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**Elbonia, 12 - 16 April, 2021 (revision of S2-210xxxx)**

**Source: Huawei, HiSilicon**

**Title: Mobility Procedures for 5MBS**

**Document for: Approval**

**Agenda Item: 8.9**

**Work Item / Release: 5MBS / Rel-17**

*Abstract: This document adds Mobility Procedure for 5MBS to the new TS. This include the mobility among the homogenous and non-homogenous 5MBS capability NG-RAN node.*

# Background and Introduction

This contribution proposes the related procedures as per the conclusion in clause 8.7 of TR 23.757.

# Proposal

It is proposed to capture the following changes vs. TS23.247.

\* \* \* \* First change\* \* \* \*

7.1.5 Mobility Procedures for 5MBS

7.1.5.1 General

UE may move from one NG-RAN node to another NG-RAN node after UE has joined the MB Session. There are various mobility scenarios possible, depending on whether one of the involved NG-RAN nodes supports 5G MBS.

During an active MBS Session, mobility between an NG-RAN supporting 5G MBS and an NG-RAN node not supporting 5G MBS requires the mobility procedure to provide the appropriate MBS traffic delivery method at the target NG-RAN node.

7.1.5.2 Xn based handover

Editor’s Note: Details for Xn based handover will be aligned with RAN WGs.

This clause describes an Xn based handover with MBS traffic delivered to the UE at the source gNB supporting 5G MBS.



Figure 7.15.2-1: Xn based handover with MBS Session

The following additions apply compared to clause 4.9.1.2 of TS 23.502 [X]:

Before Handover

 The source NG RAN has been provided with MBS Session Resource information (including the MBS Session ID and multicast QoS flow information) and the UE Context information contains an mapping information within the PDU Session Resource associated with the MBS Session Resource, e.g..including mapped unicast QoS Flows associated with the multicast QoS flow(s) of the MBS Session Resource.

Handover Preparation phase.

At Xn handover, the target NG-RAN is provided with information which causes:

* a 5G MBS non-supporting target NG-RAN node to prepare unicast resources according to unicast information;
* a 5G MBS supporting target NG-RAN node to allocate to the UE shared NG-RAN resources according to the MBS session information;

contained in the associated PDU Session Resource context.

1. Target NG-RAN to AMF: the target NG-RAN sends N2 Path Switch Request to AMF. The N2 SM message includes sufficient information to allow the SMF to know whether the target NG-RAN node supports 5G MBS and whether MBS Session Resources (in case the target NG-RAN node supports 5G MBS) or PDU Session Resources to support 5GC individual MBS traffic delivery have been established in the target NG-RAN for the UE.

Editor’s Note: details to be added, if necessary, during stage 3 phase in RAN WGs.

Based on the received N2 SM message, the SMF can differentiate two cases:z

Case A) The target NG-RAN supports 5G MBS. Step 3 applies and steps 4~8 are skipped.

1. SMF to UPF: The SMF invokes N4 Session Modification procedure with the UPF (PSA) only for unicast PDU Session.

Case B) The target NG-RAN does not support 5G MBS and the UPF is not yet configured to forward multicast data via unicast, steps 4 to 8 apply.

1. SMF to UPF (PSA): The SMF invokes N4 Session Modification procedure with UPF (PSA), the SMF instructs the UPF (PSA) to forward the multicast data received from the MB-UPF via the mapped unicast QoS flow(s) of the PDU Session. The SMF provides the mapping information between the multicast QFI and the corresponding unicast QFI of the multicast QFI in the PDU Session to the UPF (PSA), the UPF (PSA) forwards the multicast data via the PDU session based on the mapping information. If the delivery tunnel for the MBS session from MB-UPF to UPF is not established yet, the SMF instructs the UPF (PSA) to allocate a tunnel endpoint for the reception of multicast data from the MB-UPF.

If delivery of the multicast data from MB-UPF to UPF needs to be configured, steps 5 to 8 apply.

1. SMF to MB-SMF: The SMF invokes a Nmbsmf\_MBSSession\_Update (MBS session ID, SMF ID, DL tunnel info) request service operation to MB-SMF to establish the shared tunnel between the UPF(PSA) and MB-UPF.
2. MB-SMF to MB-UPF: The MB-SMF configures the MB-UPF with the received DL tunnel Info and instructs the MB-UPF to forward data of the MBS session to the UPF (PSA) via the tunnel. The MB-UPF starts to forward data of the MBS session to the UPF (PSA).
3. MB-SMF to SMF: The MB-SMF responds to SMF through Nmbsmf\_MBSSession\_Update response. If multicast data are transported via multicast, the MB-SMF provides endpoint information (e.g., the Common-TEID) including the transport multicast address.
4. SMF to UPF (PSA): The SMF invokes an N4 Session Modification procedure with the UPF (PSA). If multicast data are transported via multicast, the SMF provides endpoint information including the transport multicast address to the UPF (PSA) and the UPF (PSA) sends IGMP Join in order to receive data from the MB-UPF.
5. /10.: Editor’s Note: details on data forwarding, if applicable, needs to wait for RAN WGs.

7.1.5.3 N2 based handover

Editor’s Note: Details for N2 based handover should be aligned with RAN WG.

Editor’s Note: Procedure for multicast delivery resource establishment is FFS.

This clause describes the N2 based handover with the MBS Session established at the source 5G MBS-supporting NG-RAN.

Figure 7.15.3-1: N2 based handover with MBS Session

The following additions apply compared to clause 4.9.1.3 of TS 23.502 [8]):

1. Source NG-RAN to S-AMF: Handover Required (RAN container (associated PDU session information)).
2. SMF to T-AMF: The SMF is provided with associated PDU Session information.

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1. T-AMF to Target NG-RAN: The Target NG-RAN prepares the radio resource based on the received information.
* If the target NG-RAN does not support 5G MBS, the MBS Session information is not used. The target NG-RAN uses the associated mapping PDU Session information to allocate resource to deliver MBS data. The MBS data are transmitted as one of the QoS flows within the unicast PDU Session.
* If the target NG-RAN supports 5G MBS, the target NG-RAN uses the MBS Session information to allocate resource to deliver the MBS data.

If Target NG-RAN supports 5G MBS and the MBS delivery for the indicated MBS Session has not yet been established towards target NG-RAN, the target NG-RAN allocates the shared downlink tunnel information for receiving the MBS data from 5GC and steps 6 to 10 apply:

1. Target NG-RAN to AMF: Target NG-RAN node selects the AMF to reach MB-SMF and signals a multicast session distribution request towards AMF via the N2 Message (MBS Session ID). If the RAN node is configured to use a unicast transport for multicast distribution sessions, it allocates a downlink tunnel ID (an IP address and a GTP-U TEID) for the reception of the multicast distribution session and indicates the downlink tunnel information in the request.
2. AMF to MB-SMF: AMF invokes the Nmbsmf\_MBSSession\_Create Request (MBS session ID, [DL tunnel info]) Request towards the MB-SMF to establish the multicast distribution towards AMF.
3. MB-SMF to MB-UPF: MB-SMF invokes the N4 Session Modification procedure with MB-UPF. For unicast transport of the multicast distribution session, MB-SMF configures MB-UPF to transmit the multicast distribution session towards target NG-RAN node (using the received IP address and a GTP-U TEID).
4. MB-SMF to AMF: MB-SMF responds to AMF through the Nmbsmf\_MBSSession\_Create Response. For multicast transport of the multicast distribution, it indicates in the downlink tunnel information and the multicast address for the multicast session.
5. AMF to Target NG-RAN: AMF provides multicast session distribution response to Target NG-RAN node via the N2 Message.
6. Target NG-RAN to T-AMF: The target NG-RAN sends Handover Request Ack to T-AMF.
7. The N2 SM message includes sufficient information to allow the SMF to know whether the target NG-RAN node supports 5G MBS and whether MBS Session Resources (in case the target NG-RAN node supports 5G MBS) have been established or PDU Session Resources to support 5GC individual MBS traffic delivery have been prepared in the target NG-RAN for the UE.

Editor’s Note: How the NG-RAN's 5MBS capability is made known is FFS.

1. Editor’s Note: details on data forwarding, if applicable, needs to wait for RAN WGs.
2. Editor’s Note: details on data forwarding, if applicable, needs to wait for RAN WGs.
3. T-AMF to SMF: The AMF invokes Nsmf\_PDUSession\_UpdateSMContext request towards SMF, the message includes the received N2 SM message.

Based on the received N2 SM message, the SMF can differentiate two cases:

Case A) The Target NG-RAN supports 5G MBS. Step 22 applies and steps 23~29 are skipped.

1. SMF to UPF (PSA): The SMF invokes N4 Session Modification procedure with the UPF (PSA) only for unicast PDU Session. The SMF instructs the UPF to send the end marker packet towards the source NG-RAN and to send subsequent packets towards the target NG-RAN within the unicast PDU Session.

Case B) The target NG-RAN does not support 5G MBS. If the UPF (PSA) is not yet configured to forward multicast data via unicast, steps 23 to 29 apply.

1. SMF to UPF: The SMF may invokes N4 Session Modification procedure with UPF (PSA), the SMF instructs the UPF (PSA) to forward the multicast data received from the MB-UPF via the mapped unicast QoS Flow(s) of the PDU Session within the unicast PDU(i.e., 5GC Individual MBS traffic delivery method will be used). The SMF provides the mapping information between the multicast QFI and the corresponding mapped unicast QFI to the UPF (PSA), the UPF (PSA) forwards the multicast data via the PDU session based on the mapping information. If the delivery tunnel for the MBS session from MB-SMF to UPF is not established yet, the SMF instructs the UPF (PSA) to allocate a tunnel endpoint for the reception of multicast data from the MB-UPF.

If delivery of the multicast data from MB-UPF to UPF needs to be configured, steps 24 to 27 apply.

1. SMF to MB-SMF: The SMF invokes a Nmbsmf\_MBSSession\_Update (MBS session ID, SMF ID, DL tunnel info) request service operation to MB-SMF to establish the shared tunnel between the UPF(PSA) and MB-UPF.
2. MB-SMF to MB-UPF: The MB-SMF configures the MB-UPF with the received DL tunnel Info and instructs the MB-UPF to forward data of the MBS session to the UPF (PSA) via the tunnel. The MB-UPF starts to forward data of the MBS session to the UPF (PSA).
3. MB-SMF to SMF: The MB-SMF responds to SMF through Nmbsmf\_MBSSession\_Update response. If multicast data are transported via multicast, the MB-SMF provides endpoint information (e.g., the Common-TEID) including the transport multicast address.
4. SMF to UPF (PSA): The SMF invokes an N4 Session Modification procedure with the UPF (PSA). If multicast data are transported via multicast, the SMF provides endpoint information including the transport multicast address to the UPF (PSA) and the UPF (PSA) sends IGMP Join in order to receive data from the MB-UPF.

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7.1.5.3 X2/N2 based handover

This clause describes the XnN2 based handover with the MBS Session established at the source 5G MBS-non-supporting NG-RAN side.

If the 5GC Individual MBS traffic delivery method is used at the source NG-RAN node for the MBS Session, the existing X2 /N2 based handover procedure defined in TS23.502[6] is used to support the UE move to Target NG-RAN node.

If the target NG-RAN supports 5G MBS, and the MBS Traffic delivery method has not been switched to 5GC Shared MBS traffic delivery method during the handover, the MBS Traffic delivery method is switched from 5GC Individual MBS traffic delivery method to 5GC Shared MBS traffic delivery method right after the handover.

7.1.5.4 Minimization of data loss

Editor’s Note: Details for how to minimize data loss between the source NG-RAN node and the target NG-RAN node should be aligned with 3GPP RAN WGs.

\* \* \* \* End of changes \* \* \* \*