**3GPP TSG- Meeting #**

**, , - revision of S4-232010**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | It was identfied that RTC has many commonalities with 5GMS and hence a generalized Media Architecture representation is preferred. This alignment is documented | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Integration of RTC in Media Architecture  Bug Fixes | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Stage-3 specifications are unclear. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | Introduction, 1, 2, 3.1, 3.2, 3.3, 4.1, 4.1.2 (new), 4.2.1, 4.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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# 1 Scope

The present document specifies an architecture for real-time media communication integrated into the 5G System. To support Mobile Network Operator (MNO) and third-party services for real-time media, essential functionalities and interfaces are specified. The primary scope of this Technical Specification is the documentation of the following aspects:

- The definition of a real-time media communication architecture mapped to the 5GS architecture, with relevant core building blocks, reference point, and interfaces to support modern operator and third-party media services, based on the 5GMS architecture.

- Definition all relevant reference points and interfaces to support different collaboration scenarios between 5G System operator and third-party media communication service provider, including but not limited to an Augmented Reality (AR) media communication service provider.

- Call flows and procedures for different real-time communication service types.

- Specification to support functionalities relevant to AR such as split-rendering or spatial computing on top of a 5G System based on this architecture.

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TR 26.998: "Support of 5G glass-type Augmented Reality / Mixed Reality (AR/MR) devices".

[3] 3GPP TS 26.119: "Media Capabilities for Augmented Reality".

[4] 3GPP TS 26.113: "Enabler for Immersive Real-time Communication".

[5] 3GPP TR 26.930: "Study on the enhancement for Immersive Real-Time communication for WebRTC".

[6] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[7] 3GPP TS 23.558: "Architecture for enabling Edge Applications".

[8] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[9] 3GPP TS 36.321: "LTE; Medium Access Control (MAC) protocol specification".

[10] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction".

[11] 3GPP TS 23.501: " System architecture for the 5G System (5GS)"

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## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

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## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

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## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AR Augmented Reality

EAS Edge Application Server

ECS Edge Configuration Server

EEC Edge Enabler Client

EES Edge Enabler Server

IETF Internet Engineering Task Force

ICE Interactive Connectivity Establishment

IMS IP Multimedia Subsystem

MCU Multi-point Control Unit

MNO Mobile Network Operator

MR Mixed Reality

MSH Media Session Handler

MTSI Multimedia Telephony Service for IMS

NAT Network Address Translation

RTC Real-Time Media Communication

SDP Session Description Protocol

SFU Selective Forwarding Unit

STUN Session Traversal Utilities for NAT

TURN Traversal Using Relays around NAT

W3C World Wide Web Consortium

WebRTC Web Real-Time Communication

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# 4 Real-Time media Communication Architecture

## 4.1 Overall architecture for Real-Time media Communication (RTC)

### 4.1.1 Definition of RTC architecture

Real-Time media Communication (RTC) over 5G system in the context of this specification is defined as the delivery of delay-sensitive media from one peer to another with support of 5G network. AR conversational service described in TR 26.998 [2] is a typical use cases for RTC, which enables end-users to directly communicate real-time media including AR/MR media content as specified in TS 26.119 [3]. As identified in clause 8.4 of TR 26.998, there may be different options to enable such AR conversational service, for example re-use of parts of MTSI as defined in TS 26.114 [10] such as the IMS data channel or 5G Media Streaming for managed services.

The overall RTC architecture is shown in Figure 4.1.1-1 as below.



Figure 4.1.1-1: Real-time media communication (RTC) in 5G System

NOTE: The functions indicated by the yellow filled boxes are in scope of the present document for RTC. The functions indicated by the grey boxes are defined in 5G System specifications. The functions indicated by the blue boxes are neither in scope of 5G RTC nor 5G System specifications.

The media data is exchanged between two or more RTC endpoints over a 5G System as defined in TS 23.501 [11]. The RTC endpoint is an endpoint configured by RTC architecture in the present document. It is typically a UE, but an edge computing server can also be the RTC endpoint. The Application Provider provides a RTC Aware-Application on the UE to make use of RTC endpoint and network functions using interfaces and APIs. RTC architecture provides the core functions and entities to support WebRTC-based service over 5G System, two main functions are defined in the trusted DN.

- RTC AF: An Application Function as defined in TS 26.501 [6], but dedicated to real-time media communication.

- RTC AS: An Application Server dedicated to real-time media communication.

NOTE: If both the RTC AF and RTC AS are deployed in an external DN, this is out of scope of the present document.

The detailed RTC architecture mapping to the overall high-level architecture in Figure 4.1.1-1 is shown in Figure 4.1.1-2 below.

NOTE: Figure 4.1.1-2 illustrates only the link from one RTC endpoint to the RTC AF and RTC AS. The link from another RTC endpoint in communication with the first one is symmetric.



NOTE 1: Some subfunctions may not be required depending on the collaboration scenario. Description of collaboration scenario and its architecture variant are specified in annex A.

NOTE 2: The WebRTC Framework subfunction is a WebRTC protocol stack whose implementation is specified by W3C and IETF.

NOTE 3: Red ovals indicate API provider functions.

Figure 4.1.1-2: RTC General Architecture

The WebRTC Signalling Function may be co-located with the RTC AF. In such deployments, the WebRTC Signalling Function acts as an RTC AF with access to the 5G Core, and some of the RTC AF interactions with the WebRTC Signalling Function may be replaced to avoid concurrent/redundant requests from the RTC endpoint in the UE. Specifically, media session handling interactions between the RTC AF and the UE at reference point RTC‑5 may be replaced by the equivalent WebRTC signalling interactions defined at reference point RTC‑4.

The subfunctions inside the RTC AF, RTC AS and the RTC endpoint are defined in clause 4.2 and the reference points shown in Figure 4.1.1-2 are defined in clause 4.3.

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### 4.1.2 Generalized Media Delivery architecture

#### 4.1.2.1 Generalized Media Delivery in the 5G System

This clause and subsequent subclauses of clause 4.1.2 define a generalized Media Delivery architecture of which the architecture for Real-Time Communication (RTC) defined elsewhere in the present document is one possible realisation. In case of any misalignment between the two, the RTC architecture has precedence over this generalised architecture.

Due to the similarity of the 5GMS architecture (as defined in TS 26.501 [6]) to the architecture for Real-Time media Communication (RTC) defined in the present document, the RTC functions and 5GMS functions may share or may make use of many common functionalities for both media session handling and media delivery. A generalized Media Delivery architecture that integrates 5GMS and RTC functionality in the 5G System is defined in figure 4.1.2.1-1.

NOTE: Full integration of 5GMS and RTC is not addressed in the present document.



Figure 4.1.2.1-1: Generalized Media Delivery architecture within the 5G System

In this representation:

- The *Media Application Provider* plays the role of the RTC Application Provider.

- The *Media-aware Application* plays the role of the Native WebRTC App.

- The RTC AF is one possible realisation of the general *Media AF*.

- The RTC AS is one possible realisation of the general *Media AS*.

- The RTC endpoint is part of the general *Media Client*.

#### 4.1.2.2 Reference architecture for Media Delivery

A functional description with additional details as well as reference points is provided below, as illustrated in figure 4.1.2.2-1.



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 4.1.2.2-1: Generalized Media Delivery architecture

#### 4.1.2.3 Network Functions and UE entities

Functional definitions may be generalized as follows:

- **Media AF:** An Application Function as defined in clause 6.2.10 of TS 23.501 [11] 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 RTC functions to generalized Media Delivery architecture

|  |  |  |
| --- | --- | --- |
| Generalized media architecture function | | RTC function |
| Media AF | | RTC AF |
| Media AS | | RTC AS |
| Media Client | | RTC endpoint |
|  | Media Session Handler | RTC Media Session Handler |
|  | Media Access Function | WebRTC Framework |
| Media Application Provider | | RTC Application Provider |
| Media-aware Application | | Native WebRTC App |

#### 4.1.2.4 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: Reference point M9 is not defined by the RTC architecture.

**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 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 4.1.2.4-1: Mapping of RTC reference points to generalized Media Delivery architecture

|  |  |
| --- | --- |
| Generalized Media Delivery architecture reference point | RTC reference point |
| M1 | RTC‑1 |
| M2 | Not defined |
| M3 | RTC‑3 |
| M4 | RTC‑4 |
| M5 | RTC‑5 |
| M6 | RTC‑6 |
| M7 | RTC‑7 |
| M8 | RTC‑8 |
| M9 | Not defined |
| M10 | Not defined |
| M11 | RTC‑11 |

#### 4.1.2.5 Interfaces and APIs

##### 4.1.2.5.1 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.

##### 4.1.2.5.2 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.

##### 4.1.2.5.3 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.

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### 4.2.1 General

This clause defines minimal and essential functions as well as extra functions and entities that may appear in certain deployment or collaboration scenarios.

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### 4.2.2 Provisioning Function

The Provisioning Function of the RTC AF enables an RTC Application Provider to provision the following functionalities:

- QoS support for WebRTC sessions.

- Charging for WebRTC sessions.

- Collection of consumption and QoE metrics data related to WebRTC sessions.

- Offering Interactive Connectivity Establishment (ICE) functionality to support Network Address Traversal /NAT) such as Session Traversal Utilities for NAT (STUN) and Traversal Using Relays around NAT (TURN) servers.

- TheWebRTC Signalling Function in the RTC AS, potentially offering interoperability with other compatible signalling servers.

The Provisioning Function may not be relevant to all collaboration scenarios and some of the 5G support functionality may be offered without RTC Application Provider provisioning.