth="300000" codecs="avc1.64001e" frameRate="60/2" height="360" id="V300" sar="1:1" width="640" />
    </AdaptationSet>
  </Period>
</MPD>
```

Questions?