93e-07-UserPlane-Integrity - Version 0.0.8
RAN

3GPP TSG RAN#93e RP-21xxxx

e-Meeting, Sep 13th – 17th, 2021

Agenda item: 9.1.3

Source: 3GPP TSG RAN3 Chair (ZTE)

Title: Email Summary on User Plane Integrity Protection support for EPC connected Architectures

Document for: Discussion and Decision

1 Introduction

In this document, we will provide a summary on User Plane Integrity Protection support for EPC connected architectures using LTE and NR, using the following contributions as a starting point:

- RP-212297 New WID on User Plane Integrity Protection support for EPC connected architectures using LTE and EN-DC
- RP-212298 Motivation for New WID on User Plane Integrity Protection support for EPC connected architectures using LTE and EN-DCDiscussion

2 Discussion

The email discussion is organized as follows:

- Initial Round till Tuesday 14th Sep 10:00h UTC: Final deadline for comments on Initial email discussions
- Intermediate Round till Wednesday 15th Sep 10:00h UTC: Final deadline comments on Intermediate email discussions
- Final Round till Thursday 16th Sep 10:00h UTC: Deadline for final comments

2.1 Initial Round

Background:

According to the SoD in RP-211564, New WID on User Plane Integrity Protection support for EPC connected architectures using LTE and NR is proposed to be decided in September RAN plenary meeting with clear objectives.

According to RP-212298, the current status among WGs are:

SA3 Status:

In order to provide user plane data security, SA3 have agreed to support UPIP for EPC connected architectures. The conclusions are captured in the version of TR 33.853 that is sent for approval in the June TSG SA #92e plenary.

March TSG SA #91e plenary agreed the "WID for normative changes for User Plane Integrity Protection for LTE options" in SP-210105.

SA3 has been discussing normative CRs but have not yet sent them to TSG-SA for approval.

Their "living", draft CRs are in S3-213266 for TS 33.401 and S3-213256 for TS 33.501.

RAN 2 and RAN 3 status:

SA3 questions have been answered in response LSs in R2-2104349 (from April RAN 2 #113bis-e) and R3-212812 (from May RAN 3 #112-e). RAN 2 have indicated that NR PDCP will be used to provide UPIP.

Clause 4.2.2 of TS 37.340 (Release 15 and onwards) already permits the use of NR PDCP on LTE-only radio connections.

SA 2 Status:

SA2 has agreed the following stage 2 CRs and they are attached to an LS in RP-212494 (S2-2106974)

TS 23.401 CR3645r1

TS 23.501 CR 3009r1

TS 23.502 CR 2957r1

Furthermore, according to the technical discussion in RAN#92E, it has the common understanding that with the confirmation that NB-IoT and/or eMTC devices shall not use NR-PDCP, then this is excluded in this release.

Scenarios and objectives propsed in RP-212297 (eMTC case needs to be clarified as well):

Specify RAN basic functions for optional support and use of UPIP (at the full data rate supported by the UE) for the following EPC connected architecture options:

- EPC <-> LTE-only [RAN2, RAN3].
- EPC <-> EN-DC for both S1-U terminated in eNB and en-gNB [RAN2, RAN3].
- NB-IoT is excluded from this WID.
- Whether eMTC is excluded from this WID?

Feedback Form 1: Q1: Do you agree to approve this WI in R17? If yes, any comments on the above scenarios/objectives as proposed in RP-212297?

1 – VODAFONE Group Plc

Yes

2 – Samsung Electronics Co.

Yes, we agree to approve this WI in Rel-17 assuming it is limited to use NR PDCP, as proposed in RP-212297. Consequently, we think eMTC should also be excluded from scope of this WI.

3 – vivo Mobile Communication Co.

Yes, We agree that NR PDCP can be used for UPIP for Rel-17 LTE/EPC and the impact on RAN2 is minimal.

4 – Ericsson LM

Yes, we agree to have a Rel-17 WI for mentioned EPC connected architectures. User Plane is an integral and essential component of E-UTRA. It is mandatory supported in E-UTRA except for NB-IoT. Thus support for UPIP integrity protection should cover all tracks where user plane operation is mandatory and hence also for IoT track (eMTC) it should be supported.

The need for UPIP is not defined by whether there are current implementations with NR-PDCP. It is defined by security considerations and it should be understood that security will be important for eMBB and IoT alike. Omission of UPIP support for IoT would give the wrong impression about 3GPP's security commitments.

We further note that for eMTC (like for normal LTE) the Uu interface already supports NR-PDCP for connectivity to 5GC. Making exceptions for eMTC would likely require more effort than adding support for UPIP to both normal LTE and eMTC. Moreover, in our understanding UPIP will be optional to support and hence will not impact implementations which choose to not support it.

5 – Intel Technology India Pvt Ltd

Yes, we support having the user plane integrity protection for the EPC connected architecture described above.

For the WID in RP-212297, we think that RAN2 should be listed as the secondary WG (while led by RAN3) as this requires RAN2 works as well. Moreover, since this is an optional feature, the UE capability spec (TS 36.306) should be listed as an impacted spec.

6 – CATT

We support to have a WI to support UPIP for LTE.

Agree with Intel that RAN2 work is needed although it is minimal.One small editial comment on the WID: For the impacted TS, 36.413 should be E-UTRAN S1 Application Protocol instead of NG-RAN NG Application Protocol.

7 – QUALCOMM JAPAN LLC.

We also support soltuion using NR PDCP. To avoid much RAN2 work, the architecture options should be limited to those where the use of NR PDCP is supported with EPC today, i.e. LTE standalone and EN-DC. eMTC should be excluded in this regard (NR PDCP is supported only with 5GC today).

8 – TELECOM ITALIA S.p.A.

Yes

9 – Spreadtrum Communications

Yes, we agree to suport UPIP for LTE using NR PDCP.

10 – Telia Company AB

We agree the support of optional UPIP for LTE using NR PDCP. eMTC inclusion and exclusion should be based on evaluating the effort for both.

11 – Nokia Corporation

If sufficient time can be found for this WI in RAN2/3 (0.25 TU for one RAN2 meeting might be too little), we are fine to consider this in Rel-17.
On the WI contents:
- **eMTC support of UPIP:** We don't see the need to support UPIP for eMTC but perhaps the easiest would be to state e.g. "Support of eMTC can be considered as second priority if no extra specification changes are required" as a compromise.
- **Specifications:** On affected specifications, also TS36.306 should be listed (as LTE UE capability impacts are expected).

12 – Deutsche Telekom AG

- We support initiation of this WI for Rel-17.
- We support to include eMTC in the objectives for the reasons outlined by Ericsson.
- We confirm that NB-IoT is not included as U-Plane NB-IoT is not commercilised
- We wonder why RAN3 should be the leading WG, not RAN2 ? (work is RAN3 seems to be even less than in RAN2?)

13 – Huawei Tech.(UK) Co.. Ltd

Yes, Huawei is supporter of the WI. We do not have further comment on the WID now.

14 – ZTE Corporation

We think the work item can be approved for all cases where NR PDCP is/can be used in LTE. In cases where NR PDCP is not used today (e.g. eMTC), in order to use this, RAN2 will require some changes, but these are minor from standards perspective. We are fine to support this also for these cases assuming that the complexity increase coming from supporting NR PDCP for eMTC mobile devices is acceptable to the UE vendors/chipset vendors. If we agree to support this, this should be clarified explicitly in the WID.

One editorial comment to the WID: The detailed statements regarding NB-IoT implementations that exist in the field today can be removed. We think it is sufficient to capture in a note that NB-IoT is excluded for this WID.

15 – BT plc

Yes, we support to approve this work item for R17.

16 – LG Electronics Inc.

We suggest to wait when the final CRs are approved in SA3 since stage 3 will be extended.

On the scope, it is preferred to limit the architecture options to EPC only for reducing RAN2 impacts. NB-IoT and eMTC should be excluded.

17 – Apple Computer Trading Co. Ltd

Yes, we support the R17 WI with the assuming to use NR PDCP.

18 – Ericsson LM

We disagree with Nokia's proposed handling of eMTC. We think it is an unreasonable and unnecessary requirement and we have discussed the meaning of second priority before.

So far we think additional effort is needed to exclude eMTC rather than to support it.

19 – MediaTek Inc.

No. LTE evolution has basically stopped (other than DSS and IoT).

This proposal **is** too late into LTE lifecycle, and comes with major implementation impact, even if indicated as "just an option".

Using NR PDCP in EPC LTE only is not an architecture option that is specified or supported today. 37.340 is only describing a special case of multi-connectivity, that has fundamentally different implications and assumptions in a) UEs and b) network. Mobility aspects are also overlooked - namely across supporting/non-supporting nodes: traffic interruption is anticipated from non-homogeneous deployments.

20 – Nokia Corporation

To Ericsson: We don't have a problem with allowing UPIP for eMTC IF it comes for free, but if that's not the case (which we will only see once the work starts), we also should avoid extra work to support UPIP for eMTC.

Feedback Form 2: Q2: Take the progress in SA3 and SA2 into account, what's the standard impact on RAN2 and RAN3 to support this feature?

1 – Samsung Electronics Co.

Assuming NR PDCP is only used as in RP-212297, we only see marginal impact to RAN2 stage-3 specifications e.g. to introduce a capability and to update the conditional presence of the field *integrityProtection* for the additional scenarios.

2 – VODAFONE Group Plc

In RAN 2, some RRC update is probably needed to enable LTE only devices to use NR PDCP.

In RAN 3, S1AP and X2AP codepoints are needed, and procedures to handle movement to (and from) legacy eNB. Codepoint also needed for LTE architecture with CP UP split of CU.

3 – vivo Mobile Communication Co.

agree with Samsung.

4 – CATT

Signallings related with Initial UE access,handover and ENDC operation may need to be updated to support LTE UPIP.

5 – QUALCOMM JAPAN LLC.

Agree with Samsung on RAN2 impact. We also assume eMTC is excluded to keep RAN2 impact limited.

For RAN3 we see the following to be the main items.

- UE Capability codepoints (semantics)
- Signalling to support security policy handling on E-RAB setup, mobility and DC
- eNB behaviour linked to policy signalling

6 – Spreadtrum Communications

Agree with Samsung.

7 – Nokia Corporation

For RAN2, UE capability changes seem needed and we would also note that while LTE PDCP was designed to cope with possible forwarding losses (in EPC), NR PDCP was not (in 5GC). As a result, using NR PDCP at handover in LTE might increase packet delays, which needs to be looked at.

For RAN3, we assume some S1AP/X2AP modifications due to UPIP (e.g. codepoints for security capabilities, source/target handling of UPIP at HO). The affected RAN3 specifications seem OK.

8 – Huawei Tech.(UK) Co.. Ltd

The relation with SA2/SA3 is described in the WID.

The standard aspects in relation with SA2/SA3 are also described in the WID. The SA2/SA3 should have meeting before next RAN WGs meetings. Then RAN3 and RAN2 shall take benefit of next meetings, RAN2#116e and RAN3#114e, to discuss the SA2/SA3 technical progress, if any and liaise SA2/SA3, if needed.

9 – ZTE Corporation

In RAN2 some updates are needed to the specs to support NR PDCP for those cases where it is not supported today and to capture the updated integrity protection capability in general for LTE operation. The impact to RAN2 in our view is trivial.

In RAN3 additional UPIP codepoints in S1AP/X2AP and corresponding description need to be updated.

10 – LG Electronics Inc.

The main impact on RAN2 is to release the current restriction based on RAN2 LS, i.e., NR PDCP can be used for UPIP for Rel-17 LTE/EPC.

The main impact on RAN3 is S1/X2/E1 signaling to support UPIP policy.

11 – Apple Computer Trading Co. Ltd

Agree with Samsung on RAN2 impact.

12 – Ericsson LM

Main items include

RAN2: Remove existing restrictions which limits use of NR PDCP and configuration of UP IP for UEs connected to EPC

RAN3: S1AP/X2AP signalling and procedures to support UPIP (including capabilities, security policies and mobility)

Moderator's summary: According to the feedback in Q1 and Q2: All companies agree to approve this R17 WI as supporting UPIP with EPC connected architecture using NR PDCP except one company, 4 companies prefer to exclude eMTC, 2 companies prefer to include eMTC, while other companies keep neutral on this or do not express their opinions.

- A new R17 WI (Supporting UPIP with EPC connected architecture using NR PDCP) is approved in RAN#93e.

- Considering there is no consensus on eMTC case, exclude eMTC in R17.

- According to the standard work analyzed as below and the discussion in RAN#92, it's proposed that RAN3 is the leading group for this WI.

Potential standard impact

- RAN2: RRC spec updates are needed, e.g., removing existing restrictions which limits use of NR PDCP and configuration of UP IP for UEs. Packet delay/interruption issue during HO needs to be further investigated.

- RAN3: S1 AP and X2 AP signalling and procedures to support UPIP, e.g., during E-RAB setup, mobility and DC.

2.2 Intermediate round

According the summary from the first round of email discussion. Here moderator suggests to focus on the draft WI and TU allocation in the intermediate round.

- Pls companies provide updates based on the "draft RP-21_ rev of RP-212297_EPC UPIP WID_v00.doc" in the draft box;

- Pls rapporteur check with RAN2 chair and RAN3 chair on TU allocation for this WI (without proper TU allocation, this WI can not be approved finally):

For RAN3 TU allocation, as proposed in RP-211741, it can be included into the "basket items" with 0.5 TU shared by multiple late R17 items in RAN3#114bis-e and RAN3#115-e. Early discussion can be treated based on LSin.

TU arrangement update should also be reflected in the "LTE UPIP Time_budget_request.xls" .

Feedback Form 3: Q1: Any addtional comments can be provided here.

1 – MediaTek Inc.

R2 Chair: I think TU allocation in R2 will not be a blocking point for this WI. I had hoped that R2 TS impacts could be very simple, e.g. might not even need on-line discussion. Above I find only one comment that goes in another direction (Nokias). E.g. If we would need to modify NR PDCP behaviour for enhanced retransmissions at mobility, then that would for sure consume on-line time (and UP is usually controversial). Further explanations on the need for and potential impact of any such additional enhancements would be appreciated, thanks!

2 – VODAFONE Group Plc

Thanks for the summary so far. Some comments/questions:

a) eMTC seems to share the same signalling with other non-NB-IoT LTE devices. So, how should they be excluded withOUT adding complexity to the RAN 2 signalling or procedures, please? Note that the UE capabilities for security features are (for security reasons) signalled by NAS signalling and should not normally be disabled by bits within the UE Radio Access Capability.

b) Working in RAN 3 in November based on the incoming LS from SA2 is OK but is really misleading on TU usage.

c) we would also be interested to avoid the User Plane impacts mentioned by Nokia.

d) thanks to the RAN 2 chair for indicating that TUs should not be an issue.

3 – ZTE Corporation

Moderator's observation on the following questions:

a) eMTC seems to share the same signalling with other non-NB-IoT LTE devices. So, how should they be excluded withOUT adding complexity to the RAN 2 signalling or procedures, please? Note that the UE capabilities for security features are (for security reasons) signalled by NAS signalling and should not normally be disabled by bits within the UE Radio Access Capability.

Moderator: The key issue here is whether UE vendors/chipset vendors are ready to accept this feature in R17, accordindg to the previous email discussion, it seems not. While if we exclude this feature for eMTC, the standard effort seems minor like other features which not supported by eMTC/NB IoT, e,g., add description in RRC specs like "not applicable for eMTC UEs".

b) Working in RAN 3 in November based on the incoming LS from SA2 is OK but is really misleading on TU usage.

Moderator/RAN3 Chair: The discussion in RAN3#114e is only focus on the possible early co-ordination with SA2/SA3 rather than the detail normative work, LS interaction should be discussed in AI8.1.

c) we would also be interested to avoid the User Plane impacts mentioned by Nokia.

Moderator: It can be discussed in RAN2 as contribution driven.

d) thanks to the RAN 2 chair for indicating that TUs should not be an issue.

Moderator/RAN3 Chair: Thanks RAN2 Chair, it would be great to understand the detail TU allocation plan for this here or in email# [93e-33-RAN2-TUs].

4 – MediaTek Inc.

It is a pity that our comment is ignored in Initial Round. At least, the summary should not say "All companies agree to approve this R17 WI".

As mentioned earlier, the LTE evolution should be stopped. From implementation perspective, full rate UPIP is not a small change and may request fundamental (hardware) upgrade. We do not support to approve this WI.

5 – Huawei Tech.(UK) Co.. Ltd

Thank you for the summary and the discussion. Few comments from Huawei:

b) We have the same feeling "on misleading the TU usage"; see the discussion on RAN3 TU for more details

c) we share view of Vodafone, the User Plane impacts, it could be revisited in TEI as optimization later on. No need to open discussion in RAN2 now

e-new) Thanks to the moderator for the massive clean-up. However we see some value to the "Note", particularly the reference to SA2/SA3, it is worth to keep its

6 – Ericsson LM

We generally agree with Vodafone's observations a). eMTC shares same sigalling as other non-NB LTE devices and it is not as simple as stating that "this or that is not applicable for eMTC UEs".

We should not try to artificially exclude something which is useful and important, for no good reason. In particular when no particular effort has been identified for including; only for excluding.

No extra objectives are needed and unless we do something extra it would be included. This is a case where the WID would probably not even need to single out eMTC from other non-NB LTE.

For NB-IoT it is obviously different as it does no share the same ASN.1 and does not mandate UP support.

Under these circumstances we believe consensus should be applied to deciding to exclude support. Not the other way around. In the discussion most companies did not suggest to exclude eMTC. Furthermore the moderator seems to also acknowledge effort would be needed to exclude eMTC.

Also note that the UPIP feature will not be mandatory so the question is primarily about standards impact. One can choose not to support UPIP feature by implementation.

We don't think it is acceptable to omit standards support for UPIP for LTE-based technologies where UP is mandated/essential.

7 – QUALCOMM JAPAN LLC.

1) We are fine to leave TU allocation decision to RAN2 and RAN3 chairs.

2) Regarding the second note in the latest draft WID, we think the collaboration with SA2/SA3 should be put in a stronger statement. RAN2 and RAN3 should actually follow the requirements and designs coming from those WGs, rather than it being optional to cooporate with them.

3) CT1 should be listed as a WG which RAN3 and RAN2 need to cooperate in terms of UE capability handling for instance.

2.3 Final round

According to the online discussion, there are still concerns to support this in R17, especially on eMTC case.

Let's check whether Option1/2/3 below can be agreed as WA in this meeting:

Opt1: Approve this R17 WI with the condition that NB IoT case is excluded. Support eMTC case without extra work.

Opt2: Approve this R17 WI with the condition that NB IoT and eMTC cases are excluded.

Opt3: Approve this R17 WI for UEs that support EN-DC and/or NR-StandAlone operation.

Feedback Form 4: Please companies provide your view on WAs here.

1 – VODAFONE Group Plc

Option 1 and 2 are OK for me - assuming that option 2 is done by eMTC UEs indicating that they don't support UPIP in the NAS signalling (e.g. by using the existing R16 and earlier release message encoding).

What I pointed out in the GTW call is that there is a 3rd option:

Option 3: that the WID is only for UEs that support EN-DC and/or NR-StandAlone operation.

While I don't prefer this option 3, it is acceptable to me for Release 17.

2 – Ericsson LM

Opt2 implies more spec impact than Opt1 so if we are concerned with work and effort in Rel-17, Opt1 should be our only option. Therefore, we agree for Opt1 and disagree for Opt2. However, we don't think WA is a very nice approach for a new WI in Rel-17.

3 – Ericsson LM

To Vodafone: In what way would the spec impact be different for your Option 3?

4 – QUALCOMM JAPAN LLC.

We support Option 2.

However we understand there was another point raised in online discussion on Wednesday. That is, whether the UE not supporting EN-DC is in the scope or not.

It is our understanding that RAN2 previously recommended the use of NR PDCP for the support for EPC UPIP, based on the current status of the RAN2 standard for EPC architecture below.

- NR PDCP is supported in EN-DC
- NR PDCP is supported in LTE standalone "if" the UE supports EN-DC.
- NR PDCP is not supported in NB-IoT and eMTC

It is then our understanding that the new WI proposal submitted in this meeting proposed the following.

1. UPIP with NR PDCP in EN-DC
2. UPIP with NR PDCP in LTE standalone "regardless of" whether the UE supports EN-DC.
3. UPIP with NR PDCP in eMTC

Point 2 and 3 are departure from release-15/16 EPC design.

We can only accept the point 2, but not point 3.

5 – Nokia Corporation

Option 1 wording is unclear: Does it mean that A) eMTC is included in the WI (unconditionally, meaning WI must include UPIP for eMTC as an optional separate capability even if that requires increased amount of work to specify in WGs) OR B) eMTC is included in the WI if specifying that doesn't require (substantial) amount of work in WGs?

With that clarification, we would be fine with 1B) and 2). Also option 3 from Vodafone is fine to us.

6 – ZTE Corporation

Moderator reply to Nokia's question: The understanding on 1B is correct.

7 – Ericsson LM

In response to Qualcomm's comment:
There was previously no use case for NR-PDCP with eMTC devices connected to EPC. For eMTC devices connected to 5GC, NR PDCP is already possible for eMTC. The motivation for RAN2 going with NR PDCP for LTE UPIP is that the spec impact was judged to be less. When NR-PDCP is made generally available for LTE devices connected to EPC, there would be no difference in spec impact between non-eMTC and eMTC LTE devices.

There is no rationale for excluding eMTC from a standards perspective. On the contrary it would imply more work.

8 – VODAFONE Group Plc

To me, the rationale for NR-PDCP was entirely NOT UE related! NR PDCP has the potential for much faster (e.g. complete) network rollout of LTE UPIP... as e.g. a Rel 15 software upgrade of an LTE base station allows it to remotely control NR-PDCP hardware on a non-colocated gNB (or centralised user plane unit).

9 – VODAFONE Group Plc

To reply to Ericsson's question: in my understanding, option 1 and 2 require the RAN 2 signalling to be extended to allow non-EN-DC mobiles to be commanded to use NR-PDCP, while if we only do the WID for EN-DC UEs less changes would be needed. But if we prepare for a future with non-EN-DC capable NR/LTE devices then probably the same changes are needed as option 1 and 2.

10 – Ericsson LM

To follow-up on Vodafone's response to our question: The signalling is already in the specifications since Rel-15. There is a restriction in the spec w r t configuration of UPIP when connected to EPC, but this applies also to EN-DC case. Support for UPIP will imply support for NR PDCP so when eNB knows that the UE is capable of UPIP, the existing signalling can be used. No need for signalling extension and this applies to 'LTE SA' and EN-DC alike. In our understanding the same signalling can be used for non-eMTC LTE and eMTC.
We only see more complications and effort by trying to (artificially) restrict or exclude.

11 – QUALCOMM JAPAN LLC.

We think it is reasonable from UE vendor side to want to leverage existing UE implementations in order to support EPC UPIP. So it is important to look at the release-15/16 baseline. In this particular case, whether NR PDCP is supported or not.

Ericsson rightly mentioned that ”There was previously no use case for NR-PDCP with eMTC devices connected to EPC”. This is exactly one of the reasons why we are hesitant to include eMTC becasue there is no implementation we can leverage. On top of it, we have a concern about increasing processing burden for low complexity devices.

12 – Samsung Electronics Co.

We share the view with Qualcomm, and thus support Option 2.

It should be noted that, when RAN2 indicated ’NR PDCP only’ in the RAN2 LS before, the main reason was not about minimizing the specification impact, but to avoid new UE implementations. That is, we assumed that normal Rel-17 UEs (i.e. not eMTC/NB-IoT UEs) most likely supports NR PDCP for EN-DC/5GC operation anyway, so the UPIP can be easily supported by changing its PDCP version to NR with this ’NR PDCP only’ option. Considering the original intention of the RAN2 LS, we think both eMTC and NB-IoT UEs should be excluded from the WI.

13 – Spreadtrum Communications

RAN2 has agreed that NR PDCP can be used for UPIP. In our understanding, using NR PDCP for LTE UPIP is only applicable to UEs which support NR PDCP. According to R15/R16, the NR PDCP is supported by UE supporting EN-DC. From UE shipset vendor perspective, we think we shall not introduce new capability of NR PDCP to the LTE-only UEs, which will bring huge impacts to the UE implementation. And we also agree with QUALCOMM that we should avoid increasing processing burden for low complexity devices. Therefore, the NB IoT and eMTC should be excluded.

So we support option2, and also support modified option 3 “Approve this R17 WI only for UEs that support EN-DC operation”.

14 – Guangdong OPPO Mobile Telecom.

We support this WI as long as the scope is limited to the UEs which is capable of EN-DC.

15 – Apple Computer Trading Co. Ltd

We support Option3 and limit the scope to the EN-DC capable UE.

Currently only the EN-DC capable UE supports the NR-PDCP in the LTE connection. Therefore, to support the LTE UP IP via NR-PDCP, the simple and reasonable way is just to request the EN-DC capable UE to support this feature.

16 – Deutsche Telekom AG

Option 3 does not exist ! What is ”NR-StandAlone operation” ? -> this is Architecture Option 2 (NR connected to 5GC) and has been solved in Rel-16 already last year !

We support to cover:

- LTE connected to EPC (also for devices which do not support EN-DC)
- EN-DC connected to EPC (Architecture Option 3X/NSA)
- eMTC connected to EPC (or 5GC)
- No NB-IoT (as it does not use User Plane)
- No Architecture Option 5 nor 7

Note: I must remark that this is a totally confusing discussion (see my emails to Chris on the reflector)

17 – Orange

We agree with DT, and think it essential the WI covers not just EN-DC but also LTE connected to EPC (option 1) and LTE-M.

18 – ZTE Corporation

Moderator: If my understanding is correct, DT and Orange prefer Option1.

For Option1 includes:

- LTE connected to EPC (also for devices which do not support EN-DC/NR PDCP)
- EN-DC connected to EPC (devices which support EN-DC/NR PDCP already)
- eMTC connected to EPC (devices do not support NR PDCP yet)

While Option2 includes:

- LTE connected to EPC (also for devices which do not support EN-DC/NR PDCP)
- EN-DC connected to EPC (devices which support EN-DC/NR PDCP already)

According to the feedback from some UE/chipset vendors, only the following case can be supported:

- EN-DC connected to EPC (devices which support EN-DC/NR PDCP already)

19 – HuaWei Technologies Co.

In general we are supportive on this work proposed by Vodafone. After reading companies feedback, we suggest to go with Option 2 as we see this is the middle ground that we can achieve. Regarding how to differ eMTC UEs and LTE smart phones, we understand the existing UE capability reporting can already indicate eMTC features and UE category for eMTC UEs, thus this should not be a problem for supporting option 2.

20 – Ericsson LM

We disagree with the view/idea that the use case of UPIP should somehow be restricted by the use case of EN-DC. UPIP (Rel-17) and EN-DC (Rel-15) are two different use cases for NR-PDCP and the need for UPIP is not in any way limited to scenarios involving EN-DC or UEs supporting EN-DC. From the moderator's reply on the reflector it appears that some companies propose additional effort to anyway make an (artificial) limitation, somehow disregarding the rationale for the use case.

We are not sure it is acceptable with additional effort to restrict perfectly valid use cases. We would be fine however with a WI/WID which doesn't explicitly mention eMTC. I.e., in neither exclusive nor inclusive language with the understanding that we make no extra effort to either include or exclude it.

21 – Spreadtrum Communications

According to moderator's updated options, we only support "EN-DC connected to EPC (devices which support EN-DC/NR PDCP already)".

22 – MediaTek Inc.

- We continue being very surprised by this discussion.

- We understand the eagerness of infra vendors to be able to sell UPIP as a new *feature* to eNBs (as opposed to having to implement a security patch). Unfortunately, the situation is very different on device side - the proposal has major impact on UE implementation at a **too late stage in the LTE lifecycle** with all LTE evolution having stopped in 3GPP for a long time already (except basically for IoT and DSS). For this reason, any **applicability to LTE-only UEs is unacceptable.**
- **If the security hole does exist in LTE networks**, then this proposal ought to be treated as **an essential correction on network side, NOT as a new feature.**
- **Option 1 is NOT acceptable**
- **Option 2 is NOT acceptable**
- **Does Option 3 "NR SA" include RedCap UE?** This proposal may lead to significant cost increase for RedCap UEs supporting LTE.
- **The proposal has major implementation impact overall coming way too late into Rel-17.**
- The proposal will lead to an increase in power consumption
- **We would be ok with Option 3 only, for Rel-18. NOT for Rel-17**

23 – BT plc

EN-DC connected to EPC (devices which support EN-DC/NR PDCP already), agree to support for R17

LTE connected to EPC (also for devices which do not support EN-DC/NR PDCP), Would be acceptable to us if minimal impact to specifications to support

eMTC connected to EPC (devices do not support NR PDCP yet), would be acceptable to us if there is minimal extra work to support.

3 Conclusions

Moderator's Summary: After 3 rounds of email discussion, we can observe there are large differences on the scenarios/scopes (see Option1/2/3) and no consensus on the approval of this new R17 WI in RAN#93e so far. It seems that UE/chipset vendors are reluctant to continue the evolution of LTE-only UE to support NR PDCP.

Let's consider whether the following scenario/scope description can be accepted for all companies for further discussion:

- a. Support and use of UPIP for the EPC connected architectures only when NR PDCP is **supported**.
- b. Exclude NB IoT case.
- c. Without explicitly mention eMTC based on the common understanding that we make no extra effort to either include or exclude it.
- d. It should be supported in R17.

Feedback Form 5: Q1: Which bullet (a,b,c,d) can be agreed as above?

1 – QUALCOMM JAPAN LLC.

We are OK with a, b and d.

We understand ”a” means the following, i.e. the EPC scenarios where NR PDCP is supported in Release-16 are in the scope of WI.

- Applicable UE type: UE supporting EN-DC.
- Applicable architecure options: LTE standalone and EN-DC

Then NB-IoT and eMTC UEs are automatically out of the scope. In this sense ”c” does not make sense to us.

2 – MediaTek Inc.

We must reiterate our comments

- We understand the eagerness of infra vendors to be able to sell UPIP as a new *feature* to eNBs (as opposed to having to implement a security patch). Unfortunately, the situation is very different on device side - the proposal has major impact on UE implementation at a **too late stage in the LTE lifecycle** with all LTE evolution having stopped in 3GPP for a long time already (except basically for IoT and DSS). For this reason, **any applicability to LTE-only UEs is unacceptable.**
- **If the security hole does exist in LTE networks**, then this proposal ought to be treated as **an essential correction on network side, NOT as a new feature.**
- **Point a)** The implications of Point a. are unclear and make Point a. open-ended.
  - LTE only UEs supporting NR PDCP do not exist
  - The discussion should focus around Option 3 of the intermediate round i.e. consider ONLY LTE UEs supporting ENDC and/or NR Standalone operation
- **Point b)** NB-IoT is excluded
- **Point c)** No
- **Point d)** No - and importantly we don’t understand what is being discussed here in this Final Round (see Point a)
- **We propose RAN#93e plenary concludes:**
  - I) UPIP for LTE only UEs is NOT supported
  - II) UPIP support in LTE only configurations for UEs supporting ENDC and/or NR Standalone is discussed for **Rel-18** inclusion
    - Applicability to UEs supporting NR Standalone (RedCap) is considered independently

3 – vivo Mobile Communication Co.

we agree with QC, e.g., only ok with a, b and d.

4 – Spreadtrum Communications

We are only ok with a, b and d.

According to the TU relocation in RAN3, 4 late R17 WIs including UPIP only occupy 1.5TUs in R17. There will be many items need to be discussed for UPIP in RAN3. I am afraid we have no adequate time to discuss these items. So we also prefer to discuss this WI in R18.

5 – HuaWei Technologies Co.

We suggest for Rel-17 we go with a, b and d. To solve worries from UE vendors, we can also clearly mention eMTC is excluded. In our understanding, SA2 and SA3 have already started the Rel-17 normative work and quite a few CRs have been approved. Without RAN support, the whole work is broken, which is not a good precedence of coordination between RAN and SA.

6 – Samsung Electronics Co.

We are okay with b and d, but not c.

Regarding a, we now tend to agree with MediaTek, and can narrow down the scope to UEs that are already equipped with NR PDCP. Then, it can be revised as follows:

'Support and use of UPIP for the LTE UEs supporting EN-DC and/or NR Standalone operation'

7 – Nokia Corporation

We are OK with a, b, c and d.

We understand concerns about late introduction of the feature, but legacy UEs will anyway not need to implement this feature and it will be an **optional** capability for Rel-17 UEs. It's a bit strange to say we cannot modify LTE Rel-17 since some NR Rel-17 WIs do have LTE impact, too - why is this particular (optional) feature different from those (optional) features?

For NB-IoT/eMTC support, it's clear NB-IoT should not be supported and there was clear consensus on that. For eMTC, if LTE-only UE support of UPIP works "as-is" for eMTC (with perhaps only an extra capability bit in addition), then there's no need to exclude it. Let's try to be pragmatic and make the scope clear, then it's easier to discuss in which release the WI can be done.

8 – Nokia Corporation

One clarification to our comment: I wrote "it will be an **optional** capability for Rel-17 UEs"m which should be understood as "it will be an **optional** capability for Rel-17 **LTE** UEs", as UPIP is anyway mandatory to support for NR UEs since Rel-15.

9 – HuaWei Technologies Co.

We are confused when some companies say NR SA for Rel-18, please note NR SA UPIP has already been supported and the UE capability is mandated since Rel-16.

10 – Guangdong OPPO Mobile Telecom.

we share same understanding as QC regarding a), so this bullet should be updated as "Support and use of UPIP for the EPC connected architectures only for UE supporting ENDC". It is not necessary to emphasize SA UE. UE supporting other architecture e.g. NEDC can also support NR PDCP. we are fine with b). regarding c) our understanding is that eMTC device can't support ENDC that's why it is automatically out. We have no strong opinion on d).

11 – MediaTek Inc.

Responding to Nokia comment: This proposal is too late in Rel-17; it has major impact to UE implementation (integrity protection at full rate is not just another optional feature). It is way too late in the process now. Making it optional does not change this, it does not alleviate the risks imposed by this proposal. Had it come say 6 months ago, the situation would be different. **But we're way past allowing proposals like these, 3 months away from agreeing a Rel-18 package!**

12 – VODAFONE Group Plc

We can accept a, b, c, or d. (Also that it's just for EN-DC capable devices), and broadly agree with Nokia's comments.

In response to Mediatek's comment on R17 timeline, this work has been visible in the 3GPP pipeline for a very long while (the SID phase started in Rel 16)! Agreement on a Rel 17 Building Block WID (that was already available to RAN in June) is very similar to this week's SA agreement on WIDs for RedCap and NTN-IoT.

13 – ZTE Corporation

We are also fine with a, b and d for Rel-17. For eMTC, we don't think the spec changes are the bottleneck but we understand the concerns from UE vendors. So, it is okay to live without this option for now given the concerns from UE vendors.

14 – QUALCOMM JAPAN LLC.

We agree we do not have to discuss UPIP in NR standalone, and can focus on EPC connected architectures here.

We are not much concerned about the disconnect from SA/CT work. Please note that Qualcomm dropped the proposal in RP-210258/9 in RAN#90 which was intended to follow up on SA3 work on 5GC UPIP on additional 5G architecture options. It was due to lack of interest in RAN. It shows RAN can make their independent decision.

Given the discussion so far (mainly limitations from UE vendor side and concern on RAN3 work load), we think the compromise can be to work on EPC UPIP in **release-18** with the following scope.

- EPC UPIP using NR PDCP
- UPIP for UEs supporting EN-DC (UPIP for LTE only UEs is NOT supported).
- UPIP in LTE standalone and EN-DC operations.

In addition, to be future proof, it may make sense to discuss about UEs not supporting EN-DC, but supporting LTE standalone and NR standalone. And if such UEs shall support EPC UPIP in LTE standalone using NR PDCP.

15 – BT plc

We are okay with a,b,c & d. but would also accept Huawei's suggested compromise of a,b & d to progress this topic in R17.

16 – Ericsson LM

Similar to Vodafone, we also agree with Nokia in general.

This feature can and should be handled as other optional features without artificial limitations.

We support (b+c) and (b+c+d).

We don't agree to exclude certain flavours of LTE based on their names or use cases. In general this holds for both eMTC and NB-IoT as well as for other LTE-only. For NB-IoT we appreciate, however, that it doesn't share ASN.1 with other LTE so would imply additional effort.

Would the way forward include (a), it is our understanding that (a) in itself implies that neither NB-IoT nor eMTC need to be mentioned in the WID. In this case we could accept (a; b and c implied by a) and (a+d; b and c implied by a).

17 – Deutsche Telekom AG

We support a, b and d.

For c we are ok, but with lower priority

It should be absolutely clear that if a is adopted that it also means that a (EN-DC) UE supporting the full rate UPIP at NR PDCP layer it shall be capable for operating with full rate UPIP in a EN-DC configuration as well as in a LTE only or LTE CA/DC configuration even if no NR leg is activated. Further this applies for NR (SA) UEs which also support LTE (but not EN-DC).

18 – MediaTek Inc.

We fully support Qualcomm proposal. "Given the discussion so far (mainly limitations from UE vendor side and concern on RAN3 work load), we think the compromise can be to work on EPC UPIP in **release-18** with the following scope.

- EPC UPIP using NR PDCP
- UPIP for UEs supporting EN-DC (UPIP for LTE only UEs is NOT supported).
- UPIP in LTE standalone and EN-DC operations."

Feedback Form 6: Q2: Do you agree to send LS to SA/SA3 to check which variants need to be supported in this RAN plenary meeting?

1 – QUALCOMM JAPAN LLC.

No. We would rather avoid repeating the same dicussion in SA side.

2 – MediaTek Inc.

No - considerations are internal to RAN. RAN can report to SAx when a decision has been reached.

3 – VODAFONE Group Plc

SA 3 set the security requirements for 3GPP. The SA WID covers both LTE-only and EN-DC devices. It is reasonable that RAN question which devices should be included (e.g. based on complexity or specification impact) but it is not reasonable that RAN just ignores the security specifications. Hence some form of LS/communication is essential.

4 – Spreadtrum Communications

No, we agree with MTK.

5 – HuaWei Technologies Co.

We suggest companies to compromise as we proposed above. If the discussion results in an unfortunate situation that nothing can be agreed, we see the points from VDF and support sending LS to inform the situation in RAN, and figure out a potential way forward.

6 – Samsung Electronics Co.

No. we agree with MediaTek.

7 – Nokia Corporation

No strong view, but until RAN has RAN resolved the scope of the work an LS would just repeat the discussion in SA. Better that RAN just makes the decision and RAN plenary report informs SA of this.

8 – Guangdong OPPO Mobile Telecom.

No. we think RAN can make decision

9 – ZTE Corporation

No strong view on the LS.

10 – BT plc

Where there is no agreement in Q1, then we would support a LS to SA3/SA to clarify which scenarios UPIP for EPC are applicable.

11 – Deutsche Telekom AG

Yes, if there is doubt a LS shall be sent. The final decision can not be made in RAN !

Our understanding is that in **TR 33.853** user plane integrity protection at PDCP layer is supported with Architecture Options 1 and 3