**3GPP TSG-SA4 Meeting #124 *S4-230986***

**Berlin, Germany, 22nd May 2023 - 26th May 2023 revision of S4-230815**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **26.501** | **CR** | **0045** | **rev** | **9** | **Current version:** | **18.1.0** |  |
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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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|  |
| ***Title:***  | [5GMSA\_Ph2] 5GMS over 5MBS |
|  |  |
| ***Source to WG:*** | Qualcomm Incorporated, BBC, Tencent, Ericsson |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5GMS\_Ph2 |  | ***Date:*** | 2023-05-15 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | The work item in SP-220614 asks among others for the following:3. 5GMS over 5MBS:* Adding call flows and procedures to support carriage of 5GMS streaming sessions over 5MBS.

4. 5GMS hybrid services (5MBS and 5GMS):* Adding call flows and procedures to support 5GMS hybrid services (5MBS and 5GMS).
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|  |  |
| ***Summary of change:*** | The CR addresses the above objectives by adding* Architecture for 5GMS via MBS
* Reference Points
* Call Flows and Procedures for 5GMS via MBS
* Call Flows and Procedures for Hybrid Services
 |
|  |  |
| ***Consequences if not approved:*** | Work Item objectives not complete |
|  |  |
| ***Clauses affected:*** | 2, 4.9 (new), 5.12 (new) |
|  |  |
|  | **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:*** |

|  |  |  |  |
| --- | --- | --- | --- |
| Rev | TDoc | Title | Source |
| 0 | [S4aI221372](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI221372.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm incorporated |
| 1 | [S4-221308](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_121_Toulouse/Docs/S4-221308.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm incorporated |
| 2 | [S4aI230005](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI230005.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm incorporated |
| 3 | [S4-230081](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_122_Athens/Docs/S4-230081.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm incorporated |
| 4 | [S4-230](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_122_Athens/Docs/S4-230081.zip)288 | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm incorporated |
| 5 | [S4aI230054](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI230054.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm Incorporated, BBC, Tencent |
| 6 | [S4aI230080](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI230080.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm Incorporated, BBC, Tencent |
| 7 | [S4-230533](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_123-e/Docs/S4-230533.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm Incorporated, BBC, Tencent |
| 8 | [S4-230815](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_124_Berlin/Docs/S4-230815.zip) | [5GMSA\_Ph2] 5GMS over 5MBS | Qualcomm Incorporated, BBC, Tencent, Ericsson |

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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*.

[X] 3GPP TS 26.502: "5G Multicast-Broadcast User Service Architecture".

[Y] 3GPP TS 26.517: "5G Multicast-Broadcast User Services; Protocols and Formats".

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## 4.9 Downlink 5G Media Streaming via MBS

### 4.9.1 Architecture for downlink 5G Media Streaming over MBS

Figure 4.9.1-1 below depicts an architecture for downlink 5G Media Streaming via MBS as defined in TS 26.502 [X] that combines the functions and reference points of the 5GMS System with those of the MBS System. In the simple case, the 5GMSd AF is deployed in a Trusted DN together with the MBS System according to the collaboration model in clause A.3 of [X] and Nmbsf service operations on the MBSF are invoked by the 5GMSd AF directly at reference point Nmb10. In other deployments, as for example shown in clauses A.4 and A.5 of [X], the 5GMS System may be external to the MBS System. In this case, the service operations on the MBSF are instead invoked on the NEF at reference point N33, and the NEF then communicates with the MBSF at reference point Nmb5.

 

Figure 4.9.1-1: Architecture for 5G Media Streaming over MBS

This arrangement allows 5GMS-based downlink media streaming to be deployed as an MBS-Aware Application on top of the MBS System as defined in TS 26.502 [X].

In this case:

1. The 5GMSd AF configures the delivery of 5GMSd content to an MBS Client in the UE by provisioning an MBS User Service as defined in clause 4.5.1 of TS 26.502 [X]. In order to additionally deliver this content over one or more MBS Distribution Session, the 5GMSd AF invokes control plane procedures on the MBSF as specified in clause 7.2 of [X] and, as a result, content is ingested by the MBSTF from the 5GMSd AS using the pull-based object ingest procedures at reference point Nmb8 specified in clause 6.1 of [X].

NOTE 1: Push-based ingest of 5GMS content by the MBSTF at reference point Nmb8 is not enabled in the current release. 5GMS only supports pull based content acquisition at reference point M4.

NOTE 2: 5GMSd AS and MBS AS share similar functions and may be deployed in a single physical node.

2. The 5GMSd Client acts as MBS-Aware Application (as defined in TS 26.502 [X]) for the MBS Client. Thus, the *MBS Client* is controlled by the 5GMSd Client via the MBS-6 API (as defined in TS 26.517 [Y]).

3. The MBSTF Client receives media and other objects from the MBSTF according to the Object Distribution Method specified in clause 6.1 of TS 26.502 [X]. If Object Repair as specified in clause 4.2.6 of TS 26.502 [X] is available in the MBS System, the MBS Client uses the unicast repair delivery procedures to recover damaged objects received from the MBSTF by interacting at reference point MBS‑4‑UC.

4. The *Media Server* subfunction of the MBSTF Client provides a media server interface and shall expose the content received (and possibly repaired) by the MBS Client to the Media Player in the 5GMSd Client via reference point MBS-7 using interactions equivalent to those defined at reference point M4d.

5. The Media Player sends requests according to the signalled object availability times in the manifest. In case a media object transmitted via an MBS Distribution Session is not received by the MBS Client by the object availability times, or if it cannot be repaired in time for consumption by the 5GMSd Client, the Media Server in the MBS Client returns either an error or else a partial object in response to the Media Player's request for the media object. In this case, the Media Player may instead attempt to retrieve the media object, or ranges of it, from the 5GMSd AS at reference point M4d, if available. The object shall be available for download from the 5GMSd AS for a well-defined time period.

NOTE 3: Details on determining the availability time requirements of the application are deferred to stage 3.

The usage of existing reference points to support these scenarios is documented in the following clauses. Procedures for 5GMS via MBS are defined in clause 5.12.

### 4.9.2 Usage of 5GMS reference points for MBS-based delivery

#### 4.9.2.1 Usage of M1

Reference point M1 is used as defined in clauses 4.1 to 4.4.

In addition, the 5GMSd Application Provider shall authorize via M1 that 5GMS content may be distributed via MBS.

The translation of M1 information to MBS delivery provisioning by the 5GMSd AF is left to implementation.

NOTE: The 5GMS Application Provider may provision specific use-cases (high velocity, specific reception area, indoor/outdoor/mobile users) at reference point M1d. These service requirements are translated by the 5GMSd AF into specific Nmbsf service operations to provision the MBSF with a service that has the correct parameters for a specific location.

#### 4.9.2.2 Usage of M2d

Reference point M2d is be used as defined in clauses 4.1 to 4.4.

#### 4.9.2.3 Usage of M3d

Reference point M3d is used as defined in clauses 4.1 to 4.4.

#### 4.9.2.4 Usage of M4d

Reference point M4d is used as defined in clauses 4.1 to 4.4.

#### 4.9.2.5 Usage of M5

Reference point M5 is used as defined in clauses 4.1 to 4.4.

When 5GMS content is distributed via MBS, the 5GMSd Service Access Information shall additionally include:

1. Relevant information of the MBS Service Announcement in order to bootstrap reception of the MBS service, typically via an external service identifier. This is passed by the Media Session Handler to the MBS Client via reference point MBS-6.

 When this information is present in the Service Access Information and when the UE is MBS-capable, the 5GMSd Client shall invoke the MBS Client to initiate reception of the corresponding MBS User Service.

2. Relevant information from the MBS Service Announcement in order for the Media Session Handler to:

a) Collect metrics of the MBS User Service from the MBS Client and report them to the 5GMSd AF using an appropriate metrics reporting scheme.

b) Collect media consumption information from the MBS Client and submit it to the 5GMSd AF in 5GMS consumption reports.

#### 4.9.2.6 Usage of M6d

Reference point M6d is used as defined in clauses 4.1 to 4.4.

#### 4.9.2.7 Usage of M7d

Reference point M7d is used as defined in clauses 4.1 to 4.4.

#### 4.9.2.8 Usage of M8d

Reference point M8d is used as defined in clauses 4.1 to 4.4.

### 4.9.3 Usage of MBS reference points and interfaces

#### 4.9.3.1 Usage of Nmbsf service at Nmb10 and Nmb5+N33

The 5GMSd AF provisions MBS User Services in the MBSF as defined in clauses 5.3 of TS 26.502 [X]. In case the 5GMSd AF is in a Trusted DN together with the MBS System according to the collaboration model in clause A.3 of [X], Nmbsf service operations shall be invoked directly at reference point Nmb10. Where the 5GMSd AF is deployed outside the Trusted DN, as for example shown in Nmbsf service operations shall instead be invoked via the NEF at reference points N33+Nmb5.

#### 4.9.3.2 Usage of Nmb8

The MBSTF ingests content from the 5GMSd AS using the pull-based ingest method at reference point Nmb8.

#### 4.9.3.3 Usage of MBS User Services and Distribution Methods

Real-time object streaming as defined in clause 6.1 of TS 26.502 [X] is provisioned in the MBSTF by the MBSF acting on the provisioning instructions of the 5GMSd AF. The application service entry point instance is a downlink 5GMS streaming manifest, for example a DASH MPD or HLS playlist.

The MBS User Service Announcement as defined in clause 4.2.4 of TS 26.502 [X] is used to advertise the availability of 5GMS content delivered via MBS.

#### 4.9.3.4 Usage of MBS-6

The 5GMSd Client plays the role of an MBS-Aware Application and operates according to the procedures defined in clauses 5.2 and 5.5 of TS 26.502 [X] when communicating with the MBSF Client at reference point MBS-6.

The MBSF Client exposes information to the Media Session Handler at this reference point to manage the reception of MBS User Services.

The Media Session Handler configures the MBSF Client for reception reporting.

The MBSF Client provides reception reports to the Media Session Handler.

#### 4.9.3.5 Usage of MBS-7

The 5GMSd Client plays the role of an MBS-Aware Application and operates according to the procedures defined in clause 5.2 of TS 26.502 [X] when communicating with the MBSTF Client at reference point MBS‑7.

The MBSTF Client provides the entry point document, as well as updates of the entry point document, to the 5GMSd Client at this reference point.

The MBSTF Client exposes fully- and partially-received media objects to the Media Player in the 5GMSd Client.

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## 5.12 5GMS via MBS

### 5.12.1 General

This clause defines procedures for different use cases and scenarios when 5GMS uses MBS for delivery as introduced in clause 4.9. In all scenarios, the 5GMSd Client acts as an MBS-Aware Application.

The scenarios presented are not considered to be comprehensive and complete for all possible functionalities. For example, while MBS defines its own metrics reporting, the MBS client may also provide information to the Media Session Handler that integrates relevant data in 5GMS metrics reporting. MBS and 5GMS metrics reporting may run in parallel.

The MBSTF terminates the MBS Distribution Session and includes a proxy Media Server that it is assumed can be accessed by the Media Player using common methods, typically HTTP GET requests.

### 5.12.2 Procedures for 5GMS content delivered exclusively via MBS

In this scenario, 5GMS content is delivered exclusively via the MBS System, i.e. content is not delivered via reference point M4d, but only via MBS User Services. However, the MBSTF Client may perform unicast object repair operations via reference point MBS-4-UC, if available.

The call flow in figure 5.12.2 1 extends that defined in clause 5.3.2 to address the delivery of 5GMS content exclusively via MBS. Aspects specific to this use-case are indicated in bold.



Figure 5.12.2-1: High-level procedure for DASH content delivery via MBS

Prerequisites (step 0):

- The 5GMSd Application Provider has provisioned the 5G Media Streaming System, including content ingest **and the authorization to distribute 5GMS content via MBS**.

- **The 5GMS AF has informed the MBSF about the availability of 5GMS content** by provisioning an MBS service **and has obtained relevant information from the MBS Service Announcement (such as the MBS service identifier).**

- The MBSTF is ingesting content **from the 5GMS AS**, using pull based object acquisition.

- The MBSTF distributes the MBS User Service Announcement via the MBS User Service Announcement Channel at reference point MBS‑4‑MC, **possibly including an indication that the content is 5GMS content**.

Steps:

1: The 5GMSd-Aware Application triggers the Service Announcement procedure and the 5GMS Service and Content Discovery procedure at reference point M8.

2: A media content item is selected.

3: The 5GMSd-Aware Application triggers the 5GMSd Client to start media playback. The Media Player Entry documents are provided to the 5GMSd Client.

4: If the 5GMS-Aware Application has received only a reference to the Service Access Information (see step 1), the Media Session Handler interacts with the 5GMSd AF to acquire the whole Service Access Information. **This includes relevant information from the MBS Service Announcement (such as the MBS service identifier) in order to bootstrap reception of the MBS service.**

**5–11: The 5GMSd Client acts as an MBS-Aware Application and its Media Session Handler initiates service acquisition per TS 26.502 [X]. This establishes a transport session for the Media Player Entry and the Content.**

NOTE: The Media Player Entry and Initialization Segment(s) are made available by the MBSTF Client's proxy Media Server for subsequent request by the Media Player.

12: The Media Session Handler provides the Media Player Entry URL to the Media Player either directly or through the 5GMSd-Aware Application.

13: The Media Player is invoked by the 5GMSd-Aware Application to start media access and playback.

14: The Media Player retrieves the Media Player Entry resource (e.g. MPD) from the proxy Media Server.

15: The Media Player processes the retrieved Media Player Entry. It determines, for example, the number of transport sessions needed for media acquisition. The Media Player should be able to use the Media Player Entry information to initialize the media rendering pipeline(s) for each media stream (see step 17).

16: The Media Player notifies the Media Session Handler about the start of a new downlink media streaming session. The notification may include parameters from the Media Player Entry.

17: The Media Player configures the media rendering pipeline(s).

18: The Media Player retrieves initialization segment(s) referenced by the Media Player Entry.

**19-25: Content is delivered using Object Streaming (see clause 6.1 of TS 26.502 [X]). Session Announcement updates are provided to the MBS Client as necessary. The MBSTF receives the MBS User Service Announcement via reference point MBS‑4‑MC and hands it to the MBSF for processing. MPD updates and media segments received from the MBSTF are made available by the MBSTF Client's proxy Media Server. The Media Player retrieves media segments from the proxy Media Server in the MBSTF Client according to the Media Player Entry** **and forwards them to the appropriate media rendering pipeline.**

### 5.12.3 5GMS consumption reporting procedures for MBS

In this scenario, 5GMS consumption reporting is used to report consumption of 5GMSd content via an MBS service.

NOTE: MBS User Services Reception Reporting (see clause 4.2.5 of TS 26.502 [X]) may continue in parallel with 5GMS consumption reporting.

The call flow in figure 5.12.3‑1 extends the that defined in clause 5.6.1 to address consumption reporting. Aspects specific to this use-case are indicated in bold.



Figure 5.12.3-1: Consumption reporting for 5GMS via MBS

Prerequisites (step 0):

- The 5GMSd Application Provider has provisioned the 5G Media Streaming System, including content ingest, consumption reporting **and the permission to distribute 5GMS content via MBS**.

- The MBSTF is ingesting content **from the 5GMS AS**, using either pull mode or push mode.

- MBS media delivery is established.

- Consumption reporting is established.

Steps:

The user preferences relating to consumption reporting may be changed:

1: The 5GMSd-Aware Application selects/changes the user preferences.

2: The Media Player transmits consumption reporting user preferences to the Media Session Handler.

The first phase is initialisation.

3: The 5GMSd-Aware Application is started.

4: A media content item is selected.

5: The 5GMSd-Aware Application triggers the Media Session Handler to initiate media session handling and content playback. The Media Player Entry is provided.

6: If the 5GMS-Aware Application has received only a reference to the Service Access Information, the Media Session Handler interacts with the 5GMSd AF to acquire the whole Service Access Information. **This includes a client consumption reporting configuration** including parameters such as reporting frequency.

**7: The MBS service reception is initiated by the Media Session Handler.**

8: The Media Session Handler triggers consumption reporting in the Media Player.

9: The Media Player is invoked by the 5GMSd-Aware Application to start media access and playback.

The second phase is media playback.

When media is playing, the consumption reporting parameters may be updated by the 5GMSd AF.

10: The Media Session Handler acquires updated Service Access Information from the 5GMSd AF including updated consumption reporting parameters.

When media is playing:

**11:** Media content is accessed through different networks, **possibly via MBS** or unicast.

12: The Media Player transmits information about the media streaming resources consumed to the Media Session Handler, **including the source of the media**.

13: The Media Session Handler regularly sends consumption report(s) to the 5GMSd AF, **including information about the delivery network from which the media was acquired**.

**14: The Media Player provides an update to the Media Session Handler about the consumed media streaming resources, for example a change in the delivery network.**

The last phase is to terminate the media streaming session:

15: The 5GMSd-Aware Application triggers the Media Session Handler to stop content playback.

16: The Media Session Handler stops the Media Player.

17: The Media Session Handler stops consumption reporting in the Media Player.

18: The Media Session Handler may send final consumption report(s) to the 5GMSd AF.

#### 5.12.4 5GMS content delivery via 5G System and MBS

#### 5.12.4.1 General

This clause addresses cases for which a 5GMS service is available on MBS and at the same time on unicast. The service on unicast may be richer and extended and may provide additional user experiences. It is assumed that the content is statically provisioned on either MBS or on unicast.

Services addressed in this clause predominantly refer to the case for which the delivery manifest differentiates between resources accessible via unicast downlink media streaming at reference point M4d and resources accessible through MBS, in this case through MBS-API-U.

These resources are differentiated in the delivery manifest through different Data Networks, for example different Base URLs in DASH MPDs, or in HLS by providing different pathways. The 5GMSd Client, in particular the Media Player in collaboration with the Media Session Handler and the MBS Client, dynamically selects the delivery network from which to acquire media content according to reception conditions, user preferences or other policies. Content is provisioned such that the 5GMSd Client is able to provide a seamless user experience when switching between different delivery networks.

The call flow in figures 5.12.4-1, 5.12.4-2 and 5.12.4- 3 extends that defined in clause 5.6.1 to address generic hybrid use cases. Specific additional use cases are presented in the remainder of clause 5.12.4.



Figure 5.12.4-1: High-level procedure 5GMS content delivery via 5G System and MBS

Steps:

1: The 5GMSd Application Provider triggers 5GMS provisioning and permits concurrent 5GMS and MBS distribution of the media content.

2: As a consequence, the 5GMSd AF provisions MBS delivery. The MBS Delivery Session is set up.and the MBSF informs the 5GMS AF about the content ingest endpoints.

3: The 5GMSd AS modifies the Media Player Entry (typically a media presentation manifest) under the direction of the 5GMSd AF to indicate that content is available either on a the MBS Client's local Media Server or on 5GMSd AS.

4: The modified presentation manifest and the ingest endpoints are provided to the 5GMSd Application Provider. The manifest may also be updated by the 5GMSd Application Service Provider.

5: The media content is announced to the 5GMSd-Aware Application and the application requests the entry points for the service.

6: The 5GMSd AS begins ingesting content from the 5GMSd Application Provider and the MBSTF may, in turn, begin ingesting this content from the 5GMSd AS.



Figure 5.12.4-2: High-level procedure 5GMS content delivery via 5G System and MBS (continued)

7: The MBSTF starts one or more MBS Delivery Sessions.

8: The media content is selected by the 5GMSd-Aware Application.

9: The application initiates the media streaming session through Media Session Handler.

10: The Media Session Handler initiates the MBS streaming services.

11: The media session handler through the information from the MBS Client informs the 5GMSd-Aware Application that the service is ready.



Figure 5.12.4-3: High-level procedure for 5GMS content delivery via 5G System and MBS (continued)

12: The 5GMSd-Aware Application starts media playback.

13: The Media Player Entry (typically a media presentation manifest) is acquired by the Media Player. It may be available from the local Media Server (populated by the MBS Client) or from the 5GMSd AS, or even from both.

14: The Media Player processes the Media Player Entry and identifies that content is available from different data networks (the local Media Server and the 5GMSd AS).

15: Under the control of the 5GMSd-Aware Application, the Media Player selects the content and different content options.

16: The Media Player continuously checks with the Media Session Handler - and possibly forwarded to the MBS Client if the MBS User Service data is available - how to use the different content. This depends on the hybrid scenario. Different policies may be considered.

17: The Media Player requests initialization information either from the local Media Server or from the 5GMSd AS. The Media Player repeats this step for each required initialization segment.

18: The Media Player receives the initialization information.

19: The Media Player requests media segments according to the Media Player Entry, either from the local Media Server or from the 5GMSd AS.

20: The Media Player receives media segments and puts the information into the appropriate media rendering pipeline.

Steps 13-20 are repeated according to the Media Player Entry information.

#### 5.12.4.2 Interactive service

In a specific 5GMS content delivery via 5G System and MBS cenario, an interactive service may be provided via 5GMS while the main media content resources are delivered via MBS exclusively. In this case, the following instantiations apply:

- In step 2, the Media Entry Point document (e.g. MPD) only points to content in the local proxy Media Server.

- Step 13 as well as steps 17-20 are all terminated on the local proxy Media Server.

#### 5.12.4.3 Session continuity

In a specific 5GMS content delivery via 5G System and MBS scenario, the service is made available via both 5GMS and MBS delivery networks, but only one Representation of each Adaptation Set is provided via MBS. In this case, the following instantiations apply:

- In step 2, one Representation of each Adaptation Set is distributed via MBS.

- As long as the streaming service is accessible over MBS, the Media Player selects the media content in step 13 as well as steps 17–20 from the local proxy Media Server; content is not available from the 5GMSd AS.

- If the streaming service becomes unavailable via MBS, the Media Player switches to accessing the media content in step 13 as well as steps 17–20 from the 5GMSd AS.

- Once the streaming service becomes available again via MBS, the Media Player switches back to accessing the media content in step 13 as well as steps 17–20 from the local proxy Media Server.

#### 5.12.4.4 Time-shifted viewing

In a specific 5GMS content delivery via 5G System and MBS scenario, the service is made available via both 5GMS and MBS delivery networks, but only one Representation of each Adaptation Set is provided via MBS. The content is retained by the 5GMSd AS for a period of time to support time shifted access. In this case, the following instantiations apply:

- In step 2, one Representation is of each Adaptation Set is distributed via MBS.

- If the streaming service is accessible via MBS and the user is consuming content at the live edge, the Media Player selects the media content in the step 13 as well as steps 17–20 from the local proxy Media Server; content is not available from the 5GMSd AS.

- If the user switches to time-shift viewing mode or streaming service becomes unavailable via MBS, the Media Player switches to accessing the media content in the step 13 as well as steps 17–20 from the 5GMSd AS.

- Once the streaming service becomes available again via MBS and the user returns to the live edge, the Media Player switches back to accessing the media content in the step 13 as well as steps 17–20 from the local proxy Media Server.

#### 5.12.4.5 Content or component replacement

In a specific 5GMS content delivery via 5G System and MBS scenario, the service is made available via both 5GMS and MBS delivery networks, but only one Representation of selected Adaptation Sets is provided via MBS. Some Adaptation Sets are only available via 5GMS. In another case, two or more content alternatives may exist for a period of time, but only one alternative is provided over MBS.

In this case, the following instantiations apply:

- In step 2, the MPD is generated to define the different content alternatives.

- If the streaming service is accessible over MBS and the user watches content available on broadcast, the Media Player selects the media content in step 13 as well as steps 17–20 from the local proxy Media Server; content is not available from the 5GMSd AS.

- If the user switches content or content components, the Media Player switches to accessing the media content in the step 13 as well as steps 17–20 from the 5GMSd AS. If only a component is replaced, the Media Player accesses media content from the local proxy Media Server and the 5GMSd AS at the same time.

### 5.12.5 Procedures for dynamic provisioning of 5GMS content delivery via MBS

#### 5.12.5.1 General

In this scenario the same content is distributed via MBS and via a 5GMS System. The resources of the MBS System are statically configured. MBS-based distribution may, for example, be used only for services in high demand, and the resources and quality of the service distributed through broadcast may be adjusted according to demand. Demand may be identified through 5GMS Consumption Reporting.

The call flow in figures 5.12.5-1 and 5.12.5.-2 extends that defined in clause 5.12.1 to address generic use cases for MBS-on-demand. Specific additional use cases are presented in the remainder of clause 5.12.5.



Figure 5.12.5.1-1: High-level procedure for DASH content delivered via MBS-on-demand

Steps:

1: The 5GMS Application Provider provisions one or more 5GMSd services and permits broadcast distribution of the media content.

2: As a consequence, the 5GMSd AF provisions MBS delivery and the MBSF informs the 5GMSd AF about the resources it will use to ingest media content.

NOTE: This step may happen later, up to (and possibly as part of) step 15, for example only when demand is identified.

3: The media content is announced to the 5GMSd-Aware Application and the application request the entry points for the service.

4: The 5GMSd AS starts to ingest content from the 5GMSd Application Provider.

5: Consumption Reporting is applied for the downlink media streaming session.

Media playback initially uses unicast 5G Media Streaming:

6: The media content is selected by the 5GMSd-Aware Application.

7: The 5GMSd-Aware Application triggers the start of media playback by the Media Player.

8: The Media Entry Point docuent (e.g. DASH MPD) is requested by the Media Player from the 5GMSd AS.

9: The Media Player processes the media presentation manifest and identifies that the media content is available on the 5GMSd AS

10: The Media Player, under the control of the application, selects the media content and different content options.

11: Media content is received from the 5GMSd AS via reference point M4d.

12: The Media Player informs the Media Session Handler about the consumed media content.

13: The Media Session Handler sends consumption reports to the 5GMSd AF.

Subsequently, media playback switches to MBS:

14: By analysing the consumption reports submitted to it in the previous step, the 5GMSd AF identifies a high level of demand for the service.

15: Additional MBS Distribution Sessions are provisioned to add delivery of the service via MBS.

16: The MBSTF starts ingesting media content from the 5GMSd AS.

17: MBS media distribution starts.

18: The 5GMSd AF informs the Media Session Handler that MBS media distribution is initiated by providing updated Service Access Information.

19: MBS content reception is initiated by the Media Session Handler.

20: Once the service is ready, the content delivered on MBS is used by the Media Player. Consumption reporting continues. Specific cases may use different policies, similar to the hybrid case in clause 5.12.5.



Figure 5.12.5.1-2: High-level procedure for DASH content delivered via MBS-on-demand (continued)

#### 5.12.5.2 Operation modes

At least the following operation modes are supported based on the general procedures in clause 5.12.5.1:

1. Every 5GMS media service is mapped to exactly one MBS User Service. Whether the MBS User Service is announced and delivered or not depends on service demand. The MBS Distribution Session is adjusted dynamically – for example the MBS Distribution Session is disabled, or the bit rate is changed – depending on service demand and/or content requirements.

2. A set of MBS User Services and MBS Distribution Sessions is defined in the initial provisioning. Downlink media streaming components are dynamically mapped to statically configured MBS Distribution Services based on demand and content requirements.

3. Components of the downlink media streaming session, for example audio service components for different languages, are assigned dynamically to MBS Distribution Sessions depending on demand.