**3GPP TSG-SA5 Meeting #156 *S5-244814***

Maastricht, Netherlands, 19th Aug 2024 - 23rd Aug 2024

**Source: ZTE Corporation, China Unicom**

**Title: Add potential solutions on resource load of RedCap network**

**Document for: Approval**

**Agenda Item: 6.19.17**

# 1 Decision/action requested

***The group is asked to discuss and approval.***

# 2 References

# 3 Rationale

It was approved in SP-231734 to study the management of aspects of RedCap features. One of the working tasks is to investigate the measurements and KPIs to evaluate the performance of NR networks delivering communication services for RedCap UEs. A use case and requirement on performance evaluation on resource load of RedCap network service was approved in the last meeting. In order to satisfy the requirement mentioned above, a potential solution is proposed in this contribution.

# 4 Detailed proposal

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| **1st Change** |

5.6 Use case #6: Performance evaluation on resource load of RedCap network service

5.6.1 Description

The radio resource utilization measurements could provide operators the load information of the radio network during the measurement time period. Compared to non-Redcap UEs, RedCap UEs use fewer network resources (e.g. PRBs) relative to eMBB (enhanced mobile broadband) devices due to their reduced capabilities and lower data rate requirements. PRBs related measurements may include total PRB usage, PDSCH PRB Usage, PUSCH PRB Usage etc.

In TS 28.552 [10], radio resource utilization metrics are used to evaluate the performance of the entire network, but the current approach combines the resource utilization of RedCap UEs and non-RedCap UEs, which may not accurately reflect the performance of the RedCap service.

RedCap UEs typically have reduced capabilities and different performance characteristics compared to standard UEs.

Compared to non-Redcap UEs, RedCap UEs use fewer network resources (e.g. PRBs) related to eMBB (enhanced mobile broadband) devices. By distinguishing between the two types of UEs, network operators can better identify and troubleshoot specific network resource issues related to RedCap UEs and non-RedCap UEs, thus can allocate resources more efficiently and ensure that RedCap UEs receive adequate resource.

Therefore, it is essential to investigate an approach for separately calculating the resource load of RedCap UEs and defining the resource load performance of networks that deliver RedCap service. This will ensure a more precise evaluation of the user experience for RedCap UEs, thus make the operator to be aware of whether a cell has ever experienced high load or not in the monitoring period, and is a key input to network capacity planning and load balancing for RecCap service.

Similarly, to distinguish RedCap UEs and non-RedCap UEs for metric of the number of the active UEs in each cell is helpful for operators to know how many DRBs are running with buffered data per cell for different kinds of UEs.

Through the metrics of radio resource utilization and active users of RedCap UEs and non-RedCap UEs, operators can better evaluate the overall consumption of network resources of RedCap UEs to facilitate adjustment of related network policies.

5.6.2 Potential requirements

**REQ-RedCap-Perf-Resource:** The 3GPP management system should have capability to provide measurements related to resource load of RedCap service.

5.6.3 Potential Solutions

#### 5.4.3.1 Potential solution #1

This solution proposes to reuse and enhance the existing measurements related to radio resource utilization defined in TS28.552 [10] for this use case.

Current PRBs related measurements are specified in clause 5.1.1.2 in TS 28.552 [10], including *DL Total PRB Usage,* UL Total PRB Usage*,* PRB Usage per SSB*, etc.* In order to achieve the requirement in clause 5.6.2, most aspects of the existing measurements can be reused and some enhancements also need to be introduced.

Also, clause 5.1.1.23 in TS 28.552 [10] Number of Active UEs can also be reused to reflect the load of RedCap service including: Active UEs in the DL per cell, Active UEs in the UL per cell, Active UEs per cell, etc.

Based on the procedures above, gNB can be aware of whether the UE is RedCap or not when a UE tries to access to NG-RAN. Consequently, the measurements that performed after the inquiry of UE capability can can be split into subcounters per UE type.

When there is more than one type of UEs (e.g. RedCap UEs, eMBB UEs) covered by a cell, the measurements can be opionally split into subcounters to represent PRB number for RedCap UEs.

The related measurements will create a subcounter which can be named as per UE type.

Take the DL Total PRB Usage as an example:

RRU.PrbDl.UeType

Where UeType indicates the type of UEs (e.g. RedCap UEs, non-RedCap UE, etc) and UeType the value of RedCap can be used as measurements of PRB number for RedCap UEs.

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| **End of change** |