**TSG SA Meeting #SP-94E SP-211313r01**

**14 - 20 December 2021, Electronic meeting**

**TSG SA Rel-18 Prioritization Workshop SP-211155r02**

**9-10 December 2021, Electronic meeting**

**SA WG2 Meeting #S2-148E (e-meeting)S2-2109323**

**15 - 22 November, 2021, Electronic meeting (revision of SP-2108369r02)**

**Source: Ericsson, Deutsche Telekom, Verizon, Xiaomi, Sony, Nokia, Nokia Shanghai Bell, MediaTek, AT&T, Apple, Qualcomm, Vodafone, InterDigital, China Mobile, OPPO, DISH Network, Spreadtrum.**

**Title: New SID: Study on enhanced support of NR RedCap with long eDRX for RRC INACTIVE State**

**Document for: Approval**

**Agenda Item: 9.1.3**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

# Title: Study on enhanced support of NR RedCap with long eDRX for RRC INACTIVE state

Acronym: FS\_ARCH\_NR\_REDCAP\_Ph2

Unique identifier: 940056

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X | X | X |  |
| No | X |  |  |  |  |
| Don't know |  |  |  |  | X |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | Work Task |
| X | Study Item |

## 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  |  |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 900062 | Support of Reduced Capability NR Devices (NR\_REDCAP) | RAN work item to support of Reduced Capability NR Devices |

Dependency on non-3GPP (draft) specification:

# 3 Justification

RAN2 has studied support of device with RedCap for NR in TR 38.875. There are conclusions related to the support of extended DRX value as listed below (quoted from Clause 13 conclusions and recommendations in the TR).

*The study of UE power saving on extended DRX in RRC\_INACTIVE and/or RRC\_IDLE can be summarized as follows:*

*- Extended DRX for RedCap UEs for RRC\_IDLE and RRC\_INACTIVE have been studied. The study includes analysis of UE power saving, possible upper and lower bounds for eDRX cycles and study of possible mechanisms for eDRX for RedCap UEs in clauses 8.3.1-8.3.4.*

*- The upper bound for DRX cycles and shorter eDRX values than 5.12 seconds, i.e. 2.56 seconds have been studied and options are discussed in clause 8.3.3.*

*- Solutions for PTW and eDRX cycle configuration and which node should configure the eDRX cycle for RRC\_INACTIVE have been studied and solutions are captured in clause 8.3.4.*

*Based on the study of UE power saving on extended DRX, the following are recommended from RAN2 perspective, where feasibility is to be confirmed with SA2 and/or CT1:*

*- The applicable parts of eDRX mechanisms for LTE, including use of H-SFN, PH and PTW are expected to be re-used for RedCap UEs.*

*- It is recommended that for eDRX cycles below and equal to 10.24 seconds PTW and PH is not used and that common design for handling eDRX cycle equal to 10.24 seconds in RRC\_IDLE and RRC\_INACTIVE is specified.*

*- It is recommended eDRX cycles in RRC\_IDLE are extended up to 10485.76 seconds, unless RAN4 indicates such eDRX value requires UE to perform RRM on serving cell outside PTW.*

*- It is recommended eDRX cycles in RRC\_INACTIVE are extended > 10.24 seconds.*

SA2 has specified the support of device with Redcap for NR in Rel-17. However, the support of extended DRX cycle in RRC\_INACTIVE state is limited to maximum 10.24s.

It’s agreed that the support of extend DRX cycle longer than 10.24s will be studied in Rel-18, as documented in LS out from SA2 to RAN2/RAN3/CT1 [S2-2106978](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_146E_Electronic_2021-08/Docs/S2-2106978.zip).

The support of extended DRX cycle with long value is a key mechanism for power saving for device based on the analysis in RAN TR 38.875 for RRC\_IDLE state and RRC\_INACTIVE state. It’s critical for 5GS to provide a solution to support the long extended DRX cycle in RRC\_INACTIVE state.

# 4 Objective

The aim of this study is to investigate potential enhancements of 5GS that would enable the support of RRC\_INACTIVE state with extended DRX cycle longer than 10.24s.

NOTE 1: RRC\_INACTIVE is defined as “CM-CONNECTED with RRC\_INACTIVE” in current 3GPP specification (See TS 23.501 clause 5.3.3.2.5 and TS 38.300 clause 9.2.2.1). The study will not restrict proposals for other CM state based solutions, i.e., CM-IDLE.

The following aspects are in the scope of the study:

1. Support for enabling of eDRX cycle longer than 10.24s in RRC\_INACTIVE state.
	1. Study the support the of eDRX cycle longer than 10.24s and up to 10485.76s for RRC\_INACTIVE state for RAN paging (e.g. PTW and eDRX cycle values).
	2. Study the MT signalling and data handling when UE is not reachable due to long eDRX cycle in RRC\_INACTIVE state.

NOTE 2: The work in the first part above can be partially considered as an alignment work with RAN side since eDRX >10.24s is considered as part of the RAN rel-18 normative work.

NOTE 3: The second part above can be started with early documenting solutions discussed in Rel-17 as summarized in [S2-2108370](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_148E_Electronic_2021-11/Docs/S2-2108370.zip) and also new solutions if there is any, and analysis/evaluation/conclusion is the main part in the study.

## TU estimates and dependencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Work Task ID | TU Estimate(Study) | TU Estimate(Normative) | RAN Dependency(Yes/No/Maybe)  | Inter Work Tasks Dependency Editor’s Note: This column should highlight if WT#x is self-contained, or is depended on completion of other WTs |
| WT#1 | 2 TU | 1 TU | Yes | WT#1 is self-contained |
| WT#1.1 | 0.5 TU | 0.5 TU | Yes | WT#1.1 is self-contained |
| WT#1.2 | 1.5 TU | 0.5 TU | Yes | WT#1.2 is depended on the completion of WT#1.1 |
| WT#2 |  |  |  |  |
| WT#3 |  |  |  |  |

Total TU estimates for the study phase: 2 TU

Total TU estimates for the normative phase: 1 TU

Total TU estimates: 3 TU

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| Internal TR  | 23.abc | Study on Support for NR RedCap with long eDRX for RRC INACTIVE state | SA#96June2022(TBD) | SA#97Sep2022(TBD) |  |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

Qian, Chen, Ericsson, (qian.xb.chen@ericsson.com)

# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

RAN aspects will be coordinated with relevant RAN WGs.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| AT&T |
| Deutsche Telekom |
| Ericsson |
| MediaTek Inc. |
| Nokia |
| Nokia Shanghai Bell |
| Sony |
| Verizon |
| Xiaomi |
| Apple |
| China Mobile |
| Huawei |
| Qualcomm |
| Vodafone |
| InterDigital |
| OPPO |
| DISH Network |
| Spreadtrum |
|  |