3GPP TSG-RAN WG2 #113-e R2-2101964

Electronic Meeting, 25th Jan – 5th Feb 2021

Agenda Item: 7.4.2 DAPS handover Corrections

Source: Huawei, HiSilicon

Title: Report of [AT113-e][211][MOB] DAPS corrections (Huawei)

Document for: Discussion, Decision

# 1 Introduction

This document is to collect companies comment in the following email discussion:

* [AT113-e][211][MOB] DAPS corrections (Huawei)

Scope:

* + - Discuss which DAPS corrections (for LTE and NR) marked for this discussion are seen agreeable
    - Some (or even all) CRs may be merged together if seen needed

Intended outcome:

* + - Discussion summary in R2-2101964 (by email rapporteur).
    - Agreeable CRs (if any)

Deadline for providing comments, for rapporteur inputs, conclusions and CR finalization:

* + - Initial deadline (for companies' feedback): 1st week Thu, UTC 0900
    - Initial deadline (for rapporteur's summary in R2-2101964): 1st week Fri, UTC 09:00
    - Deadline for CR finalization: 2nd week Thu, UTC 1000

**Please fill in your contact information in the end of this document.**

# 2 Discussion

Companies are requested to add their comments in the boxes below.

## 2.1 CP: Minor corrections

Corrections to TS38.300 on DAPS release:

[R2-2101519](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101519.zip) Addition of releasing the source part of DAPS DRBS upon DAPS release LG Electronics France CR Rel-16 38.300 16.4.0 0340 - F NR\_Mob\_enh-Core

Summary of change:

The behavior of releasing the source part of DAPS DRBs is added to the case of receiving an explicit release of DAPS bearer in the clause 9.2.3.2.1 that is for C-plane for handover.

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| Company | Agree?  (Yes or No) | Comments |
| Intel | Yes | The changes is correct. Impact analysis is missing. It would be good if we can find the general descriptions on release. |
| Nokia | Yes | Correct, we can clarify source part is released as well. |
| Mediatek | Yes | The proposed change affects both ME and Radio access network. TS38.300 should also be corrected as well for spec/feature alignment. |
| LG | Yes (Proponent) |  |
| Samsung | Yes, but | We agree to the intention. No strong opinion but the wording maybe improved, e.g.  The UE releases the source resources for all established RBs, security configuration of the source cell and stops DL/UL reception/transmission with the source upon receiving an explicit release from the target node. |
| ZTE | Yes, but | Agree with the intention. Perhaps we can simply use “the source cellconfiguration” to cover both SRB and DRB resources in the source part. |
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[R2-2100626](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2100626.zip) Miscellaneous corrections for Mobility Enhancements Intel Corporation (Rapporteur), Ericsson CR Rel-16 38.331 16.3.0 2345 - D NR\_Mob\_enh-Core

Summary of change:

**Change 1:comma is added between “configured” and “for”**

If any DAPS bearer is configured**,** for each SRB:”

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| Company | Agree?  (Yes or No) | Comments |
| Intel | Yes | The change is correct, but would be good to merge. |
| Nokia | Yes | Editorial, to be merged. |
| Mediatek | Yes | The change makes the spec clearer. |
| LG | Yes |  |
| Samsung | Yes | We are one of the proponents. |
| ZTE | Yes |  |
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[R2-2101533](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101533.zip) Corrections for DAPS Handover MediaTek Inc. CR Rel-16 38.331 16.3.1 2417 - F NR\_Mob\_enh-Core

Summary of change:

<1> In subclause 5.3.5.5.4, include the case of “if any DAPS bearer is configured and the RLC bearer is associated with an SRB”

<2> Restructure subclause 5.3.5.8.3, so that

* For DAPS bearers, specify how they are reverted back to non-DAPS bearers (i.e. target RLF released, PDCP entity reconfigured, etc.) upon T304 expiry, regardless of whether RLF is detected or not.
* For SRBs, separate the procedures to be applied regardless of whether RLF is detected or not (e.g. target PDCP/RLC release) and those applicable only when source RLF is not detected (e.g. resumption of suspended SRB in the source PCell).
* Add a general “revert back to the UE configuration used in the source PCell” to specify that the state variables and parameters of each radio bearer
* For non-DAPS bearers, delete the “revert back” descriptions
* Delete the “revert back” description for SDAP and measurement configurations.

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| Company | The first change is agreeable?  (Yes or No) | The second change is agreeable?  (Yes or No) | Comments |
| Intel | Yes | No | Change 2 is incorrect, in addition should not “3> revert back to the UE configuration used in the source PCell;” already covered the release of DAPS configuration?  New added below sentences are covered by „2> else“  3> else:  4> store the handover failure information in VarRLF-Report as described in the subclause 5.3.10.5;  4> initiate the connection re-establishment procedure as specified in subclause 5.3.7. |
| Nokia | Yes, but | No | For the first change, instead of including condition here, better to avoid configuration of DAPS for SRB in RRC-configuration itself.  For the second change, bringing the re-establishment within DAPS bearer check may lead to duplicate actions related to re-establishment. |
| MediaTek | Yes | Yes | Regarding the second change, what we have in current text (UE behavior upon T304 expiry) considers two cases:  (1) DAPS & no source PCell RLF: reset target MAC, release target RLC, reconfigure PDCP to release DAPS  (2) else (a. no DAPS, or b. DAPS & source PCell RLF): revert back to the UE configuration used in the source PCell;  We think the UE MAC/RLC/PDCP descriptions of case (1) and (2b) should be aligned. That is, if we mention “release DAPS” for case (1), we should do the same for case (2b).  Also, we do have the following NOTE:  “NOTE 1: In the context above, "the UE configuration" includes state variables and parameters of each radio bearer.”  Our understanding is that “revert back to the UE configuration used in the source PCell” does not include the release of DAPS. Even though implementation-wise the UE may do so, we suggest having the proposed re-structure to clarify UE behavior for “DAPS & source PCell” upon T304 expiry. |
| LG | Yes | No | For the 2nd change, the “configuration“ cannot cover the “state variables“ and the “data stored in transmission and reception buffers“.  Also the 2nd change cannot cover measurement configuration handling to revert back to the source Pcell’s measurment configuration.  With this reason, we don’t support the 2nd change considering that the current text in 5.3.5.8.3 was captured after the long discussion. |
| Samsung | Yes | No |  |
| ZTE | Yes | No | Regarding the handling of RBs upon T304 expiry, we think the current procedure text is clear enough. |
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[R2-2101534](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101534.zip) Corrections for DAPS Handover MediaTek Inc. CR Rel-16 36.331 16.3.0 4580 - F LTE\_feMob-Core

Summary of change:

<1> In subclause 5.3.5.6, add an if-clause for the case that radio link failure has been detected for the source MCG.

* For DAPS bearers, specify how they are reverted back to non-DAPS bearers (i.e. target RLF released, PDCP entity reconfigured, etc.) upon T304 expiry, regardless of whether RLF is detected or not.

For SRBs, specify target PDCP/RLC release.

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| Company | Agree?  (Yes or No) | Comments |
| Intel | No | should not “ 3> revert back to the configuration used in the source PCell;“already covered the release of DAPS configuration? |
| Nokia | No | Agree with Intel. This release is already covered. |
| LG | No | The case is already covered by below statements in 5.3.5.6:  3> revert back to the configuration used in the source PCell;  NOTE 1a: In the context above, "the configuration" includes state variables and parameters of each radio bearer. PDCP entities associtated with RLC UM and SRB bearers are reset after the successful RRC connection re-establishment procedure according to clause 5.2 in TS 36.323 [8]. In the above, "the configuration" includes the RB configuration using NR PDCP, if configured (i.e. by nr-RadioBearerConfig1 and nr-RadioBearerConfig2). |
| Samsung | No | Same view as Intel |
| ZTE | No | Share the same view as Intel. |
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[R2-2101568](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101568.zip) Corrections to DAPS handover in LTE ZTE Corporation, Sanechips CR Rel-16 36.331 16.3.0 4583 - F LTE\_feMob-Core

Summary of change:

1. Update the procedure text in 5.3.11.1 as follows:

1> if any DAPS bearer is configured, upon receiving N310 consecutive "out-of-sync" indications for the source PCell from lower layers and T304 is running:

2> start timer T310 for the source PCell;

2. Update the condition “NotFullConfigHO” to “DAPS”, remove all conditions for the presence of the field in the filed description of the IE *daps-HO* to the explanation of the condition “DAPS”.

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| Company | The first change is agreeable?  (Yes or No) | The second change is agreeable?  (Yes or No) | Comments |
| Intel | Yes | Yes | This is to align with NR |
| Nokia | No | Yes | First change not needed. It is implicit that during DAPS only source PCell will be active. Earlier text is fine. OK for second change. |
| Mediatek | Yes | Yes |  |
| LG | Yes | Yes | It seems to be aligned to the current NR spec |
| Samsung | Yes | Yes |  |
| ZTE | Yes | Yes | Regarding Nokia’s comments, the main intention for the first change is to reflect that the RLM in source is only performed when T304 is running (the UE is not required to keep RLM in source after successful RA to the target), which is aligned to the NR spec. |
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## 2.2 CP: Handling of non-DAPS bearers

[R2-2101101](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101101.zip) Handling of non-DAPS bearers during DAPS HO MediaTek Inc. discussion

Summary of this discussion paper:

The key observations are:

**Observation 4: In DAPS HO, UE not only reverts back the UE configuration, but also the data flushed in the previous RLC/PDCP re-establishment when HO command is received.**

**Observation 5: UE needs to create a backup cope and maintain the UE configuration and data buffered for each non-DAPS bearer in DAPS HO, which introduces much complexity in UE implementation.**

And the proposal is:

**Proposal: RAN2 to discuss the issue and select a solution between option 1 and option2.**

* Option 1: UE always perform the RLC/PDCP re-establishment for non-DAPS bearers when HO fails, even if the source PCell has not experienced RLF.
* Option 2: UE suspends non-DAPS bearers upon reception of HO command. UE performs RLC/PDCP re-establishment for non-DSPS bearers when HO succeeds; UE resumes non-DAPS bearer when HO fails.

Actually the similar discussion has been done in R2-2003371 [Post109e#11][MOB] Resolving open issues for DAPS (Intel), and the final decision is as below:

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| **Question 3.7-1: do you see the need to change existing way in the CR, e.g. (impact RRC)**   * Option 1: PDCP re-establishment twice (upon the reception of DAPS handover command and upon the fallback) * Option 2: PDCP re-establishement only when the random access is successfully completed to the target. * Option 3: It is up to implementation * Option 4: same as in the CR, Revert back to the UE configuration used for the DRB in the source, includes PDCP, RLC states variables, the security configuration and the data stored in transmission and reception buffers in PDCP and RLC entities ;   Summary: 12 companies provided inputs  **Fallback handling for Non-DAPS DRB:**  **Option 2, PDCP only reestablishment when RACH is successfully completed in target: 4**  **Option 4: same as existing CR, Revert back to the UE configuration used for the DRB in the source, includes PDCP, RLC states variables, the security configuration and the data stored in transmission and reception buffers in PDCP and RLC entities ; 10**  Rapporteur would suggest to go for majority.  RRC S3.7-1: For non-DAPS DRB handling, do not agree that PDCP only reestablishment when RACH is successfully completed in target: |

In Rapporteur’s understanding, only the final result but not the detailed UE actions is specified for non-DAPS DRBs in current spec. As for the question raised in R2-2101101 “how could it be possible to revert back the data, which has been flushed?”, it’s left up to UE implementation.

**Question:** Do companies agree that reverting-back the ‘discarded’ data for non-DAPS bearer in case of DAPS HO failure is an issue?

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| Company | Agree?  (Yes or No) | Comments |
| Intel |  | Agree it will require additional efforts from UE to support it. Would be ok to make Source recovery based DAPS failure handling as optional feature like what we did for CHO based recoveery. |
| Nokia |  | The issue is not very clearly described. RLC/PDCP re-establishment on HO failure is similar to RRC-Re-establishment case. This is also indicated as option 1 in the solution’s proposal. Option 2 seems to be the current behaviour already?  [Mediatek] In current DAPS HO, UE needs to revert back the configuration and data at the source side as if nothing happens. UE doesn’t perform RLC/PDCP re-establishment for non-DAPS bearer in HO failure.  Option 1 is to do similar procedure as legacy HO; option2 is not current behaviour, because RLC/PDCP re-establishment is delayed a little bit when HO is successfully completed. |
| Mediatek | Yes | The handling of non-DAPS bearer is much more complicated than the handling of DAPS bearer. The optimization target of DAPS is to minimize the UP interruption of DAPS bearer. It’s not worthwhile to make the implementation too complicated just for the optimization of the corner case, i.e. HO failure.  Considering the UE memory restriction, the total number of RBs can be supported in DAPS HO will be reduced to a half if a backup copy of data is always required for each non-DAPS bearer. |
| LG | No | It is up to UE implementation. |
| Samsung | Yes, but | We have some sympathy with the issue since we raised similar issues and proposed Option 2. However, it seems that RAN2 already discussed this and concluded it before. |
| ZTE |  | Considering we had spent much time to discuss the fall-back handling of non-DAPS bearer at previous meetings, we think it’s not necessary to re-open this issue at this stage. And it can be up to the UE implementation on how to revert back to the UE configuration and buffered data. |
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**Question:** if companies think reverting-back the ‘discarded’ data for non-DAPS bearer in case of DAPS HO failure is an issue, and further effort is needed, e.g. in order to reduce the UE complexity for fallback to source cell, which option would companies like to choose?

* Option 1: UE always perform the RLC/PDCP re-establishment for non-DAPS bearers when HO fails, even if the source PCell has not experienced RLF.
* Option 2: UE suspends non-DAPS bearers upon reception of HO command. UE performs RLC/PDCP re-establishment for non-DSPS bearers when HO succeeds; UE resumes non-DAPS bearer when HO fails.
* Option 3: other option.

Option 3.1: make source recovery based DAPS failure handling as optional feature

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| Company | Which option to choose? | Comments |
| Intel | Option 3.1 | Would be ok to make Source recovery based DAPS failure handling as optional feature like what we did for CHO based recoveery. |
| Nokia | Option 2 |  |
| Mediatek | Option1, option2, option 3.1 | Either option1 or option 2 are OK to us. Option 3.1 to make DAPS HO failure as optional and to introduce a capability bit is also fine to us, which may be the easiest way to address the issue in both implementation and specification. |
| LG |  | If the change is needed, we perfer Option 2. |
| Samsung | Option 2, but | If the majority are reluctant to discuss this again and want to keep the current spec, we are ok to follow the majority view. |
| ZTE |  | If the majority thinks the change is needed, we prefer option 2. |
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## 2.3 CP: DAPS security concerns

[R2-2101501](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101501.zip) Views on several security concerns for DAPS handover Samsung discussion Rel-16 NR\_Mob\_enh-Core

**Proposal 1. Confirm that the network implementation can resolve possible security issue for ROHC when security key is not updated in DAPS handover, e.g. the network can trigger DAPS handover for DRB not configured with ROHC to avoid possible security issue if it does not change the security key.**

**Proposal 2. Confirm that there is no security issue for uplink switching during DAPS handover when security key is not updated.**

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| Company | P1 is agreeable?  (Yes or No) | P2 is agreeable?  (Yes or No) | Comments |
| Intel | Yes | Yes | P1 is coveredy by R2-2100619, and therefore we may have conclusion during online discussion. |
| Nokia | OK, but not needed | OK, but not needed | Security key change is agreed as needed for DAPS. Why do we need to handle another scenario, with more conditions, such as ROHC not enabled? Addressed at the session on 25.01. |
| Mediatek | Yes | Yes |  |
| LG | Yes | Yes |  |
| Samsung | Yes | Yes |  |
| ZTE | Yes | Yes |  |
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[R2-2101902](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101902.zip) Potential security issue on DAPS handover with key change failure SHARP Corporation discussion Rel-16 NR\_Mob\_enh-Core R2-2010209

**Proposal: Add a NOTE to RRC specifications (both 38.331 and 36.331) to inform that it is left to network implementation to avoid key stream reuse after UE falls back to the source cell due to DAPS handover with key change failure**

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| Company | Agree?  (Yes or No) | Comments |
| Intel |  | tend to agree the potential security issue, but this can be resolved by refresh the key before next HO after DAPS failure recovery. |
| Nokia |  | Network implementation can take care of modifying to the new key for next handover command to same cell. And chances of UE attempting regular handover after DAPS handover failure is also very low, right? We should not add the NOTEs to cover each potential corner case. |
| LG | No | This case is a rare case and it can be handled by the network implementation. Since the network will know the security issue after DAPS HO failure, the network will simply update security if the UE should perform HO towards the same cell. |
| Samsung | No | It can be handled by network implementation. |
| ZTE |  | Agree with the intention. The NW can know DAPS HOF via FailureInformation report so it can be up to the NW implementation to ensure a new key is derived for the same target cell, if selected. But we wonder whether we need to add so many notes for the NW implementation in each corner case. |
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## 2.4 UP Topics

[R2-2101498](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101498.zip) Handling of unforeseen protocol data during DAPS handover Samsung discussion Rel-16 NR\_Mob\_enh-Core

[R2-2101497](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101497.zip) CR for handling of unforeseen protocol data during DAPS HO Samsung CR Rel-16 38.321 16.3.0 1035 - F NR\_Mob\_enh-Core

**Proposal. During DAPS handover, the source MAC entity shall discard the received MAC subPDU for non-DAPS bearer when a MAC PDU including an LCID for non-DAPS bearer is received.**

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| Company | Agree?  (Yes or No) | Comments |
| Intel |  | Tend to agree the problem may be caused by MAC layer retransmission for non DAPS bearer.  I assume for non DAPS bearer, RLC/PDCP should not send any data to MAC,and therefore should cause problem. |
| Nokia | No | This change is not required. It should be RLC/PDCP responsibility to stop the transmission for non-DAPS bearer. This may also require RRC to MAC interaction to include the DAPS indication. |
| Mediatek | NO | Up transmission of HO command, the network should stop schedule the non-DAPS bearer through the source cell. Even if UE keeps the source MAC configuration, the received MAC PDU should not include non-DAPS bearer data. Even if UE receives the unseen protocol data, we don’t think it will cause error. Becasue the LCH is associated to the target cell, the source MAC has no way to deliver the MAC SDU to upper layer. |
| LG | No | The case is already covered by below statements:  From 38.321  When a MAC entity receives a MAC PDU for the MAC entity's C-RNTI or CS-RNTI, or by the configured downlink assignment, containing an LCID or eLCID value which is not configured, the MAC entity shall at least:  1> discard the received subPDU. |
| Samsung | Yes (proponent) | Actually, based on the comments from others, we are not sure if other companies consider the concerned scenario, exactly. The scenario is like this:   * There would be a case that the source gNB transmitted a MAC PDU but didn’t receive the corresponding HARQ ACK ‘‘before the transmission of DAPS handover command to UE‘‘ * The source gNB transmits a DAPS handover command to UE. * The source gNB can perform HARQ retransmission for the MAC PDU ‘‘during DAPS handover‘‘. * The transmitted MAC PDU before DAPS handover can include MAC subPDU corresponding to non-DAPS DRB. * If UE receives the MAC PDU, it is not clear how UE handle the MAC subPDU corresponding to non-DAPS DRB since the LCID is configured but the RLC entity is not associated with the source MAC entity anymore.   @Nokia, Just for my understanding, You mean that the network ensure that the DRB’s RLC PDU is not included in MAC PDU if the DRB is supposed to be configured with non-DAPS DRB? Or The network will delay the transmission of DAPS handover command to UE until the reception of HARQ ACK if the MAC PDU includes the DRB’s RLC PDU which is supposed to be configured with non-DAPS DRB?  @MediaTek, in the concerned scenario, the MAC PDU was already transmitted before the transmission of DAPS handover command. You are saying that the network will stop the HARQ retransmission for the MAC PDU??? If the MAC PDU includes DAPS DRB’s MAC subPDU, then the data will be lost. We have concern about the data loss.  @LG, I am afraid that we cannot agree to your statement. As we mentioned in the contribution, the LCID for non-DAPS DRB is still configured and thus UE cannot discard the MAC subPDU according to your reference. |
| ZTE | Yes | Agree with the problem may be happened when the source node performs HARQ re-transmission including MAC subPDU for non-DAPS bearer. |
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[R2-2101499](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_113-e\\R2-2101499.zip) Correction on PDCP transmit operation Samsung CR Rel-16 38.323 16.2.0 0064 - F NR\_Mob\_enh-Core, NR\_IIOT-Core

Summary of change:

To remove the parenthesis to make “else” consider all other cases except the activation status of PDCP duplication.

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| Company | Agree?  (Yes or No) | Comments |
| Intel | Yes |  |
| Nokia |  | We prefer adding more text to cover all cases within the ‘else’ related subclauses than to remove the existing clarification. |
| Mediatek |  | Agree the intention. Is it clear to revise it as i.e. the PDCP duplication is deactived or not configured for the RB? |
| LG | No | According to current specification, the split bearer is considered as the deactivation state. Considering this, the DAPS bearer can be considered as the deactivation state. Thus, the change is not needed. |
| Samsung | Yes | DAPS DRB is not related to PDCP duplication state at all. |
| ZTE | Yes |  |
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# 3 Conclusion

Based on the discussion in the previous sections we propose the following:

# Annex

# In order to ease possible offline discussions, all delegates having provided input in this document are requested to fill the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia | Jedrzej Stanczak | jedrzej.stanczak[at]nokia.com |
| Mediatek | Yuanyuan Zhang | Yuany.zhang@mediatek.com |
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