Source   **Telecom ParisTech**
Status   **For consideration at the 109th MPEG Meeting**
Title   **Defect Report on DASH 2nd edition**
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1   Introduction

This contribution investigates timing in segment template, as defined in DASH 2nd edition. More specifically, it focuses on section 5.3.9.5.3 and identifies some problems that need clarifications.

2   Reminder

As stated in 7.2.1, the MPD start time of each segment "shall provide an approximation of the Media Presentation time T_M within the Period. Specifically, the MPD start time shall be drift-free relative to the presentation time T_P signalled in the media stream, i.e. the accuracy of the offset of the MPD start time relative to the presentation time does not depend on the position of the Segment in the Representation."

It is therefore reasonable to consider that MPD start time of the segment is roughly (but not exactly) the same as the media time in the segment minus the @presentationTimeOffset. This is confirmed by the fact that the MPD start time of the segment of a single-segment representation is 0.

3   MPD Time

3.1   Problem

In 5.3.9.5.3, the spec states:

In order to obtain the list of Media Segment URLs, i.e. the URL for each Segment at a specific position k in the list based on the Segment Information, the following shall apply:

If **SegmentTemplate** element is present, the template-based Segment URL construction shall be applied as follows:

If the Representation contains or inherits a **SegmentTemplate** element with *$Number$* then the URL of the Media Segment at position k in the Representation is determined by replacing the $*Number*$ identifier by (k-1) + @startNumber.

We can therefore say that the first segment in the representation has a $Number$ equal to @startNumber, in other words k=1 for the first segment (it is not obvious reading the spec whether the indexing is 1-based or 0-based).

We then have:

"If @duration attribute is present, then the MPD start time of the Media Segment is determined as $(k - (k_{Start} - 1))$ times the value of the attribute @duration with k_{Start} the value of the @startNumber attribute, if present, or 1 otherwise. The MPD duration of the Media Segment is the value of the attribute @duration unless the Media Segment is the last one the Representation (see below for more details)"

The first problem here is that @startNumber, which could have any offset, is substracted with a 1-based index in the list. For the result of this equation to be coherent, @startNumber has to be the index of the first segment, e.g. 1…

Taking it a bit further, the MPD start time of the first (k=1) segment is therefore:
$(1 - (k_{Start} - 1)) *$ duration $= (2 - k_{Start}) *$ duration $= (2-1)*$ duration

which means that « presentation media time = 0 » is approximated in « MPD start time = SegmentDuration ».

Let's now compute the AST of the first segment in this list (first segment in the representation):

Seg(AST) = @AST + period@Start(let's assume 0) + MPD Start Time + @duration = @AST + @duration + @duration = @AST + 2*@duration

So the client has to wait one complete @duration after the segment is produced before fetching it!

3.2   Tracking down the issue

In m30349 it was suggested to specify a default value of 1 for the startNumber if not specified (OK), but the proposed changes introduced a (*Number*-(*Number*$_{Start}$-1)) in the MPD start time which was wrong.

The initial COR1 text (w13495) was:

"If @duration attribute is present, then the MPD start time of the Media Segment is determined as (*Number*-*Number*$_{Start}$) times the value of the attribute @duration with *Number*$_{Start}$ the value of the @startNumber attribute. The MPD duration of the Media Segment is the value of the attribute @duration unless the Media Segment is the last one the Representation (see below for more details)"

We believe this formulation is the right one: it makes start numbers and indexes in the list independent, and gives a decent MPD time approximation (0 ~= 0).

Additionally, using (k-k$_{start}$) or equivalent in 5.3.9.5.3 is confusing, since one is an index in a list and the other a number, not necessarily one-based.

4   Proposed edits

4.1   In 5.3.9.5.3

Replace

"If a Representation consists of more than one Media Segment, then this ach Representation has assigned a list of consecutive Media Segments."
with
"If a Representation consists of more than one Media Segment, then this Representation has assigned a list of consecutive Media Segments."

4.2   In 5.3.9.5.3

Replace

"

- If the Representation contains or inherits a `SegmentTemplate` element with *$Time$* then the URL of the media segment at position *k* is determined by replacing the $*Time*$ identifier by the time address associated to this segment. The time address is determined as follows:

— if the `@duration` attribute is present, then the time address is determined by replacing the $*Time*$ identifier with $((k\text{-}1) + (\texttt{@startNumber-1}))* \texttt{@duration}$. Further, if the Segment does not contain the Segment Index, then the media time of the Segment shall be accurately expressed by the MPD information in the following sense:

— the value $((k\text{-}1) + (\texttt{@startNumber-1}))* \texttt{@duration}$ shall be identical to the earliest presentation time in the segment.

— the duration of the segment in media presentation time shall be identical to the value of the `@duration` attribute.

— if the `SegmentTimeline` element is present, then the time address is determined by replacing the $*Time*$ identifier with the earliest presentation time of the k-th segment as documented in the Segment timeline in 5.3.9.6.

"

with

"

- If the Representation contains or inherits a `SegmentTemplate` element with *$Time$* then the URL of the media segment at position *k* is determined by replacing the $*Time*$ identifier by MPD start time of this segment, as described bellow.

"

4.3   In 5.3.9.5.3

Replace

"If `@duration` attribute is present, then the MPD start time of the Media Segment is determined as (k - (k_{Start} - 1)) times the value of the attribute `@duration` with k_{Start} the value of the `@startNumber` attribute, if present, or 1 otherwise. The MPD duration of the Media Segment is the value of the attribute `@duration` unless the Media Segment is the last one the Representation (see below for more details)"

with

"If @duration attribute is present, then the MPD start time of the Media Segment is determined as ($Number$-$Number_{Start}$) times the value of the attribute @duration with $Number_{Start}$ the value of the @startNumber attribute, and $Number$ the segment number (e.g. (k-1) + $Number_{Start}$). The MPD duration of the Media Segment is the value of the attribute @duration unless the Media Segment is the last one the Representation (see below for more details)."

4.4   In Annex A.3

Replace:

"MediaSegment.URL[*i*], is obtained by replacing the $*Number*$ identifier by *i* + `@startNumber` in the **SegmentTemplate**`@media` string"
with:
"MediaSegment.URL[*i*], is obtained by replacing the $*Number*$ identifier by *i-1* + `@startNumber` in the **SegmentTemplate**`@media` string"

Or simply:
"MediaSegment.URL[*i*], is obtained as described in 5.3.9.5.3".

4.5   In Annex A.3

Replace:

"MediaSegment.URL[*i*], is obtained by replacing the $*Time*$ identifier by MediaSegment[*i*].startTime in the **SegmentTemplate**`@media` string."

With

"MediaSegment.URL[*i*], is obtained by replacing the $*Time*$ identifier by MediaSegment[*i*].startTime in the **SegmentTemplate**`@media` string, as described in 5.3.9.5.3."

5   Conclusion

We recommend adding the described edits in a new COR to DASH 2nd edition.