

# DASH-IF IOP: DASH APIs for Interactivity (DAInty)

Proposal for specification of APIs between application and DASH client

## 1 Background

3GPP SA4 is currently working on a service interactivity work item ('SerInter') to specify the necessary signaling, transport and other service layer functionality in support of dynamic user engagement and resulting auxiliary content presentation during the consumption of a streaming or downloaded service/content by the mobile device. SA4 has identified the need for APIs to be specified between the DASH client and the device application it serves.

## 2 Justification

Personalized and interactive service capabilities in streaming and download services, delivered via unicast or broadcast, can drive higher end-user satisfaction and loyalty to the service provider by creating greater "stickiness" of the provider's service offerings such as linear TV programs, live sports events and downloadable multimedia content. It would also provide a means for a subscription-based streaming service provider to further monetize its service.

Service interactivity features associate with a main program are typically implemented as overlaid display of continuous or discrete media content, hyperlinks or interactive menu items, etc., which are activated at precise times during the program playout. For example, interactivity features could be pre-scheduled to occur at certain points of the main program, or they can be dynamically instantiated during unplanned incidences, such as an injury time-out in a sports event. To activate either form of interactivity, the application served by the DASH client, or DASH-based application , assumed to be interactivity-enabled (i.e., it executes the business logic associated with the interactivity feature), must be dynamically notified of the occurrences of such interactivity events, along with any data supplied by the service/content provider associated with the interactivity feature such as logic or media content. The DASH Event mechanism as defined in ISO/IEC 23009-1 has been adopted and profiled in ATSC 3.0, in the A/337 Application Signaling standard, to support the synchronization of application-controlled actions of features, such as interactivity, associated with linear services.

3GPP SA4, in the SerInter work item, is similarly considering the DASH Event mechanism to enable the triggering and associated data provisioning function (if any) of service interactivity. However, there is a key difference between the 3GPP and ATSC 3.0 device architectures that prevents the reuse by 3GPP of the ATSC-defined mechanisms. ATSC 3.0 assumes that the broadcast receiver platform/middleware itself is DASH-aware, hence capable of retrieving the DASH Event Streams (both MPD Event and inband Event Streams) and forwarding the Events to the application via defined APIs. 3GPP, in LTE Broadcast (a.k.a. eMBMS) delivery of DASH-formatted services, assumes that the eMBMS receiver middleware is DASH-agnostic. Therefore, for the app to acquire the interactivity-related DASH Event information, APIs pertaining to subscription and notification delivery must be defined between the DASH client and the app.

In addition to such APIs for enabling the delivery of interactivity-specific DASH Event information to the DASH-based application, 3GPP SA4 desires the definition of APIs between the DASH client and the app for app access to timed Web assets/resources pertaining the service interactivity functionality as carried in dedicated ISO BMFF tracks, in the “Carriage of Web Resource in ISOBMFF” work item in MPEG (ISO/IEC 23001-15). Lastly, for the purpose of interactivity usage/consumption reporting by the app, 3GPP has interest in the definition of an API to enable the app to rely on the DASH client to perform such reporting of interactivity-related usage information to a network server, by leveraging the existing DASH QoE metrics mechanisms defined in MPEG-DASH and 3GP-DASH specifications.

Such APIs are intended for use by the application, assumed to be interactivity-capable, for the following purposes:

- Enabling the application to subscribe to, and the DASH client to deliver to the application, DASH Event Stream messages (both inband Event Stream and MPD Events) which contain interactivity-related information.
- Enabling the application to subscribe to, and the DASH client to deliver to the application, an ISO BMFF “timed Web Asset track” which conveys interactivity-related data synchronized to other media tracks in the ISO BMFF file. The specification of such timed Web Asset track is ongoing work in MPEG.
- Enabling the application to send measurements of interactivity-specific consumption information to the DASH client, as the means for the application to rely on the DASH client to in turn perform reporting of interactivity usage data to a network server.

The above DASH client APIs of interest to 3GPP in its SerInter work item are currently not defined by any SDO or industry forum. Such APIs are needed as an open standards-based and interoperable mechanism to support the service interactivity functionality targeted in the 3GPP SerInter work item. It is also believed that the relevance of such APIs applies not only to the 3GPP use case above, but will facilitate more consistent usage of the Event mechanism in DASH for interactive applications, as well as providing generic APIs for use by DASH-based applications in browsers and apps.

It is anticipated that the implementation of these DASH client APIs in various Rich OS environments and application development frameworks will be realized as a programmatic library that is linked to the application code and that runs in the application context. That library implementation communicates with the DASH client and abstracts the implementation-specific interactions with the DASH client from the application. The DASH client APIs expose to the application a set of simple interfaces described in the form of IDL definitions.

### 3 Objectives

The work item deals with the consistent definition of event signaling in DASH as well as the definition of APIs between the DASH client and the app. Specifically the following objectives are considered:

- Definition of consistent usage of DASH Events and other DASH/ISO BMFF features for carriage of interactive and web data
- Definition of consistent APIs between the DASH client and the DASH-aware application for events
- Definition of requirements for DASH client and DASH-aware application to support the APIs and event features

- Development of test cases, test vectors and conformance software to support the development of a content and a dash.js extension to support the use cases.
- Development of sample applications to support the use cases.
- Communication with other organizations on relevant use cases and enablers

## 4 Dependencies and Referenced Specifications

This document relates to work in DASH-IF or other organizations as follows

Organization	Work Item or Specification	Status
3GPP	Service Interactivity	Ongoing
3GPP	3GP-DASH specification, TS 26.247	Published since Release 10 and updated continuously
3GPP	MBMS Transport Protocol and API, documented in TS 26.347	Completed in Rel-14
MPEG	Carriage of Web Resource in ISOBMFF (ISO/IEC 23001-15)	Ongoing
ATSC	ATSC A/337 "Application Signaling"	In Proposed Standard ballot
ATSC	ATSC A/344 "Interactive Content"	Passed Proposed Standard ballot
DASH-IF/ATSC	DASH Profile for ATSC 3.0	Available in v1.0

The document is expected to normatively reference the following specifications:

Organization	Specification	Status
MPEG-DASH	ISO/IEC 23009-1 third edition	To be published

Note: The codec or format must be approved (i.e. it has a reference-able specification) by one of the standardisation bodies, after being passed through an open and public standardisation process, such as ISO/IEC, ETSI, ITU, IETF, W3C and SMPTE.

## 5 Supporting Individual Members

The generation of the new feature is supported by the following companies:

Supporting Member		Contact Person
1	Qualcomm Incorporated	Thomas Stockhammer
2	LG Electronics	Minsung Kwak
3	Sony	Kazuhiko Takabayashi
4	Ericsson	Per Fröjd
5	Nomor Research	Waqar Zia

It should be noted that during the discussion of this work item proposal in DASH-IF, it was pointed out that development of dash.js on which the APIs are targeted for implementation and validation is typically done by people who typically do not actively participate in the IOP WG meetings, and therefore may be unable to contribute to the technical work. It was acknowledged by Qualcomm that they, along

with other supporters of the work item, are expected to be the main contributors to the API definition, and drive the related implementation/validation on dash.js.

Note :

- Please provide 5 DASH-IF members that support the inclusion of this IOP.
- Provide evidence that a complete value chain will be in place e.g. encoding/packager, service operator and client implementation including browser-based clients.

## 6 Expected Output and Timeline

The following outputs and timelines are expected:

Milestone	Description	Expected Date
1	<ul style="list-style-type: none"><li>• Start of activity</li></ul>	2017/12/15
2	<ul style="list-style-type: none"><li>• Document for Internal Review</li></ul>	2018/02/15
3	<ul style="list-style-type: none"><li>• Document for community review</li><li>• Documentation of conformance rules</li><li>• Definition of Test cases</li></ul>	2018/03/15
4	<ul style="list-style-type: none"><li>• Completion of community review</li></ul>	2018/04/15
5	<ul style="list-style-type: none"><li>• Addressing of Comments from community review</li><li>• Conformance Software</li><li>• Verified IOP test vectors, i.e. consumption of two independent implementations</li><li>• Publication</li></ul>	2018/05/15

## 7 Affected Documents

Provide the DASH-IF document that are expected to be affected, possibly new documents.

Affected Documents	Current Version
DASH-IF Guidelines for Implementation: DASH-IF Interoperability Points	V4.1

## 8 Leadership

Provide a person that is responsible for the completion of the IOP.

Thomas Stockhammer (Qualcomm Incorporated, tsto@qti.qualcomm.com)