**3GPP TSG SA WG4#114-e** ***S4-210779***

**E-meeting, 19th-28th May, 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
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|  | **TR 26.802** | **CR** | **–** | **rev** | **–** | **Current version:** | **1.2.8** |  |
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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 |  |

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| ***Title:*** | pCR to TR26.802 on conclusions | | | | | | | | | |
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| ***Source to WG:*** | TELUS | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GMS\_Multicast | | | | |  | ***Date:*** | | | 2021-05-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **D** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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)*. | | | | | | | |  | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Added potential standardization areas and solutions | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | |  | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | Several clauses | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Changes against baseline document TR 26.802 v1.2.8 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

FIRST CHANGE

# 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*.

[27] 3GPP TS 26.511: "5G Media Streaming (5GMS); Profiles, codecs and formats".

[28] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

NEXT CHANGE

### 4.4.3 5G Multicast–Broadcast Services (5MBS) system architecture

Figure 4.4.3‑1 below illustrates the 5G Multicast–Broadcast Services (5MBS) system architecture in reference point representation. It is logically identical to Figure 5.1‑2 in TS 23.247 [26].

C:\Users\t841804\AppData\Local\Microsoft\Windows\INetCache\Content.Word\5MBS System Architecture - Reference point representation 2020-05-12.emf

Figure 4.4.3-1: 5G Multicast–Broadcast Services system architecture in reference point representation

### 4.4.4 Baseline Network Reference Architectures

#### 4.4.4.1 General

This clause presents a variant of the network reference architecture in clause 5 of TS 23.247 [26] with the following changes:

- Reference point “xMB” only refers to an interface that is provided by the BM-SC. For the 5MBS media delivery functions, the MBSTF exposes an interface which is xMB-U based.

- The MBSF is integrated into a 5GMS AF function that may expose an internal API resembling xMB-C. Support for standalone MBSF is for study.

- A standalone MBSF may be needed for different interworking scenarios. Interworking with legacy systems is for further study.

Legend for Figure 4.4.4.2-1 and Figure 4.4.4.3-1:

- Blue boxes: control plane functions as shown in TS 23.247 Figure 5.1-2.

- Orange boxes: user plane functions as shown in TS 23.247 Figure 5.1-2. .

- White boxes: Application servers and functions, for example a 5GMSd AF and AS.

- Blue lines: control plane interfaces.

- Red lines: user plane interfaces.

- Black labeled interfaces: existing reference points from Release 16.

- Coloured labeled interfaces: newly coined reference points for Release 17 for 5MBS in the 5GMS architecture.

#### 4.4.4.2 5GMSA functions in the Trusted DN

The following diagram illustrates a network reference architecture with all 5GMS and 5MBS functions within the Trusted DN. A 5GMS Application Provider (typically) in an External DN configures the 5GMS features via a Release 17 version of M1d interface. Two different models are considered:

1: The usage of 5MBS for media distribution is completely hidden from the 5GMS Application Provider. The 5GMS System selects usage of 5MBS based on internal criteria.

2: By means of 5GMS provisioning procedures at (extended) M1d, the 5GMS Application Provider explicitly controls the potential usage of 5MBS in certain areas and for certain content. For example, some content might not be authorized for 5MBS distribution by content rights owners. Or, some content might only be authorized for 5MBS distribution.

C:\Users\t841804\AppData\Local\Microsoft\Windows\INetCache\Content.Word\5MBS reference architecture - Converged architecture mapping to 5GMS 2021-05-12.emf

Figure 4.4.4.2-1: 5MBS architecture combined with 5GMS hosted in Trusted DN

#### 4.4.4.3 5GMSA functions in an External DN

The following diagram illustrates a network reference architecture with all 5GMS within an external DN. Only the MBSTF resides inside a trusted DN. A 5GMS Application Provider (typically) in an external DN configures the 5GMS features via a Release 17 version of M1d interface.

C:\Users\t841804\AppData\Local\Microsoft\Windows\INetCache\Content.Word\5MBS reference architecture - Converged architecture mapping to 5GMS (external) 2021-05-12.emf

Figure 4.4.4.3-1: 5MBS architecture combined with 5GMS hosted in External DN

NEXT CHANGE

#### 4.4.5.4 5GMS client architecture using 5MBS (option B)

(SNIPPED)

In practical deployments that combine 5G Media Streaming with 5MBS, the MBSF is likely to be co-located with the 5GMS AF, as described in clause 4.4.1 of the present document. In addition, the 5MBS AS is likely to be co-located with the 5GMS AS in such deployments because the two functions share a high degree of commonality. Figure 4.4.5.4‑2 below illustrates this likely deployment architecture.

C:\Users\t841804\AppData\Local\Microsoft\Windows\INetCache\Content.Word\FS_5GMS_Multicast - Client architecture - Combined 5GMS and 5MBS (alternative v4) 2021-05-12.emf

Figure 4.4.5.4-2: Combined 5GMS and MBS client architecture (option B) depicting likely co-location

NEXT CHANGE

### 5.6.3 Conclusions

It is proposed to define the User Plane and Control Plane Functionalities and APIs of a 5MBS Client, as counterpart of “MBMS Client” API in clause 6 in TS 26.347 for control plane and clause 7 in TS 26.347 for user plane. The various client architecture are expected to be specified in new specification for 5MBS Client APIs, for example TS 26.513.

NEXT CHANGE

## 6.2 Potential Standardization Areas

### 6.2.1 Introduction

Initially, the following areas are identified as potential standardization areas:

* Create Delivery Methods in the MBSTF to support 5MBS User Service to use 5MBS capabilities.
* Define Service aspects in MBSF, such as User Service Announcement.
* Using 5MBS together with 5G Media Streaming Architecture is one scenario.
* Define Nmb6 (based on xMB-C) and Nmb4 (based on xMB-U). It is assumed that MB2 interface will be supported in Release 17 “as is”.
* Define the realization of Nmb2 (between MBSF and MBSTF), which configures and controls the delivery functions (like object delivery).
* Expect to have a new spec TS 26.502 to document these potential standardization areas.

### 6.2.2 5MBS User Service Architecture

Figure 6.2-1 provides a view of the network architecture for 5MBS User Service delivery and control. In this figure, two potential standardization areas are identified:

1. How AF and MBSF interact to support MBS session operations and transport (i.e. xMB-C and MB2-C reference points).

2. How to provide MBSTF functionality related to MBS data handling (e.g. encoding) via xMB-U and MB2-U interfaces. Based on the definition in TS 23.247, MBSTF performs generic packet transport functionalities available to any IP multicast enabled application such as framing, multiple flows, packet FEC (encoding). It also performs multicast/broadcast delivery of input files as objects or object flows. If needed, MBSTF provides a media anchor for MBS data traffic and sourcing of IP multicast.



Figure 6.2-1: Network Architecture for 5MBS User Service Delivery and Control

NEXT CHANGE

# 7 Potential Solutions

## 7.1 General

This clause provides potential solutions for the standardization areas identified in clause 6.

## 7.2 Support of multicast ABR in 5G Media Streaming Architecture

(SNIPPED)

## 7.3 Multicast-Broadcast User Service

### 7.3.1 Introduction

An “MBMS user service”-like support is expected to be provided by the MBSF and MBSTF. 5MBS User Services enable applications. It presents a complete service offering to an end-user, via a set of APIs that allows the 5MBS Client to activate or deactivate reception of the service.

The 5MBS User Service architecture is independendent of 5G Media Streaming (5GMS) and may be used without 5GMS. There are scenarios where 5GMS is the northbound application function, as depicted in clause 5.4 where four different deployment models are presented. In another example, 5G Multicast ABR media streaming service could be a User Service where the 5MBS User Services allow streaming of DASH content as defined in TS 26.501, and it also includes the use of a MBS session to deliver the DASH segments in multicast. When delivering content to a 5MBS Client, the MBSTF uses one or more 5MBS Delivery Methods.

Figure 7.3.1-1 depicts a potential solution for functional entities in MBSF and MBSTF to support 5G Multicast-Broadcast User Service.



Figure 7.3.1-1: 5GS multicast-broadcast user service functional entities

### 7.3.2 MBSF

The following functions in the MBSF to support 5MBS will be defined in 3GPP TS 23.247 [26]:

- Interacting with MB-SMF for MBS session operations, determination of N6mb transport parameters, and session transport (via interface Nmb1).

- Selection of serving MB-SMF for an MBS Session (via interface Nmb1).

NOTE: The equivalent reference point of Nmb1 in MBMS control plane is SGmb.

- Configuration (via interface Nmb2) of the sender IP multicast address to use for the MBS session in cases where the IP multicast stream is originated by the MBSTF.

The following MBSF functionality and procedures related to service and MBS data handling to support 5MBS User Service are studied in the present document:

- Interacting with the MBSTF (if needed) for 5MBS Delivery Method control (via Nmb2).

- Interacting with the AF (optionally via NEF) (via Nmb6/xMB-C).

NOTE: It is assumed that MB2-C interface will be supported in Release 17 “as is”, as specified in 3GPP TS 29.468 [18] and RFC 6733 [20].

- Interacting with the PCF (via Nmb7) to relay or initiate a request for different PCF treatment.

- Interacting with the UE (via MBS-5).

NOTE: The MBS-5 interface might be a abstract interface, i.e. using an undefined/external transport.

- The User Service Discovery/Announcement provides session access information, which is necessary to initiate the reception of a 5MBS User Service. The session access information may contain information for presentation to the end-user, as well as application parameters used in generating service content to the 5MBS Client.

### 7.3.3 MBSTF

In MBSTF, the use of reference point Nmb5 to provide IP multicast traffic delivery to the MB-UPF will be defined in 3GPP TS 23.247 [26].

NOTE: The equivalent reference point of Nmb5 in MBMS is SGi-mb.

The following MBSTF functionality and Delivery Methods related to MBS data handling, to support 5MBS User Services, will be studied in the present document.

- Interacting with the AS (via interface Nmb4/xMB-U).

- Interacting with the UE (via MBS-4-MC).

A set of 5MBS Delivery Methods are provided by the MBSTF. These provide functionality such as security and key distribution, reliability control (by means of FEC techniques) and associated delivery procedures. The following Delivery Methods will be studied in the present document:

***- Object delivery method:*** Functionally, this is equivalent to the “Download Delivery Method” in TS 26.346 [16] and also supports the real-time delivery of media segments (as special objects) including Low-Latency CMAF delivery.

Figure 5.3.1.1-1 illustrates a simplified user plane model of FLUTE as an example of a possible MBSTF object delivery method. However, the protocol to support the object delivery function is for future study.

***- Transparent delivery method:*** This supports the IP streaming use cases, for which UDP payloads (also referred to as Application Data Units) are distributed as part of UDP or IP flows carried to the UE over an MBS session. Examples of higher layer protocols are RTP, packetized MPEG-2 TS or other UDP-based streams.

***- Group Communication delivery method:*** This delivers a multicast UDP/IP packet flow to the UE.

:The potential merger of Transparent delivery method and Group Communication delivery method is for future study. For details also refer to clause 5.5.2.

The above Delivery Methods may use either a multicast or broadcast session to deliver content to a receiving application, and may also make use of a set of 5MBS associated delivery procedures.

***MBS session*** refers to a multicast session or a broadcast session, as defined in TS 23.247 [26].

- In a ***Multicast MBS session***, an MBS session delivers the multicast communication service. A Multicast MBS session is characterised by the content to send, by the list of UEs that may receive the service and, optionally, by a multicast area in which to distribute it

- In a ***Broadcast MBS session***, an MBS session delivers the broadcast communication service. A broadcast MBS session is characterised by the content to send and the geographical area for content distribution.

### 7.3.4 5MBS together with 5G Media Streaming Architecture

Figure 7.3.4-1 depicts a deployment of 5G Media Downlink Streaming delivery over multicast. The 5GMSd Application Provider is a combined external application entity and content-specific media functionality (e.g. media creation, encoding and formatting) that uses the 5GMS System to distribute media to a 5GMSd-Aware Application.



Figure 7.3.4-1: 5G multicast media streaming User Service functional entities

The 5GMSd AF provides 5G Media Downlink Streaming provisioning, and various control functions to the Media Session Handler in the 5GMS Client located in the UE. It may relay or initate a request for different PCF treatment.

In the deployment architecture as shown by Figure 7.3.4-1, the 5GMSdAF and MBSF are fully separated logical functions. Alternatively, as depicted in Figure 5.4.2-1, the MBSF could be integrated within the 5GMSd AF. In such a deployment, the embedded MBSF still uses the Nmb2 to configure and control the multicast delivery functionality of the MBSTF.

Detailed deployment options in the UE are described in clause 4.4.2 of the present document.

NEXT CHANGE

# 8 Conclusions and Next Steps

## 8.1 General

Table 8.1-1 summarizes the conclusions of key issues.

Table 8.1-1: Summary of Key Issues, Conclusions and Next Steps

|  |  |
| --- | --- |
| Key Issues | Conclusions and Next Steps |
| Key Issue#1: How to support multicast ABR in 5G Media Streaming Architectrue | Mapping relevant MABR logical functions into 5G Multicast/Broadcast Service architecture.  Standardize how to use Delivery Methods, and collaboration models to support MABR. |
| Key Issue#2: How to design Nmb2 interface | Nmb2 reference point provides interaction between MBSF and MBSTF. It is used to control the transport services offered by the MBSTF. |
| Key Issue#3: Collaboration and deployment scenarios | Collaboration B2 deployed without 5GMS functions as baseline reference architecture for normative work |
| Key Issue #4: Reuse of MBMS service layer | In the normative work, define detailed service layer in MBSF and MBSTF. |
| Key Issue #5: Client architecture options | Define the User Plane and Control Plane Functionalities and APIs of 5MBS Client. |
| Key Issue #6: Hybrid 5GMS services | [to review in the offline #3]Architectural Extensions: Architecture and call flows for the following hybrid 5GMS unicast and 5MBS scenarios with high priority: (i) Interactive Service, (ii) Session Continuity, (iii) Time-shifted viewing, (iv) Targeted content replacement, (v) Reporting, and (vi) Unicast recovery. Additional functionalities such as (i) Enhanced service quality, (ii) Component replacement, and (iii) Fast start-up may be addressed as well if time permits.  Protocol Extensions: The required functions of the reference points for hybrid services need to be checked against existing functions in TS 26.501, TS 26.511, TS 26.512, TS 26.346, TS 26.347 and TS 26.348 and extended if needed, possibly with new specifications. |
| Key Issue #7: 5GMS via eMBMS | [to review in the offline #3]To support 5GMS over eMBMS and in particular systems that address the 5G Broadcast requirements (including ROM-services, SFN, broadcast-only, etc.), it is proposed to define the architectural enhancements, call flows and procedures for 5GMS using MBMS User Services as well as hybrid 5GMS services via MBMS User Services and unicast. Stage-3 aspects to support these functionalities include extensions on 5GMS Protocols as well as extensions in xMB, MBMS user services and MBMS-APIs.  Furthermore, it is proposed to further study to what extent "5MBS uses MBMS transport-only mode” as introduced in clause 5.8.2.2 is feasible based on the SA2 defined architecture and address potential normative work at a later stage. |

Based on the conclusions for the different key issues, the following consolidated conclusions are reached as baseline for normative work:

- Define the configuration of Delivery Methods in the MBSTF to realise 5MBS User Services in the MBSF using available 5MBS capabilities.

- Define Service aspects in the MBSF, such as User Service Announcement.

- Using 5MBS together with 5G Media Streaming Architecture as one scenario that needs to be supported including hybrid services.

- Define Nmb6 (based on xMB-C) and Nmb4 (based on xMB-U).

NOTE: It is assumed that MB2 interface will be supported in Release 17 “as is”.

- Define the realization of Nmb2 (between MBSF and MBSTF), which configures and controls the Delivery Methods (such as object delivery).

- Define 5MBS client functionalities and APIs.

- Define 5GMS via eMBMS.

Based on this, the following specifications are expected to be addressed.

- Expect to have several new specifications to document these potential standardization areas:

- TS 26.50x defining the 5MBS User Service Architecture including the northbound, MBSF/MBSTF to 5MBS client and 5MBS client interfaces. This specification also includes:

- Relevant call flows and procedures to support 5GMS over 5MBS

- Relevant call flows and procedures to support 5GMS hybrid services

- Relevant call flows and procedures for 5GMS independent usage of 5MBS

- TS 26.51x defining the 5G MBS User Service protocol and Delivery Methods for the interfaces defined in TS26.50x. The objective of the proposed work item is the definition of a set of transport/application protocols to enable the deployment of 5MBS User Services. The present document takes into consideration the need to maximize the reuse of components of already specified MBMS.

- TS 26.51x defining the 5MBS Client API.

- Expect to have extensions to existing specifications to document these potential standardization areas:

- Extend TS 26.501 to reference to TS 26.50x and provide a basic description on 5GMS via 5MBS and 5GMS hybrid services.

- Extend relevant clauses in TS 26.501 [1], TS 26.511 [27], TS 26.512 [28], TS 26.346 [16], TS 26.347 [21] and TS 26.348 [15] to 5GMS via eMBMS.



8.2 Next Steps

The following work is proposed be progressed

1. Architecture and procedures defining the 5MBS User Service Architecture
2. 5G MBS User Service protocols and delivery methods based on 1)
   1. <add details>
3. 5GMS via eMBMS – architectural and procedural extensions independent of 1 and 2
   1. <add details>
4. Further studies on the following topics
   1. <add details>

It is recommended to

* Initiate normative work on TS 26.50x, and
* Extend relevant clauses in TS 26.501 [1], TS 26.511 [27], TS 26.512 [28], TS 26.346 [16], TS 26.347 [21] and TS 26.348 [15] to 5GMS via eMBMS for Rel-17
* Initiate normative work on TS 26.51x once 1 is completed for Rel-17
* Revisit new study topics after the completion of of topics 1-3

<Add the following details to the different work phases>

The following normative works are proposed to be progressed and documented TS 26.502 on 5MBS User Service Architecture and General Description

1. Define the separation of the User Plane and Control Plane Functionalities of “BM-SC” (now MBSF and MBSTF), and the Nmb2 reference point between MBSF and MBSTF. The MBSF is the control plane function, which generates and manages metadata to access the 5MBS User Service session. The Nmb2 reference point is used to control the transport services offered by the MBSTF.

Define the procedures between MBSF and MBSTF to use Nmb2 to establish 5MBS data transfer, including description of delivery methods

* + 1. Object delivery Method that includes Download delivery method/File Delivery (as defined in TS 26.346, clause 7), and DASH/HLS over MBMS (as defined in TS 26.346, clause 5.6 and 5.7, including Low-Latency CMAF as defined in 5GMS)
    2. A common packet delivery method that includes the relevant delivery aspects of transparent delivery method, group communication delivery method and streaming delivery method as defined in TS 26.346, clause 8B, 8A and 8 respectively.
    3. It is assumed that the MBSTF does not need to support a separate Group Communication method. Instead, the MBSF instantiates a version of a 5MBS transparent delivery method. It is recommended that an informative clause describes the usage of 5MBS transparent delivery for Group Communication support.
    4. The relevant functions as now defined as Associated Delivery Procedures in TS 26.346, clause 9, and aligning with 5GMS.

1. Collaboration model B2 will be used as basis in the normative work. Other collaboration and deployment scenarios will be supported by the technical specification. It is recommended to illustrate the different collaboration and deployment scenarios (independently from 5GMS) in an informative clause.
2. Define the necessary extensions of relevant “MBMS Service Layer” functionalities to support 5GS and 5MBS Sessions (as to be defined in Rel-17, TS 23.247). This pre-dominantly includes the definition or proper delivery method establishment.

Define 5MBS User Service procedures for Discovery/Announcement, Initiation/Termination, and relevant procedures to align with 5GS design principles

1. Define stage 2a logical reference point between the MBSF and the 5MBS AS that allows 5MBS User Services session descriptions to be published by the former to the latter.
2. Define a procedure that allows the 5MBS Client to retrieve 5MBS User Services session descriptions via logical reference point MBS‑4‑UC.
3. Define a procedure at logical reference point MBS‑5 for announcing to the 5MBS Client a set of 5MBS User Services session descriptions that are hosted on the 5MBS AS.
4. Define the means to describe multiple object delivery sessions in a 5MBS User Services session description.

The following normative works are proposed to be progressed and documented TS 26.51x on 5MBS User Service protocol and Delivery Methods, based on TS 26.502 as described above.

1. The following “user service” functionalities (as defined in TS 26.346) with proper mapping to 5MBS architecture (as to be defined in Rel-17, TS 23.247) are proposed to be reused and extended if needed. The combination with 5G Media Streaming is one deployment scenario.

a) Service Announcement and Discovery as defined in TS 26.346 based on userServiceDescription. Stage-3 aspects may be reconsidered, for example to align with 5GS design principles.

2. Provide the relevant functions and protocols for northbound interfaces based on the xMB API defined in TS 26.348.

3. Define the API between MBSF and MBSTF (named 'Nmb2'). The Nmb2 reference point is used to control the transport services offered by the MBSTF

a. The Nmb2 API should re-use the xMB-C concepts and properties identified in clause 5.3.1.4.

b. The Nmb2 API should support configuration with N6-mb parameters.

c. The Nmb2 API should allow selection and configuration of different 5MBS delivery methods, in particular a new 5MBS object delivery method and a 5MBS transparent delivery method.

4. Decide multiplexing level of in-band ancillary information (e.g. keep MIME Type based like in eMBMS). In case a different QoS profile is used for in-band ancillary information, then the MB-UPF needs to filter/identify the in-band ancillary information.

5. The existing xMB-C API does not support the ingest of 5MBS User Service related in-band ancillary information. The 5MBS version of xMB-C (Nmbsf) should be evolved to include this suppport.

The following normative works are proposed to be progressed and documented in TS 26.501 [1]:

1. Provide a general description and architecture for delivering media services over 3GPP multicast/‌broadcast with reference to the Collaboration B0 mapping in clause 7.2.1.4.

2. Define stage 2 procedures for discovering and establishing a Multicast ABR session, for dynamically (de)selecting multicast transport sessions, for recovering from multicast packet loss and for reporting usage statistics and Quality of Experience metrics for the purpose of optimal service management.

The following normative works are proposed to be progressed and documented in TS 26.513 for 5MBS client API.

1. It is proposed to define the User Plane and Control Plane Functionalities/APIs of 5MBS Client, as counterpart of “MBMS Client” API in clause 6 in TS 26.347 for control plane and clause 7 in TS 26.347 for user plane. The various client architecture will be specified in new specification on 5MBS Client API TS 26.513.

The following normative works are proposed to be progressed and documented in relevant clauses of TS 26.501 [1], TS 26.511 [27], TS 26.512 [28], TS 26.346 [16], TS 26.347 [21] and TS 26.348 [15]

END OF CHANGES