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# Introduction

ISO/IEC DIS 23090-10 [XX] includes support for partial access within a V3C sequence at the file format level based on spatial sub-division of the 3D space and mappings of scene objects to corresponding spatial regions.

However, current DASH signalling for spatial regions and partial access in the DIS is based on a single atlas track containing all the atlas tiles. Moreover, V3C Preselections are required to include a list of all Adaptation Sets related to the V3C content. This contradicts the semantics of Preselections in MPEG-DASH, where the client is expected to select one Representation from each Adaptation Set included in the @preselectionComponents attribute (@value attribute in the case of a preselection descriptor). In the case of partial access, only Adaptation Sets corresponding to the tiles associated with a spatial region should be streamed.

In this contribution, we present a solution to address this problem based on multiple atlas tile Preselections and introducing new descriptors to signal supporting information.

# Proposed Solution

## V3C Atlas Tile Preselection

When V3C atlas tiles are carried in separate tracks these shall be represented by separate Adaptation Sets with the @codecs attribute for the Adaptation Sets set to 'v3t1'. Tracks carrying video-coded V3C component information associated with an atlas tile track shall also be carried in separate Adaptation Sets with the @codecs attribute set to 'resv.vvvc.XXXX', where XXXX corresponds to the four-character code (4CC) of the video codec (e.g., avc1 or hvc1).

Adaptation Sets associated with, and including, an atlas tile track shall be part of a single Preselection in the MPD with the atlas Adaptation Set being the main Adaptation Set for that Preselection (i.e., the id of the atlas Adaptation Set is the first id in the list of Adaptation Sets of the @preselectionComponents attribute in the Preselection element or the @value attribute of the Preselection descriptor). The concatenation of the Initialization Segment of the V3C Adaptation Set and the Initialization Segment of the Main Adaptation Set of the Preselection, in order, followed by subsegments of a Representation of the V3C Adaptation Set and subsegments of the components of the Preselection in any order results in an ISOBMFF file conforming to clause 6.4.

## Signaling Tiles in a V3C Atlas Tile

V3C atlas tiles carried by a V3C atlas tile Adaptation Set shall be signaled by a **V3CAtlasTiles** descriptor either in the V3C atlas tile Adaptation Set itself or in the Preselection for the V3C atlas tile. A **V3CAtlasTiles** descriptor is an **SupplementalProperty** descriptor with the @schemeIdUri attribute equal to "urn:mpeg:mpegI:v3c:2020:tile". At most one **V3CAtlasTiles** descriptor may be present at the Adaptation Set level or the Preselection level. The @value attribute of the **V3CAtlasTiles** descriptor shall not be present. The **V3CAtlasTiles** descriptor shall include the attributes defined in Table 1.

Table 1 Elements and attributes for the V3CAtlasTiles descriptor

|  |  |  |  |
| --- | --- | --- | --- |
| **Elements and attributes for V3CAtlasTiles descriptor** | **Use** | **Data type** | **Description** |
| v3c:@tiles | M | StringVectorType | Indicates the tile addresses of the atlas tiles carried by the V3C atlas tile track represented by the Adaptation Set within which the V3CAtlasTiles descriptor is present. The value of the @tiles attribute is a space separated list of atlas tile addresses. For ISO BMFF, this shall include all tile addresses listed in the AtlasTileSampleEntry of the V3C atlas tile track. |
| v3c:@atlas\_id | O | xs:integer | Indicates the id of the atlas track carried by the atlas Adaptation Set associated with the atlas tile represented by the Adaptation Set within which the V3CAtlasTiles descriptor is present. |
| Legend:  For attributes: M=Mandatory, O=Optional, OD=Optional with Default Value, CM=Conditionally Mandatory.  For elements: <minOccurs>..<maxOccurs> (N=unbounded)  Elements are **bold**; attributes are non-bold and preceded with an @. | | | |

The data types for the various elements and attributes of the **V3CAtlasTiles** descriptor shall be as defined in the following XML schema.

<?xml version="1.0" encoding="UTF-8"?>  
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"   
 targetNamespace="urn:mpeg:mpegI:v3c:2020"   
 xmlns:v3c="urn:mpeg:mpegI:v3c:2020"   
 elementFormDefault="qualified">   
  
 <xs:attribute name="tiles" type="StringVectorType" />  
 <xs:attribute name="atlas\_id" type="xs:integer" use="optional" />  
   
</xs:schema>

## Mapping Atlas Tile Adaptation Sets to Static Spatial Regions

To associate Adaptation Sets for a V3C atlas tile, including the Adaptation Set for the V3C atlas tile track and associated Adaptation Sets for the video-coded components, a **V3CRegionId** descriptor shall be used. This descriptor is a **SupplementalProperty** element with a @schemeIdUri attribute equal to "urn:mpeg:mpegI:v3c:2020:vpsr". A single **V3CRegionId** descriptor shall be present at the adaptation set level or the representation level in the V3C atlas tile Adaptation Set or at the preselection level for the Preselection representing the atlas tile.

The @value attribute of the **V3CRegionId** shall be equal to the value of @id for one of the spatial regions listed in the **V3C3DRegions** descriptor in the Main V3C Adaptation Set.

If the **V3CRegionId** descriptor is present in an Adaptation Set, this indicates that the Adaptation Set is part of a set of Adaptation Sets associated with the spatial region whose id is given by the descriptor. If the **V3CRegionId** descriptor is present in a Preselection, this indicates that the Adaptation Sets that are part of this Preselection are associated with the spatial region whose id is given by the descriptor.

## Dynamic Volumetric Metadata

Dynamic volumetric timed-metadata tracks carrying dynamic spatial region information and scene object information, as specified in clause 8.5 of ISO/IEC 23090-10, shall be represented in the DASH MPD file by a separate Adaptation Set with a single Representation with the following constraints:

* @codecs attribute shall have the value 'dyvm'.
* @associationId attribute may contain an ID of a V3C Main Adaptation Set signalled in the MPD.

The sole Representation of dynamic volumetric metadata Adaptation Set is therefore associated (linked) with the Representations in V3C Main Adaptation Set using an @associationId attribute, defined in ISO/IEC 23009-1 ‎[5], with a @associationType attribute value that includes the 4CC 'dyvm'

# References

1. N19285, “Text of ISO/IEC DIS 23090-10 Carriage of Visual Volumetric Video-based Coding Data”, MPEG 130, April 2020
2. m52960, “V-PCC elementary stream with multiple atlases in ISOBMFF”, MPEG 130, Electronic Meeting, April 2020
3. m53482, “Atlas Tile Group Tracks for Partial Access Support in MPEG-I Part 10”, MPEG 130, Electronic Meeting, April 2020
4. N18855, “Text of ISO/IEC 14496-12 6th Edition”, MPEG 128, Geneva, Switzerland, October 2019
5. N18609, “Text of ISO/IEC FDIS 23009-1 4th Edition”, MPEG 127, July 2019