**3GPP TSG-SA WG4 Meeting #126 S4-231640r01**

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Title: [5GMS\_Ph2, RTC] Discussion on media reference architecture

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Agenda Item: 8.10 (Other Rel-18 matters)

Document for: Discussion and agreement

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# Abstract

This paper proposes some changes to the proposed generalised reference architecture for Media Delivery.

# 1. Background

At SA4#124, it was agreed to pursue the development of a new common stage 3 specification for Media Delivery in Release 18, designated **TS 26.510** [1], that harmonises media session handling procedures and APIs for both 5G Media Streaming (5GMS) and Real-Time Communication (RTC) in TS 26.506 [3]. The stage 2 architectures for 5GMS and RTC defined respectively in TS 26.501 [2] and TS 26.506 [3] will remain separate in Release 18. However, it was agreed in principle that both of these specifications will instead be enhanced to (redundantly) define a generalised Media Delivery architecture. Each of these stage‑2 specifications will also map its respective reference model onto the common Media Delivery reference architecture.

Change requests to that effect were contributed to SA4#125, but there was insufficient time to agree them:

* TS 26.501 CR0074 [S4-231196] was postponed.
* TS 26.506 CR0001 [S4-231197] was postponed.

In reviewing the generalised Media Delivery reference model, some long-standing deficiencies were noted by the author of this paper and a revision to the first of the above TDocs was proposed. Specifically, the existing 5G Media Streaming architecture model in TS 26.501 [2] violates the following basic tenet of a reference model:

* A named reference point *uniquely* identifies *exactly one pair* of system actors.

As can be seen in figure 1 overleaf, the **5GMS Client** function in the UE violates this tenet in two different ways:

1. **Reference points M6 and M7 are not unique**: they each appear twice, with different pairs of system actors in each case:
	* M6 between 5GMS-Aware Application and Media Session Handler.
	* M6 between Media Stream Handler and Media Session Handler.

and:

* + M7 between 5GMS-Aware Application and Media Stream Handler.
	+ M7 between Media Session Handler and Media Stream Handler.
1. **There is more than one reference point between the Media Session Handler and the Media Stream Handler**, namely:
	* M6
	* M7



NOTE: The 5GMS Client in the UE is depicted in the form of Media Session Handler and Media Stream Handler constituent functions which expose APIs to one another in the same way that those APIs are exposed to 5GMS-Aware Applications. This UE architecture is not applicable generally; it is just as valid to implement a 5GMS Client that does not expose interfaces M6 and M7 within the 5GMS Client. It is also valid for a 5GMS Client inside a UE to be completely self-contained, such that all functionality typically implemented in the 5GMS-Aware Application is embedded in the UE and thus interfaces M6 and M7 are not exposed at all.

Figure 1: 5G Media Streaming general architecture
(reproducing figure 4.1-2 from TS 26.501)

The root of the problem is the conflation of two distinct architectural concepts:

* **Reference point**.
* **Interface** (a.k.a. “exposed API”).

This discussion paper proposes a refinement of the generalised Media Delivery reference model that attempts to disentangle the two above architectural concepts in order to address the problem. The aim is to permit a **straightforward mapping** from both the extant 5GMS and RTC models with minimal specification text. An additional aim is to define meaningful – but reasonably short – names for the exposed APIs so that referring to them in specification text is not overly cumbersome.

In addition, while the stage-2 specifications are being examined and enhanced, it would be useful to consider whether **additional reference points** should be added to the generalised reference model to describe the possibility of:

* Chaining of Application Functions to allow its logical responsibilities to be distributed.
* Peer-to-peer Media Delivery from one UE to another without mediation through an Application Server.

NOTE: Adding reference points to the reference architecture does not imply that they need to be further defined. At the same time as defining them, they can be declared out of scope in the present release (deferring the details until later) or just beyond the scope of 3GPP standardisation.

# 2. Generalized Media Delivery architecture

## 2.1 Generalized Media Delivery in the 5G System

Due to the similarity of the 5GMS architecture (as defined in the present document) to the architecture for Real-Time Communication (RTC) defined in TS 26.506 [X], the RTC functions and 5GMS functions may share or may make use of many common functionalities for both media session handling and media delivery. While a full integration of 5GMS and RTC is not addressed in the present document, a generalized 5G media architecture that integrates 5GMS and RTC can be represented as shown in figure 4.1.2.1-1.



Figure 4.1.2.1-1: Generalized media support within the 5G System

In this representation:

- The 5GMS AF is one possible realisation of the general Media AF.

- the 5GMS AS is one possible realisation of the general Media AS.

- The 5GMS Client is part of the general Media Client.

## 2.2 Reference architecture for Media Delivery

A functional description with additional details as well as reference points is provided below, as illustrated in figure 4.1.2.2-2.



NOTE 1: Exposed APIs are named in *italics*.

NOTE 2: If the Media Client is deployed as a monolithic functional block, it may choose not to expose interfaces externally at reference point M11.

Figure 4.1.2.2-2: Generalized 5G Media Delivery architecture

## 2.3 Network Functions and UE entities

Functional definitions may be generalized as follows:

- **Media AF:** An Application Function similar to that defined in clause 6.2.10 of TS 23.501 [Y] dedicated to Media Delivery.

- **Media AS:** An Application Server dedicated to Media Delivery.

- **Media Client:** A UE internal function dedicated to Media Delivery comprising:

- **Media Session Handler:** An entity on the UE that communicates with the Media AF in order to establish, control and support the delivery of a media session.

- **Media Access Function:** An entity on the UE that communicates with the Media AS in order to access and deliver media content. The media access function for example may be further sub-divided into content delivery protocols, codecs, media types and metadata representation.

- **Media-aware Application:** An application entity on the UE that makes use of 3GPP-defined APIs to invoke the Media Session Handler and/or the Media Access Function in order to support Media Delivery.

NOTE: An application (e.g., a web browser application) that does not invoke either the Media Session Handler or the Media Access Function using 3GPP-defined APIs is not considered a Media-aware Application and is not mapped into the generalized Media Delivery reference architecture.

Table 4.1.2.3-1 Mapping of 5GMS functions to generalized Media Delivery architecture

|  |  |  |  |
| --- | --- | --- | --- |
| Generalized media architecture function | 5GMSd function | 5GMSu function | RTC function |
| Media AF | 5GMSd AF | 5GMSu AF | RTC AF |
| Media AS | 5GMSd AS | 5GMSu AS | RTC AS |
| Media Client | 5GMSd Client | 5GMSu Client | RTC endpoint |
|  | Media Session Handler | Media Session Handler | RTC Media Session Handler |
|  | Media Access Function | Media Stream Handler (Media Player) | Media Stream Handler (Media Streamer) | WebRTC Framework |
| Media Application Provider | 5GMSd Application Provider | 5GMSu Application Provider | RTC Application Provider |
| Media-aware Application | 5GMSd-Aware Application | 5GMSu-Aware Application | Native WebRTC App |

## 2.4 Reference points

The following reference points are defined for Media Delivery:

**M1**: Reference point between the Media Application Provider and the Media AF for the provisioning of Media Delivery.

**M2**: Reference point between the Media Application Provider and the Media AS for the purposes of ingesting media into the Media AS or egesting media from the Media AS.

NOTE 1: Reference point M2 is not defined by the RTC architecture in this release.

**M3**: Reference point between the Media AF and the Media AS for the purposes of Media AS configuration and/or for media session handling in relation to Media Delivery.

NOTE 2: Reference point M3 is defined by the RTC architecture in this release but specification is for future study.

**M4**: Reference point between the Media AS and the Media Access Function in the UE for the purpose of downlink transport of media from the Media AS to the Media Access Function ("content distribution") or uplink transport of media from the Media Access Function to the Media AS ("content contribution").

NOTE 3: Session setup signalling at reference point RTC‑4 lies outside the scope of reference point M4.

**M5**: Reference point between the Media AF and the Media Session Handler in the Media Client for the purpose of media session handling in relation to Media Delivery.

**M6**: Reference point between the Media-aware Application and the Media Session Handler for the purpose of configuring the Media Session Handler.

**M7**: Reference point between the Media-aware Application and the Media Access Function for the purpose of media access control.

**M8**: Reference point between the Media-aware Application and the Media Application Provider.

NOTE 4: Reference point M8 is private and therefore beyond the scope of standardisation.

**M9**: Reference point between one instance of the Media AF and another for the purpose of Media AF instance chaining.

NOTE 5: The details of reference point M9 are for future study.

NOTE 5bis: Reference point M9 is not defined by the 5GMS architecture in this release.

NOTE 5ter: Reference point M9 is not defined by the RTC architecture in this release.

**M10**: Reference point between one instance of the Media AS and another for the purpose of peer-to-peer media transport between different Media Clients.

NOTE 6: Reference point M10 is not defined by the 5GMS architecture in this release.

NOTE 6bis: Reference point M10 is not defined by the RTC architecture in this release.

**M11**: Reference point between the Media Session Handler and the Media Access Function (both in the Media Client) for the purpose of configuring the Media Session Handler and/or media access control.

Table 4.1.2-1 Mapping of 5GMS reference points to generalized 5G Media Delivery architecture

|  |  |  |  |
| --- | --- | --- | --- |
| Generalized media architecture reference point | 5GMSd reference point | 5GMSu reference point | RTCreference point |
| M1 | M1d | M1u | RTC‑1 |
| M2 | M2d | M2u | Not defined |
| M3 | M3d | M3u | RTC‑3 |
| M4 | M4d | M4u | RTC‑4 |
| M5 | M5d | M5u | RTC‑5 |
| M6 | M6d | M6u | RTC‑6 |
| M7 | M7d | M7u | RTC‑7 |
| M8 | M8d | M8u | RTC‑8 |
| M9 | Not defined | Not defined | Not defined |
| M10 | Not defined | Not defined | Not defined |
| M11 | M6d, M7d | M6u, M7u | UnlabelledRTC‑11? |

## 2.2 Interfaces and APIs

## 2.2.1 Interfaces and APIs supporting media session handling

The Media AF exposes the following network service interfaces for media session handling:

- *Provisioning API* (Maf\_Provisioning): External API, exposed to the Media Application Provider by the Media AF at reference point M1 to provision the usage of the Media Delivery and to obtain feedback.

- *Media Session Handling API* (Maf\_SessionHandling) exposed by a Media AF to the Media Session Handler at reference point M5 and/or to the Media AS at reference point M3 for media session handling, control, reporting and assistance that also include appropriate security mechanisms, e.g. authorization and authentication.

The Media Session Handler exposes the following UE APIs for media session handling:

- *Media Session Handling Client API*: exposed by the Media Session Handler to the Media-aware Application at reference point M6 and to the Media Access Function at reference point M11, for configuring media session handling, including service launch.

## 2.2.2 Interfaces and APIs supporting media transport

The Media AS exposes the following network service interfaces to support media transport:

- *Media Application Server Configuration API* (Mas\_Configuration) used by the Media AF at reference point M3 to configure the Media AS.

The Media AS exposes the following media transport interfaces:

- *Application Provider media transport interface* between the Media AS and the Media Application Provider, used to exchange media data using a media transport protocol at reference point M2.

- *Client-facing media transport interface* between the Media Access Function and the Media AS, used to exchange media data using a media transport protocol at reference point M4.

The Media Access Client exposes the following UE APIs for media access control:

- *Media Access Control API* exposed by the Media Access Function to the Media-aware Application at reference point M7 and to the Media Session Handler at reference point M11, in order to configure and communicate with the Media Access Function.

## 2.2.2 Interfaces and APIs supporting application functionality

The Media Application Provider exposes the following network service interfaces to support application functionality:

- *Application-private API* used for information exchange between the Media-aware Application and the Media Application Provider at reference point M8.

# 3. Proposal

It is proposed that SA4 agrees to:

1. Include the information documented in section 2 in the permanent document.
2. To revise TS 26.501 CR0074 and TS 26.506 CR0001 to align with the revised generalised architecture as described in this contribution.
3. To record in the Permanent Document an agreement that the 5GMS or RTC architecture has precedence over the generalised architecture in case of misalignment between the two.

# References

[1] 3GPP TS 26.510: "Media delivery; interactions and APIs for provisioning and media session handling", Release 18.

[2] 3GPP TS 26.501: "5G Media Streaming architecture", Release 18.

[3] 3GPP TS 26.506: "5G Real-time Media Communication Architecture (Stage 2)", Release 18.