**3GPP TSG-SA5 Meeting #134e *S5-206082***

**November 16 – 25, 2020, E-meeting** *s5-2abcde*

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| *CR-Form-v11.4* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.313** | **CR** | **0010** | **rev** | **-** | **Current version:** | **16.0.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Add LBO use cases, requirements, and related information | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Intel | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eSON\_5G | | | | |  | ***Date:*** | | | 2020-11-06 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | LBO use cases, requirements, and related information are needed to complete the Rel. 17 eSON\_5G WI | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add LBO use cases, requirements, and related information | | | | | | | | |
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| ***Consequences if not approved:*** | | Rel. 17 eSON\_5G WI cannot be completed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.1, 6.4.2, 6.1.1, 6.1.2, 7.1, and 7.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

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| **First Modified Sections** |

## 6.4 Use cases

### 6.4.1 Distributed SON management

#### 6.4.1.x LBO (Load Balancing Optimisation)

| Use case stage | Evolution/Specification | <<Uses>> Related use |
| --- | --- | --- |
| **Goal** | To automatically distribute user traffic among neighboring cells to ensure the radio resources are efficiently used, while providing quality end-user experience and performance. |  |
| **Actors and Roles** | D-SON management function to support LBO function. |  |
| **Telecom resources** | * gNB; * The producer of provisioning MnS |  |
| **Assumptions** | N/A |  |
| **Pre-conditions** | * 5G NR cells are in operation. * LBO is in operation. |  |
| **Begins when** | The D-SON management decides to enable LBO function. |  |
| **Step 1 (M)** | The D-SON management function requests the producer of provisioning MnS to set the handover and/or reselection parameters ranges (see clause 15.5.1.4 in TS 38.300 [7]) for the LBO function. |  |
| **Step 2 (M)** | The D-SON management function requests the producer of provisioning MnS to set the targets for the LBO function. |  |
| **Step 3 (M)** | The D-SON management function requests the producer of provisioning MnS to enable the LBO function. |  |
| **Step 4 (M)** | The LBO function uses the reported load information over the X2, Xn, F1 and E1 interfaces from neignboring cells to perform load balancing by means of cell reselection/handover parameters re-configuration and handover actions (e.g. offloading UEs to neighboring cells) (see clause 15.5 in TS 38.300 [7]), and may send a notification to the D-LBO management function when the LBO action has been performed. |  |
| **Step 5 (M)** | The D-SON management function collects LBO related measurements, and analyses them to evaluate the LBO performance. |  |
| **Step 6 (M)** | The D-SON management function performs the following action, if the LBO performance does not meet the target:  1. Request the producer of provisioning MnS to update the targets for LBO function.  2. Request the producer of provisioning MnS to update the ranges for handover parameters. |  |
| **Ends when** | All the steps identified above are successfully completed. |  |
| **Exceptions** | One of the steps identified above fails. |  |
| **Post-conditions** | The LBO performance has been optimized. |  |
| **Traceability** | **REQ-DLBO-FUN-1, REQ-DLBO-FUN-2, REQ-DLBO-FUN-3** |  |

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| **Next Modified Sections** |

## 6.1 Requirements

### 6.1.1 Distributed SON management

#### 6.1.1.2 LBO (Load Balancing Optimisation)

**REQ-DLBO-FUN-1** producer of provisioning MnS should have a capability allowing an authorized consumer to set or update the targets, HO offset ranges, and control parameters for LBO function.

**REQ-DLBO-FUN-2** producer of performance assurance MnS should have a capability allowing the authorized consumer to collect the LBO related performance measurements that are used to evaluate the LBO performance.

**REQ-DLBO-FUN-3** producer of provisioning MnS should have a capability to notify the authorized consumer about the LBO actions being performed.

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| **Next Modified Sections** |

### 6.4.2 Centralized SON

#### 6.4.2.x LBO (Load Balancing Optimisation)

| Use case stage | Evolution/Specification | <<Uses>> Related use |
| --- | --- | --- |
| **Goal** | To automatically distribute user traffic among neighboring cells to ensure the radio resources are efficiently used, while providing quality end-user experience and performance. |  |
| **Actors and Roles** | C-SON function to support LBO. |  |
| **Telecom resources** | * gNB; * The producer of provisioning MnS |  |
| **Assumptions** | N/A |  |
| **Pre-conditions** | * 5G NR cells are in operation. * The C-SON has been enabled. |  |
| **Begins when** | The C-SON function decides to enable LBO function. |  |
| **Step 1 (M)** | The C-SON function collects LBO load measurements by consuming the MnS of performance assurance. |  |
| **Step 2 (M)** | The C-SON function analyses measurements to determine the actions to optimize the traffic load distributions among neighboring cells that include consuming the MnS of provisioning to update the ranges for handover parameters. |  |
| **Step 3 (M)** | The C-SON function collects LBO related measurements, and analyses them to evaluate the LBO performance against the targets. |  |
| **Step 4 (M)** | The C-SON function may request the producer of provisioning MnS to update the ranges for handover parameters, if the LBO performance does not meet the target: |  |
| **Ends when** | All the steps identified above are successfully completed. |  |
| **Exceptions** | One of the steps identified above fails. |  |
| **Post-conditions** | The LBO performance has been optimized. |  |
| **Traceability** | **REQ-CLBO-FUN-1, REQ-CLBO-FUN-2** |  |

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| **Next Modified Sections** |

### 6.1.2 Centralized SON

#### 6.1.2.x LBO (Load Balancing Optimisation)

**REQ-CLBO-FUN-1** producer of provisioning MnS should have a capability allowing an authorized consumer to set or update the HO offset ranges for LBO function.

**REQ-CLBO-FUN-2** producer of performance assurance MnS should have a capability allowing the authorized consumer to collect the LBO load and target related performance measurements.

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| **Next Modified Sections** |

# 7 Management services for SON

## 7.1 Management services for D-SON management

### 7.1.x LBO (Load Balancing Optimisation)

#### 7.1.x.1 MnS component type A

Table 7.1.x.1-1: D-LBO type A

|  |  |
| --- | --- |
| MnS Component Type A | Note |
| Operations and notifications defined in clause 5 of TS 28.532 [3]:  - createMOI operation  - getMOIAttributes operation  - modifyMOIAttributes operation  - deleteMOI operation  - notifyMOIAttributeValueChanges operation  - notifyMOICreation  - notifyMOIDeletion  - notifyMOIChanges | It is supported by Provisioning MnS for NF, as defined in TS 28.531 [11]. |
| Operations defined in clause 11.3.1.1.1 in TS 28.532 [3] and clause 6.2.3 of TS 28.550 [12]:  - notifyFileReady operation  - reportStreamData operation | It is supported by Performance Assurance MnS for NFs, as defined in TS 28.550 [12]. |

#### 7.1.x.2 MnS Component Type B definition

##### 7.1.x.2.1 Targets information

The targets of D-LBO are shown in the Table 7.1.x.2.1-1.

Table 7.1.x.2.1-1: D-LBO targets

| Target Name | Definition | Legal Values |
| --- | --- | --- |
| RRC connection establishments successful rate related to load | The number of “Successful RRC connection establishments” / the number of “Attempted RRC connection establishments”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |
| RRC connection re-establishments successful rate related to load | The number of (“Successful RRC connection re-establishment with UE context” + “Successful RRC connection re-establishment without UE context”) / the number of “Number of RRC connection re-establishment attempts”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |
| RRC connection resuming successful rate related to load | The number of “Successful RRC connection resuming” / the number of “Number of RRC connection resuming attempts”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |

##### 7.1.x.2.2 Control information

The parameter is used to control the LBO function.

Table 7.1.x.2.2-1: D-LBO control information

| Control parameter | Definition | Legal Values |
| --- | --- | --- |
| D-LBO function control | This attribute allows the operator to enable/disable the LBO functionality. | Boolean  On, off |

##### 7.1.x.2.3 Parameters to be updated

The ranges of handover parameters are provided by LBO management function.

Table 7.1.x.2.3-1: Ranges of handover parameters

| Control parameters | Definition | Legal Values |
| --- | --- | --- |
| Maximum deviation of Handover Trigger | This parameter defines the maximum allowed absolute deviation of the Handover Trigger, from the default point of operation (see TS 38.300 [7] and TS 38.423 [17]). | [-20..20] in unit 0.5 dB |
| Minimum time between Handover Trigger changes | This parameter defines the minimum allowed time interval between two Handover Trigger change performed by MRO. This is used to control the stability and convergence of the algorithm (see TS 38.300 [7]). | [0.. 604800] in unit Seconds |
| Tstore\_UE\_cntxt | The timer used for detection of too early HO, too late HO and HO to wrong cell. Corresponds to Tstore\_UE\_cntxt timer described in TS 38.300 [7]. | [0..1023] in unit 100 milliseconds |

#### 7.1.x.3 MnS Component Type C definition

##### 7.1.x.3.1 Performance measurements

Performance measurements related LBO are captured in Table 7.1.x.3.1.-1:

Table 7.1.x.3.1-1. D-LBO related performance measurements

| Performance measurements | Description | Related targets |
| --- | --- | --- |
| Attempted RRC connection establishments | Includes the number of RRC connection establishment attempts (see clause 5.1.1.15.1 in TS 28.552 [5]). | RRC connection establishments successful rate related to load |
| Successful RRC connection establishments | Includes the number of successful RRC establishments (see clause 5.1.1.15.2 in TS 28.552 [5]). | RRC connection establishments successful rate related to load |
| Number of RRC connection re-establishment attempts | Includes the number of RRC connection re-establishment attempts (see clauses 5.1.1.17.1 in TS 28.552 [5]). | RRC connection re-establishments successful rate related to load |
| Successful RRC connection re-establishment | Includes the number of successful RRC connection re-establishment (see clauses 5.1.1.17.2 and 5.1.1.17.3 in TS 28.552 [5]). | RRC connection re-establishments successful rate related to load |
| Number of RRC connection resuming attempts | Includes Number of RRC connection resuming attempts (see clause 5.1.1.18.1 in TS 28.552 [5]). | RRC connection resuming successful rate related to load |
| Successful RRC connection resuming | Includes the number of successful RRC connection resuming (see clause 5.1.1.18.2 in TS 28.552 [5]). | RRC connection resuming successful rate related to load |

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| **Next Modified Sections** |

### 7.2 Management services for C-SON7.2.x LBO (Load Balancing Optimisation)

#### 7.2.x.1 MnS component type A

Table 7.2.x.1-1: C-LBO type A

|  |  |
| --- | --- |
| MnS Component Type A | Note |
| Operations and notifications defined in clause 11.1.1 of TS 28.532 [3]:  - createMOI operation  - getMOIAttributes operation  --- modifyMOIAttributes operation  - - deleteMOI operation  - - notifyMOIAttributeValueChanges operation  - notifyMOICreation  - notifyMOIDeletion  - notifyMOIChanges | It is supported by Provisioning MnS for NF, as defined in 28.531 [11]. |
| Operations defined in clause 11.3.1.1.1 in TS 28.532 [3] and clause 6.2.3 of TS 28.550 [12]:  - notifyFileReady operation  - reportStreamData operation | It is supported by Performance Assurance MnS for NFs, as defined in 28.550 [12]. |

#### 7.2.x.2 MnS Component Type B definition

##### 7.2.x.2.1 Targets information

The targets of C-LBO are shown in the Table 7.2.x.2.1-1.

Table 7.2.x.2.1-1: C-LBO targets

| Target Name | Definition | Legal Values |
| --- | --- | --- |
| RRC connection establishments successful rate related to load | The number of “Successful RRC connection establishments” / the number of “Attempted RRC connection establishments”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |
| RRC connection re-establishments successful rate related to load | The number of (“Successful RRC connection re-establishment with UE context” + “Successful RRC connection re-establishment without UE context”) / the number of “Number of RRC connection re-establishment attempts”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |
| RRC connection resuming successful rate related to load | The number of “Successful RRC connection resuming” / the number of “Number of RRC connection resuming attempts”.  The target is met if the actual rate is equal to or greater than the target value. | Integer  [0..100] in unit percentage |

##### 7.2.x.2.2 Control information

The parameter is used to control the LBO function.

Table 7.2.x.2.2-1: C-LBO control information

| Control parameter | Definition | Legal Values |
| --- | --- | --- |
| C-LBO function control | This attribute allows the operator to enable/disable the LBO functionality. | Boolean  On, off |

##### 7.2.x.2.3 Parameters to be updated

The table below lists the ranges of handover parameters.

Table 7.2.x.2.3-1: Ranges of handover parameters

| Control parameters | Definition | Legal Values |
| --- | --- | --- |
| Maximum deviation of Handover Trigger | This parameter defines the maximum allowed absolute deviation of the Handover Trigger, from the default point of operation (see TS 38.300 [7] and TS 38.423 [17]). | [-20..20] in unit 0.5 dB |
| Minimum time between Handover Trigger changes | This parameter defines the minimum allowed time interval between two Handover Trigger change performed by MRO. This is used to control the stability and convergence of the algorithm (see TS 38.300 [7]). | [0.. 604800] in unit Seconds |
| Tstore\_UE\_cntxt | The timer used for detection of too early HO, too late HO and HO to wrong cell. Corresponds to Tstore\_UE\_cntxt timer described in TS 38.300 [7]. | [0..1023] in unit 100 milliseconds |

#### 7.2.x.3 MnS Component Type C definition

##### 7.2.x.3.1 Performance measurements

Table 7.2.x.3.1-1. lists the performance measurements that are used to monitor the load of NR cells (see clause 15.5.1.2 in TS 38.300 [7]).

Table 7.2.x.3.1-1. C-LBO load performance measurements

|  |  |  |
| --- | --- | --- |
| Performance measurements | Description | Note |
| DL Total PRB Usage | This measurement provides the total usage (in percentage) of physical resource blocks (PRBs) on the downlink (see clause 5.1.1.2.1 in TS 28.552 [5]). |  |
| UL Total PRB Usage | This measurement provides the total usage (in percentage) of physical resource blocks (PRBs) on the uplink (see clause 5.1.1.2.2 in TS 28.552 [5]). |  |
| Distribution of DL Total PRB Usage | This distribution measurement is to monitor when a cell may experience overload situation in the downlink (see clause 5.1.1.2.3 in TS 28.552 [5]). |  |
| Distribution of UL Total PRB Usage | This distribution measurement is to monitor when a cell may experience overload situation in the uplink (see clause 5.1.1.2.4 in TS 28.552 [5]). |  |
| DL PRB used for data traffic | This measurement provides the number of physical resource blocks (PRBs) in average used in downlink for data traffic (see clause 5.1.1.2.5 in TS 28.552 [5]). |  |
| UL PRB used for data traffic | This measurement provides the number of physical resource blocks (PRBs) in average used in uplink for data traffic (see clause 5.1.1.2.7 in TS 28.552 [5]). |  |
| Mean number of RRC Connections | This measurement provides the mean number of users in RRC connected mode during the granularity period (see clause 5.1.1.4.1 in TS 28.552 [5]). |  |
| Max number of RRC Connections | This measurement provides the maximum number of users in RRC connected mode during the granularity period (see clause 5.1.1.4.2 in TS 28.552 [5]). |  |
| Mean number of stored inactive RRC Connections | This measurement provides the mean number of users in RRC inactive mode during each granularity period (see clause 5.1.1.4.3 in TS 28.552 [5]). |  |
| Max number of stored inactive RRC Connections | This measurement provides the maximum number of users in RRC inactive mode during each granularity period (see clause 5.1.1.4.3 in TS 28.552 [5]). |  |

Table 7.2.x.3.1-2 lists the performance measurements used to monitor the LBO performance against the targets:

Table 7.2.x.3.1-2. C-LBO related performance measurements

| Performance measurements | Description | Related targets |
| --- | --- | --- |
| Attempted RRC connection establishments | Includes the number of RRC connection establishment attempts (see clause 5.1.1.15.1 in TS 28.552 [5]). | RRC connection establishments successful rate related to load |
| Successful RRC connection establishments | Includes the number of successful RRC establishments (see clause 5.1.1.15.2 in TS 28.552 [5]). | RRC connection establishments successful rate related to load |
| Number of RRC connection re-establishment attempts | Includes the number of RRC connection re-establishment attempts (see clauses 5.1.1.17.1 in TS 28.552 [5]). | RRC connection re-establishments successful rate related to load |
| Successful RRC connection re-establishment | Includes the number of successful RRC connection re-establishment (see clauses 5.1.1.17.2 and 5.1.1.17.3 in TS 28.552 [5]). | RRC connection re-establishments successful rate related to load |
| Number of RRC connection resuming attempts | Includes Number of RRC connection resuming attempts (see clause 5.1.1.18.1 in TS 28.552 [5]). | RRC connection resuming successful rate related to load |
| Successful RRC connection resuming | Includes the number of successful RRC connection resuming (see clause 5.1.1.18.2 in TS 28.552 [5]). | RRC connection resuming successful rate related to load |

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| **End of Modified Sections** |