

**INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC1/SC29/WG11 MPEG2014/M34352
July 2014, Sapporo, Japan**

Source **Telecom ParisTech, Canon Research Centre France**
Status **For consideration at the 109th MPEG Meeting**
Title **Identifying representations across Periods in DASH**
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1 Introduction

During the 107th MPEG meeting, contribution m32204 [1] presented a use case for object tracking, in the context of the Spatial Relationship Description Core Experiment, where a DASH player wanted to select the Adaptation Set(s) in a Period containing the same object or content previously selected in a previous Period. The proposed solution was very specific to SRD while the ability to identify a piece of content across Periods was an interesting and generic tool. During the 108th MPEG meeting, contribution m33112 [2] reviewed the existing tools for identifying the continuity of Adaptation Sets across Periods: AdaptationSet@id, Subset and AssetIdentifier and proposed to use the AssetIdentifier at AdaptationSet level. That contribution was noted and the group welcomed more study. This contribution proposes a review of the options.

2 Analysis and Proposal

Contribution m33284 [3] proposed an analysis of the problem but in a global discussion on period continuity. It discussed the ability of doing seamless playback across Periods. We believe that this is orthogonal to being able to signal that an AdaptationSet represents the same (part of) content as another AS in a previous period. For instance, you may want to indicate that Periods can be played seamlessly while there is no editorial continuity, objects represented on screen are completely different (e.g. a movie followed by an ad) or you may want to select a content that was selected before, without necessarily requiring seamless playback. We focus here on signaling the editorial continuity, i.e. we want to signal that a part of the content is present in two AS from two different periods.

In m33284, a proposed solution to identify that Adaptation Set correspond to the same (part of) content (called “associated Adaptation Set”) is to use:

- the same Asset identifier at the period level;
- the same AdaptationSet@id value, meaning that:
 - o the same language;
 - o the same content type;
 - o the same aspect ratio;
 - o the same Role values;
 - o the same Accessibility elements;
 - o and the same Viewpoints are used.

This seems overly restrictive. One might want to indicate that 2 Adaptation Sets for which the aspect ratio has changed in the period still represent the same part of the Asset. Similarly, Accessibility descriptors might be added or removed.

Using the AdaptationSet@id, i.e. using the same id value for 2 AS in different Periods, is a possible option. Its drawbacks are that:

- content may already have been authored with this feature and will be wrongly processed by DASH engines using AS@id to detect content continuity. This is acceptable only if we assume that existing content does not reuse @id values, which is probably true.
- it can only identify that two AS represent exactly the same content. If one wants to identify part of the Asset, this is not possible.

We agree with m33112, that SubSet is not a good option [2].

As reported in m33112, using the AssetIdentifier descriptor is indeed a valid option.

We could also identify that Adaptation Sets represent the same (part of content) using any other descriptor (for instance Role, or SupplementalProperty), even if the schemeIdURI and value attributes are unknown to the DASH engine (similar to the behavior of Asset Identifier). However, this would require that a DASH engine keeps in memory the descriptors it does not recognize for comparison with other descriptors in future Periods. This does not seem to be a valid approach.

Considering for example, a media presentation having one video stream multiplexed with two audio streams and exposed in MPD as one single Representation comprising three SubRepresentations, it may be useful for direct identification of one audio stream from one Period to another to have a consistent identifier between these two audio SubRepresentations. Therefore, we suggest also considering an identifier at SubRepresentation level. Moreover, in order to have a simple insertion of this identifier in the MPD schema, we recommend defining it as an element of the RepresentationBaseType.

In addition, to support the tracking use case initially proposed by Sharp in [1], typically with moving regions of interest, it may be useful to associate one AdaptationSet, Representation or SubRepresentation to one or more identifiers, in particular when these moving regions of interest have some overlapping areas, these areas being described in MPD as an AdaptationSet, Representation or SubRepresentation.

We then propose to modify the MPD schema as follows:

```
<!-- Representation base (common attributes and elements) -->
  <xs:complexType name="RepresentationBaseType">
    ...
    <xs:element name="InbandEventStream" type="DescriptorType" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="AssetIdentifier" type="DescriptorType" minOccurs="0"
maxOccurs="unbounded"/>
    ...
  </xs:complexType>
```

3 Conclusion

We recommend changing the DASH standard, possibly via the PDAM2, to allow defining one or more identifier, for example with AssetIdentifier descriptor, in RepresentationBaseType.

4 References

- [1] m32204: “Additional Parameters for Spatial Relationship Description (in CE-SRD)” by S. Watanabe, Y. Tokumo, MPEG#107, San José, January 2014
- [2] m33112: “DASH: signaling the continuity of adaptation sets across periods” by Y. Tokumo, S. Watanabe, T. Iwanami, MPEG#108, Valencia, April 2014
- [3] m33284: “Ad Insertion and Period Continuity” by T. Stockhammer, MPEG#108, Valencia, April 2014