**GPP TSG-S4 Meeting #113-e *S4-210621***

**Online, , 6th–14th April 2021** revision of S4-210475

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO 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 |  | Radio Access Network |  | Core Network |  |

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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). | | | | | | | |  | |
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| ***Reason for change:*** | | Initial solution to Key Issue #1, Scenario #2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Proposed architecture for interworking between the DVB-MABR reference model and the proposed 5MBS reference model. | | | | | | | | |
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| ***Consequences if not approved:*** | | Failure to progress the study of this Key Issue and requirements will not be fed into other aspects of solution design. | | | | | | | | |
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| ***Clauses affected:*** | | 7.2.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | |  | | |
| ***affected:*** | |  |  | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | |  | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

FIRST CHANGE

# 7 Potential Solutions

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

## 7.1 General

(SNIPPED)

## 7.2 Key Issue #1: Support of multicast ABR in 5G Media Streaming Architecture

### 7.2.1 Mapping of DVB‑MABR and CableLabs MABR reference architectures to 5MBS reference architecture for Scenario #1

(SNIPPED)

### 7.2.2 Interworking of DVB‑MABR reference architecture with 5MBS reference architecture for Scenario #2

#### 7.2.2.1 Introduction

With reference to an external Multicast ABR system interworking with a 5MBS System as described in clause 5.2.3, a different arrangement of logical functions and reference points is needed from that of Scenario #1.

Multicast ABR Scenario #2 may be realised by the following deployment models outlined in clause 5.4 of the present document:

**- Collaboration C** (see clause 5.4.4) where all media-related functions are deployed in an External DN and a multicast packet stream (optionally encapsulated in a unicast tunnel) is injected directly into the MB‑UPF in the Trusted DN at reference point N6, as depicted in Figure 4.4.1.3‑1. The multicast packet stream may include AL‑FEC repair packets. Because the externally generated multicast packet stream emulates the candidate 5MBS Delivery Method for segmented media, the 5MBS Client can receive it and can perform AL‑FEC and unicast repair procedures on the packet payloads as needed.

In this collaboration, the *Provisioning* function plays the role of an externally hosted 5GMSd AF; the *Content hosting* function plays the role of an externally hosted 5GMSd AS and the *Multicast server* provides the “MBSTF-like” function. HTTP-based unicast repair operations use the 5MBS AS as a proxy to the *Content hosting* function in the External DN.

- **Collaboration D** (see clause 5.4.5) which is the same as Collaboration C except that the externally generated multicast packet stream injected into the MB‑UPF at N6 is in an application-specific format that differs from the candidate 5MBS Delivery Method for segmented media, for example the DVB-MABR profile of ROUTE or the CableLabs profile of NORM. In this case, the 5MBS Client can receive the packet payloads, but cannot repair them using 5MBS AL‑FEC or 5MBS HTTP-based unicast repair procedures. The received packet payloads are instead delivered to a 5MBS-Aware Application at MBS‑7 that is responsible for media object reassembly, repair procedures and onward delivery to a media player.

In this collaboration, the DVB-MABR *Multicast gateway* function could, for example, play the role of the 5MBS-Aware Application.

#### 7.2.2.2 Interworking architecture for Collaboration C

Figure 7.2.2.2‑1 below shows how the DVB‑MABR reference model (blue functions and reference points) integrates with the 5MBS reference model proposed in the present document (green functions and reference points) and the 5MBS reference model for 5GC (grey functions and reference points) in the case of **Collaboration C**.



Figure 7.2.2.2‑1: Interworking between the DVB‑MABR reference model and the 5MBS reference model (Collaboration C)

In the control plane of the end-to-end system:

1. The content provider’s *Provisioning* function in the External DN is interworks with the MB‑SMF in the Trusted DN by invoking Nmbsmf APIs via the NEF. These are used to provision a transport-only multicast delivery session for each target DVB-MABR multicast transport session, plus an additional delivery session to convey the DVB-MABR multicast gateway configuration transport session.

As part of this interaction, the multicast address(es) to be used in the data plane are nominated by the MB‑SMF.

2. The *Provisioning* function configures the DVB‑MABR multicast transport session(s) in the *Multicast server* as usual via CMS.

NOTE 1: The multicast addresses nominated by the MB‑SMF are included in the DVB-MABR multicast server configuration instance document passed at reference point CMS. (This includes the transport parameters for each multicast transport session, plus those for the multicast gateway configuration transport session.)

NOTE 2: This step is outside the scope of 3GPP standardisation.

3. The availability of the transport-only multicast delivery session(s) is advertised to the 5MBS Client in the conventional manner at reference point MBS‑5.

The advertisement includes the address of the 5MBS AS to support interworking of HTTP-based unicast repair.

4. The DVB‑MABR *Rendezvous service* and *Multicast gateway* are notified by the 5MBS Client about the availability of transport-only multicast delivery sessions via the MBS‑6 API.

In the user plane of the end-to-end system:

5. Multicast packets produced by the *Multicast server* are likely tunnelled across the network between the External DN and the Trusted DN.

6. The MB‑UPF transparently delivers these multicast packets to the 5MBS Client on the UE via MBS‑4‑MC.

7. Using the notifications received from the 5MBS Client in step 4 above, the *Rendezvous service* configures itself such that presentation manifest requests made at reference point B are redirected to the *Multicast gateway* when the corresponding media is available from an advertised transport-only multicast delivery session.

8. Using the notifications received from the 5MBS Client in step 4 above, the *Multicast gateway* function subscribes to the desired multicast transport session(s) by invoking the appropriate MBS‑6 API call on the 5MBS Client. Dynamic adaptation between multicast transport sessions is achieved by making appropriate MBS‑6 API calls to unsubscribe from one and subscribe to another.

8. In particular, the *Multicast gateway* subscribes to the multicast gateway configuration transport session as soon as it is announced at MBS-6 in order to acquire the multicast gateway configuration instance document and any other multicast delivery objects provided on the multicast gateway configuration transport session, such as presentation manifests and/or initialisation segments.

9. The 5MBS Client on the UE receives multicast packets at MBS‑4‑MC for subscribed transport-only multicast delivery sessions. Using the information in the Service Announcement received in step 3 above, the 5MBS Client applies AL‑FEC repair to the received packets.

For any unrecoverable packet payloads, the 5MBS Client performs HTTP-based unicast repair with the 5MBS AS via MBS‑4‑UC, using the relevant associated procedures configuration from the Service Announcement received in step 3 above.

10. The 5MBS Client exposes intact playback delivery objects to the correct 5MBS-Aware Application (here, the *Multicast gateway* function) via reference point MBS‑7.

Metadata about the reception of the playback delivery object is exposed to the *Multicast gateway* at MBS‑7, including information about packet loss rate and AL‑FEC repair success rate.

11. Intact playback delivery objects are exposed to the *Content playback* function as normal at reference point L.

NOTE 3: This step is outside the scope of 3GPP standardisation.

#### 7.2.2.3 Interworking architecture for Collaboration D

Figure 7.2.2.3‑1 below shows how the DVB‑MABR reference model (blue functions and reference points) integrates with the 5MBS reference model proposed in the present document (green functions and reference points) and the 5MBS reference model for 5GC (grey functions and reference points) in the case of **Collaboration D**.



NOTE: Because use of the unicast path is uncoordinated with 5MBS functions in this collaboration, reference point MB‑N9 between the MB-UPF and UPF is omitted.

Figure 7.2.2.3‑1: Interworking between the DVB‑MABR reference model and the 5MBS reference model (Collaboration D)

In the control plane of the end-to-end system:

1. The content provider’s *Provisioning* function in the External DN interworks with the MB‑SMF in the Trusted DN by invoking Mbmsmf APIs via the NEF. These are used to provision a transport-only multicast delivery session for each target DVB-MABR multicast transport session, plus an additional delivery session to convey the DVB-MABR multicast gateway configuration transport session.

As part of this interaction, the multicast address(es) to be used in the data plane are nominated by the MB‑SMF.

2. The *Provisioning* function configures the DVB‑MABR multicast transport session(s) in the *Multicast server* as usual via CMS.

NOTE 1: The multicast addresses nominated by the MB‑SMF are included in the DVB-MABR multicast server configuration instance document passed at reference point CMS. (This includes the transport parameters for each multicast transport session, plus those for the multicast gateway configuration transport session.)

NOTE 2: This step is outside the scope of 3GPP standardisation.

3. The availability of the transport-only multicast delivery session(s) is advertised to the 5MBS Client in the conventional manner at reference point MBS‑5.

4. The DVB‑MABR *Rendezvous service* and *Multicast gateway* are notified by the 5MBS Client about the availability of transport-only multicast delivery sessions via the MBS‑6 API.

In the user plane of the end-to-end system:

5. Multicast packets are likely tunnelled across the network between the External DN and the Trusted DN.

6. The MB‑UPF transparently delivers these multicast packets to the 5BMS Client on the UE via MBS‑4‑MC.

7. Using the notifications received from the 5MBS Client in step 4 above, the *Rendezvous service* configures itself such that presentation manifest requests made at reference point B are redirected to the *Multicast gateway* when the corresponding media is available from an advertised transport-only multicast delivery session.

8. Using the notifications received from the 5MBS Client in step 4 above, the *Multicast gateway* function subscribes to the desired multicast transport sessions by invoking the appropriate MBS‑6 API call on the 5MBS Client. Dynamic adaptation between multicast transport sessions is achieved by making appropriate MBS‑6 API calls to unsubscribe from one and subscribe to another.

9. In particular, the *Multicast gateway* subscribes to the multicast gateway configuration transport session as soon as it is announced at MBS-6 in order to acquire the multicast gateway configuration instance document and any other multicast delivery objects provided on the multicast gateway configuration transport session, such as presentation manifests and/or initialisation segments.

10. The 5MBS Client on the UE receives multicast packets at MBS‑4‑MC for subscribed transport-only multicast delivery sessions and routes them to the correct 5MBS-Aware Application (here, the *Multicast gateway* function) via reference point MBS‑7.

NOTE 3: The 5MBS Client does not attempt to make good any missing or corrupted multicast packets in this collaboration scenario.

11. The *Multicast gateway* parses and reassembles received multicast packets into playback delivery objects, as normal. It may apply Application‑Level Forward Error Correction to repair missing packets, as configured in the multicast gateway configuration instance document received in step 9. It may also perform HTTP-based unicast repair at reference point A, as configured in the multicast gateway configuration instance document. Reference point A is realised via a conventional PDU Session.

NOTE 4: This step is outside the scope of 3GPP standardisation, beyond the use of a PDU Session.

12. Intact playback delivery objects are exposed to the *Content playback* function as normal at reference point L.

NOTE 5: This step is outside the scope of 3GPP standardisation.

END OF CHANGES