3GPP TSG-RAN WG2 #113e R2-21XXXXX

Electronic meeting, 25th Jan – 5th Feb, 2021

Agenda Item: 8.16.3

Source: Ericsson (email discussion Rapporteur)

Title: Summary of [AT113-e][032][eNPN] UE onboarding and provisioning for NPN

Document for: Discussion, Decision

# 1 Introduction

This document is to kick-off the following email discussion:

* [AT113-e][032][eNPN] UE onboarding and provisioning for NPN (Ericsson)

Scope: Take into account documents submitted to this section, 1st pass: identify what is required to be supported by AS and determine the RAN2 impact, if possible. Identify common views / potential initial agreements, Identify points that need further discussion. Can also gather comments on the need to ask questions to other group.

Intended outcome: Report with agreeable proposals and discussion points (not too many, preferably < 10) for treatment on-line

Deadline: 1st Deadline for Comments: Friday Jan 29 1000 UTC. Other deadline if needed by rapporteur. Report Ready for treatment on-line Feb 3.

## Contact information

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates to provide their contact information in the following table:

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| --- | --- | --- |
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# 2 Discussion

The following RAN2 centric objectives are captured in the NG\_RAN\_PRN\_enh WID (see [RP-202363](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Docs/RP-202363.zip)), regarding the scope of the current email discussion:

* Support UE onboarding and provisioning for NPN including:
  + The UE onboarding relevant parameter broadcast from SIB [RAN2]
  + The associated cell selection/reselection, cell access control and the connected mode mobility support [RAN2/RAN3]

Therefore, as indicated above, the intention of the present document is to identify common views regarding what is required to be supported by AS and the related RAN2 impact.

The list of Tdocs considered for this email discussion is available in the Reference section below.

## 2.1 Relevant parameter broadcast in SIB

SA2’s eNPN study item resulting in TR 23.700-07 (see [SP-200967](https://www.3gpp.org/ftp/tsg_sa/TSG_SA/TSGs_90E_Electronic/Docs/SP-200967.zip)) concluded the following in clause 8.4.1:

- The NG-RAN of the Onboarding network includes an indication for Onboarding enabled in the SIB (per O-SNPN, considering that the NG-RAN can be shared) so that the UE can discover and select an appropriate O-SNPN. The UE may or may not be pre-configured with O-SNPN network selection information (e.g. O-SNPN network identifiers).

NOTE 2: Whether the indication for Onboarding is sufficient or more SIB information is needed can be further discussed in the normative phase.

**Q1.1.a: Do you agree that a 1-bit indication for onboarding is needed in the SIB?**

**Q1.1.b: Do you agree that this indication should broadcast per O-SNPN in shared-cell scenarios?**

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| --- | --- | --- | --- |
| **Company** | **Yes/No (Q1.1**.**a)** | **Yes/No (Q1.1**.**b)** | **Comments** |
| ZTE | Yes | Yes |  |
| OPPO | Yes | Yes |  |
| Huawei, HiSilicon | Yes | Yes |  |
| MediaTek | Yes | Yes |  |
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Some companies argue that a 1-bit indication is enough for onboarding purposes, yet others point out that it would be beneficial to broadcast additional information, e.g. the Subscription Owner (SO) SNPN associated with the Onboarding SNPN (O-SNPN), or even the Group ID (GID) of the latter. However, it should be stressed, what is also mentioned in some contributions, that onboarding is a “one-shot” procedure which is not time-critical. Therefore, a 1-bit indication (e.g., in SIB1) could arguably be sufficient to signal whether the O-SNPN’s NG-RAN supports onboarding. In this same line, the amount of onboarding-related information may determine the SIB on which this should be broadcast, given the size constraints imposed by different SIBs. It is therefore important to find consensus on the above.

**Q1.2.a: Do you think any additional SIB information (e.g. SO-SNPN) besides the 1-bit indication is needed?**

**Q1.2.b: Which SIB should be used to indicate support for onboarding?**

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| **Company** | **Yes/No (Q1.2.a)** | **SIB** preference **(Q1.2**.**b)** | **Comments** |
| ZTE | FFS | SIB1 | For the Q1.2a, we think whether more SIB information (e.g. Group ID of the SO) is needed, further input from the SA2/CT1 is needed. |
| OPPO | Maybe | depends | For Q1.2.a, GID can be considered, but we should get SA2 input before introducing it. One more thing is for access control for onboarding, maybe both cell level and per AC level access control parameters can be considered.  For Q1.2.b, no matter additional SIB information is introduced or not for onboarding, 1-bit indication should be put into SIB1 to enable UE fast cell selection; As for additional SIB information if agreed, we can discuss further. |
| Huawei, HiSilicon | FFS | SIB1 | Q1.2.a can wait for SA2 progress.  For Q1.2.b, 1-bit indication per O-SNPN will not introduce too much overhead, thus can be included in SIB1. |
| MediaTek | No | SIB1 (for now) | We see no need for additional information to be broadcasted for now. If SA2 agree to additional information, this can be taken into account later.  As it is just a 1-bit indication, SIB1 should be able to accommodate this information. However as the process should only rarely occur (i.e. a UE with no NPN credentials), we are open to including this information in other SIBs. |
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Even though it may not be in RAN2 scope, in [R2-2101002](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101002.zip) the question came up whether it is possible for the cells belonging to the same SNPN to broadcast different contents with regard to onboarding (e.g., some of them broadcast the “onboarding supported” indication while others don’t, or, the cells broadcast different SO/DCS IDs).

Thus, it remains to be clarified whether the support is to be homogeneous throughout the O-SNPN or if it may differ from one cell to another.

**Q1.3: Should the broadcast of onboarding-related information be homogenous throughout the O-SNPN (same onboarding related content broadcast in all cells belonging to the O-SNPN)?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | No | We think the on-boarding is supported by part of cells and part of AM, that is why 1 bit indication in the system information is needed.  For the AMF, SA2 has agreed that the UE need to indicate on-boarding purpose to RAN node to assist the AMF selection, it also means that not all of the AMF in the O-SNPN would support on-boarding feature.  Furthermore, from the network deployment aspect, there is no need to support on-boarding feature among the whole network, e.g. deploy on-boarding feature only on the cells that next to a factory (that has lots of UE with on-boarding requirements) |
| OPPO |  | As mentioned by rapporteur, this may be out of RAN2 scope. More addition, Onboarding is one-shot procedure, no cell reselection/Mobility issue involved, so it does not make sense to discuss the network deployment among cells. |
| Huawei, HiSilicon | SA2 to clarify | The motivation for this clarification is to facilitate the cell selection process for AS.  If the answer from SA2 is “No”, AS procedures will be much easier: after NAS selects an O-SNPN, AS could follow the legacy cell selection procedure. Otherwise, AS needs to take the 1-bit indication for onboarding into consideration as well. |
| MediaTek | SA2 to clarify | It is unclear whether cell reselections can take place while the onboarding/remote provisioning procedure is ongoing (e.g. if the UE can enter Inactive state). If yes, it is important to know whether the onboarding information changes from cell to cell – as it would affect cell reselection.  It would be useful to get some clarification from SA2 on the two aspects above. |
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## 2.2 Cell selection/reselection and mobility support

When addressed, some companies’ view is that the onboarding indication does not impact AS cell selection/reselection and that legacy procedure should be enough for a UE to decide whether it can select a cell given the available onboarding indication. However, there are others that do not agree with this or did not discuss it.

**Q2.1: Do you see any impacts on cell selection/reselection procedures (e.g. a need to change suitable cell criteria) to support UE onboarding in O-SNPNs?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | We think at least the UE shall select the cell that support on-boarding as suitable cell, which will change suitable cell criteria. |
| OPPO | Maybe | if AMF routing mechanism for onboarding is decoupled with suitable cell criteria check, no enhancement for suitable cell criteria is needed; but we may revisit this if more input is identified from SA2, e.g. GID. |
| Huawei | Depends | For cell selection, it depends on the answer of Q1.3. See comments to Q1.3.  For cell reselection:  During the UE onboarding and remote provisioning procedure, it seems that UE will not transit to the idle or inactive states and reselect an O-SNPN cell. Once the credential is provisioned or the onboarding PDU session expires, the UE deregisters with the O-SNPN and will not reselect a cell within the O-SNPN. Therefore we have not identified valid scenarios for cell reselection within O-SNPN. If the network is changed (O-SNPN is changed), the UE will perform cell selection instead of reselection. |
| MediaTek | Yes | At least for cell selection, we see an impact. The UE should only select a cell with the onboarding indication, when the onboarding procedure needs to be performed.  For cell reselection, please refer to our comments for Q1.3. It would be useful to get some clarifications from SA2 on this aspect. |
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Similarly, not all companies indicated their position on the impact of onboarding on connected mode mobility.

**Q2.2: Do you see any impact regarding connected mode mobility?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | The on-boarding is a one-shot procedure, we don’t think it has impact to the connected state mobility. Instead, once the UE indicate on-boarding purpose to the network, the network shall simplify the procedure as much as possible, e.g. avoid any DC, or handover related procedure. |
| OPPO | No | Onboarding is one-shot procedure, no Mobility issue involved. |
| Huawei | No | No connected mobility issues spotted so far. |
| MediaTek | No |  |
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## 2.3 Cell access and congestion control

Two trends became apparent with respect to the approach needed to provide congestion control, one is based on using the onboarding indication and the other by means of the Unified Access Control (UAC) mechanism. While the latter allows for higher granularity by allowing the RAN to configure a barring factor and a barring time for onboarding, it also requires additional complexity in terms of specification work since a new Access Class value needs to be introduced by SA1 for the onboarding procedure (which might eventually be a once-in-a-lifetime procedure).

Instead, with the first option, if a 1-bit indication is used to broadcast onboarding support, the O-SNPN’s RAN could toggle this bit in the SIB to control congestion due to UE onboarding requests and, thus, controlling the access.

**Q3: What approach is more suitable for RAN-level congestion control handling?   
Option A) Toggle the onboarding indication in the SIB  
Option B) Use the UAC approach  
Option C) Other mechanism is needed   
Option D) There is no need to control congestion due to onboarding at a RAN level**

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| **Company** | **Preferred option** | **Comments** |
| ZTE | B | We think option A is naturally supported, but only the option A is not enough, UAC approach is also needed |
| OPPO | A or B | For Option A, more like network implementation, no need to specify anything.  For Option B, onboarding also belongs to MO signalling, the UAC parameters defined for MO signalling can be reused for most of the time, network can control the access rate by changing the UAC parameters for MO signalling; but new cause for onboarding can be further considered, we should coordinate with CT1. |
| Huawei, HiSilicon | B | Option B provides a finer granularity than Option A. |
| MediaTek | D | The onboarding/remote provisioning procedure should seldom occur, as the case where a UE does not have NPN credentials to access the NW should only typically occur once in a UE’s lifetime. We therefore see no reason to introduce congestion control for this rare occurrence. |
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## 2.4 Onboarding request

From the conclusions of TR 23.700-07 (see clause 8.4.1), the following information is provided from the UE to the network for the purpose of onboarding.

- Upon registration to an SNPN for Onboarding, the UE provides an indication at RRC level that the RRC connectionis for onboarding. This information will be specified only for SNPN and allows NG-RAN to select an appropriate AMF that supports onboarding procedures.

Most companies agree that an onboarding request indication is needed, while [R2-2100278](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100278.zip) states this is not necessary.

**Q4.1: Do you agree that UEs should signal an onboarding request indication?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | As concluded in the 23.700-07 |
| OPPO | Maybe | Implicitly, e.g. new cause if agreed  Explicitly, e.g. A new indicator in Msg5 |
| Huawei | Yes | We should respect the SA2 conclusion. However, the motivation is to assist AMF selection, which is more of a RAN3 issue and can be studied in RAN3 first. |
| MediaTek | Yes | SA2 have concluded that there is a need for such an indication. |
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Several companies' view is to add this indication in *RRCSetupComplete*, i.e., msg5. But some companies have proposed to signal this in the *RRCSetupRequest* message, i.e., msg3. The rapporteur understands that these options require as a minimum:

* For *RRCSetupRequest* (msg3), a new *EstablishmentCause* for onboarding purposes,
* For *RRCSetupComplete* (msg5), a new field indicating onboarding purpose.

**Q4.2: If an onboarding request needs to be signalled, where should it be added?**

**Option A) *RRCSetupComplete* (i.e., msg5)**

**Option B) *RRCSetupRequest* (i.e., msg3)**

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| **Company** | **Preferred option** | **Comments** |
| ZTE | Option A | Normally, if the Msg 5 can work, the Msg 5 shall be selected. Considering that there are only 5 spare values left for the establish cause in the Msg3, it’s better to include such indication in the Msg5. |
| OPPO | A or B | Depends whether new cause is introduced or not. |
| Huawei, HiSilicon | A or B | No strong view. |
| MediaTek | Option A | No strong view, but we have a slight preference to use Msg5 for the same reasons as ZTE |
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[R2-2101516](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101516.zip) pointed out the need to include this in other messages, e.g. *RRCResumeComplete*.

**Q4.3: Is the onboarding request information needed in other RRC messages, e.g. *RRCResumeComplete*?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | No | After the on-boarding, the UE will be de-registered from the on-boarding network, the UE would not enter into the Inactive state under the on-boarding SNPN. Thus there is no need to include this indication in the *RRCResumeComplete* message. |
| OPPO | No | Inactive state is not applicable for onboarding. |
| Huawei, HiSilicon | No | Same understanding as ZTE. |
| MediaTek | Depends | We need to check with SA2 if the UE can enter Inactive state while the onboarding/remote provisioning procedure is ongoing. |
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Finally, [R2-2101616](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101616.zip) proposes to optionally include more information than only the onboarding request indication.

**Q4.4: Is additional information needed from the UE to the network for onboarding purposes?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | FFS | On this issue, we think more input from SA2/CT1is needed, which depends on SA2/CT1’s requirements. |
| Huawei, HiSilicon | FFS | OK to discuss, but SA2 input is preferred. |
| MediaTek | No for now | If SA2 agree to include additional information, this can be taken into account later. |
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## 2.5 Onboarding network types

The support of PLMNs acting as Onboarding Networks has been mentioned in certain contributions, e.g. [R2-2101002](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101002.zip), [R2-2101616](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101616.zip), and [R2-2101930](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101930.zip) provides a draft LS, where SA2 is asked to confirm whether an SNPN capable UE operating in SNPN Access Mode could still register to a PLMN for onboarding and remote provisioning (i.e., to an O-PLMN).

According to the rapporteur’s understanding, discussions on onboarding PLMNs are ongoing in SA2 (see [SA2 email discussion](ftp://ftps.3gpp.org/tsg_sa/WG2_Arch/TSGS2_143e_Electronic/INBOX/CCs/Moderated_Email_Discussion/eNPN/S2-21xxxxx-eNPN-issues-normative_r03_FINAL.docx)). Therefore, it is sufficient to wait for SA2 to conclude and update the TR 23.700-07.

**Q5: Do you agree that we can focus on O-SNPNs and wait for SA2 to conclude on onboarding PLMNs?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | We agree to give O-SNPN high priority and wait for more inputs on O-PLMN from SA2. |
| OPPO | Yes | At this stage, we agree the suggestion, but also fine to send LS to SA2 to clarify the PLMN scenario, anyway coordination is needed. |
| Huawei, HiSilicon | - | No strong view on this issue. |
| MediaTek | - | We prefer to send an LS to SA2 to clarify whether PLMNs can be used for onboarding. |
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## 2.6 Other issues

**Q6: Are there any other related issues that are not addressed by the previous questions?**

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| **Company** | **Other issue(s)** |
| ZTE | We also have a question on whether the network can trigger DC or handover procedure during on-boarding?  From the RAN side, for the on-boarding access attempt, it shall make the procedure as simple as possible, e.g. avoid the handover/redirection just for the load balancing, unnecessary measurement and so on. Thus about the on-boarding indication, besides the function of AMF selection, it can also be used by the RAN node to simplify the AS procedures as much as possible. |
| OPPO | Cell level access control for onboarding can be further considered. |
| MediaTek | It is unclear if the UE can enter Inactive/Idle state while the onboarding and remote provisioning procedure is ongoing. This can be checked with SA2, and depending on their response, we can determine if there are any cell reselection impacts. |
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## 2.7 Proposed questions to other WGs

**Q7: Any other proposed questions to other WGs related to onboarding in SNPNs?**

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| **Company** | **WG(s)** | **Proposed question(s)** |
| OPPO | SA2/CT1 | SA2: send LS to SA2 to clarify the PLMN scenario for onboarding;  CT1: send LS to CT1 to clarify whether UAC enhancement is needed or not for onboarding. |
| MediaTek | SA2 | 1. Can the UE enter Inactive/Idle mode while the onboarding procedure is ongoing?  2. Can the onboarding indication change from cell to cell within the O-SNPN?  3. Can PLMNs be used for onboarding? |
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# 3 Conclusion

To be added.

# References

[R2-2100491](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100491.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_113-eDocsR2-2100491.zip) UE onboarding Ericsson discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2101616](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101616.zip) Discussion the issue to support UE onboarding and provisioning for NPN CMCC discussion Rel-17 NG\_RAN\_PRN\_enh

[R2-2101002](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101002.zip) Discussion on RAN2 impact of UE onboarding and remote provisioning for SNPN and PNI-NPN Huawei, HiSilicon, China Telecom discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2100242](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100242.zip) Initial Discussion for Onboarding OPPO discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2100243](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100243.zip) Cell Access Control for Onboarding OPPO discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2100278](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100278.zip) Discussion on UE Onboarding and Provisioning for NPN CATT discussion Rel-17

[R2-2100432](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100432.zip) Consideration on the Onboarding and Provisioning for NPN ZTE Corporation, Sanechips discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2100442](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100442.zip) UE onboarding and provisioning for NPN Qualcomm Incorporated discussion

[R2-2100544](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100544.zip) Overview of RAN2 impacts to support UE onboarding and provisioning for NPN Nokia, Nokia Shanghai Bell discussion Rel-17 NG\_RAN\_PRN\_enh

[R2-2100635](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100635.zip) RAN2 impact on support UE onboarding and provisioning for NPN Intel Corporation discussion Rel-17 NG\_RAN\_PRN\_enh-Core

[R2-2100839](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100839.zip) Support UE onboarding and provisioning for NPN vivo discussion

[R2-2101516](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101516.zip) Support of UE onboarding and provisioning for NPN LG Electronics discussion Rel-17

[R2-2101898](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101898.zip) LS on UE onboarding and remote provisioning for SNPN CMCC LS out Rel-17 To:SA2 Cc:RAN3 Revised

[R2-2101930](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101930.zip) draft LS on UE onboarding and remote provisioning for SNPN CMCC LS out Rel-17 [R2-2101898](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101898.zip) To:SA2 Cc:RAN3