3GPP TSG-RAN WG2 #112-e draftR2-2010784

Electronic meeting, 2nd – 13th November, 2020

Agenda Item: 8.12.1

Source: Rapporteur (Ericsson)

Title: Summary of [AT112-e][111][REDCAP] TP drafting for the TR (Ericsson)

Document for: Discussion, Decision

# Introduction

The document summarizes the following offline discussion:

* [AT112-e][111][REDCAP] TP drafting for the TR (Ericsson)

 Scope: draft a TP based on meeting agreements

 Intended outcome: Endorsed TP

 Deadline (for companies' feedback): Friday 2020-11-13 02:00 UTC

 Deadline (for rapporteur's summary in R2-2010784): Friday 2020-11-13 10:00 UTC

The current plan is to have (at least) two phases in the discussion

* Phase 1: Discussion based on agreements and discussion from online session
	+ Until Tuesday 2020-11-10 17:00 UTC
* Phase 2: For the new agreements and TP based on the other offline discussions [112], [113], [114]
	+ Until Friday 2020-11-13 02:00 UTC

There may be intermediate updates before and between the deadlines based on discussion, for example updates based on the actual endorsed TP. Such updates will be announced on the reflector.

# Delegate contact information

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| --- | --- |
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# Discussion

Draft TR 38.875 (see e.g. [1]) includes at least the following sections/clauses to which RAN2 should provide input to:

* 8 UE power saving
	+ 8.3 Extended DRX for RRC Inactive and/or Idle
	+ 8.4 RRM relaxation for stationary devices
* 10 Definition and constraining of reduced capabilities
	+ 10.1 Definition of reduced capabilities
	+ 10.2 Constraining of reduced capabilities
* 11 UE identification and access restrictions
	+ 11.1 UE identification
	+ 11.2 Access restrictions

The above sections contain further subsections for feature description, analysis of coexistence with legacy Ues and specification impacts and power saving and performance analysis for power saving related features.

In the following sections the companies are asked to provide feedback and/or TPs for the draft TR 38.875 based on the RAN2 agreements and discussion during RAN2#112-e. The rapporteur company has provided some initial text suggestions for general descriptions based on existing specification text and agreements which companies are welcome to comment.

## UE power saving section

In RAN2#112-e the following has been captured in the chair minutes related to UE power saving:

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| R2-2009617 Summary of [Post111-e][912][RedCap] TP for TR Ericsson report FS\_NR\_redcapProposal 1 Endorse the TR revision in R2-2009616.* Xiaomi wonders about the text for eDRX. VC: This can be further checked when discussing the TP. Apple thinks we don’t even need the first paragraph (which is related to LTE).
* Endorsed (further changes to the content in the initial TR are of course possible)

Proposal 2 Use the power consumption model in TR 38.840, taking the latest RAN1 agreements into account, as the baseline for the power consumption analysis of eDRX and RRM relaxation. * QC is fine with p2. Vivo as well, as this was also discussed in RAN1
* Agreed

Proposal 3 Capture power consumption analysis of eDRX in RRC\_IDLE and RRC\_INACTIVE and of alternatives for RRM relaxation in the TR.* QC wonders what “capture” means here: are we expected to provide simulation results for power consumption? Ericsson thinks that at least companies are allowed to bring evaluations. Whether this goes in an Annex can be discussed.
* Vivo supports p3
* LGE is fine with p2 and p3, but if we don’t support longer eDRX for Inactive there is probably not much to do. Ericsson clarifies this is also about RRM relaxation
* Power saving simulations results can be included case by case based on discussion
* Power consumption analysis can be put in an Annex of the TR
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and

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| [R2-2009364](file:///C%3A/Data/3GPP/Extracts/R2-2009364%20Summary%20of%20email%20discussion%20915%20-%20Summary%20-%20final.docx) Summary of email discussion 915 – UE power saving features CATT discussion Rel-17 FS\_NR\_redcapProposal 1: Supporting years-long battery life is a requirement of REDCAP UesProposal 2: The eDRX cycle in RRC\_IDLE is extended beyond 10.24s for REDCAP Ues. Proposal 3: The eDRX cycle in RRC\_IDLE is extended up to 2621.44s for REDCAP Ues, as a baseline.Proposal 4: If it is agreed to extend the eDRX cycle in RRC\_INACTIVE beyond 10.24s for REDCAP Ues, the extended value is the same as for RRC\_IDLE i.e. 2621.44s, as a baseline.Proposal 5: In case RAN2 agrees to extend the maximum eDRX cycle in RRC\_INACTIVE beyond 10.24s, SA2/CT1/RAN3 should be informed.* Mediatek has strong concerns to go for longer eDRX cycles for RRC Inactive and send LS to other groups for this. Intel agrees, they also have concerns on the related complexity: no need to send LS until RAN2 agrees on the need. QC/Oppo/ZTE agree.
* Apple thinks that there could be benefits in going for this and then have no objections to ask other groups.
* Not enough support to send an LS, at least from this meeting. Can continue to discuss the need for longer eDRX in Inactive in the next meeting.

<snip>Proposal 14: RAN2 de-prioritizes work on RRM relaxation of the serving cell for REDCAP Ues until RAN4 analyzes the resulting performance impact. RAN2 sends an LS at this meeting to RAN4 asking to study such performance impacts.* Mediatek wonders about the content of the LS. Is this to ask about power consumption evaluations or performance requirements? CATT thinks the intention is to ask about possible impacts. ZTE agrees with Mediatek and doesn’t see the need for relaxation for serving cell measurements. ZTE thinks RAN4 needs at least 2 meetings to provide simulation results and then provide feedback to RAN2. Vivo also has some concerns on the timeline if we send an LS to RAN4: RAN2 should discuss first if this is needed
* We don’t send an LS to RAN4, at least from this meeting. We can continue to discuss in RAN2 about the potential benefit for this and then decide how to progress
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The current text in the endorsed draft TR for section “8.3 Extended DRX for RRC Inactive and/or Idle” is the following:

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| 8.3 Extended DRX for RRC Inactive and/or Idle8.3.1 Description of featureIn LTE / EPC, the UE may be configured with an extended DRX (eDRX) cycle. The UE may operate in extended DRX only if the UE is configured by upper layers and the cell indicates support for eDRX in System Information. In RRC\_IDLE the eDRX cycle has maximum value of 2621.44 seconds (43.69 minutes) (for NB-IoT the maximum is 10485.76 seconds or 2.91 hours). Hyper SFN (H-SFN) is broadcasted by the cell and increments by one when SFN wraps around. Paging Hyperframe (PH) refers to the H-SFN in which the UE starts monitoring paging DRX during a Paging Time Window (PTW).For RedCap Ues in NR, extended DRX cycles can be introduced at least up to 10.24 s for both RRC\_IDLE and RRC\_INACTIVE. If extension beyond 10.24 s is specified, similar mechanism as in LTE is expected to be feasible including use of H-SFN, PH and PTW.8.3.2 Analysis of UE power saving8.3.3 Analysis of performance impacts8.3.4 Analysis of coexistence with legacy Ues8.3.5 Analysis of specification impacts |

The agreements related to the section consider UE power saving analysis for which there are separate discussion points below, thus no updates are provided to this section during this phase. Companies are welcome to provide their comments on existing text, if any:

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| **Company** | **Input to section 8.3 (extended DRX) in the TR, if any?** |
| T-Mobile USA | WID specifically excludes LWPA services and we believe that REDCAP should be targeted at wearable devices. eDRX needs to be limited to 10.24 seconds, therefor the sentence “If extension beyond 10.24 s is specified, similar mechanism as in LTE is expected to be feasible including use of H-SFN, PH and PTW.“ needs to be deleted |
| Qualcomm | We agree with the comment made by Apple during online that the first paragraph is not necessary. The TR can just reference LTE spec where needed. For example, “For RedCap Ues in NR, extended DRX cycles can be introduced at least up to 10.24 s for both RRC\_IDLE and RRC\_INACTIVE. If extension beyond 10.24 s is specified, similar mechanism as in LTE is expected to be feasible including use of H-SFN, PH and PTW [x].” |
| OPPO | We are fine with Qualcomm’s suggested change. |
| Samsung | We are also fine with Qualcomm’s suggestion.Regarding T-Mobile’s comment, from our understanding, the text is merely based on the agreement from the last meeting, so it is okay to keep it. Agreements via email – from offline 111:1. For RRC\_IDLE, the DRX cycle is at least extended to 10.24s. FFS on further extension ‎beyond 10.24s.
2. For RRC\_IDLE and/or RRC\_INACTIVE, if the NR DRX cycle range is extended beyond 10.24s, the LTE ‎eDRX mechanism beyond 10.24s (e.g., PTW, PH, etc.) is used as baseline when NR eDRX cycle is configured beyond 10.24s.
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| Intel | Do not see the problem to keep the background of LTE in the TR;Regarding T-Mobile’s comments, we agree with Samsung. SO far that is based on the agreements, and ok to keep. But we did not discuss the “feasibility”, and therefore should stick to agreements on this, i.e. ““If extension beyond 10.24 s is specified, similar mechanism as in LTE (e.g. H-SFN, PH and PTW) is used as baseline ~~expected to be feasible including use of H-SFN, PH and PTW~~.” |
| LGE | No strong view on this. Either the original TP or the example text suggest by QC looks fine to us. |

There were no agreements on RRM relaxation, and no text currently in the TR, however companies are welcome to provide early suggestions or TPs to section 8.4 RRM relaxation for stationary devices:

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| **Company** | **Input to section 8.4 (RRM relaxation) in the TR, if any?** |
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For power consumption analysis it was agreed to discuss case-by-case whether they can be included. It was also agreed power consumption analyses can be put in Annex of the TR. However, what may have been missed during the online session is that there is already section 6.2. in the TR for “Evaluation methodology for UE power saving” which can be used for assumptions, and sections 8.3.2 and 8.4.2 for “Analysis of UE power saving” for eDRX and RRM relaxation, respectively. Instead of putting everything to Annex, it is proposed to reuse these sections when applicable. Annex can be used as well when motivated.

**Rapporteur proposal:**

Use the existing sections 6.2, 8.3.2 and 8.4.2 in the TR for capturing power consumption analysis assumptions and results or conclusions, where applicable. When motivated, Annex can be used for further details.

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| **Company** | Agree with Rapporteur proposal?  | Comments |
| Qualcomm | No | We are fine with keeping section 6.2 in the main body of the TR, as evaluation methodology has been agreed by companies. Section 8.3.2 and 8.4.2 can be moved to an annex, as agreed during the online discussion.  |
| OPPO | No | Agree with Qualcomm. As agreed in the last week’s online session, power consumption analysis (i.e. section 8.3.2 and 8.4.2) can be put in an Annex of the TR. |
| Samsung | - | We share the view with Qualcomm: the (un-calibrated) analysis can be put into Annex. |
| Intel |  | Agree Qualcomm’s comments on handling of section 8.3.2 and 8.4.2.  |
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The following tdocs submitted to RAN2#112-e include analyses, at least parts of which could be potentially used in the TR.

**eDRX**

[R2-2009116](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009116.zip) (MediaTek): Model based on TR 38.840 and example results on relative gain vs I-DRX up to 2.9 h eDRX cycle with High SINR and Low SINR.

[R2-2009620](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009620.zip) (Ericsson): Model based on TR 38.840 and example results of eDRX in RRC\_IDLE and RRC\_INACTIVE with different data inter-arrival times.

In rapporteur’s understanding the above results have been updated based on earlier discussion with the values used in RAN1.

The companies are welcome to discuss and provide comments on the analyses provided so far:

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| **Company** | OK to include analysis from [R2-2009116](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009116.zip) (MediaTek) in the TR? | Suggestions on which parts/details to capture or concerns with the analysis. Please elaborate if you think the analysis should not be captured.  |
| Qualcomm | OK (see comments) | We are fine with including the simulation/evaluation results in Section 2.1 in an annex in the TR. One suggestion on the study is to include different number of SSBs needed by UE in low-SINR scenarios, since that highly depends on UE implementation and has a direct impact on the results.We do not think it is necessary to include the analysis in the TR, because TRs typically capture only agreements, not analysis.  |
| OPPO |  | Similar comments as Qualcomm. Different number of SSBs assumed for low-SINR scenarios should be considered. |
| Intel | Ok | Ok to include the analysis from companies in the TR, but we should make clear that the results are not confirmed in RAN2. .  |
| LGE | OK | We are fine to capture the analysis in the TR. |

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| **Company** | OK to include analysis from [R2-2009620](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009620.zip) (Ericsson) (on eDRX) in the TR? | Suggestions on which parts/details to capture or concerns with the analysis. Please elaborate if you think the analysis should not be captured. |
| Qualcomm | OK (see comments) | We are fine with including the simulation/evaluation results in Section 2.2 in an annex in the TR. However, we do not think it is necessary to include the analysis in the TR, because TRs typically capture only agreements, not analysis. |
| Intel | Ok | Ok to include the analysis from companies in the TR, but we should make clear that the results are not confirmed in RAN2. .  |
| LGE | OK |  |

**RRM relaxation**

[R2-2009087](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009087.zip) (vivo, Guangdong Genius) includes references to TR 38.840 on analysis of different RRM relaxation mechanisms.

[R2-2009620](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009620.zip) (Ericsson) includes results on device power consumption against increasing RRM neighbour cell measurement invervals for a specific scenario, model based on TR 38.840.

**Question:** Should we re-use or refer to parts of the analysis in TR 38.840 related to RRM relaxation, e.g. parts highlighted in [R2-2009087](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009087.zip) (vivo, Guangdong Genius) in the TR?

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| **Company** | Yes / No | Suggestions on which parts of TR 38.840 could be re-used, or referred to in TR 38.875 related to RRM relaxation. |
| Qualcomm | Yes (refer) | We think including a reference to TR 38.840 is sufficient. |
| OPPO | Yes | Reference to TR 38.840 is sufficient. |
| Samsung | Yes | Agree with Qualcomm and OPPO. |
| Intel | Yes | Agree with Qualcomm and OPPO.  |
| LGE | Yes | Agree with Qualcomm and OPPO. |

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| **Company** | OK to include analysis from [R2-2009620](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_112-e/Docs//R2-2009620.zip) (Ericsson) (on RRM) in the TR? | Suggestions on which parts/details to capture or concerns with the analysis. Please elaborate if you think the analysis should not be captured. |
| Qualcomm | OK (see comments) | We are fine with including Fig 5 in the TR. |
| Samsung | OK | We are fine to capture it into the annex (as said above). |
| Intel | Ok | Ok to include the analysis from companies in the TR, but we should make clear that the results are not confirmed in RAN2. .  |
| LGE | OK | We are fine to capture the analysis in the TR. |

## Definition and constraining of reduced capabilities section

In RAN2#112-e the following agreements have been captured in the chair minutes on definition and constraining of reduced capabilities:

Agreements:

1. RedCap UE capabilities can be categorized as:

• Min capabilities all RedCap UEs support (i.e. mandatory for RedCap UE) if identified;

o FFS on whether some features are mandatory with signaling for RedCap UE, i.e. IOT bit;

o (Note: RedCap UEs might have the same set of higher layer capabilities, however this is FFS in RAN2)

• Optional capabilities (signaled explicitly)

1. Following scenarios are considered when design the capability signaling for RedCap UE, but FFS on the details, e.g. what each category of features may include and on the applicability of the cases:

For the features that are mandatory for non-Redcap UEs:

Case1: The Redcap UE mandatorily supports the feature with the same value;

Case2: The Redcap UE mandatorily supports the feature, but with different value (e.g. bandwidth value);

Case3: The Redcap UE optionally supports the feature;

Case4: The Redcap UE does not support the feature at all.

For the features that are optional for non-Redcap UEs:

Case1: The Redcap UE does not support the feature at all.

Case2: The Redcap UE supports the feature with different value;

Case3: The Redcap UE supports the feature with the same value;

Case4: The Redcap UE mandatorily supports the feature

Based on the agreements, the following is suggested as revised text on clause “10.1.1 Description of the feature” (under “10.1 Definition and constraining of reduced capabilities”):

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| 10.1.1 Description of featureAs a baseline, the existing UE capabilities framework is used to indicate the capabilities of RedCap UEs. The UE reports its UE radio access capabilities which are static at least when the network requests.Network should be able to control UE accesses and differentiate them from legacy UEs. The number of different UE types should be minimised.Assuming that minimum capabilities all RedCap UEs support are identified and eventually specified, the RedCap UE capabilities can be categorized as: * Minimum mandatory capabilities that all RedCap UEs support.
* Optional capabilities, to be signaled explicitly.

For capability signaling of RedCap UEs, the following scenarios are possible, however feasibility and applicability of the cases and the final division to categories depend on the exact RedCap capabilities (to be defined):* For the features that are mandatory for non-Redcap UEs:
	+ The Redcap UE mandatorily supports the feature with the same value;
	+ The Redcap UE mandatorily supports the feature, but with different value (e.g. bandwidth value);
	+ The Redcap UE optionally supports the feature;
	+ The Redcap UE does not support the feature at all.
* For the features that are optional for non-Redcap UEs:
	+ The Redcap UE does not support the feature at all.
	+ The Redcap UE supports the feature with different value;
	+ The Redcap UE supports the feature with the same value;
	+ The Redcap UE mandatorily supports the feature

Editor’s note: The details and numbers of device types is FFS and discussion should be coordinated between RAN1/RAN2. |

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| **Company** | **Is the above text agreeable?**  | **Feedback / TP suggestions** |
| T-Mobile USA | NO | RAN2 agreement was extensively discussed. Delete “The number of different UE types should be minimized.” and replace with the identical text agreed during the online session |
| Qualcomm | Agreeable, with comments | We tend agree with T-Mobile. The TR can capture the full text agreed during online in the last meeting. |
| OPPO |  | Agree with above comments. Pasting meeting agreements would be preferred. |
| Samsung | Agree with T-Mobile | We also prefer to capture the agreements as they are. |
| Intel | Yes | “Assuming that minimum capabilities all RedCap UEs support are identified and eventually specified, the RedCap UE capabilities can be categorized as: “ is only related to “- Minimum mandatory capabilities that all RedCap UEs support.” And unrelated to “Optional capabilities, to be signaled explicitly.”Therefore for this part, revision is needed. Regarding the comments on “The number of different UE types should be minimized.”, this has been agreed in last meeting. We should keep it.  |
| LGE | Yes | The current TP looks fine. |
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| **Company** | **Any other input to section 10.1 in the TR?** |
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In the TR, for constraining reduced capabilities section “10.2 Constraining of reduced capabilities” should describe the feature and analyse coexistence and impacts. There has not yet been discussion/agreements on this part during RAN2#112-e. Companies are welcome to suggest baseline text for that section:

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| **Company** | **Input to section 10.2 in the TR, if any?** |
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## UE identification and access restrictions section

In RAN2#112-e the following agreements have been captured in the chair minutes on UE identification and access restrictions:

Agreements:

1. Whether it is needed to identify RedCap UEs during Msg3 from RAN2 perspective or not depends on the following two aspects:

- Whether Msg4/5 special handing for RedCap UE is needed, pending RAN1

- Whether there is a need to reject part of RedCap UEs in addition to cell barring and UAC mechanism

For UE identification there is no existing text in the endorsed TR in Section 11.1. The following is suggested to be captured as baseline text and based on the agreements in RAN2#112-e:

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| 11.1 UE identification11.1.1 Description of featureThe network needs to identify RedCap UEs in order to ensure such UEs can operate properly in the cell, to schedule messages properly and to possibly to restrict UEs access to the network. The feasibility of the different solutions on when such information should be available to the network depends on whether there is a need for network to have the information that the UE is a RedCap UE prior to scheduling a particular message. The following options for including an indication of have been discussed:- Option 1: Msg1 (Separate initial UL BWP or PRACH partitioning)- Option 2: Msg3- Option 3: Msg5- Option 4: MsgA for 2 step RAAnalysis of Option 1: … Analysis of Option 2: Whether it is needed for the network to identify a RedCap UE prior to or during reception of Msg3 depends on (FFS further details and pending RAN1 discussion) whether Msg4 and/or Msg5 need special handling and whether there is a need to provide opportunity for RRC to reject connection establishment based on that the UE is a RedCap UE.Analysis of Option 3: …Analysis of Option 4: …11.1.2 Analysis of coexistence with legacy UEs11.1.3 Analysis of specification impacts |

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| **Company** | **Is the above text agreeable as baseline?**  | **Feedback / TP suggestions** |
| T-Mobile USA | No | This assumes that there will be multiple categories of REDCAP UE’s which hasn’t been determined. REDCAP needs to have a baseline set of mandatory capabilities with optional features added on top of the baseline capabilities.  |
| Qualcomm | Yes |  |
| OPPO | Yes  |  |
| Samsung | Yes | We appreciate all the efforts from rapporteur. |
| Intel | Partially yes | “The feasibility of the different solutions on when such information should be available to the network depends on whether there is a need for network to have the information that the UE is a RedCap UE prior to scheduling a particular message. ” Why do we need this sentence? |
| LGE | Yes |  |
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| **Company** | **Input to section 11.1 in the TR, if any?** |
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For access restrictions, there has been no discussion so far during RAN2#112-e, the following is the existing text:

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| 11.2 Access restrictions11.2.1 Description of featureNG-RAN supports overload and access control functionality such as RACH back off, RRC Connection Reject, RRC Connection Release and UE based access barring mechanisms.For RedCap UEs, an indication in broadcast system information can be used to indicate whether a RedCap UE can camp on the cell or not.Unified access control framework is specified in TS 22.261 and it applies to all UEs in RRC\_IDLE, RRC\_CONNECTED and RRC\_INACTIVE for NR. This mechanism can also apply to RedCap UEs to control RedCap UEs accesses to the network. Editor’s note: FFS on details of above, e.g. explicit or implicit indication in SI, details of UE access identifier and/or access categories for reduced capability UEs.11.2.2 Analysis of coexistence with legacy UEs11.2.3 Analysis of specification impacts |

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| **Company** | **Any input to section 11.2 in the TR?** |
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# Phase 2

TBD

# Summary

TBD

# References

1. [R2-2009616](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs//R2-2009616.zip), TR 38.875 update, RAN2#112-e, Electronic meeting, November 2020.