**SA WG4 Meeting #109E (e-meeting) *S4-200809***

**E-meeting, 20th May – 3rd June 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **26.501** | **CR** | **<CR#>** | **rev** | **<Rev#>** |  **Current version:** | **16.3.1** |  |
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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 |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:***  |  Correction on Media Architecture  |
|  |  |
| ***Source to WG:*** | Tencent |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5GMSA |  | ***Date:*** | 2020-5-15 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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 canbe 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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | 1. According to TS 23.501, AFs in the trusted DN can only communicate with relevant Network Functions, not all the Network Functions.
2. For note 1 in clause 4.2.1, the EPS aspect is FFS. However, the EPS aspect is mentioned in clause 4.1. It is proposed to replace note 1 with the EPS description in clasue 4.1.
3. For note 5 in clause 4.2.1 and note 4 in clause 4.3.1, it needs to be clarified that the NEF is only used by the 5GMS AF to interact with the PCF in R16.
4. In clause 4.2.2, note 1 is related with SBA, however, SBA is not clearly mentioned in the above architecture. It’s also not clear which part of the figure is related with SBA.
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| ***Summary of change:*** | 1. Clarify that the AFs in the trusted DN can only communicate with relevant Network Functions in clause 4.1, 4.2.1, and 4.3.1.
2. For note 1 in clause 4.2.1, it is proposed to replace the original FFS with the EPS description in clasue 4.1.
3. Regards to note 5 in clause 4.2.1 and note 4 in clause 4.3.1, it clarifies that the NEF is only used by the 5GMS AF to interact with the PCF in R16.
4. Remove note 1 in clause 4.2.2.
5. Other editorial changes.
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| ***Consequences if not approved:*** | Some misunderstandings and misalignments exist. |
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| ***Clauses affected:*** | 4.1, 4.2.1, 4.2.2, 4.3.1 |
|  |  |
|  | **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:*** |  |

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| --- | --- |
| ***This CR's revision history:*** |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* First Change \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 4.1 Overall Media Architecture

Streaming in the context of the specification is defined as the delivery of time-continuous media as the predominant media. Streaming points to the fact that the media is predominantly sent only into a single direction and consumed as it is received. Additionally, the media content may be streamed as it is produced, referred to as live streaming. If content is streamed that is already produced, it is referred to as on-demand streaming.

The overall 5G Media Streaming Architecture is shown in figure 4.1-1.



Figure 4.1-1: 5G Media Streaming within the 5G System

NOTE: The functions indicated by the yellow filled boxes are in scope of stage 3 specifications for 5GMS. 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 Media Streaming nor 5G System specifications.

The 5GMS Application Provider uses 5GMS for streaming services. It provides a 5GMS Aware Application on the UE to make use of 5GMS Client and network functions using interfaces and APIs defined in 5GMS.

The architecture in Figure 4.1-1 represents the specified 5GMS functions within the 5G System (5GS) as defined in TS23.501 [2]. Three main functions are defined:

- 5GMS AF: An Application Function similar as defined in TS23.501 [2], clause 6.2.10, dedicated to 5G Media Streaming.

- 5GMS AS: An Application Server dedicated to 5G Media Streaming.

- 5GMS Client: A UE internal function dedicated to 5G Media Streaming.

5GMS AF and 5GMS AS are Data Network (DN) functions and communicate with the UE via N6 as defined in TS23.501 [2].

Functions in trusted DNs are trusted by the operator’s network as illustrated in Figure 4.2.3-5 of TS 23.501[2]. Therefore, AFs in trusted DNs may directly communicate with relevant 5G Core functions.

Functions in external DNs, i.e. 5GMS AFs in the external DNs, may only communicate with 5G Core functions via the NEF using N33.

The present document specifies the according network architectures for 5GS. The 5GMS architecture may be applied to an EPS although such an application is not specified in the present document and is left to the discretion of deployments and implementations.

The 5G Media Services Architecture maps the overall high-level architecture shown in figure 4.1-1 to the architecture shown in figure 4.1-2.



Figure 4.1-2: 5G Media Streaming General Architecture

NOTE: In figure 4.1-2 the 5GMS Client in the UE is depicted in the form of a UE that exposes APIs to the constituent functions Media Session Handler and Media Stream Handler in the same way that the same 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 ad 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.

The remainder of the present document specifies stage 2 aspects of the media streaming functional entities shown in the general architecture of figure 4.1-2.

This architecture specification addresses two main scenarios as concerns each individual media streaming operation:

- Downlink streaming: The network is the origin of the media and the UE acts as the consumption device

- Uplink streaming: The UE is the origin of the media and the network acts as the consumption entity

The functional entities and interfaces of the media streaming general architecture need to be elaborated with specificities relating to downlink and uplink streaming. For this purpose corresponding descriptions add the suffix “d” for downlink and “u” for uplink functionality as appropriate in each case.

Clause 4.2 introduces the 5G Unicast Media Downlink Streaming Architecture.

Clause 4.3 introduces the 5G Unicast Media Uplink Streaming Architecture.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Second Change \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 4.2 5G Unicast Media Downlink Streaming Architecture

### 4.2.1 Standalone – Non-Roaming

The 5GMSd Application Provider uses 5GMSd for downlink streaming services. It provides a 5GMSd Aware Application on the UE to make use of 5GMSd Client and network functions using interfaces and APIs defined in 5GMS.

The architecture in Figure 4.2.1-1 represents the specified 5GMSd functions within the 5G System (5GS) as defined in TS23.501 [2]. Three main functions are defined:

- 5GMSd AF: An Application Function similar as defined in TS23.501 [2], clause 6.2.10, dedicated to 5G Media Downlink Streaming.

- 5GMSd AS: An Application Server dedicated to 5G Media Downlink Streaming.

- 5GMSd Client: A UE internal function dedicated to 5G Media Downlink Streaming.

5GMSd AF and 5GMSd AS are Data Network (DN) functions and communicate with the UE via N6 as defined in TS23.501 [2].

Functions in trusted DNs are trusted by the operator’s network as illustrated in Figure 4.2.3-5 of TS 23.501[2]. Therefore, AFs in trusted DNs may directly communicate with relevant 5G Core functions.

Functions in external DNs, i.e. 5GMSd AFs in external DNs, may only communicate with 5G Core functions via the NEF using N33.

NOTE 1: The 5GMS architecture may be applied to an EPS although such an application is not specified in the present document and is left to the discretion of deployments and implementations.



Figure 4.2.1-1: 5G Media Downlink Streaming within 5G System

NOTE 2: The functions indicated by the yellow filled boxes are in scope of stage 3 specifications for 5GMS. 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 Media Streaming nor 5G System specifications.

The architecture in Figure 4.2.1-2 represents the media architecture connecting UE internal functions and related network functions.



Figure 4.2.1-2: Media Architecture for unicast media downlink streaming

NOTE 3: The functions indicated by the yellow filled boxes are in scope of stage 3 for 5GMSd. The functions indicated by the grey boxes are defined in 5GS. The interfaces indicated by solid lines are in scope of stage 3 for 5GMSd. The interfaces indicated by dashed lines are defined in 5GS. The interfaces indicated by dotted lines are neither in scope of 5GS nor 5GMSd, but are considered as part of informative call flows.

NOTE 4: Red ovals indicate API provider functions.

NOTE 5: The 5GMSd AF may also interact with the NEF for NEF-enabled API access. However, within Release 16, the NEF is only used by the 5GMSd AF to interact with the Policy and Charging Function (PCF) in 5GMS specifications.

NOTE 6: Some information might also be exchanged via the OAM, although the OAM is not explicitly shown in the architecture.

The following functions are defined:

- 5G Media Streaming Client for downlink (5GMSd Client) on UE: Receiver of 5GMS downlink media streaming service that may be accessed through well-defined interfaces/APIs. Alternatively the UE may be implemented in a self-contained manner such that interfaces M6d and M7d are not exposed at all.

- The 5GMSd Client contains two sub-functions

- Media Session Handler: A function on the UE that communicates with the 5GMSd AF in order to establish, control and support the delivery of a media session. The Media Session Handler may expose APIs that can be used by the 5GMSd Aware Application.

- Media Player: A function on the UE that communicates with the 5GMSd AS in order to stream the media content and may provide APIs to the 5GMSd Aware Application for media playback and the Media Session Handler for media session control.

- 5GMSd Aware Application: The 5GMSd Client is typically controlled by an external media application, e.g. an App, which implements external application or content service provider specific logic and enables establishing a media session. The 5GMSd Aware Application is not defined within 5G Media Streaming specifications, but the function makes use of 5GMSd Client and network functions using interfaces and APIs defined in 5GMSd.

- 5GMSd AS: An Application Server which hosts 5G media functions. Note that there may be different realizations of 5GMSd ASs, for example a Content Delivery Network (CDN).

- 5GMS Application Provider: External application or content specific media functionality, e.g., media creation, encoding and formatting that uses 5GMSd to stream media to 5GMSd Aware applications.

- 5GMSd AF: provides various control functions to the Media Session Handler on the UE and/or to 5GMS Application Provider. It may relay or initiate a request for different Policy or Charging Function (PCF) treatment or interact with other network functions via NEF.

NOTE 7: There may be multiple 5GMSd AFs residing within the Trusted Media Functions entity each exposing one or more APIs.

The following interfaces are defined for 5G Media Downlink Streaming:

- M1d (5GMSd Provisioning API): External API, exposed by the 5GMSd AF to provision the usage of the 5G Media Streaming System and to obtain feedback.

- M2d (5GMSd Ingest API): Optional External API exposed by the 5GMSd AS used when the 5GMSd AS in the trusted DN is selected to host content for the streaming service.

- M3d: (Internal and NOT SPECIFIED): Internal API used to exchange information for content hosting on a 5GMSd AS within the trusted DN.

- M4d (Media Streaming APIs): APIs exposed by a 5GMSd AS to the Media Player to stream media content.

- M5d (Media Session Handling API): APIs exposed by a 5GMSd AF to the Media Session Handler for media session handling, control and assistance that also include appropriate security mechanisms e.g. authorization and authentication.

- M6d (UE Media Session Handling APIs): APIs exposed by a Media Session Handler to the 5GMSd Media Session Handler for client-internal communication and 5GMSd Aware Application to make use of 5GMS functions.

- M7d (UE Media Player APIs): APIs exposed by a Media Player to the 5GMSd Aware Application and Media Session Handler to make use of the Media Player.

- M8d: (Application API): application interface, which is used for information exchange between the 5GMSd Aware application and the 5GMSd Application Provider, for example to provide service access information to the application. This API is external to the 5G System and not specified by 5GMS.

NOTE 8: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

The following subfunctions are identified as a part of a more detailed breakdown of the 5GMSd AS for stage 3 specifications:

- Adaptive Bit Rate (ABR) Encoder, Encryption and Encapsulator

- Manifest (e.g. MPD) Generator and Segment (e.g. DASH) Packager

- Origin Server

- CDN Server (e.g. Edge Servers)

- DRM Server (e.g. DRM License Server)

- Service Directory

- Content Guide Server

- Replacement content server (e.g. Ad content server)

- Manifest Proxy, i.e. MPD modification server

- App Server

- Session Management Server

5GMSd UE Media function breakdown is provided in clause 4.2.2.

### 4.2.2 UE 5GMSd Functions

The UE may include many detailed subfunctions that can be used individually or controlled individually by the 5GMSd-Aware application. This clause breaks down several relevant identified sub-functions for which stage-3 specification is available.

The 5GMSd Aware Application itself may include many functions that are not provided by the 5GMSd client or the 5G UE. Examples include service and content discovery, notifications, social network integration, etc. The 5GMSd Aware application may also include functions that are equivalent to ones provided by the 5GMSd client and may only use a subset of the 5GMSd client functions. The 5GMSd Aware Application may act based on user input or may for example also receive remote control commands from the 5GMSd Aware Application Provider through M8d.

With respect to Media Player functions, Figure 4.2.2-1 shows more detailed functional components of a UE for media player functions to access the 5GMSd AS.

Figure 4.2.2-1: UE 5G Media Downlink Streaming Functions (Media Player centric)

The following subfunctions are identified as part of a more detailed breakdown of the Media Player Function:

- Media Access Client: Accesses Media Content such as DASH-formatted Media Segments.

- Media Decapsulation: Extracts the elementary media streams for decoding and provides media system related functions such as time synchronization, capability signalling, accessibility signalling, etc.

- DRM Client (optional): when present, DRM client might or might not be a part of Media player. It provides a content protection mechanism with its unique key management and key delivery system, authentication/authorization, policy enforcement and entitlement check. DRM client is not defined within 5G Media Streaming specifications.

- Media Decryption (optional): when present, media decryption is responsible to decrypt the media samples using the keys provided in the DRM license, and further passing to the media decoder to enable playback of encrypted media. The media decryption and media decoding could be implemented on general-purpose processor in software or hardware, or for more secured and robust architecture, the decryption, decoding and rendering could be implemented on the hardware on secure processors.

- Media Decoders: Decodes the media like audio or video.

- Media Rendering / Presentation: Presents the media using an appropriate output device and enables possible interaction with the media.

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With respect to the Media Session Handler, Figure 4.2.2-2 shows more detailed functional components of a UE to access the 5GMSd AF.



Figure 4.2.2-2: UE 5G Media Streaming Functions (Control-Centric)

NOTE 1: The yellow color indicate here that the 3GPP has created specifications for the function.

NOTE 2: A UE is a logical device which may correspond to the tethering of multiple physical devices or other types of realizations.

The following subfunctions are identified as part of a more detailed breakdown of Media Session Handler:

- Media Session Handler Core: Realization of a "session" concept for media communications, spanning optionally over multiple stateless sessions. May optionally interact with network-based 5GMSd AFs.

- Metrics collection and reporting: executes the collection and reporting of metrics.

- Consumption reporting: reports to a 5GMSd AF about the currently consumed media within the available presentation, about the UE capabilities and about the environment of the media session for potential transport optimizations by the network or consumption report analysis.

- Associated Delivery Procedures: Functionalities provided by the 5GMSd client to support the application in the delivery of the media presentations, such as location filtering

- Network Assistance: assisting functions provided to the 5GMSd Client and Media Player

NOTE 3: Based on such a decomposition, additional interfaces and APIs may exist in inside the UE.

- Media Control Interface(s) to configure and interact with the different UE media functions.

- Media Control Interface for media session management.

- Control interface for metrics collection and reporting.

- Decoded media samples are handed over to the media renderer.

- Decrypted, compressed media samples are handed over to a trusted media decoder.

- In case of encryption, the encrypted, compressed media samples are handed over to the DRM Client.

NOTE 4: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Second Change \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 4.3 5G Media Uplink Streaming Architecture

### 4.3.1 Media Architecture

The 5GMSu Application Provider uses 5GMSu for uplink streaming services. It provides a 5GMSu Aware Application on the UE to make use of 5GMSu Client and network functions using interfaces and APIs defined in 5GMSu.

The architecture in Figure 4.3.1-1 represents the specified 5GMSu functions within the 5G System (5GS) as defined in TS23.501 [2]. Three main functions are defined:

- 5GMSu AF: An Application Function similar as defined in TS23.501 [2], clause 6.2.10, dedicated to 5G Media Uplink Streaming.

- 5GMSu AS: An Application Server dedicated to 5G Media Uplink Streaming.

- 5GMSu Client: A UE internal function dedicated to 5G Media Uplink Streaming.

5GMSu AF and 5GMSu AS are Data Network (DN) functions and communicate with the UE via N6 as defined in TS23.501 [2].

Functions in trusted DNs are trusted by the operator’s network as illustrated in Figure 4.2.3-5 of TS 23.501[2]. Therefore, AFs in trusted DNs may directly communicate with relevant 5G Core functions.

Functions in external DNs, i.e. 5GMSu AFs in external DNs, may only communicate with 5G Core functions via the NEF using N33.



Figure 4.3.1-1: Media Architecture for unicast media uplink streaming

NOTE 1: The functions indicated by the yellow filled boxes are in scope of stage 3 specifications for 5GMS. 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 Media Streaming nor 5G System specifications.

The architecture in Figure 4.3.1-2 represents the media architecture connecting UE internal functions and related network functions for 5G Media Uplink Streaming.



Figure 4.3.1-2: Media Architecture for unicast media uplink streaming

NOTE 2: The functions indicated by the yellow filled boxes are in scope of stage 3 for 5GMSu. The functions indicated by the grey boxes are defined in 5GS. The interfaces indicated by solid lines are in scope of stage 3 for 5GMSu. The interfaces indicated by dashed lines are defined in 5GS. The interfaces indicated by dotted lines are neither in scope of 5GS nor 5GMSu , but are considered as part of informative call flows.

NOTE 3: Red ovals indicate API provider functions.

NOTE 4: The 5GMSu AF may also interact with the NEF for NEF-enabled API access. However, within Release 16, the NEF is only used by the 5GMSu AF to interact with the Policy and Charging Function (PCF) in 5GMSu specifications.

NOTE 5: Some information might also be exchanged via the OAM, although the OAM is not explicitly shown in the architecture.

The following functions are defined:

- 5G Media Streaming Client for uplink (5GMSu Client) on UE: Originator of 5GMSu service that may be accessed through well-defined interfaces/APIs. The UE may also be implemented in a self-contained manner such that interfaces M6u and M7u are not exposed at all.

- The 5GMSu Client contains two sub-functions

- Media Session Handler: A function on the UE that communicates with the 5GMSuAF in order to establish, control and support the delivery of a media session. The Media Session Handler exposes APIs that can be used by the 5GMSu Aware Application.

- Media Streamer: A function on the UE that communicates with the 5GMSu AS in order to stream the media content and provides a service to the 5GMSu Aware Application for media capturing and streaming and the Media Session Handler for media session control.

- 5GMSu Aware Application: The 5GMSu Client is typically controlled by an external media application, e.g. an App, which implements external application or content service provider specific logic and enables establishing a media session. The 5GMSu Aware Application is not defined within 5G Media Streaming specifications, but the function makes use of 5GMSu Client and network functions using interfaces and APIs defined in 5GMSu.

- 5GMSu AS: An Application Server which hosts 5G media functions. Note that there may be different realizations of 5GMSu AS's, for example a Content Delivery Network (CDN).

- 5GMSu Application Provider: External application or content specific media functionality, e.g., media storage, consumption, transcoding and redistribution that uses 5GMSu to stream media from 5GMSu Aware applications.

- 5GMSu AF: provides various control functions to the Media Session Handler on the UE and/or to 5GMSu Application Provider. It may relay or initiate a request for different Policy or Charging Function (PCF) treatment or interact with other network functions via NEF.

NOTE 6: There may be multiple 5GMSu AFs residing within the Trusted Media Functions entity each exposing one or more APIs.

The following interfaces are defined for 5G Media Uplink Streaming:

- M1u (5GMSu Provisioning API): External API, exposed by the 5GMSu AF to provision the usage of the 5G Media Streaming Uplink Streaming system and to obtain feedback.

- M2u (5GMSu Publish API): Optional External API exposed by the 5GMSu AS used when the 5GMSu AS in the trusted DN is selected to receive the content for the streaming service.

- M3u: (Internal and NOT SPECIFIED): Internal API used to exchange information for content hosting on a 5GMSu AS within the trusted DN.

- M4u (Media Uplink Streaming APIs): APIs exposed by a 5GMSu AS to the Media Streamer to stream media content.

- M5u (Media Session Handling API): APIs exposed by a 5GMSu AF to the Media Session Handler for media session handling, control and assistance that also include appropriate security mechanisms e.g. authorization and authentication.

- M6u (UE Media Session Handling APIs): APIs that may be exposed by a Media Session Handler to the 5GMSu Aware Application to make use of 5GMSu functions.

- M7u (UE Media Streamer APIs): APIs that may be exposed by a Media Streamer to the 5GMSu Aware Application and Media Session Handler to make use of the Media Streamer.

- M8u: (Application API): application interface, which is used for information exchange between the 5GMSu Aware application and the 5GMSu Application Provider, for example to provide service access information to the application. This API is external and not specified in 5GMSu.

NOTE 7: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* END CHANGES \*\*\*\*\*\*\*\*\*\*\*\*\*\*