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**Source: Nokia, Nokia Shanghai Bell,**

**Title: Updates to Evaluation and Conclusion for key issue 2**

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**Work Item / Release: FS\_5MBS\_Ph2 / Rel-18**

*Abstract of the contribution: This paper proposes updates to evaluation and conclusions for key issue 2 based on the incoming RAN3 LS S2-2210195.*

# 1 Introduction

Soln #2, #7. #8, #9, #24 and #29 are proposed to address Key Issue #2: 5MBS MOCN Network Sharing.

**Objective:** Among the various solutions, the major point of argument is whether to use –

1) a single TMGI for the shared MBS service. Solution #29, #7 with TMGI option and Solution #8 falls under this category

2) multiple native TMGIs (corresponding to each PLMN). Solution #2, and #7 with SSM option falls under this category.

* Note that, other solutions (#9, #24) are not ruled out for the normative phase in SA2. However, from RAN3 LS (S2-2210195) it is clear that, from RAN WG perspective, only solutions #2, #7, #24 and #29 can work and are preferred. The exact response from RAN3 LS is

Solutions #2, #7, #24 and #29 can work, while solutions #2, #7 with majority support in RAN3.

Besides, RAN3 also achieved the following agreements:

* + The solution should not have impact on Rel-17 UE and Rel-17 gNB
  + The identity providing a reference to the same MBS service should not depend on the momentarily participating operators considering of the possibility for sharing operators leaving or entering the common ongoing session from time to time, that’s to say the solution should be robust to cover the cases that the shared PLMNs start and stop the MBS session at the same time and start and stop the MBS session at the different time
  + It could not be assumed that MB-SMF/AF/MBSF is aware which NG-RAN node or which cell within a NG-RAN node is shared since currently NG-RAN node only inform AMF of the supported PLMN and no coordination with MB-SMF/AF/MBSF
  + Solution 24 brings configuration efforts which may have flexibility and scalability issue in case MBS services are dynamically added or removed

Therefore, in this conclusion paper our objective is to discuss various aspects of the above mentioned preferred solutions and draw conclusion for the normative phase accordingly.

**Possible Deployment Scenarios:**

In a shared MOCN RAN deployment, there can be various scenarios with the following possibilities

1. All RAN nodes in the PLMN are shared
2. Some RAN nodes of a PLMN are shared some are non-shared
3. Some RAN nodes are Rel 18 nodes, some are Pre-Rel. 18 nodes
4. Some UEs are Rel. 18 UEs, some are Pre-Rel. 18 UEs

**On the Solution #2 and #7-SSM option (option1):**

In the updated version, Soln#7 proposes to use associated session ID to be passed from the AF to NG-RANs via 5GCs. The associated session ID can be SSM or TMGI as two options.

*Multiple TMGIs*: In these solutions, there will be multiple individual TMGIs used with respect to each CN. There will be more signalling overhead in terms of multiple TMGI allocations, multiple MBS service requests and multiple service announcements.

*Multiple Service announcements:* If the NG-RAN node is shared then, in this solution there would be multiple MBS session set-ups for each PLMN, multiple service announcements for UEs of each PLMN, and multiple broadcasts from NG-RAN.

*For shared NG-RANs:* It will receive multiple MBS service requests each with one individual native TMGIs along with assistance information. For the solution #7 the identification is SSM (source specific multicast) address. However, the SSM is optional one and AF may use individual transport for the UPF.

*For non-shared NG-RANs:* As reported in RAN3 LS response, “It could not be assumed that MB-SMF/AF/MBSF is aware which NG-RAN node or which cell within a NG-RAN node is shared since currently NG-RAN node only inform AMF of the supported PLMN and no coordination with MB-SMF/AF/MBSF”, therefore, it would be difficult to customize the MBS service set-ups among shared and non-shared NG-RAN nodes. It would be idle to have a single TMGI that can be used towards all shared plus non-shared NG-RAN nodes.

*For pre-Rel. 18 RAN nodes*: No major issues.

*For pre-Rel. 18 UEs*: No major issues.

**In summary, those solutions have the following disadvantages:**

* Redundant broadcast of configuration for all TMGIs (for shared Rel-18 nodes)
* Redundant broadcast of data and configuration for all TMGIs (for shared Rel-17 nodes)

**On the Solution #7 TMGI option (Option2):**

It is understood that RAN3 did not yet consider this new option added at the last SA2 meeting.

In the updated version, Soln#7 proposes to use associated session ID to be passed from the AF to NG-RANs via 5GCs. The associated session ID can be SSM or TMGI as two options. In the TMGI option (let’s say, option 2), the NG-RAN uses the TMGI indicated in the associated session ID in radio interface, instead of the TMGI of broadcast MBS session.

*Single TMGI:* In this option they propose to use a single, Spcl. TMGI. However, the method does not have any improvement over the efficiency. For example,

* Multiple TMGIs are anyway allocated with each shared CNs and AF selects one among the allocated ones as the special TMGI.
* AF sends multiple service requests as usual with individual native TMGIs plus the special TMGI as additional indication.
* AF sends several TMGIs in the service announcement (the shared TMGI for supporting nodes and non-shared TMGIs for non-supporting nodes) (While this is not clearly stated in the updated solution 7, it seems assumed in the evaluation of the solution)

*Multiple Service announcements:* If the NG-RAN node is shared then, in this solution there would be multiple broadcast MBS session set-ups for each PLMN and multiple service announcements for UEs of each PLMN, separately. Moreover, there will be additional service announcements with Spcl. TMGIs.

*For shared NG-RANs:* It will receive multiple MBS service requests each with one individual native TMGIs and one Spcl. TMGI (indicated in assistance information). The shared NG-RAN would ignore the native TMGI and broadcast the Spcl. TMGI. In such case a pre-Rel.18 UE cannot able to decode and receive the broadcast service which is a severe backward compatibility issue.

*For non-shared NG-RANs:* It also proposes to use the same TMGI for both, shared as well as non-shared NG-RANs. However, it is not clear as why the non-shared NG-RAN needs assistance information? Moreover, if both shared and non-shared Rel 18 RAN nodes can receive and use same Spcl. TMGI, what is the need for including the individual native TMGIs?

*For pre-Rel. 18 RAN nodes*: It is mentioned that the Pre-Rel-18 NG-RANs will ignore the special TMGI and continue to establish the broadcast MBS sessions using the native TMGI. However, this is to be noted that the Spcl. TMGI is part of the additional information, and the pre-Rel-18 RAN node has to upgraded to understand this and ignore.

*For pre-Rel. 18 UEs*: Pre-Rel-18 UEs can only receive the MBS broadcast when the TMGI that they received though service announcement match with TMGI broadcasted by the NG-RAN. In case of this solution, even if multiple service announcements are done, it is not clear that how a pre-Rel-18 UE can select the service announcement with Spcl. TMGI and not with its own native TMGI.

**In summary, this solution has the following disadvantages:**

* Non-backward compatible with Rel-17 UEs (due to multiple TMGIs in the service announcement)
* Redundant broadcast of data and configuration for all TMGIs (for shared Rel-17 nodes)

**On Solution #29:**

*All-purpose single TMGI*: Soln#29 proposes to create broadcast MBS sessions with a single TMGI and optional MOCN signalling flag, so that the shared NG-RAN can determine and bring one broadcast MBS session over the air. Therefore, there is **less signalling overhead.**

*For shared NG-RANs:* The NG-RAN may receive multiple MBS service set-up requests (with same TMGI) or a single shared service set-up request. In case of multiple service requests, the NG-RAN can ignore all and use only one.

*For non-shared NG-RANs:* It also proposes to use the same TMGI for both, shared as well as non-shared NG-RANs.

*For pre-Rel. 18 RAN nodes*: They need not decode/read the TMGI information and simply use the single common TMGI.

*For pre-Rel. 18 UEs*: They receive the common TMGI in service announcement as well as from NG-RAN. So, they can receive the MBS broadcast service.

*Multiple Service announcements:* With solution #29, it is possible to have a single MBS session set-up and single shared service announcement by the AF. This is because only solution #29 advocates to use a single TMGI that can work, both shared RAN nodes (both, Rel 18 and pre-Rel-18), non-shared RAN nodes (both, Rel-18 and pre-Rel-18).

**In summary, this solution has the following advantages:**

* Small system and implementation impacts as no new identifier is required.
* Backward compatible with Rel-17 UEs
* No redundant broadcast of data and configuration for all TMGIs (for shared Rel-17 and Rel-18 nodes)
* The same service announcement can be used towards UEs in all PLMNs

The solution has a potential issue if non-shared Rel-17 nodes reject an TMGI with a MNC and MCC of a different PLMN, but this would be non-standardized behavior. It is suggested to clarify in Rel-17 that this behavior is not appropriate.

**On Solution #24:**

**This solution has the following disadvantages:**

* Redundant broadcast of configuration for all TMGIs (for shared Rel-18 nodes)
* Redundant broadcast of data and configuration for all TMGIs (for shared Rel-17 nodes)
* configuration efforts which may have flexibility and scalability issue in case MBS services are dynamically added or removed (see RAN3 LS)

# 2 Proposal

It is proposed to include the following changes in TR 23.700-47.

\*\*\* 1st Change \*\*\*

## 7.2 Key Issue #2: 5MBS MOCN RAN Sharing

Soln #2, #7. #8, #9, #24 and #29 are proposed to address Key Issue #2: 5MBS MOCN Network Sharing.

Soln#2 proposes a solution of providing an additional identifier by the AF towards the MB-SMF when creating MBS sessions. The MB-SMF passes it to the NG-RANs. Based on the additional identifier, the shared NG-RAN can understand multiple Broadcast MBS sessions are transferring the same content and deliver packets from one session over the air.

Soln#7 proposes to use associated session ID to be passed from the AF to NG-RANs via 5GCs, to enable shared NG-RAN to associate multiple Broadcast MBS sessions. The shared NG-RAN associate multiple Broadcast MBS sessions and deliver packets from one session over the air. The associated session ID can be SSM or TMGI as two options. To further saving CN resources and NG-RAN processing efficiency, Soln#7 proposes to establish one user plane within those broadcast MBS sessions. In case there is a failure in the on-going user plane, shared NG-RAN will initiate the establishment of another user plane towards another 5GC.

Soln#8 proposes to use MOCN TMGI to create one broadcast MBS session towards one 5GC for those shared NG-RANs, and if all NG-RANs under MBS service area are not shared, also create one broadcast MBS session towards each 5GC for each PLMN for those dedicated NG-RANs.

Soln#9 proposes pass all the associated TMGIs from the AF towards the MB-SMF when creating MBS sessions. The MB-SMF pass the TMGI list to the NG-RANs. The NG-RAN selects the primary TMGI and return the primary TMGI and its usage area to the AF via the MB-SMF, so that AF can update service announcement to let UEs to understand the TMGIs and their corresponding usage area. To further saving CN resources and NG-RAN processing efficiency, Soln#9 also proposes not to establish the user plane in case the TMGI of the broadcast MBS session is not the primary TMGI.

Soln#24 proposes to configure the associated TMGIs in NG-RANs, so that shared NG-RAN can associate multiple broadcast MBS sessions and delivery the content of one broadcast MBS session over the air.

Soln#29 proposes to use the same TMGI to create broadcast MBS sessions towards each 5GC together with a MOCN signalling flag to differentiate from normal broadcast MBS sessions. Soln#29 also proposes to establish one user plane within those broadcast MBS sessions. In case there is a failure, shared NG-RAN will initiate the establishment of another user plane towards another 5GC.

The evaluation can be performed from the following aspects:

**Whether the solution can enable shared NG-RAN to optimize radio resource utilization for MOCN network sharing deployment?**

These criteria can be used to evaluate whether the solution can address KI#2.

Soln#2 and Soln#7 introduce additional identifier and associated session ID to be provided by the AF. The AF provide it to the MB-SMF in MBS session creation. The MB-SMF passes it to the NG-RANs, so that shared NG-RAN can bring data from one broadcast MBS session over the air.

Soln#8 proposes to create only one broadcast MBS session towards shared NG-RAN, so the shared NG-RAN will only deliver the data from this broadcast MBS session over the air.

Soln#9 passes all the relevant TMGIs to the NG-RAN, so that shared NG-RAN will select the primary TMGI and deliver the data from the broadcast MBS session identified by the primary TMGI.

Soln#24 configures the associated TMGIs in NG-RANs, so that shared NG-RAN can bring data from one broadcast MBS session over the air.

Soln#29 proposes to create broadcast MBS sessions with the same TMGI and additional MOCN signalling flag, so that the shared NG-RAN can determine and bring one broadcast MBS session over the air.

All those solutions can address KI#2.

**Whether the solution can be applied to any deployments?**

In MOCN network sharing deployment, it is possible that not all NG-RAN nodes are shared. There may be some NG-RAN nodes dedicated to specific PLMN which connected to the corresponding 5GC. The assumption that all NG-RAN nodes are shared in MOCN network sharing deployment cannot be made.

In Soln#2, Soln#7, Soln#9, Soln#24 and Soln#29, AF creates each broadcast MBS session separately, so that the shared NG-RAN will receive multiple broadcast session setup requests and offer the service, while the dedicated NG-RAN will receive only the corresponding broadcast session setup request to offer the service.

In Soln#8, AF creates one broadcast MBS session towards one 5GC for those shared NG-RAN nodes, and if all NG-RAN nodes under MBS service area are not shared, creates one broadcast MBS session towards each 5GC for those dedicated NG-RAN nodes.

**Whether extra efforts are needed when introducing a new MBS service?**

To introduce a new MBS service (e.g. a TV channel), it is important to evaluate whether extra efforts are needed.

In Soln#2, Soln#7, Soln#8 and Soln#29, AF can perform TMGI allocation and broadcast MBS session creation as in Rel-17. Soln#9 requires all relevant TMGIs to be allocated prior to the broadcast MBS session creation, which are minor implications on the AF. For those solutions, the new MBS service can be introduced by the invoking Nmbsmf or Nmbsf APIs, without additional efforts.

Soln#24 requires the coordination of the O&M configuration in NG-RANs (provision relevant TMGIs) and service operation (TMGI allocation and broadcast MBS session creation). The O&M configuration is done prior to TMGI allocation, since the TMGI belongs on a pre-agreed service-id range amongst the participating PLMNs. For example, if PLMNs with MCC=234, MNC=15 (operator A) and MCC=234, MNC=10 (operator B) are doing MBS RAN sharing, the corresponding RAN nodes are already configured with the PLMN-ids of each of the sharing partner and can be configured with the specific respective service-id (6 digits numbers) of the TMGIs of two PLMNs that correspond to the same content or even range of service-ids. For instance, service-id=123456 (for operator A) and service-id=001234 (for operator B) corresponds to content from "TV channel X".

For all solutions, prior to introducing new MBS services, the configuration in all shared NG-RANs need to be done beforehand.

**How many TMGIs are advertised by a shared NG-RAN?**

The number of TMGIs advertised will cause some impacts on the radio resource efficiency.

Soln#2, Soln#7 SSM option and Soln#24 propose to have all the relevant TMGIs advertised, and those TMGIs point to the same radio resource for broadcast data delivery. Soln#7 TMGI option only has one TMGI advertised.

Soln#8 only has one MOCN TMGI advertised.

Soln#9 only has the selected primary TMGI advertised.

Soln#29 only has one common TMGI advertised.

**Is it backward compatible (service announcement impacted)?**

The backward compatibility is an important aspect in the evaluation. If the solution is backward compatible, it can benefit Rel-17 UEs to work in the optimized way. All the solutions are backward compatible in radio interface, but some are not in the service announcement.

In Soln#2, Soln#7 SSM option and Soln#24, there are no impacts on service announcement. Each UE will get the service announcement with its own TMGI with the PLMN ID it belongs to.

In Soln#29 and Soln#7 TMGI option, each UE will get the service announcement with a common TMGI, which may have different PLMN ID from its network.

However, Soln#7 TMGI option assumes in addition that the service announcement includes the TMGI for non-shared RAN nodes. Including several TMGIs in one service announcement is not backward compatible.

In Soln#8, there are no impacts on service announcement as well. Each UE may get the one service announcement with MOCN TMGI and another one with its own TMGI (i.e. TMGI dedicated to PLMN) if not all NG-RAN nodes under MBS service area are shared. However, the user needs to switch the MBS sessions when the UE moves between shared and non-shared cells, as the service announcements are not correlated.

In Soln#9, AF needs to consolidate the information it receives from all shared NG-RANs and include TMGIs with their usage area in service announcement.

**How UE receives broadcast MBS session data?**

The complexity of the UE logic is not negligible.

In Soln#2, Soln#7 SSM option and Soln#24, a UE can receive the broadcast MBS session data with its own TMGI, as indicated in the service announcement. In Soln#29 and Soln#7 TMGI option, a UE receives the broadcast MBS session data with a common TMGI in the service announcement.

In Soln#8, each UE may use the MOCN TMGI or its own TMGI to receive the broadcast MBS session data, depends on whether it is served by a shared NG-RAN or dedicated NG-RAN.

NOTE: When the UE receives Service Announcement including MOCN TMGI and Service Announcement including its own TMGI (i.e. TMGI dedicated to the PLMN) for same service from the AF, the service layer (e.g. 5MBS client, MC service client) or the application layer of the UE needs to be able to understand the MOCN TMGI and its own TMGI are for same service based on the information in the service announcements, e.g. SDP info with IP multicast address and port#, Service ID, and UE needs to be able to switch the listening TMGI when moving to the new cell without broadcasting the currently used TMGI. However, the lower layer does not have to be aware that these two TMGIs are for same service.

In Soln#9, a UE needs to determine its location and find the appropriate TMGI to be used. And then, it can use the selected TMGI to receive broadcast MBS session data.

**Is the solution resource efficient in CN and NG-RAN processing?**

For those multiple broadcast MBS sessions, only the packets delivered over one broadcast MBS session will be used. The packets over other broadcast MBS sessions will be dropped, which wastes not only 5GC transportation resource, but also NG-RAN processing resource.

Soln#2 and Soln#24 propose to establish all user planes which improves the service reliability, but less resource efficient.

Soln#7, Soln#9 and Soln#29 propose to establish one user plane across those broadcast MBS sessions. In case the on-going one fails, NG-RAN initiates the establishment of another user plane, to improve the service reliability. In this approach, there will be some additional service interruption time for the user plane re-establishment (from MB-UPF to NG-RAN). However, compared with the error detection period, the additional user plane establishment period is small.

In Soln#8, each NG-RAN has only one broadcast MBS session. Note that there is a trade-off between *"resource efficient in CN and NG-RAN processing"* and *"the efforts to re-establish the shared tunnel when currently used N3mb tunnel is released"*. Having multiple shared tunnels could be beneficial for that case.

**Are there signalling impact in 5GC and NG-RAN?**

All solutions require service operation update provided by MB-SMF, as it is a new feature to be introduced. Some solutions avoid signalling impact in 5GC and NG-RAN, while some require.

Soln#2 and Soln#7 require an additional identifier (associate session ID) to be passed from the AF to NG-RAN via 5GC. Soln#9 requires the complete TMGI list to be passed. Soln#29 requires a MOCN signalling flag to be passed and the TMGI in use may have different PLMN ID.

Soln#8 requires MB-SMF return shared MBS service area to AF, but there is no signalling impact in 5GC and NG-RAN.

Soln#24 avoids the signalling impact by the configuration in NG-RAN. However, depends on the alternatives to be chosen, it may require TMGI allocation to be delegated to NEF or MBSF.

**Does AF require knowledge which NG-RAN node or which cell within a NG-RAN node is shared?**

Sol#8 assumes that the AF has such knowledge.

Sol#9 assumes that the AF is informed by the RAN about a primary TMGI and its opticality area. It can thus derive shared areas but does not need such knowledge when establishing the MBS session.

Sol#2, Sol#7, Sol#24 and Sol#29 do not require that the AF has such knowledge.

**Can the PLMNs involved in a shared MBS broadcast session start and stop the MBS session at different times?**

In Sol#8 the session would be interrupted if the PLMN used for the shared MBS session leaves the MBS session. Although the AF could subsequently re-establish the session via a different PLMN.

Sol#2, Sol#7, Sol#9, Sol#24 and Sol#29 allow that PLMNs involved in a shared MBS broadcast session start and stop the MBS session at different times. For solution#29 note that the MBS session release is independent of the TMGI de-allocation.

**Does the AF require knowledge of the UE´s PLMN when sending a service announcement?**

The AF may provide service announcements via application specific means, for instance via UEs reading a Web page. It may be complicated for an AF to determine the PLMN of a UE when providing the service announcement.

Sol#2, and Sol#7 assume that the service announcement contains different TMGIs for different PLMNs.

Sol#8 assumes that the AF may provide additional PLMN-specific service announcements for non-shared nodes.

Sol#9, Sol#24 and Sol#29 do not require that the AF has knowledge of the UE´s PLMN when sending a service announcement.

Table 7.2-1 illustrate the comparison of the solutions for KI#2 5MBS MOCN Network Sharing.

Table 7.2-1: Comparison of solutions for KI#2 5MBS MOCN Network Sharing

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Solution | | | | | |
| Evaluation Aspects | 2 | 7  (NOTE 3) | 8 | 9 | 24 | 29 |
| **Enable shared NG-RAN to optimize radio resource utilization** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Applicable to any MOCN network sharing deployment** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Additional efforts required when introducing a new MBS service** | No | No | No | No | Yes | Yes |
| **Number of TMGIs advertised** | All | All/One | One | One | All | One |
| **Backward compatible (regarding no Service announcement impact)** | Yes | Yes/No | Yes | No | Yes | Yes |
| **Is movement between shared and non-shared nodes transparent to the user?** | Yes | Yes | No | Yes | Yes | Yes |
| **Additional logic in UE when receiving data** | No | No/No?  (NOTE 1) | No? (NOTE 1) | Yes | No | No |
| **Resource Efficiency in 5GC and NG-RAN** | No | Yes | Yes | Yes | No | Yes |
| **Additional effort for recovering data transmission (NOTE 2)** | No | Yes | NA | Yes | No | Yes |
| **Signalling impacts in 5GC and NG-RAN** | Yes | Yes | No | Yes | No | Yes |
| **Does AF require knowledge which which cells are shared?** | No | No | Yes | No | No | No |
| **Can the PLMNs involved in a shared MBS broadcast session start and stop the MBS session at different times?** | Yes | Yes | No | Yes | Yes | Yes |
| **Does the AF require knowledge of the UE´s PLMN when sending a service announcement?** | Yes | Yes | Yes | No | No | No |
| NOTE 1: The service layer or application layer of the UE may be impacted as described in the NOTE under *"How UE receives broadcast MBS session data?"* It applies to Soln#8. It does not apply to Soln#7 SSM Option. It applies to Soln#7 TMGI option only when there are pre Rel-18 NG-RANs.  NOTE 2: The answer "No" means NG-RAN needs to detect the failure and switch the user plane locally, the "Yes" means NG-RAN needs to establish user plane towards another CN additionally, and the “NA” means it is the same as the MBS session for non-MOCN scenario.  NOTE 3: The first value refers to SSM option and the second value refers to TMGI option, when there are two values in the cell. | | | | | | |

Besides those criteria mentioned above, some other issues shall also need to be taken into consideration:

**Whether AF can release MBS sessions flexibly?**

It is possible for the AF to request to trigger the MBS session deletion procedure for one or several PLMNs after a while.

Soln#2 and Soln#7 SSM option use extra ID to identify the service, therefore the release of one PLMN will not affect other PLMNs. Soln#24 assumes the relationship is pre-configured therefore releasing will not affect others as well.

Soln#8, Soln#29, and Soln#7 TMGI option propose to use MOCN TMGI (or same TMGI). However, a TMGI can be allocated and released separately from an MBS session, and thus the MOCN TMGI (or same TMGI) must be kept not deallocated when the MBS session towards this PLMN is stopped, if it is still in use by other PLMNs.

Soln#9 proposes to pass all the associated TMGIs from the AF towards the MB-SMF when creating MBS sessions. When releasing the broadcast MBS session for one PLMN, the MBS session context of the PLMNs needs to be updated as well, which requires further clarification. Or the AF must keep holding the associated TMGIs till all relevant MBS sessions are released.

**Whether the solution can be compatible with pre Rel-18 NG-RANs?**

With the compatibility of pre Rel-18 NG-RANs, operators can deploy the MBS service freely. Otherwise, the optimization developed for KI#2 cannot be applied, until all the NG-RAN nodes are upgraded.

In Soln#2, Soln#7 SSM Option and Soln#9, the additional information (associated session ID, TMGI list) is sent to NG-RAN as an optional parameter. Pre Rel-18 NG-RANs will ignore the parameter and continue to establish the broadcast MBS sessions in legacy way. The optimization will not be applied to pre Rel-18 NG-RANs, i.e. the same MBS content will be broadcasted several times over the air interface. However, the Soln#9 brings additional requirements on AF to construct the mapping of the primary TMGI and the usage area manually.

In Soln#24, no additional information needs to be passed to NG-RAN, and thus pre Rel-18 NG-RANs could work naturally.

In Soln#8 uses MOCN TMGI and native TMGI to separately target different NG-RAN nodes. There are no issues for dedicated pre Rel-18 NG-RANs, but for those shared pre Rel-18 NG-RANs, the MOCN TMGI may not be supported.

Soln#29 assumes the TMGI from one certain PLMN as the common TMGI and uses it as the TMGI together with the MOCN signalling to create broadcast MBS sessions in all of the PLMNs requested by the AF. The MCC/MNC (i.e., PLMN ID) field of the common TMGI can be different from the current PLMN about to establish the broadcast MBS session, and there is no standardized requirement to check those fields or not. A dedicated pre Rel-18 NG-RAN nodes could not support the TMGI if it checks the MCC/MNC. There are different views on whether Rel-17 will be affected and whether the proprietary behavior can be ruled out. Depending on implementation, a shared pre Rel-18 NG-RAN node may only accept the first broadcast MBS session, while reject the later ones with the same TMGI. A shared pre Rel-18 NG-RAN node may accept all broadcast session setup requests with the same TMGI and only store the MBS session context of the latest one. However, the UEs from all PLMNs will be able to receive the MBS session using that TMGI and the MBS data will only be transmitted a single time.

Soln#7 TMGI option also uses a common TMGI to be associated session ID. Pre Rel-18 NG-RANs will ignore it and continue to establish the broadcast MBS sessions using the native TMGI (the TMGI in MBS session ID). The broadcast MBS session establishment and content delivery work in the legacy way. However, it also requires AF to use native TMGI in service announcement, which leads to the similar service announcement issue as Soln#8 (multiple TMGIs are provided to the UE for the same MBS service).

\*\*\* 2nd Change \*\*\*

## 8.2 Key Issue #2: MOCN network sharing

### 8.2.1 Interim Conclusions

For conclusions, the following aspects will be considered:

- For solutions where the broadcast MBS sessions for different PLMNs are established towards a NG-RAN node, the NG-RAN node shall be able to identify the same MBS service and avoid multiple deliveries over radio.

- A solution compatible with Rel-17 UEs is preferred.

The following interim conclusions will be taken into account:

- It should be possible not to establish all the shared delivery tunnels to the same NG RAN from different PLMNs for the same MBS service.

- The solution should support scenario where all RAN nodes are shared by PLMNs and the scenario where only part of the RAN nodes are shared by PLMNs.

- The solution should allow the PLMNs involved in a shared MBS broadcast session to start and stop the MBS session at different times.

- The solution should not require that MB-SMF, AF, or MBSF is aware which NG-RAN node or which cell within a NG-RAN node is shared.

- If possible, a common TMGI applicable in all PLMNs participating in the MBS session is preferred as MBS session identifier,

- NEF should be able to validate whether an AF is allowed to create an MBS session for MOCN network sharing

- If different AFs interact with different PLMNs for the same MBS session with MOCN network sharing, those AFs need to coordinate MBS session identifiers applicable in all PLMNs. and need to provide the same data for the MBS session via means outside the scope of 3GPP.

### 8.2.2 Conclusions

Normative work for key issue 2 will be based on solution 29.

NOTE: During the normative work, coordination with RAN WGs is required.