**3GPP TSG-WG SA2 Meeting #146E e-meeting *S2-2106081r04***

**Elbonia, August 16 – 27, 2021 (revision of S2-210xxxx)**

**Source: Huawei, HiSilicon, Ericsson**

**Title: Multicast session state model**

**Document for: Approval**

**Agenda Item: 8.9**

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

*Abstract: This contribution clarifies the multicast session state model in section 4.3.*

# 1. Discussion

It is proposed to make the following updates:

- Adding reference to the procedural parts: in the last meeting we refined most of the procedures, hence it is proper now to add the references for the session state transition descriptions in section 4.3.

- UEs need to stay in CM-CONNECTED state to receive multicast MBS session data, therefore, it is clarified in Active state that:

"Radio resources for the multicast session are established": RAN node needs to prepare the resources.

"To receive multicast MBS session data, UEs that joined the multicast session shall be in CM-CONNECTED state": since RAN node needs to determine PTM/PTP mode switching therefore the UE shall stay in CM-CONNECTED state to receive multicast MBS data.

- In "Multicast Session Configuration", remove the description about configuration, since such part is already/needs to be included in 7.1.1.1 or 7.1.1.2. Therefore, duplicate the description in this section seems unnecessary.

- There is an EN saying that "It is FFS when the multicast session is in configured state, whether AF can trigger Activation request or Deactivation request. And if AF is not allowed, it is FFS about the implications towards the AF". Since AF does not need to know the session status. And if AF wants to change "active” or “inactive" state, AF could send a unified message, and MB-SMF determines to either only update local multicast MBS session context or additionally trigger the activation/deactivation. It is proposed to remove this EN.

- Remove the duplicated description, i.e., "Triggered by the 5GC" in session activation/deactivation procedures.

- For the last EN "It is FFS whether to merge figure 4.3-1 into figure 4.3-2, and state model in NG-RAN and SMF still needs FFS", State of NG-RAN related to NG-RAN local info stored in deactivation state. It is proposed to remove this EN.

# 2. Text Proposal

It is proposed to capture the following changes vs. TS 23.247.

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

4.3 Multicast session state model

The following illustrate the states for the multicast session:

**- Configured state**: Information about the multicast session (e.g. QoS information) is configured in 5GC NFs (e.g. MB-SMF) serving the multicast session, but no User Plane resources towards NG-RAN are reserved and no MBS data can be transmitted. A TMGI can be allocated for the multicast session. UEs may be allowed to join (subject to authorization check and configuration), but the first accepted UE join request will trigger the multicast session establishment towards the NG-RAN and the UE, see clause 7.2.1.

NOTE 1: The SMF is not involved in the multicast session while the multicast session is in configured state.

NOTE 2: There may be several interim states in the configured state, e.g. TMGI requested, or information about the multicast session provided, but these interim states will not be specified in this release.

- **Active state**: Multicast session is established and MBS data can be transmitted to the UEs that have joined the multicast session. Radio resources for the multicast session are established. To receive multicast MBS session data, UEs that joined the multicast session shall be in CM-CONNECTED state for receiving data of the multicast session. UEs are allowed to join the multicast session (subject to authorization check). 5GC resources and radio resources for the multicast session are reserved for UEs that joined the multicast session.

- **Inactive state**: Multicast session is established but no MBS data is transmitted to the UEs that have joined the multicast session. Radio resources for the multicast session are released, and the UEs that joined the multicast session may be in CM-CONNECTED or CM-IDLE state. UEs are allowed to join the multicast session (subject to authorization check).

The following procedures are defined which result in transition of the multicast session state:

**Multicast Session Configuration**: The AF provides information about the multicast session and optionally request the allocation of a TMGI, see clause 7.1.1.1 and 7.1.1.2. Alternatively, the information about the multicast session can be pre-configured in the network. The configuration may indicate whether the multicast session may be established in active or inactive state and when a multicast session can become active. The AF may provide configuration in several steps, e.g. to first request TMGI and then provide full information about the multicast session and allow it to be established, or to update the information whether the multicast session is to be in active or inactive state after establishment. Multicast session state transitions from NULL to Configured state.

NOTE 3: A multicast session can also be configured by the operator via OAM or be established without prior configuration.

Editor’s Note: How the procedure works if multicast session is configured by the operator or established without prior configuration is FFS.

- **Multicast Session Establishment**: When the join request of the first UE for the multicast session is accepted, the multicast session is established towards the NG-RAN node and the UE, see clause 7.2.1. Multicast session state transitions from NULL or Configured state to either Inactive or Active state.

- **Multicast Session Activation**: See clause 7.2.5.2, Triggered by the 5GC, the radio resources for the multicast session are established and multicast session data starts to be transmitted to the UE. UEs in CM-IDLE state and CM-CONNECTED with RRC Inactive state that joined the multicast session are notified. Activation can be triggered by AF request or data notification from the MB-UPF. Multicast session state transitions from Inactive state to Active state.

NOTE 4: The AF could not be aware, and the NEF will not be aware, whether a session is in configured or established state. An AF may therefore update the session configuration to request the activation of a session prior to the establishment of the session, and this will determine that the session is subsequently established in active state when the first UE joins, but will not trigger the Multicast Session Activation state transition.

- **Multicast Session Deactivation**: See clause 7.2.5.3. Triggered by the 5GC, the radio resources for the multicast session are released and multicast session data stops to be transmitted to the UE. Deactivation can be triggered by AF request or no reception of multicast data by the MB-UPF. Multicast session state transitions from Active to Inactive state.

- **Multicast Session Release**: Triggered by the last UE leaving the multicast session (see clause 7.2.2.2), or Multicast Session De-configuration procedure (7.1.1.5 or 7.1.1.6), the resources for the multicast session are released in both 5GC nodes and RAN nodes, see clause 7.2.2. Multicast session state transitions from Active or Inactive state to Configured.

- **Multicast Session De-configuration**: All information about the multicast session is removed from the 5GC, and the TMGI for the multicast session (if allocated during Multicast Session Configuration) is deallocated, see clause 7.1.1.3 or 7.1.1.4. The deconfiguration may be triggered by an AF request. Multicast session state transitions from Configured, Active or Inactive state to NULL.

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**Figure 4.3-1: Multicast session states and state transitions**



**Figure 4.3-2: Multicast session states and state transitions in MB-SMF**

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**Figure 4.3-4: Multicast session states and state transitions in NG-RAN**

NOTE: Multicast session states and state transitions in NG-RAN is for illustration purpose, the final decision will be made by RAN WGs.

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**Figure 4.3-5: Multicast session states and state transitions in SMF**

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