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Concepts and requirements for Type 1 interface HeNB to HeNB Management System (HeMS)
(3GPP TS 32.591 version 18.0.0 Release 18)

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project Technical Specification Group Services and System Aspects, Telecommunication Management; as identified below:

3GPP TS 32.591: "Telecommunications management; Home eNode B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Concepts and requirements for Type 1 interface HeNB to HeNB Management System (HeMS)".

3GPP TS 32.592: "Telecommunications management; Home eNode B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Information model for Type 1 interface HeNB to HeNB Management System (HeMS) ".

3GPP TS 32.593: "Telecommunications management; Home eNode B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Procedure flows for Type 1 interface HeNB to HeNB Management System (HeMS)".

3GPP TS 32.594: "Telecommunications management; Home eNode B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Data definitions for Type 1 interface HeNB to HeNB Management System (HeMS)".

1 Scope

The present document describes the concepts and requirements of OAM for Home eNodeB (HeNB). The requirements captured in this document shall be met via Type 1 interface between HeNB and HeMS.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

[3] 3GPP TS 32.102: "Telecommunication management; Architecture".

[4] TR-069 Amendment 2, CPE WAN Management Protocol v1.1, Broadband Forum.

[5] 3GPP TS 32.435: "Performance Measurement, eXtensible Markup Language (XML) file format definition".

[6] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Alarm Integration Reference Point (IRP): Information Service (IS) ".

[7] 3GPP TS 22.220: " Service requirements for Home Node B (HNB) and Home eNode B (HeNB)".

[8] 3GPP TS 33.320: "Security of Home Node B (HNB) / Home evolved Node B (HeNB)".

[9] 3GPP TS 32.551: " Energy Saving Management (ESM); Concepts and requirements ".

[10] 3GPP TR 32.826: " Study on Energy Savings Management (ESM) ".

3 Definitions and abbreviations

For the purposes of the present document, the terms and definitions given in TS 32.101 [2], TS 32.102 [3] and TS 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TS 32.101 [2], TS 32.102 [3] and TS 21.905 [1], in that order.

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

HeMS Home eNodeB Management System
HeNB Home eNodeB

4 Concepts and background

Home eNodeB has the following characteristics:

- The quantity of Home eNodeBs is likely to be large
- There may be many Home eNodeB vendors
- The location of Home eNodeB could be in a private residence which may not be accessible for frequent on-site maintenance

Based on the above characteristics, this specification defines the functionalities needed for the management of Home eNodeB over a Type 1 interface.

5 Business level requirements

5.1 Requirements

5.1.1 Configuration Management

REQ-OAMP_CM-CON-001 The HeNB shall be able to automatically, i.e. without human operator on-line interaction or attention, configure itself to be ready for service when powered up and connected to HeMS.

REQ-OAMP_CM-CON-002 The HeNB shall be able to automatically, i.e. without human operator on-line interaction or attention, configure itself to be in service when powered up and connected to HeMS.

REQ-OAMP_CM-CON-003 The HeNB shall be able to automatically, i.e. without human operator on-line interaction or attention, upgrade its software/firmware and configuration.

REQ-OAMP_CM-CON-004 The HeNB auto-configuration shall be done in such way that the performance of the surrounding macro cells is not adversely affected.

REQ-OAMP_CM-CON-005 The HeNB auto-configuration function should be adaptive to react to change in the network and changes in the radio environment.

REQ-OAMP_CM-CON-006 The operator shall be able to remotely reboot the HeNB.

REQ-OAMP_CM-CON-007 The operator shall be able to remotely start/stop the radio transmission of the HeNB.

REQ-OAMP_CM-CON-008 In case IPsec is used, the system should be engineered to ensure that the HeNB IP address changes as minimally as possible.

REQ-OAMP_CM-CON-009 The operator shall be able to remotely reconfigure the frequency and radio bandwidth of HeNB to adapt to changes in the radio environment and required bandwidth.

REQ-OAMP_CM-CON-010 The HeNB should allow configuration of the IPsec or non-IPsec usage option based on the operator's policy [8].

REQ-OAMP_CM-CON-011 The operator shall be able to activate/deactivate energy savings on one or multiple HeNBs in the network [9][10].

REQ-OAMP_CM-CON-012 The operator shall be able to configure energy saving policy for the one or more HeNBs in the network [9][10].

5.1.2 Performance Management

REQ-OAMP_PM-CON-001 The HeNB may have the capability to collect its performance related data.

REQ-OAMP_PM-CON-002 The HeNB shall send performance data based on operator configured policy.

REQ-OAMP_PM-CON-003 Operator shall be able to retrieve performance data file from the HeNB.

5.1.3 Fault Management

REQ-OAMP_FM-CON-001 The HeNB shall support Fault Management to enable the operator to monitor and manage the HeNB.

REQ-OAMP_FM-CON-002 The HeNB shall provide alarm related information only on demand by the operator or based on operator configured policy.

5.1.4 Security Management

REQ-OAMP_SM-CON-001 The HeNB shall have the capability to protect itself against Denial of Service attack over the Type 1 interface.

5.2 Actor roles

Not defined in this version.

5.3 Telecommunications resources

Not defined in this version.

5.4 High level use cases

5.4.1 HeNB Energy Saving use cases

UC1a: Capacity-Limited Networks

Capacity-limited networks are normally dimensioned to cope with peak time traffic demand and can hence be under-utilized in off-peak times peak time traffic demand e.g. at certain hours of the night, when the overall load as well as the load distribution onto the different cells may differ significantly from peak times.

For energy saving management in such networks, the objective is therefore to adapt the network to these changing conditions by activating energy saving on selected cells. One approach is to concentrate the load into a few selected cells that remain active during low traffic demand periods with increased coverage area and to deactivate the remaining less loaded cells.

UC1b: Hybrid E-UTRAN Macro Cell and HeNB Cell Coverage

A variation of the above use case is to have all cells in the building can be shut down. The overlay macro cell can provide coverage for all the HeNBs in that area.

Depending on the architecture, energy saving decisions and corresponding state transfers are made by network elements (or element / domain managers) or by network management systems.

6 Specification level requirements

6.1 Requirements

6.1.1 Configuration Management

The requirements for configuration management are as follows:

REQ-OAMP_CM-FUN-001 The HeNB configuration shall be administered by the HeMS utilising the TR-069 CWMP Protocol, reference [4].

REQ-OAMP_CM-FUN-002 HeMS shall be able to reboot the HeNB.

REQ-OAMP_CM-FUN-003 HeMS shall have remote access to the HeNB to start/stop the radio transmission.

REQ-OAMP_CM-FUN-004 HeMS shall have remote access to the HeNB to start/stop the radio transmission on the frequencies specified by HeMS.

REQ-OAMP_CM-FUN-005 HeMS shall maintain the configuration data of the HeNB.

REQ-OAMP_CM-FUN-006 When the HeNB is initially powered up and connected to the HeMS, HeMS shall send the initially needed configuration data to the HeNB.

REQ-OAMP_CM-FUN-007 If the inner IPsec tunnel IP address of the HeNB changes and HeNB is connected to HeMS via IPsec Tunnel then the HeNB shall notify the HeMS using TR-069.

REQ-OAMP_CM-FUN-008 The HeMS shall specify which parameters it needs to be notified of when the HeNB changes their values through auto-configuration. The HeNB shall notify the HeMS of changes in the values of any such auto-configured parameters.

REQ-OAMP_CM-FUN-009 The HeNB shall inform the HeMS of its ability to auto-configure parameters or groups of parameters that are relevant to the HeMS.

REQ-OAMP_CM-FUN-010 HeMS shall be able to specify a value, or a valid range of values, for any parameter that is auto-configurable by the HeNB.

REQ-OAMP_CM-FUN-011 Configuration management capability for the HeNB shall be supported by means of TR-069 RPCs SetParameterValues, AddObject and DeleteObject . Optionally a bulk configuration management file may be supported. In this case the TR-069 manager uses the RPC download method to trigger a CM file download from a file server.

REQ-OAMP_CM-FUN-012 The HeNB shall provide a capability allowing the HeMS to manage downloading of HeNB software/firmware image files and provide mechanisms for version identification and notification to the HeMS of the success or failure of a file download.

REQ-OAMP_CM-FUN-013 In normal operation, the HeNB shall maintain its configuration data following a HeNB reboot.

REQ-OAMP_CM-FUN-014 The HeNB shall support capabilities to inform the HeMS about the results of specific actions triggered by the HeMS.

REQ-OAMP_CM-FUN-015 It shall be possible to initiate a management connection at the request of either the HeNB or the HeMS.

REQ-OAMP_CM-FUN-016 The HeNB shall be able to inform the HeMS of the changes in radio environment and required radio bandwidth.

REQ-OAMP_CM-FUN-017 The operator shall be able to remotely reconfigure the frequency and radio bandwidth of HeNB.

REQ-OAMP_CM-FUN-018 If the HeNB is unable to offer service for an operator configured time period it will deactivate the air interface.

REQ-OAMP_CM-FUN-019 The HeNB shall support a capability to allow the HeMS to activate Local IP Access.

REQ-OAMP_CM-FUN-020 The HeNB shall support a capability to allow the HeMS to deactivate Local IP Access.

REQ-OAMP_CM-FUN-021 The HeMS should be able to securely configure the HeNB according to the operator's policy, whether or not to use IPsec for subsequent connections.

REQ-OAMP_CM-FUN-022 The HeNB should support a capability allowing the HeMS to initiate energy saving activation.

REQ-OAMP_CM-FUN-023 The HeNB should support a capability allowing the HeMS to initiate energy saving deactivation.

REQ-OAMP_CM-FUN-024 When a HeNB is in energySaving state the HeMS shall not consider the NE as a fault, and no alarms shall be raised.

REQ-OAMP_CM-FUN-025 The HeNB should support a capability allowing the HeMS to configure the time period during which energy saving is allowed or not allowed.

REQ-OAMP_CM-FUN-026 The HeNB should support a capability to notify the HeMS when it goes into or out of energySaving state.

REQ-OAMP_CM-FUN-027 The HeNB should support a capability allowing the HeMS to configure a cell traffic load threshold and time duration to be used for the decision if a network element goes into energySaving state.

REQ-OAMP_CM-FUN-028 The HeNB should support a capability allowing the HeMS to configure a cell traffic load threshold to be used for the decision if a network element goes out of energySaving state.

6.1.2 Performance Management

The HeNB may support Performance Management to enable the operator to monitor the HeNB network based on the business level requirements.

The requirements for performance management are as follows.

REQ-OAMP_PM-FUN-001 The HeNB may have the Performance Management capabilities administered by the HeMS.

REQ-OAMP_PM-FUN-002 The HeNB shall support the retrieval of the Performance Information from the HeNB utilising the file transfer option of TR-069 CWMP Protocol, reference [4].

REQ-OAMP_PM-FUN-003 The HeNB shall be configurable by the HeMS to produce an XML File at regular intervals which contains the HeNB performance Information and then upload the XML File.

REQ-OAMP_PM-FUN-004 The XML File Formats produced by the HeNB shall adhere to the 3GPP XML Performance Management File Formats, reference [5].

REQ-OAMP_PM-FUN-005 The HeNB shall upload PM files using TR-069 compliant file transfer protocols.

REQ-OAMP_PM-FUN-006 HeMS shall have the ability to configure policies for the HeNB performance data file upload.

6.1.3 Fault Management

REQ-OAMP_FM-FUN-001 The HeNB shall have the Fault Management capabilities administered through the HeMS.

REQ-OAMP_FM-FUN-002 The HeNB shall have the ability to send alarm related information to HeMS according to operator configured policy.

REQ-OAMP_FM-FUN-003 The alarm related information to be sent to the HeMS by the HeNB shall support the inclusion of the appropriate Information attributes, as defined in 3GPP TS.32.111-2, reference [6].

REQ-OAMP_FM-FUN-004 The HeNB shall maintain the following information:

a. Alarm Management Information – which contains the alarm management and reporting parameters configurable by the HeMS

b. Alarms List – Alarms currently active on the HeNB

c. Alarm History – contains the alarms previously created by the HeNB.

d. Pending Delivery Queue – contains the alarms queued to be sent to the HeMS on the next management connection

REQ-OAMP_FM-FUN-005 The HeNB shall support the following ways of alarm handling:

a. Expedited handling– the HeNB connects to the HeMS immediately to raise the alarm and logs the alarm in the Alarm History.

b. Queued handling – the HeNB queues the alarm internally pending connection to the HeMS, logs the alarm in the Alarm History, and delivers the alarm on the next connection to the HeMS

c. Logged handling – the HeNB does not send the alarm to the HeMS and logs the alarm in the Alarm History.

d. Disabled handling– the HeNB does not send the alarm to the HeMS and will not log the alarm in the Alarm History

REQ-OAMP_FM-FUN-006 The HeMS may configure the alarm handling for each type of HeNB alarm according to the HeNB alarm handling capabilities and the default handling if not specified by the HeMS shall be “Logged handling”.

REQ-OAMP_FM-FUN-007 The HeMS shall have the ability to throttle the sending of alarms from the HeNB to the HeMS

REQ-OAMP_FM-FUN-008 The HeMS shall have the capability to retrieve alarm related information from the HeNB using TR-069 RPC Method Calls.

REQ-OAMP_FM-FUN-009 The HeMS shall have the capability to completely purge on the HeNB the Alarms List and the Pending Delivery Queue and may have the capability to completely purge on the HeNB the history of Alarms.

REQ-OAMP_FM-FUN-010 The HeMS shall have the capability to activate and deactivate the alarm reporting by the HeNB.

REQ-OAMP_FM-FUN-011 The HeMS shall be able to define the frequency of passive reporting.

REQ-OAMP_FM-FUN-012 The HeMS shall be informed immediately of alarms (raised, changed, cleared) classified as expedited notifications only.

REQ-OAMP_FM-FUN-013 The HeNB shall provide a capability allowing the HeMS to access information that it may use to diagnose and resolve connectivity or service issues.

6.1.4 Security Management

REQ-OAMP_SM-FUN-001.The HeNB shall have the capability to communicate with the HeMS via TR-069 CWMP, reference [4], through the support of one of the two security mechanisms determined by the Network Operator’s Security Policies:

- utilising SSL/TLS outside the IPsec Tunnel

- within the IPsec Tunnel with the option to utilise SSL/TLS within the IPsec Tunnel for additional end-to-end security

TR-069 CPE devices are currently factory programmed with a Bootstrap HeMS URL only and therefore the HeNB capable CPEs requiring to utilise IPsec for connection to the HeMS either require to be factory programmed with Bootstrap Security Gateway/IPsec Information or this information is supplied outside of the IPsec tunnel before tunnel establishment utilising SSL/TLS.

REQ-OAMP_SM-FUN-002 The HeNB shall provide a capability to prevent tampering with the interactions that take place between the HeNB and the HeMS as well as management functions of a HeNB.

REQ-OAMP_SM-FUN-003 The HeNB shall provide a capability allowing the HeMS to authenticate the HeNBs.

REQ-OAMP_SM-FUN-004 The HeNB shall be able to authenticate the HeMS prior to responding to interactionstriggered by the HeMS.

REQ-OAMP_SM-FUN-005 The HeNB shall provide a capability supporting confidentiality for interactionstaking place between the HeNB and the HeMS.

6.2 Actor roles

Not defined in this version.

6.3 Telecommunications resources

Not defined in this version.

6.4 Use cases

6.4.1 Energy saving activation on selected network elements (Centralized ES)

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	Activating energy saving for a selected network elements in a part of the network	
Actors and Roles	HeMS as the user	
Telecom resources	Network elements (NEs) and their OSS.	
Assumptions	Centralized ES is performed. The network operator has decided to activate energy saving on selected network elements in a part of the network (network elements, e.g. base stations) based on time period and network load. This requires to activate energy saving on some network elements and to activate compensatingForEnergySaving on others. HeMS is monitoring the load on the NE.	
Pre conditions	The network topology should allow transferring some network elements into energySavingState while maintaining coverage by transferring some other into ES-Compensate state. Network elements (e.g. base stations) are not in a faulty state.	
Begins when	The HeMS decides to activate energy saving on selected network elements in a part of the network based on monitored decreased network load and time period.	
Step 1 (M)	The HeMS makes a decision on which NEs should enter energySaving state, compensatingForEnergySaving state, or notEnergySaving state based on network load, geographic positions and time of day.	
Step 2 (M)	Based on the output of step1, the HeMS initiates energy saving activation and energy saving compensation activation on the NEs selected for the respective state transition.	
Step 3 (M)	After the completion of the energy saving activation process, theNE informs the HeMS on the result of the process.	
Ends when	The selected network elements are in energySaving state, and other selected network elements are in compensatingForEnergySaving state.	
Exceptions	FFS	
Post Conditions	Energy saving activation has been performed on some selected NEs. Other selected NEs are in compensatingForEnergySaving state. The network coverage is maintained. The network capacity is adapted to the reduced load.	
Traceability	REQ-OAMP_CM-FUN –023, REQ-OAMP,_CM-FUN –025, REQ-OAMP_CM-FUN –027	

6.4.2 Deactivation of energy saving on selected network elements (Centralized ES)

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	Deactivating energy saving for a selected part of the network	
Actors and Roles	HeMS as user	
Telecom resources	Network elements (NEs) and their OSS.	
Assumptions	Centralized ES is performed. The network operator has decided to deactivate energy saving on selected network elements in a part of the network (network elements, e.g. base stations) based on time period and network load. HeMS is monitoring the load on the NE.	
Pre conditions	The affected network elements are in energySavingstate or in ES-Compensate state. Network elements (base stations) are not in a faulty state.	
Begins when	The HeMS decides to deactivate energySaving for selected network elements in a part of the network based on network load.	
Step 1 (M)	The HeMS makes a decision on which NEs should remain in energySaving state or compensatingforEnergySaving state, or enter notEnergySaving state based on network load, geographic positions and maximum coverage of base stations.	
Step 2 (M)	Based on the output of step1, the HeMS initiates energy saving deactivation and energy saving compensation deactivation on the NEs selected for the respective state transition.	
Step 3 (M)	After the completion of the energy saving deactivation process, the NE informs the HeMS on the result of the process.	
Ends when	The selected network elements come out of energy saving state.	
Exceptions	FFS.	
Post Conditions	Energy saving deactivation has been performed on the selected NEs. The selected NEs are in notEnergySaving state. The network coverage is maintained. The network capacity accommodates the increased load.	
Traceability	REQ-OAMP_CM-FUN –024, REQ-OAMP_CM-FUN –025, REQ-OAMP_CM-FUN –027	

6.4.3 Energy saving activation on selected network elements (Distributed ES)

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	Activating energy saving for a selected network elements in a part of the network	
Actors and Roles	HeMS as user	
Telecom resources	Network elements (NEs) and their OSS.	
Assumptions	The network operator has enabled the distributed energy saving function on selected network elements in a part of the network (network elements, e.g. base stations). This allows to activate energy saving on some network elements and to activate energy saving compensation on others. HeMS configures the policy for load threshold.	
Pre conditions	The network topology should allow transferring some network elements into energySavingstate while maintaining coverage by transferring some others into ES-Compensate state. Network elements (e.g. base stations) are not in a faulty state.	
Begins when	The distributed algorithm decides to activate energy saving on selected network elements in a part of the network based on monitored decreased network load and time period provisioned policy.	
Step 1 (M)	The NE executes the energy saving algorithm to determine which neighboring NEs should enter energySaving, compensatingForEnergySaving, or notEnergySaving state.	
Step 2 (M)	Based on the output of step 1, those NEs that have been selected to be transferred to compensatingForEnergySaving state, initiate energy saving compensation and inform the HeMS.	
Step 3 (M)	Based on the output of step 1, those NEs that have been selected to be transferred to energySaving state, perform energy saving activation and inform the HeMS.	
Ends when	The selected base stations are in energySaving state, and other selected base stations are in compensatingForEnergySaving state.	
Exceptions	FFS.	
Post Conditions	Energy saving activation has been performed on some selected NEs. Other selected NEs are in compensatingForEnergySaving state. The network coverage is maintained. The network capacity is adapted to the reduced load.	
Traceability	REQ-OAMP_CM-FUN–25, REQ-OAMP_CM-FUN –026, REQ-OAMP,_CM-FUN –028, REQ-OAMP_CM- REQ-OAMP_CM-FUN –030	

6.4.4 Energy saving deactivation on selected network elements (Distributed ES)

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	Deactivating energy saving for a selected part of the network	
Actors and Roles	HeMS as user	
Telecom resources	Network elements (NEs) and their OSS.	
Assumptions	The network operator has enabled the energy saving distributed function on selected network elements in a part of the network, so that the NEs can deactivate energy saving state depending on load conditions.	
Pre conditions	The affected network elements are in energySaving state or in compensatingForEnergySaving state. Network elements (e.g. base stations) are not in a faulty state.	
Begins when	The distributed algorithm decides to deactivate energy saving for a selected part of the network based on energy saving policy.	
Step 1 (M)	The NE executes the energy saving algorithm that decides which NEs remain in energySaving state or compensatingforEnergySaving state or enter notEnergySaving state.	
Step 2 (M)	Based on the output of step 1, those NEs that in energySaving state or compensatingforEnergySaving state which have been selected to be transferred to notEnergySaving state, initiate energy saving deactivation or energy saving compensation deactivation and inform the HeMS.	
Ends when	The selected network elements are in nonEnergySaving state.	
Exceptions	FFS.	
Post Conditions	Energy saving deactivation has been performed on the selected NEs. The selected NEs are in notEnergySaving state. The network coverage is maintained. The network capacity accommodates the increased load.	
Traceability	REQ-OAMP_CM-FUN–25, REQ-OAMP_CM-FUN –026, REQ-OAMP,_CM-FUN –029, REQ-OAMP_CM- REQ-OAMP_CM-FUN –030	

Annex A (informative): Energy Saving use cases for HeNB

A.1 UC1a: Capacity-Limited Networks

Capacity-limited networks are normally dimensioned to cope with peak time traffic demand and can hence be under-utilized in off-peak times peak time traffic demand e.g. at certain hours of the night, when the overall load as well as the load distribution onto the different cells may differ significantly from peak times.

For energy saving management in such networks, the objective is therefore to adapt the network to these changing conditions by activating energy saving on selected cells. One approach is to concentrate the load into a few selected cells that remain active during low traffic demand periods with increased coverage area and to deactivate the remaining less loaded cells.

HeNBs are ideal candidates for policy based energy saving. For this use case let us consider an office building where there are several HeNBs deployed.

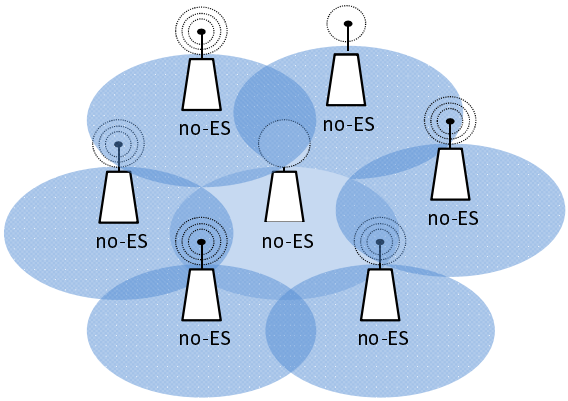

Figure A.1-1

Offices are generally closed between 9:00 PM to 6:00 AM. A policy based energy saving can be used to shut down cells that would not have any traffic during these times. Depending on the need one of cells can provide minimum coverage for the building.

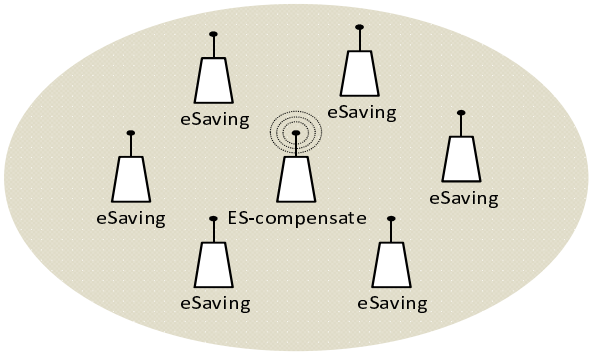

Figure A.1-2: Different network arrangements corresponding to capacity demand variation for energy saving purposes

A.2 UC 1b: Hybrid E-UTRAN Macro Cell and HeNB Cell Coverage

Alternately, if the building is completely closed for holidays or weekends all cells in the building can be shut down. The overlay macro cell can provide coverage for all the HeNBs in that area.

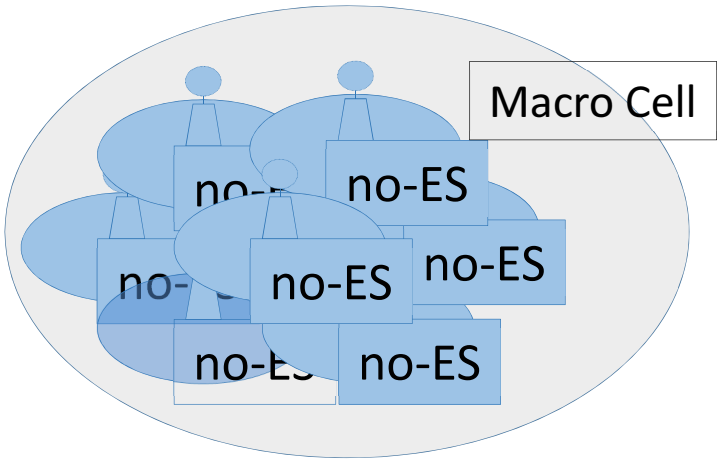

Figure A.2-1

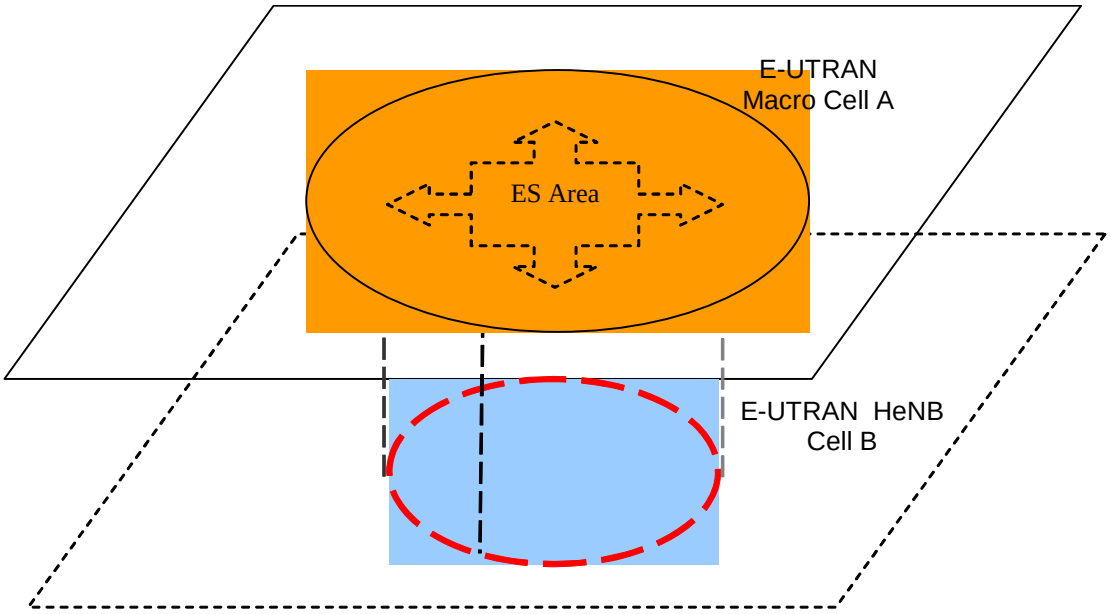

Figure A.2-2: Hybrid E-UTRAN Macro Cell and HeNB Cell Coverage

In this scenario, two E-UTRAN Cells with different cell types cover the same geographical area. Cell B (HeNB Cell) is covered totally by Cell A (Macro Cell). Generally, Cell A is deployed by eNB to provide continuous coverage of the area, while Cell B is deployed by Home eNB to increase the capacity of the special sub-areas, such as home or business mall or office. The energy saving procedure in the coverage of Cell B (ES area) may be triggered in case that light traffic or no traffic in Cell B is detected. Cell B deactivation of energy saving may also be triggered when the traffic of ES area resumes to a high level. Home eNB which deploys the HeNB cell can be totally switched off during the ES procedure.

Activating energy saving on certain NEs and modifying radio parameters for increasing coverage for other cells can lead to different neighbor relations as well as different cell and frequency layouts, which should be addressed by automatic neighbor relation, interference control, e.g. through OAM-driven configuration or SON function. Depending on the specific scenarios, activating energy saving on NEs could ultimately lead to switching off all radio-transmission-related functions at a site, which would lead to reduced energy consumption and could implicitly lead to even further energy saving, e.g. when air condition systems at a site adapt to the reduced cooling requirements – which is not considered here in detail.

Depending on the architecture, energy saving decisions and corresponding state transfers are made by network elements (or element / domain managers) or by network management systems.

Annex B (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Jun 2009	SA#44	SP-090304	--	--	Presentation to SA for information	--	1.0.0
Mar 2010	SA#47	SP-100057	--	--	Presentation to SA for approval	1.0.0	2.0.0
Mar 2010	--	--	--	--	Publication of SA approved version	2.0.0	9.0.0
Jun 2010	SA#48	SP-100264	001	--	Missing Requirement for an operator's defined time period at the HeNB	9.0.0	10.0.0
Mar 2011	SA#51	SP-110099	002	1	Add LIPA management requirements	10.0.0	10.1.0
May 2011	SA#52	SP-110288	004	2	Correction of requirements for HeNB non-IPsec usage - alignment with 33.320	10.1.0	10.2.0
2012-09	-	-	-	-	Update to Rel-11 version (MCC)	10.2.0	**11.0.0**
2014-10	-	-	-	-	Update to Rel-12 version (MCC)	11.0.0	**12.0.0**
2014-12	SA#66	SP-140799	006	1	Use case description for energy saving management for HeNBs	12.0.0	**13.0.0**
			007	1	Use case for energy saving management for HeNBs		
			008	1	Requirements for energy saving management for HeNBs		

Change history							
Date	**Meeting**	**Tdoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2016-12						Correction of LTE logo (MCC)	13.0.1
2017-04	SA#75	-	-	-		Promotion to Release 14 without technical change	**14.0.0**
2018-06	-	-	-	-	-	Update to Rel-15 version (MCC)	**15.0.0**
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	**16.0.0**
2022-04	-	-	-	-	-	Update to Rel-17 version (MCC)	**17.0.0**
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	**18.0.0**

History

Document history		
V18.0.0	May 2024	Publication