**3GPP TSG SA WG5 Meeting #142e S5-222090**

**Online, , 04 Apr 2022- 12 Apr 2022**

**Source: Samsung**

**Title: pCR 28.104 Handover Optimization**

**Document for: Approval**

**Agenda Item: 6.6.5**

# 1 Decision/action requested

***The group is asked to discuss and approve the proposals.***

# 2 References

None

# 3 Rationale

Current handover procedures are mainly based on radio conditions for selecting the target gNB upon a handover. The target gNB accepts or rejects the handover (HO) request depending on various conditions. In virtualized environment, the HO may be rejected due to inadequate available resources within the target gNB. The notion of resources may include virtual resources (e.g., compute, memory) and/or radio resources (e.g., PRB, RRC connected users). If the HO request is rejected, a UE will try to connect to a different gNB until the request is successfully accepted. Several target gNBs can be tried until the request is successfully accepted. This process can result in wastage of UE and network resources, while it may also introduce service disruption due to increased latency and radio link failures (RLFs). It also introduces inefficiency in the HO or other network procedures.

The solution proposed enables analytics report stating when the target gNB is optimal for handover. This address the following requirements from section 7.2.5.2.3

|  |  |  |
| --- | --- | --- |
| **REQ-MOB\_MDA-01** | MDA capability for handover optimization shall be able to provide the analytics output related to current statistics and future predictions of virtual resource consumption of gNB. | Handover optimization |
| **REQ-MOB\_MDA-02** | MDA capability for handover optimization shall be able to provide the analytics output related to current statistics and future predictions of radio resource consumption of gNB. | Handover optimization |
| **REQ-MOB\_MDA-07** | MDA capability for handover optimization shall be able to provide the analytics output including the following information that can be used to optimize handover decisions:  - Indication on whether the target gNB is optimal for handover.  - Recommended action to optimize the target gNB and/or the selection of the target gNB for handover. | Handover optimization |

# 4 Detailed proposal

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| --- |
| **First modification** |

### 8.4.x Mobility management analytics

#### 8.4.x.1 Handover Optimization analysis

##### 8.4.x.1.1 MDA type

The MDA type for handover optimization is: Mobility.Management.HandoverOptimization.

##### 8.4.x.1.2 Enabling data

The enabling data for handover optimization analysis are provided in table 8.4.x.1.2-1.

For general information about enabling data, see clause 8.2.1.

Table 8.4.x.1.2-1: Enabling data for handover optimization analysis

|  |  |  |
| --- | --- | --- |
| Data category | Description | References |
| Performance Measurements | Consumed virtual resources of target gNB | Virtualised resource usage measurement (clause 6.2 of TS 28.552[4]) |
| The physical radio resource utilization of the target gNB | Physical radio resource utilization of the target gNB, see clause 5.1.1.2 of TS 28.552 [4]; |
| PDCP Data Volume of NR cells | Clause 5.1.2.1 and 5.1.3.6 of TS 28.552 [4]. |
| MDT Data | UE measurements related to RSRP, RSRQ, SINR (serving cell and neighbour cells) and UE location information | RSRPs, RSRQs and UE location of M1 measurements for NR in TS 32.422 [6] and TS 32.423 [7]. |

##### 8.4.x.1.3 Analytics output

The specific information elements of the analytics output for handover optimization analysis, in addition to the common information elements of the analytics outputs (see clause 8.3), are provided in table 8.4.x.1.3-1.

Table 8.4.x.1.3-1: Analytics output for handover optimization analysis

|  |  |  |  |
| --- | --- | --- | --- |
| Information element | Definition | Support qualifier | Properties |
| TargetgNB | This provides analytics report for each target gNB for handover optimization. | M | type: TgtgNB  multiplicity: 1…\*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
|  |  |  |  |

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| --- |
| **Second modification** |

## 8.5 Data type definitions

### 8.5.x TgtgNB <<dataType>>

#### 8.5.x.1 Definition

This data type specifies the information about the target gNB for handover.

#### 8.5.x.2 Information elements

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Definition | Support qualifier | Properties |
|  |  |  |  |
|  |  |  |  |
| isOptimal | This specifies if the gNB is optimal for handover. The value TRUE indicates that the gNB is optimal at present.  Allowed Values: TRUE and FALSE. | M | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: TRUE  isNullable: False |
| futureOptimal | This specifies if the gNB is optimal for handover at a future point of time. | M | type: FutureOptimal  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: TRUE  isNullable: False |
|  |  |  |  |
|  |  |  |  |
| PredictedQoE | The predicted QoE value of UE (e.g., PDCP Data Volume, MOS value, etc) in the target gNB identified by gNBID or the target cell identified by cell ID. | M | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| ValidTime | This specifies the timestamp for which the predicted QoE value are valid. | M | type: ProjectionDuration  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| gNBId | It identifies a gNB within a PLMN |  | type: TgtgNB  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |

### 8.5.y VirRes <<dataType>>

#### 8.5.y.1 Definition

This data type specifies the virtual resource consumption.

#### 8.5.y.2 Information elements

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Definition | Support qualifier | Properties |
| virtualCPU | It indicates the average virtual CPU usage over the time duration indicated by projectionTime attribute. | M | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| virtualMemory | It indicates the average virtual memory usage over the time duration indicated by projectionTime attribute. | M | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| virtualDisk | It indicates the average virtual storage usage over the time duration indicated by projectionTime attribute. | M | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| projectionTime | This specifies the timestamp for which the projections are made | M | type: ProjectionDuration  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |

### 8.5.a PhyRes <<dataType>>

#### 8.5.a.1 Definition

This data type specifies the physical resource consumption.

#### 8.5.a.2 Information elements

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Definition | Support qualifier | Properties |
| DLPRBUsage | This specifies the average total usage (in percentage) of physical resource blocks (PRBs) on the downlink for any purpose, over the time duration indicated by projectionTime attribute. | M | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| ULPRBUsage | This specifies the average total usage (in percentage) of physical resource blocks (PRBs) on the uplink for any purpose, over the time duration indicated by projectionTime attribute. | M | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| projectionTime | This specifies the timestamp for which the projections are made | M | type: ProjectionDuration  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
|  |  |  |  |

### 8.5.s ProjectionDuration <<dataType>>

#### 8.5.s.1 Definition

This data type specifies the time duration for which the projections are made.

#### 8.5.s.2 Information elements

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Definition | Support qualifier | Properties |
| FromTime | This specifies the timestamp from when the projection are made | M | type: DateTime  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| ToTime | This specifies the timestamp till when the projection are made | M | type: DateTime  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |

### 8.5.e FutureOptimal <<dataType>>

#### 8.5.e.1 Definition

This data type specifies the time duration for which the gNB is optimal for upgrade.

#### 8.5.e.2 Information elements

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Definition | Support qualifier | Properties |
| FutureOptimal | This specifies if the gNB is optimal for handover at a future point of time. The value TRUE indicates that the gNB is optimal for handover.  Either isOptimal or isFutureOptimal will be present. | M | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: TRUE  isNullable: False |
| FutureOptimalTime | This specifies the time duration during which the gNB is optimal for handover. | CM | type: ProjectionDuration  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| ProjectedVResCon | This specifies the projected virtual resource consumption | M | type: VirRes  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| ProjectedPResCon | This specifies the projected physical resource consumption | M | type: PhyRes  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
|  |  |  |  |
| cellLocalId | It identifies a NR cell of a gNB. | O | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |