3GPP TSG-RAN WG3 #114-e R3-215887

Online, 01 – 11 Nov, 2021

Agenda Item: 22.2.2

Source: Huawei (moderator)

Title: Summary of discussion on MBS1\_SessMgmt

Document for: Approval

# Introduction

**CB: # MBS1\_SessMgmt**

**- Procedures and detail IEs for multicast group paging?**

**- Procedures and detail IEs to setup/release shared N3 tunnel?**

**- Procedures and detail IEs for multicast session activation/deactivation/setup/release/modify and whether to support activation/deactivation procedure?**

**- Procedures and detail IEs for broadcast session activation/deactivation/update and whether to unify broadcast and multicast procedures?**

**- TPs if agreeable and check details, split work, if needed**

**- Capture agreements and open issues**

(HW - moderator)

Summary of offline disc

# For the Chairman’s Notes

//to be added

# Discussion

*Moderator’s Note: Please notice that this sod takes the latest SA2 progress made in SA2#147e meeting into account as well.*

## Multicast Session Management

### Signalling design on Providing MBS Session and Flow info from CN to RAN

The contributions [1] [5] [6] [9] [15] [18] provide the details about providing MBS session and flow info from CN to RAN. There are 2 options as follow:

* Option 1: Update UE associated NGAP: PDU Session Resource Modify Request Transfer IE and PDU Session Resource Setup Request Transfer IE to include detailed MBS Context. [1][6][9][15][18]
* Option 2: Introduce an AMF initiated class 1 procedure to setup MBS context in NG-RAN node. In the request message, multicast QoS flow information and tunnel information included in the MB-SMF container is transferred to NG-RAN node. [5]

**Question 1: Which option do you prefer to provide MBS session and flow info from CN to RAN? Why?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Option 1 | There has agreement that no MBS Session Start for multicast. |
| Nokia | Option 1 | Agree with Huawei. |
| Qualcomm | Option 1 | Slightly prefer option 1 because it is aligned with SA2 spec better.  Option 2 is acceptable too. Supporting both are also fine.  Option 2 decouples MBS session context establishment and MBS UE context establishment. So, it is flexible e.g. in supporting MBS session pre-establishment for delay reduction and may be more efficient in signaling load. |
| CMCC | Option 1 | A long lasting discussion, a decision should be made now. |
| Lenovo, Motorola Mobility | Option 1 |  |
| ZTE | Option 1 for multicast | For multicast service, we prefer to use option 1. Because multicast session related procedure is a kind of UE associated procedure. Just to clarify the wording “*MBS Context*” in the description above. |
| CATT | Option 2 | It is OK to use UE associated procedure to support UE join procedure. However, as to the establishment of multicast session in NG-RAN node, we think it is more proper to use non UE associated procedures with the following reasons:  First, the QoS information for MBS flow is common to all UE, it is reasonable to transfer this information via non UE associated procedure.  Secondly, admission control for MBS flow could only be supported by option 2.We could not assume that the NG-RAN node could always admit all flows/PDU sessions. |
| Ericsson |  | The nature of the MBS feature calls for solutions that avoid per-UE activities, especially when those per-UE activities have to be performed within a short (or: as short as possible) period of time. The consequence, once one has understood and accepted those obvious facts is, that Option 1 can only lead to performance disasters and system instabilities once the feature is switched on.  Apart from that,  a) there is a Session Activation message foreseen by SA2 for which SA2 clarified during discussions that it can be sent as the first message to RAN. so option 2 does not need to be newly introduced, it exists already.  b) there is the possibility that UEs are in CM-CONNECTED w/o associated PDU Session Resources established (due to other current activities or due to the option foreseen in SA2 spec to not activate the UP for an associate PDU Session). this calls for a generalized solution. NOTE: please add discussion to that topic in your SoD. we are puzzled that this is generally ignored throughout the papers.  c) there is no reason to start wasting time while performing associated PDU Session Activation or Modification to only get the MBS Session information to RAN, the same information in every single per-UE configuration process. The very much acceptable minor delta to support establishment of MBS Session resources for CM-CONNECTED UEs w/o associated PDU Session resources would be provision of joining information outside associated PDU Session context to RAN.  d) different sources for the same MBS Session information is a conceptual rocky-horror-picture-show. you may show affection for destructive system concepts that sounds like ultra-hard-metal-music, but again, MBS calls for a one-trigger-serves-all approach, that should be really obvious. The only little difference to SA2 would be the timing of an already foreseen signal and adding MBS Session information to that signal, and we are really fine. a tiny delta. |
| NEC | Option 1 |  |
| Samsung | Option 1 and 2, with comments | A non-UE associated procedure is required for multicast. The purpose of non-UE associated procedure is to active the multicast. Therefore we agree option 2 with some modification of option 2. e.g. QoS flow information can be included in the Session Request message from the CN to NG-RAN. However the shared tunnel information is not included in this Session Request/Response message. |

In contribution [15], the update procedure for multicast are proposed as follow:

* The existing NAGP PDU Session Resource Modification procedure shall be enhanced to support multicast session update in case ARP of QoS parameters is updated.
* A new NAGP procedure (e.g., multicast session update) shall be introduced to support multicast session update in case the QoS parameters other than ARP needs to be updated, it is a non-UE associated NGAP procedure triggered by MB-SMF.

Based on approved S2-2108002, the Multicast session update procedure is modified to be allow update the service requirement (result in multicast QoS parameters update and/or multicast QoS flow addition/removal) and/or MBS Service Area for an ongoing multicast session.

Thus, from the moderator point of view, we propose:

* Introduce non-UE associated NGAP procedure (e.g., multicast session update) triggered by MB-SMF to support multicast session update in case the change of QoS parameters or service area.

**Question 2: Do you agree with the proposal above? Why?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | YES |  |
| Nokia | Partly | OK to introduce Session Update but according to TS 23.247, the non-UE associated Session Update is instead introduced to e.g. update the ARP (see section 7.2.6). |
| Qualcomm | Yes |  |
| CMCC | Yes |  |
| Lenovo, Motorola Mobility | Yes | The update of ARP should be carried by the non-UE associated procedure. |
| ZTE | Yes |  |
| CATT | Yes | Besides, we think the session update procedure should be a class 1 procedure in which the NG-RAN node could provide the success/failure of the update. |
| Ericsson |  | If you assume that an MC Session Update procedure is able to provide MBS Session parameters, why shouldn’t it possible to also introduce those parameters into the MBS Session Activation signal already foreseen in SA2 TS?  Don’t understand the ARP/other parameters difference. |
| NEC | Yes |  |
| Samsung | Yes | Non-UE associated NGAP procedure for update is needed. |

In contribution [11], PDU Session Resource Setup Required procedure is introduced for the NG-RAN node to request the setup of PDU Session Resources associated to a Multicast MBS Session the UE has joined.

**Question 3: Do you agree to introduce NGAP: PDU Session Resource Setup Required procedure? Why?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | NO | According to section 7.2.1.3 step 1 of TS 23.247 V17.0.0, the UE will send UL NAS message (N1 SM container (PDU Session Modification Request)) to AMF in order to join the multicast group. This is not NGAP message obviously. |
| Nokia | NO | Agree with Huawei. The proposal is not aligned with TS 23.247. |
| Qualcomm | Depending on question 1 | No need if option 1 of question 1 is selected.  If option 2 is supported, this procedure is necessary for the scenario MBS UE context is established before MBS session context. |
| CMCC | No |  |
| Lenovo, Motorola Mobility | No | If option 1 of Question is adopted, the procedure is not needed. |
| ZTE | No | We share the similar view with HW. Based on the SA2’s description, UE can trigger the MBS session setup by UL NAS message. We prefer to follow the SA2’s description. |
| CATT | FFS | Related to the decision on MBS session establishment procedure |
| Ericsson |  | Not providing this question in the context within which the proposal was made is very misleading.  You really have to read this in the context of the possibility to support not activating the UP for an associated PDU Session, as introduced by SA2, together with the possibility foreseen by RAN2 to support MRB only RRC configuration. As long as we do need to cope with existing inter-gNB mobility procedures and want to support such RRC configuration, we should at least foresee the option to perform HO.  this, btw, would deserve a separate discussion point, as pointed out above. why are all papers so silent on that topic? SA2 TS contains a clear hint that RAN feedback is needed. |
| NEC | No | See our comment in Q1, NGAP PDU Session Resource Setup Required procedure is not required. |
| Samsung | No |  |

In second round, we will discuss the detail IEs for providing MBS session and flow info. Before we discuss it, there’s a question that needs to be clarified. In contribution [11][15], the MB-SMF container is mentioned in TP of 38.413. We can discuss whether to introduce it.

**Question 4: Whether to introduce and define new MB-SMF containers to TS 38.413?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Ok but | It seems cleaner, but it is better to further check with SA2/CT4. |
| Nokia | Ok but | Same view as Huawei. |
| Qualcomm | OK | Agree with Huawei and Nokia. |
| CMCC | OK |  |
| Lenovo | OK |  |
| ZTE | OK | We think the MB-SMF container is necessary for the MBS procedure. Detail Ies inside the container can be further discussed by companies. |
| CATT | OK | Similar view with Huawei |
| Ericsson |  | we have always assumed that there is quite some alignment between the functional concepts of PDU Session and MBS Session Resource concepts: while the customer of a PDU Session is a single UE, the customer of a MBS Session is the session itself, or the multitude of Ues forming the group. Guess we captured this in our first meeting. Definition of MB-SMF containers is part of such alignment.  What is of course not covered in this question is how to deal with the 1:n:m relation between an MBS Session context in the MB-SMF and the multitude of AMFs connected to a multitude of of NG-RAN nodes. This is where the analogy with PDU Sessions end. |
| NEC | Ok | A container is better than a new PDU session resource required procedure. |
| Samsung | Ok but | Same view as Huawei |

### Shared NG-U Tunnel Setup/Release

In the last meeting, there were agreements about shared NG-U tunnel, as follow:

* Define a Gnb triggered class 1 procedure to trigger the setup of NG-U resources.
* The main application of this procedure is related to setup of NG-U resources.
* If an MBS Session Resource within a Gnb serves multiple MBS service areas, the same NG MBS Session Resource context may be associated with multiple NG-U resources.
* During an ongoing multicast session, NG-U resources maybe setup or released upon UE mobility by means of a Gnb triggered procedure.

Then, we can further discuss the procedures and detail Ies based on these agreements and the contributions [2][5][6][9][15]. From the moderator point of view, we propose:

Introduce non-UE associated class1 NGAP procedures (name FFS)

* Multicast Distribution Setup procedure, triggered by the Gnb
* Multicast Distribution Release procedure, triggered by the Gnb

**Question 5: Do you agree to the proposal above? Any suggestion for the procedure/message name?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Agree |  |
| Nokia | Partly | Procedure name is “MBS Distribution Update Request” because we can combine in same NGAP procedure the request to setup and to release the shared NG-U tunnel (only one procedure visible to AMF). – see also question 7. |
| Qualcomm | Agree |  |
| CMCC | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| ZTE | Agree |  |
| CATT | Agree |  |
| Ericsson | Agree |  |
| Nec | Agree |  |
| Samsung | Partly | We also think Nokia’s idea is more efficient. |

Based on the agreements, for location dependent MBS services, the Area Session ID is provided during MBS distribution establishment or release procedure(s). Then, there are 2 options for provide the Area Session ID in those procedures, as follow:

* Option 1: per MBS session NG-U tunnel(s) establishment and release. [11]
* Option 2: per Area Session NG-U tunnel establishment and release. [2][8]

**Question 6: Which option do you prefer? Why?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Option 2 | The NG-U tunnel establishment is triggered when first UE belonging to the corresponding Area join or first UE belonging to the Area handover to the target NG-RAN.  And, for signaling design, Option 2 is simpler than Option 1. |
| Nokia | Option 2 | Different MB-UPF may potentially be contacted depending on the area session ID. |
| Qualcomm | Option 2 |  |
| CMCC | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 | The question is overlapping with CB#MBS3. |
| ZTE | Option 2 | For location dependent MBS service, we prefer per area session NG-U tunnel procedure for simplicity. |
| CATT | Option 2 | Similar reason as Nokia |
| Ericsson | “multi-Option 2” | There is some misunderstanding here:  Our procedure text proposal talks about “one or several …NG-U bearers.” Not necessarily about all NG-U bearers per MBS session at once. |
| NEC | Option 2 | if only part of the Area releases/establishes the MBS session, the MBS service areas should be modified. |
| Samsung | Option 2 |  |

In TS 23.247 V17.0.0, there is description of N2 container transferred by AMF used in multicast distribution related procedures, as follow:

|  |
| --- |
| 9.1.3.2 Nmbsmf\_ MBSSession\_ContextUpdate service operation **Service operation name:** Nmbsmf\_MBSSession\_ContextUpdate  **Description:** NF Service Consumer can use this service to request or terminate the reception of data of a multicast session.  **Inputs, Required:** if consumer is AMF: N2 container (Establishment or Release, MBS session ID, Possible Area session ID, Possible GTP Tunnel info for unicast transport), AMF ID, if consumer is SMF: SMF ID, MBS session ID, Action(Establishment or Release).  **Inputs, Optional:** if consumer is SMF: Area Session ID, Unicast GTP Tunnel info of the UPF.  **Outputs, Required:** Success or not.  **Outputs, Optional:** if consumer is AMF: N2 container (MBS session ID, Possible Multicast DL tunnel info); if consumer is SMF: Possible Multicast DL tunnel info. |

The contribution [2] provided the details about shared NG-U tunnel, as bellow

* The NG-RAN node directly signals to the MB-SMF to setup or release the N3 shared tunnel. A common procedure can be used for the setup and release over NGAP since this should be relayed transparently by the AMF. This procedure applies to the use case of context removal at the last UE leaving and also to the use case of outgoing handover.

But according to section 7.2.1.4 step 3 of TS 23.247 V17.0.0, the AMF stores the information for the NG-RAN nodes (e.g. NG-RAN node ID) for the subsequent signaling related to the MBS Session. And according to section 7.2.3.4 step 6 of TS 23.247 V17.0.0, the AMF removes the RAN node ID from storage in the context of the multicast session. Therefore we can infer that the AMF is aware of the setup and release NG tunnel. Thus, separate procedures should be used.

Based on this, we propose:

* Introduce MULTICAST DISTRIBUTION SETUP REQUEST message
  + MBS Session ID, Area Session ID(Optional)
  + [MB-SMF container]: Multicast Distribution Update Request Transfer (Setup Indicator, MBS Session ID, Area Session ID(Optional) and DL GTP-U tunnel info (presence if the gNB decides or is configured to use unicast transport)
* Introduce MULTICAST DISTRIBUTION SETUP RESPONSE message
  + MBS Session ID, Area Session ID(Optional),
  + [MB-SMF container]: Multicast Distribution Update Response Transfer (MBS Session ID, Area Session ID(Optional) and IP multicast DL tunnel info (presence if IP multicast transport), (optional)Failure Cause)
* Introduce MULTICAST DISTRIBUTION RELEASE REQUEST message
  + MBS Session ID, Area Session ID(Optional), Release Cause
  + (if use unicast transport) [MB-SMF container]: Multicast Distribution Update Request Transfer (Release Indicator, MBS Session ID, Area Session ID(Optional) and DL GTP-U tunnel info, Release Cause)
* Introduce MULTICAST DISTRIBUTION RELEASE RESPONSE message
  + including MBS Session ID, Area Session ID(Optional)

***Note that the same MB-SMF container is used in setup and release messages, to align with SA2 design.***

**Question 7: Do you agree to the proposals above?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Agree |  |
| Nokia | Disagree | We think one procedure is enough. It is true that if AMF stores the NG-RAN node IDs (and not the MB-SMF, because both are possible and would work) then we can complement [2] by simply adding a new IE (enumerated (setup, release)) to indicate the action. But we prefer one procedure over NG for simplicity. |
| Qualcomm | Agree | Single procedure with setup/release option as Nokia proposed is also OK. |
| CMCC |  | No strong view |
| Lenovo, Motorola Mobility | Agree |  |
| ZTE | Agree | We share the same understanding with HW on the distribution setup/release procedures. Detail IEs in the MB-SMF container can be FFS. |
| CATT | Agree | Agree to use different procedures, the detail of the IEs need further discussion. |
| Ericsson |  | May I ask you to cease using the term “design” when talking about stage-3 work wrongly performed in SA2.  There is no technical reason to have only one container - it is RAN3 protocol design to decide this. And RAN3 protocol design has shown that overloading containers/procedures with functions has to be avoided by all means to keep the system modular and design extendable. Please follow what we have done for PDU Session Resource control. You cannot call such “simple” approach, this is rather “simplistic”, or, to quote an earlier chairman, pre-maturely optimising. |
| NEC | Agree |  |
| Samsung |  | Nokia proposal is fine to us. Same NGAP message can be used. |

### Multicast Session Activation and Deactivation

There are some contributions [5][6][9][14][15][18] mentioned the Multicast Session Activation and Deactivation.

Based on the newly approved SA2 CR S2-2108011, the MBS session activation and deactivation procedures had been clarified as follow:

|  |
| --- |
| 11. If the MB-SMF finds out there are shared tunnel established, steps11-15 are performed. The MB-SMF sends Namf\_MBSCommunication\_N2MessageTransfer Request (TMGI, N2 SM Information (Activation, TMGI)) to the AMF for those NG-RAN nodes, which have shared tunnel with MB-UPF. This step may be performed in parallel with step 2.  NOTE 2: The messages in steps 10a, 11, and 12 are MBS-specific and it is possible that the AMF(s) in steps 10a, 11, and 12 are not associate to any UEs involved in the multicast MBS Session.  12. The AMF sends NGAP activation request message (N2 SM Information ()) to the NG-RAN nodes. |

|  |
| --- |
| 5. If the MB-SMF finds out there are shared tunnel established over N3mb interface, the MB-SMF sends Namf\_MBSCommunication\_N2MessageTransfer Request (TMGI, N2 SM information (Deactivation, TMGI)) to the AMFs.6. The AMF sends NGAP deactivation request message (N2 SM information ()) to the NG-RAN nodes. |

According to TS 23.247 V17.0.0 table 6.9.1-1, the Multicast MBS Session context AMF has no MBS Session State (Active/Inactive/Configured). The state indicator in N2 container is transparent to the AMF. When MB-SMF trigger session activation or deactivation, the AMF only can be aware of change of the state, instead of changing from which state to which state.

Table 6.9.1-1: Multicast MBS Session context

| **Parameter** | **Description** | **NG-RAN** | **MB-SMF** | **SMF** | **AMF** |
| --- | --- | --- | --- | --- | --- |
| State | State of MBS session ('Active multicast session' or 'Inactive multicast session' or 'Configured multicast session') | X  (note 2) | X | X  (note 2) |  |

From the moderator point of view, to align with SA2 progress, we propose:

* **Introduce a single non-UE associated NGAP class1 procedure to support multicast session activation and deactivation (e.g., multicast session state update/name FFS), triggered by the MB-SMF to the gNB via AMF.**
* **Introduce NGAP: MULTICAST SESSION STATE UPDATE REQUEST/RESPONSE/FAILURE messages, and include MBS Session ID (TMGI) and the state indicator in the MB-SMF container carried by these messages.**

**Question 8: Do you have any comments?**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Agree | We agree to align with TS 23.247.  AMF has no session state. The session activation or deactivation is transparent to AMF. |
| Nokia | Agree |  |
| Qualcomm | Agree |  |
| CMCC | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| ZTE | Agree |  |
| CATT |  | In fact, we have some doubt on the benefit of introducing inactive state for MBS session in NG-RAN node. If it has to be introduced, agree to use one procedure since it is transparent to AMF. |
| Ericsson | Disagree | We do not understand the context within which you discuss the AMF awareness of the session state.  TS 23.247 still talks about activation and deactivation signals in the message flows. |
| NEC | Agree |  |
| Samsung | Disagree | Don’t understand the intention of using single procedure. According to TS23.247, the intention of notifying NG-RAN about the activation is “The NG-RAN shall not release the radio connection of a UE that has joined into the multicast session only because no unicast traffic is received for the UE”. Then same requirement should be put to the AMF. AMF will not release the N2 connection of the UE in this case. Then AMF should know the session state. Otherwise, the AMF can release the connection of the UE when the session is active.  Therefore we think separated procedures for activation, modification and release. |

### Multicast Group Paging

This issue is overlapped with the discussion in CB: # 8\_MBSPaging, whether anything to be discussed here for Multicast group Paging is pending to the discussion in CB#8.

## Broadcast Session management

In previous meeting, it was agreed in RAN3 to have MBS Session Start/Release procedure for Broadcast, but no agreement was made on how to establish the shared NG-U tunnel for Broadcast session.

Considering that there will be a session start procedure triggered by 5GC, it is straightforward to consider that the shared NG-U is established during the session start procedure, i.e. the 5GC may provide IP multicast address in Session Start Request, and then the Gnb may provide DL TNL Address in Session Start Response if unicast transmission is used.

On the other hand, in contribution [11], it is proposed to use a Gnb triggered MBS Session Resource Setup/Release Required procedure is introduce to establishment/ release of one or several NG-U bearer(s), for both broadcast and Multicast.

**Question 9: which option do you prefer to establish the shared NG-U tunnel for broadcast session?**

* **Option 1: Established during Broadcast Session Setup Request/Response, similar to 4G Embms.**
* **Option 2: after Broadcast Session Setup, RAN triggers shared NG-U tunnel establishment towards 5GC, to align with Multicast.**

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Huawei | Option 1 | Option 1 works well, seems no need to have option 2. |
| Nokia | Option 1 | Option 1 is aligned with TS 23.247 section 7.3.1. |
| Qualcomm | Option 1 |  |
| CMCC | Option1 |  |
| Lenovo, Motorola Mobility | Option 1 |  |
| ZTE | Option 1 |  |
| CATT | Option 1 |  |
| Ericsson |  | If this would be the only controversy, I would be really glad.  I would find it charming to have some common ground for multicast and broadcast. Note, that the Ericsson proposal to have separate MC and BC procedures is already one step in your direction. Would be glad to see others moving as well.  I thought that it would be beneficial for location dependent content delivery to rather let the RAN to trigger establishment. |
| NEC | Option 1 |  |
| Samsung | Option 1 |  |

## Others

If you have other issues to be discussed, please elaborate:

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comment |
| Ericsson |  | as hinted above, I didn’t see a single paper talking about the following EN:  Editor's Note: The implication of not triggering PDU Session UP activation in NG-RAN when SMF informs the NG-RAN of UE join requires RAN collaboration.  this has implications on many aspects in our view. you cannot ignore that intentionally. |
|  |  |  |
|  |  |  |

# Conclusion, Recommendations [if needed]

If needed

# References

1. R3-214788 (TP for 38.413) Stage 3 for MBS Context and UE MBS Context (Nokia, Nokia Shanghai Bell)
2. R3-214789 (TP for 38.413) Stage 3 for User Plane Shared Delivery Tunnel (Nokia, Nokia Shanghai Bell)
3. R3-214790 (TP for 38.413) Stage 3 for Broadcast Session (Nokia, Nokia Shanghai Bell, Huawei)
4. R3-215059 TP for 38.413 on session management for broadcast (CATT)
5. R3-215060 TP to 38.410 on session management for multicast (CATT)
6. R3-215138 Consideration on Multicast Session Management (Huawei, CBN, Lenovo, Motorola Mobility, Qualcomm Incorporated, China Unicom, China Telecom)
7. R3-215139 (TP to TS 38.410 BL CR) Multicast Session Management (Huawei, CBN, Lenovo, Motorola Mobility, Qualcomm Incorporated, China Unicom, China Telecom)
8. R3-215140 (TP to TS 38.413 BL CR) Multicast Session Management (Huawei, CBN, Lenovo, Motorola Mobility, Qualcomm Incorporated, China Unicom, China Telecom, CMCC)
9. R3-215202 Reflections on Session Management for multicast NR MBS (Ericsson)
10. R3-215203 [TP for BL CR 38.300, 38.401, 38.410] on Session Management for NR MBS (Ericsson)
11. R3-215204 [TP for BL CR 38.413, 38.423] on Session Management for NR MBS (Ericsson)
12. R3-215240 (TP to TS 38.470 BL CR) Multicast Session Management (Qualcomm Incorporated, Huawei, Lenovo, Motorola Mobility)
13. R3-215241 (TP to TS 38.473 BL CR) Multicast Session Management (Qualcomm Incorporated, Huawei, Lenovo, Motorola Mobility)
14. R3-215515 MBS Session management for broadcast and multicast (Samsung)
15. R3-215620 (TP for TS 38.413) Management of multicast session (ZTE Corporation)
16. R3-215621 (TP for TS 38.300) Management of multicast session (ZTE Corporation)
17. R3-215622 (TP for TS 38.410) Management of multicast session (ZTE Corporation)
18. R3-215677 MBS Session management over NG for multicast (CMCC)
19. R3-215697 (TP to TS 38.300) MBS session management over NG (CMCC, Huawei)