ERICSSON

Radio Network

Description

10/1551-LZA 701 6004/1 Uen AJ4C

Contents

1 Introduction

This document describes the management model, the concepts, the use of the managed objects, and the commands that belong to the managed area, Radio Network. A managed area represents a group of functions and managed objects in the network, where each area is relatively independent of other areas.

2 Function and Concepts

The Radio Network managed area allocates resources and provides information for the cells and sectors in the network. The cell and sector resources are defined in the MOM during RBS autointegration. Cell and sector resources can also be unlocked during autointegration.

2.1 Terminology

The terms *cell*, *sector*, and *sector carrier* have the following meanings in LTE:

Sector — A geographical area spanned by the transmission angle from one or a group of antennas. The sector is configured to handle one specific frequency band and connected to the `SectorEquipmentFunction` MO.

Cell — A geographical area with its own carrier frequency and channels within the sector frequency band. Several cells can share sector equipment. A cell can contain one or more sector carriers.

Sector Carrier — A sector carrier represents the use of the resources referred to by the `SectorEquipmentFunction` MO.

2.2 Methods for Configuring the Radio Network

The following methods for configuring the Radio Network are available:

— Importing and exporting radio network configuration data to and from the LTE RAN through the bulk CM interface in OSS-RC. For additional information, refer to the document *BCG, Bulk Configuration General, Function Description*.

— Entering data directly using the Element Manager application in OSS-RC. For additional information, refer to Element Manager.

— Entering data directly in the RBS using the Element Manager application in the RBS. For additional information, refer to Element Manager.

— Using low-level Script interfaces, or using the generic browser, the Common Explorer. For additional information, refer to the document *CEX, OSS Common Explorer, User Guide*.

2.2.1 Workflow Using Configuration Import-Export Function

Configure the radio network using the method configuration import-export function and the OSS to make many changes or expand the network.

The OSS provides area configuration management using planned areas. Configuration information from the planned area is downloaded from the OSS to the RBS during RBS autointegration.

A complete radio network configuration is prepared externally in a radio planning tool. The configuration data is in an XML file in the format specified by the Bulk CM Information Model.

The planned network data is imported to the OSS and includes both 3GPP parameters and Ericsson-specific parameters.

The workflow using the configuration import-export function is shown in the following figure:

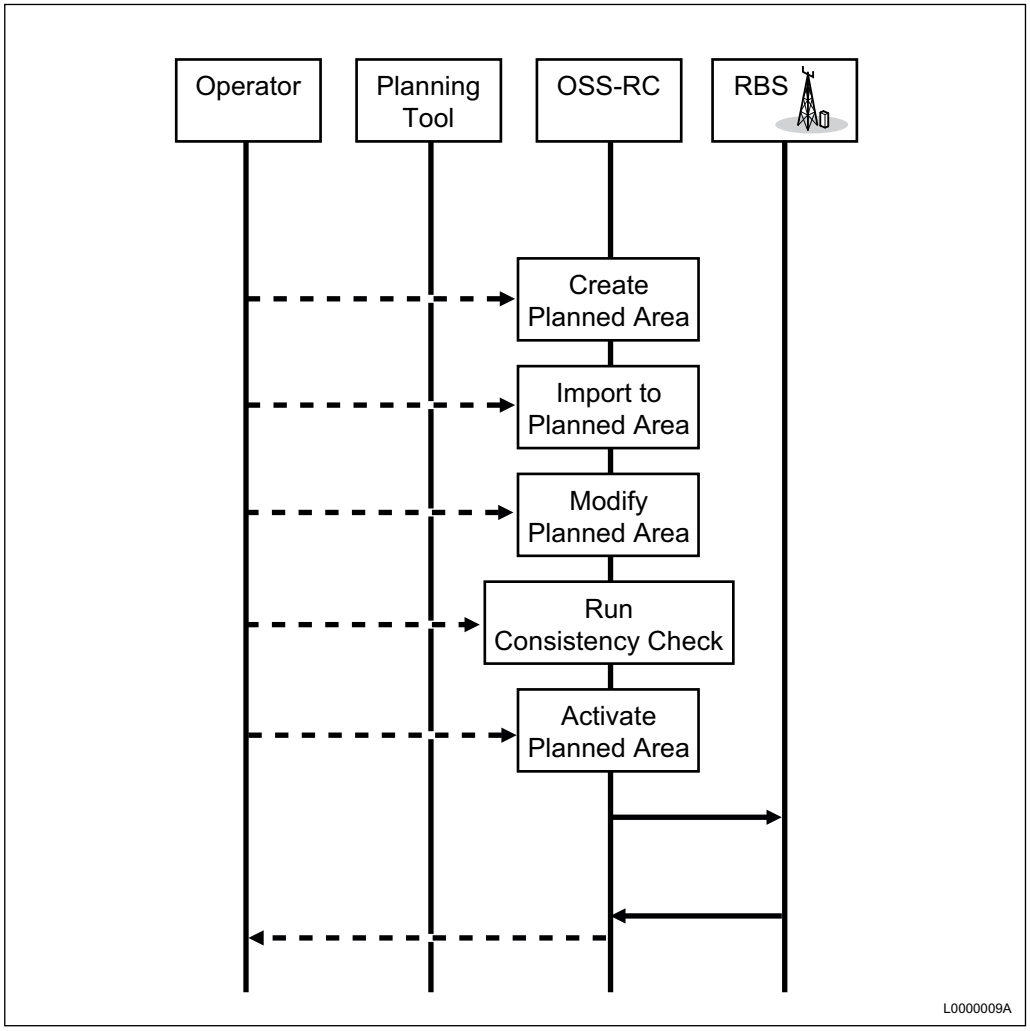


Figure 1 Radio Network Configuration with Configuration Import-Export Function and Planned Areas

3 Managed Object Model

This section describes the management model defined for this area: see Figure 6 and

— for FDD: Figure 2, and Figure 4

— for TDD: Figure 3, and Figure 5.

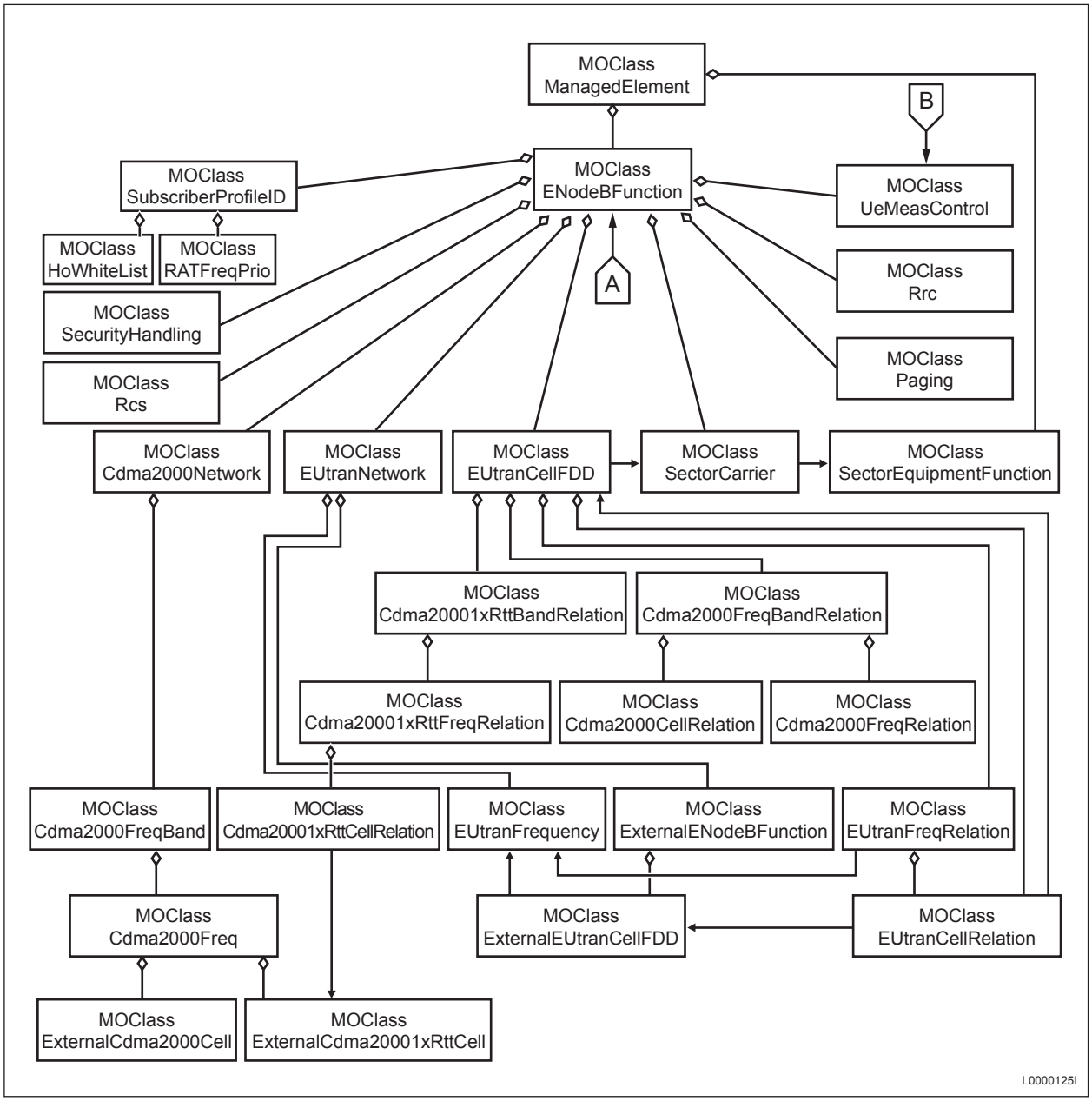


Figure 2 For FDD: Radio Network MO (part 1)

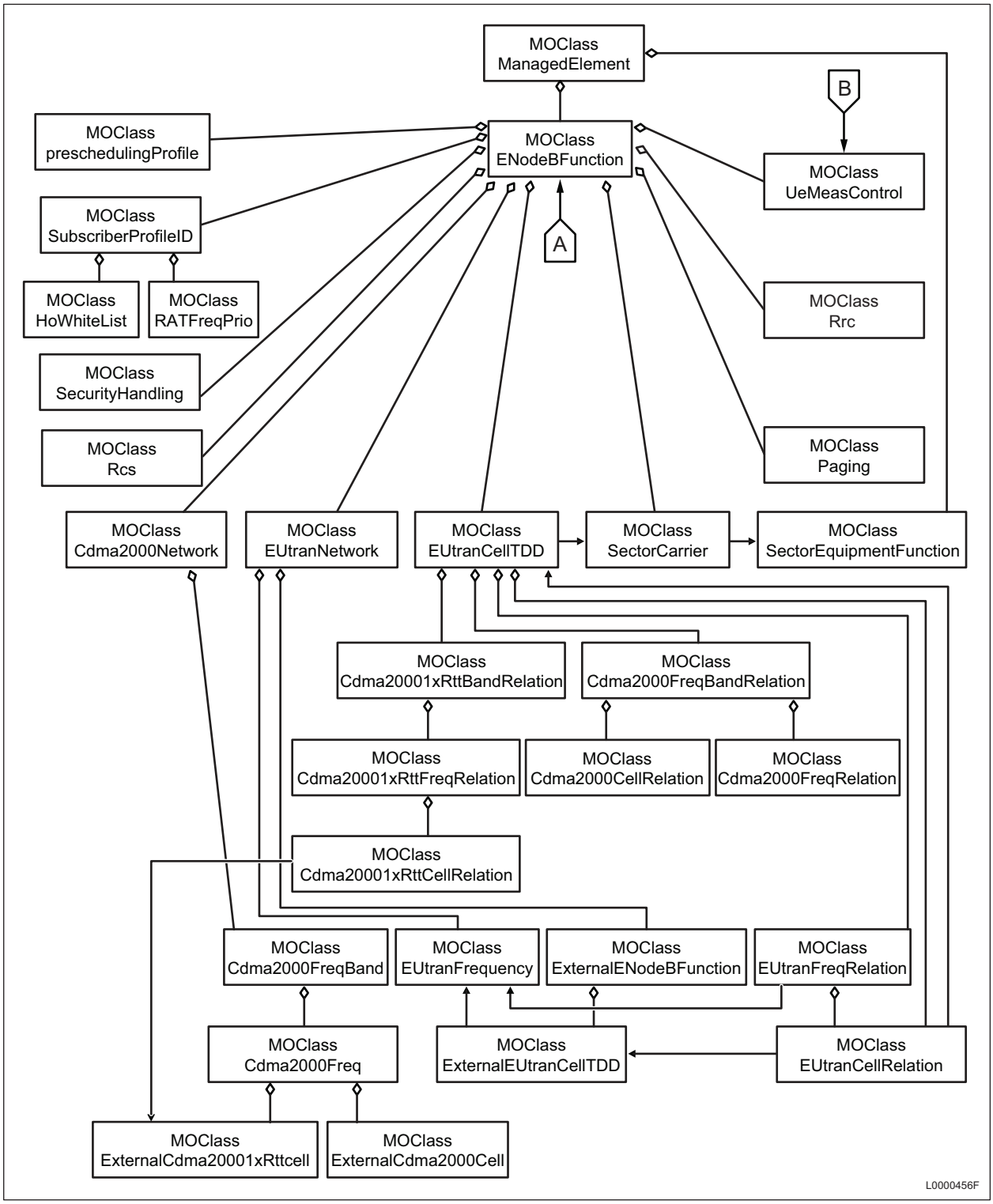


Figure 3 For TDD: Radio Network MO (part 1)

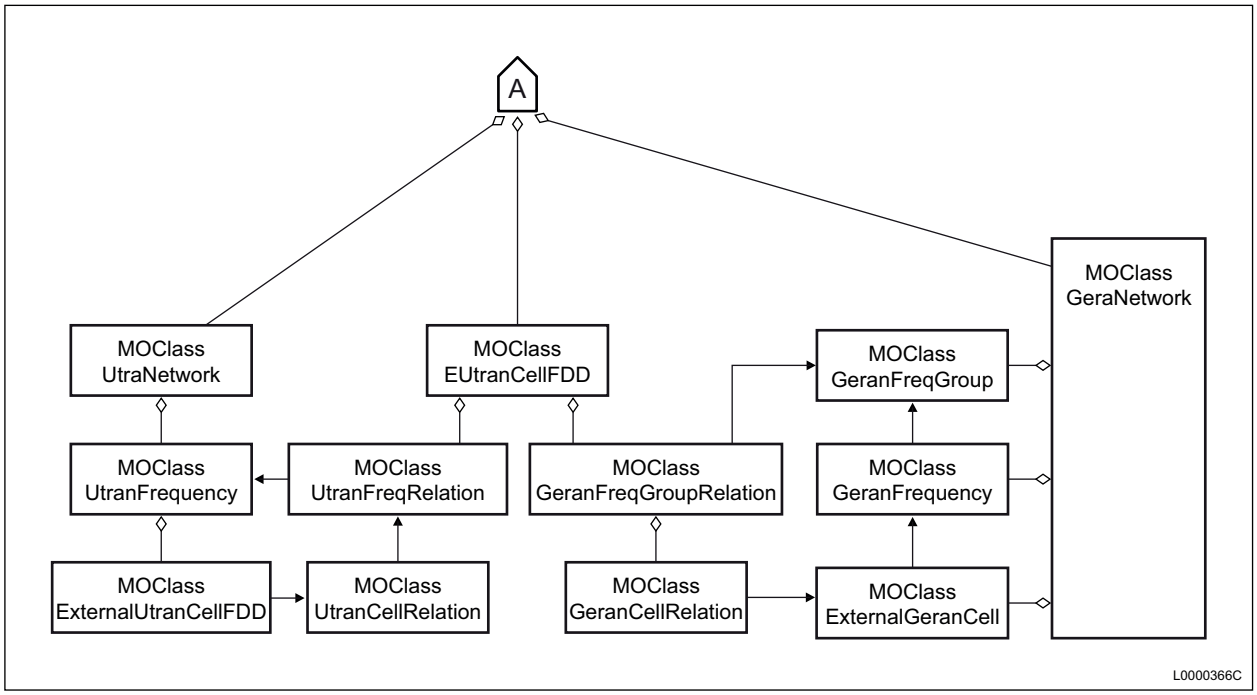


Figure 4 For FDD: Radio Network MO (part 2)

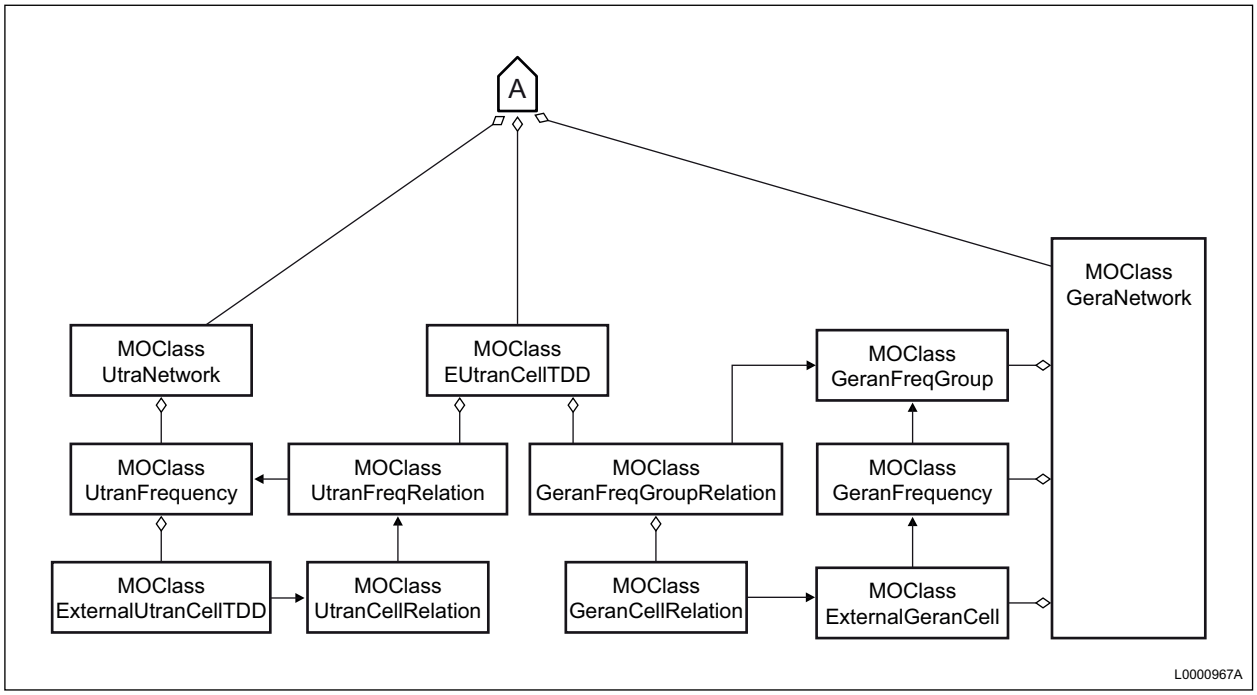


Figure 5 For TDD: Radio Network MO (part 2)

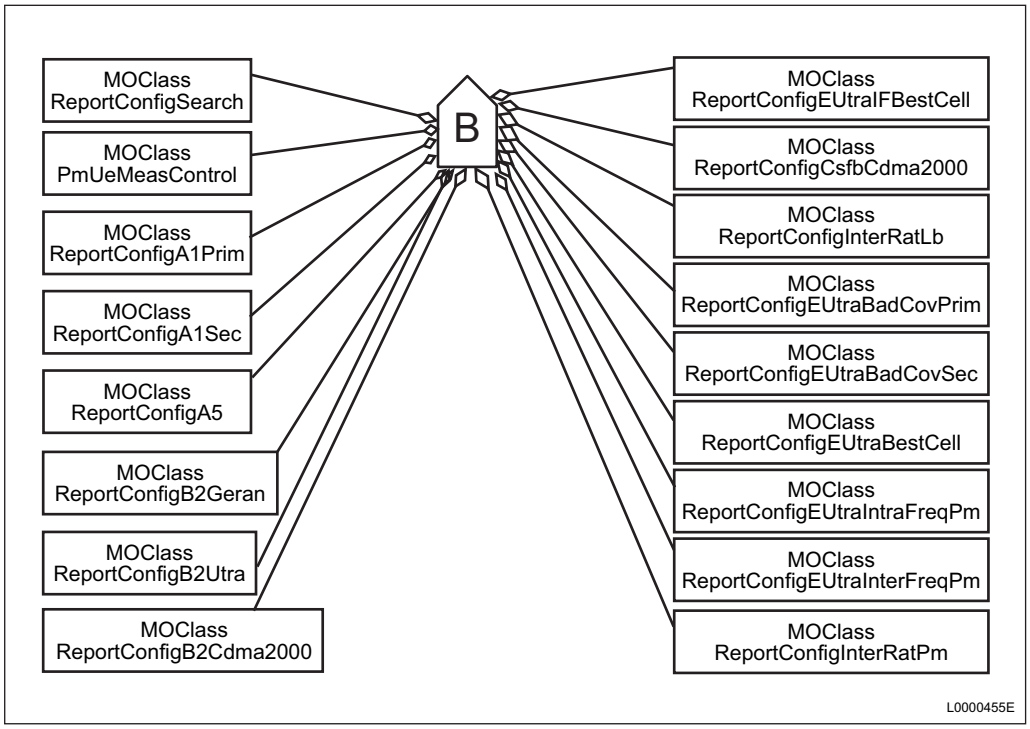


Figure 6 Radio Network MO (part 3)

The Radio Network managed objects are described in the following table:

Table 1 Radio Network Managed Objects

Managed Object	Description
Cdma20001xRttBandRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a cdma20001xRttFreqBand. It contains parameters that are specific for this relation.
Cdma20001xRttCellRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a cdma20001xRttCell. It contains parameters that are specific for this relation.
Cdma20001xRttFreqRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a cdma20001xRttFreq. It contains parameters that are specific for this relation.
Cdma2000CellRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a Cdma2000 Cell.

Managed Object	Description
Cdma2000Freq	Represents a CDMA2000 frequency.
Cdma2000FreqBand	Represents a CDMA2000 frequency band.
Cdma2000FreqBandRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a Cdma2000FreqBand .
Cdma2000FreqRelation	This Managed Object represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a CDMA2000 Frequency.
Cdma2000Network	Represents a CDMA2000 network.
ENodeBFunction	Represents the RBS and contains parameters required by the RBS.
EUtranCellFDD , or EUtranCellTDD	Represents a Frequency Division Duplex (FDD), or Time Division Duplex (TDD) cell, and contains parameters required by the cell. Contains parameters for the mandatory common channels.
EUtranCellRelation	Represents the handover relationship between two neighboring E-UTRAN cells.
EUtraNetwork	Contains external ENodeBs, those other than the one represented by managed object ENodeBFunction .
ExternalCdma20001xRttCell	Represents a CDMA2000 1xRTT cell.
ExternalCdma2000Cell	Represents a CDMA2000 eHRPD cell.
ExternalENodeBFunction	Represents an external ENodeB.
ExternalEUtranCellFDD , or ExternalEUtranCellTDD	Represents a neighbor E-UTRAN FDD, or TDD cell in another ENodeB in any Mobility Management Entity (MME) pool.
ExternalGeranCell	Represents an external GERAN cell.
ExternalUtranCellFDD , or ExternalUtranCellTDD	Represents an external UTRAN FDD cell. Represents an external UTRAN TDD cell.
GeranCellRelation	Represents the handover relationship between an E-UTRAN cell and a neighboring GERAN cell.
GeraNetwork	Represents a GERAN network.
GeranFreqGroup	Contains information about a set of GERAN ARFCN values, which represent a group of GERAN frequencies within the same band.

Managed Object	Description
GeranFreqGroupRelation	Represents a mobility relation between an EUtranCellFDD, or EUtranCellTDD, and a GeranFreqGroup.
GeranFrequency	Contains information of a specific GERAN frequency.
HoWhiteList	Contains a whitelist of SPID values that are allowed to perform an incoming handover requests when the cell is in the mode "reserved for operator use"
NonPlannedPciDrxProfile	Contains DRX profiles, DRX parameters, to map with the Non-planned PCI CGI reading. RDN for this MO type is "NonPlannedPciDrxProfile=1".
Paging	Represents the paging functions of the RBS that are common for all cells.
PmUeMeasControl	Contains the settings for PM Initiated UE Measurements.
RATFreqPrio	Contains data that overrides information in the IdleModeMobilityControlInfo and RedirectedCarrierInfo (sent to UE at RRCConnectionRelease) that is configured for the cell. Only UEs that have a SPID value matching the list in this MOC is affected.
Rcs	Represents the Radio Connection Supervision (RC) functionality in the RBS.
ReportConfigA1Prim	Contains Report Configuration settings for the primary A1 event measurements. The A1 event is used to detect the Bad Coverage Cease condition. Primary and secondary reporting configuration MOs refer to the option to use different settings for two simultaneous measurements for the event A1.
ReportConfigA1Sec	Contains Report Configuration settings for the secondary A1 event measurements. The A1 event is used to the detect traffic-related Bad Coverage Cease condition. Primary and secondary reporting configuration MOs refer to the option to use different settings for two simultaneous measurements for the event A1.
ReportConfigA5	Contains Report Configuration settings for the A5 event measurements. The A5 event is used to detect when serving cell becomes worse than threshold1, and neighbor cell becomes better than threshold2.

Managed Object	Description
ReportConfigA5UlTrig	Contains Report Configuration settings for the A5 event measurements initiated by Uplink-Triggered Inter-Frequency Mobility. The A5 event is used to detect when serving cell becomes worse than threshold1, and neighbor cell becomes better than threshold2.
ReportConfigB2Cdma2000	Contains Report Configuration settings for the B2 event for CDMA2000 measurements. The B2 event is used to detect when a CDMA2000 cell becomes better than threshold2, and serving cell becomes worse than threshold1.
ReportConfigB2Geran	Contains Report Configuration settings for the B2 event for GERAN measurements. The B2 event is used to detect when a GERAN cell becomes better than threshold2, and serving cell becomes worse than threshold1.
ReportConfigB2GeranUlTrig	Contains report configuration settings for the B2 event for GERAN measurements initiated by Uplink-Triggered Inter-Frequency Mobility. The B2 event is used to detect when a GERAN cell becomes better than threshold2, and serving cell becomes worse than threshold1.
ReportConfigB2Utra	Contains Report Configuration settings for the B2 event for UTRA measurements. The B2 event is used to detect when a UTRAN cell becomes better than threshold2, and serving cell becomes worse than threshold1.
ReportConfigB2UtraUlTrig	Contains report configuration settings for the B2 event for UTRA measurements initiated by Uplink-Triggered Inter-Frequency Mobility. The B2 event is used to detect when a UTRAN cell becomes better than threshold2, and serving cell becomes worse than threshold1.
ReportConfigCsfbCdma2000	Contains Report Configuration settings for the B1 or B2 event for CDMA2000 1xRTT measurements. It is used when searching for a suitable target cell when CS Fallback is triggered for the UE.
ReportConfigEUtraBadCovPrim	Contains the Report Configuration settings for primary bad coverage UE measurements.
ReportConfigEUtraBadCovSec	Contains the Report Configuration settings for secondary bad coverage UE measurements.
ReportConfigEUtraBestCell	Contains the Report Configuration settings for best cell UE measurements.

Managed Object	Description
ReportConfigEUtraInterFreqPm	Contains the Report Configuration settings for UE measurements on E-UTRA inter-frequencies initiated by PM.
ReportConfigEUtraIntraFreqPm	Contains the Report Configuration settings for UE measurements on E-UTRA intra-frequencies initiated by PM.
ReportConfigInterRatLb	Contains the report configuration settings for UE measurements that are initiated for IRAT offload actions.
ReportConfigInterRatPm	Contains the Report Configuration settings for UE measurements on inter-RAT (GERAN or UTRAN) frequencies initiated by PM.
SectorCarrier	Represents the use of the resources referred to by the SectorEquipmentFunction MO.
SectorEquipmentFunction	Contains parameters for configuring antenna and antenna near products.
SecurityHandling	Represents security handling in the RBS.
SubscriberprofileID	Parent for all SPID-related MO Classes
UeMeasControl	Represents the manageable characteristics for User Equipment (UE) measurements.
UtranCellRelation	Represents the handover relationship between an E-UTRAN cell and a neighboring UTRAN cell.
UtraNetwork	Represents an UTRAN network.
UtranFreqRelation	Represents a mobility relation between an EUtranCellFDD or EUtranCellTDD , and a UtranFrequency .
UtranFrequency	Contains information of a specific UTRAN frequency.
CarrierAggregationFunction	Contains parameters and constraints for the Carrier Aggregation function
For FDD only: ReportConfigSCellA6	This managed object contains the report configuration settings for A6 measurements on the frequency configured for this cell (when used as SCell).
For FDD only: ReportConfigSCellA1A2	This MO contains the report configuration settings for the A2/A1 measurements in this cell (when used as SCell) to trigger start/stop of search for SCell candidates on frequencies which are not serving frequencies of the UE.
For FDD only: ReportConfigSCellA4	This MO contains the report configuration settings for the A4 measurements to find

Managed Object	Description
	suitable SCell candidates on frequencies which are not serving frequencies of the UE.
ReportConfigCsfbUtra	This MO contains the report configuration settings for the B1 or B2 event for UTRA measurements, used when searching for a suitable target cell when CS Fallback is triggered for the UE.
ReportConfigCsfbGeran	This MO contains the report configuration settings for the B1 or B2 event for GERAN measurements. It is used when searching for a suitable target cell when CS Fallback is triggered for the UE.
Rrc	Models the manageable RRC (Radio Resource Control) protocol characteristics.

For general information about managed objects, the MOM, and generic operations available on managed objects, refer to the Managed Object Model (MOM) User Guide.

4 Configuration

This chapter describes parameters of managed objects in the managed area Radio Network.

This section describes configuration of the attributes and parameters for:

— E-UTRAN cells - included in the `EUtranCellFDD` , or the `EUtranCellTDD` MO class

— Paging - included in the `Paging` MO class

— Radio connection supervision - included in the `Rcs` MO class

— Sector functions - included in the `SectorEquipmentFunction` MO class

— Security handling - included in the `SecurityHandling` MO class

— User Equipment (UE) measurement control - included in the `UeMeasControl` MO class

— Subscriber Triggered Mobility included in the `RATFreqPrio` , and `HoWhiteList` MO Classes

— Cells in surrounding nodes and networks - included in the `EUtraNetwork` , `UtraNetwork` , `GeraNetwork` , and `Cdma2000Network` MO classes with child MO classes.

Radio network configuration data can be created in the OSS, stored in a planned area, and activated before the RBS is available in the network. However, the RBS must be defined in the OSS before configuration data can be entered in the planned area and activated.

For additional information about MO parameters, refer to Radio Network Parameters.

Note: Setting an unsupported value can affect traffic. A few MOs, parameters, counters, and value ranges can be visible in the MOM even though they are not yet supported. This is because system design considers future aspects. Refer to Parameter and Counter Limitations for a list of limitations to the MOM included in this library.

4.1 Adding, Deleting, and Reconfiguring Cells

The generic MO operations to use are `create`, `delete`, and `setAttribute`, using Element Manager, or other user interfaces.

For additional information, refer to Element Manager.

4.1.1 Adding Cells

To create a cell, the referenced SectorCarrier MO , and the referenced SectorEquipmentFunction MO must have been created previously.

Create the EUtranCellFDD or EUtranCellTDD MO. When the cell is added, parameter configurations are saved persistently by the RBS.

After the cell is added, the EUtranCellFDD or EUtranCellTDD MO exists and has administrative state set to locked, operational state is set to disabled, and availability status is set to offline. The cell parameters are stored persistently in the MOM.

Note: For FDD only: when using the 20MHz_Perf_FDD operational profile, the profile must be manually applied by performing the activateProfile action on the OpProfiles MO whenever a new cell MO is created . Some of the settings only take effect after cell locking, followed by unlocking, which means that all cells with the attribute administrativeState set to UNLOCK will be automatically locked during the activation of the 20MHz_Perf_FDD profile, and then automatically unlocked when the activation is ready.

For more information about operational profiles and user profiles see Operational Profiles, FDD Only on page 132.

4.1.2 Deleting Cells

Before the EUtranCellFDD or EUtranCellTDD MO is deleted, its administrative state must be set to locked.

When the MO is deleted, the cell parameters are deleted from the RBS, and when the cell is deleted from the RBS, the MO is removed.

If the MO administrative state is set to unlocked deletion will be rejected because deletion of unlocked MOs is prohibited.

Note: It is quite common that deleting cells is preceded by deleting relations and in such case it is recommended to set temporarily the attribute x2SetupTwoWayRelations to false. This will decrease signaling on X2 interfaces and prevent recreation of already deleted relations.

Note: When last cell is deleted all S1 and X2 links are disabled immediately, so in some cases updates may not reach neighbors. Then it might be necessary to perform manual actions in neighbors and remove obsolete relations or wait until ANR removes them.

4.1.3 Locking Cells

When the cell administrative state is set to locked, all the cell resources are released by the RBS. Before releasing cell resources, transmission and reception

of mandatory common channels are turned off and all UE contexts residing in the cell are discarded.

It is possible to move the traffic to another cell before the cell is locked. This feature is described in Cell Soft Lock.

4.1.4 Unlocking Cells

When the administrative state of the cell is set to `unlocked`, the RBS allocates resources for the cell. All created cells are considered for resource handling. Once resources are allocated, the RBS starts transmission of mandatory common channels on the Uu interface.

Note: Unlocking Cells in an RRUL can take longer than normal.

4.1.5 Reconfiguring Cells

This section describes reconfiguration of `EUtranCellFDD` or `EUtranCellTDD` MO attributes under several conditions:

Table 2 Conditions for Reconfiguring Cells

Condition	Description
Cell Temporarily Disabled	Reconfiguring attributes requires the cell to be temporarily disabled during the reconfiguration. The attributes are marked with *Disturbances: Changes can affect traffic* in the MOM. The cell is locked during the reconfiguration and that traffic through the cell is not possible until the cell is unlocked. The cell is automatically locked when the reconfiguration starts. It is unlocked when the attributes have been changed and the new attribute values are used.
Cell Locked	Since the cell is locked and no traffic exists in the cell, it can be reconfigured. The cell remains locked after reconfiguration and must be manually unlocked.
Cell Enabled due to Fewer Required Resources	The new configuration requires fewer cell resources than are available. The cell can be enabled with the available resources.
Disabled Cell	The cell is disabled both before and after reconfiguration. The cell is successfully taken down but does not become enabled. An alarm is triggered indicating that the cell is still disabled.

4.1.6 Dynamic Cell Status

The operator can retrieve a snapshot of attached UEs and set up radio bearers per cell, making it possible to see if the RBS node is accepting traffic. This is useful when returning an RBS to operational mode after maintenance work, after an upgrade has been performed, when a new feature has been activated, and for troubleshooting purposes.

The operator can request Dynamic Cell Status in the following ways:

— Remotely

- From the OSS through Common Explorer (Network Configuration and Network Status perspectives) where Dynamic Cell Status is available in a menu. More information can be found in *CEX, OSS Common Explorer, User Guide*.
- From RBS Element Manager, where Dynamic Cell Status is requested through the `collectDynamicCellStatus` MO action in the `ENodeBFunction` MO class. More information can be found in Element Manager.

— On-site

From RBS Element Manager or NCLI through a Client Computer connected locally to the RBS. Dynamic Cell Status is requested by the `collectDynamicCellStatus` MO action in the `ENodeBFunction` MO class.

4.1.7 Cell Distribution in Multi-DU Configurations

Sector pooling is used to support carrier aggregation in a multi-DU configured RBS.

With sector pooling, all cells in one sector are placed on one DU. The cells are on the DU to which the RU for the cell sector is connected.

In a multi-DU configured RBS the parameter `EUtranCellFDD.hostingDigitalUnit` or `EUtranCellTDD.hostingDigitalUnit` , shows the DU on which baseband the cell processing is located.

For more information about multi-DU configurations see RBS Equipment.

Note: When using multi-DU configurations with RRUL 81, each carrier deployment requires a separate DU.

Cell location on DU is not fixed in this type of configuration.

4.1.8 Baseband Capacity License Distribution in Multi-DU Configurations

In a multi-DU configured RBS the distribution of the following baseband capacity licenses can be configured:

— `CapacityFeatureLicense` = `DlBasebandCapacity`

— `CapacityFeatureLicense` = `UlBasebandCapacity`

— `CapacityFeatureLicense` = `DlPrbCapacity`

— `CapacityFeatureLicense` = `UlPrbCapacity`

All baseband capacity licenses are handled as a group. The parameter `licCapDistrMethod` in the `ENodeBFunction` MO class is used to set how the licensed capacity is distributed between the baseband processing resources.

4.2 External Network Configuration

This section describes how to configure eNodeBs for external cells and coexisting EUTRANs, UTRANs, GERANs, CDMA2000 eHRPD, and CDMA2000 1xRTT networks. ENodeBs configured with information about surrounding cells in other base stations is a prerequisite for UE mobility involving those cells.

Automated Neighbor Relations (ANR) is a feature automating most of this configuration (for LTE cells for TDD). However, the MOs representing frequencies and frequency relations must always be created by the operator. Those MOs are prerequisites for ANR.

4.2.1 Defining EUTRANs

Create MOs in the following order in a structure as shown in Figure 4 for FDD, or in Figure 5 for TDD:

Steps

1. `EUtranFrequency`
2. `EUtranFreqRelation`

   The following can alternatively be dynamically created by the ANR feature or by the X2 Configuration function. More information can be found in Automated Neighbor Relations and X2 Configuration.
3. `ExternalENodeBFunction`
4. `ExternalEUtranCellFDD` or `ExternalEUtranCellTDD`
5. `EUtranCellRelation`

4.2.2 Defining UTRANs

Create MOs in the following order in a structure as shown in Figure 4 for FDD, or in Figure 5, for TDD:

Steps

1. `UtraNetwork`
2. `UtranFrequency`
3. `UtranFreqRelation`

   For FDD only, the following can alternatively be dynamically created by the Automated Neighbor Relations (ANR) function, manually by operator, or by the ANR UTARN feature. A license must be installed to activate the ANR UTRAN feature. More information can be found in Automated Neighbor Relationsand `ANR Function` .
4. FDD only: `ExternalUtranCellFDD`
5. TDD only: `ExternalUtranCellTDD`
6. `UtranCellRelation`
7. TDD only: `UtranTDDFreqRelation`

4.2.3 Defining GERANs

Create MOs in the following order in a structure as shown in Figure 4 for FDD, or Figure 5 for TDD:

Steps

1. `GeraNetwork`
2. `GeranFreqGroup`
3. `GeranFreqGroupRelation`
4. `GeranFrequency`

   The following can alternatively be dynamically created by the ANR feature. More information can be found in Automated Neighbor Relations.
5. `ExternalGeranCell`
6. `GeranCellRelation`

4.2.4 Defining CDMA2000 eHRPD Networks

Create MOs in the following order in a structure as shown in Figure 2 for FDD, or Figure 3 for TDD:

Steps

1. `Cdma2000Network`
2. `Cdma2000FreqBand`
3. `Cdma2000FreqBandRelation`
4. `Cdma2000Freq`
5. `Cdma2000FreqRelation`
6. `ExternalCdma2000Cell`
7. `Cdma2000CellRelation`

4.2.5 Defining CDMA2000 1xRTT Networks

Create MOs in the following order in a structure as shown in Figure 2 for FDD, or Figure 3 for TDD:

Steps

1. `Cdma2000Network`
2. `Cdma2000FreqBand`
3. `Cdma20001xRttBandRelation`
4. `Cdma2000Freq`
5. `Cdma20001xRttFreqRelation`
6. `ExternalCdma20001xRttCell`
7. `Cdma20001xRttCellRelation`

Note: For CS Fallback, it is important to set a reference to the MO class `ExternalCdma20001xRttCell` from `EUtranCellFDD` or `EUtranCellTDD`, by setting the attribute `EUtranCellFDD.ExternalCdma20001xRttCellRef` or `EUtranCellTDD.ExternalCdma20001xRttCellRef`.

4.3 Release with Redirect including NACC

This section describes the inclusion of NACC information upon performing Release with Redirect to GSM and WCDMA. The Release with Redirect can be triggered by CS Fallback or by poor coverage detection.

To activate Release with Redirect including NACC, do the following:

Steps

1. Install licenses and activate the feature state: see Licensing and the `RedirectWithNacc` MO class.

4.4 Redirect with System Information

This section describes how to configure Redirect with System information. It enables reception of NACC information from external UTRAN or GERAN cells using RIM procedures.

The NACC information is used when a UE in a local LTE cell needs to perform a CS Fallback or Release with Redirect to an external UTRAN or GERAN cell. Install and activate three licenses to enable this feature. Release with Redirect including NACC, GSM Session Continuity, and WCDMA Session Continuity.

To configure conditions for Redirect with System Information for WCDMA, use the parameter `ExternalUtranCellFDD.rimCapable` or `ExternalUtranCellTDD.rimCapable` , and the parameter `forcedSiTunnelingActive` in the `ENodeBFunction` MO class.

To configure conditions for Redirect with System Information for GSM, use the parameter `rimCapable` in the `ExternalGeranCell` MO class and the parameter `forcedSiTunnelingActive` in the `ENodeBFunction` MO class.

More information can be found in Redirect with System Information.

To activate Redirect with System Information, do the following:

Steps

1. Make sure the prerequisite license, Release with Redirect including NACC, is installed and activated: see Licensing and Redirect with System Information.
2. If applicable, make sure the prerequisite license, GSM Session Continuity, is installed and activated: see Licensing and Coverage-Triggered GERAN Session Continuity.
3. If applicable, make sure the prerequisite license, WCDMA Session Continuity, is installed and activated: see Licensing and Coverage-Triggered WCDMA Session Continuity.

4.5 Ericsson Lean Carrier

Ericsson Lean Carrier (ELC) is a licensed feature that only transmit CRSs when UEs expect them to be present. Thus it can improve DL throughput. ELC can be supported both for FDD and TDD.

To configure the feature, do the following:

Steps

1. Install the license and activate the feature state using the Ericsson Lean Carrier license, see Manage Licenses and Hardware Activation Codes and Ericsson Lean Carrier.
2. Set the `EUtranCellFDD.elcEnabled`or `EUtranCellTDD.elcEnabled` to true.
3. Set the `EUtranCellFDD.tTimeAlignmentTimer` or `EUtranCellTDD.tTimeAlignmentTimer` to `0`.
4. Set `ENodeBFunction.timeAndPhaseSynchAlignment` to true.
5. Set `EUtranCellTDD.noOfPucchCqiUsers` to 128 if max.16 active ELC users supported.
6. Set `EUtranCellFDD.noOfPucchCqiUsers` to 320 if max. 32 active ELC users supported.
7. Set `Paging.nB` to a value except 4T or 2T.

4.5.1 ELC 320ms DRX

ELC 320ms DRX function allows operators to configure longer DRX cycles to specific ELC UEs based on configured IMEI range or to all UEs of the cell. Longer DRX cycle saves UE battery power. This function is supported both for FDD and TDD.

4.5.1.1 License installation and feature activation

4.5.1.1.1 Activating IMEISV based 320ms DRX

After completing the steps found in Ericsson Lean Carrier chapter, do the following:

Steps

1. Install the license and activate the feature state using the Differentiated UE Handling, see Manage Licenses and Hardware Activation Codes and Differentiated UE Handling.

2. Configure the 320ms UEs masked IMEISV range in `ImeisvProfile.listOfTacSvSns`.
3. Set `ImeisvProfile.elc320msDrxEnabled` to true.

4.5.1.1.2 Activating Cell Level 320ms DRX

After completing the steps found in Ericsson Lean Carrier chapter, do the following:

Steps

1. Set `EUtranCellFDD.elcLongDrxCycle` or`EUtranCellTDD.elcLongDrxCycle` to SF320.

4.5.2 Blacklisting UEs

Blacklisting function allows operators to configure ELC incompatible UEs as blacklisting UEs based on their masked-IMEI range. When blacklisting UEs are connected, ELC will be temporary off in the cell which ensures the performance of ELC incompatible UEs. This function is supported both for FDD and TDD.

4.5.2.1 License Installation and Feature Activation

After completing the steps found in Ericsson Lean Carrier chapter, do the following:

Steps

1. Install the license and activate the feature state using the Differentiated UE Handling, see Manage Licenses and Hardware Activation Codes and Differentiated UE Handling.
2. Configure the blacklisting UEs masked IMEISV range in `ImeisvProfile.listOfTacSvSns`.
3. Set `ImeisvProfile.listOfFeaturesToTurnOff` to 4.

4.5.3 VoLTE Interoperation

ELC VoLTE interoperation function increases ELC compatibility with VoLTE and provides more ELC gain in case of VoLTE. It has support for both FDD and TDD.

VoLTE requires that the attribute `schedulingAlgorithm` in the MO class `QciProfileOperatorDefined` or `QciProfilePredefined` is set to the value DELAY_BASED for serviceType VoIP.

4.5.3.1 Configure Downlink BLER Target

To enable Downlink BLER Target, do as follows:

Steps

1. Set the MO attribute `dlBlerTargetEnabled` in the MO class `EUtranCellFDD` or `EUtranCellTDD` to TRUE.

   Note: Configure Uplink BLER Target as in Configure Uplink BLER Target.

4.6 Circuit Switched Fallback Configuration

This section describes configuration of Circuit Switched (CS) fallback to CDMA, GSM, and WCDMA. LTE provides CS Fallback to support voice calls and CS-domain services (for example SMS) in circuit switched networks.

The following licensed features control CS fallback:

— CS Fallback for Dual-Radio UEs

— CS Fallback to CDMA 1X

— CS Fallback to GERAN and UTRAN

— Enhanced CS Fallback to CDMA 1X

— Emergency Call Handling for CS Fallback

— PSHO-Based CS Fallback to UTRAN

— Measurement-Based CSFB Target Selection

Note: Feature CS Fallback to GERAN and UTRAN must not be enabled when feature CS Fallback to CDMA 1X or Enhanced CS Fallback to CDMA 1X are enabled.

Before configuring CS fallback, a network to fall back to must be configured in the eNodeB: see External Network Configuration on page 19.

4.6.1 Activating and Deactivating CS Fallback for Dual-Radio UEs

To activate CS Fallback (CDMA2000 1xRTT), do the following:

Steps

1. Install licenses and activate the feature state: see Licensing and CS Fallback for Dual-Radio UEs.

Note: To deactivate the features, use the same parameters as when activating them.

4.6.2 Activating and Deactivating Fallback to CDMA 1X

To activate CS Fallback to CDMA 1X (CDMA2000 1xRTT), do the following:

Steps

1. Install licenses and activate the feature state: see Licensing and CS Fallback to CDMA 1X.

   Note: To deactivate the features, use the same parameters as when activating them.

4.6.3 Activating and Deactivating CS Fallback to GERAN and UTRAN

To activate CS Fallback to GERAN and UTRAN, do the following:

Steps

1. Make sure that licenses for prerequisite features are activated. Prerequisite features are the coverage-triggered session continuity features: see Activating GERAN Session Continuity on page 44 (GSM) and Activating WCDMA Session Continuity on page 44 (WCDMA).
2. Install licenses and activate the feature state: see Licensing and CS Fallback to GERAN and UTRAN.

   Note: To deactivate the features, use the same parameters as when activating them.

4.6.4 Activating and Deactivating Enhanced CS Fallback to CDMA 1X

To activate Enhanced CS Fallback to CDMA 1X (CDMA2000 1xRTT), do the following:

Steps

1. Make sure that the license for prerequisite feature is activated. The prerequisite feature is the CS Fallback to CDMA 1X (CDMA2000 1xRTT) feature.
2. Install licenses and activate the feature state: see Licensing and Enhanced CS Fallback to CDMA 1X.

   Note: To deactivate the features, use the same parameters as when activating them.

4.6.5 Activating and Deactivating PSHO-Based CS Fallback to UTRAN

To activate PSHO-Based CS Fallback to UTRAN, do the following:

Steps

1. Make sure the license for prerequisite features CS Fallback to GERAN and UTRAN, Coverage-Triggered WCDMA IRAT Handover, and Coverage-Triggered WCDMA Session Continuity are activated.

2. Install licenses and activate the feature state: see Licensing and PSHO-Based CS Fallback to UTRAN.

   Note: To deactivate the features, use the same parameters as when activating them.

4.6.6 Activating and Deactivating Measurement-Based CSFB Target Selection

To activate Measurement-Based CSFB Target Selection, do the following:

Steps

1. Make sure the license for prerequisite features Coverage-Triggered GERAN Session Continuity, Coverage-Triggered WCDMA Session Continuity, and CS Fallback to GERAN and UTRAN are activated.

2. Install licenses and activate the feature state: see Licensing and Measurement-Based CSFB Target Selection.

   Note: To deactivate the features, use the same parameters as when activating them.

4.6.7 Activating and deactivating IE Registered LAI support during CSFB

To activate IE Registered LAI support during CSFB, do the following:

Steps

1. Make sure that MO attribute csfbUseRegisteredLai in MO class EnodeBFunction has the value 1. This attribute is a boolean type, the default value is 0.

   Note: To deactivate the function, make sure that MO attribute csfbUseRegisteredLai in MO class EnodeBFunction has the value 0.

4.6.8 Reconfiguring Frequency Priorities

To configure conditions for redirection to GERAN, use the following parameters in the GeranFreqGroupRelation MO class:

— csFallbackPrio

— csFallbackPrioEC

— mobilityActionCsfb

To configure priorities between the frequencies to fall back to, use the following parameters on all instances of the UtranFreqRelation MO class:

— csFallbackPrio

— csFallbackPrioEC

There is no corresponding priority for CDMA2000 1xRTT. The UE is registered in the LTE network and in the CDMA2000 network to fallback to.

4.6.9 Configuring CS Fallback to CDMA 1X

To configure conditions for CS Fallback to CDMA 1X (CDMA2000 1xRTT), use the following attributes:

— freqCdma in the MO class RATFreqPrio .

  Carrier frequency within a CDMA2000 1xRTT band. When the value is configured to -1000, the parameter is ignored and the csFallbackPrio and csFallbackPrioEC apply to all frequencies within one band.

— cdma1xRttBandClass in the MO class RATFreqPrio .

  1xRTT frequency band in which the 1xRTT Carrier can be found.

— cellReselectionPriority in the MO class RATFreqPrio .

  Absolute priority of the same carrier frequency used by the cell reselection procedure.

  Note: The cellReselectionPriority within a 1xRTTBandClass must be the same.

— csFallbackPrio in the MO class RATFreqPrio .

  CDMA2000 1xRTT CS fallback frequency priority. This parameter prioritizes CDMA2000 1xRTT frequencies among all frequencies related to the cell for UE in connected mode. 0 means the lowest priority.

— csFallbackPrioEC in the MO class RATFreqPrio .

CDMA2000 1xRTT CS fallback frequency priority. This parameter prioritizes CDMA2000 1xRTT frequencies among all frequencies related to the cell for UE in connected mode.

— acBarring0to9R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload classes 0 through 9.

— acBarring10R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarring11R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarring12R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarring13R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarring14R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarring15R9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for access overload class N, N = 10 to 15.

— acBarringEmgR9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for calculating the access class barring factor for emergency calls and emergency message transmissions for access overload classes 0 through 9.

— acBarringMsgR9 in the MO class ExternalCdma20001xRttCell .

  Access class barring factor configuration. This parameter used for modifying the access class barring factor for message transmissions.

— acBarringRegR9 in the MO class ExternalCdma20001xRttCell .

Access class barring factor configuration. This parameter used for modifying the access class barring factor for autonomous registrations.

— `foreignNidReg` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT NID roamer registration indicator.

— `foreignSidReg` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT SID roamer registration indicator.

— `homeReg` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Home registration indicator.

— `multipleNid` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Multiple NID storage indicator.

— `multipleSid` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Multiple SID storage indicator.

— `parameterReg` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Parameter-change registration indicator.

— `powerDownRegR9` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Power-down registration indicator.

— `powerUpReg` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Power-up registration indicator.

— `registrationPeriod` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Registration period.

— `registrationZone` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT Registration zone.

— `totalZone` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT number of registration zones to be retained.

— `zoneTimer` in the MO class `ExternalCdma20001xRttCell` .

CDMA2000 1xRTT zone timer length.

— `protocolRev` in the MO class `ExternalCdma20001xRttCell` .

P_REV in 3GPP2 C.S0097. The protocol revision level of the BTS, for example 5 = IS95B, 6 = IS2000 Release 0, 7 = IS2000 Release A.

— minProtocolRev in the MO class ExternalCdma20001xRttCell .

  MIN_P_REV in 3GPP2 C.S0097.

— authenticationEnabled in the MO class ExternalCdma20001xRttCell .

  AUTH in 3GPP2 C.S0097. This parameter indicates whether the authentication is enabled.

— maxNumAltServiceOption in the MO class ExternalCdma20001xRttCell .

  MAX_NUM_ALT_SO in 3GPP2 C.S0097.

— preferredMsidType in the MO class ExternalCdma20001xRttCell .

  PREF_MSID_TYPE in C.S0097. The preferred identity used by mobile.

— mcc in the MO class ExternalCdma20001xRttCell .

  Part of country code.

— imsiBit11and12 in the MO class ExternalCdma20001xRttCell .

  IMSI_11_12 in C.S0097. The 11th and 12th digits of the IMSI.

— imsiTSupported in the MO class ExternalCdma20001xRttCell .

  BTS IMSI-T supported indicator. Set to TRUE to enable IMSI-T support.

— fchFchInitSetupRc3 in the MO class ExternalCdma20001xRttCell .

  FPC_FCH_INIT_SETUP_RC3 in C.S0097. 7 dB, matches ECAM range/ granularity of 8 bits/0.125 dB.

— fchFchInitSetupRc4 in the MO class ExternalCdma20001xRttCell .

  FPC_FCH_INIT_SETUP_RC4 in C.S0097. 7 dB, matches ECAM range/ granularity of 8 bits/0.125 dB.

— fchFchInitSetupRc5 in the MO class ExternalCdma20001xRttCell .

  FPC_FCH_INIT_SETUP_RC5 in C.S0097. 7 dB, matches ECAM range/ granularity of 8 bits/0.125 dB.

— fchFchInitSetupRc11 in the MO class ExternalCdma20001xRttCell .

  FPC_FCH_INIT_SETUP_RC11 in C.S0097. 8 dB, matches ECAM range/ granularity of 8 bits/0.125 dB.

— fchFchInitSetupRc12 in the MO class ExternalCdma20001xRttCell .

FPC_FCH_INIT_SETUP_RC12 in C.S0097. 8 dB, matches ECAM range/ granularity of 8 bits/0.125 dB.

— `pilotIncrement` in the MO class `ExternalCdma20001xRttCell`.

  PILOT_INC in C.S0097. This parameter indicates the Pilot PN sequence offset index increment. The interval between pilots for base stations in a system.

— `localTimeOffset` in the MO class `ExternalCdma20001xRttCell`.

  LTM_OFF in C.S0097. This parameter indicates the offset of local time in units of 0.5 hr from system time (GNSS).

— `dayLightSaving` in the MO class `ExternalCdma20001xRttCell`.

  DAYLT in C.S0097. This parameter indicates whether Daylight saving is on or off.

— `gcsnaL2AckTimer` in the MO class `ExternalCdma20001xRttCell`.

  Length of time the mobile station or IWS waits after it sends GCSNA1xCircuitService message, in units of 80 ms.

— `gcsnaSequenceContextTimer` in the MO class `ExternalCdma20001xRttCell`.

  `GCSNASequenceContextTimer` value. The value of `GCSNASequenceContextTimer` is greater than the value of `GCSNAL2AckTimer`. This field is in units of 100 ms.

— `SIB8.tReselectionCdma1xRtt` in the MO class `EUtranCellFDD` or `EUtranCellTDD`.

  Cell reselection timer value applicable when evaluating cell reselection towards CDMA2000 1xRTT. The value corresponds to TreselectionCDMA_1xRTT in *3GPP TS 36.304*.

— `SIB8.tReselectionCdma1xRttSfHigh` in the MO class `EUtranCellFDD` or `EUtranCellTDD`.

  Scaling factor for TreselectionCDMA_1xRTT for high-mobility state. This parameter specifies the scaling factor to be used with TreselectionCDMA_1xRTT for High-mobility state. Corresponds to Speed dependent ScalingFactor for TreselectionCDMA_1xRTT in *3GPP TS 36.304*.

— `SIB8.tReselectionCdma1xRttSfMedium` in the MO class `EUtranCellFDD` or `EUtranCellTDD`.

  Scaling factor for TreselectionCDMA_1xRTT for medium-mobility state. The value of the tReselectionCdma1xRtt parameter is multiplied with this factor if the UE is in Medium-mobility state. Corresponds to "Speed dependent ScalingFactor for TreselectionCDMA_1xRTT" in *3GPP TS 36.304*.

— `marketId` in the MO class `ExternalCdma20001xRttCell`.

  Market ID in MSC identifier.

— `switchNumber` in the MO class `ExternalCdma20001xRttCell`.

  Switch Number in MSC identifier.

— `cellId` in the MO class `ExternalCdma20001xRttCell`.

  Cell identity. Normal range is `0` to 4095.

— `sectorNumber` in the MO class `ExternalCdma20001xRttCell`.

  Sector number. Normal range is `0` to 15.

— `threshXHigh1xRtt` in the MO class `Cdma20001xRttBandRelation`.

  Threshold used in reselection towards a high priority CDMA2000 1xRTT band class.

— `threshXLow1xRtt` in the MO class `Cdma20001xRttBandRelation`.

  Threshold used in reselection towards a low priority CDMA2000 1xRTT band class.

— `includeInSystemInformation` in the MO class `Cdma20001xRttCellRelation`.

  This attribute Indicates whether the CDMA2000 cell is included in System Information.

— `includeInSystemInformationRel9` in the MO class `Cdma20001xRttCellRelation`.

  This attribute indicates whether the CDMA2000 cell is included in the Release 9 part of System Information.

— `pnOffset` in the MO class `ExternalCdma20001xRttCell`.

  CDMA physical cell identity.

— `acBarring1xRttForMoDataPresent` in the MO class `ExternalCdma20001xRttCell`.

  Presence indication in SIB8 of Information Element `acBarring1xRttMoData`.

— `sid` in the MO class `ExternalCdma20001xRttCell`.

  System unique identifier.

— `nid` in the MO class `ExternalCdma20001xRttCell`.

Network unique identifier.

— `EUtranCellFDD.dummyCdmaBandClass` or `EUtranCellTDD.dummyCdmaBandClass` :

dummy CDMA frequency band in the CSFBParametersResponseCDMA2000 message that can be used to force registration each time the UE moves across LTE and CDMA 1xRTT networks.

— `EUtranCellFDD.initCdma2000SysTimeType` or `EUtranCellFDD.initCdma2000SysTimeType` :

For FDD: SYNCHRONOUS is recommended. For TDD: this parameter must be set to ASYNCHRONOUS if `frameStartOffset` is non-zero; otherwise SYNCHRONOUS can be used.

More information about the feature CS Fallback to CDMA 1X is found in CS Fallback to CDMA 1X.

4.6.10 Configuring Enhanced CS Fallback to CDMA 1X

To configure conditions for Enhanced CS Fallback to CDMA 1X (CDMA2000 1xRTT), use the following attribute:

— `qOffsetFreq` in the MO class `Cdma20001xRttFreqRelation` .

Frequency-specific offset to apply when evaluating triggering conditions for measurement reporting.

To optimize report configurations for CDMA2000 1x RTT measurements: see Event B1 Measurement Configuration on page 110.

4.7 Carrier Aggregation

The Carrier Aggregation, 3CC DL Carrier Aggregation Extension and 4CC DL Carrier Aggregation Extension licensed features permit data transmission on two, three or four carriers simultaneously to one UE.

Note:

Prerequisite features are described in each feature description.

To configure the feature, do the following:

Steps

1. Install the license and activate the feature state: see Licensing, Carrier Aggregation, 3CC DL Carrier Aggregation Extension or 4CC DL Carrier Aggregation Extension.

2. Create the EutranCellRelation MO if it does not exist.
3. Set the EUtranCellRelation.sCellCandidate to ALLOWED or to ONLY_ALLOWED_FOR_DL.
4. Set the EUtranCellRelation.isRemoveAllowed attribute to FALSE.

   For more information, see Carrier Aggregation, 3CC DL Carrier Aggregation Extension or 4CC DL Carrier Aggregation Extension.

4.7.1 Dynamic SCell Selection for Carrier Aggregation

The Dynamic SCell Selection for Carrier Aggregation feature is based on the Carrier Aggregation feature and offers the following functions:

— A cell used as a PCell can have more than one SCell candidate.

— An SCell candidate of a cell can be added or deleted without the need to lock and unlock the cell for the change to take effect.

— Based on L3 measurements and by the SCell selection algorithm, the SCell of a UE is dynamically configured or deconfigured.

— When the number of component carriers is decided, it is not considered whether the UE can support lower subset band combinations. Hence, there is more opportunity for a configuration with higher number of component carriers.

— After successful SCell configuration, any SCell deconfiguration attempt is prevented if it leads to an unsupported UE capability or non-standard Carrier Aggregation band combination.

4.7.1.1 License installation and feature activation

Steps

1. Install the license and activate the feature state using DynamicSCellSelectionforCarrierAggregation license: see License Management.
2. Lock or unlock the cell with featureState = ACTIVATED
3. If it does not exist, create the EutranCellRelation MO.
4. Set the EUtranCellRelation.sCellCandidate to ALLOWED or to ONLY_ALLOWED_FOR_DL for those cells intend to be used as sCell. More information is found in Dynamic SCell Selection for Carrier Aggregation.
5. Set the EUtranCellRelation.isRemoveAllowed attribute to FALSE.

6. Set `CarrierAggregationFunction.sCellSelectionMode` attribute to proper mode.

After This Task

For more information, see Dynamic SCell Selection for Carrier Aggregation.

4.7.2 Supplemental Downlink for Carrier Aggregation, FDD only

This feature introduces the ability to utilize a downlink only carrier for a secondary cell (SCell) with downlink carrier aggregation.

Note: An FDD or a TDD cell that is configured as barred, can be used as an SCell when the Supplemental Downlink for Carrier Aggregation feature is active and the cell is configured as an SCell candidate. For more information, see Supplemental Downlink for Carrier Aggregation.

4.7.2.1 License installation and feature activation

Install the license and activate the feature state using the `SupplementaryDownlinkforCarrierAggregation` license: see License Management

4.7.2.2 Downlink Only Cell Configuration

The operator performs the following eNodeB configuration to enable Supplemental Downlink for Carrier Aggregation. The downlink only configuration is band agnostic. For general instruction on how to add a cell see Adding Cells on page 16.

To configure the Supplemental Downlink for Carrier Aggregation feature:

Steps

1. Lock the `EUtranCellFDD` MO.

   Note: Some of the following attribute changes require that the `EUtranCellFDD` is locked to take effect or to allow the change. For that reason, it is recommended that the `EUtranCellFDD` MO is locked until the changes are complete.

2. For Band 29, set the `EUtranCellFDD.earfcnul` attribute to `0`. Value `0` means that the UL channel number is `N/A` for the downlink only bands. For all other bands, set the `EUtranCellFDD.earfcnul` attribute to the applicable band definition in the 3GPP specification.

3. Set the `EUtranCellFDD.ulChannelBandwidth` attribute for the downlink only cell to the same value as the `EUtranCellFDD.dlChannelBandwidth` attribute.

4. Set the EUtranCellFDD.isDlOnly attribute to TRUE for the downlink only cell.

   Note: Takes effect only after lock/unlock of the EUtranCellFDD MO.

5. Set the SectorCarrier.noOfRxAntennas attribute for the downlink-only cell to 0 (default) to indicate that the available number of RX antennas in eNodeB is 0 when the EUtranCellFDD.isDlOnly attribute is set to TRUE.

   Note: Changes only allowed if the EUtranCellFDD MO is locked.

6. For configurations with a radio supporting single band per RfPort, set all values for the RfBranch.ulAttenuation attribute and the RfBranch.ulTrafficDelay attribute or RfBranch.ulAttenuationPerFqRange attribute and RfBranch.ulTrafficDelayPerFqRange attribute to -1 for all RfBranches of the downlink only cell indicating that it is not used. For configurations with a radio supporting multi-band per RfPort, set all values for the RfBranch.ulAttenuationPerFqRange attribute and the RfBranch.ulTrafficDelayPerFqRange attribute to -1 for all RfBranches of the downlink only cell indicating that it is not used.

7. Set the EUtranFreqRelation.connectedModeMobilityPrio attribute for the downlink only cell frequency to -1 to prevent unnecessary mobility measurements.

8. Set the EUtranFreqRelation.voicePrio attribute to -1 to prevent unnecessary mobility measurements.

9. Set the EUtranFreqRelation.arpPrio attribute to -1 to prevent unnecessary mobility measurements.

10. Set the EUtranFreqRelation.anrMeasOn attribute for the downlink only cell frequency to FALSE to avoid automatic neighbor relations measurements.

11. Set the EUtranCellRelation.isHoAllowed attribute for the downlink only cell to FALSE to avoid hand over attempts to this cell.

12. Set the EUtranCellRelation.loadBalancing attribute for the downlink only cell to NOT_ALLOWED (default).

13. Set the EUtranCellRelation.sCellCandidate attribute for the downlink only cell to ALLOWED to indicate that the cell referenced by EUtranCellRelation.neighborCellRef attribute can be used as a secondary component carrier for the UE using this cell as the primary component carrier.

14. Set the EUtranCellRelation.isRemoveAllowed attribute to FALSE.

15. Unlock the EUtranCellFDD MO.

4.7.3 PDCCH enhancement for Carrier Aggregation and VoLTE, FDD Only

This feature enhances the PDCCH link adaptation in case of carrier aggregation. A true PDCCH outer loop is introduced for primary cell. For UEs with VoLTE calls (with a bearer mapped to QCI 1), a more robust outer loop is applied.

If the features ePDCCH LA, VoLTE and CA are enabled, then any configured SCells are deactivated for the UE when a VoLTE bearer is set up. However, if attribute `CarrierAggregationFunction.pdcchEnhancedLaForVolte` is set to `TRUE`, the following applies for the SCell:

— The SCell is not deactivated.

— UEs will not receive PDSCH transmissions on the SCell for the subframes from the time interval that a VoLTE packet arrives in the eNodeB and until it departs the eNodeB.

More information is found in Enhanced PDCCH Link Adaptation.

4.7.4 PDCCH Enhancement for TDD

In TDD, the feature Enhanced PDCCH Link Adaptation is only applicable for UEs that are configured with HARQ-ACK bundling. Therefore, it is not applicable for UEs configured with Carrier Aggregation.

More information is found in Enhanced PDCCH Link Adaptation.

4.7.5 Inter-eNodeB Carrier Aggregation

The purpose of the Inter-eNodeB Carrier Aggregation feature is to enable downlink carrier aggregation between cells not located on the same eNodeB.

4.7.5.1 Activating Inter-eNodeB Carrier Aggregation

For information about activating the feature, see Inter-eNodeB Carrier Aggregation section Network Requirements.

4.7.5.2 Management of Inter-eNodeB SCell Candidates

An external SCell candidate is added in the following way:

Steps

1. Create MO `EUtranCellRelation` and MOs `ExternalEUtranCellFDD` or `ExternalEUtranCellTDD`, either manually or using ANR or BNR.

2. Ensure attribute `EUtranCellRelation.neighborCellRef` points to MOs `ExternalEUtranCellFDD` or `ExternalEUtranCellTDD`.
3. Set attribute `EUtranCellRelation.sCellCandidate` to state `ALLOWED`.
4. It is suggested that attribute `EUtranCellRelation.isRemoveAllowed` is set to state `FALSE`.
5. It is suggested that attribute `isRemoveAllowed` for MOs `ExternalEUtranCellFDD` and `ExternalEUtranCellTDD` is set to `FALSE`.

   For setup of cell relations, see Defining EUTRANs on page 19.

   To use more than one MO `EUtranCellRelation` per MO `EUtranCellFDD`, the Dynamic SCell Selection for Carrier Aggregation feature must also be activated.

   More information is found in Inter-eNodeB Carrier Aggregation.

4.7.6 Configurable SCell Priority

The Configurable SCell Priority feature enhances the SCell selection algorithm for feature Dynamic SCell Selection for Carrier Aggregation by adding:

— Prioritization of carrier frequencies eligible for SCell selection and prioritization of SCells to be selected for carrier aggregation within a carrier frequency.

— A method for distributing the SCell utilization among carrier frequencies.

— A bandwidth and layer-aware SCell selection.

4.7.6.1 License installation and feature activation

Steps

1. Install the license and activate the feature state using `ConfigurableScellPrio` license, see Manage Licenses and Hardware Activation Codes.
2. Lock or unlock the cell with `featureState = ACTIVATED`.
3. If it does not exist, create the `EUtranCellRelation` MO.
4. Set the `EUtranCellRelation.sCellCandidate` attribute to `ALLOWED` or `ONLY_ALLOWED_FOR_DL` for those cells intended to be used as SCell.
5. Set the `EUtranCellRelation.isRemoveAllowed` attribute to `FALSE`.

6. Set the `CarrierAggregationFunction.dynamicSCellSelectionMethod` attribute to the desired value.

7. If the `CarrierAggregationFunction.dynamicSCellSelectionMethod` attribute is set to the `PRIORITIZED` value then set the `EUtranFreqRelation.caFreqPriority`, `EUtranFreqRelation.caFreqProportion` and `EUtranCellRelation.sCellPriority` attributes to values that reflect the network bandwidth potential, coverage overlap and desired relative load. If desired, set the `caPrioThreshold` attribute in MOs `EUtranCellFDD` and `EUtranCellTDD` to a non default value.

8. Set the `CarrierAggregationFunction.enhancedSelectionOfMimoAndCa` attribute to the desired value to enable/disable the potential effective bandwidth evaluation.

9. Set the `CarrierAggregationFunction.sCellSelectionMode` attribute to a proper mode. Values `UN_ACK_SIMULTANEOUS_SCELL_SELECTION` or `ACK_SIMULTANEOUS_SCELL_SELECTION` are only supported when effective bandwidth evaluation is enabled.

   For more information, see Configurable SCell Priority.

4.7.7 Configure VoLTE Optimized Carrier Aggregation

This section contains information on configuring the VoLTE Optimized Carrier Aggregation feature.

The VoLTE Optimized Carrier Aggregation feature, that improves VoLTE retainability by deconfiguration of SCells and measurements related to CA and SCell during VoLTE calls, is configured by the following steps:

Prerequisites

— The feature Carrier Aggregation is required to run VoLTE Optimized Carrier Aggregation.

— VoLTE Optimized Carrier Aggregation is a licensed feature. License key is required for activation.

Steps

1. Activate VoLTE Optimized Carrier Aggregation license key.

2. Set the attribute `featureState` to `Activated` in the applicable MO instance, depending on node type:

Node Type	License Control MO
DU-based	`OptionalFeatureLicense= VoLTEOptimizedCA`

Node Type	License Control MO
Baseband-based Node	FeatureState= CXC4012259

3. Set the MO attribute sCellHandlingAtVolteCall in the MO class EUtranCellFDD or EUtranCellTDD to DECONF_SCELLS, DECONF_UL_SUPPRESS_DL_SCELLS or DECONF_UL_SCELLS.

4.8 256-QAM Downlink Configuration

To configure 256-QAM Downlink, do the following:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes and 256-QAM Downlink.
2. Set the dl256QamEnabled to *TRUE*.
3. Set the radioTransmitPerformanceMode to *QAM_256_BOOST*.

4.9 Multiple Frequency Band Indicators

The Multi-Frequency Band Indicators (MFBI) feature enables interoperability between LTE frequency bands. An LTE RAN can effectively operate on several frequency bands simultaneously.

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Multiple Frequency Band Indicators feature. See *Manage Licenses and Harware Activation Codes*.

— The eNodeB assumes that each physical frequency is always appointed with the same primary band by using the same EARFCN across the network.

More information and configuration guidelines are found in *Multiple Frequency Band Indicators*.

4.9.1 Activating Intra-Cell Handover to Additional Band

This function enhances the Multiple Frequency Band Indicators feature so that Carrier Aggregation (CA) is enabled for more UEs. UEs can support CA on the MFBI additional band even if they cannot on the primary band. If this is the case, the eNodeB immediately triggers an intra-cell handover to the MFBI additional band. This occurs after initial context setup, reestablishment and incoming handover. The result increases availability of Carrier Aggregation.

It is also possible for an operator to prioritize between the bands , regardless of the current CA possibilities for the band in use. The most prioritized band for which there are valid CA combinations will then be chosen. Furthermore, intra frequency X2 handover is done directly to the same band in target eNodeB as used in source eNodeB, which is optimizing the performance.

The following attributes are used to control Intra-Cell Handover to Additional Band:

— `ENodeBFunction.caAwareMfbiIntraCellHo`

  Turns the Intra-Cell Handover to Additional Band function on and off.

— `ENodeBFunction.useBandPrioritiesInSCellEval`

  Turns the band prioritization functionality on and off

— `ENodeBFunction.prioritizeAdditionalBands`

  Decides whether primary or additional bands should be prioritized.

— `EUtranCellFDD.prioAdditionalFreqBandList`

  `EUtranCellTDD.prioAdditionalFreqBandList`

  Provides the priority order between the additional bands.

Note: Intra-Cell Handover to Additional Band requires licenses for Multiple Frequency Band Indicators and Carrier Aggregation to be operable.

4.9.2 Activating Frequency Band Indicator Priority Rel-12

Frequency Band Indicator Priority Rel-12 is an enhancement to the Multiple Frequency Band Indicators feature. If a UE supports band prioritization and at least one additional band of a cell, it connects to the additional band, both at initial connection setup and at connection reestablishment. This can occur even when it supports the primary band as well. The operator can prioritize additional bands over the primary band and other additional bands. It is recommended to enable Intra-Cell Handover to Additional Band together with this feature, for the sticky handover functionality.

The following attributes are used to configure Frequency Band Indicators Priority Rel-12:

— `EUtranCellFDD.useBandPrioritiesInSIB1`

  `EUtranCellTDD.useBandPrioritiesInSIB1`

  Activates and deactivates the feature.

— `EUtranCellFDD.additionalFreqBandList`

`EUtranCellTDD.additionalFreqBandList`

Lists all supported additional frequency bands.

— `EUtranCellFDD.prioAdditionalFreqBandList`

`EUtranCellTDD.prioAdditionalFreqBandList`

Lists additional frequency bands in the order of priority. If it is empty or it contains frequency bands that are not listed in `additionalFreqBandList`, it is considered faulty and not used. If it contains fewer bands than `additionalFreqBandList`, the remaining supported bands are added to the end of the priority list used.

Note: Frequency Band Indicators Priority Rel-12 requires a license for Multiple Frequency Band Indicators to be operable. Only UEs supporting band prioritization, which is indicated by having `FreqBandPriorityAdjustment-r12` set to 1 in UE-EUTRA-Capability, can utilize this feature.

4.10 Coverage-Triggered Session Continuity Configuration

LTE can direct sessions to other E-UTRAN frequencies and to CDMA, GSM, and WCDMA networks.

The following licensed features control coverage-triggered session continuity:

— Coverage-Triggered Inter-Frequency Session Continuity

— Coverage-Triggered CDMA-eHRPD Session Continuity

— Coverage-Triggered WCDMA Session Continuity

— Coverage-Triggered GERAN Session Continuity

— TDD Only: Coverage-Triggered TD-SCDMA Session Continuity

Before configuring coverage-triggered session continuity, a coexisting network must be configured in the eNodeB: see External Network Configuration on page 19.

To configure event A2 UE measurement parameters see Poor Coverage Measurement Configuration on page 100.

The feature Mobility Control at Poor Coverage improves the functionality of the Coverage-Triggered features to increase the flexibility of mobility handling at poor coverage. It introduces a search zone along the edge of the cell, where UE measurements search for alternative frequencies and cells.

The Uplink-Triggered Inter-Frequency Mobility feature enhances mobility by introducing uplink channel quality. It is measured in the eNodeB as SINR. It is an addition to the quantities measured on the downlink channel. This improves the

Mobility Control at Poor Coverage feature and the functionality of the following features to increase mobility handling flexibility at poor uplink channel coverage:

— Coverage-Triggered Inter-Frequency Handover

— Coverage-Triggered TD-SCDMA Handover

— Coverage-Triggered WCDMA Handover

4.10.1 Activating Inter-Frequency Session Continuity

Install licenses and activate the feature state. More information can be found in Licensing and Coverage-Triggered Inter-Frequency Session Continuity.

4.10.2 Activating CDMA-eHRPD Session Continuity

Install licenses and activate the feature state. More information can be found in Licensing and Coverage-Triggered CDMA-eHRPD Session Continuity.

4.10.3 Activating WCDMA Session Continuity

Install licenses and activate the feature state. More information can be found in Licensing and Coverage-Triggered WCDMA Session Continuity.

4.10.4 Activating GERAN Session Continuity

Install licenses and activate the feature state. More information can be found in Licensing and Coverage-Triggered GERAN Session Continuity.

4.10.5 Activating TD-SCDMA Session Continuity, TDD only

Install licenses and activate the feature state. More information can be found in Licensing and Coverage-Triggered TD-SCDMA Session Continuity.

4.10.6 Reconfiguring E-UTRAN Inter-Frequency Redirection Conditions

The MO class `EUtranFreqRelation` represents a mobility relation between an `EUtranCellFDD` or `EUtranCellTDD` , and an E-UTRAN frequency.

Steps

Define the relationship as follows:

1. Create an E-UTRAN frequency target for redirection using the parameter `arfcnValueUtranDl` in the `EUtranFrequency` MO class.

2. Create a relationship to the frequency target using the following parameters in the `EUtranFreqRelation` MO class.

   — `connectedModeMobilityPrio`

   — `mobilityAction`

4.10.7 Reconfiguring CDMA-eHRPD Redirection Conditions

The MO class `Cdma2000FreqRelation` represents a mobility relation between an `EUtranCellFDD` . or `EUtranCellTDD` , and a CDMA2000Frequency.

Steps

Define the relationship as follows:

1. Create a CDMA2000 frequency target for redirection using the parameter `freqCdma` in the `Cdma2000Freq` MO class.
2. Create a relationship to the frequency target using the following parameters in the `Cdma2000FreqRelation` MO class:

   — `connectedModeMobilityPrio`

   — `cdma2000FreqRef`

4.10.8 Reconfiguring UTRAN Redirection Conditions

The MO class `UtranFreqRelation` represents a mobility relation between an `EUtranCellFDD` or `EUtranCellTDD` , and a UtranFrequency.

Steps

1. Create an UTRAN frequency target for redirection using `arfcnValueUtranDl` in the `UtranFrequency` MO class.
2. Create a relationship to the frequency target using the `connectedModeMobilityPrio` parameter in the `UtranFrequencyRelation` MO class

4.10.9 Reconfiguring GERAN Redirection Conditions

The MO class `GeranFrequency` represents a mobility relation between an `EUtranCellFDD` or `EUtranCellTDD` , and a `GeranFrequency` .

Steps

1. Create a GERAN frequency target for redirection using the following parameters in the `GeranFrequency` MO class.
   - `arfcnValueGeranDl`
   - `bandIndicator`
2. Create a relationship to the frequency target using the `connectedModeMobilityPrio` and `mobilityAction` parameters in the `GeranFreqGroupRelation` MO class.

4.10.10 Reconfiguring TDD-SCDMA Redirection Conditions, TDD Only

Parameters required for cell reselection to UTRA TDD are provided in System Information Block type 6 in the SIB to the UE. The MO class `UtranTDDFreqRelation` includes the UTRA TDD parameters. Equal priorities between RATs are not supported: the attribute `cellReselectionPriority` cannot have the same value as `Cdma2000FreqBandRelation`, `GeranFreqGroupRelation`, `EUtranFreqRelation` or `UtranFreqRelation` MO attribute.

4.11 Load Management Configuration

This section describes configuration for load management features.

The following load management features are available:

- Basic Load Management (basic feature)
- Dynamic Load Control (licensed feature)
- Priority Paging (licensed feature)
- Load-Based Access Barring (licensed feature)

The following licensed features control traffic load balancing:

- Inter-Frequency Load Balancing
- IFLB Activation Threshold
- IRAT Offload to WCDMA
- Inter-Frequency Offload
- Automated Cell Capacity Estimation

- Coverage-Adapted Load Management
- Release Inactive UE at High Load Handover
- Admission-Triggered Offload
- Limited-Uplink-Aware IFLB
- Carrier Aggregation-Aware IFLB
- UE Thoughput-Aware IFLB
- Overlaid Cell Detection

4.11.1 Basic Load Management

The purpose of the Basic Load Management feature is to protect the eNodeB and cells from overload while minimizing the impact to the traffic.

The feature consists of the following self-contained functions:

- Paging Intensity Control
- DU Connection Intensity Control
- Static Cell Connection Intensity Control
- MP Load Control
- Procedure Latency Supervision
- Access Class Barring
- BB Management Interface Intensity Control

For more information see the document Basic Load Management.

4.11.2 Dynamic Load Control

Dynamic Load Control is one of the Load Management features in the eNodeB and provides overload protection for cells with a highly loaded air interface.

For more information see the document Dynamic Load Control.

4.11.3 Priority Paging

Priority Paging is one of the Load Management features in the eNodeB and provides filtering of the order in which the paging messages are handled by the eNodeB.

For more information see the document Priority Paging.

4.11.4 Load-Based Access Barring

Load-Based Access Barring is one of the Load Management features in the eNodeB and makes it possible to automatically set the barring information broadcasted in SIB2 based on load control levels in a cell.

For more information see the document Load-Based Access Barring.

4.11.5 Progressive Access Barring

Progressive Access Barring provides the possibility to define priorities between different types of traffic so that barring starts for some traffic types at some point and other traffic types only if the load further increases. It is possible to differentiate among the traffic types that are specified in 3GPP System Information Block Type 2 (SIB2), that is, CSFB Calls, VoLTE Calls, Video Calls, Other Calls (AC 0-9), and so on.

For more information about the feature, see Progressive Access Barring.

4.11.6 Release Inactive UE at High Load Handover

Release Inactive UE at High Load Handover is one of the features that contributes to the load management in the eNodeB. The feature, when enabled, releases with redirect inactive UEs instead of performing handover, when the UE moves towards the edge of the cell. For more information see Release Inactive UE at High Load Handover.

4.11.7 Inter-frequency Load Balancing

The purpose of Inter-frequency Load Balancing is to manage uneven distribution of traffic load between different carrier frequencies. It enables efficient use of network resources on multiple carrier frequencies and achieves similar user experience independent of the carrier in use. Load balancing is achieved by relocation of User Equipment (UE) in connected mode to carriers that are underused compared with the carrier in use.

The feature introduces a method for the assessment of traffic load based on the presence of Evolved Radio Access Bearers (E-RAB) in the cell and the QoS class to which they belong.

The Inter-frequency Load Balancing feature is realized as a network feature, where neighboring RBS cooperate and perform the traffic load adjustments, without a central node controlling those efforts.

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Coverage-Triggered Inter-Frequency Handover feature.

  See License Management and Coverage-Triggered Inter-Frequency Handover.

— A license key must be activated to operate the Inter-frequency Load Balancing feature.

  See License Management and Inter-frequency Load Balancing.

— The cell relations where load balancing is desired must be configured to allow load balancing actions and reporting.

  The `loadBalancing` parameter is set to *ALLOWED* in the desired `EUtranCellRelation` MO.

— Load balancing between cells in different RBS nodes requires an X2 connection between the RBS nodes.

More information and configuration guidelines are found in Inter-frequency Load Balancing.

4.11.8 IFLB Activation Threshold

The purpose of the IFLB Activation Threshold is to reduce UE measurements and handovers for Inter Frequency Load Balancing, by introducing a frequency-based load threshold.

The feature is an add-on to Inter-frequency Load Balancing.

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Inter-frequency Load Balancing feature.

  See License Management and Inter-frequency Load Balancing.

— A license key must be activated to operate the IFLB Activation Threshold feature.

  See License Management and IFLB Activation Threshold.

To configure conditions for IFLB Activation Threshold use attribute `lbActivationThreshold` in the MO class `EUtranFreqRelation` :

— The minimum target cell load (subscription ratio) the source cell takes into account when determining the amount of load balancing action to a cell using this carrier frequency.

More information and configuration guidelines are found in IFLB Activation Threshold.

4.11.9 IRAT Offload to WCDMA

The purpose of IRAT Offload to WCDMA is to hand over traffic load above a configured threshold from an over-utilized E-UTRAN cell to a configured set of UTRAN FDD cells with spare capacity. The feature uses the introduced method from Inter-frequency Load Balancing for the assessment of traffic load based on the presence of Evolved Radio Access Bearers (E-RAB) in the cell and the QoS class to which they belong. The IRAT Offload to WCDMA feature is realized as a network feature, where neighboring E-UTRAN and UTRAN cells cooperate and perform the traffic load adjustments, without a central node controlling those efforts.

The feature is an add-on to Inter-frequency Load Balancing. The two features can be operated standalone, one at a time, or in combination for simultaneous inter-frequency load balancing and IRAT offload. The IRAT Offload to WCDMA feature is optional and license controlled, more information can be found in Inter-RAT Offload to WCDMA.

To configure conditions for IRAT Offload to WCDMA, use the following attributes:

— `EUtranCellFDD.lbUtranOffloadThreshold` or `EUtranCellTDD.lbUtranOffloadThreshold`.

  Threshold for eNodeB. The value applies for offload towards UTRAN target cells. The eNodeB attempts to offload traffic from the source cell corresponding to the subscription ratio above the threshold.

— For FDD only: `lbUtranCellOffloadCapacity` in the MO class `ExternalUtranCellFDD`

  Offload subscription capacity associated with the UTRAN target cell. The value is used to moderate the offload rate to the UTRAN target cell.

— `lbUtranOffloadBackoffTime` in the MO class `LoadBalancingFunction`

  Backoff time for eNodeB. The value applies to inhibit further offload to a UTRAN target cell that rejects incoming offload.

— `loadBalancing` in the MO class `UtranCellRelation`

  Load Balancing. The value specifies whether load balancing action to the referenced target UTRAN cell is allowed.

— Optimize the event B1 report configuration: see Event B1 Measurement Configuration on page 110.

4.11.10 Inter-Frequency Offload

The purpose of this feature is to off-load traffic load above an off-load threshold from an E-UTRAN cell to an Ericsson or non-Ericsson E-UTRAN FDD or TDD cell.

This feature uses the introduced method from Inter-frequency Load Balancing for the assessment of traffic load based on the presence of Evolved Radio Access Bearers (E-RAB) in the cell and the Quality of Service (QoS) class to which they belong.

This feature is an alternative feature to Inter-frequency Load Balancing (IFLB). The main difference to IFLB is that there is no load information exchange between the cells in Inter-Frequency Offload. The two features can be operated standalone, one at a time.

The Inter-Frequency Offload feature is optional and license controlled, more information can be found in Inter-Frequency Offload.

To configure conditions for Inter-Frequency Offload, use the following attributes:

— `EUtranCellFDD.lbEUtranTriggerOffloadThreshold` or `EUtranCellTDD.lbEUtranTriggerOffloadThreshold`.

  Threshold for eNodeB when acting as an offload source cell. The value applies for offload towards E-UTRAN target cells. The eNodeB attempts to offload traffic from the source cell corresponding to the subscription ratio above the threshold.

— FDD only: `EXternalEUtranCellFDD.lbEUtranCellOffloadCapacity` or `ExternalEUtranCellTDD.lbEUtranCellOffloadCapacity`. Offload subscription capacity associated with the E-UTRAN target cell. The value is used to moderate the offload rate to the E-UTRAN target cell.

— `lbEUtranOffloadBackoffTime` in the MO class `LoadBalancingFunction`

  Backoff time for eNodeB. The value applies to inhibit further offload to a E-UTRAN target cell that rejects incoming offload.

— `loadBalancing` in the MO class `EUtranCellRelation`

  Load Balancing. The value specifies whether load balancing or offload action to the referenced target E-UTRAN cell is allowed.

— `EUtranCellFDD.lbEUtranAcceptOffloadThreshold` or `EUtranCellTDD.lbEUtranAcceptOffloadThreshold`.

  Threshold for eNodeB when acting as an offload target cell. The value applies for offload handover received from other E-UTRAN cells. The eNodeB accepts incoming offload handover when the subscription ratio is below the threshold.

4.11.11 Automated Cell Capacity Estimation

The purpose of the Automated Cell Capacity Estimation feature is to automatically and periodically estimate the downlink capacity to serve the load management features with valid estimates for the selected cells.

The feature introduces a method for the estimation of the current capacity of the downlink of each cell, which is used for load management features to assess the traffic load. By performing periodic estimations of the cell capacity, the load management features get more reliable values on the current capacity.

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Automated Cell Capacity Estimation feature.

To configure conditions for the Automated Cell Capacity Estimation feature, use the following attributes:

— `useEstimatedCellCap` in the MO `AutoCellCapEstFunction` .

  Parameter for switching on the use of estimated cell capacity in load management features.

— `cellCapMinCellSubCap` in the MO `AutoCellCapEstFunction` .

  Minimum value for the estimated cell capacity.

— `cellCapMaxCellSubCap` in the MO `AutoCellCapEstFunction` .

  Maximum value for the estimated cell capacity.

For more information see the document Automated Cell Capacity Estimation.

4.11.12 Coverage-Adapted Load Management

The purpose of the Coverage-Adapted Load Management feature is to optimize the amount of load to be transferred to neighboring E-UTRAN and UTRAN cells and the number of required Inter-frequency and IRAT measurements for load balancing purposes. The optimization is performed based on the available coverage overlap between the source cell and neighboring cell which is estimated by the Best Neighbor Relations (BNR) feature. This optimization potentially enhances the load balancing performance in most network scenarios including networks where different cell sizes can exist.

The Coverage-Adapted Load Management feature is used with the Load Management features and the Best Neighbor Relations (BNR) features and can be used in either an Intra-LTE or an IRAT to WCDMA network scenario.

The following must be fulfilled at feature activation:

Intra-LTE Network Scenario

— A license key must be installed and activated to operate the Coverage-Adapted Load Management feature.

— A license key must be installed and activated to operate the Coverage-Triggered Inter-Frequency Handover feature.

— A license key must be installed and activated to operate either the Inter-Frequency Load Balancing feature or the Inter-Frequency Offload feature, or both of them.

— A license key must be installed and activated to operate the Best Neighbor Relations for Intra-LTE Load Management feature.

For more information see License Management.

IRAT Network Scenario

— A license key must be installed and activated to operate the Coverage-Adapted Load Management feature.

— A license key must be installed and activated to operate the Coverage-Triggered WCDMA IRAT Handover feature.

— A license key must be installed and activated to operate the Inter-RAT Offload to WCDMA feature.

— A license key must be installed and activated to operate the Best Neighbor Relations for WCDMA IRAT Offload feature.

For more information see License Management.

To configure conditions for the Coverage-Adapted Load Management feature in the Intra-LTE or IRAT to WCDMA network scenario, use the following attributes:

— `lbCovIndicated` in the MO `EUtranCellRelation` for Intra-LTE, and in the MO `UtranCellRelation` for IRAT to WCDMA.

  The `lbCovIndicated` attribute implies the indication of a load balancing relation candidate. If a target cell with low hit rate is desired to be a load balancing relation candidate, set the parameter of the target cell to `TRUE`.

  Note: When the Overlaid Cell Detection feature is operable, the `lbCovIndicated` attribute in the MO `EUtranCellRelation` is updated automatically.

  When evaluating the best neighbor cells, the source cell considers the total hit rate on the corresponding target frequency, instead of the target cell hit rate.

— `lbMeasScalingLimit` in the MO `LoadBalancingFunction` .

  The `lbMeasScalingLimit` attribute specifies the scaling factor for the required number of UE candidates needed for load balancing measurements to meet the load balancing target. The attribute default value is recommended.

For more information about the feature see Coverage-Adapted Load Management.

4.11.13 Carrier Aggregation-Aware IFLB

Carrier Aggregation-Aware IFLB is a licensed feature that provides improved average system throughput. This is done by efficiently distributing Carrier Aggregation (CA)-capable users to cells where the carrier aggregation capability can be utilized in a better way.

Carrier Aggregation Triggered Redirection (CATR) is done at Initial Context Setup. The UE is evaluated for PCell and SCell carrier aggregation capacity in the source cell and in the available load balancing target cells. If a potentially better neighbor cell is found, the UE is configured to measure that cell and perform handover.

During UE selection for inter-frequency load balancing, a carrier aggregation capable UE is evaluated to make sure that it is only subject to load balancing action if a better carrier aggregation target is found.

More information about the feature and configuration guidelines are found in Carrier Aggregation-Aware IFLB.

To configure the feature, do the following:

Steps

1. Configure the Inter-Frequency Load Balancing feature as described in Inter-frequency Load Balancing on page 48. Parameter `loadBalancing` must be set to `ALLOWED` in the desired `EUtranCellRelation` MO for CATR to work.
2. Install the license and activate the feature state as described in Carrier Aggregation-Aware IFLB, and License Management. The licensing MO is `CarrierAggregationAwareIFLB`.
3. The feature is used together with carrier aggregation. To configure the Carrier Aggregation feature see Carrier Aggregation on page 34.
4. Set parameter `caTriggeredRedirectionActive` in MO class `EutranFreqRelation` to specify if CATR is activated from the current cell towards a certain frequency.
5. Set parameter `lbCaThreshold` in MO class `LoadBalancingFunction` .

   Note: This parameter is used both for CATR and for load balancing evaluation for CA-capable UEs. For more information see Carrier Aggregation-Aware IFLB.
6. Set parameter `lbDiffCaOffset` in MO class `LoadBalancingFunction` .

   Note: This parameter is used both for CATR and for load balancing of CA-capable UEs. For more information see Carrier Aggregation-Aware IFLB.

7. Set parameter `lbCaCapHysteresis` in the MO class `LoadBalancingFunction` . This is done to specify the capacity-related hysteresis value considered when checking the capacity criterion for both load balancing of CA-capable UEs and CATR.

8. Set parameter `lbCaHysteresis` in the MO class `LoadBalancingFunction` to specify the load-related hysteresis value to be added to the `lbCaThreshold` or `lbDiffCaOffset` parameters at load balancing of CA-capable UEs from the source cell.

9. Set parameter `eSCellCapacityScaling` in the MO class `ExternalENodeBFunction` to decrease CA attraction of cells belonging to indicated eNodeB by scaling SCell subscription capacity down. It is applied when cells are used as external SCell (ESCell) for CA.

4.11.14 Admission-Triggered Offload

The purpose of the Admission-Triggered Offload feature is to help control the load created by Guaranteed Bit Rate (GBR) bearers in LTE cells. The feature offloads the UEs to other LTE frequency or RAT when the source cell's GBR usage exceeds some ATO threshold. This ensures efficient utilization of resources in the LTE and available IRAT resources.

The offload of UEs with GBR bearers is triggered before admission reject or even service degradation starts to occur. The underlying trigger mechanism uses Monitored System Resources (MSR) to signal exceeded resource usage.

To configure conditions for Admission-Triggered Offload, use the following attributes:

— `lbATOThresholdLevel1` in the MO class `AdmissionControl` .

  Percentage of dynamic GBR monitored system resource usage threshold which is used to initiate Admission-Triggered Offload for UEs with certain QCI bearer.

— `lbATOThresholdLevel2` in the MO class `AdmissionControl` .

  Similar to `lbATOThresholdLevel1` but it should be set higher value. This second threshold is used to allow a certain margin of GBR resource usage increase before Admission-Triggered Offload actions are allowed for UEs with QCI constellations containing more GBR QCIs.

— `atoAllowed` in the MO class `EUtranFreqRelation` for intra-LTE, and in the MO class `UtranFreqRelation` for IRAT to WCDMA.

  Specify whether Admission-Triggered Offload is activated from the current cell towards a certain E-UTRAN or UTRAN frequency.

— `atoThresh1QciProfileHandling` in the struct `EutranFreqToQciProfileRelation` for Intra-LTE, and in the struct `UtranFreqToQciProfileRelation` for IRAT to WCDMA.

  QCI profile handling with regard to Admission-Triggered Offload (ATO), when ATO Level1 threshold is exceeded. This parameter affects when Service Specific Load Management (SSLM) is `OPERABLE`.

— `atoThresh2QciProfileHandling` in the struct `EutranFreqToQciProfileRelation` for Intra-LTE, and in the struct `UtranFreqToQciProfileRelation` for IRAT to WCDMA.

  QCI profile handling with regard to Admission-Triggered Offload, when ATO Level2 threshold is exceeded. This parameter affects when Service Specific Load Management (SSLM) is `OPERABLE`.

— `atoAllowed` in the struct `FreqPrioEUTRA` for Intra-LTE, and in the struct `FreqPrioUTRAN` for IRAT to WCDMA.

  Indicate if the related E-UTRAN or UTRAN frequency is allowed as a target frequency for Admission-Triggered Offload feature. This parameter affects when UE has an associated Subscriber Profile ID (SPID).

For more information about the feature, see Admission-Triggered Offload.

4.11.15 UE Throughput-Aware IFLB

UE Throughput-Aware IFLB is a feature in the area of Load Balancing within LTE.

UE Throughput-Aware IFLB is an enhancement of the feature Inter-frequency Load Balancing and includes:

— Throughput aware UE selection: Before using a UE for load balancing the possible UE throughput in the source and the potential throughput in target cell is estimated and compared. A decision on whether to move the UE or not is based on the throughput difference. Only the UEs that have most benefit, or the least performance degradation from being moved, are used for load balancing.

— Load balancing at setup: IFLB uses a cyclic UE scanning procedure in order to find UEs to use for load balancing. In this feature the load balancing action is moved to UE context setup instead. Additionally UEs with long connection times can be repeatedly evaluated in intervals.

The feature is an add-on to Inter-frequency Load Balancing. The following must be fulfilled at feature activation:

— A license key must be activated to operate the Inter-frequency Load Balancing feature. See Manage Licenses and Hardware Activation Codes and Inter-frequency Load Balancing.

— A license key must be activated to operate the UE Throughput-Aware IFLB feature. See Manage Licenses and Hardware Activation Codes and UE Throughput-Aware IFLB.

More information and configuration guidelines are found in UE Throughput-Aware IFLB.

Steps

To configure conditions for UE Throughput-Aware IFLB, use the following attributes:

1. `lbUeEvaluationTimer` in the MO class `LoadBalancingFunction`

   Specifies the timer to initiate evaluation of a UE for load balancing measurement.

2. `lbTpNonQualFraction` in the MO class `EUtranCellFDD` and `EUtranCellTDD` .

   Configures the fraction of UEs to be non-qualified for throughput aware load balancing.

3. `lbTpRankThreshMin` in the MO class `EUtranCellFDD` and `EUtranCellTDD` .

   Configures a minimum relative gain threshold for throughput aware load balancing.

4.11.16 Limited-Uplink-Aware IFLB

Limited-Uplink-Aware IFLB is a licensed feature that improves the IFLB behavior when the cell traffic bearing capacity is limited by the uplink capacity.

Limited-Uplink-Aware IFLB introduces the following:

— a MOM attribute `estCellCapUsableFraction`, which is a scaling factor applied to the result of Automated Cell Capacity Estimation before being used by IFLB as the cells traffic bearing capacity, for example Cell Subscription Capacity.

— a MOM attribute `cellDownlinkCaCapacity`, which is the manual estimation of the cell downlink capacity. `cellDownlinkCaCapacity` is used, only when ACCE is not activated, by CA-Aware for the calculation of aggregation subscription capacity.

For more information about the feature, see Limited-Uplink-Aware IFLB.

Steps

To configure Limited-Uplink-Aware IFLB, do the following:

1. Configure the IFLB as described in Inter-frequency Load Balancing on page 48. Parameter loadBalancing must be set to `ALLOWED` in the desired `EUtranCellRelation` MO.
2. Install the license and activate the feature state as described in Limited-Uplink-Aware IFLB, and Manage Licenses and Hardware Activation Codes. The licensing MO is `LimitedUplinkAwareIFLB` .
3. The feature is used together with ACCE and CA-Aware IFLB. To configure Automated Cell Capacity Estimation and Carrier Aggregation-Aware IFLB, see Automated Cell Capacity Estimation on page 51 and Carrier Aggregation-Aware IFLB on page 54.
4. Set parameter `estCellCapUsableFraction` and `cellDownlinkCaCapacity` in MO class `EUtranCellFDD` or `EUtranCellTDD` .

4.11.17 Overlaid Cell Detection

The Overlaid Cell Detection feature is used in an Intra-LTE scenario with the purpose to automatically and dynamically identify target cells for load balancing or offload. This includes identifying small cells.

The Overlaid Cell Detection feature is used in combination with the following features, Inter-Frequency Load Balancing, Best Neighbor Relations for Intra-LTE Load Management and Coverage-Adapted Load Management, in order to facilitate load management towards small cells. This implies improvement in network utilization in heterogeneous networks where different cell sizes can exist in the network.

The following must be fulfilled at feature activation:

— A license key must be installed and activated to operate the Overlaid Cell Detection feature.

— A license key must be installed and activated to operate either the Inter-Frequency Load Balancing feature or the Inter-Frequency Offload feature.

Note: Feature Inter-Frequency Offload is only possible to use when offload relations belong to Ericsson eNodeBs.

— A license key must be installed and activated to operate the Best Neighbor Relations for Intra-LTE Load Management feature.

For more information, see Manage Licenses and Hardware Activation Codes.

To configure conditions for the Overlaid Cell Detection feature, use the following attributes:

— EUtranCellRelation.incomingLoadBalancing

The `incomingLoadBalancing` attribute determines if feature Overlaid Cell Detection has qualified this cell relation as an overlaid neighbor, i.e. high hit rate, on the corresponding frequency relation. The value `TRUE` means that the neighbor cell is encouraged to initiate load balancing towards the source cell. The value `FALSE` means that no specific preference exist.

— EUtranCellRelation.lbCovIndicated

The `lbCovIndicated` attribute determines if the cell relation has high hit rate towards the source cell. The attribute is automatically updated when the feature Overlaid Cell Detection is operable.

— LoadBalancingFunction.txPwrForOverlaidCellDetect

The `txPwrForOverlaidCellDetect` attribute determines the maximum transmission power of the source cell on which feature Overlaid Cell Detection is allowed to be applied. For source cells with higher transmission power than specified in this attribute, overlaid neighbor cells are not identified.

For more information about the feature, see Overlaid Cell Detection.

4.12 Coverage-Triggered Handover Configuration

LTE can perform coverage-triggered handover to other E-UTRAN frequencies and to WCDMA networks.

The following licensed features control coverage-triggered handover:

— Coverage-Triggered Inter-Frequency Handover

— Coverage-Triggered WCDMA Handover

— Single Radio Voice Call Continuity (SRVCC) Handover to UTRAN

— Single Radio Voice Call Continuity (SRVCC) Handover to GERAN

Before configuring coverage-triggered WCDMA handover, a coexisting WCDMA network must be configured in the eNodeB: see External Network Configuration on page 19.

Before configuring SRVCC Handover to GERAN, a coexisting GERAN network must be configured in the eNodeB: see External Network Configuration on page 19.

More information on configuration of UE measurement parameters can be found in UE Measurement Control Configuration on page 98.

The feature Mobility Control at Poor Coverage improves the functionality of the Coverage-Triggered features to increase the flexibility of mobility handling at poor coverage. It introduces a search zone along the edge of the cell, where UE measurements will search for alternative frequencies and cells.

The Uplink-Triggered Inter-Frequency Mobility feature enhances mobility by introducing uplink channel quality. It is measured in the eNodeB as SINR. It is an addition to the quantities measured on the downlink channel. This improves the Mobility Control at Poor Coverage feature and the functionality of the following features to increase mobility handling flexibility at poor uplink channel coverage:

— Coverage-Triggered Inter-Frequency Handover

— Coverage-Triggered TD-SCDMA Handover

— Coverage-Triggered WCDMA Handover

The feature also introduces an uplink search zone along the edge of the cell, where UE measurements search for alternative frequencies and cells. If a frequency or cell is detected, a mobility action is initiated.

4.12.1 Activating Coverage-Triggered Inter-Frequency Handover

Install a valid license key and activate the feature state. More information can be found in Licensing and Coverage-Triggered Inter-Frequency Handover.

4.12.2 Blacklisted E-UTRAN Cells

E-UTRAN cells can be blacklisted in E-UTRAN measurements. Use parameter `blackListedCells` in `EUtranFreqRelation` MO class to define black listed cells.

4.12.3 Activating Coverage-Triggered WCDMA Handover

Install a valid license key and activate the feature state. More information can be found in Licensing and Coverage-Triggered WCDMA IRAT Handover.

4.12.4 Configuring Session Continuity Related Functions for Inter-Frequency Handover

Coverage-Triggered Inter-Frequency Handover share several functions with Coverage-Triggered Inter-Frequency Session Continuity.

Configure the following common functions before other Inter-Frequency Handover specific settings:

— Instances of `ExternalEUtranCellFDD` or `ExternalEUtranCellTDD` with parenting structures, cell relations and frequency relations: see External Network Configuration on page 19.

— Coverage-Triggered Inter-Frequency Session Continuity: see Coverage-Triggered Session Continuity Configuration on page 43

— Event A2 UE measurement parameters: see Poor Coverage Measurement Configuration on page 100.

4.12.5 Configuring Session Continuity Related Functions for WCDMA Handover

Coverage-Triggered WCDMA Handover shares several functions with the Coverage-Triggered Session Continuity features.

Configure the following common functions before other WCDMA handover-specific settings:

— Instances of `ExternalUtranCellFDD` or `ExternalUtranCellTDD` with parenting structures, cell relations and frequency relations: see External Network Configuration on page 19.

— Coverage-Triggered WCDMA Session Continuity: see Coverage-Triggered Session Continuity Configuration on page 43

— Event A2 and B2 UE measurement parameters: see UE Measurement Control Configuration on page 98.

4.12.6 Configuring Blind Inter-Frequency Handover

To configure eNodeBs to initiate blind handovers for cell relations, without further measurements after the event A2 report, do the following:

— Set the `mobilityAction` attribute to `HANDOVER` for the `EUtranFreqRelation` MO representing the target frequency.

— Set the `EUtranCellFDD.covTriggerdBlindHoAllowed` or `EUtranCellTDD.covTriggerdBlindHoAllowed` MO attribute for the serving cell.

— Set the `coverageIndicator` attribute to `COVERS` for the `EUtranCellRelation` MO representing the cell relation to the target cell. This setting indicates that the target cell is suitable for handover no matter in what direction UE is leaving the source cell.

— Set the `isHoAllowed` attribute to `true` for the `EUtranCellRelation` MO representing the cell relation to the target cell.

4.12.7 Configuring Blind WCDMA Handover

To configure eNodeBs to initiate blind handovers for cell relations, without further measurements after the event A2 report, do the following:

— Set the `mobilityAction` attribute to `HANDOVER` for the `UtranFreqRelation` MO representing the target frequency.

— Set the `EUtranCellFDD.covTriggerdBlindHoAllowed` or `EUtranCellTDD.covTriggerdBlindHoAllowed` MO attribute for the serving cell.

— Set the coverageIndicator attribute to COVERS for the UtranCellRelation MO representing the cell relation to the target cell. This setting indicates that the target cell is suitable for handover no matter in what direction UE is leaving the source cell.

— Set the isHoAllowed attribute to true for the UtranCellRelation MO representing the cell relation to the target cell.

4.12.8 Configuring Measurement-Based Inter-Frequency Handover

To configure eNodeBs to initiate event A5-based handovers, do the following:

— Set the mobilityAction attribute to HANDOVER for the EUtranFreqRelation MO representing the target frequency.

— Set the isHoAllowed attribute to true in each EUtranCellRelation MO representing a cell relation that:

  • Can be reported by the event A5 measurement

    And

  • Must be possible to use as a target cell

— Set the ueMeasurementActive attribute to true in the UeMeasControl MO. This setting has no effect on relations with blind handovers configured.

— Optimize the event A5 report configuration: see Event A5 Measurement Configuration on page 107.

4.12.9 Configuring Measurement-Based WCDMA Handover

To configure eNodeBs to initiate event B2-based handovers, do the following:

— Set the mobilityAction attribute to HANDOVER for the UtranFreqRelation MO representing the target frequency.

— Set the isHoAllowed attribute to true in each UtranCellRelation MO representing a cell relation that:

  • Can be reported by the event B2 measurement

    And

  • Must be possible to use as a target cell

— Set the ueMeasurementActive attribute to true in the UeMeasControl MO. This setting has no effect on relations with blind handovers configured.

— Optimize the event B2 report configuration: see Event B1 Measurement Configuration on page 110.

4.12.10 Activating SRVCC Handover to UTRAN

Install a valid license key and activate the feature state. More information can be found in Licensing and SRVCC Handover to UTRAN.

4.12.11 Activating SRVCC Handover to GERAN

Install a valid license key and activate the feature state. More information can be found in Licensing and SRVCC Handover to GERAN.

4.12.12 Configuring E-RAB Setup Reject Cause

Configure E-RAB setup reject cause in accordance with either of the following ways:

— If the reject cause `X2 Handover triggered` is to be used, set `zzzTemporary52` to 1.

— (Default) If the reject cause `Interaction with other procedure` is to be used, set `zzzTemporary52` to a value different than 1.

4.13 Best Neighbor Relations for Load Management Configuration

This section describes the configuration for Best Neighbor Relations for Load Management, which is controlled by the following licensed features

— Best Neighbor Relations for Intra-LTE Load Management

— Best Neighbor Relations for WCDMA IRAT Offload

4.13.1 Best Neighbor Relations for Intra-LTE Load Management

The purpose of the Best Neighbor Relations for Intra-LTE Load Management feature is to evaluate whether inter-frequency neighbor cells are suitable for inter-frequency load balancing or inter-frequency offload. Suitable inter-frequency neighbor cells are automatically included as load balancing relations.

The feature introduces a method for the assessment of hit-rate of each cell relation which is compared to reference thresholds, to decide whether the load balancing or offload to this target cell is allowed. Hit-rate is defined as the likelihood of a UE candidate in the source cell to be qualified for load balancing or offload to a certain target cell (dynamic value).

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Coverage-Triggered Inter-Frequency Handover feature.

— A license key must be activated to operate either the Inter-Frequency Load Balancing feature or the Inter-Frequency Offload feature, or both of them.

— A license key must be activated to operate the feature Best Neighbor Relations for Intra-LTE Load Management.

— Load balancing between cells in different RBS nodes requires an X2 connection between the RBS nodes if inter-frequency load balancing is required

To configure conditions for the feature Best Neighbor Relations for Intra-LTE Load Management, use the following attributes:

— `lbHitRateEUtranMeasUeThreshold` in the MO `LoadBalancingFunction`.

  This is the required minimum number of connected users in the (source) cell to allow initiation of UE measurements for `lbHitRate` estimation on E-UTRAN frequencies.

— `lbHitRateEUtranMeasUeIntensity` in the MO `LoadBalancingFunction`.

  The value specifies the number of UE measurements for `lbHitRate` estimation (per cell and Load Balancing cycle) for each E-UTRAN frequency.

— `lbHitRateEUtranAddThreshold` in the MO `LoadBalancingFunction`.

  This threshold implies that E-UTRAN cell relations with an `lbHitRate` value greater than this threshold are considered suitable for load management.

— `lbHitRateEUtranRemoveThreshold` in the MO `LoadBalancingFunction`.

  This threshold implies that E-UTRAN cell relations with a`lbHitRate` value less than this threshold are considered not suitable for load management.

— `lbBnrPolicy` in the MO `EUtranFreqRelation`.

  The attribute specifies the policy for updating the `loadBalancing` attribute by the feature Best Neighbor Relations for Intra-LTE Load Management. The policy is valid for all cell relations corresponding to this `EUtranFreqRelation`. If it is configured to `NOT_ALLOWED` for a frequency relation, then no UE measurements for `lbHitRate` estimation are to be initiated on the frequency. Any other setting of `lbBnrPolicy` (than `NOT_ALLOWED`) means that UE measurements for `lbHitRate` estimation are to be initiated on E-UTRAN frequencies.

— `lbBnrAllowed` in the MO `EUtranCellRelation`.

  The attribute specifies whether the feature Best Neighbor Relations for Intra-LTE Load Management is allowed to automatically change the `loadBalancing` attribute for the E-UTRAN cell relation.

More information about the configuration: see Best neighbor Relations for Intra-LTE Load Management.

4.13.2 Best Neighbor Relations for WCDMA IRAT Offload

The purpose of the Best Neighbor Relations for WCDMA IRAT Offload feature is to evaluate whether WCDMA IRAT neighbor cells are suitable for WCDMA IRAT offload. Suitable WCDMA IRAT neighbor cells are automatically included as load balancing relations.

The feature introduces a method for the assessment of hit-rate of each cell relation which compared to reference thresholds to decide whether IRAT offload to this target cell is allowed. Hit-Rate is defined as the likelihood of a UE candidate in the source cell to be qualified for IRAT offload to a certain target cell (dynamic value).

The Best Neighbor Relations for WCDMA IRAT Offload feature is realized as a network feature without a central node controlling those efforts.

The feature Best Neighbor Relations for WCDMA IRAT Offload is used with IRAT Offload to WCDMA to identify the suitable WCDMA target load relations to be used for WCDMA IRAT Offload.

The following must be fulfilled at feature activation:

— A license key must be activated to operate the Coverage-Triggered WCDMA IRAT Handover feature.

— A license key must be activated to operate Inter-RAT Offload to WCDMA feature.

— License keys must be activated to operate the SRVCC Handover to UTRAN feature if offload to UTRAN requires Single Radio Voice Call Continuity (SRVCC).

— A license key must be activated to operate the Best Neighbor Relations for WCDMA IRAT Offload feature.

To configure conditions for the Best Neighbor Relations for WCDMA IRAT Offload feature, use the following attributes:

— `lbHitRateUtranMeasUeThreshold` in the MO `LoadBalancingFunction`.

  The required minimum number of connected users in the (source) cell to allow initiation of UE measurements for `lbHitRate` estimation on UTRAN frequencies.

— `lbHitRateUtranMeasUeIntensity` in the MO `LoadBalancingFunction`.

  The value specifies the number of UE measurements for `lbHitRate` estimation (per cell and Load Balancing cycle) for each UTRAN frequency.

— lbHitRateUtranAddThreshold in the MO LoadBalancingFunction.

  This threshold implies that UTRAN cell relations with a lbHitRate value greater than this threshold are considered suitable for load management.

— lbHitRateUtranRemoveThreshold in the MO LoadBalancingFunction .

  This threshold implies that UTRAN cell relations with a lbHitRate value less than this threshold are considered not suitable for load management.

— lbBnrPolicy in the MO UtranFreqRelation .

  This attribute specifies the policy for updating the loadBalancing attribute by the feature Best Neighbor Relations for WCDMA IRAT Offload. The policy is valid for all cell relations corresponding to this UtranFreqRelation . If it is configured to NOT_ALLOWED for a frequency relation, then no UE measurements for lbHitRate estimation are to be initiated on the frequency. Any other setting of lbBnrPolicy (than NOT_ALLOWED) means that UE measurements for lbHitRate estimation are to be initiated on UTRAN frequencies.

— lbBnrAllowed in the MO UtranCellRelation .

  This attribute specifies whether the feature Best Neighbor Relations for WCDMA IRAT Offload is allowed to automatically change the loadBalancing attribute for the UTRAN cell relation.

More information about configuration: see Best Neighbor Relations for WCDMA IRAT Offload.

4.14 E-UTRAN Cell Configuration

A cell must be associated with a previously created SectorCarrier MO and a previously created SectorEquipmentFunction MO before the EUtranCellFDD or EUtranCellTDD MO can be created.

4.14.1 Cell Identities

The following attributes provide identifying information for the cell in the network:

— eNodeBPlmnId

  The ENodeB Public Land Mobile Network (PLMN) ID that forms part of the ENodeB Global ID used to identify the node over the S1 interface.

— EUtranCellFDD.cellId or EUtranCellTDD.cellId :

  RBS internal ID for the EUtranCell must be unique in the RBS. Together with the RBS ID and PLMN this is a universally unique Cell ID.

— EUtranCellFDDId or EUtranCellTDDId

ID of the cell that is part of the relative distinguished cell name.

— physicalLayerCellIdGroup (EUtranCellFDD.physicalLayerCellIdGroup or EUtranCellTDD.physicalLayerCellIdGroup).

Physical-layer cell IDs are grouped into 168 unique physical-layer cell ID groups, each group containing 3 unique subidentities. This attribute identifies the group. This attribute and physicalLayerSubCellId (EUtranCellFDD.physicalLayerSubCellId or EUtranCellTDD.physicalLayerSubCellId) are used to calculate physical layer cell ID (see *3GPP TS 36.211*) that is sent as part of the system information (see *3GPP TS 36.331*).

— physicalLayerSubCellId (EUtranCellFDD.physicalLayerSubCellId or EUtranCellTDD.physicalLayerSubCellId). Physical-layer cell identities are grouped into 168 unique physical-layer cell-identity groups, each group containing 3 unique subidentities. This attribute identifies the subidentity within the group.

This attribute and physicalLayerCellIdGroup (EUtranCellFDD.physicalLayerCellIdGroup or EUtranCellTDD.physicalLayerCellIdGroup) are used to calculate the physical layer cell identity (see *3GPP TS 36.211*) that is sent as part of the system information (see *3GPP TS 36.331*).

— physicalLayerCellId (EUtranCellFDD.PhysicalLayerCellId or EUtranCellTDD.PhysicalLayerCellId).

Physical-layer cell identities are grouped into 168 unique physical-layer cell-identity groups, each group containing 3 unique subidentities. This attribute identifies the physical cell identity that the UE is reporting.

Note: This attribute also exists for ExternalEUtranCellFDD and ExternalEUTranCellTDD as well.

— The sectorCarrierRef refers to the SectorCarrier MO which the EUtranCellFDD or EUtranCellTDD includes.

Only one instance of the SectorCarrier MO class must be configured per cell, but if the Combined Cell feature is activated, more than one instance of SectorCarrier can be configured.

— EUtranCellFDD.tac or EUtranCellTDD.tac .

Tracking area code for the E-UTRAN cell.

— EUtranCellFDD.userLabel or EUtranCellTDD.userLabel .

Label for free text.

4.14.2 Bandwidth and Radio Channels

Do!

Inappropriate settings can cause significant problems. Changes to the attributes described in this section can affect traffic.

The following attributes identify bandwidth and channel numbers for the cell:

For FDD only:

— `earfcndl` :

specifies the channel number for the central downlink frequency. The mapping from channel number to physical frequency is defined in 3GPP specification *TS 36.104*.

— `dlChannelBandwidth` :

downlink channel bandwidth in the cell. The supported channel bandwidth per frequency band is described in 3GPP specification *TS 36.101*.

— `earfcnul` :

specifies the channel number for the central uplink frequency. The mapping from channel number to physical frequency is defined in 3GPP specification *TS 36.104*.

— `ulChannelBandwidth` :

uplink channel bandwidth in the cell.

— `dlInternalChannelBandwidth` / `ulInternalChannelBandwidth` :

Internal downlink/uplink channel bandwidth in the cell with reduced channel bandwidth. Reduced bandwidth for an LTE carrier creates free space for carriers of other radio technologies to use within a standard spectrum 5 MHz. Reduced channel bandwidth is only supported on specified radios, seeRBS Configurations .

For TDD only:

— `earfcn` :

specifies the channel number for the central frequency. The mapping from channel number to physical frequency is defined in 3GPP specification *TS 36.104*.

— `channelBandwidth` :

channel bandwidth in the cell. The supported channel bandwidth per frequency band is described in 3GPP specification *TS 36.101*.

Note: Some bandwidth-related attribute values require licenses: see Licensing.

Note: To include SIB3 in System Information, an instance of the EUtranFreqRelation MO must be created which refers to a EUtranFrequency MO with the parameter `arfcnValueEUtranDl` set to the same value as the parent EUtranCellFDD/EUtranCellTDDs parameter `earfcndl`.

Note: A maximum of four frequency bands and four different bandwidths are supported in a single DUS. For more information about frequency bands and bandwidths see RBS Configurations.

4.14.3 Configure Maximum RF Output Power

The following attributes in the cell MOs affect maximum RF output power:

— `pMaxServingCell`:

Pmax to be used in the cell. If not found, the UE applies the maximum power according to the UE capability.

If the High Power UE feature is used, the following applies:

To enable high power UEs on a cell on frequency band 41, the MOM attribute `EUtranCellTDD.pMaxServingCell` must be set to a value higher than 23, representing the output power 23 dBm.

— `pZeroNominalPucch`:

Nominal component of the UE transmit power for PUCCH.

— `pZeroNominalPusch`:

Nominal component of the UE transmit power for PUSCH.

— `alpha`:

Pathloss compensation factor for power control of the PUSCH.

4.14.4 Configuring Dual Layer Beamforming Performance Package, TDD Only

The feature Dual Layer Beamforming Performance Package allows use of Transmission mode 8, which is a mode that allows transmission of data over two spatial layers.

Dual Layer Beamforming Performance Package is a licensed feature and requires a license. This feature requires that the feature Octal Antenna Uplink Performance Package is also installed and activated.

Further information can be found in Dual Layer Beamforming Performance Package and Octal Antenna Uplink Performance Package.

Parameters in the `AntennaSubunit` MO class are used to select the initial beamforming weights for all downlink channels.

Use the following parameters to configure cross-polarized antennas with 65 and 90 degree half-power beam width, and co-polarized antennas with 65 and 90 degree half-power beam width:

— `azimuthHalfPowerBeamwidth`

— `commonChBeamfrmPortMap`

Use the following parameters to customize beamforming weights for the common channels and transmission mode 3. Logical antenna ports 0 and 1 are used for common channel beamforming:

— `customCommonChBeamfrmWtsAmplitude`

— `customCommonChBeamfrmWtsPhase`

Steps

To activate the Dual Layer Beamforming Performance Package feature, do the following:

1. Install the license and activate the feature state: see Licensing

4.14.5 Cell User Capacity and QoS

The following attributes provide information about the cell user capacity and quality of service:

— `EUtranCellFDD.noOfPucchCqiUsers` or `EUtranCellTDD.noOfPucchCqiUsers` :

  Number of Channel Quality Indicator (CQI) resources available on the Physical Uplink Control Channel (PUCCH) channel.

— `EUtranCellFDD.noOfPucchSrUsers` or `EUtranCellTDD.noOfPucchSrUsers` :

  Number of scheduling request resources available on the PUCCH channel.

— `EUtranCellFDD.qciTableRef` or `EUtranCellTDD.qciTableRef` :

Refers to the MO QciTable and assigns a QoS Class Identifier (QCI) table to a cell.

Note: The QciTable MO must exist before the reference can be made.

The values of both attributes noOfPucchSrUsers and noOfPucchCqiUsers must be set according to the following rules:

— The values must not be set to 0.

— For FDD: the maximum values depend on cell bandwidth.

— For TDD: the maximum values depend on cell bandwidth and the number of cells.

— The values must not violate the limits on maximum number of PUCCH PRB per cell as defined in Control Channel Dimensioning.

Note: Change of attribute noOfPucchCqiUsers or noOfPucchSrUsers takes effect immediately but can affect traffic: existing RRC connections can, for example, drop.

4.14.6 Configurable uplink BLER target

The following attributes are used to control the feature Configurable UL BLER Target.

— EUtranCellFDD.ulBlerTargetEnabled or EUtranCellTDD.ulBlerTargetEnabled

Turns on and off the feature Configurable UL BLER Target.

— EUtranCellFDD.ulHarqVolteBlerTarget or EUtranCellTDD.ulHarqVolteBlerTarget

The UL BLER target to be used for VoLTE UEs. This BLER target is used for all UL transmissions for UEs that have a QCI1 bearer configured. If a UE does not have QCI1 bearer configured, the normal UL BLER target is used.

4.14.7 Cell Availability

The following attributes provide information about cell availability:

— EUtranCellFDD.acBarringInfo or EUtranCellTDD.acBarringInfo :

contains all access barring information.

— EUtranCellFDD.administrativeState or EUtranCellTDD.administrativeState :

the administrative status of the cell.

— EUtranCellFDD.availabilityStatus or EUtranCellTDD.availabilityStatus :

the availability status of the cell. It contains details about EUtranCellFDD.operationalState or EUtranCellTDD.operationalState : this attribute is set by the software in the RBS.

— EUtranCellFDD.cellBarred or EUtranCellTDD.cellBarred :

specifies if the cell is required for a specific purpose and not accessible to random user equipment.

— EUtranCellFDD.primaryPlmnReserved or EUtranCellTDD.primaryPlmnReserved :

indicates if the primary PLMN ID in the cell is reserved for operator use. The primary PLMN ID is reserved if this attribute is set to true.

Note: The parameter eNodeBPlmnId in the parent ENodeBFunction MO holds the value of the primary PLMN ID.

— EUtranCellFDD.operationalState EUtranCellTDD.operationalState

The operational state. This attribute is set by the software in the RBS.

4.14.8 CSI-RS Configuration

The following attributes define the CSI-RS configuration:

— EUtranCellFDD.csiRsConfigType8TxFDD for FDD cells

— EUtranCellTDD.csiRsConfigType8TxTDD for TDD cells

Configuration type for CSI-RS.

— EUtranCellFDD.physicalLayerSubCellId for FDD cells

— EUtranCellTDD.physicalLayerSubCellId for TDD cells

Physical-layer cell identities are grouped into 168 unique physical-layer cell-identity groups, each group containing three unique subidentities. This attribute identifies the subidentity within the group.

4.14.9 Scheduling and Interference Management

The following attributes are used for the UL ICIC (Uplink Inter-Cell Interference Coordination) function and provides information about scheduling and interference management for the cell:

— `EUtranCellFDD.ulInterferenceManagementActive` or `EUtranCellTDD.ulInterferenceManagementActive` : Enables or disables uplink interference management.

— `EUtranCellFDD.ulConfigurableFrequencyStart` or `EUtranCellTDD.ulConfigurableFrequencyStart` : start frequency offset for the allocation of resources when the uplink interference management is disabled, expressed as a percentage of the configured bandwidth.

— `EUtranCellFDD.ulFrequencyAllocationProportion` or `EUtranCellTDD.ulFrequencyAllocationProportion` : frequency resources allocated in UL, expressed as a percentage of the configured bandwidth.

The above UL ICIC parameters provide functionality to block certain parts of the UL frequency band. The parameters can also be used as PUSCH blocking functionality with PUCCH overdimensioning to meet some of the additional spectrum emission requirements according to *3GPP TS 36.101*. For more information about parameter settings for PUSCH blocking see Colocation and Coexistence Guideline. For more information about the PUCCH Overdimensioning feature see PUCCH Overdimensioning on page 75.

4.14.10 Frame Management, FDD Only

The following attribute provides information about frame management for the cell:

Frame start offset of the cell is set by the attribute `frameStartOffset` in the `EUtranCellFDD` MO class.

Note: In the current release, the value of `EUtranCellFDD.frameStartOffset` must be set to `0`.

4.14.11 Frame Management, TDD Only

The following attributes in the `EUtranCellTDD` MO class provide information about frame management for the cell:

— `frameStartOffset`:

Frame start offset of the cell is set using the MOM struct `FrameStartOffsetTDD` in the `EUtranCellTDD.frameStartOffset` attribute.

Note: In the current release, the value of `frameStartOffset` for all frequency bands except band 39 is recommended to be set to `0`. For band 39, the value is recommended to be set to `0` unless coexisting with TDSCDMA, in which case a non-zero value is required.

— `EUtranCellTDD.specialSubframePattern`

The special subframe pattern configuration for Downlink Part of Time Slot (DwPTS), Guard Period (GP), and Uplink Part of Time Slot (UpPTS). All TDD cells in the same DU or same Frequency band or specific frequency band combinations where one frequency overlaps with another, for example, band 38 and band 41, must have the same `specialSubframePattern` configuration.

Note: The attribute `EUtranCellTDD.specialSubframePattern` cannot have the value `5` if the value of the Paging attribute `nB` is `T4`. More information can be found in Paging Configuration on page 86, and in *3GPP TS 36.213*.

— `EUtranCellTDD.subframeAssignment`

The assignment of uplink and downlink subframes for the TDD frame structure (called UL/DL configuration in *3GPP TS 36.211*). All TDD cells in the same DU or same frequency band or specific frequency band combinations where one frequency overlaps with another, for example, band 38 and band 41, must have the same UL and DL `subframeAssignment` .

4.14.12 Additional UE Output Power Restrictions

Additional Maximum Power Reduction (A-MPR) can be signalled by a Network Signaling value to the UE to meet additional requirements in specific deployment scenarios and specific frequency bands (bands 1, 2, 4, 10, 13, 26, 35 and 36).

The following attribute is related to additional UE output power restrictions:

— `EUtranCellFDD.networkSignallingValue` or `EUtranCellTDD.networkSignallingValue` :

specifies the Network Signaling value to be broadcast in the cell. Default is `NS_01` meaning that no additional back-off is required by the UE. Other supported values are:

`NS_03` indicating bands 2, 4, 10, 35 and 36

`NS_04` indicating band 1

`NS_05` indicating band 1

`NS_07` indicating band 13

`NS_12` indicating band 26

`NS_13` indicating band 26

4.14.13 PUCCH Overdimensioning

The licensed feature PUCCH Overdimensioning provides the following operator configurable attributes:

— `EUtranCellFDD.pucchOverdimensioning` or `EUtranCellTDD.pucchOverdimensioning` :

The `pucchOverdimensioning` attribute specifies the number of resource blocks that the PUCCH must be shifted at each band edge. Supported values are `0`, 3, 4, 7, 8,13, 24 and 25. Default value is `0`, which corresponds to no PUCCH overdimensioning.

The configured value of this parameter has to be set to a value equal to or less than the result of the following:

The total number of PRBs representing the UL system bandwidth divided by 2 (where the result is rounded down to the closest integer), minus the total number of PRBs allocated for PUCCH divided by 2, minus the total number of PRBs allocated for PRACH divided by 2.

If the above condition is not fulfilled a ResourceConfigurationFailure alarm with the error description slogan `PUCCH Overdimensioning configuration invalid` is raised.

— `EUtranCellFDD.puschMaxNrOfPrbsPerUe` or `EUtranCellTDD.puschMaxNrOfPrbsPerUe` :

specifies the maximum number of PRBs that the network allows any UE to use for PUSCH in a cell. This limitation is needed to meet some of the additional spectrum emission requirements according to *3GPP TS 36.101* with PUCCH overdimensioning. Default value is `100`, which means that no limitation is imposed.

Note: Both the value of the `pucchOverdimensioning` parameter and the amount of resources allocated for PUCCH, affects where the resource allocation for the Physical Uplink Shared Channel (PRACH) starts. In case sub-band radio is used it is not allowed for PRACH to span over a 5 MHz sub-band border, which has to be considered when configuring the value of this parameter. If the Advanced Cell Supervision feature is active and the PRACH spans a sub-band border, the Unreliable Resource alarm is raised.

Note: Setting the values of the `pucchOverdimensioning` and `puschMaxNrOfPrbsPerUe` parameters to other than their default values, only takes effect if the corresponding license for the PUCCH Overdimensioning feature is installed and activated. For more information see PUCCH Overdimensioning and License Management.

To achieve the desired behavior the PUCCH Overdimensioning functions can also be used together with PUSCH Blocking, and Additional Maximum Power Reduction (A-MPR). PUSCH blocking is achieved by use of the UL ICIC (Uplink

Inter-Cell Interference Coordination) operator configurable parameters. For detailed information about the feature see PUCCH Overdimensioning.

4.14.14 Configuring Increased PDCCH Coverage

For more information, see PDCCH Power Boost on page 133 and PDCCH Coverage Extension on page 135.

4.14.15 Cell Handover

The following attributes configure handover in the cell:

— `EUtranCellFDD.minBestCellHoAttempts` or `EUtranCellTDD.minBestCellHoAttempts` :

number of attempts for handover to a cell better than the serving one, before handover is attempted to the next best cell. If there is no next best cell in the UE report, handover to the best cell is attempted repeatedly.

— `EUtranCellFDD.reservedBy` or `EUtranCellTDD.reservedBy` :

contains a list of `EUtranCellRelation` managed objects that reserve this managed object.

Note: The managed object cannot be deleted if it is reserved.

4.14.16 Cell Reselection

The following attributes configure cell reselection:

— `EUtranCellFDD.systemInformationBlock3` or `EUtranCellTDD.systemInformationBlock3` :

contains cell reselection information common for intra-frequency, inter-frequency, and/or IRAT cell reselection.

— `EUtranCellFDD.systemInformationBlock6` or `EUtranCellTDD.systemInformationBlock6` :

contains cell reselection information common for cell reselection towards UTRAN.

— `EUtranCellFDD.systemInformationBlock7` or `EUtranCellTDD.systemInformationBlock7` :

contains cell reselection information common for cell reselection towards GERAN.

— `EUtranCellFDD.systemInformationBlock8` or `EUtranCellTDD.systemInformationBlock8` :

contains cell reselection information common for cell reselection towards CDMA2000.

4.14.17 Transmission Mode, TDD Only

The Transmission Mode (TM) used for UEs connected to a cell can be configured with the attribute `transmissionMode` in the `EUtranCellTDD` MO class. The transmission mode for a cell can be set to, for example, Transmit Diversity or Open-Loop Spatial Multiplexing.

More information on these transmission modes can be found in Dual-Antenna Downlink Performance Package.

To use the transmission modes Single- or Dual-Layer Beamforming the respective licenses are required. More information can be found in Single Layer Beamforming Performance Package and Dual Layer Beamforming Performance Package.

4.14.18 X2 Setup

The process is preceded by the creation of the MO `TermPointToENB` in the source RBS. It is created either manually, by the ANR feature, or by the OSS when activating a planned area. See X2 Configuration for more information.

To create `TermPointToENB` and the parent MOs manually see S1, M3, and X2 Control Plane Connections.

4.14.19 Activating and Deactivating DRX for Connected UE

Discontinuous Reception (DRX) for connected UE is a licensed feature that is activated per cell.

To activate DRX, do the following:

Steps

1. Install licenses and activate the feature state: see Licensing, and Efficient DRX/DTX for Connected UE. For the Service Specific DRX feature see Service Specific DRX.
2. Activate DRX on each cell: see the `EUtranCellFDD.drxActive` or `EUtranCellTDD.drxActive` attribute.

   To deactivate DRX, use the same parameters as when activating DRX.

4.14.20 Spatial Division Multiplexing Support

This section provides information on whether Spatial Division Multiplexing (SDM) is supported in the cell.

— `EUtranCellFDD.sdmActive` or `EUtranCellTDD.sdmActive` :

specifies if SDM for combined cell configuration is activated or not. If SDM is activated, it is possible to multiplex multiple UEs in different sector carriers in the same time and same frequency resource.

Note: The SDM functionality for combined cell is not supported. If the parameter is set to `true`, it does not take effect.

4.14.21 Adjustable CRS Power

Adjustable CRS power provides means to optimize the power distribution on resource elements according to the network topology for improved DL throughput, for example in dense networks, or extended coverage in rural environments. More precisely, to be able to tune the network performance and the inter-cell interference there is support for controlling the power of the DL reference signals. With the power level of the DL reference signal, it is also possible to control the PDSCH power to improve the use of the DL radio power or reduce cell interference.

Set the following parameter to adjust CRS power:

— `EUtranCellFDD.crsGain` or `EUtranCellTDD.crsGain` : It sets the DL power of the cell-specific Reference Signals (RS) relative to a reference level defined by the power of the PDSCH type A resource elements. If crsGain is +3 dB, the power of the RS is 3 dB higher than a PDSCH type A resource element.

To keep legacy behavior `crsGain` must be configured to `300` (in `0.01` dB).

For details about common channels see Power Control.

Set the following parameter to adjust the power of PDSCH Type B:

— `EUtranCellFDD.pdschTypeBGain` or `EUtranCellTDD.pdschTypeBGain` :

it specifies the power level of PDSCH type B resource elements according to a power gain which is set relatively to resource elements of PDSCH type A. `pdschTypeBGain` will be replaced with the MOM parameter `pdschTypeBGain` in a later release.

Range: {`0`, 1, 2, 3}, Default=`0` (36.213) .

To keep legacy behavior `pdschTypeBGain` should be configured to 1.

For details about downlink power settings see Power Control.

Absolute mobility thresholds may need to be adjusted if reference symbol power is changed: see Deployment Guideline under section *Adjusting System Parameters*.

Note: PDSCH type A resource elements are located within a symbol that does not contain reference signals in the air interface. According to 3GPP, `crsGain` corresponds to $-\rho_A$ (36.213). PDSCH type B resource elements are located within a symbol that contains reference signals in the air interface. According to 3GPP, parameter `pdschTypeBGain` corresponds to P_B or ρ_B/ρ_A (36.213).

In order to avoid over-allocation of RF signal power, the values of `crsGain` equal to 4.77 dB and 6 dB are overwritten to 3 dB. (these two values will be removed in a later release). If `crsGain` is 1.77 dB or 3 dB, and PDSCH Type B gain is 5/4 (that is pdschTypeBGain is `0` (36.213)), then the gain is remapped by SW to a gain equal to 1 (that is pdschTypeBGain is 1 (36.213)). This is to prevent over-allocation of RF signal power.

4.14.22 Configure Soft Reduction of TX Power of Cell

Prerequisites

The license for Soft Reduction of Cell Tx Power is installed, and the feature is active.

Do not change the value of the attribute `EUtranCellFDD.dlPowerRatio` when `EUtranCellFDD.dlPowerState` is `CHANGING`.

Steps

1. To reduce the cell TX power from the initially configured value, set the value of the attribute `EUtranCellFDD.dlPowerRatio` below `100` %.

   Note: Changing the `EUtranCellFDD.dlPowerRatio` attribute can result in loss of traffic.

4.15 Sector Carrier Configuration

A sector carrier is part of a defined cell. The `SectorCarrier` MO class is a sub class to the `EUtranCellFDD` or `EUtranCellTDD` MO class.

The `SectorCarrier` MO represents the use of the resources that are referred to by the `SectorEquipmentFunction` MO.

An `EUtranCellFDD` or `EUtranCellTDD` MO can refer to one or, with the Combined Cell feature activated, several instances of the `SectorCarrier` MO class.

4.15.1 Adding Sector Carriers

In order to add a sector carrier, the referenced SectorEquipmentFunction MO must exist.

Create the SectorCarrier MO. When the sector carrier is added, all the sector carrier attributes are saved in the RBS.

After the sector carrier is added, the SectorCarrier MO exists with operationalState set to DISABLED and the availabilityStatus set to OFFLINE.

4.15.2 Deleting Sector Carriers

When deleting a SectorCarrier MO, the sector carrier must not be associated with any cell. When a sector carrier has a cell associated with it, the request to delete the sector carrier is rejected by the RBS.

When deleting a sector carrier, all references and the SectorCarrier MO are deleted from the RBS.

4.15.3 Configure Sector Carrier

The configuration of sector carrier is determined by the following parameters in the SectorCarrier MO class.

— sectorCarrierId :

the parameter is the sector carrier identity containing the value component of the RDN.

— availabilityStatus :

the availability status of the sector carrier. It contains details about operationalState . This attribute is set by the application in the RBS.

— operationalState :

the operational state. This attribute is set by the application in the RBS.

— sectorFunctionRef :

refers to the SectorEquipmentFunction MO to which the SectorCarrier MO class belongs.

— configuredMaxTxPower:

maximum output power to be used in a SectorCarrier. The output power is evenly distributed over the antenna connectors used for TX transmission that are allocated for the SectorCarrier MO.

If the total power used per antenna connector of a sector equipment is more than the total power available when the cell using the `SectorCarrier` MO is unlocked, an alarm is generated.

Note: The cell must be manually locked before changing the parameter value.

When seamlessly changing (increasing or decreasing) output power, the radio units can lose traffic on the already activated carriers for up to 60 milliseconds at a time. The loss of traffic will occur up to three times for each radio unit during each seamless power change.

Do!

Inappropriate settings may cause significant problems.Changes may affect traffic.

— `maximumTransmissionPower` :

maximum possible power at the antenna reference point for all DL channels in all TX branches used simultaneously in a sector carrier.

— `txPowerPersistentLock`:

Do!

Inappropriate settings may cause significant problems.Changes to the attributes described under this bullet may affect traffic.

To prohibit an unwanted change to a higher value of the total output power during normal operation, the total TX output power can be locked by the `txPowerPersistentLock` attribute.

Note: Set `txPowerPersistentLock` to `true` only for micro RBS.

When `txPowerPersistentLock` is set to true, it is not possible to:

- change the attribute `configuredMaxTxPower`
- delete the MO instance
- set the attribute `txPowerPersistentLock` to FALSE

If `txPowerPersistentLock` is set to true, a re-integration of the node is required to change the setting of the attribute and to change the value of the total output power.

— Antenna Configuration

Some antenna configurations require licenses: see Licensing.

Do!

Inappropriate settings may cause significant problems.Changes to the attributes described under this bullet may affect traffic.

The following attributes provide information on the antenna configuration of the sector carrier:

- noOfRxAntennas

  The number of antennas that can be used for uplink reception in a sector.

  If the parameter value is set to 0 and the OptionalFeatureLicense (QuadAntUlPerfPkg or OctAntUlPerfPkg) are DEACTIVATED, the predefined value for the number of RX antennas is 2.

  If the parameter value is set to 0 and the OptionalFeatureLicense (QuadAntUlPerfPkg or OctAntUlPerfPkg) are ACTIVATED, noOfRxAntennas will be set to the maximum available number of multiple antennas as defined in the configuration listed in the note below. It may cause DEGRADED and/or DISABLED cells due to lack of configured resources.

  The noOfRxAntennas must be the same for all SectorCarriers in the cell.

  Note: When an OptionalFeatureLicense for multiple antennas applies to all SectorCarriers in the node. The recommendation is to set the parameter to the desired number of RX antennas, that is to a non-zero value, to avoid problems when having SectorCarrier with different number of RX antennas.

  Check the noOfRxAntennas against the OptionalFeatureLicense according to: noOfRxAntennas per SectorCarrier = 2(basic configuration) or 4 if QuadAntUlPerfPkg is activated, or 8 if QuadAntUlPerfPkg is activated, or 0 if EUtranCellFDD.isDlOnly = TRUE (that is, no UL should be allocated).

  Note: If configuring a sector with only one RX, the value of parameter noOfRxAntennas must be 1.

- noOfTxAntennas

  The number of antennas that can be used for downlink transmission in a sector. If not all TX antennas in the sector are used, the configured number of antennas get all the output power provided by the sector (depending on their output power capacity).

If the parameter value is set to 0 and the OptionalFeatureLicense (DualAntDlPerfPkg, TxDataCloning, QuadAntDlPerfPkg, SingLayBeamfPerfPkg or DualLayBeamfPerfPkg) are DEACTIVATED, the predefined value for the number of TX antennas is 1.

If the parameter value is set to 0 and the OptionalFeatureLicense (DualAntDlPerfPkg, TxDataCloning, QuadAntDlPerfPkg, SingLayBeamfPerfPkg or DualLayBeamfPerfPkg) are ACTIVATED, the noOfTxAntennas will be set to the maximum available number of multiple antennas as defines defined in the configuration listed in the below note. It may cause DEGRADED and/or DISABLED cells due to lack of configured resources. The noOfTxAntennas must be the same for all SectorCarriers in the cell.

Note: An OptionalFeatureLicense for multiple antennas applies to all SectorCarriers in the node. The recommendation is to explicitly set the parameter to the desired number of TX antennas, that is to a non-zero value, to avoid problems when having SectorCarrier with different number of TX antennas.

Check the noOfTxAntennas against OptionalFeatureLicense according to: noOfTxAntennas per SectorCarrier = 1 (basic configuration) or 2 if DualAntDlPerfPkg is activated, or 4 if TxDataCloning is activated, or 4 if QuadAntDlPerfPkg is activated, or 8 if SingLayBeamfPerfPkg or DualLayBeamfPerfPkg are activated.

- rfBranchRxRef :

  an optional list of RfBranches to be deterministically allocated to the RX carrier branches in this sector carrier. This gives the user the opportunity to, for example, select antenna or antenna polarization for a specific RX carrier branch.

  The list should contain as many entries as the number of used RX antennas for this sector carrier. The first referred RfBranch will be allocated to RX carrier branch number one, the second referred RfBranch will be allocated to RX carrier branch number two and so on. Each referred RfBranch must already be referred to in the associated SectorEquipmentFunction MO.

  If the list is left empty, non-deterministic (default) RfBranch allocation for the RX carrier branches will take place. Default allocation means choosing those RfBranches referenced in the SectorEquipmentFunction MO that are connected to free radio resources. Thus the final RfBranch allocation could vary.

  This optional list is only used if absolute control of RfBranch allocation is necessary. Default allocation will automatically handle limitations of the Radio resources and allow for reconfiguration at RfBranch failures.

- rfBranchTxRef :

an optional list of RfBranches to be deterministically allocated to the TX carrier branches in this sector carrier. This gives the user the opportunity to, for example, select antenna or antenna polarization for a specific TX carrier branch.

The list should contain as many entries as the number of used TX antennas for this sector carrier. The first referred RfBranch will be allocated to TX carrier branch number one, the second referred RfBranch will be allocated to TX carrier branch number two and so on. Each referred RfBranch must already be referred to in the associated `SectorEquipmentFunction` MO.

If the list is left empty, non-deterministic (default) RfBranch allocation for the TX carrier branches will take place. Default allocation means choosing those RfBranches referenced in the `SectorEquipmentFunction` MO that are connected to free radio resources. Thus the final RfBranch allocation could vary.

This optional list is only used if absolute control of RfBranch allocation is necessary. Default allocation will automatically handle limitations of the Radio resources and allow for reconfiguration at RfBranch failures.

Note: If there is a value mismatch between either of the above mentioned parameters and the number of available resources in the node, a Service Degraded alarm may be issued.

— `reservedBy` in MO class `SectorCarrier` : this parameter contains a list of MO instances that reserve this MO instance.

— `reservedBy` in MO class `SectorEquipmentFunction` : in case of combined cell this parameter contains a list of `SectorCarrier` MO instances that reserve this MO instance. Max 4 `SectorCarrier` can reserve the same `SectorEquipmentFunction` .

— `prsEnabled` : for details see PRS Configuration on page 121.

— `virtualSector` indicates whether the current sector carrier is a virtual sector or not. Virtual sector is called virtual sector, because they are modeled by MO `SectorCarrier` instead of MO `SectorEquipmentFunction`.

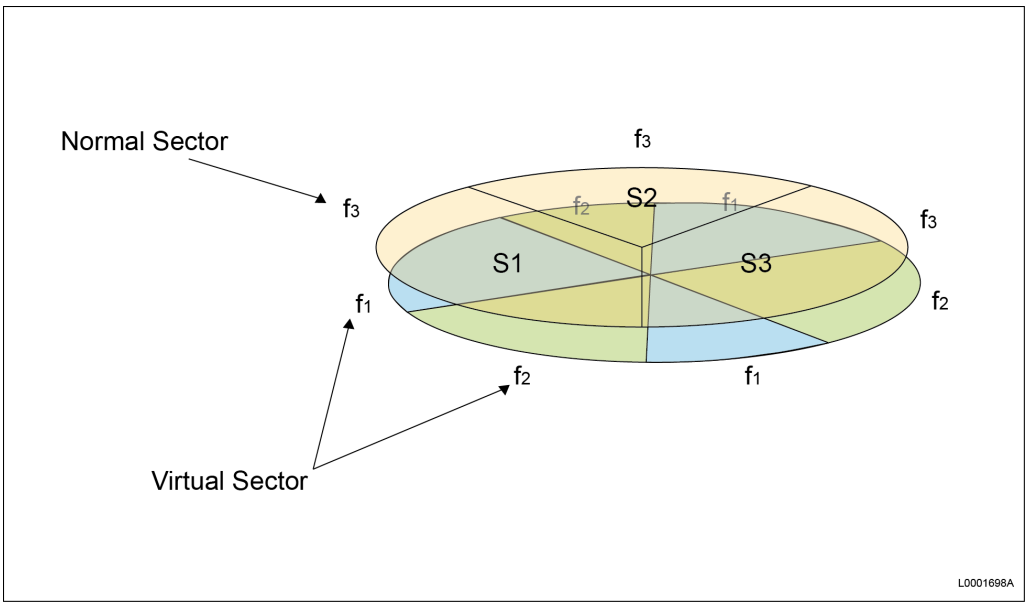
Note: The `virtualComChBeamfrmWtsAmplitude` cannot be set to invalid value if `virtualSector` is set to true.

— `virtualComChBeamfrmWtsAmplitude`contains an array of eight amplitudes for common channel beamforming weights.

Note: At least one of the eight amplitudes must have non-zero values, for the beamforming weights to take effect.

— `virtualComChBeamfrmWtsPhase` is a parameter that contains an array of eight phases for common channel beamforming weights.

In case of two layers, one layer with virtual sectors, one with normal sectors, in order to be able to use Carrier Aggregation or Inter-Frequency Load Balancing between these layers, use the configuration shown below.



There are three carriers per radio. One carrier (f3) covers the full physical sector and the other two carriers (f1 and f2) cover the virtual sectors.

Figure 7 Compatible Configuration for Carrier Aggregation or Inter-Frequency Load Balancing

— The `ulForcedTimingAdvanceCommand` forces an additional value to the Timing Advance Command in Random Access Response and advances the FFT windows for PUSCH, PUCCH, and SRS with the same amount of time. `ulForcedTimingAdvanceCommand` is given in multiples of T_0 = 0.52 µs.

  The default value 0 should be used for sector carriers in macro cells.

  For sector carriers in micro cells, recommended setting is described with the following notation:

  n - Assigned value of the parameter `ulForcedTimingAdvanceCommand`.

  d - Distance between the antennas of the micro cell and the antennas of the closest macro cell with a sector carrier in the same Uplink Coordinated Multi-Point Reception (UL CoMP) Group.

  Note: It is recommended to have a single UL CoMP Group per carrier and per DU or Baseband to maximize the gains of the feature.

  c - Speed of light in air.

If d ≤ 300 meters, the parameter n has the default value $n = 0$.

If d> 300 meters, the parameter n is recommended to be set to:

$n = [d / (c \times T_0)]$.

Inserting the values for c and T_0 gives $n = 6.4 \times d_{km}$, where d_{km} is the distance d, expressed in *km*.

4.16 Random Access Configuration

This section covers configuration of random access functionality. The values of some attributes of the `EUtranCellFDD` or `EUtranCellTDD` MO class determines the random access characteristics.

— `EUtranCellFDD.rachRootSequence` or `EUtranCellTDD.rachRootSequence` :

the first root sequence number for Random Access Channel (RACH) preamble generation. RACH root sequence is broadcast as a part of system information distribution and used for preamble detection. The definition for logical root sequence number can be found in *3GPP TS 36.211*.

— `EUtranCellFDD.cellRange` or `EUtranCellTDD.cellRange` :

defines the maximum distance from the RBS where a connection to a UE can be setup or maintained or both.

— `EUtranCellFDD.cfraEnable` or `EUtranCellTDD.cfraEnable` :

this parameter is used to enable or disable Contention Free Random Access (CFRA).

Note: This feature is currently not supported for the US market.

4.17 Paging Configuration

This section covers configuration of paging functionality. The values of the attributes of the `Paging` MO class determine the paging characteristics.

— `defaultPagingCycle` :

the attribute determines the Default Paging Cycle used by the RBS and broadcast in System Information (SIB2). This value is overridden by the UE specific paging cycle, if it is provided in incoming Paging from MME, and if it is smaller than the `defaultPagingCycle` .

Setting a smaller value for the attribute `defaultPagingCycle` results in a shorter paging time, but a more "bursty" Paging traffic, since more UEs will

be grouped to use the same PF. A larger value for the attribute results in longer paging times, but distributes the Paging traffic more evenly in time.

— `maxNoOfPagingRecords` :

the number of UEs paged in a PO can not exceed the number specified by the value of the `maxNoOfPagingRecords` attribute. If the received number of Paging messages from MME, targeting the same PO, exceeds `maxNoOfPagingRecords` , the excess paging records are sent in the next PO in the Paging Cycle.

Hence setting this parameter to a smaller value may cause extra delays for some Paging messages, but instead it limits the bandwidth used by paging. A larger value may require more of the RBS bandwidth but decreases the probability of extra delays for UEs.

— `nB` :

the value of the attribute determines the number of Paging Occasions (PO) in each Paging Frame (PF). Together with the attribute `defaultPagingCycle` it determines the paging time and the distribution of the Paging traffic in time.

Setting the value of the `nB` attribute so that there are fewer POs in each PF will decrease the total number of available POs and hence the Paging traffic will be more "bursty".

— `pagingDiscardTimer` :

the attribute determines the maximum period of time a received Paging may be retained or queued in the RBS before it is discarded. The value of the `pagingDiscardTimer` should be the same as that set in the paging resend timer in the MME.

Setting the attribute value too high will result in the RBS paging queue containing several instances of the same paging sent by the MME. Setting the value of the attribute too low will remove some paging messages from the RBS paging queue prematurely. This will result in unnecessary paging resend from the MME.

Note: Further information can be found in TA Planning Guideline.

4.18 RCS Configuration

This section covers configuration of Radio Connection Supervision (RCS). The attributes of the MO classes `Rcs` , QciProfilePredefined and QciProfileOperatorDefined determine the RCS characteristics.

The following attributes are used to determine the time that a UE can be inactive before it is released:

— Rcs.tInactivityTimer

— QciProfilePredefined.inactivityTimerOffset

— QciProfileOperatorDefined.inactivityTimerOffset

The performance can be improved by setting suitable values for these attributes. The default value of the attribute `tInactivityTimer` is 61 and the default value of `inactivityTimerOffset` is 0. Setting the attribute values too low results in too frequent releases of UEs, and setting the values too high results in some UEs using more system resources than needed. For more information about the configuration and the attributes see Service Specific Inactivity Timer.

The following attribute is used to determine the action when a Radio Link Control (RLC) Downlink (DL) Delivery Failure occurs in a multi Data Radio Bearer (DRB) connection:

— `Rcs.rlcDlDeliveryFailureAction`

4.19 Non-planned PCI Range Configuration

This section covers configuration of Non-planned PCI Range. In the source macro eNB, the operator must configure the parameters to support Non-planned PCI range feature.

This is the process to activate the Non-planned PCI Range feature:

Steps

1. Configure Non-planned PCI Range for each frequency relation.
2. Configure `EUtranCellRelation.cellIndividualOffsetEUtran` for each frequency relation.
3. Configure the DRX profile for Non-planned PCI.
4. Set the `ENodeBFunction.measuringEcgiWithAgActive` to `TRUE` to enable autonomous gap for CGI measurement.

4.20 Sector Configuration

The generic MO operations to use are `create`, `delete`, and `setAttribute`, using Element Manager or other user interfaces.

For additional information, refer to Element Manager.

4.20.1 Adding Sectors

To add sectors:

1. The SectorEquipmentFunction MO is created and associated with one or several AntennaUnitGroup MOs created previously.
2. Creating the sector triggers the RBS to store all the sector parameters persistently.
3. When the SectorEquipmentFunction MO administrative state is set to unlocked, the RBS allocates and configures all hardware connected to the sector, and it is associated with one or several RfBranch MOs. The parameter settings are stored persistently in the RBS.
4. The RBS performs uplink and downlink gain calibration of the antenna branches.

After the sector is added, a SectorEquipmentFunction MO exists with administrative state is set to locked, operational state is set to disabled, availability status is set to offline.

4.20.2 Deleting Sectors

When deleting a SectorEquipmentFunction MO, it should not be associated with any sector carriers.

When deleting a sector, all references and the SectorEquipmentFunction MO are deleted from the RBS.

When a sector is unlocked or has a sector carrier associated with it, the request to delete the sector is rejected by the RBS.

4.20.3 Locking Sectors

When changing the SectorEquipmentFunction MO to administrative state set to locked, all hardware connected to the sector is released, and the sector cannot handle any cells. All connected cells become automatically disabled with availability status is set to dependency_locked.

4.20.4 Unlocking Sectors

When the SectorEquipmentFunction MO is unlocked, the RBS calibrates uplink and downlink gain of the antenna branches.

Note: If the antenna branches that are associated with the sector are not fully functional within 5 minutes, the sector is enabled with its actual state.

If the sector has dependency-locked cells associated with it, the cells are enabled when the sector is enabled.

4.20.5 SectorEquipmentFunction Attributes

When attributes are reconfigured, the sector must be manually locked and unlocked for the new value to take effect. The following are `SectorEquipmentFunction` attributes:

— `administrativeState`:

the administrative state of the sector.

— `availabilityStatus`:

the availability status of the sector. It contains details about `operationalState`. This attribute is set by the software in the RBS.

— `eUTRANFqBands`:

The list of LTE frequency bands supported by the hardware associated with the `SectorEquipmentFunction` MO.

If one frequency band is only partially supported by some associated RF branches, the supporting for this band would be explicitly displayed for each RF branch. Valid frequency band values are specified in *3GPP TS 36.104, subclause 5.7.3*. Full support on one RF branch means the whole 3GPP defined band is fully covered the RF branch working frequency ranges. Partial support on one RF branch means some part of the 3GPP defined band is covered by the RF branch working frequency ranges, but other parts are not.

In downlink direction, one RF branch working frequency ranges are the same as its associated RF port frequency ranges. In uplink direction, one RF branch working frequency ranges are the intersection of its associated RF port frequency ranges and the optionally associated Frequency Shifting TMA (TMF) frequency range. The RF port frequency ranges is referring to attribute `dlFrequencyRanges` and `ulFrequencyRanges` on `RfPort` MO, the supported frequency ranges depends on radio unit capability, that can be displayed in multiple frequency ranges, with lowest sub range first (699000 kHz–716000 kHz and 815000 kHz–830000 kHz) or single frequency range (704000 kHz–716000 kHz).

Note: For hardware not supporting E-UTRA frequency bands, the list is *empty*.

— `operationalState`:

the operational state. This attribute is set by the software in the RBS.

— `reservedBy`:

contains a list of `SectorCarrier`, or `EUtranCellFDD` or `EUtranCellTDD` MO instances that reserve this MO instance. Maximum four `SectorCarrier` can reserve the same `SectorEquipmentFunction`.

— `rfBranchRef`:

reference to the RfBranch MO instances being reserved.

— SectorEquipmentFunctionId:

the ID of the sector containing the value component of the RDN. It must be unique in the network.

— userLabel:

label for free text.

— availableHwOutputPower:

Sum of the HW power capability for all radio hardware in the sector.

4.20.6 Distributed Antenna System

The configuration supported by default is the receive/transmit (RX/TX) duplex configuration. It is possible to connect an antenna system with separate ports for receive and transmit (simplex reception and transmission connections) as opposed to the default receive/transmit duplex connection. This is useful for Distributed Antenna Systems (DAS), that often have separate ports for transmission and reception.

The rfPortRef attribute in the RfBranch Managed Object (MO) is affected. The rfPortRef attribute points out which port to use on the radio unit.

The RfPort MO with identities RXA_IO and RXB_IO represent the ports labeled RXA I/O and RXB I/O configured as RX ports. The identities must be set during configuration.

— In the RfPort MO, corresponding to the port marked RXA I/O on the radio unit, the parameter RfPortId must have the value RXA_IO. The rfPortRef attribute in the corresponding RfBranch MO must also have the value RXA_IO

— In the RfPort MO corresponding to the port marked RXB I/O on the radio unit, the parameter RfPortId must have the value RXB_IO. The rfPortRef attribute in the corresponding RfBranch MO must also have the value RXB_IO

The RfPort MO with identities A, B, and so on, represent the antenna ports, labeled RF A and RF B on the radio unit.

4.20.7 6 Sector Configurations

It is possible to configure 6 sectors per RBS with a single DU. This reduces the equipment cost. The alternative is to configure 6 sectors with two DUs, resulting in two nodes.

To set up 6 cells with a single DU, the MOM parameters EUtranCellFDD.noOfPucchCqiUsers and EUtranCellFDD.noOfPucchSrUsers,

or EUtranCellTDD.noOfPucchCqiUsers and EUtranCellTDD.noOfPucchSrUsers in the cells must comply with the rules described in Control Channel Dimensioning, otherwise the cell setup will be rejected.

Note: All cells must be set to administrative state locked before configuring 6 cells. Once all cells are configured, set administrative state of all cells to unlocked.

4.20.8 7-12 Sector Configurations

It is possible to configure 12 sectors per RBS with a single or dual DUS41. This provides increased coverage.

To set up 12 cells with a dual DUS41 configuration, the MOM parameters EUtranCellFDD.noOfPucchCqiUsers and EUtranCellFDD.noOfPucchSrUsers , or EUtranCellTDD.noOfPucchCqiUsers and EUtranCellTDD.noOfPucchSrUsers in the cells must comply with the rules described in Control Channel Dimensioning, otherwise the cell setup will be rejected.

Note: All cells must be set to administrative state locked before configuring 12 cells. Once all cells are configured, set administrative state of all cells to unlocked.

4.20.9 13-18 Sector Configurations

It is possible to configure 18 sectors per RBS with dual or triple DUS 41. This provides increased coverage.

To set up 18 cells with a dual or triple DUS 41 configuration, the MOM parameters EUtranCellFDD.noOfPucchCqiUsers and EUtranCellFDD.noOfPucchSrUsers , or EUtranCellTDD.noOfPucchCqiUsers and EUtranCellTDD.noOfPucchSrUsers in the cells must comply with the rules described in Control Channel Dimensioning, otherwise the cell setup will be rejected.

Note: All cells must be set to administrative state locked before configuring 18 cells. Once all cells are configured, they must be set to administrative state unlocked again.

4.20.10 Configure Feature Multi-Sector Per Radio

4.20.10.1 Single Sector Per Radio Preparations

Perform the following steps on a single sector per radio before configuring the Multi-Sector Per Radio feature:

Steps

1. Lock the EUtranCellFDD or EUtranCellTDD MO.
2. Lock the SectorEquipmentFunction MO.
3. Update SectorCarrier MO with the desired rfBranches to remain on defined sector.
4. Update SectorEquipmentFunction MO with the desired rfBranches to remain on defined sector.
5. Unlock the SectorEquipmentFunction MO.
6. Unlock theEUtranCellFDD or EUtranCellTDD MO.

4.20.10.2 Create New Sector

Perform the following steps to create new sectors for the Multi-Sector Per Radio feature:

Steps

1. Create new RfBranches for the new sector if needed.
2. Set the rfPortRef attribute to the wanted RfPort on the AuxPlugInUnit MO.
3. Create a new SectorEquipmentFunction MO.
4. Set the rfBranchRef attribute to the desired RfBranches.
5. Create a new SectorCarrier MO.

   Note: The feature can be configured on a 4 TX or 4 RX radio. The configuration is possible on a radio group with either one 2 TX and 2 RX radio, or one 0 TX and 2 RX radio. For in-band mode, it can also be configured on a radio group with one 4 RX and 2 TX radio, or one 2 RX and 4TX radio.

4.20.10.3 Multi-Sector Per Radio Configuration

Perform the following steps to configure the Multi-Sector Per Radio feature:

Steps

1. Configure the configuredMaxTxPower attribute in the SectorCarrier MO for both sectors. Make sure that the sum of the power for the two sectors does not exceed the maximum allowed output power: this is determined by the license or the maximum output power of the radio unit.

2. Create a new EUtranCellFDD or EUtranCellTDD MO for each sector created in Create New Sector on page 93
3. Activate the Multi-Sector Per Radio license. If more than three cells have been created in one DU or Baseband unit, the 6 Cell Support feature license must also be activated.

   Note: If the feature is configured on a radio group, activation is not needed.
4. Unlock the SectorEquipmentFunction MO.
5. Unlock the EUtranCellFDD or EUtranCellTDD MO.

4.20.11 Virtual IBW, TDD Only

Virtual IBW is introduced by the RRUS 82.

With Virtual IBW, RRUS 82, an 8-path RRU, can operate with two separate sets of 4TX/4RX branches in different sectors, or three separate sets of 2TX/2RX branches in different sectors on one antenna. This means that one SectorEquipmentFunction and one RBB per four RF branches must be used.

For information on radios that support Virtual IBW see RBS Configurations.

4.21 Mixed Mode

Mixed Mode allows different radio access standards (LTE + GSM, LTE + WCDMA, LTE + CDMA, and LTE + LTE) to share the same physical radio resources (radio units and antenna system). There are two licensed features that requires licenses, Mixed Mode Radio and Multi-Operator RAN, that use Mixed Mode. More information can be found in Mixed Mode Radio, Multi-Operator RAN, and Expanding to Mixed Mode Radio.

Note: Multi-Operator RAN is limited to LTE+LTE.

Steps

To activate Mixed Mode in Multistandard RBS or Multi-Operator RAN, do the following:

1. Install licenses and activate the feature state: see Licensing.
2. Set the value of the parameter isSharedWithExternalMe to true.

   Attribute mixedModeRadio is being deprecated and replaced by isSharedExternalWithMe. The new attribute is valid for both DU and Baseband, but with different MO classes. FieldReplaceableUnit is used with Baseband nodes, AuxPlugInUnit is used with DU nodes.

Note: A radio unit using Mixed Mode can require longer restart times.

If the radio unit is shared by multiple RATs, the mixed mode parameter must be enabled on all RATs.

4.22 Cascadable Radio Units

Cascadable Radio Units allows new RBS configurations with radio cascading capability from 2 to the maximum of 6 radio units per CPRI link in a chain. It enables larger cell configuration (6/12 sector cell) or a higher order of MIMO cell (for example 4X4 MIMO) per eNodeB.

Cascadable radio Units is a licensed feature. However, a license is not required if all the cascaded radios are in the same sector.

If using cascaded radios in more than one sector a license is required. More information can be found in Cascadable Radio Units.

Steps

To activate Cascadable Radio Units do the following:

1. Install licenses and activate the feature state: see Licensing and Cascadable Radio Units.

4.23 Resource Allocation Strategy

Resource allocation specifies how the scheduler performs frequency resources allocation to each UE being scheduled together at a specific time. It is within the QoS Configuration and can be configured per QCI.

The resource allocation parameters are related to the licensed features Downlink Frequency-Selective Scheduling and Uplink Frequency-Selective Scheduling. Individual licenses are required for each feature. To activate the feature, do the following: Install licenses and activate the feature states.

By default, frequency selective scheduling is turned off for QCIs with resource allocation strategy parameter value set to `RESOURCE_FAIR`. Activate frequency selective scheduling for a certain bearer type by setting the parameter value to `FREQUENCY_SELECTIVE`.

When resource allocation is set to `FREQUENCY_SELECTIVE`, the scheduler attempts to schedule each UE in different parts of the band where their channel qualities are better to provide better cell capacity and coverage.

The behavior of resource allocation is configured using the following parameters:

— `dlResourceAllocationStrategy` in MO class `QciProfilePredefined` and `dlResourceAllocationStrategy` in MO class `QciProfileOperatorDefined`

  Specifies whether downlink frequency-selective scheduling must be used for each QCI.

— `resourceAllocationStrategy` in MO class `QciProfilePredefined` and `resourceAllocationStrategy` in MO class `QciProfileOperatorDefined`

  Specifies whether uplink frequency-selective scheduling must be used for each QCI.

Parameter values can be changed without disabling the cell.

More information can be found in Downlink Frequency-Selective Scheduling, Uplink Frequency-Selective Scheduling, and Scheduler.

4.24 Minimum Rate Proportional Fair Scheduler

Minimum Rate Proportional Fair Scheduler is a licensed feature and require licences. To activate the feature, do the following: Install licenses and activate the feature state.

The behavior of Minimum Rate Proportional Fair Scheduler is configured using the following parameters:

— `schedulingAlgorithm` : specifies which scheduling algorithm that must be used for each QCI.

— `dlMinBitRate` : this parameter defines the minimum downlink Bit rate which the scheduler will attempt to enforce for users with this QCI.

— `ulMinBitRate` : this parameter defines the minimum uplink Bit rate which the scheduler will attempt to enforce for users with this QCI.

Parameter values can be changes without disabling the cell.

Note: It is recommended that all bearers in the same cell use the same type of scheduling. That is, all bearers in the same cell should use either Resource Fair scheduling or all should use Proportional Fair scheduling. While it is possible to mix Resource Fair scheduling and Proportional Fair scheduling, this can lead to ill-conditioned system behavior and should be avoided.

More information can be found in Minimum Rate Proportional Fair Scheduler and Scheduler.

4.25 Configure Data-Aware Uplink Scheduling

Data-Aware Uplink Scheduling improves uplink UE throughput and PRB resource utilization for large-buffer UEs with good channel conditions, identified as data-aware UEs. This also increases uplink average UE throughput and uplink cell throughput. This is achieved by ensuring that data-aware UEs are scheduled more frequently, and are allocated more radio resources than by the basic Scheduler function.

This licensed feature supports both TDD and FDD. It can be enabled or disabled at cell level.

To configure the feature, do the following:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes.
2. Enable or disable Data-Aware Uplink Scheduling by setting the number of data-aware UEs that can be candidates to get improved radio resources. This is handled by MOM attribute `noOfUlImprovedUe` in MO Class `EUtranCellFDD` and `EUtranCellTDD`.

   Note: The feature is enabled at activation, with the attribute `noOfUlImprovedUe` automatically set to 1.
3. Set the MOM attribute `bsrThreshold` in MO Class `EUtranCellFDD` and `EUtranCellTDD`.

   The attribute `bsrThreshold` is used to identify data-aware UEs.
4. Enable or disable the function of forcing data-aware UEs to be scheduled last in PUSCH resource allocation using the MOM attribute `ulImprovedUeSchedLastEnabled` in MO Class `EUtranCellFDD` and `EUtranCellTDD`.

   Note: The function is enabled by default.

4.26 Security Handling Configuration

This section covers configuration of security handling. The values of the attributes of the `SecurityHandling` MO class determine the security handling characteristics of an RBS.

— The `cipheringAlgoPrio` attribute determines the priority of the algorithms for ciphering UP data messages and RRC messages. It is possible to set attribute values specifying that some algorithms are not used at all.

Setting the value of the `cipheringAlgoPrio` to `EEA0` turns off the UP data and RRC message ciphering.

— The `countWrapSupervisionActive` attribute determines if the RBS supervises COUNT-C wrapping: see *3GPP TS 36.331*.

If the value of the attribute `countWrapSupervisionActive` is set to `true`, a new encryption key is generated by releasing and reestablishing the UE connection to the RBS when the supervision function indicates that the COUNT-C is close to its end. This ensures that the same COUNT-C value is never used twice as an encryption input

Do!

Inappropriate settings may cause significant problems.

if the value of the `countWrapSupervisionActive` attribute is set to `false`, no COUNT-C supervision is performed. This can result in the same COUNT-C value being used more than once as input for the encryption, which can compromise security.

— `integrityProtectAlgoPrio` :

the attribute determines which of the Integrity Protection Algorithms (ZUC, AES, and SNOW 3G) should be allowed, and their priority order.

Do!

Inappropriate settings may cause significant problems.

it is possible to allow the use of only one of the Integrity Protection Algorithms. However, this may cause failed handover of any UE unable to use the selected Integrity Protection Algorithm.

4.27 UE Measurement Control Configuration

This section covers configuration of User Equipment (UE) Measurement Control. All UE Measurement Control attributes can be found in the `UeMeasControl` MO class and control the system behavior regarding UE measurements. All attributes have default values that provide UE measurement functionality. The operator can change the attribute values in order to optimize network performance, however.

The most important UE measurement parameters are:

— Best cell

— Bad coverage

— UE measurement filter

3GPP TS 36.214 defines the quantities Reference Signal Received Power (RSRP) and Reference Signal Received Quality (RSRQ).

Further information on the uses of UE measurements can be found in Intra-LTE Handover and Performance Management.

4.27.1 UE Measurement Quality Threshold Configurations

`sMeasure`

The attribute determines the cell quality threshold value at which the UE starts to perform measurements. The default value is the most sensitive value available in the value range. The attribute is included in the `UeMeasControl` MO class.

4.27.2 Event A3 Measurement Configuration

Optimize mobility behavior by adjusting the values of the following attributes that are included in the `ReportConfigEUtraBestCell` MO class:

— `hysteresisA3`

The attribute determines the hysteresis for A3 events. Setting an appropriate value for the `hysteresisA3` attribute prevents rapid back-and-forth handover.

— `reportQuantityA3`

The attribute determines what the UE includes in measurement reports. Default value is `both`, which provides both RSRP and RSRQ measurements. Setting the value to `sameAsTriggerQuantity` only provides reports with RSRP or RSRQ according to what is set for the attribute `triggerQuantityA3` , which reduces load on the UE.

— `triggerQuantityA3`

The attribute determines which one of the RSRP and RSRQ measurements are used to trigger A3 events.

— `timeToTriggerA3`

The attribute determines the time to trigger value for A3 event.

— `a3offset`

The offset value for event A3 determines how much stronger a neighboring cell must be to fulfill the `bestCell` criterion.

— reportAmountA3

The attribute determines the number of reports for periodical reporting. A value of 0 indicates that an unlimited number of reports can be generated.

— reportIntervalA3

The attribute determines the interval for event triggered periodical reporting.

4.27.3 Poor Coverage Measurement Configuration

Poor coverage behavior is handled by event A2 UE measurements.

Report Configurations for Primary Poor Coverage UE Measurements

The report configurations for primary UE Measurements are included in the ReportConfigEUtraBadCovPrim MO class.

Optimize report configurations for primary UE Measurements by adjusting the values of the following attributes:

— a2ThresholdRsrpPrim

The attribute determines the threshold for A2 events if, and only if, the attribute triggerQuantityA2Prim is set to RSRP.

— a2ThresholdRsrqPrim

The attribute determines the threshold for A2 events if, and only if, the attribute triggerQuantityA2Prim is set to RSRQ.

— hysteresisA2prim

The attribute determines the hysteresis for primary A2 measurements. Setting an appropriate value for the attribute helps prevent triggering A2 events that are not necessary.

— reportQuantityA2Prim

The attribute determines the UE content in measurement reports. Default value is both, which provides both RSRP and RSRQ measurements. Setting the value to sameAsTriggerQuantity only provides reports with RSRP or RSRQ according to what is set for the attribute triggerQuantityA2Prim, which reduces load on the UE.

— timeToTriggerA2Prim

The attribute sets the time to trigger primary A2 events.

— triggerQuantityA2Prim

The attribute determines whether RSRP or RSRQ is used to trigger primary A2 events. The default value is RSRP, but can be set to RSRQ if desired.

— reportIntervalA2Prim

The attribute determines the interval for event triggered periodical reporting.

Report Configurations for Secondary Poor Coverage UE Measurements

The report configurations for secondary UE Measurements are included in the ReportConfigEUtraBadCovSec MO class.

Optimize report configurations for secondary UE Measurements by adjusting the values of the following attributes:

— a2ThresholdRsrpSec

The attribute determines the threshold for A2 events if, and only if, the attribute triggerQuantityA2Sec is set to RSRP.

— a2ThresholdRsrqSec

The attribute determines the threshold for A2 events if, and only if, the attribute triggerQuantityA2Sec is set to RSRQ.

— hysteresisA2sec

The attribute determines the hysteresis for secondary A2 measurements. Setting an appropriate value for the attribute helps prevent triggering A2 events that are not necessary.

— reportQuantityA2Sec

The attribute determines the UE content in measurement reports. Default value is both, which provides both RSRP and RSRQ measurements. Setting the value to sameAsTriggerQuantity only provides reports with RSRP or RSRQ according to what is set for the attribute triggerQuantityA2Sec , which reduces load on the UE.

— triggerQuantityA2Sec

The attribute determines whether RSRP or RSRQ is used to trigger secondary A2 events. The default value is RSRQ, but can be set to RSRP if desired.

— reportAmountA2Sec

The attribute determines the number of reports for periodical reporting. A value of 0 indicates that an unlimited number of reports can be generated.

— reportIntervalA2Sec

The attribute determines the interval for event triggered periodical reporting.

Report Configurations for Mobility Control at Poor Coverage UE Measurements

The report configurations for Mobility Control at Poor Coverage UE Measurements are included in the MO class `ReportConfigSearch` .

Optimize report configurations for Mobility Control at Poor Coverage UE Measurements by adjusting the values of the following attributes:

— `a1a2SearchThresholdRsrp`

  This attribute determines the Reference Signal Received Power (RSRP) threshold value for events A1Search and A2Search.

— `a1a2SearchThresholdRsrq`

  This attribute determines the Reference Signal Received Quality (RSRQ) threshold value for events A1Search and A2Search.

— `hysteresisA1A2SearchRsrp`

  This attribute determines the hysteresis value for RSRP in events A1Search and A2Search measurements.

— `hysteresisA1A2SearchRsrq`

  This attribute determines the hysteresis value for RSRQ in events A1Search and A2Search measurements.

— `timeToTriggerA1Search`

  This attribute determines the time-to-trigger value for measurement in event A1Search.

— `timeToTriggerA2Search`

  This attribute determines the time-to-trigger value for measurement in event A2Search.

— `a2CriticalThresholdRsrp`

  This attribute determines the RSRP threshold value for event A2Critical.

— `a2CriticalThresholdRsrq`

  This attribute determines the RSRQ threshold value for event A2Critical.

— `hysteresisA2CriticalRsrp`

  This attribute determines the hysteresis value for RSRP in event A2Critical measurement.

— `hysteresisA2CriticalRsrq`

This attribute determines the hysteresis value for RSRQ in event A2Critical measurement.

— `timeToTriggerA2Critical`

This attribute determines the time-to-trigger value for measurement in event A2Critical.

— `inhibitA2SearchConfig`

This attribute is used to deactivate RSRP or RSRQ event A2 measurements.

— `hysteresisA5RsrqOffset`

The offset to obtain the hysteresis for A5 measurement for trigger quantity RSRQ.

— `timeToTriggerB2Rsrq`

This attribute determines the time-to-trigger value for event B2 with trigger quantity RSRQ.

— `hysteresisB2RsrqOffset`

The offset to obtain the hysteresis for B2 measurement for trigger quantity RSRQ.

UE Measurement Control for Mobility Control at Poor Coverage

The UE measurement control for Mobility Control at Poor Coverage are included in the MO class `UeMeasControl`.

Optimize UE measurement control for Mobility Control at Poor Coverage by adjusting the values of the following attributes:

— `UeMeasControl.bothA5RsrpRsrqCheck`

This attribute is used to activate or deactivate the extended A5 "Target Good Enough" check. To activate the extended check, set the value to `1`. Any other value means the extended check is deactivated. The extended A5 check means that both the RSRQ and RSRP values from the A5 measurement report are checked, and only when both values are better than the corresponding thresholds will the reported cell be considered a viable handover target, see Mobility Control at Poor Coverage.

— `UeMeasControl.bothB1RscpEcnoCheck`

Used to activate or deactivate the extended B1 "Good enough target cell IRAT" check.

— `UeMeasControl.bothB2RscpEcnoCheck`

Used to activate or deactivate the extended B2 "Good enough target cell IRAT" check.

— `UeMeasControl.bothInterA3RsrpRsrqCheck`

Used to activate or deactivate the extended A3 "Good enough target cell on the same LTE frequency" check.

— `UeMeasControl.bothIntraA3RsrpRsrqCheck`

Used to activated or deactivate the extended A3 "Good enough target cell on other LTE frequency" check.

Report Configurations for Uplink Triggered Inter-Frequency Mobility Measurements

The report configurations for Uplink Triggered Inter-Frequency Mobility Measurements are included in the MO class `ReportConfigSearch`.

MO class `eNodeBFunction` contains an attribute to enable the uplink supervision.

Optimize report configurations for Uplink Triggered Inter-Frequency Mobility Measurements by adjusting the values of the following attributes:

— `a1a2UlSearchThreshold`

This attribute determines the UL-normalized SINR max threshold value for events A1 UL Search and A2 UL Search.

— `hysteresisA1A2UlSearch`

This attribute determines the hysteresis value for UL events A1 UL Search and A2 UL Search measurements.

— `timeToTriggerA1UlSearch`

This attribute determines the time-to-trigger value for UL measurement in event A1 UL Search.

— `timeToTriggerA2UlSearch`

This attribute determines the time-to-trigger value for UL measurement in event A2 UL Search.

— `a2UlCriticalThreshold`

This attribute determines the UL-normalized SINR max threshold value for event A2 UL Critical.

— `hysteresisA2UlCritical`

This attribute determines the hysteresis value for UL event A2 UL Critical measurements.

— `timeToTriggerA2UlCritical`

This attribute determines the time-to-trigger value for UL measurement in event A2 UL Critical.

— `qciA1A2UlThrOffsets`

This attribute determines QCI profile specific offsets to A1 UL and A2 UL search.

— `enabledUlTrigMeas`

This attribute enables or disables the UL SINR Max measurements and event triggers for the UL quality. The attribute only has effect if feature license for Uplink-Triggered Inter-Frequency Mobility is not installed.

4.27.4 Event A1 Measurement Configuration

Event A1 measurement implies that a bad coverage condition ceases, that is, the serving cell coverage becomes better than a threshold. Primary and secondary reporting configuration MOs refer to the option to use different settings for two simultaneous measurements.

Report Configurations for Primary Event A1 UE Measurements

The report configurations for primary A1 UE measurements are included in the `ReportConfigA1Prim` MO class.

Optimize report configurations for primary UE measurements by adjusting the values of the following attributes:

— `a1ThresholdRsrpPrim`

The attribute determines the threshold for A1 events if, and only if, the attribute `triggerQuantityA1Prim` is set to RSRP.

— `a1ThresholdRsrqPrim`

The attribute determines the threshold for A1 events if, and only if, the attribute `triggerQuantityA1Prim` is set to RSRQ.

— `hysteresisA1Prim`

The attribute determines the hysteresis for primary A1 measurements. Setting an appropriate value for the attribute helps prevent triggering A1 events that are not necessary.

— `reportQuantityA1Prim`

The attribute determines the UE content in measurement reports. Default value is `both`, which provides both RSRP and RSRQ measurements. Setting the value to `sameAsTriggerQuantity` only provides reports with RSRP or RSRQ according to what is set for the attribute `triggerQuantityA1Prim`. This reduces load on the UE.

— `timeToTriggerA1Prim`

The attribute sets the time to trigger primary A1 events.

— `triggerQuantityA1Prim`

The attribute determines whether RSRP or RSRQ is used to trigger primary A1 events. The default value is `RSRP`, but can be set to `RSRQ` if desired.

— `reportAmountA1Prim`

The attribute determines the number of reports for periodical reporting. A value of `0` indicates that an unlimited number of reports can be generated.

— `reportIntervalA1Prim`

The attribute determines the interval for event triggered periodical reporting.

Report Configurations for Secondary Event A1 UE Measurements

The report configurations for secondary UE measurements are included in the `ReportConfigA1Sec` MO class.

Optimize report configurations for secondary UE Measurements by adjusting the values of the following attributes:

— `a1ThresholdRsrpSec`

The attribute determines the threshold for A1 events if, and only if, the attribute `triggerQuantityA1Sec` is set to `RSRP`.

— `a1ThresholdRsrqSec`

The attribute determines the threshold for A1 events if, and only if, the attribute `triggerQuantityA1Sec` is set to `RSRQ`.

— `hysteresisA1Sec`

The attribute determines the hysteresis for secondary A1 measurements. Setting an appropriate value for the attribute helps prevent triggering A1 events that are not necessary.

— `reportQuantityA1Sec`

The attribute determines the UE content in measurement reports. Default value is `both`, which provides both RSRP and RSRQ measurements. Setting

the value to sameAsTriggerQuantity only provides reports with RSRP or RSRQ according to what is set for the attribute triggerQuantityA1Sec . This reduces load on the UE.

— triggerQuantityA1Sec

The attribute determines whether RSRP or RSRQ is used to trigger secondary A1 events. The default value is RSRQ, but can be set to RSRP if desired.

— reportAmountA1Sec

The attribute determines the number of reports for periodical reporting. A value of 0 indicates that an unlimited number of reports can be generated.

— reportIntervalA1Sec

The attribute determines the interval for event triggered periodical reporting.

4.27.5 Event A5 Measurement Configuration

The A5 event implies that the serving cell becomes worse than a first threshold, and neighbor cell becomes better than a second threshold.

The report configurations for event A5 UE measurements are included in the ReportConfigA5UlTrigmaxReportCellsA5 MO class.

Optimize report configurations for event A5 UE measurements by adjusting the values of the following attributes:

— a5Threshold1Rsrp

The attribute determines the first threshold value for A5 events if, and only if, the attribute triggerQuantityA5 is set to RSRP.

— a5Threshold2Rsrp

The attribute determines the second threshold value for A5 events if, and only if, the attribute triggerQuantityA5 is set to RSRP.

— a5Threshold1Rsrq

The attribute determines the first threshold value for A5 events if, and only if, the attribute triggerQuantityA5 is set to RSRQ.

— a5Threshold2Rsrq

The attribute determines the second threshold value for A5 events if, and only if, the attribute triggerQuantityA5 is set to RSRQ.

— hysteresisA5

The attribute determines the hysteresis for A5 measurements. Setting an appropriate value for the attribute helps prevent triggering A5 events that are not necessary.

— `reportQuantityA5`

The attribute determines the UE content in measurement reports. Default value is `both`, which provides both RSRP and RSRQ measurements. Setting the value to `sameAsTriggerQuantity` only provides reports with RSRP or RSRQ according to what is set for the attribute `triggerQuantityA5` . This reduces load on the UE.

— `timeToTriggerA5`

The attribute sets the time-to-trigger A5 events.

— `triggerQuantityA5`

The attribute determines whether RSRP or RSRQ is used to trigger primary A5 events. The default value is `RSRP`, but can be set to `RSRQ` if desired.

— `timeToTriggerA5Rsrq`

The time-to-trigger value for A5 event with trigger quantity RSRQ.

— `reportAmountA5`

The attribute determines the number of reports for periodical reporting. A value of `0` indicates that an unlimited number of reports can be generated.

— `reportIntervalA5`

The attribute determines the interval for event triggered periodical reporting.

— `maxReportCellsA5`

The attribute determines the maximum number of cells to include in the measurement report for the event A5 measurement.

Event A5 Report Configurations for Uplink-Triggered Inter-Frequency Mobility

The report configurations for event A5 UE measurements initiated by Uplink-Triggered Inter-Frequency Mobility are included in the `ReportConfigA5Ultrig` MO class.

Optimize report configurations for event A5 UE measurements by adjusting the values of the following attributes:

— `a5Threshold2Rsrp`

The attribute determines the second threshold value for A5 events. Should be set to a value corresponding to `a5Threshold2Rsrp` of `ReportConfigA5`.

— hysteresisA5

The attribute determines the hysteresis for A5 measurements. Setting an appropriate value for the attribute helps prevent triggering A5 events that are not necessary.

— timeToTriggerA5

The attribute sets the time-to-trigger A5 events.

— reportIntervalA5

The attribute determines the interval for event triggered periodical reporting.

4.27.6 Inter-Frequency Event A3 Measurement Configuration

The report configurations for Inter-frequency Event A3 UE Measurements are included in the MO class ReportConfigEUtraIFBestCell .

Optimize report configurations for inter-frequency event A3 UE measurements by adjusting the values of the following attributes:

— a3offset

The attribute determines the offset value for A3 event.

— hysteresisA3

The attribute determines the hysteresis for A3 event.

— a3RsrqOffset

This attribute is used to obtain the a3offset for trigger quantity RSRQ, when the feature Mobility Control at Poor Coverage is operable.

Note: If the attribute has value -2000000000 (default), it will be handled as if it had value 0.

— hysteresisA3RsrqOffset

This attribute is used to obtain the hysteresisA3 for trigger quantity RSRQ, when the feature Mobility Control at Poor Coverage is operable.

Note: If the attribute has value -2000000000 (default), it will be handled as if it had value 0.

— triggerQuantityA3

The attribute determines the quantity that triggers the A3 event.

— timeToTriggerA3

The attribute determines the time-to-trigger value for A3 event.

— `timeToTriggerA3Rsrq`

The attribute determines the time-to-trigger value for A3 event with trigger quantity RSRQ.

4.27.7 Event B1 Measurement Configuration

The B1 event implies that Inter RAT neighbor becomes better than the threshold. This measurement is used when searching for a suitable target cell when CS Fallback is triggered for the UE. This measurement is also used when selecting suitable UE for offload and the event B1 threshold RSCP ensures that the target UTRAN cell provides good enough coverage for the UE. The report configurations for event B1 measurements are included in the following MOs:

— `ReportConfigCsfbGeran`

— `ReportConfigCsfbCdma2000`

— `ReportConfigInterRatLb`

— `ReportConfigCsfbUtra`

Event B1 Report Configurations for GERAN Measurements

The MO `ReportConfigCsfbGeran` contains report configuration settings for the B1 or B2 event for GERAN measurements, used when searching for a suitable target cell when CS Fallback is triggered for the UE.

`ReportConfigCsfbGeran.thresholdGeran`
The attribute determines the Signal Quality in the ThresholdGERAN, threshold value for event B1 or B2.

`ReportConfigCsfbGeran.hysteresis`
The attribute determines the hysteresis value for the event B1 measurement or B2 measurement.

`ReportConfigCsfbGeran.maxReportCells`
The attribute determines the maximum number of cells to include in the measurement report for the event B1 or B2 measurement.

`ReportConfigCsfbGeran.reportAmount`
The attribute determines the number of reports for periodical reporting for the event B1 or B2 measurement. Value `0` means that reports are sent as long as the event is fulfilled.

`ReportConfigCsfbGeran.reportInterval`

The attribute determines the interval for event-triggered periodical reporting for the event B1 or B2 measurement.

ReportConfigCsfbGeran.timeToTrigger
The attribute determines the time to trigger value for the eventB1 or B2 measurement.

Event B1 Report Configurations for CDMA2000 1xRTT Measurements

The MO ReportConfigCsfbCdma2000 contains report configuration settings for the B1 or B2 event for CDMA2000 1xRTT measurements. This measurement is used when searching for a suitable target cell when CS Fallback is triggered for the UE.

ReportConfigCsfbCdma2000.thresholdCdma20001xRtt
The attribute determines the signal quality in the CDMA2000 threshold for B1 events.

ReportConfigCsfbCdma2000.hysteresis
The attribute determines the hysteresis value for the event B1 measurement on CDMA2000.

ReportConfigCsfbCdma2000.timeToTrigger
The attribute sets the time to trigger B1 event measurement on CDMA2000.

UeMeasControl.csfbHoTargetSearchTimer
The attribute determines the length of time the eNodeB waits for a report from B1 event measurements configured in the UE for CS Fallback reasons.

UeMeasControl.maxMeasCdma20001xRtt
The attribute determines the maximum number of measurements that can be concurrently performed by the UE on CDMA2000 1xRTT measurement objects.

Event B1 Report Configurations for Inter-RAT Offload to WCDMA Measurements

The MO ReportConfigInterRatLb contains report configuration settings for the B1 event for Inter-RAT Offload to WCDMA measurements. This measurement is used when selecting a suitable UE for offload. The event B1 threshold (RSCP) ensures that the target UTRAN cell provides good enough coverage for the UE.

ReportConfigInterRatLb.utranB1ThresholdRscp
The attribute determines the RSCP threshold value or event B1 measurement.

ReportConfigInterRatLb.utranHysteresisB1
The attribute determines the hysteresis for B1 event measurement.

Event B1 Report Configurations for UTRA measurements

The MO ReportConfigCsfbUtra contains report configuration settings for the B1 or B2 event for UTRA measurements, used when searching for a suitable target cell when CS Fallback is triggered for the UE.

ReportConfigCsfbUtra.thresholdEcNo
The attribute determines the ratio of energy per modulation bit to noise spectral density used in the enum ThresholdUTRA, the threshold value for event B1 and threshold2 value for event B2.

ReportConfigCsfbUtra.thresholdRscp
The attribute determines the RSCP in the enum ThresholdUTRA, the threshold value for event B1 and threshold2 value for event B2.

ReportConfigCsfbUtra.hysteresis
The attribute determines the hysteresis value for the event B1 measurement or B2 measurement.

ReportConfigCsfbUtra.maxReportCells
The attribute determines the maximum number of cells to include in the measurement report for the event B1 or B2 measurement.

ReportConfigCsfbUtra.reportAmount
The attribute determines the number of reports for periodical reporting for the event B1 or B2 measurement. Value 0 means that reports are sent as long as the event is fulfilled.

ReportConfigCsfbUtra.reportInterval
The attribute determines the interval for event-triggered periodical reporting for the event B1 or B2 measurement.

ReportConfigCsfbUtra.timeToTrigger
The attribute determines the time to trigger value for the event B1 or B2 measurement.

4.27.8 Event B2 Measurement Configuration

The B2 event implies that the serving cell becomes worse than a first threshold, and an IRAT neighbor cell becomes better than a second threshold. This measurement confirms if the UE listens to cells (UTRA FDD, UTRA TDD and CDMA2000 eHRPD) or frequencies (GERAN), before a release with redirect is triggered to those technologies. The report configurations for event B2 measurements are included in the following MO Classes:

— ReportConfigB2Utra

— ReportConfigB2Cdma2000

— ReportConfigB2Geran

The B2 report configurations for UTRA and GERAN measurements are the same as the B1 report configurations as described in UE Measurement Control Configuration on page 98.

Event B2 Report Configurations for UTRA Measurements

The MO class ReportConfigB2Utra contains report configuration settings for the B2 event for UTRA measurements. The event is used to detect when the serving cell becomes worse than a first threshold and a UTRAN cell becomes better than a second threshold.

Optimize report configurations for UTRA Measurements by adjusting the values of the following attributes:

— b2Threshold1Rsrp

The attribute determines the first threshold for B2 events if, and only if, the attribute triggerQuantityB2 is set to RSRP.

— b2Threshold1Rsrq

The attribute determines the first threshold for B2 events if, and only if, the attribute triggerQuantityB2 is set to RSRQ.

— b2Threshold2RscpUtra

The attribute determines the second threshold (UTRA threshold) for B2 events if, and only if, the attribute triggerQuantityB2 is set to RSCP.

— b2Threshold2EcNoUtra

The attribute determines the ratio of energy per modulation bit to noise spectral density in the second threshold value (UTRA threshold) for B2 events. This only applies if, and only if, the attribute triggerQuantityB2 is set to ECNO. b2Threshold2EcNoUtra is not applicable for UTRA TDD.

— hysteresisB2

The attribute determines the hysteresis for B2 event measurements on EUTRAN. Setting an appropriate value for the attribute helps prevent triggering B2 events that are not necessary.

— timeToTriggerB2

The attribute sets the time to trigger B2 events.

— triggerQuantityB2

The attribute determines the quantity for the first threshold that is sent to the UE, and is used together with the second threshold to trigger the event B2.

— `reportAmountB2`

The attribute determines the number of reports for periodical reporting. A value of `0` indicates that an unlimited number of reports can be generated.

— `reportIntervalB2`

The attribute determines the interval for event triggered periodical reporting.

— `maxReportCellsB2`

The attribute determines the maximum number of cells to include in the measurement report for the event B2 measurement.

Event B2 Report Configurations for CDMA2000 Measurements

The MO class `ReportConfigB2Cdma2000` contains report configuration settings for the B2 event for CDMA2000 measurements. The event is used to detect when the serving cell becomes worse than a first threshold, and a CDMA2000 cell becomes better than a second threshold.

Optimize report configurations for CDMA2000 measurements by adjusting the values of the following attributes:

— `b2Threshold1Rsrp`

The attribute determines the first threshold for B2 events if, and only if, the attribute `triggerQuantityB2` is set to RSRP.

— `b2Threshold1Rsrq`

The attribute determines the first threshold for B2 events if, and only if, the attribute `triggerQuantityB2` is set to RSRQ.

— `b2Threshold2Cdma2000`

The attribute determines the signal quality in the second threshold (CDMA2000 threshold), for B2 events.

— `hysteresisB2`

The attribute determines the hysteresis for B2 event measurements on EUTRAN. Setting an appropriate value for the attribute helps prevent triggering B2 events that are not necessary.

— `timeToTriggerB2`

The attribute sets the time to trigger B2 events.

— triggerQuantityB2

The attribute determines the quantity for the first threshold that is sent to the UE, and is used together with the second threshold to trigger the event B2.

— reportAmountB2

The attribute determines the number of reports for periodical reporting. A value of 0 indicates that an unlimited number of reports can be generated.

— reportIntervalB2

The attribute determines the interval for event triggered periodical reporting.

— maxReportCellsB2

The attribute determines the maximum number of cells to include in the measurement report for the event B2 measurement.

Event B2 Report Configurations for GERAN Measurements

The MO class ReportConfigB2Geran contains report configuration settings for the B2 event for GERAN measurements. The event is used to detect when a GERAN cell becomes better than a second threshold and the serving cell becomes worse than a first threshold.

Optimize report configurations for GERAN measurements by adjusting the values of the following attributes:

— b2Threshold1Rsrp

The attribute determines the first threshold for B2 events if, and only if, the attribute triggerQuantityB2 is set to RSRP.

— b2Threshold1Rsrq

The attribute determines the first threshold for B2 events if, and only if, the attribute triggerQuantityB2 is set to RSRQ.

— b2Threshold2Geran

The attribute determines the signal quality in the second threshold (GERAN threshold), for B2 events.

— hysteresisB2

The attribute determines the hysteresis for B2 event measurements on EUTRAN. Setting an appropriate value for the attribute helps prevent triggering B2 events that are not necessary.

— timeToTriggerB2

The attribute sets the time to trigger B2 events.

— triggerQuantityB2

  The attribute determines the quantity for the first threshold that is sent to the UE, and is used together with the second threshold to trigger the event B2.

— reportAmountB2

  The attribute determines the number of reports for periodical reporting. A value of 0 indicates that an unlimited number of reports can be generated.

— reportIntervalB2

  The attribute determines the interval for event triggered periodical reporting.

— maxReportCellsB2

  The attribute determines the maximum number of cells to include in the measurement report for the event B2 measurement.

Event B2 Report Configurations for UTRA Measurements for Uplink-Triggered Inter-Frequency Mobility

The report configuration settings for event B2 UE measurements for UTRA initiated by Uplink-Triggered Inter-Frequency Mobility are included in MO Class ReportConfigB2UtraUlTrig.

Optimize report configurations for UTRA measurements by adjusting the values of the following attributes:

— b2Threshold2EcNoUtra

— b2Threshold2RscpUtra

— hysteresisB2

— reportIntervalB2

— timeToTriggerB2

Event B2 Report Configurations for GERAN Measurements for Uplink-Triggered Inter-Frequency Mobility

The report configuration settings for event B2 UE measurements for GERAN initiated by Uplink-Triggered Inter-Frequency Mobility are included in MO Class ReportConfigB2GeranUlTrig.

Optimize report configurations for GERAN measurements by adjusting the values of the following attributes:

— b2Threshold2Geran

- hysteresisB2
- reportIntervalB2
- timeToTriggerB2

4.27.9 Configure Inhibition of B2-RSRQ

The attribute UeMeasControl.inhibitB2RsrqConfig enables or disables configuration of B2-RSRQ, if event A2Search-RSRQ is triggered by UE entering the search zone.

- inhibitB2RsrqConfig = FALSE

  The node configures event B2-RSRQ when event A2-RSRQ is reported by the UE.

- inhibitB2RsrqConfig = TRUE

  The node does not configure event B2-RSRQ when the event A2-RSRQ is reported by the UE.

By default, this value is set to FALSE.

4.27.10 UE Measurement Filter Configuration

Filtering is used to improve event evaluation based on UE measurements. It helps prevent isolated anomalous UE measurements from influencing event evaluation too much. The attributes are included in the UeMeasControl MO class.

The following filtering coefficients exist:

- filterCoefficientEUtraRsrp

  The attribute determines the filtering coefficient for EUTRA using measured RSRP.

- filterCoefficientEUtraRsrq

  The attribute determines the filtering coefficient for EUTRA using measured RSRQ.

- filterCoefficientEUtraUlSinrMax

  The attribute determines the filtering coefficient for EUTRA using UE UL-normalized Signal-to-Noise-Max measurements in eNodeB. This filter is utilized for eNodeB uplink measurements.

- filterCoefficientEUtraNI

The attribute determines the filtering coefficient for noise and interference value measure in eNodeB and is used in calculation of Uplink Signal-to-Noise-Ratio.

For further information see the chapter about Layer 3 Filtering in *3GPP TS 36.331*.

4.27.11 Event Based ANR Measurements

This section lists the ANR-specific parameters for event based ANR measurements.

The purpose with event based ANR measurements is to detect neighbor cells before UE have reported them in mobility reports for handover.

The process employed by the UE for the event based evaluations of surrounding cells uses parameters sent by the serving RBS to the UE. The ANR function use reports from the UE to identify neighbor cells.

The `EnodeBFunction.measuringEcgiWithAgActive` parameter is used to enable CGI measurement with autonomous gap for the target LTE and UTRAN cell.

For parameters to adjust the report volume see ANR Function.

4.27.11.1 Event A3 for ANR

The A3 event implies that one or several neighbor cells become better than the serving cell also when some offset and hysteresis values are taken into account. General event A3 configuration is described in Event A3 Measurement Configuration on page 99.

Event A3 for ANR use the following parameters in the `ReportConfigEUtraBestCellAnr` MO class, relating to the general event A3 parameters:

— `a3offsetAnrDelta`

— `hysteresisA3`

— `timeToTriggerA3`

4.27.11.2 Event A5 for ANR

The A5 event implies that the serving cell becomes worse than a first threshold, and neighbor cell becomes better than a second threshold. General event A5 configuration is described in Event A5 Measurement Configuration on page 107.

Event A5 for ANR use the following parameters relating to the general event A5 parameters in the `ReportConfigA5` MO class:

- triggerQuantityA5
- a5Threshold1RsrpAnrDelta
- a5Threshold1RsrqAnrDelta
- a5Threshold2RsrpAnrDelta
- a5Threshold2RsrqAnrDelta
- hysteresisA5
- timeToTriggerA5

4.28 System Information

System Information consists of a MasterInformationBlock (MIB) and a number of SystemInformationBlocks (SIB). SystemInformationBlockType1 is carried in its own dedicated RRC message. SIBs other than SystemInformationBlockType1 are carried in SystemInformation (SI) messages which can be configured using following parameters included in the EUtranCellFDD or EUtranCellTDD MO class.

- EUtranCellFDD.changeNotification or EUtranCellTDD.changeNotification :

  for each System Information Block (SIB), indicates when the SIB content is changed, if system information change notification is broadcast prior to broadcast of updated system information.

- EUtranCellFDD.mappingInfo or EUtranCellTDD.mappingInfo :

  this parameter mappingInfo defines which SI message each SIB is included in. One or more SIBs may be included in the same SI message. If more than one SIB are to be included in the same SI message, they will have the same periodicity as defined by the value of the parameter EUtranCellFDD.siPeriodicity or EUtranCellTDD.siPeriodicity for that SI message.

- EUtranCellFDD.modificationPeriodCoeff or EUtranCellTDD.modificationPeriodCoeff :

  the modification period is expressed in number of radio frames = modificationPeriodCoeff * defaultPagingCycle. More information about the paging-related parameters determine and the default paging cycle can be found in Paging.

  The modificationPeriodCoeff results in the number of Paging Occasions for an IDLE UE to detect a system information change notification. Setting a large value for this parameter will increase the probability that SI Change notifications will reach all UEs, but will generate a slightly higher load during

a modification period. Setting a lower value will decrease the load during a modification period, but will also decrease the probability that the SI message SI Change notifications will reach all UEs.

Note: `modificationPeriodCoeff * defaultPagingCycle` must be equal to or less than 1024 radio frames.

— `EUtranCellFDD.siPeriodicity` or `EUtranCellTDD.siPeriodicity` :

this parameter defines the periodicity of System Information (SI) messages.

— `EUtranCellFDD.siWindowLength` or `EUtranCellTDD.siWindowLength` :

This parameter `siWindowLength` defines the length of the SI window, expressed in ms, within which each SI message is transmitted. Setting a large value for this parameter may allow message repetition (and thus greater redundancy), but use slightly more system resources.

The value for `siWindowLength` applies to all SI messages.

Note: It must be possible to schedule all SI messages within the shortest value for `siPeriodicity` used. That is: `siWindowLength * 'transmitted number of SI-messages' <= MIN(siPeriodicitySIx)`.

Note: The following is valid for `EUtranCellTDD.siWindowLength` only.

The setting of `siWindowLength` is invalid if there is no DL sub-frame within the transmission window of each SI message that is configured. This means that `siWindowLength = {1, 2} ms` may be invalid for TDD `subframeAssignment = 1`. Also `siWindowLength = 1 ms` may be invalid for TDD `subframeAssignment = 2`, depending on the number of SI messages configured.

The behavior of individual SIBs 1 - 8 can be controlled by parameters listed in the System Information section of Radio Network Configuration.

4.29 Positioning Configuration

This section covers configuration of the Observed Time Difference of Arrival (OTDOA) positioning method. The attributes of the `EUtranCellFDD` or `EUtranCellTDD` MO class determine the OTDOA characteristics The Positioning Reference Signals (PRS) is transmitted over the entire bandwidth. All cells participating in OTDOA positioning must be configured with PRS. OTDOA can be activated per cell.

4.29.1 Activation and License Configuration

The following must be fulfilled at feature activation:

— A license key must be activated to operate OTDOA support in Secure User Plane Location (SUPL) feature. See License Management and OTDOA User Plane Location Support.

— Set EUtranCellFDD.otdoaSuplActive or EUtranCellTDD.otdoaSuplActive to ACTIVATED or DEACTIVATED per cell.

— Configure the feature Clock Source over GPS with time and phase synchronization.

— Set ENodeBFunction.timeAndPhaseSynchAlignment to TRUE.

Note: If parameter ENodeBFunction.timeAndPhaseSynchAlignment is set to TRUE the OTDOA feature will be disabled if the time and phase synchronization accuracy for OTDOA is not fulfilled.

4.29.2 PRS Configuration

There are two ways of configuring PRS. The preferred way, guarantees non-collisions between PRS and SIB1 sub-frames. Configure PRS by setting the parameter EUtranCellFDD.prsPeriod or EUtranCellTDD.prsPeriod :

— prsPeriod

Periodicity of the PRS transmissions. The value of prsPeriod together with a fixed value for PRS subframe offset, is used by the eNodeB to calculate the read-only EUtranCellFDD.prsConfigIndexMapped or EUtranCellTDD.prsConfigIndexMapped parameter.

The alternative way gives full flexibility, but collisions between PRS and SIB1 sub-frames may occur:

Configure PRS by setting the parameters EUtranCellFDD.prsConfigIndex and EUtranCellFDD.NoConsecutivePrsSubframes , or EUtranCellTDD.prsConfigIndex and EUtranCellTDD.NoConsecutivePrsSubframes .

— prsConfigIndex:

the Positioning Reference Signal (PRS) index value for the cell defines the periodicity of the PRS transmissions and the PRS subframe offset as defined in *3GPP TS 36.211*. The value is copied by the eNodeB to the read-only EUtranCellFDD.prsConfigIndexMapped , or EUtranCellTDD.prsConfigIndexMapped parameter.

Note: prsConfigIndex must be set to a value which avoids collision between the PRS subframe and SIB1, otherwise the eNodeB will respond with a cell setup reject.

— prsEnabled

If this attribute is set to TRUE, the PRS will be sent from this SectorCarrier MO.

If only one sector carrier is configured in the cell, the parameter must be set to true.

Configure PRS for improved positioning accuracy by setting the following parameters:

— EUtranCellFDD.prsTransmisScheme or EUtranCellTDD.prsTransmisScheme :

this parameter allows selecting either antenna switching or pre-coder switching for the PRS transmission.

— EUtranCellFDD.prsPowerBoosting or EUtranCellTDD.prsPowerBoosting :

this parameter allows the selection of different power boosting alternatives for PRS transmissions.

— EUtranCellFDD.prsMutingPatternLen or EUtranCellTDD.prsMutingPatternLen :

this parameter allows the selection of the length in number of bits of the PRS muting pattern.

— EUtranCellFDD.prsMutingPattern or EUtranCellTDD.prsMutingPattern :

this parameter is a bit string. It stores the muting pattern in use.

4.29.3 Cell Geographical Information

The cell geographical information is defined by the following attributes in the EUtranCellFDD or EUtranCellTDD MO:

— EUtranCellFDD.latitude or EUtranCellTDD.latitude :

the degree of latitude of the transmitter antenna position.

In the case of a combined cell:

If all sector carriers in a combined cell have the same output power, for example in indoor scenario or 3-sector site scenario, it is assumed that the antennas of different sector carriers are located close to each other, therefore the position parameter is set using any of the antennas position. If there is one macro sector that has the highest power, the position parameter is set using the antenna position of the macro sector.

— EUtranCellFDD.longitude or EUtranCellTDD.longitude :

the degree of longitude of the transmitter antenna position.

In the case of a combined cell:

If all sector carriers in a combined cell have the same output power, for example in indoor scenario or 3-sector site scenario, it is assumed that the antennas of different sector carriers are located close to each other, therefore the position parameter is set using any of the antennas position. If there is one macro sector that has the highest power, the position parameter is set using the antenna position of the macro sector.

— `EUtranCellFDD.altitude` or `EUtranCellTDD.altitude` :

the altitude of the transmitter antenna in meters.

In case of a combined cell:

If all sector carriers in a combined cell have the same output power, for example in indoor scenario or 3-sector site scenario, it is assumed that the antennas of different sector carriers are located close to each other, therefore the position parameter is set using any of the antennas position. If there is one macro sector that has the highest power, the position parameter is set using the antenna position of the macro sector.

— `EUtranCellFDD.uncertSemiMajor` or `EUtranCellTDD.uncertSemiMajor` : semi-major axis of uncertainty.

— `EUtranCellFDD.uncertSemiMinor` or `EUtranCellTDD.uncertSemiMinor` : semi-minor axis of uncertainty.

— `EUtranCellFDD.orientMajorAxis` or `EUtranCellTDD.orientMajorAxis` : the orientation of major axis of uncertainty, in degrees clockwise from north.

— `EUtranCellFDD.uncertAltitude` or `EUtranCellTDD.uncertAltitude` : the uncertainty altitude.

— `EUtranCellFDD.confidence` or `EUtranCellTDD.confidence` : set to define the percentage of confidence that the target is within the ellipsoid parameters defined by the `uncertSemiMajor`and the `uncertAltitude` parameters.

— `EUtranCellFDD.eutranCellCoverage` or `EUtranCellTDD.eutranCellCoverage` models the cell coverage area used for UE positioning. The cell coverage area is defined by the cell bearing, cell opening angle and cell radius.

— `EUtranCellFDD.eutranCellPolygon` or `EUtranCellTDD.eutranCellPolygon` models the manageable characteristics for the cell polygon used for UE positioning.

4.30 Maximum Cell Range

FDD only: Maximum Cell Range is configured with the attribute `cellRange` in the `EUtranCellFDD` MO class.

TDD only: Maximum Cell Range is configured with the attributes `cellRange`, `subframeAssignment` and `specialSubframePattern` in the `EUtranCellTDD` MO class.

Note: The feature Maximum Cell Range must be installed and enabled in order to set values other than 15 km for `cellRange`. More information on the feature and how to install and enable it can be found in Maximum Cell Range and in the `MaximumCellRange` MO class. License Management and Licensing describe license handling.

TDD only: for `cellRange` values larger than 15, the parameter `subframeAssignment` must be set to 1. There are also limitations to the allowed configuration of `cellRange` depending on the `specialSubframePattern`.

Note: For TDD there is a trade-off between DL throughput and cell range:

For TDD only:

— `specialSubframePattern 7` allows cell ranges 1...18 km. Using specialSubframePattern 7 provides the best DL throughput. `EUtranCellTDD.cellRange` values larger than 18 will be rejected due to inconsistency between `specialSubframePattern` and `cellRange`.

— `specialSubframePattern 6` allows cell ranges 1...29 km

  Using specialSubframePattern 6 provides a slightly reduced DL throughput. `EUtranCellTDD.cellRange` values larger than 29 will be rejected due to inconsistency between `specialSubframePattern` and `cellRange`.

— `specialSubframePattern 5` allows cell ranges 1...93 km.

  Cell ranges greater than 29 km requires use of `specialSubframePattern 5`, but this significantly reduces DL throughput. `cellRange` values larger than 93 will be rejected due to inconsistency between `specialSubframePattern` and `cellRange`.

4.31 Air Interface Load Generator

The configuration of the Air Interface Load Generator is determined by the parameters in the `AirIfLoadProfile` MO class:

— `ailgChangePeriod`

— `ailgHighPrio`

- ailgLoadType
- ailgLowPrioModType
- dlPrbLoadLevel
- minLoadLevelPdcch
- noOfOcngPrbSeries
- ocngPrbSerie

Minimal load level associated with downlink Physical Resource Block (PRB) use expressed as a percentage.

The Air Interface Load Generator requires that the corresponding license is installed. More information on handling licenses can be found in License Management.

4.31.1 Start and Stop Air Interface Load Generator

Steps

Start and stop the Air Interface Load Generator as follows:

1. Start the Air Interface Load Generator with the parameter EUtranCellFDD.startAilg or EUtranCellTDD.startAilg .
2. Stop the Air Interface Load Generator with the parameter EUtranCellFDD.stopAilg or EUtranCellTDD.stopAilg .

4.31.2 Automatic Restart of Air Interface Load Generator

Use the parameter EUtranCellFDD.ailgAutoRestartEnabled or EUtranCellTDD.ailgAutoRestartEnabled to configure the Air Interface Load Generator to be automatically restarted after the following:

- Cell disabled, followed by cell enabled
- Node start
- Node restart

Note: The parameter value must be set to TRUE for the automatic restart to take place.

4.32 Subscriber Triggered Mobility

This section covers configuration of Subscriber Profile ID (SPID) for RAT and frequency selection priority. SPID creates subscriber specific behavior in order to control UE mobility.

4.32.1 SPID Controlled Idle Mode Mobility and Session Continuity

SPID for RAT and frequency selection priority is used to define camp priorities in idle mode and to control inter-RAT as well as inter- and intra-frequency handover in connected mode.

The following must be fulfilled at feature activation:

— A license key must be activated to operate SPID for RAT and Frequency Priority Modification (RFPM). See License Management and Subscriber Triggered Mobility.

The configuration of SPID is determined by the following parameter in the `RATFreqPrio` MO class:

— `spidList`

A list that includes all UEs that are affected by the RAT priorities specified in this MO class.

— `t320`

The validity time for cell reselection priority information provided by dedicated signalling. Used by the UE.

— `freqPrioListEUTRA`, `freqGroupPrioListGERAN`, `freqPrioListUTRA`, `bandClassPrioListCDMA2000`

Prioritize the specified RAT frequencies, among all frequencies related to the cell, for UE cell reselection procedure and for UEs in connected mode.

4.32.2 SPID for Operator Reserved Cells

When performing a handover of a UE in connected mode to a cell configured to be reserved for operator use, the source eNodeB do not have information about the target cell reservation.

By using SPID the target cell can check if the UE belongs to a group that is allowed to perform incoming handover to an operator reserved cell. This allows configuration of test UEs with a SPID value present in a white list. UEs not present in this list will be rejected.

The following must be fulfilled at feature activation:

— A license key must be activated to operate SPID for Operator Reserved Cell (ORC). See License Management and Subscriber Triggered Mobility.

The configuration of the feature is determined by the following parameter in the `HoWhiteList` MO class:

— `spidList`

  A list of UEs, that are allowed to perform incoming handover to a cell that is reserved for operator use.

4.33 UE Throughput-Based Mobility to Wi-Fi

UE Throughput-Based Mobility to Wi-Fi is a licensed feature that makes it possible for the operator to control the mobility between Wi-Fi and LTE, based on the current end-user throughput in Wi-Fi respective LTE. By tuning the attribute `biasThpWifiMobility` , the mobility can be steered to or from Wi-Fi when UE in `CONNECTED` mode requests access to WiFi. For information about license handling, feature activation and feature operation see UE Throughput-Based Mobility to Wi-Fi.

4.34 Multi-Layer Service-Triggered Mobility

Multi-Layer Service-Triggered Mobility is a licensed feature used for mobility purposes. With this feature, operators can configure different A1 and A2 Search threshold offset values for different cells and QCIs. It is also possible to configure different A5 and B2 threshold offset values for different target frequencies or QCIs, and for target frequencies for the good enough cell on other RAT or frequency. These offsets are used to compute measurement thresholds in the following procedures:

— Initial context setup

— E-RAB setup

— E-RAB release

— E-RAB modify

— Incoming handover

Different services and frequency relations can be tuned by setting different A1 and A2 thresholds respective different A5 or B2 thresholds. For more information about feature activation and configuration parameters see Multi-Layer Service-Triggered Mobility.

4.35 Shared LTE RAN

A core network operator provides its mobile phone services through a PLMN (Public Land Mobile Network). Conventionally, a PLMN consists of a radio access network (RAN) and core network (CN), through which only one operator provides services to its subscriber. Subscribers of other operators may receive services as national or international roamers.

The Shared LTE RAN feature includes RAN functions that makes it possible for operators to share a network. It supports session continuity and handover to and from a Shared Network.

LTE Shared Network Support is a licensed feature, more information can be found in Shared LTE RAN.

To activate LTE Shared Network Support, do the following:

— Install licenses and activate the feature state: see Licensing and Shared LTE RAN.

4.35.1 Configure PLMNs in Shared network

Configure shared RAN using the following parameters in the `EUtranCellFDD` or the `EUtranCellTDD` MO class:

— `EUtranCellFDD.activePlmnList` or `EUtranCellTDD.activePlmnList` :

  this parameter lists PLMN IDs that are served by at least one MME.

— `EUtranCellFDD.additionalPlmnList` or `EUtranCellTDD.additionalPlmnList` :

  this parameter lists additional PLMN IDs supported in the cell.

— `EUtranCellFDD.primaryPlmnReserved` or `EUtranCellTDD.primaryPlmnReserved` :

  this parameter specifies if the primary PLMN ID is reserved for operator use in the cell.

— `EUtranCellFDD.additionalPlmnReservedList` or `EUtranCellTDD.additionalPlmnReservedList` :

  this parameter specifies for the list of PLMN IDs in the `additionalPlmnList` whether or not they are reserved for operator use in the cell.

Configure the following parameters:

— `activePlmnList`, in the `ExternalEUtranCellFDD` or the `ExternalEUtranCellTDD` MO class. It lists the PLMN IDs in the External E-UTRAN Cell.

— nnsfMode in the ENodeBFunction MO class. It determines the mode used by the RBS for the non-access stratum node selection.

— zzzTemporary23 is in the ENodeBFunction MO class. The parameter is used to decide which PLMN is used to fill the PLMN part of the EVENT_PARAM_GUMMEI header field in each PM event.

  • 0 – The served PLMN from the first GUMMEI in the served GUMMEIs IE in the last S1-AP S1 SETUP RESPONSE or S1-AP MME CONFIGURATION UPDATE message received by the eNodeB from the MME.

  • 1 – The PLMN selected by the UE.

Configure Frequency Relations in Shared RAN

The frequency relations for the shared RANs must be defined.

Configure the following parameters for the applicable RANs.

— Shared LTE RAN

  List all allowed LTE PLMN identities using the parameter allowedPlmnList in the EutranFreqRelation MO class for LTE RANs.

— Shared GSM RAN

  List all allowed GSM PLMN identities using the parameter allowedPlmnList in the GeranFreqGroupRelation MO class for LTE RANs.

— Shared WCDMA RAN

  List all allowed WCDMA PLMN identities using the parameter allowedPlmnList in the UtranFreqRelation MO class for LTE RANs.

Configure System Information in Shared RAN

The SIBs must also include information for the shared networks. More information about SIBs can be found in System Information on page 119. and in Radio Network Configuration

Configure the following parameters:

— Shared LTE RAN

  • includeInSystemInformation in EUtranCellRelation MO class.

  • includeInSystemInformation in EUtranFreqRelation MO class.

— Shared WCDMA RAN

  includeInSystemInformation in UtranFreqRelation MO class.

— Shared GSM RAN

  includeInSystemInformation in GeranFreqGroupRelation MO class.

— Shared CDMA2000 RAN

  includeInSystemInformation in Cdma2000CellRelation MO class.

4.36 Radio Resource Partitioning, FDD Only

This licensed feature makes it possible to configure predefined shares for the usage of the radio resources. The partitions are based on PLMN for operators sharing the radio network or partitions based on SPID values used for specific groups of UEs.

More information about the feature Radio Resource Partitioning is found in Radio Resource Partitioning.

Note: If more than one set of ResourcePartition and resourcePartitionShare is required, multiple ResourcePartitionGroup MOs must be defined.

4.36.1 Configure Radio Resource Partitioning Based on PLMN

When configuration is based on PLMN, the license for Shared LTE RAN needs to be activated. More information can be found in Shared LTE RAN.

Steps

1. Install the license and activate the feature state; see Licensing and the RadioResourcePartitioning MO class.
2. Create an MO ResourcePartition for each set of PLMN(s) to include in a resource partition.
3. Set partitionId and plmnList in each ResourcePartition MO.

   plmnList specifies which PLMN(s) to include in the resource partition.
4. Create an MO ResourcePartitionGroup.
5. Create an MO ResourcePartitionGroupMember for each ResourcePartition that shall belong to the ResourcePartitionGroup. Set resourcePartitionRef to specify a ResourcePartition and set resourcePartitionShare to define the share of resources available to the partition.
6. Set EUtranCellFDD.resourcePartitionGroupRef to the ResourcePartitionGroup to be used in this cell.

7. **Note:** All PLMNs defined in `EUtranCellFDD.additionalPlmnList` must exist in the `ResourcePartitionGroup` before lock/unlock of the cell is done.

   Lock/unlock cell for changes to take effect.

4.36.2 Configure Radio Resource Partitioning Based on SPID

When configuration is based on SPID, the license for Subscriber Triggered Mobility needs to be activated. More information can be found in `Subscriber Triggered Mobility`.

Steps

1. Install the license and activate the feature state; see `Licensing` and the `RadioResourcePartitioning` MO class.
2. Create `ResourcePartition` MO one for each set of SPID values to include in a resource partition.
3. Set `partitionId` and `spidList` in each `ResourcePartition` MO.

   `spidList` specifies which SPID(s) to include in the resource partition, see `Radio Resource Partitioning` for special handling of SPID `0` and an empty list.
4. Create an MO `ResourcePartitionGroup`.
5. Create an MO `ResourcePartitionGroupMember` for each `ResourcePartition` that shall belong to the `ResourcePartitionGroup`. Set `resourcePartitionRef` to specify a `ResourcePartition` and set `resourcePartitionShare` to define the share of resources available to the partition.
6. Set `EUtranCellFDD.resourcePartitionGroupRef` to the `ResourcePartitionGroup` to be used in this cell.
7. Lock/unlock cell for changes to take effect.

4.37 Combined Cell

Combined cell provides the support of having several transmitting and receiving points in a cell. This is realized by allowing multiple sector carriers to belong to the same cell. In a combined cell the corresponding `EUtranCellFDD` or `EUtranCellTDD` MO then refers to several instances of the `SectorCarrier` MO class.

The following limitations are applicable:

— Only one instance of the SectorCarrier MO class must be configured per cell. Otherwise the cell unlock will be rejected. If the Combined Cell feature is activated, more than one instance of the SectorCarrier MO class can be configured per cell. More information on configuring the SectorCarrier MO class for Combined Cell is found in Combined Cell.

— The SDM functionality is not supported for combined cell.

Before configuring and activating the Combined Cell feature, do the following:

— Make sure licenses for prerequisite features are activated. Prerequisite features are listed in Combined Cell.

Note: The High Speed UE feature cannot be used in conjunction with the Combined Cell feature.

4.38 Advanced Cell Supervision

Advanced Cell Supervision is a licensed feature that provides the operator with the possibility of getting immediate information when sleeping cells are suspected.

To configure the feature:

Steps

1. Install the license and activate the feature state: see Licensing.
2. Set the sensitivity level with the parameter EUtranCellFDD.advCellSupSensitivity or EUtranCellTDD.advCellSupSensitivity : see Advanced Cell Supervision for guidelines.

4.39 Operational Profiles, FDD Only

The Operational Profiles feature provides automatic setting of groups of system parameters through profiles. User profiles are applied manually through actions performed on the operational profiles MO, OpProfiles . For more information about user profiles see User Profiles on page 132.

4.39.1 User Profiles

In the current release, only one user profile is available. It is the profile "20MHz Performance - FDD Low Load" with the profile name 20MHz_Perf_FDD. The action activateProfile in the OpProfiles MO is used to activate the profile.

The 20MHz_Perf_FDD user profile optimizes system parameters in the Radio Resource Control (RRC) and the EUtranCellFDD MO for 20 MHz performance. Some of the settings only take effect after cell locking, followed by unlocking,

which means that all cells with the attribute `administrativeState` set to `UNLOCK` will be automatically locked during the activation of the profile, and then unlocked afterwards.

Note: The `20MHz_Perf_FDD` profile can only be activated when using FDD, and only be used in recommended cases.

To deactivate the `20MHz_Perf_FDD` profile, the action `deactivateProfile` in the `OpProfiles` MO is used. The system parameters included in the profile will be set to default values during the deactivation. Some of the settings only take effect after cell locking, followed by unlocking. All the cells that have the attribute `administrativeState` set to `UNLOCKED` will be automatically locked during the deactivation of the profile, and then unlocked afterwards.

4.40 PDCCH Power Boost

The PDCCH Power Boost is a licensed feature to improve PDCCH cell coverage and system capacity of PDCCH and PDSCH.

In some applications, like beam forming and heterogeneous network scenarios with small cells, it can be beneficial to increase the power of the PDCCH. The PDSCH benefits from the beam forming gain, but for PDCCH, which is not beam formed, the PDCCH power can be increased.

For heterogeneous network scenarios with cell range extension, the PDCCH can suffer heavy interference in the small cells and can benefit from increased power.

The boosting of the maximum CCE aggregation level is active when the license is operable and the MOM parameter `EUtranCellFDD.pdcchPowerBoostMax` or `EUtranCellTDD.pdcchPowerBoostMax` is greater than `0` dB.

The operator can set the maximum PDCCH power boost of the maximum CCE aggregation level in steps of 1 dB from `0` dB (no boost) up to 6 dB with the MOM parameter `pdcchPowerBoostMax` .

When this value is set larger than `0` dB, UE-specific PDCCHs which require more than 8-CCEs (or 4-CCE in those cases this is the maximum CCE aggregation level) to meet the BLER target, is boosted.

For UE-specific PDCCHs requiring more than `pdcchPowerBoostMax`dBs of power to meet the BLER target, the power increase will, however, be limited to the set value of `pdcchPowerBoostMax`.

Broadcast messages, such as RaMsg2, paging, and SIBs, are boosted to the maximum level: `pdcchPowerBoostMax`.

To configure the feature:

Steps

1. Install the license and activate the feature state. See PDCCH Power Boost.
2. Set the pdcchPowerBoostMax MOM parameter: EUtranCellFDD.pdcchPowerBoostMax or EUtranCellTDD.pdcchPowerBoostMax . See Configuring Increased PDCCH Coverage on page 76.

4.40.1 Configuration Guidelines

The parameter pdcchPowerBoostMax: EUtranCellFDD.pdcchPowerBoostMax or EUtranCellTDD.pdcchPowerBoostMax indicates the maximum power boost in dB, applied to PDCCHs that require more than the maximum Control Channel Element (CCE) aggregation level. Setting the parameter to 0 dB results in no PDCCH Power Boost. The parameter can be configured in the range of: 0, 1, 2, 3, 4, 5 and 6 dB.

The parameter depends on:

— Cell bandwidth

— Physical control format indicator (CFI) parameter pdcchCfiMode (EUtranCellFDD.pdcchCfiMode or EUtranCellTDD.pdcchCfiMode

— Configuration of Physical Control Format Indicator Channel (PCFICH)

For recommended settings of parameter pdcchPowerBoostMax (EUtranCellFDD.pdcchPowerBoostMax or EUtranCellTDD.pdcchPowerBoostMax): see Table 3 and Table 4.

Table 3 Recommended maximum setting of PDCCH Power Boost parameter for 1Tx or 2Tx.

CFI	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1	N/A	N/A	N/A	0	1	3
2	N/A	0	1	4	6	6
3	0	1	3	6	6	6

Table 4 Recommended maximum setting of PDCCH Power Boost parameter for 4Tx.

CFI	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1	N/A	N/A	N/A	0	1	3
2	N/A	2	1	4	6	6
3	0	1	3	6	6	6

4.41 PDCCH Coverage Extension

The PDCCH Coverage Extension is a basic feature to increase the PDCCH coverage for downlink assignments in limited RF conditions.

The desired options of the feature are chosen by the operator by enabling them by MOM parameters. The operator can monitor KPIs to measure gains, RRC procedure success rate for example HO, and costs, for example DL Throughput and CCE Utilization. For more information see PDCCH Coverage Extension.

4.42 Internal MCE, FDD Only

The licensed feature Internal MCE is closely related to the feature LTE Broadcast, providing the connectivity to the core network without the need to setup additional centralized MCE nodes.

More information about the feature Internal MCE is found in Internal MCE.

To configure the feature:

Steps

1. Install the license and activate the feature state: see Licensing.
2. Configure Clock Source over GPS or IEEE 1588 Time and Phase Synchronization.
3. Set `ENodeBFunction.timeAndPhaseSynchAlignment` to TRUE.
4. Configure `serviceAreaId` in the `MbsfnArea` MO.
5. Create the `MceFunction` MO.
6. Configure the M3 interface to one or several MMEs in the `termPointToMmeM3` MO: see S1, M3, and X2 Control Plane Connections.

4.43 LTE Broadcast, FDD Only

The licensed feature LTE Broadcast can be used for file download and for streaming services, for example mobile television. It is based on the 3GPP standardized Multimedia Broadcast and Multicast Service (MBMS). A multicast solution allows for a more efficient use of radio resources than a unicast solution does.

More information about the feature LTE Broadcast is found in LTE Broadcast.

To configure the feature:

Steps

1. Configure the Internal MCE feature: see Internal MCE, FDD Only on page 135.
2. Install the license and activate the feature state: see Licensing.
3. Configure Clock Source over GPS or IEEE 1588 Time and Phase Synchronization.
4. Set ENodeBFunction.timeAndPhaseSynchAlignment to `TRUE`.

   Note: If parameter ENodeBFunction.timeAndPhaseSynchAlignment is set to `TRUE` the LTE Broadcast feature will be disabled if the time and phase synchronization accuracy for LTE Broadcast is not fulfilled.
5. Set ENodeBFunction.timePhaseMaxDeviationMbms to 5 micro seconds.
6. Configure `serviceAreaId` in the `MbsfnArea` MO.
7. `neighCellConfig` must be set to "Not all neighbour cells have the same MBSFN subframe allocation as the serving cell" by setting the parameter `neighCellConfig` in the `EUtranFreqRelation` MO to the value `0`: `DIFF_MBSFN_SUBFRAMES` .
8. For the attributes `modificationPeriodCoeff` in the MO `EUtranCellFdd` and `defaultPagingCycle` in the MO `Paging` , the following relation must be true:

   *modificationPeriodCoeff * defaultPagingCycle ≤ 512 radio frames*.
9. Set `EUtranCellFDD.mappingInfo.mappingInfoSIB13` to map SIB13 to the desired SI message. Also set `EUtranCellFDD.changeNotification.changeNotificationSIB13` to TRUE. Lock/unlock cell must be done for the changes to take effect.
10. Configure admission parameters for eMBMS in `dlMbmsGbrRatio` in MO AdmissionControl.
11. Create the MO `MulticastListener` with a reference to an `IpInterface` MO or an `Ipv6Interface` MO.
12. Create the `Mbms` MO.
13. Create `MbsfnArea` MOs containing the subframe configuration to activate for one or several `MbmsServices`.
14. Create an MO `MbsfnAreaCellRelation` for each cell that belong to an `MbsfnArea` .
15. Create one or several MOs `PmchMch` under each `MbsfnArea` .

16. Create MOs MbmsService for each LTE Broadcast session planned and configure it's Temporary Mobile Group Identity (TMGI) or a list of TMGIs. The same TMGI can be configured in one or two MbmsService MOs. If present in two MOs they must belong to separate MbsfnArea MOs.

4.44 MBMS Multicarrier Support, FDD Only

The licensed feature MBMS Multi-Carrier Support is closely related to the feature LTE Broadcast and supports the UE to move to or stay on a carrier that broadcasts an MBMS Service in which the UE is interested.

More information about the feature MBMS Multicarrier Support is found in MBMS Multi-Carrier Support.

To configure the feature:

Steps

1. Install the license and activate the feature state: see Licensing.
2. Configure serviceAreaId in the MbsfnArea MO. The configured serviceAreaId becomes activeServiceAreaId if the MBMS Multi-Carrier Support feature is activated and the cell has an unreserved MbsfnAreaCellRelation to an unlocked MbsfnArea .
3. Set EUtranCellFDD.mappingInfo.mappingInfoSIB15 to map SIB15 to the desired SI message. Lock/unlock cell must be done for the changes to take effect.
4. Configure inter-frequency UE measurement parameters in MO ReportConfigEUtraInterFreqMbms.

4.45 SIB16 Time Information Broadcast

The licensed feature SIB16 Time Information Broadcast can be used as the time source for accurate setting of the system clock in the UE, required for example for reception of LTE Broadcast.

More information about the feature SIB16 Time Information Broadcast is found in SIB16 Time Information Broadcast.

To configure the feature:

Steps

1. Install the license and activate the feature state: see Licensing.
2. Configure Clock Source over GPS or IEEE 1588 Time and Phase Synchronization.

3. Set ENodeBFunction.timeAndPhaseSynchAlignment to TRUE.

   Note: If parameter ENodeBFunction.timeAndPhaseSynchAlignment is set to TRUE the SIB16 Time Information Broadcast feature will be disabled if the time and phase synchronization accuracy for SIB16 Time Information Broadcast is not fulfilled.

4. Set EUtranCellFDD.mappingInfo.mappingInfoSIB16 to map SIB16 to the desired SI message. Lock/unlock cell must be done for the changes to take effect.

5. Configure the data transmitted in the information elements dayLightSavingTime, leapSeconds and localTimeOffset in the MO TimeSetting.

   Note: The change date for leap seconds needs to be set when the addition of a leap second is announced.

4.46 Energy Saving Configurations

This section describes features that can save energy on the antenna or the radio unit.

The following energy saving features are available:

— Micro Sleep Tx

— MIMO Sleep Mode

— Cell Sleep Mode

— Low Energy Scheduler Solution on page 139

4.46.1 Micro Sleep Tx

This feature decreases energy consumption in the radio unit by putting the power amplifier in sleep mode when no user data needs to be transmitted.

For more information see Micro Sleep Tx.

4.46.2 MIMO Sleep Mode

This feature enables the eNodeB to switch the antenna from Multiple Input Multiple Output (MIMO) to Single Input Multiple Output (SIMO) operation mode, that is, to reduce the number of TX ports, when low traffic is detected on the cell.

This way operators can save power during low traffic hours. The feature can be enabled on one or multiple cells on the node.

For more information see MIMO Sleep Mode.

4.46.3 Cell Sleep Mode

This feature makes it possible to decrease energy consumption by automatically turning off under-utilized overlaid capacity cells during low or no traffic conditions. The turned off cells are automatically turned on again when the traffic resumes.

For more information, see Cell Sleep Mode.

4.46.4 Low Energy Scheduler Solution

This feature increases the number of blank subframes by delaying data transmission based on predefined conditions. Increasing the number of blank subframes makes it possible to save energy as blank subframes consume less energy.

For more information, see Low Energy Scheduler Solution.

4.47 RRC Connection Establishment

The purpose of the RRC Connection Establishment function is to set up a dedicated signaling connection between the UE and the eNodeB. No specific licenses are required to activate RRC Connection Establishment.

To configure conditions for RRC Connection Establishment, use the parameter `t300` in the `Rrc` MO class.

Note: The 3GPP specified timers t3xx must be changed with caution as they severely can affect KPIs for accessibility and retainability. The default settings represent best practice.

For more information see Radio Bearer Service.

4.48 Multi-Target RRC Connection Re-Establishment

The licensed feature Multi-Target RRC Connection Re-Establishment introduces RRC connection re-establishment in other cells than the serving cell. The Multi-Target RRC Connection Re-Establishment feature is used in combination with the basic feature RRC Connection Re-establishment which only supports RRC Connection Re-establishment in the serving cell.

The following must be fulfilled at feature activation:

— To support any kind of connection re-establishment in an eNodeB, set attribute `rrcConnReestActive` to `TRUE`. This applies even for the basic case

where re-establishment is attempted in a serving cell with no ongoing procedure. For more information see Radio Bearer Service.

— A valid license key must be installed. For more information see License Management.

— To configure re-establishment on more than one eNodeB, all nodes must be Ericsson eNodeB nodes. Otherwise the attempt to fetch context information is not performed.

Optimize re-establishment procedure by adjusting the values of the following attributes:

— `tRelocOverallValue` in the MO `ENodeBFunction` .

— `t301` in the MO `Rrc` .

— `t304` in the MO `Rrc` .

— `t311` in the MO `Rrc` .

Note: The 3GPP specified timers t3xx must be changed with caution as they severely can affect KPIs for accessibility and retainability. The default settings represent best practice.

For more information about the feature see Multi-Target RRC Connection Re-Establishment.

4.49 Prescheduling

Prescheduling is a licensed feature feature that minimizes the round-trip time. It gives Physical Uplink Shared Channel (PUSCH) grants to UEs in advance, that is, without receiving scheduling requests or buffer status reports.

More information can be found in Prescheduling.

To install and configure Prescheduling, do the following:

Steps

1. Install the license and activate the feature state.
2. Configure the behavior of Prescheduling using the following parameters:
   — `initPreschedulingEnable = true` indicates that prescheduling is enabled during connection setup phase.
   — `preschedulingDataSize` specifies the granted data size during prescheduling period.

— `preschedulingDuration` determines the duration time for prescheduling to be performed, and it stops beyond this time.

— `preschedulingPeriod` determines the period in ms lapsed between granted prescheduling instances.

4.50 Uplink Scheduling Control for Out-of-Coverage UEs

This licensed feature improves system performance by limiting resources to unreachable UEs. It identifies scheduling resources allocated to out-of-coverage UEs and releases them for reallocation.

To configure Uplink Scheduling Control for Out-of-Coverage UEs do the following:

— To activate the feature state, install the license and an MO instance `UlSchedContlForOocUes` is automatically created.

This parameter is valid for the MO classes `EUtranCellFDD` and `EUtranCellTDD`:

— `EUtranCellFDD.ulSchedCtrlForOocUesEnabled` or `EUtranCellTDD.ulSchedCtrlForOocUesEnabled`, enables the feature Uplink Scheduling Control for Out-Of-Coverage UEs.

For more information refer to Manage Licenses and Hardware Activation Codes and Uplink Scheduling Control for Out-of-Coverage UEs.

4.51 Service Or Priority-Triggered Inter-Frequency Handover

The licensed feature Service or Priority-Triggered Inter-Frequency Handoverintroduces the ability to trigger a handover to a different frequency whenever voice service is not allowed on the current frequency, or whenever it is preferable to have the UE on a different frequency for positioning precision for the current priority level, such as for emergency calls.

At feature activation, a valid license key must be installed. For more information, see License Management.

Configure whether the feature is going to be active or not in the cell. If active, configure whether the feature is going to operate on bearers based on voice service or priority by setting the value of the attribute `servOrPrioTriggeredIfHo` in MO `EUtranCellFDD` or MO `EUtranCellTDD` .

For more information about the feature, see Service or Priority-Triggered Inter-Frequency Handover.

4.52 Configure Adaptive RLC Poll-Retransmission

This licensed feature uses an updated algorithm on two existing MOM configuration parameters, in the MO classes `SignalingRadioBearer` and `DataRadioBearer`:

— `dlMaxRetxThreshold`

— `tPollRetransmitDl`

To configure Adaptive RLC Poll-Retransmission:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes .
2. Set the attribute `dlMaxRetxThreshold` to specify the number of poll-retransmission attempts before declaring RLF on downlink, and set `tPollRetransmitDl` for the default poll interval.

Results

The updated algorithm uses `tPollRetransmitDl` as a starting point for calculating the poll-retransmission interval on SRBs and DRBs in downlink. It checks the current ARQ Round Trip Time (RTT) and gradually increases the poll interval up to a maximum of 500ms.

This reduces poll-retransmissions on SRBs and DRBs in downlink and extends the time to declare Radio Link Failure (RLF) on downlink (DL) without impacting poll behavior for other UEs.

For more information, see License Management and the feature description Adaptive RLC Poll-Retransmission.

4.53 Configure Network-Assisted CRS Interference Cancellation, FDD Only

This FDD-only feature increases downlink-throughput by limiting the cell-specific reference signal (CRS) interference. It facilitates manual configuration of the CRS assistance information of neighbor-cells: the eNodeB provides this information to the UEs so that they can limit the CRS interference.

To configure Network-Assisted CRS Interference Cancellation:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes .

2. Set the external eNodeB neighbor cell parameters:
   - ExternalEUtranCellFDD.noOfTxAntennas
   - ExternalEUtranCellFDD.mbsfnSubframeAlloc
3. Set the CRS information in the corresponding CRS neighbor cell parameters:
   - EUtranCellFDD.maxSentCrsAssistCells
   - EUtranCellRelation.crsAssistanceInfoPriority

   For more information, see Manage Licenses and Hardware Activation Codes and Network-Assisted CRS Interference Cancellation.

4.54 TTI Bundling

TTI Bundling is a licensed feature for FDD only, which provides improved uplink coverage for Voice over IP services. To configure the feature the license needs to be installed and the feature state activated, see TTI Bundling for more information. The following attributes are used to configure TTI Bundling:

- EUtranCellFDD.ttiBundlingSwitchThres specifies SINR threshold for triggering a switch to TTI bundling.
- EUtranCellFDD.ttiBundlingSwitchThresHyst specifies hysteresis of SINR threshold for triggering a switch to TTI bundling.
- EUtranCellFDD.ttiBundlingAfterHo controls if UE remains in TTI bundling mode after handover.
- EUtranCellFDD.ttiBundlingAfterReest controls if UE remains in TTI bundling mode after reestablishment.

4.55 SR Processing Level

The following attributes are used to configure SR processing level:

- `EUtranCellFDD.srDetectHighThres` or `EUtranCellTDD.srDetectHighThres` defines how many dB higher than the original SR detection threshold can be used as high SR detection threshold. Used together with `srProcessingLevel` to reduce false SR detection.
- `EUtranCellFDD.srProcessingLevel` or EUtranCellTDD.srProcessingLevel defines how many SRs eNodeB must receive in a row in order to process it. Used together with `srDetectHighThres` to reduce false SR detection.

4.56 Adaptive CFI Prohibit during Handover

The following attributes are used to control whether adaptive CFI should be prohibited during handover:

— `EUtranCellFDD.adaptiveCfiHoProhibit` or `EUtranCellTDD.adaptiveCfiHoProhibit` controls adaptive CFI to avoid using CFI=1 or CFI=1,2 when scheduling UEs that are in handover.

4.57 Link Adaptation for Last Scheduled UE

The following attributes are used to switch on or off the link adaptation function of allocating largest possible resource to last scheduled UE:

— `EUtranCellFDD.lastSchedLinkAdaptEnabled` or `EUtranCellTDD.lastSchedLinkAdaptEnabled` controls if link adaptation function allocates largest possible resource to last scheduled UE in the DL. Used to improve UE decoding success rate with reduced code rate.

4.58 Dynamic PUCCH, FDD Only

This licensed feature is used to dynamically allocate and deallocate PUCCH PRB pairs so that more PRB resources are available for PUSCH, compared to the static PUCCH dimensioning.

The license and feature activations are done on node level.

The following applies:

— If the feature is enabled, the new PUCCH layout is always applied in cells after cell lock/unlock.

— If the feature is disabled, the new PUCCH layout is not applied in cells after cell lock/unlock.

It is possible to disable the Dynamic PUCCH allocation or deallocation operation per cell by setting the attribute allocThrPucchFormat1 in MO class EUtranCellFDD to 0. It can be reset with a value larger than 0. When it becomes disabled, the number of PUCCH PRBs is fixed in current state.

4.59 Configure an Operating Bandwidth of a Standard LTE Carrier Bandwidth

The configuration of LTE carriers for operation bandwidth involves several steps including blocking the scheduler usage of edge PRBs as well as configuring the radio operation carrier bandwidth.

Note: For supported radios see RBS Configurations.

For information on flexible channel bandwidth, see Flexible Channel Bandwidth

Steps

1. Configure carrier as normal.
2. Activate the feature PUCCH Overdimensioning.
3. Configure scheduler to block uplink PRBs at carrier edge:

Table 5 MOM Attribute Values

LTE Standard Carrier	Alternative Operation Bandwidth	MOM Attribute Values			
		pucchOverdimensioning	ulInterferenceManagementActive	ulConfigurableFrequencyStart	ulFrequencyAllocationProportion
5 MHz	4.2 MHz	2	false	22	80
	4.4 MHz	1	false	14	88
	4.6 MHz	1	false	14	88
	4.8 MHz	1	false	14	88
10 MHz	9 MHz	1	false	7	94

4. Configure scheduler to block downlink PRBs at carrier edge:

Table 6 MOM Attribute Values

LTE Standard Carrier	Alternative Operation Bandwidth	MOM Attribute Values		
		dlInterferenceManagementActive	dlConfigurableFrequencyStart	dlFrequencyAllocationProportion
5 MHz	4.2 MHz	false	n/a	80
	4.4 MHz	false	n/a	88

LTE Standard Carrier	Alternative Operation Bandwidth	MOM Attribute Values		
		dlInterferenceManagementActive	dlConfigurableFrequencyStart	dlFrequencyAllocationProportion
	4.6 MHz	false	n/a	88
	4.8 MHz	false	n/a	88
10 MHz	9 MHz	false	7	94

5. Configure the radio for operation carrier bandwidth:

Table 7 MOM Attribute Values

LTE Standard Carrier	Alternative Operation Bandwidth	MOM Attribute Values	
		dlInternalChannelBandwidth	ulInternalChannelBandwidth
5 MHz	4.2 MHz	4200	4200
	4.4 MHz	4400	4400
	4.6 MHz	4600	4600
	4.8 MHz	4800	4800
10 MHz	9 MHz	9000	9000

4.60 Differential Uplink Power Control

This licensed feature is used to dynamically adjust the power of PUSCH in order to improve UL performance in scenarios with high wide-band and time-variable uplink interference.

To configure the feature, do the following:

Steps

1. Install the license and activate the feature state, see Licensing.
2. Disable or enable the differential uplink power control feature on cell level, using `EUtranCellFDD.enableSinrUplinkClpc` or `EUtranCellTDD.enableSinrUplinkClpc`.
3. Set the attribute `EUtranCellFDD.rxSinrTargetClpc` or `EUtranCellTDD.rxSinrTargetClpc`, which specifies the threshold of the RX SINR target.
4. Set the attribute `interferenceThresholdSinrClpc` and `ulPsdLoadThresholdSinrClpc` in MO Class `EUtranCellFDD` or

EUtranCellTDD to decide the condition of SINR-based PUSCH closed-loop power control.

4.61 Configure Dynamic Uplink Resource Allocation

To configure Configurable Dynamic Uplink Resource Allocation, do the following:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes and Dynamic Uplink Resource Allocation.
2. Set the dynUlResourceAllocEnabled to TRUE for each cell.

Results

Configuration of already existing parameters that affect the feature:

— To achieve the desired differentiation between different QCIs, pre-existing parameter QciProfilePredefined.relativePriority has to be set for the wanted QCIs (as described in Relative Priority Scheduling).

The feature is designed to work with the feature Minimum Rate Proportional Fair Scheduler enabled.

The feature will work with all settings on QciProfilePredefined.schedulingAlgorithm (but no differentiation in MAXIMUM_C_OVER_I due to the nature of the algorithm).

Setting QciProfilePredefined.ulMinBitRate to NOT zero will affect the differentiation ratio between the relative priorities for the proportional fair scheduling algorithms (see Minimum Rate Proportional Fair Scheduler).

4.62 Configure Category M Access

To configure Category M Access, do the following:

Steps

1. Install the license and activate the feature state, see Manage Licenses and Hardware Activation Codes and Category M Access.
2. Set the catm1SupportEnabled to *TRUE*.

4.63 Configure HARQ-ACK Format Selection for Single Carrier

This feature is only applicable for TDD and a UE without any SCells configured. The UE needs to be CA capable to support PUCCH format 3. To configure HARQ-ACK Format Selection for Single Carrier, do the following:

Steps

1. Enable one or both of the following:
   - Set the `nonCaAnModeMuxEnable` attribute in the `EUtranCellTDD` MO to TRUE to enable TDD HARQ-ACK Multiplexing support. The changes take effect immediately, locking and unlocking the cell is not required.
   - Set the `nonCaAnModeF3Enable` attribute in the `EUtranCellTDD` MO to TRUE to enable TDD PUCCH format 3 support. Lock and unlock the cell for the changes to take effect.

   Note: The feature is disabled by default.

4.64 Configure Category M Connected Mode Mobility

This feature provides connected mode mobility for Category M1 UEs. For intra-frequency mobility, it uses X2 or S1 based intra-frequency handover. For inter-frequency mobility, it uses both blind and measurement-based handover, and blind and measurement-based release with redirect to E-UTRAN cells. The following attributes are used to configure this feature:

- `EutranCellRelation.isHOAllowedBr`

  If set to true, this attribute enables handover of Category M1 UEs between cells.

- `UeMeasControl.intraFreqMeasModeBr`

  Determines how the intra-frequency A3 measurement is configured, with measurement gaps if needed:

  - If set to `0`, the intra-frequency A3 measurement is configured when a supported Category M1 UE is connected.
  - If set to 1, the intra-frequency A3 measurement is configured when the UL-normalized SINR of PUSCH is lower than the threshold determined by the `ReportConfigA1A2Br.a1a2UlIntraSearchIntraFThr` attribute. This is the default value.

- `ueMeasControl.ueMeasurementsActiveBr`

  If set to true, this attribute enables inter-frequency measurements for Category M1 UEs.

— EUtranFreqRelation.connectedModeMobilityPrioBr and EutranFreqRelation.voicePrioBr

  These attributes determine priorities among frequencies to measure for Category M1 UEs.

— EUtranFreqRelation.mobilityActionBr

  This attribute determines what is the preferred way of transferring a Category M1 UE to the given frequency.

— ReportConfigEUtraBadCovPrim.a2ThrRsrpPrimOffsetCeABr or ReportConfigEUtraBadCovSec.a2ThrRsrpSecOffsetCeABr

  These attributes determine the A2 RSRP offsets specific for Category M1 UEs.

— ReportConfigA1Prim.a1ThrRsrpPrimOffsetCeABr or ReportConfigA1Sec.a1ThrRsrpSecOffsetCeABr

  These attributes determine the A1 RSRP offsets specific for Category M1 UEs.

— EUtranCellFDD.covTriggeredBlindHoAllowedBr and EUtranCellRelation.CoverageIndicatorBr

  If the EUtranCellFDD.covTriggeredBlindHoAllowedBr attribute is set to true, and the EUtranCellRelation.CoverageIndicatorBr attribute of the neighbor cell is set to COVERS, blind inter-frequency handover for the Category M1 UE can be initiated.

— EUtranCellFDD.measGapShareSchemeCeABr or EUtranCellTDD.measGapShareSchemeCeABr

  These attributes determine how the UE shares the measurement gaps when both intra-frequency and inter-frequency measurements require it.

4.65 Configure Narrowband IoT Load Distribution

The Narrowband IoT Load distribution feature provides a basic intra-eNodeB traffic load distribution mechanism for Narrowband IoT UEs. It redistributes UEs at connection release to carrier frequencies randomly selected from a list. The list of frequencies to use and the proportion of UEs to be redirected to each of them is configurable by the following parameters:

— NbIdleModeLoadDistr.nbCarrierFreqList

  This parameter defines the carrier frequencies that are candidates for the load distribution. Maximum eight frequencies can be on the list.

— NbIdleModeLoadDistr.nbFreqDistributionList

This parameter defines the proportion of UEs to be redirected to each frequency from NbIdleModeLoadDistr.nbCarrierFreqList. The sum of these proportions cannot exceed 100%. If the sum is less than 100%, a proportion of the UEs, equal to the difference between the sum and 100%, are not redirected.

4.66 Configure Category M Load Distribution

The Category M Load Distribution feature provides a basic intra-eNodeB traffic load distribution mechanism for Category M UEs. It redistributes UEs at connection release to carrier frequencies randomly selected from a list.

To activate the feature, after activating the license control MO, do the following:

1. Configure the EUtranCellFDD.idleModePrioAtReleaseRef attribute with a reference to an instance of the IdleModePrioAtRelease MO class.

   To set this attribute, the EUtranFreqRelation MO class must be defined for each frequency defined in IdleModePrioAtRelease.

   If the Load-Based Distribution at Release feature is active in the cell, this attribute is already defined. Otherwise it is set to null by default.

2. Configure the IdleModePrioAtRelease.catMFreqDistributionInfo attribute in the referenced instance of the IdleModePrioAtRelease MO class.

The list of frequencies to use and the proportion of UEs to be redirected to each of them is configurable by the following parameters:

— CatMFreqDistributionInfo.eUtranFreqRefList

  This parameter defines the carrier frequencies that are candidates for the load distribution. Maximum eight frequencies can be on the list.

— CatMFreqDistributionInfo.freqDistributionList

  This parameter defines the proportion of UEs to be redirected to each frequency from CatMFreqDistributionInfo.eUtranFreqRefList.

  The sum of these proportions cannot exceed 100%. If the sum is less than 100%, a proportion of the UEs, equal to the difference between the sum and 100%, are not redirected.

  It is possible to configure both single frequencies and groups of frequencies. A frequency group is defined when a frequency with a proportion larger than 0% is followed by one or several frequencies with a proportion of 0%. The proportion for the first of these frequencies is then valid for all frequencies in the group.

5 Release with Redirect to TD-SCDMA, TDD Only

This section describes how to configure Release with Redirect to TD-SCDMA.

The following parameters are used to configure Release with Redirect to TD-SCDMA:

— The parameter `mobilityAction` in the `UtranTDDFreqRelation` MO class.

  This parameter gives the operator the possibility to configure the preferred way to transfer a UE in connected mode to a UTRAN TDD frequency/ frequency group. For example, this can be to either transfer the UE using Release with Redirect without NACC or Release with Redirect with NACC.

— The parameter `mobilityActionCsfb` in the `UtranTDDFreqRelation` MO class.

  This parameter gives the operator the possibility to configure the preferred way to transfer a UE in connected mode to a UTRAN TDD frequency/ frequency group. For example, this can be to either transfer the UE using Release with Redirect without NACC or Release with Redirect with NACC.

— The parameter `maxMeasUtraTDD` in the `UeMeasControl` MO class.

  This parameter restricts the number of measurements on UTRA TDD measurement objects which the RBS can concurrently assign to a UE.

The license for TD-SCDMA Session Continuity is required. To activate Release with Redirect to TD-SCDMA, do the following:

Steps

1. Make sure that the prerequisite license for TD-SCDMA Session Continuity is installed and activated. More information can be found in Licensing and Coverage-Triggered TD-SCDMA Session Continuity.
2. If applicable, make sure that the license for CS Fallback to GERAN and UTRAN is installed and activated. More information can be found in CS Fallback to GERAN & UTRAN.
3. If applicable, make sure that the license for Redirect with NACC is installed and activated. More information can be found in Redirect with System Information.
4. If applicable, make sure that the license for Emergency Call Handling for CS Fallback is installed and activated. More information can be found in Emergency Call Handling for CS Fallback.

5. If applicable, make sure that the license for Automated Neighbor Relations is installed and activated. More information can be found in Automated Neighbor Relations.

6 Fault Management

This section describes fault management.

6.1 General Fault Management Guidelines

Refer to Manage Faults.

6.2 Fault Management Related to Sector

This section describes fault management specifically related to sector and cell management.

The cell and sector resources in the radio network are supervised by the RBS. Alarms are issued when a cell or sector is disabled due to failure in one or more of the resources the cell or sector uses.

The alarm on the `EUtranCellFDD` MO (or `EUtranCellTDD` MO) or `SectorEquipmentFunction` MO (or both) ceases when the `SectorEquipmentFunction` , or `EUtranCellFDD` (or `EUtranCellTDD`) is enabled.

The alarms generated by the `SectorEquipmentFunction` MO are usually primary and the alarms on the `EUtranCellFDD` or `EUtranCellTDD` MO are usually secondary. When there is a secondary alarm on the `EUtranCellFDD` , or `EUtranCellTDD` MO, the primary fault can be found in the RBS or the transport network.

For information about alarms and fault management events, refer to Alarm and Event List.

Specific alarm and event conditions may cause the failures described below.

Delete Sector Failure

When a `SectorEquipmentFunction` is unlocked or has cells associated with it, the request to delete the sector is rejected and the `SectorEquipmentFunction` MO is not deleted.

Inconsistent Hardware Configuration

A sector cannot be successfully configured because of a faulty hardware configuration in the MOM. Refer to Inconsistent Configuration for more information.

Unlock Sector Failure

The sector cannot be enabled because of failure in one or more resources that it needs. The alarm ResourceConfigurationFailure will be triggered.

Unlock Sector with License Shortage

The sector may become degraded because of a license shortage. If the requested license is not available, the sector can use only 20 W per radio unit, which is the LTE basic functionality for output power.

The sector will then have operational state is set to Enabled, availability status is set to Degraded. Refer to Inconsistent Configuration if the sector is degraded due to requesting more output power than it has available licenses for. Refer to ResourceConfigurationFailure if the license server is unavailable.

6.3 Fault Management Related to Cell

Unlock Cell Failure – Resource Allocation Failure

The cell can not be unlocked since a RERC layer cannot allocate the resources required for the cell. The reason for the failure may be lack of resources (including licenses) or configuration error. An alarm is triggered, refer to Resource Allocation Failure for more information.

Unlock Cell Failure – Cell Failed due to Internal RBS Failure

Resources for the cell have been allocated successfully, but the cell setup fails and `Cell` becomes disabled or `dependencyFailed`. This occurs if all required HW resources have not been set up for the cell.

One of the alarms Resource Configuration Failure, Service Unavailable or Resource Allocation Failure Service Degraded will be triggered.

Unlock Cell Failure – Unsupported Parameter

Resources for the cell have been allocated successfully, but configuration fails because a parameter has a value that is not supported by one or more of the resources. The alarm Resource Configuration Failure will be raised.

7 Performance Management

Refer to the MOM for specific PM counters for the `EUtranCellFDD` or the `EUtranCellTDD` managed object.

Refer to Managed Object Model (MOM) for more information on performance management counters.

Note: Setting an unsupported value may affect traffic. A few MOs, parameters, counters, and value ranges may be visible in the MOM even though they are not yet supported. This is because system design considers future aspects. Refer to Parameter and Counter Limitations for a list of limitations to the MOM included in this library.