3GPP TSG-RAN WG1 Meeting #109-e draftR2-2001796

Electronic meeting, February 24th – March 6th, 2020

Agenda Item: 7.2.4

Source: Ericsson (Rapporteur)

Title: Report of [AT109e][308][NBIOT] PUR RRC in general and L1 signalling impact to RRC (Ericsson )

Document for: Report

# Introduction

The report has not yet been presented or discussed online, and it was agreed to be extended:

* [AT109e][308][NBIOT] PUR RRC in general and L1 signalling impact to RRC (Ericsson )

      Status: extended

      Scope: Progress the FFS not agreed above from [R2-2002028](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002028.zip%22%20%5Co%20%22http%3A//www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_eDocsR2-2002028.zip)

      Intended outcome: Report in R2-2001792. Updated report in R2-2001796

      Deadline: Monday 2nd March 1200 CET

Compared to original report in R2-2001792 this version contains comments from LG and Thales, and some updates in the conclusions and proposals. Also grouping of proposals has been done in summary section.

This report is intended for providing summary of the proposals not yet agreed from [R2-2002028](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002028.zip) after the first treatment in RAN#109-e:

**[AT109e][308][NBIOT] PUR RRC in general and L1 signalling impact to RRC (Ericsson)**

      Status: Not started

      Scope: Progress the FFS not agreed above from [R2-2002028](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002028.zip)

      Intended outcome: Report

      Deadline: Thursday 27th 0900 CET

The following have been agreed during RAN2#109-e so far:

|  |
| --- |
| Agreements:* Similar to EDT, upon transmission using PUR, RRC configures PHY to use PUR.
* EDT value for timer t300 applies when UL data is included in transmission using PUR.
* When UL data is not included (i.e. only RRC message is included) in transmission using PUR, non-EDT value applies to t300.
* PUR periodicity includes at least values of several minutes, tens of minutes, ~hour, several hours, ~one day. FFS exact minimum and maximum values and total number of values.
 |

Companies are asked to provide their views for the rest of the proposals moved to offline discussion and initially marked [FFS] in [R2-2002028](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002028.zip). The summary submitted to the meeting is used as baseline and tables for replies have been added. The intention is to identify possible proposals and way forward to be further agreed during RAN2#109-e.

Companies are also welcomed to provide comments on other issues, i.e. those marked with [ASN.1/CR] and [Postpone], which are grouped in separate sections with tables for possible company input.

# Discussion

## Details of procedural aspects of PUR in RRC

### PUR configuration for CP solution

Two submitted tdocs [5] and [12] include discussion on details of where to store PUR configuration for CP solution and implications of possible interactions. Additionally [6] is a draft LS to RAN3 related to discussion in [5]. The following proposals are included in these two tdocs:

* RAN2 assumes that part of the PUR configuration of the UE can be stored in the MME transparently and the eNB does not link the PUR configuration to each UE in IDLE mode [5] (Huawei)
	+ Send the LS to RAN3 to ask the support of the signalling. [5] (Huawei)
* It’s suggested that eNB can tag the D-PUR resource configuration with S-TMSI for a UE using CP solution.[12] (ZTE)
	+ Once the S-TMSI changes, UE using CP solution and with D-PUR configuration would immediately indicate the new S-TMSI to eNB (e.g. the S-TMSI change indicating is performed in the same RRC\_CONNECTED state as that the S-TMSI is changed by NAS).[12] (ZTE)

There are two open issues: Where the PUR configuration is stored when UE is in RRC\_IDLE (e.g. in eNB and/or in MME) and if and how the eNB links UE and its PUR configuration.

The above papers from Huawei and ZTE opposite views on the issues, thus the following proposals are likely to require more discussion:

1. [FFS] MME stores at least part of the UE's PUR configuration in RRC\_IDLE.
2. [FFS] RAN2 to discuss if and how eNB links PUR configuration to each UE in RRC\_IDLE.

Offline discussion

Companies are asked to provide their views on Proposals 1 and 2:

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| --- | --- | --- |
| **Company** | **Is P1 agreeable?**  | **Comments** |
| Ericsson | Perhaps later | In our view it is problematic to agree P1 before the full solution is clear, which it is not from [5] and [12]. What information is to be stored in MME and what in eNB? It is not exactly clear how the configuration storage in MME would work from eNB point of view, e.g. how would the eNB know all of the relevant configuration for a particular PUR occasion.  |
| Huawei, HiSilicon | Agree with P1 | In our view, only the PHY parameters needed for the eNB to receive the PUR transmission are stored in the eNB. And those parameters should be maintained similarly to PRACH resource, i.e. not linked individually to each UE or to PUR-RNTI. Other configuration parameters should be linked to S-TMSI included in the uplink RRC message for PUR and stored in the MME transparently.One basic concept of the CP solution is that there is no UE context in the eNB for UEs in IDLE mode. Storing the whole PUR configuration in the eNB for UEs in Idle mode will reduce the benefit of the CP solution from the eNB point of view. |
| Qualcomm | - | Agree with Ericsson’s comment. |
| Nokia |  | As indicated by Ericsson more discussion needed to understand the complete solution of this split of storage of information between ENB and MME. |
| ZTE |  | The questions asked by Ericsson are also what we have thought. And we think now we are doing more discussion.We can understand HW’s point but we have identified at least the following two issues for which we think really needs eNB to link the PUR configuration with UE:* Case 1: In order to make it feasible for eNB to reconfigure or release PUR resources by RRCConnectionRelease, it is necessary for the eNB to identify which D-PUR resource configuration is allocated to a certain UE.
* Case 2: RAN2 has already agreed that ’m’ is not increased (neither by UE nor eNB) while UE is in RRC\_CONNECTED. For this, eNB should know which D-PUR resource is configured for a certain UE in RRC\_CONNECTED state. If the eNB cannot aware this, the “m” will be (incorrectly) increased at the UE’s D-PUR occasion during the RRC\_CONNECTED state, since no D-PUR transmission performs in RRC\_CONNECTED state.

If the D-PUR configuration is stored in MME, (frequent) eNB acquiring PUR configuration from MME and MME responding would be needed. Especially for the case 2, taken into account that MME cannot aware D-PUR occasion (as MME does not have the SFN info and MME will not decode the D-PUR configuration IE), the D-PUR configuration should be delivered to eNB every time the UE enters into RRC\_CONNECTED state, which will increase the S1 and/or Ng interface load greatly. In fact, the D-PUR configuration delivery is only useful when eNB needs to associate the D-PUR configuration with the UE, e.g., when the D-PUR will be reconfigured or released, or when the D-PUR occasion occurs in the UE’s RRC\_CONNECTED state. For other cases, e.g., the UE’s RRC\_CONNECTED state lies between the UE’s two adjacent D-PUR occasions or the D-PUR doesn’t need to be reconfigured or released, the D-PUR configuration delivery will be redundant and useless, and cause unnecessary signaling overhead. |
| LG |  | We think the MME could store PUR related information so that the UE does not need to PUR configuration request whenever it changes the cell. But for the PUR configuration, we are not sure what kind of parameters could be maintained in the MME and whether it is beneficial.  |

|  |  |
| --- | --- |
| **Company** | **Does eNB need to link PUR configuration and UE and if, how? Please elaborate on how the configuration for CP PUR would work (if not clear in above reply).**  |
| Ericsson | eNB would have to store UE-specific PUR information to be able to decode the PUR transmission; e.g. PUR C-RNTI, TBS, MCS, DM-RS cyclic shift, etc. It would not work to retrieve such information at first after the PUR transmission, and hence it is not sufficient for eNB to just store common information on which time- and frequency-resources are used for any UE in the cell. |
| Huawei, HiSilicon | We think it is not feasible to link the PUR configuration directly to each UE in the CP solution due to UE ID:1. It is not possible to link the PUR configuration to S-TMSI as S-TMSI is transparent to the eNB and eNB is not allowed to store S-TMSI. That is why in the UP solution we have another UE ID between the UE and the eNBs (resume ID)2. It is complicated to link the PUR configuration to PUR-RNTI. In this case, PUR-RNTI needs to be unique in the cell, which may impact the total number of available UE specific RNTI in the cell. |
| Qualcomm | Agree with Ericsson. Regardless of whether UP or CP, eNB needs to be able to decode the UL transmission. |
| Nokia | Agree with Ericsson and QC |
| ZTE | With concern for PUR configuration stored in MME, we think it’s more suitable to let eNB link the PUR configuration with UE.For CP solution, it’s straightforward to use S-TMSI to identify a UE between UE and eNB. And then eNB could locate the related D-PUR resource configuration based on the UE’s S-TMSI. It’s simple. If company think S-TMSI should be transparent to the eNB, we also think it’s not suitable to let MME stores pure RAN configuration. For this option, one concern may be S-TMSI change. And if this happens, the eNB would no longer accurately locate the D-PUR resource configuration for a certain UE. One possible solution is that if the S-TMSI changes, UE using CP solution and with PUR configuration can indicate the new S-TMSI to eNB (e.g. by UL message of ULInformationTransfer). The eNB can update the tag of the stored PUR resource configuration with the new S-TMSI. Considering S-TMSI seldom changes for UE in one MME, we think this is not big issue. |
| LG | We also think the eNB should maintain PUR configuration for both CP and UP solution. For UE identity for CP solution, we have the same view as ZTE. |

Conditional on discussion on proposals 2 and 3, an LS to RAN3 might be needed:

1. [FFS, conditional on P1/P2] Send LS to RAN3 on supporting signaling for PUR configuration.

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| --- | --- |
| **Company** | **If P1 or similar is agreed, should RAN2 send LS to RAN3?** |
| Ericsson | Yes we can send LS conditional on if above proposals would be agreed.  |
| Huawei, HiSilicon | Yes. Signaling support from RAN3 is needed if part of the PUR configuration is stored in the MME. |
| Qualcomm | Agree with above comments. |
| Nokia | We need discussion within RAN2 to conclude on the scope of changes for MME and LS can be decided based on the same. |
| ZTE | If we go for P2, we don’t think LS to RAN3 is needed. |
| LG | If P1 is agreed, yes. Probably, cc SA2. |

Conclusion and proposal(s) for PUR configuration for CP solution:

Regarding the configuration and what would be stored where – there seems to be no general objection on storing necessary information at eNB and rest at MME. However, based on the feedback, it seems it is not clear to companies what information are needed at eNB and what information could be stored at MME. It is clear this aspect requires further discussion.

Some points raised by companies:

* PHY parameters needed for decoding should be kept in eNB
* How the eNB links UE / PUR occasion to a particular PUR configuration
* There should be no need to link PUR PHY configuration but it would be similar to e.g. PRACH configuration
* There is no concept of CP context in RRC\_IDLE
* eNB should be able to link configuration with UE e.g. to release PUR configuration
* Are there issues with 'm' counting e.g. in RRC\_CONNECTED if there is no linking between config and UE?

**Rapporteur Proposal 1 RAN2 to continue discussion on e.g. how storing of PUR parameters would be split between eNB and MME and other details before agreeing on where PUR configuration is stored for CP solution.**

Regarding need to link UE and PUR configuration, further details are discussed related to P2 but based on replies no conclusion can be drawn. One company brought up issues with using either PUR C-RNTI or S-TMSI as identifier, and one company discussed some solutions on how S-TMSI could work. Several companies indicate that eNB would need to somehow identify the PUR configuration of a particular UE to be able to decode the transmission.

Rapporteur Proposal 2 RAN2 to continue discussion on if and how eNB links CP-PUR configuration to each UE in RRC\_IDLE.

Regarding sending LS to RAN3, it seems rather clear such would be needed but only if RAN2 agrees to keep some part of the configuration in MME. This can be considered later.

### L1 signalling impact

Huawei/HiSilicon [7] and Qualcomm [9] discuss PHY-RRC interaction in the case of the following RAN1 agreement:

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| --- |
| **The dedicated PUR ACK DCI at least includes the NPUSCH repetition adjustment (absolute value as per legacy table), and the field is 3 bits.** |

Huawei brings up potential issue in updating the repetition number in case delta configuration is used for PUR configuration and number of PUSCH repetitions is an optional parameter with the following proposal:

* RAN2 to discuss how to handle parameter update triggered by L1 signalling. [7] (Huawei)

There is no explicit proposal in [9] but Qualcomm mentions RAN1 specifications (TS 36.213) has captured the case and that RRC configuration would not need to be updated because of this. TS 36.213 states:

|  |
| --- |
| * For a PUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number determined by the repetition adjustment field according to Table 8-2b and Table 8-2c from the most recent MPDCCH DCI format 6-0A/6-0B with CRC scrambled by PUR C-RNTI for PUR ACK feedback indication (as defined in [4]) if detected, configured by higher layers otherwise.
 |

Based on above RAN2 should agree whether changes are required in RAN2 specifications and details of such changes, if needed:

1. [FFS] RAN2 to discuss if RAN1 agreement on repetition adjustment update triggered by L1 signalling requires any changes in RAN2 specifications.

Offline discussion

Companies are asked to provide comments for P4, i.e. whether changes would be needed in RAN2 specifications based on the L1 signaling discussed above:

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| --- | --- | --- |
| **Company** | **P4: Are changes needed in RAN2?** | **Comments** |
| Ericsson | Yes | In our understanding, if the UE receives a repetition adjustment in DCI, RRC should be updated to make this applicable to any future PUR transmission (and not just for retransmissions within the current PUR occasion). But then, as pointed out by HW, it is not clear how the update would be done in detail (without further discussion) |
| Huawei, HiSilicon | Yes | We are not sure how delta configuration in RRC will work after the parameter has been updated via L1 signaling, i.e. what will be the reference value, the one stored in RRC or the one stored in PHY.Also, for the case where full PUR configuration is received in RRC, does that override L1 configuration?Another issue is that today PHY only has the configuration of the physical resources in use, which is provided by RRC on a procedure basis, e.g. configuration for paging reception, configuration for RACH procedure, configuration for unicast transmission. With the RAN1 approach, PHY will have to keep configuration of multiple types of resources locally. |
| Sierra Wireless | Yes | When a number of repetitions is sent in L1 unacknowledged, the eNB will need schedule the higher of the number of repeats of the current and previous configuration. Only when the UE transmits the updated number of repetitions will the eNB know that the UE has received the configuration for the new number. If the UE uses the older number of repetitions the eNB will need to try again to reconfigure it, |
| Qualcomm | Maybe for clarifying what delta config means. | Our understanding is the updates of any parameters by L1 would contain within PHY. It is clear from the statement in RAN1 spec “the UE **shall** use the repetition number **determined** by the **repetition adjustment field according to Table 8-2b and Table 8-2c from the most recent MPDCCH DCI** format 6-0A/6-0B with CRC scrambled by PUR C-RNTI for PUR ACK feedback indication (as defined in [4]) if detected, configured by higher layers otherwise**.”**Regarding Ericsson’s comment: “to make this applicable to any future PUR transmission (and not just for retransmissions within the current PUR occasion)”, RRC does not need to be updated. PHY applies the values based on RRC configured value and L1 adjustment from the latest PUR DCI, if any.Clearly, the RAN1 specification says use RRC parameter with L1 adjustment. So, if you adjust RRC parameter already based on L1, that would be wrong (RAN1 spec does NOT say indicate to higher layers so that parameter can be adjusted, followed by use RRC parameter in PHY)RRC and L1 stored values have to be independently maintained. For every transmission, the above described rule applies (from 36.213). How to handle delta config needs to be clarified, but that does not mean L1 ACK parameters will update RRC values.For the case where full PUR configuration is received in RRC, does that override L1 configuration: Yes. But this needs to be handled in RAN1 spec. (Example, power control is handled the same way.)Regarding Sierra’s comment – OK, but how does that impact RAN2 spec? |
| Nokia | Further clarification needed | From UE perspective, if it receives the adjustment in DCI, it can update the stored grant with modified repetition for next transmission. But it also depends on whether ENB adjusts the transmission on sending the DCI itself or on receiving next uplink transmission with the modified repetition. But how the ENB detects this in next PUR is also not clear. If both ENB and UE uses the DCI transmission or reception as checkpoint to modify the PUR configuration, then only RAN2 impact is that MAC adjusts the stored configuration. Here it also linked to the decision on who maintains the PUR configuration which is part of other offline discussion. As more and more close interaction with physical layer activities needed because of L1 based control.. PUR configuration and management at MAC is prefered. |
| ZTE | Agree with QC | We echo QC’s concern that: the RAN1 specification says use RRC parameter with L1 adjustment. So, if you adjust RRC parameter already based on L1, that would be wrong. And we tend to agree with QC that RRC and L1 stored values have to be independently maintained. |
| LG | Agree with QC. |  |

Conclusion and proposal(s) for PUR configuration for CP solution:

Based on replies it seems not all aspects of this are clear in RAN2. However, there seems to be some sort of consensus on that L1 update would not require direct modification of the RRC configuration, but the update would be done at PHY layer. However, it is not clear how such configuration is stored. One proposal is to update this in stored grant.

**Rapporteur Proposal 3 RAN2 to confirm L1 update on repetition number is not intended to update the RRC configuration (i.e. higher layer configuration) but adjust the value provided by higher layers.**

Then there are some further issues likely requiring more discussion, i.e. how such adjustment would work with delta configuration and how would e.g. full configuration case work. These aspects do not seem to be crystal clear based on the RAN1 specification text / agreements.

**Rapporteur Proposal 4 FFS whether further changes or clarifications are needed in RAN2 specifications related to updating of number of repetitions via DCI, e.g. related to delta configuration.**

### Handover or connection re-establishment

ASUSTeK provides discussion on handover and connection re-establishment procedures [22], and whether UE should always release PUR configuration when initiating RA procedure. The following proposals and options are discussed:

* RAN2 to discuss whether the UE should release D-PUR configuration due to a handover or a RRC connection re-establishment procedure.[22] (ASUSTeK)
* RAN2 to discuss which option among Opion1 to Option 3 to be adopted for releasing D-PUR configuration due to a handover or a RRC connection re-establishment procedure in RRC\_CONNECTED state.[22] (ASUSTeK)
	+ **Option 1:** The UE releases the D-PUR when it does a RA procedure (due to handover or RRC connection re-establishment) on a new cell.
	+ **Option 2:** The UE releases the D-PUR when it does a RA procedure (due to handover or RRC connection re-establishment), i.e. regardless of condition (b).
	+ **Option 3:** The UE releases the D-PUR when it initiates a handover or a RRC connection re-establishment procedure, i.e. regardless of condition (a) and (b).
		- **Condition (a):** initiation of RA procedure
		- **Condition (b):** change to a new cell.

The following agreement has been made earlier which corresponds to Option 1, however, handover and connection re-establishment are not explicitly mentioned:

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| --- |
| * TA validation criterion “Serving cell changes” is implicitly always enabled, which means that TA is considered invalid when the UE initiates RA procedure in a different cell than where TA was last validated.
 |

The intention of earlier agreement, also based on earlier email discussions, seems to be that PUR configuration needs only to be released in a new cell as PUR configuration is not coordinated between eNBs, that is, if cell is not changed, configuration could be kept (as long as TA is valid). It can be discussed further whether the earlier agreement needs to be updated or whether for HO and/or re-establishment should be treated differently:

1. [FFS] RAN2 to agree between Options 1-3 and update or clarify earlier agreement if needed.

Offline discussion

Companies are asked to provide their view of which option to go for based on P5:

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1-3?** | **Comments**  |
| Ericsson | 1 | The intention was that PUR configuration would be released when UE initiates RA in another cell. This means, also release after HO or re-establishment to another cell. Within the same cell there doesn't seem to be a need to release.  |
| Huawei, HiSilicon | Option 1 | We have agreed:The UE must release the D-PUR when it does a RA procedure on a new cell. |
| Sierra Wireless | Option 1  | The reason for release of D-PUR is a change of cell. The UE may need to perform RACH on the same cell to send non-PUR data or just to update an invalid TA. This does not mean the D-PUR must be released. |
| Qualcomm | Option 1 |  |
| Nokia | Option 1 | Similar discussion in other offline discussion also needs to be checked for consistency in final proposal. |
| ZTE | Option 1 |  |
| LG | Option 1 |  |

Conclusion and proposal(s) for TA validation criteria / handover and re-establishment:

For this question there is consensus for Option 1 above. Therefore, based on the replies the UE should release the D-PUR when it does a RA procedure due to handover or RRC connection re-establishment on a new cell. This is captured already by the earlier agreement, so it is not clear if this needs any updates, or whether e.g. capturing following in chairman notes would be enough:

**Rapporteur Proposal 5 TA validation criterion “Serving cell changes” applies also when handover and RRC Connection Re-establishment results in RA in a new cell.**

### Text proposals for procedural aspects

TA RSRP signaling

Sierra Wireless has text proposal on RSRP change TA validation criterion:

* Adopt the TP in section 3 as baseline for configuration of TA validation criteria based on serving cell RSRP change for both eMTC and NB-IoT.[3] (Sierra)

In the text proposal in [3] the approach seems to be to update the configuration of RSRP thresholds every time TA is updated e.g. by providing a table of mapping of TA value to RSRP threshold change value in PUR configuration. This approach has not yet been agreed in RAN2 and in the current running CRs the RSRP thresholds are signaled as part of the PUR configuration not related to TA values.

Before adopting the text proposal, RAN2 should decide whether the approach proposed in [3] is adopted:

1. [FFS] RAN2 to discuss whether the thresholds for RSRP change TA validation criteria need to be updated every time TA is validated or updated and whether signaling of RSRP thresholds needs to be optimized.

Offline discussion

Companies are asked to provide their view based on P6 and the text proposal in [3]:

|  |  |
| --- | --- |
| **Company** | **Comments (on P6 and e.g. text proposal in [3])** |
| Ericsson | We don't think there is need to change RSRP thresholds after TA update, which also doesn't seem to be the RAN4 intention. PUR is mainly intended to relatively static UEs. For other scenarions, other solutions could be used or new PUR configuration could be requested.  |
| Huawei, HiSilicon | We think the detail of RSPR based TA validation is up to RAN1/4 to design. Currently, our understanding is that the mechanism is similar to relaxed monitoring, with possibility to have 2 RSRP thresholds. According to our understanding on the mechanism agreed in RAN1/RAN4, TP is provided taking NB-IoT RRC running CR as an example:In configuration:pur-NRSRPThreshold-r16 SEQUENCE { rsrp-IncreaseThresh-r16 RSRP-ChangeThresh-r16, rsrp-DecreaseThresh-r16 RSRP-ChangeThresh-r16 OPTIONAL --Need ON} OPTIONAL, --Need ORTA criteria:A UE shall consider the timing alignment value for transmission using PUR to be valid when all of the following conditions are fulfilled:1> if *pur-TimingAlignmentTimer* is configured:2> *pur-TimingAlignmentTimer* is running as confirmed by lower layers;1> if *pur-NRSRPThreshold* is configured:2> if *rsrp-DecreaseThresh* is configured:3> *rsrp-DecreaseThresh* < |SrxlevRef – Srxlev| < *rsrp-IncreaseThresh*; 2> else:3> |SrxlevRef – Srxlev| < *rsrp-IncreaseThresh*;  |
| Sierra Wireless | When the RSRP delta threshold is used to validate the TA it should be changed to match the TA whenever the TA is updated. If the TA changes and the RSRP threshold is not matched to it then the RSRP threshold will no longer be an accurate measure of TA validity.If a TA change update is by a small amount, the current RSRP delta may still be applicable. However, this is not an acceptable strategy because successive small changes of TA can eventually make the overall TA change move outside the RSRP threshold applicable range.Ideally upper and lower RSRP thresholds are used and they are always provided together with a new TA. Using the pre-configured table proposed in [3] enables the RSRP thresholds to be updated on every TA update by the UE without the need for the eNB to send the RSRP thresholds with every TA update. |
| Qualcomm | While I think everyone understands the intended right behavior, I think the TP provided by Huawei is incorrect. For example, if decrease thresh is 4, increase thresh is 8, SrxlevRef is 25, Srxlev is 20, the first equation says the criteria is fulfilled for TA validation (i.e. TA is valid), but clearly, the decrease is more than threshold and TA should be invalid.Let’s try to avoid complicated equations for simple stuff. Refer to eMTC running CR:1>  if *rsrp-ChangeThresh* is configured:2>  since the last TA validation, the serving cell RSRP has not increased by more than *rsrp-IncreaseThresh*; and2>  since the last TA validation, the serving cell RSRP has not decreased by more than *rsrp-DecreaseThresh*;<skip>***rsrp-ChangeThresh***Indicates the threshold of change in serving cell RSRP in dB for TA validation. Value dB4 corresponds to 4 dB, value dB6 corresponds to 6 dB and so on. **When *rsrp-ChangeThresh* is included, if *rsrp-DecreaseThresh* is absent the value of *rsrp-IncreaseThresh* is also used for *rsrp-DecreaseThresh*.**The above clearly covers both the cases of one threshold and two thresholds without introducing confusing equations avoiding chances of error. |
| Nokia | Agree with Ericsson that update of RSRP threshold for every TA update. |
| ZTE | Firstly, we don’t support P6 as we think there has no deterministic relationship between TA value and RSRP change thresholds.Secondly, for TA validation criteria, we initially have similar thoughts in [R2-2001200] as HW, e.g., taking RSRP change criteria for relaxed monitoring as reference and giving some formula. During later discussion, we think QC’s suggestion (simple text description) in eMTC running CR may be also OK. If no further issues are identified, we are fine to go for the way in eMTC running CR and keep alignment between NB-IoT and eMTC. |
| LG | We don’t support P6.We are fine with QC’s TP.  |

Conclusion and proposal(s) for TA RSRP signaling:

In rapporteur's understanding based on the comments above, there is one company who would like to link updated TA value with updates RSRP values for thresholds, while other six companies think RAN2 should capture what has been indicated by RAN4 earlier regarding RSRP thresholds. Also, the discussion on TA / RSRP linkage is not in RAN2 scope according to rapporteur's understanding.

**Rapporteur Proposal 6 Capture the TA criteria for RSRP changes according to the earlier RAN4 LS in the running CRs.**

## Details of PUR parameters and parameter ranges in RRC

### PUR periodicity

Four companies (Huawei/HiSilicon, Ericsson, ZTE/Sanechips, Sierra Wireless) have provided proposals on range and details of PUR periodicity, i.e., the following proposals:

* For both NB-IoT and eMTC, hsf is used as the unit for PUR periodicity and the value range is {hsf128 (about 22 minutes), hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192 (about 23.3 hours), spare} [8] (Huawei)
* PUR periodicity and start position are based on legacy counters: subframe, SFN, H-SFN.[10] (Ericsson)
* PUR periodicity of up to at most 3h is supported.[10] (Ericsson)
* The PUR periodicity parameter is quantized as a power of 2 to allow for multiplexing of PUR UEs.[10] (Ericsson)
* 3-bits or 4-bits is used for signaling PUR periodicity in the range from SFN=256 (2.5s) to SFN=1048576 (3h).[10] (Ericsson)
* It’s suggested that the requestedPeriodicity can be set up to several days, and the minimal granularity can be 1ms.[14] (ZTE)
* PUR periodicity configurations should be from one HSFN to 1024 HSFN counts in binary multiples and in binary multiples of complete HSFN counts up to at least 64.[21] (Sierra)
* The eNB should be able to configure offsets to enable interleaving of UEs that can have the shortest allowed periodicity.[21] (Sierra)

On possible range, Ericsson proposes range from 2.5 s up to 2.9 h, Huawei proposes from 22 min up to ~1 day, ZTE proposes from 1 ms up to several days and Sierra doesn't have explicit suggestion on min and max values, but based on discussion suggests at least periodicity of one day if not more. The proposed minimum and maximum values are different, most overlap can be found with values from tens of minutes, hours or multiple hours up to one day. The exact minimum and maximum need more discussion.

Huawei and Sierra suggest using multiple of H-SFN cycle as granularity, Ericsson proposes SFN-based granularity (min of 256) and ZTE proposes 1 ms as minimum granularity. Huawei, Sierra and Ericsson seem to base their proposals (if not explicitly) on powers of 2.

As a way forward, following are proposed:

1. PUR periodicity configuration granularity is based on counts of binary multiples of HSFN, i.e. full SFN cycles (= 10.24 s). FFS on exact count.

Offline discussion

In online web-session on Tuesday 24.2., above proposal was moved to be discussed offline. Also, following was agreed:

|  |
| --- |
| PUR periodicity includes at least values of several minutes, tens of minutes, ~hour, several hours, ~one day. FFS exact minimum and maximum values and total number of values. |

To fully understand what is needed to be captured e.g. in RRC regarding PUR periodicity, companies are asked to provide input to P7 and PUR periodicity in general, and possible suggestion for full value range:

|  |  |  |
| --- | --- | --- |
| **Company** | **Is P7 agreeable?**  | **Comments (e.g. alternatives, how alternative would work, etc)** |
| Ericsson | Yes | The alternative of basing on absolute time introduces several problems and new open issues. |
| Huawei, HiSilicon | Agree | We think we need to discuss the following aspects:1. Minimum/maximum value (in general, it depends on exact count)We think the minimum periodicity should be about 30 minutes. The maximum periodicity should be about 1 day.2. Exact countIn order to provide above maximum periodicity, we prefer to use HSFN3. GranularityWe need to consider signaling overhead. Thus 8 or 16 different values between 30 minutes and 1 day. Each of value should be power of 2. |
| Sierra Wireless | Maybe not | There is strong application developer interest in accurate time based periods of at least 1 day and 1 hour. It is worthwhile making PUR useful to the end user. |
| Qualcomm | Agree | Agree with Huawei comments |
| Nokia | Agree | Agree with Huawei comments |
| ZTE |  | We think there are two issues. One is how many periodicity values are needed and what the granularity is. The other is how to present these values. For the first issue, we are fine with that PUR periodicity includes at least values of several minutes, tens of minutes, ~hour, several hours, ~one day. FFS exact minimum and maximum values and total number of values. For the second issue, we are not clear about Ericsson’s concern. As we have mentioned another option in R2-2001201 to present the periodicity, e.g., [xxx] hours [yyy] minutes [zzz] seconds and [www] miliseconds, if this is so-called absolute time mentioned by Ericsson, we cannot agree with Ericsson. We haven’t seen the issues but think it may be more flexible, if we assume periodicity values may be diverse. |
| Thales | Agree | Minimum value should be around 1 minutes and maximum value 1day, especially for sensors lower end is important and there maximum benefit can be achieved. For the lower values to be configurable we should consider also compatibility to other mechanisms such as eDRX timing. For larger values e.g. between 3hours and 1day we should also consider alignment possibilities 12 or 24hours as exact values.Hence for Cat-M and NB-IoT values should be configurable allowing an alignment with eDRX whether in addition values such as 1hour are needed is FFS. There is a demand but drawbacks in misaligned timer of various features may occur.At least there needs to be the possibility to align activity phases.For 12 hours and 1 day should also be configurable to operate PSM aligned. We would suggest ~ 16 concreate values to be considered, especially the lower once to be derived by SFN/HSFN aligned.  |

|  |  |
| --- | --- |
| **Company** | **Suggestion for exact value range, including min, max value and number of values.** |
| Ericsson | We have proposed range {2.5s, …, 3h}. The evaluations in [R2-2000984](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2000984.zip) show that the UE power reduction compared to EDT is insignificant for PUR periodicities longer than 3h. Therefore, there is in our view no motivation to use PUR instead of the more generic and simpler EDT solution in this domain (e.g. TA validity evaluation and storing Idle radio resources would not be needed).If there is consensus on longer periodicities, we can support something like Huawei proposal in [8], with the note that some shorter periodicities of e.g. couple of minutes should be supported, as the power gains for such scenarios seem to be the best based on the evaluations. |
| Huawei, HiSilicon | {hsf128 (about 22 minutes), hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192 (about 23.3 hours), spare} |
| Sierra WIreless | Power saving will improve as standby current improves. We should design for the future.Periods: 24 hours divided by three for 8 hours then divided successively by 2 down to 56.25sThe time reference increment unit could be 10ms which is 8640000 counts for 24 hours. Inserting a 3 into the divide chain means that there would be times unavailable for PUR. This should not be a problem because 100% utilization of resources br PUR is not expected, |
| Qualcomm | 22 mins minimum is not enough, 2.5s minimum is probably not needed. 3h max is not enough. So, proposed by Huawei plus some smaller values {hsf8, hsf16, hsf32, hsf64, hsf128…. hsf8192, spareX}. |
| ZTE | Firstly, the value range of periodicity should be decided according to the traffic pattern. Considering that NB-IoT/eMTC is usually used to transmit infrequent small data and the transmission interval may be large, e.g. for several days, we suggest the maximum periodicity value can be several days. Secondly, we assume it would be simple to let PUR periodicity use the same value range with Time offset and PUR requestedTimeOffset. Considering that PUR time offset relates the PUR resource occasion(e.g. the UL Grant), the value of PUR time offset should be accurate(e.g. with granularity of 1ms).In a summary, we have the following suggestion for PUR periodicity: [xxx] hours [yyy] minutes [zzz] seconds and [www] miliseconds, where the range of xxx can be [0...7\*24], the range of yyy can be [0...60], the range of zzz can be [0...60] and the range of www can be [0...999]. |
| Thales | In principle we agree with Huawei, further we would like to add some lower values as pointed out by QTI So we propose {hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, 6 hours, 12 hours, 24 hours, spare}. For values above 3 hours there should also a PSM aligned configuration possible hence we would support values such as 6, 12 or 24 hours in addition. |

Conclusion and proposal(s) for PUR peridiodicity:

Regarding P7 on periodicity granularity, five companies would agree, one company might not and one company explicitly doesn't say anything. Rapporteur proposal at this point is to have a working assumption based on this to progress the discussion on the actual values. Note that this WA can be reverted if RAN2 decides on some other mechanism, e.g. based on absolute time.

**Rapporteur Proposal 7 Working assumption: PUR periodicity configuration granularity is based on counts of binary multiples of HSFN, i.e. full SFN cycles (= 10.24 s).**

For actual periodicities, the company positions don't seem to have changed much since the submission. However, out of five companies, three companies seem to be OK with HW approach with additional smaller values. Thus, this is proposed as a way forward at this stage – FFS left in the configuration so companies can propose further values or these can be left as spares.

**Rapporteur Proposal 8 PUR periodicity is {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, spareX, [FFS]}.**

If this is not acceptable, then the discussion needs to continue with detailed proposals from companies including all impacts e.g. due to alternative way of keeping count (i.e. absolute time).

### TA timer

The following proposal from Huawei/HiSilicon, ZTE/Sanechips and Sierra Wireless have been submitted on possible values for the TA timer:

* For both NB-IoT and eMTC, hsf is used as basic unit for TA timer and the value range is {hsf256 (about 43 minutes), hsf512, hsf1024, hsf2048, hsf4096, hsf8192, hsf16384 (about 46.6 hours), spare} [8] (Huawei)
* It’s suggested that the value of pur-TimingAlignmentTimer can use the unit of PUR Period.[13]
* eNB should configure a D-PUR TA timer length to ensure that at least one D-PUR occasion occurs while the D-PUR TA timer is running.[23] (ASUSTeK)

Common assumption behind the proposals above is that TA timer value should at least allow one D-PUR occasion before TA is declared invalid. It should be noted that RAN2 has not yet agreed on exact starting location of the TA timer and based on the common assumption also PUR periodicity should be agreed first, therefore the proposal is to postpone the discussion until these aspects are agreed.

1. If eNB configures PUR, there should be at least one PUR opportunity before TA expiration.
2. TA timer range and values are discussed further and agreed once TA timer start location and PUR periodicity have been agreed.

Offline discussion

No progress on TA time value range was achieved during the online discussion, and companies are asked to provide input on TA Timer value range, if possible.

As indicated above, the exact conclusion may depend on the possible PUR periodicity and the exact time when TA timer would be started:

|  |  |
| --- | --- |
| **Company** | **Comments on TA timer and value range** |
| Ericsson | TA timer range could be configured as factor of the PUR periodicity, i.e. factor n={1, .., 8}. There is no point in configuring a TA timer that is shorter than the configured PUR period, and two TA timer values which both fall in the same PUR period would in practice have the same effect (e.g. if PUR period is 1h, TA timers 1.2h and 1.8h would give the same behavior). 8 is selected to match to max value for PUR skip parameter ‘m’. We should also take care that timer covers the PUR occasion as intended with possible retransmissions. |
| Huawei, HiSilicon | We think the value range of TA timer should be similar to the value range of periodicity. |
| Qualcomm | Similar view as Ericsson |
| Nokia | Similar view as Ericsson. |
| ZTE | We think Ericsson’s comments may be similar with ours, e.g., TA timer should be at least larger than one PUR periodicity can be set to several multiple of PUR periodicity (e.g. the TA timer length = X \* PUR periodicity).  |
| LG | Agree with Ericsson and ZTE  |

Conclusion and proposal(s) for TA timer:

Based on replies above, five companies seem to be OK with range such as {1,…8} PUR periodicities, one company thinks similar range as PUR periodicity can be used. Based on majority:

**Rapporteur Proposal 9 TA timer range is multiple of PUR periodicities, e.g. 1,…, 8. FFS on exact values and whether offset is applied so that e.g. retransmissions are covered.**

### Time offset

For PUR time offset THALES, Huawei/HiSilicon, ZTE/Sanechips and Sierra Wireless have provided the following proposals:

* The UE may include a time offset for its PUR configuration into its request.[1] (THALES)
* The requested PUR timing offset shall be in the same range as the periodicity range.[1] (THALES)
* The eNodeB may provide in its PUR configuration a time offset.[1] (THALES)
* The configurable PUR timing offset shall be at least in the range of 1 to 2 times the periodicity range.[1] (THALES)
* For both NB-IoT and eMTC, a 2-level start offset is introduced for PUR:
	+ Level 1: startHSF: {hsf128 (about 22 minutes), hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192 (about 23.3 hours), spare}
	+ Level 2: startSubframe: INTEGER(0..2559), value is in number of sub-frames by step of (PUR periodicity / 2560). [8] (Huawei)
* The value range of requestedTimeOffset should be the same as that of the requestedPeriodicity, and it should not be described strictly at subframe level (e.g. the field description can be a little flexible and leave some space for eNB scheduling).[14] (ZTE)
* The value range of pur-TimeOffset should be the same as that of the requestedPeriodicity, and it should be described strictly at subframe level(e.g. start from which subframe).[14] (ZTE)
* PUR offset requests should be a limited range from a value of from HSFN127.[21] (Sierra)

First and third proposal above have already been agreed, i.e. time offset can be included in PUR configuration request and in PUR configuration [26]:

|  |
| --- |
| * PUR configuration request may contain a time offset request, i.e. requested time of the first PUR transmission. *Details FFS.*
* PUR configuration may contain a time offset, i.e. time of the first PUR transmission. *Details FFS.*
 |

All proposals from companies indicate the range of the time offset should be (at least) the PUR periodicity. Whether smaller granularity than e.g. HSFN is needed or whether e.g. 2-level structure should be adopted can be discussed further. Therefore:

1. The PUR time offset has the same range as PUR periodicity.
2. [FFS] RAN2 to discuss the granularity of PUR time offset.

Offline discussion

P9 was briefly discussed online, but no agreement was reached. Companies are asked to provide input on P9 and P10, i.e. on possible range for PUR time offset and granularity or other suggested design principles:

|  |  |  |
| --- | --- | --- |
| **Company** | **Is P9 agreeable?**  | **Comments (e.g. alternative suggestions)** |
| Ericsson | Depends on max periodicity | This depends on what periodicity range we will have. To us it does not seem viable to have very long offset, i.e. why would the UE ask for configuration very much earlier compared to when the first occasion should happen? With our earlier proposal on periodicity up to 3 h the proposal makes some sense, but if e.g. 1 day is maximum, we don't think UE should ask for configuration 1 day in advance, or the network to configure such. Long offsets may result in further issues e.g. in synchronization and starting the timers etc (see also e.g. reply on TA timer start in the other discussion). |
| Huawei, HiSilicon | TBD | The meaning of offset is not clear to us.If it reflects when the UE wants to start to use PUR grant, we agree with P9.If it is the offset for the eNB to distribute different UEs, similarly as in SPS and DRX, we think it should be subframe level.Thus we have the two level proposal. Level 1 is related to P9. |
| Sierra Wireless | Yes | If clock based time is adopted then PUR offset times will also need to use the same range and increments. |
| Qualcomm | Yes | Our understanding of the proposal is what Huawei is saying as first interpretation (it reflects when the UE wants to start to use PUR grant). |
| ZTE | Yes |  |
| Thales | Yes | For the UE requested time offset the time offset is the same as the periodicity values.For the configured value, we need to decide:1. The eNodeB will only provide the requested or larger values. (This would comply to a range in between Toffset to Toffset + periodicity.) If considering Toffset=peridicty the range is between 1 and 2 times Toffset, which can be signaled by Toffset.
* 0 Means agree on the proposed time
* X means start at X+Toffset proposed
1. The eNodeB can provide any value between 0 and Toffset+periodicity, regardless whether Ue would be ready with its information or not.
* It can be seen that values between 0 and requested Toffset may not make much sense as likely leading to a first missed occasion. And 2nd try lays in the range defined by a)

We suggest to adopt outlined method in a), the configured time offset, as the same range as the periodicity including a value 0, which means agreeing on the proposed time offset. However, here the radio frame based values we see as sufficient. |
| LG | - | We are thinking it is not necessarily related to have the same range of PUR periodicity but we are fine with P9.  |

|  |  |
| --- | --- |
| **Company** | **Comments on P10 on granularity of PUR time offset, other related comments** |
| Ericsson | Radio frame granularity should be sufficient, subframe level is up to eNB scheduler. |
| Huawei, HiSilicon | Level 1: startHSF: {hsf128 (about 22 minutes), hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192 (about 23.3 hours), spare}Level 2: startSubframe: INTEGER(0..2559), value is in number of sub-frames by step of (PUR periodicity / 2560). See above comment. For level 1, we agree with P9. |
| Sierra Wireless | The precision of the configuration of offsets needs to match the precision the eNB needs to use to interleave the timings of UEs using PUR.The ability for a UE to request an offset only needs to apply to longer time offsets so the minimum offset request step could be as big as 15 minutes.. |
| Qualcomm | Similar view as Ericsson |
| ZTE | Same as PUR periodicity: [xxx] hours [yyy] minutes [zzz] seconds and [www] miliseconds, where the range of xxx can be [0...7\*24], the range of yyy can be [0...60], the range of zzz can be [0...60] and the range of www can be [0...999]. |
| Thales | {hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, 0, spare}0 to be included only for configured time offset, which means agree on proposed time offset. Configured time offset starts as calculating point from proposed time offset.We are open to adopt subframe granularity in addition, but don’t see it as necessary. |

Conclusion and proposal(s) for time offset:

Based on the replies, the purpose of the offset is not clear to all but some common understanding is that it is about when the first PUR opportunity would be, i.e. when UE would use first PUR UL transmission. It seems some details may depend on the exact range and mechanism e.g. related to PUR periodicity, thus following is proposed as working assumption:

**Rapporteur Proposal 10 Working assumption: PUR time offset has the same range as PUR periodicity. FFS details of configuration.**

### PUR response timer

The following have been proposed on PUR response timer/window by Huawei/HiSilicon, ZTE/Sanechips and Sierra Wireless. One proposal from LG Electronics relates to handling application layer response:

* The value range for PUR response timer in NB-IoT is {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24s [8] (Huawei)
* The value range for PUR response timer in eMTC is {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240} [8] (Huawei)
* The pur-ResponseWindowSize can use the same value range as that for the mac-ContentionResolutionTimer.[14] (ZTE)
* RAN2 is kindly asked to discuss whether the application layer response for D-PUR transmission will be considered in the D-PUR design.[17] (LGE)
* Enable configurable PUR response search space windows of 10ms to 2.56s[21] (Sierra)
* Enable the use of CDRX during the PUR SS window.[21] (Sierra)

Proposals from Huawei and ZTE suggest to use same value ranges as for *mac-ContentionResolutionTimer* for EDT. Sierra proposes somewhat shorter time range. As PUR procedures follow those of EDT, the following is proposed as way forward:

1. For NB-IoT: The value range for PUR response timer is same as in EDT (FDD): {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24s
2. For eMTC: The value range for PUR response timer is same as in EDT: {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}.

LGE proposes for RAN2 to discuss whether application layer response is taken into account in PUR design. This discussion seems to be similar as RAN2 has had for EDT and contention resolution timer, i.e., PUR response timer should cover at least some cases, thus no proposal is made in this summary.

The last proposal on whether connected mode DRX should be used is likely contentious based on earlier discussion on similar features (e.g. EDT), and is not necessary to make Rel-16 PUR work. This discussion can be postponed:

1. [Postpone] RAN2 to discuss whether C-DRX should be used within PUR response window.

Offline discussion

The value ranges were briefly discussed online, some comments were received and it was decided to continue offline. Therefore, companies are asked to provide ranges for the timers and any other comments for both eMTC and NB-IoT:

|  |  |
| --- | --- |
| **Company** | **Suggestions on PUR response timer / PUR SS window for NB-IoT**  |
| Ericsson | Ok to reuse the EDT range as proposed. |
| Huawei, HiSilicon | We think contention resolution timer in EDT and PUR response timer cover almost the same procedure. Thus the value range for contention resolution timer in EDT can be reused.For NB-IoT: The value range for PUR response timer is same as in EDT (FDD): {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24s |
| Qualcomm | Ok to have similar to EDT contention resolution timer. |
| Nokia | OK to reuse the same timer value range. But the delay for PUR response is expected to be lower than contention resolution phase as it is always dedicated allocation. |
| ZTE | Agree with above. Moreover, considering PUR response timer will be started at the PUR transmission and restarted at the PUR re-transmission, and UE should monitor the PUR SS from the begin of PUR transmission to the end (e.g. the PUR transmission is finished or the UE is fall backed to the RRC\_CONNECTED), we think the value of PUR SS window should be factor multiple the PUR response timer. |
| Thales | OK to reuse EDT range. |
| LG | We are fine to reuse the EDT rage. However, we are not sure if the application layer feedback is considered in PUR design because even in EDT design, the MAC contention resolution timer is not configured to receive the application layer feedback; if the feedback is expected, the eNB may send Msg4 for fallback to RRC\_CONNECTED. If the application layer feedback is considered and the network configures PUR response timer based on the design, we think RAN2 may need to send LS to SA2. Also, the application layer feedback(user data) is different from the lower layer feedback(control plane feedback) for UL transmission. So, the response timer may not need to start 4 subframe after last PUSCH transmission.  |

|  |  |
| --- | --- |
| **Company** | **Suggestions on PUR response timer / PUR SS window for eMTC**  |
| Ericsson | Ok to reuse the EDT range as proposed. |
| Huawei, HiSilicon | For eMTC: The value range for PUR response timer is same as in EDT: {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}. |
| Qualcomm | Ok to have similar to EDT contention resolution timer. |
| Nokia | Lower value is prefered. But OK with reuse of EDT timer if majority thinks it is simpler option |
| ZTE | Agree with above. |
| Thales | OK to reuse EDT range. |
| LG | Same answer as for NB-IOT. |

|  |  |
| --- | --- |
| **Company** | **Other comments (e.g. related to P13)**  |
| Huawei, HiSilicon | We think P13 is optimization and can be postponed. We are not sure about the benefit considering that RAN1 has already introduced L1 ACK. |
| Qualcomm | Agree with Huawei. |
| Nokia | Not needed. PUR response window is limited. |
| ZTE | Considering that PUR SS GAP (e.g. NPDCCH-StartSF-USS in NB-IoT) can be configured to match the Uu RTT to avoid the UE power consumption for PDCCH monitoring, we think C-DRX within PUR window is not needed.  |

Conclusion and proposal(s) for PUR response timer:

Based on the replies it seems all companies are OK with reusing EDT contention resolution timer ranges. The following proposals are the same as P11 and P12 above.

Rapporteur Proposal 11 For NB-IoT: The value range for PUR response timer is same as in EDT (FDD): {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24s.

Rapporteur Proposal 12 For eMTC: The value range for PUR response timer is same as in EDT: {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}.

Regarding other issues, e.g. configuring C-DRX, there seems to be no support thus no proposal is made.

### Number of grant occasions

The following issue is brought up in only one tdoc (ZTE/Sanechips):

* The number of PUR grant occasions in D-PUR request can be two values: one-shot or infinity.[14]

The following working assumption has been made earlier:

|  |
| --- |
| * Working assumption: Counter for D-PUR occasions, i.e., “n”, is not introduced and “indefinite” or “one-shot” are the only possible configurations.
 |

It should be possible for the UE to indicate whether it wants only one PUR occasion, according to an agreement:

|  |
| --- |
| * D-PUR request includes number of PUR grant occasions requested with possibility to request infinite. FFS other values.
 |

The working assumption considers configuration and the possible values which can be requested by the UE have not been agreed yet, therefore it seems necessary to discuss what values can be requested by the UE:

1. [FFS] RAN2 to discuss and agree the values for number of PUR grant occasions which can be requested by the UE.

Offline discussion

Companies are asked to provide views on P14 on number of PUR grant occasions which UE can explicitly request in PUR configuration request:

|  |  |  |
| --- | --- | --- |
| **Company** | **Suggestion for values** | **Comments** |
| Ericsson | {1, inf} at leastMay depend on other agreed value ranges | If we are not going to use 'n', OK to confirm the above WA. Note that some issues e.g. with TA timer could be avoided by using 'n' instead, but we have discussed this earlier already and provided our views. |
| Huawei, HiSilicon | One or infinity | Same as in configuration |
| Sierra Wireless | 1 and infinity | Infinity should be the default, Since 1 does not save power, 1 could be avaialble upon request. |
| Qualcomm | 1, 2, 4, 8, inf | Same as m (and 1). Can be optional, where absent means inf (default). |
| Nokia | Agree with QC |  |
| ZTE | Only one-shot or infinity |  |
| Thales | 1 and infinity | 1 and infinity at least. |
| LG | Min: 1, Max: inf  | As Sierra suggested, infinity could be the default. On the other hand, without UE request, 1 could be configured by the network. We don’t need to restrict the usage. |

Conclusion and proposal(s) for number of grant occasions in PUR request:

Six companies reply one or infinity should be supported, two companies additionally want to have {2, 4, 8}. Rapporteur proposal is based on majority, otherwise remaining values on top of {1, inf} are FFS.

**Rapporteur Proposal 13 Number of PUR grant occasions requested can be one or infinity.**

## Proposals initially marked [ASN.1/CR]

The following proposals and discussions were initially tagged with [ASN.1/CR], i.e. to be discussed further when discussing the running CRs:

* Adopt the TP given in section 2.1 for RRC running CR section 5.3.3.3x.[9] (Qualcomm)
* Running CR on 36.331 should be updated as proposed in Annex regarding the condition of the PUR configuration request procedure.[16] (LGE)

First proposal relates to fallback indication handling, and proposal is to discuss this jointly including interactions between MAC and RRC:

1. [ASN.1/CR] RAN2 to discuss details of L1 fallback indication handling jointly in context with MAC and RRC specs.

The second proposal proposes to update reference to size of MAC PDU in PUR configuration request conditions to expected size of MAC PDU.

1. [ASN.1/CR] Update reference to MAC PDU size to expected MAC PDU size in conditions for initiating PUR configuration request.

The following proposal from Huawei/HiSilicon is about which parameters should support delta configuration:

* PHY parameters are grouped and delta configuration is supported for the group instead of individual PHY parameter. [8] (Huawei)

This can be discussed further together with the running CRs:

1. [ASN.1/CR] PHY parameters are grouped and delta configuration is supported for the group
2. [ASN.1/CR] FFS whether other PUR parameters can be grouped and details of delta signaling.

The following proposals from Huawei/HiSilicon and ZTE/Sanechips related to ASN.1 and PUR configuration:

* Capture parameters highlighted in yellow in the above tables in PUR-Config(-NB)-r16 for NB-IoT and eMTC. [8] (Huawei)
* Remove pur-TBS-r16 in NB-IoT RRC running CR. [8] (Huawei)
* newUE-Identity-r16 should be Cond PUR.[14] (ZTE)
1. [ASN.1/CR] Capture remaining parameters from RAN1 parameter list in PUR-config(-NB) in running TS 36.331 CRs
2. [ASN.1/CR] Remove pur-TBS-r16 in NB-IoT RRC running CR.
3. [ASN.1/CR] newUE-Identity-r16 should be Cond PUR.

In the following, companies may provide comments regarding above proposals e.g. if further discussions are needed before discussing these in context of running CRs:

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Huawei, HiSilicon | We would like to invite companies to provide comment on proposal 18, whether delta configuration is per parameter or per parameter “group”, e.g. L1 parameters can be grouped together.For proposal 21, we do not see the need to have Cond for every single parameter. It should be the eNB to provide proper configuration. In LTE, Cond is used only when there is a need to indicate if the parameter is mandatory present for this feature. |
| Qualcomm | Regarding Huawei’s comment above: we agree a balance needs to be reached for signaling efficiency. Per parameter delta is not efficient if the involved parameters are e.g. Boolean flags (because it also needs setup/release requirements), so grouping of parameters along with setup/release of the group should be considered. |

Summary of comments:

**Rapporteur Proposal 14 Further details of delta configuration, e.g. if it is per parameter or per parameter group can be discussed in context of the running CRs.**

## Proposals initially marked [Postpone]

Following proposals have initially been assigned for possible postponing:

* RAN2 analyze the security aspects of RRC signaling related to D-PUR configuration for CP solution. [4] (Nokia)
* RAN2 is kindly asked to discuss NAS-level D-PUR configuration request.[18] (LGE)
* RAN2 is kindly asked to discuss whether D-PUR can be used to send a paging response message.[19] (LGE)
* RAN2 is kindly asked to discuss shared preconfigured uplink resource transmission in RAN2 aspects.[20] (LGE)
1. [Postpone] RAN2 to analyze the security aspects of RRC signaling related to D-PUR configuration for CP solution.
2. [Postpone] RAN2 to discuss whether NAS-level D-PUR configuration request is supported.
3. [Postpone] RAN2 to discuss whether D-PUR can be used to send a paging response message.
4. [Postpone] RAN2 to discuss aspects of shared preconfigured uplink resource transmission.

In the following, companies may provide comments regarding above if needed:

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Huawei, HiSilicon | We do not see any security problem for PUR request for the CP solution. This is the same as all RRC procedures in the CP solution.Agree to postpone above discussion. |
| Nokia | PUR request and configuration will result in periodic allocation of resources compared to CP solution. In CP solution only one grant is used for every transmission. The impact of security issue is higher for PUR configuration. |

Summary of comments:

Two comments on the security of the CP solution. Rapporteur this discussion can be continued but it is not clear whether it would be useful to do this in an offline, thus recommendation to postpone.

# Summary

The following rapporteur proposals should be "easy" agreements, i.e. no further discussion seems to be necessary:

**Rapporteur Proposal 3 RAN2 to confirm L1 update on repetition number is not intended to update the RRC configuration (i.e. higher layer configuration) but adjust the value provided by higher layers.**

**Rapporteur Proposal 5 TA validation criterion “Serving cell changes” applies also when handover and RRC Connection Re-establishment results in RA in a new cell.**

**Rapporteur Proposal 9 TA timer range is multiple of PUR periodicities, e.g. 1,…, 8. FFS on exact values and whether offset is applied so that e.g. retransmissions are covered.**

Rapporteur Proposal 11 For NB-IoT: The value range for PUR response timer is same as in EDT (FDD): {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24 s.

Rapporteur Proposal 12 For eMTC: The value range for PUR response timer is same as in EDT: {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}.

On Proposal 5 above, it should perhaps be clarified whether any changes are needed cf. the earlier agreement or if it would be enough to capture the intention e.g. in chair notes.

The following are based on majority so companies are asked to consider whether acceptable to them:

**Rapporteur Proposal 7 Working assumption: PUR periodicity configuration granularity is based on counts of binary multiples of HSFN, i.e. full SFN cycles (= 10.24 s).**

**Rapporteur Proposal 8 PUR periodicity is {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, spareX, [FFS]}.**

**Rapporteur Proposal 13 Number of PUR grant occasions requested can be one or infinity.**

The following is proposed as working assumptions, as details may depend on other agreements (e.g. PUR periodicity)

**Rapporteur Proposal 10 Working assumption: PUR time offset has the same range as PUR periodicity. FFS details of configuration.**

The following relate to CP-PUR and the details of where and how configuration should be stored during RRC\_IDLE and requires further discussion of the exact solutions:

**Rapporteur Proposal 1 RAN2 to continue discussion on e.g. how storing of PUR parameters would be split between eNB and MME and other details before agreeing on where PUR configuration is stored for CP solution.**

Rapporteur Proposal 2 RAN2 to continue discussion on if and how eNB links CP-PUR configuration to each UE in RRC\_IDLE.

The following are left for further discussion, e.g. in the relevant running CR discussions:

**Rapporteur Proposal 4 FFS whether further changes or clarifications are needed in RAN2 specifications related to updating of number of repetitions via DCI, e.g. related to delta configuration.**

**Rapporteur Proposal 6 Capture the TA criteria for RSRP changes according to the earlier RAN4 LS in the running CRs.**

**Rapporteur Proposal 14 Further details of delta configuration, e.g. if it is per parameter or per parameter group can be discussed in context of the running CRs.**

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