Qucell 4G/LTE Small Cell

CBRS Small Cell (HeNB) Manual

(Model: SC-220)

Caution Please read cautions in this manual carefully before handling Qucell HeNB.

Please keep this operation manual carefully to be accessible any time when you need

Figures in this manual are just examples. It may be different from real images.

Contents

1. Application Range

This document describes feature, function and structure of 『LTE Small Cell (HeNB)』 (abbreviate to "Small Cell")

1.1. References

- This document consists of information for the supported software and Small Cell for Small Cell users.

1.2. Revision History

Revision history of this document, please refer to the table below.

Version	Date	Editor	Changes
0.0.1	2019-04-11	Qucell DEV	Initial draft

1.3. Copyright

2. LTE Small Cell System Summary

LTE Small Cell(HeNB) is wireless network system which supports 3GPP LTE (Long Term Evolution)(3GPP LTE is abbreviated as "LTE" hereafter) service. LTE Small Cell can be a cost effective solution for both installation and operation with performance as a Macro cell and internet security. LTE Small Cell can provide the service through Backhaul connection which have already been installed or can be provided at low cost regardless of time and place.

2.1. What is a Small Cell?

Small cells are low-powered radio node(10~hudreds meters) and it means small base station(eNodeB) including Femtocell, Picocell, Metrocell and Microcell. Small cell is low-power wireless AP(Access Point) which connects terminal with mobile wireless network using fixed wideband internet connection. And it provides improved cellular coverage, and capacity of mobile communication services. (Source: Small Cell Forum - http://www.smallcellforum.org)

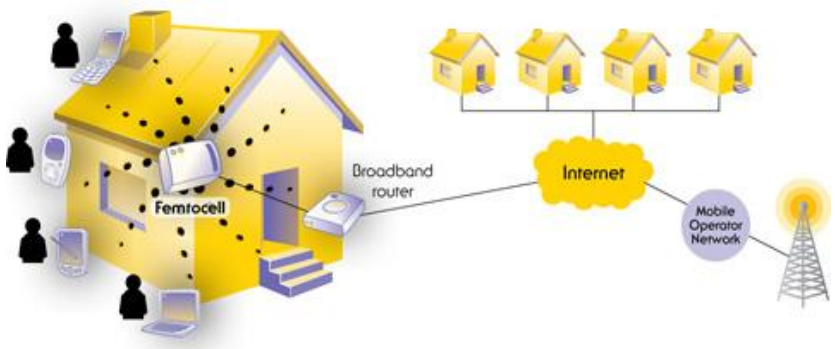

Figure 1. Use of Small Cell (Source: Small Cell Forum)

2.2. Types of Small Cell

Femtocell

Femtocell is a small, low-power cellular base station. It was designed for use in home or small business areas. A broader term which is more widespread in the industry is small cell, with femtocell as a subset. Main features of Femtocell are IP backhaul, Self-optimization, low-power, easy to install and etc. Small Cell of Femtocell type can be classified to two types as follows:

1. Residential Small Cell: used at home
2. Enterprise Small Cell: used for enterprise/in-building, smaller than Picocell

Picocell

Picocell is a low-power power compact base station that covers small area, such as office and part of a building. Sometimes, it includes Small Cells used at outdoors.
The necessity of expert knowledge is minimized because of self-optimizing function of the Small Cell technology,
But it is necessary to pay attention to the selection of the number and location of the device to be installed in the room.

Metrocell

Metrocell means Small Cell which is used to provide large capacity in downtown area. It is usually mounted on wall, lamppost and CCTV, positioned on the street structure. Sometimes, Femtocell, Picocell, Microcell are included in Metrocell.

Microcell

Because of inefficient Macro coverage, Microcell, the base station which covers small outdoor area, is used for extending coverage for in/outdoor users. Sometimes, Microcell is installed at indoors and used to provide more capacity and coverage than Picocell.

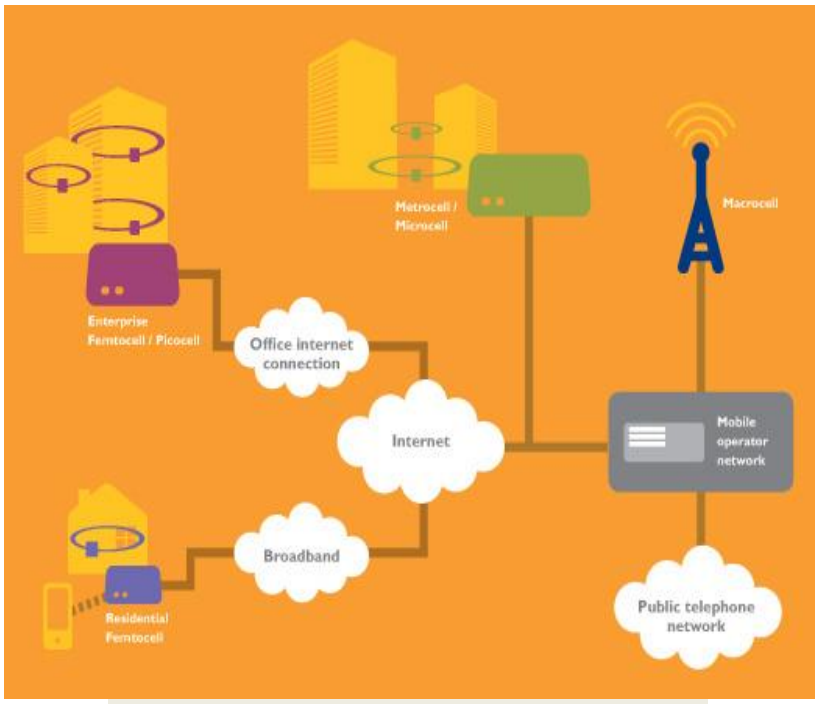

Figure 2. Types of Small Cell (Source: Small Cell forum)

2.3. Features of LTE Small Cell

LTE services support data service except multimedia on user handset. To satisfy user's needs, it is necessary to provide high-speed but low-cost packet transmission service.

LTE Small Cell Features are as follows:

1. Data Traffic dispersion effect: Because LTE Small Cell can use existing Internet/PSTN
2. Coverage expansion effect: LTE Small Cell can cover shadow area such as in-building area.

Introduction and Utilization of Small Cell could be new revenue model to mobile operator because it can support Low-cost but high-efficiency convergence service infra.

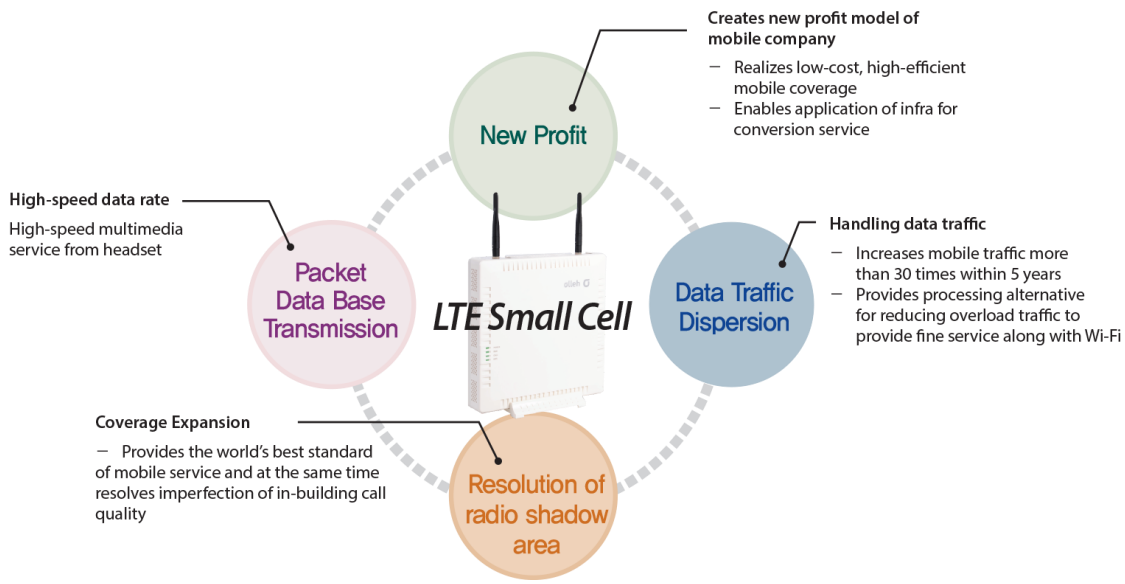

Figure 3. Features of LTE Small Cell

2.4. System Summary

LTE Small Cell provides a high-speed data service adopting downlink OFDMA (Orthogonal Frequency Division Multiple Access) transmission technique, uplink SC (Single Carrier) FDMA transmission technique and various Spectrum allocations with supporting scalable bandwidth. LTE Small Cell contains LTE service function in SoC and thus it is possible to compose system simply with low cost.

For high-efficiency, the inner hardware accelerator of SoC is utilized and main function is realized in the form of software from the Multi Core processor inside SoC, providing diverse and flexible services.

- Qucell LTE Small Cell Includes feature for deactivating radiation of signal from the device when failure/malfunction is detected via connected electronic communication circuit equipment.

- Qucell LTE Small Cell Includes feature for deactivating radiation of signal, automatically from the device, when communication between the device and the connected electronic communication circuit equipment is fails.

2.5. LTE Small Cell Network Configuration

LTE Small Cell is also called HeNB(Home evolved UTRAN Node B), it serves Wireless connection function with UE to process Packet by LTE Air Standards between UE(User Equipment) and EPC. LTE Small Cell serves HeNB function interworking with HeNB GW(Gateway), HeMS(HeNB Management System) Server.

Small Cell is connected with HeNB GW and ready to serve Services by communicating with MME. Process of Small Cell setting, management, alarm, statistics and etc. is dealt with through HeMS Server which has connection with Small Cell through IP network.

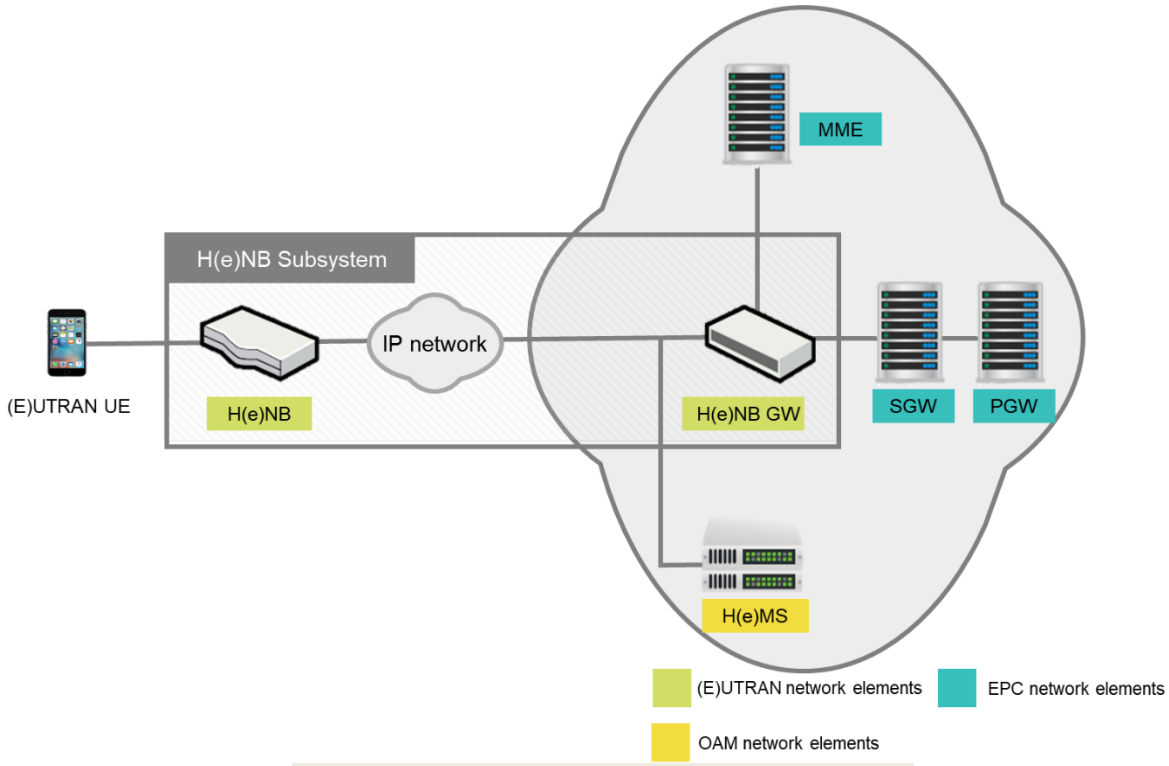

Figure 4. Connection diagram for LTE Small Cell and EPC

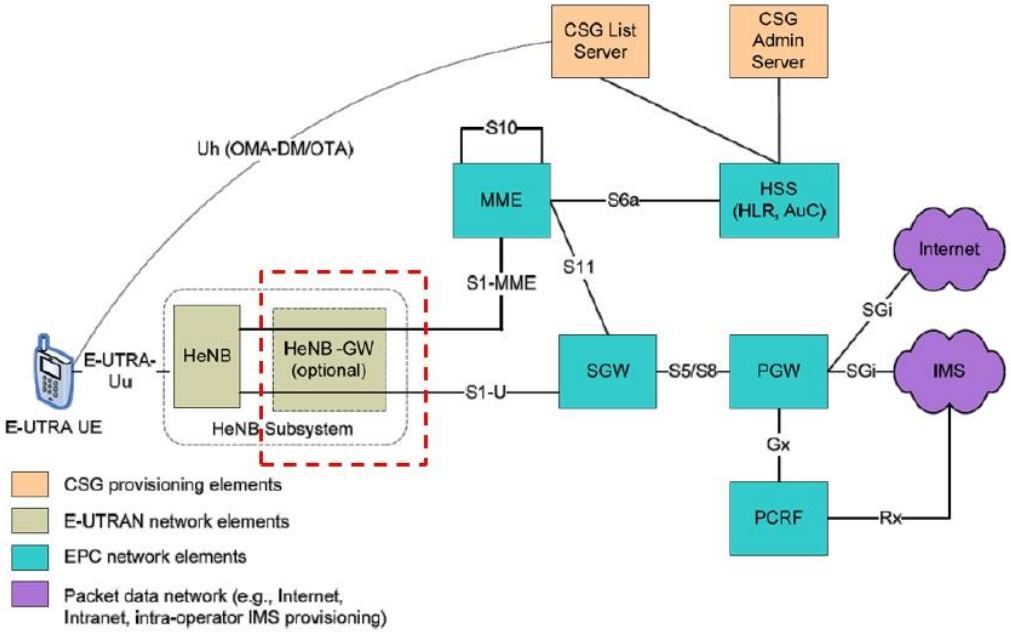

Figure 5. E-UTRAN Small Cell network configuration diagram

3. Small Cell System

3.1. Appearance of Small Cell

Small Cell H/W size is 305 x 305 x 80 (mm). There are 3 LED indicators on the back side. LED functions are like below.

1. Power/GPS
2. Internet
3. Service

The LTE antenna is located inside the Small cell H/W. One GPS Port is located on top view. Two LAN port are located on bottom view.

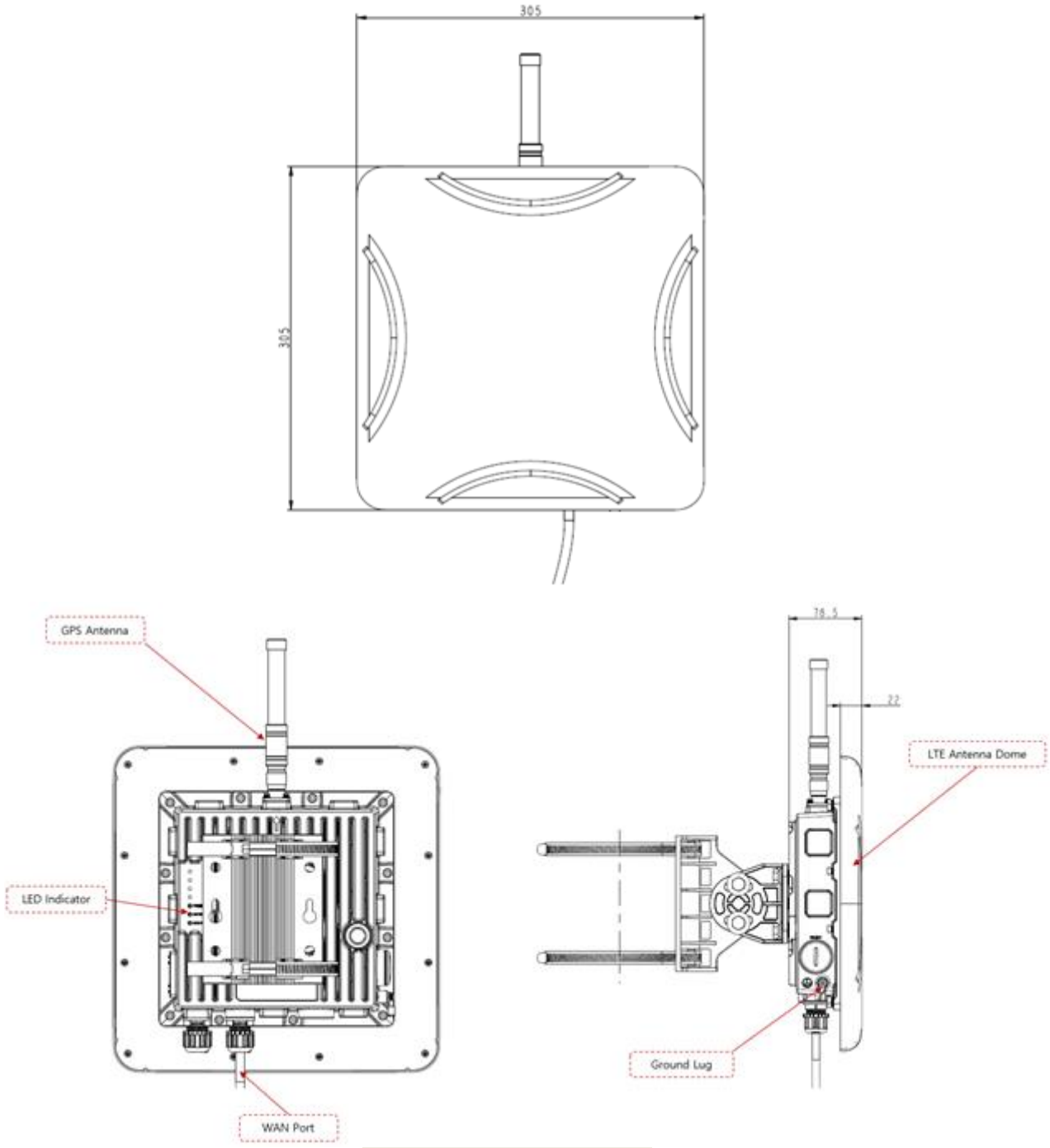

Figure 6. Small Cell H/W picture

3.2. Small Cell Installation Method

Small Cell H/W support two mount options that Pole mount, Wall mount. For Pole mount option, it needs a Horse clamp to fix main body.

1. Pole mount and Horse Clamp

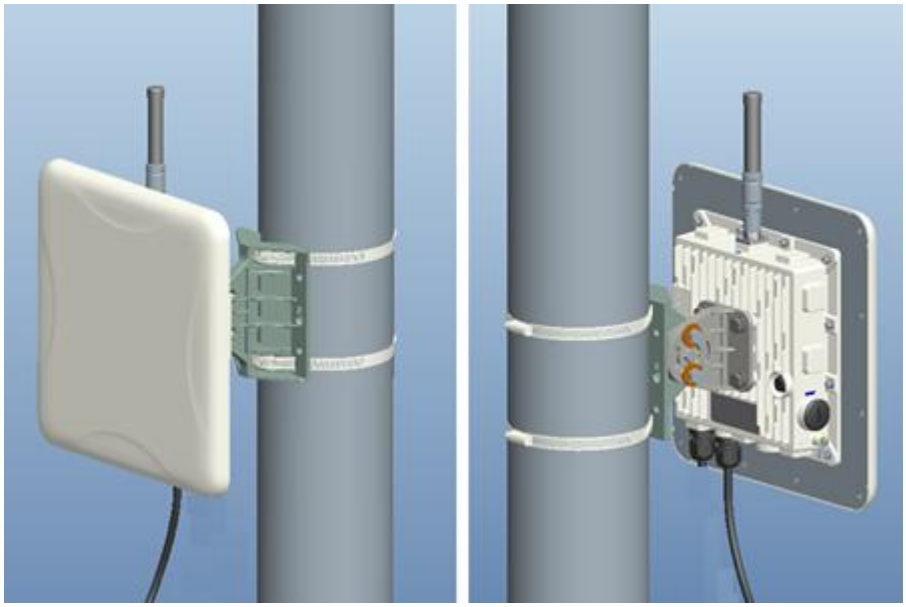

Figure 7. Pole mounting

2. Wall mount

Figure 8. Wall mounting

3.3. System Configuration

Operating system and LTE Protocol Stack operate by using Core Processor, DSP and Hardware Accelerator inside of SoC. Small Cell is configured using SoC that acts as the main processor and LTE HeNB. LTE Digital Signal flows from/to SoC and LTE signal is received and transmitted through RF Transfer, Amp and Antenna. Power and network connection Interface interwork with SoC is configured to interwork with Backhaul and SoC through network interface.

3.4. Standards and Interface

- LTE Small Cell supports below standards which is related HeNB of 3GPP Rel 9/10.

- *Table 1. 3GPP Standards supported by LTE Small Cell*

Number	Title
22.220	Service requirements for Home Node B (HNB) and Home eNode B (HeNB)
23.830	Architecture aspects of Home Node B (HNB) / Home enhanced Node B (HeNB)
23.832	IMS aspects of architecture for Home Node B (HNB)
25.367	Mobility procedures for Home Node B (HNB); Overall description; Stage 2
25.467	UTRAN architecture for 3G Home Node B (HNB); Stage 2
25.469	UTRAN Iuh interface Home Node B (HNB) Application Part (HNBAP) signalling
25.820	3G Home Node B (HNB) study item Technical Report
25.967	Home Node B (HNB) RF Requirements
32.581	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Concepts and requirements for Type 1 interface HNB to HNB Management System (HMS)
32.582	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Information model for

	Type 1 interface HNB to HNB Management System (HMS)
32.583	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Procedure flows for Type 1 interface HNB to HNB Management System (HMS)
32.821	Telecommunication management; Study of Self-Organizing Networks (SON) related OAM Interfaces for Home Node B (HNB)
33.820	Security of Home Node B (HNB) / Home evolved Node B (HeNB)
33.320	Security of Home Node B (HNB) / Home evolved Node B (HeNB)
32.591	Telecommunication management; Home enhanced Node B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Concepts and requirements for Type 1 interface HeNB to HeNB Management System (HeMS)
32.592	Telecommunication management; Home enhanced Node B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Information model for Type 1 interface HeNB to HeNB Management System (HeMS)
32.593	Telecommunication management; Home enhanced Node B (HeNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Procedure flows for Type 1 interface HeNB to HeNB Management System (HeMS)
32.453	Telecommunication management; Performance Management (PM); Performance measurements Home enhanced Node B (HeNB) Subsystem (HeNS)
33.401	3GPP System Architecture Evolution (SAE); Security architecture
32.571	Telecommunication management; Home Node B (HNB) and Home eNode B (HeNB) management; Type 2 interface concepts and requirements
32.572	Telecommunication management; Home Node B (HNB) and Home eNode B (HeNB) management; Type 2 interface models and mapping functions
23.402	UMTS; LTE; Architecture Enhancements for Non 3GPP access
24.301	UMTS; LTE; Non Access Stratum Protocol for Evolved Packet System
25.913	Requirements for E-UTRA and E-UTRAN

36.101	User Equipment (UE) radio transmission and reception
36.201	LTE; E-UTRAN; LTE Physical Layer; General Description
36.211	Physical Channels and Modulation
36.212	Multiplexing and Channel Coding
36.213	Physical Layer Procedures
36.300	E-UTRAN Overall Description
36.306	User Equipment (UE) radio access capabilities
36.321	E-UTRA Medium Access Control Protocol (MAC) Specification
36.322	E-UTRA Radio Link Control (RLC) Protocol Specification
36.323	E-UTRA Packet Data Convergence Protocol (PDCP) Specification
36.331	E-UTRAN Radio Resource Control (RRC) Protocol Specification
36.413	E-UTRA S1 Application Protocol (S1AP)
36.423	E-UTRAN X2 Application Protocol

- Satisfying the structure defined in 3GPP TS36.300, LTE Small Cell provides standards specific interfaces. It supports S1-U and S1-MME interface defined in TS29.281 and TS36.413 for the interworking of Small Cell, HeNB GW or EPC. HeNB GW added Network structure is as follows.

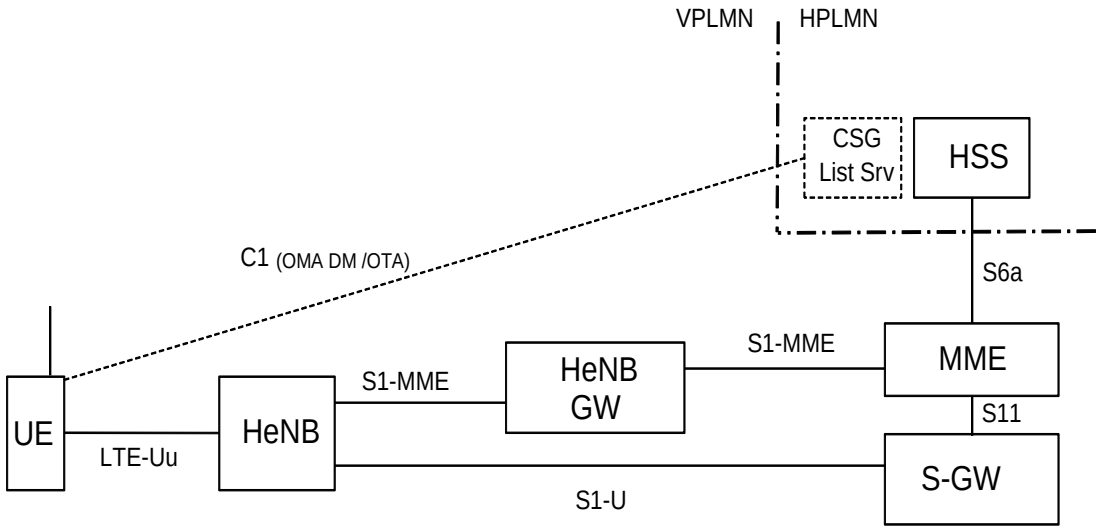

Figure 9. LTE Small Cell(HeNB) and HeNB GW, EPC Interface

LTE Small Cell can be used to connect directly to the EPC as following figure without going through HeNB GW and it also supports S1-U, S1-MME interface defined in TS29.281 and TS36.413.

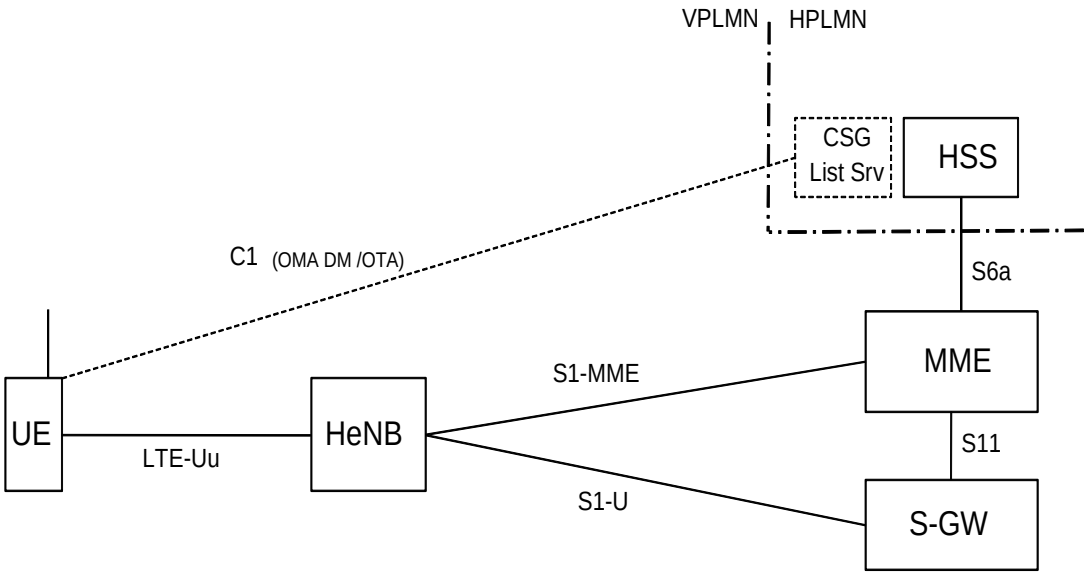

Figure 10. LTE Small Cell(HeNB) and EPC Interface (S1-U, S1-MME)

3.5. Support Service

- LTE Small Cell supports below services.
- Data Call Service
- SMS, MMS Service
- Voice Call Service (VoLTE)

3.6. Synchronization

LTE Small Cell supports synchronization using GPS, PTP/NTP and NL.

3.7. Handover

Small Cell supports S1/X2 based handover defined in 3GPP TS 36.331, TS 36.413 and TS 36.413. The following figures show the handover procedures.

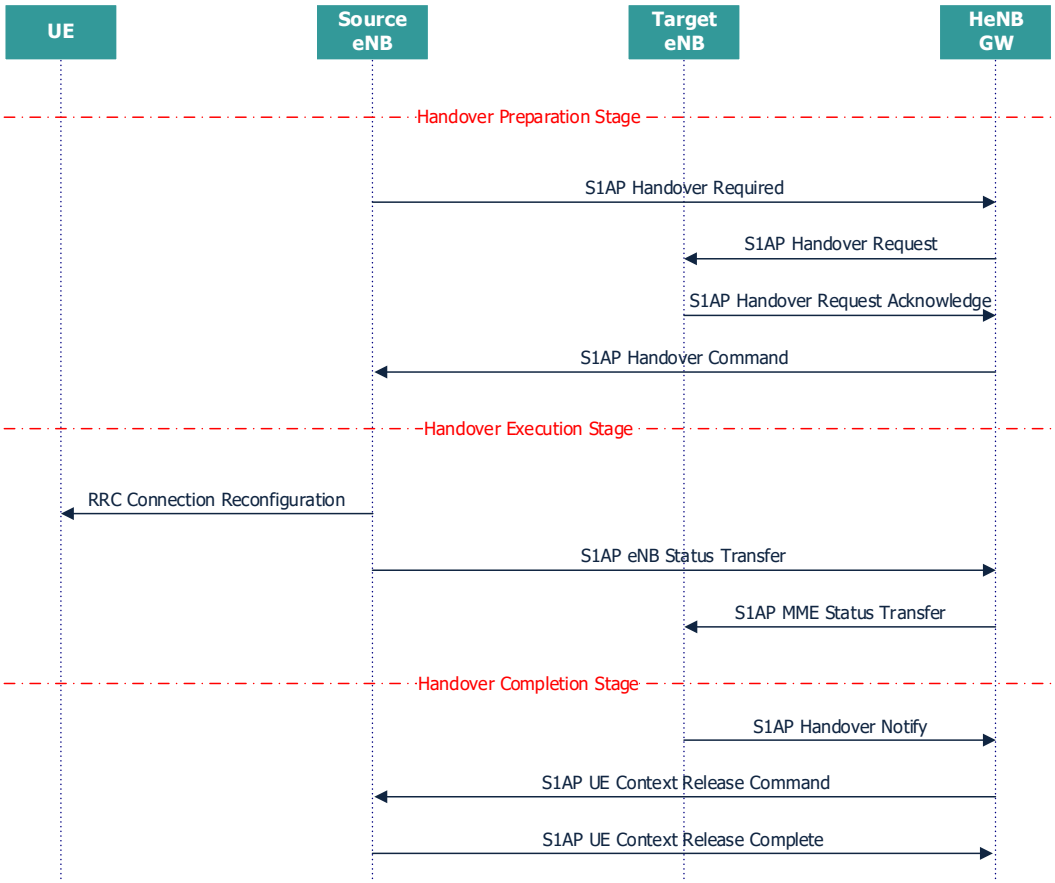

Figure 11. S1 Handover Procedures

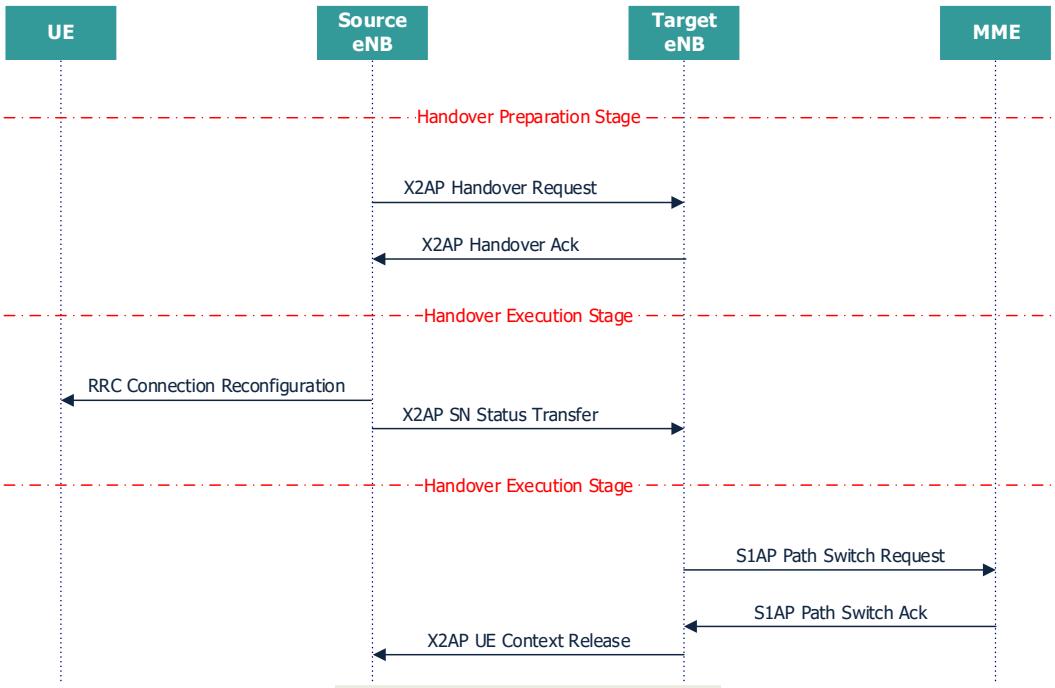

Figure 12. X2 Handover Procedures

3.8. Scheduling

Small Cell supports QoS scheduling (conforming to QCI priority, GBR and MBR for GBR bearer, UE-AMBR for Non-GBR bearer) and PF (Proportional fairness) scheduling for Non-GBR bearer.

3.9. ANR (Automatic Neighbor Relation)

Small Cell can automatically update for neighbor cell's information such as Physical Cell ID, Cell Global ID, Tracking Area Code and etc. Neighbor cell information obtained through ANR can be used for handover and HeMS management

Small Cell supports 3 kinds of ANR methods

- NL (Network Listening) based ANR
- UE based ANR
- X2 based ANR

3.10. CBRS (Citizen Broadcast Radio Service)

3.10.1. CBSD (Citizen Broadcast Radio Service Device)

Small Cell supports CBSD – SAS (Spectrum Access System) protocol in CBRS. CBSD function in Small Cell complies with WINNF CBRS standards and supports multiple grants to activate one or more cells. The small cell device acts as CBSD in CBRS. In order to start service, CBSD needs grant(s) allocated from SAS. One grant consists of information related to channel configuration, e.g. bandwidth, max EIRP (Effective Isotropic Radiated Power). After stored Grants, CBSD should set configuration following grant information. Following figure describes small cell network diagram with CBRS.

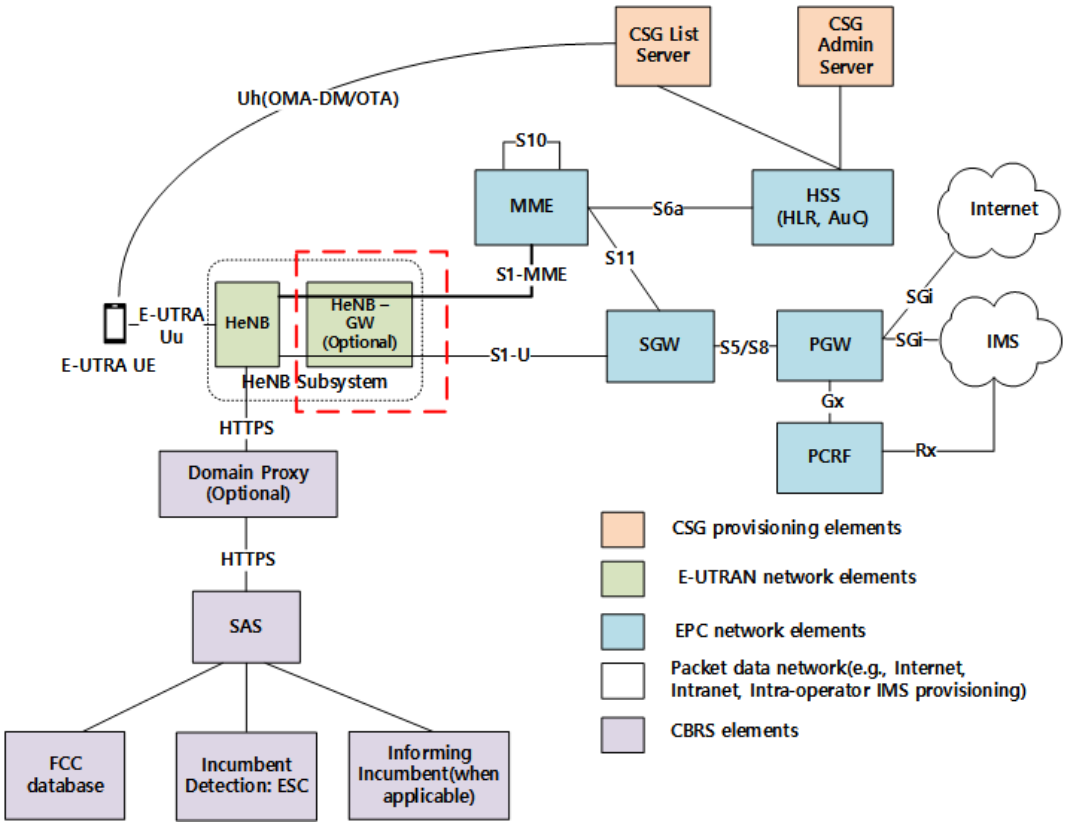

Figure 13. E-UTRAN Small Cell network configuration diagram with CBRS

In CBSD – SAS interface, CBSD should send request messages according to the CBSD state. Following figure describes CBRS registration state. When CBSD is unregistered state, CBSD sends registration request message to register state which means CBSD can request grant. And CBSD can send deregistration message to deregister from the SAS.

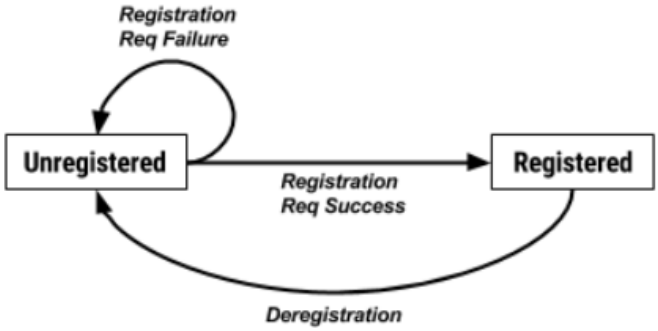

Figure 14. CBRS Registration State Diagram

Following figure describes CBRS Granted state. CBSD can send grant request with user desired parameter. If grant request is acceptable, SAS allocate grant with "Granted" status which means not yet authorized. CBSD sends heartbeat request in order to Authorize the Grant. After SAS sends

success response, grant status changes to "Authorized" and CBSD is ready to start service. CBSD should send Heartbeat request message sequentially to maintain authorized grant. And CBSD can send relinquishment message to remove grants.

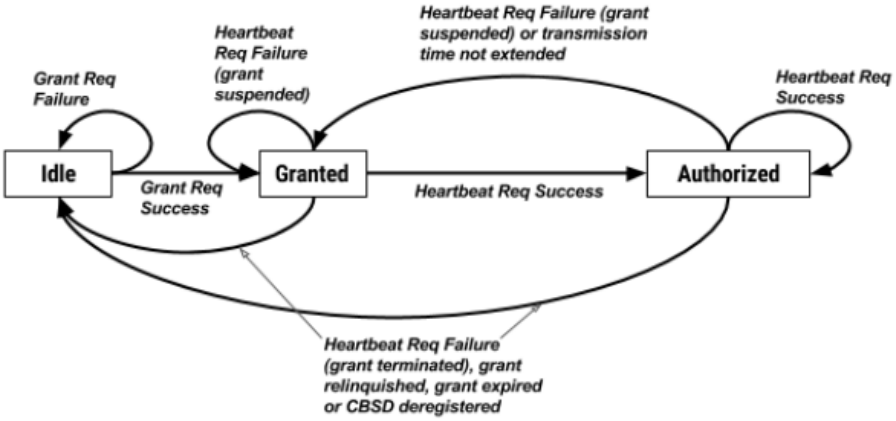

Figure 15. CBRS Granted State Diagram

3.10.2. Domain Proxy

Domain Proxy supports aggregating CBSD messages in CBSD – SAS interface. Following figure describes CBSD – Domain proxy – SAS architecture. Domain proxy acts as CBSDs from SAS point of view, so interface between Domain Proxy and SAS is almost same with CBSD – SAS interface. Likewise, Domain proxy acts as SAS from CBSD point of view, so interface between Domain Proxy and CBSD is almost same with CBSD – SAS interface.

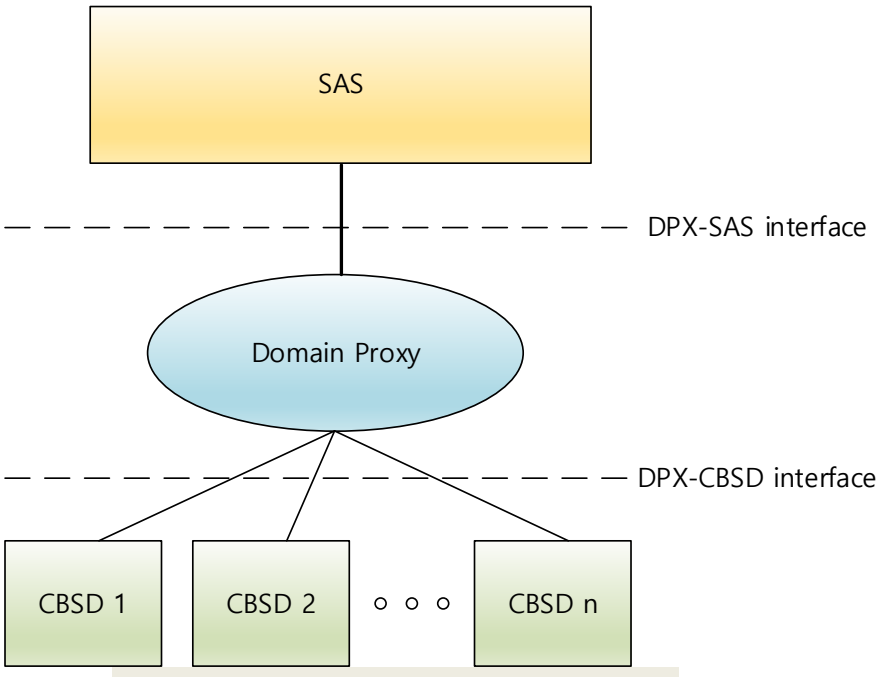

Figure 16. CBSD – Domain Proxy – SAS Architecture

4. Product Specification

Table 2. LTE Small Cell Specification

Classification		Standard
Band	LTE	LTE Band 48 (CBRS, CA) • CBRS Freq. : 3550MHz ~ 3700MHz
Maximum Output		12dBm/Path for 10MHzBW 15dBm/Path for 20MHzBW
Bandwidths		10MHz, 20MHz CA: 10MHz+10MHz, 10MHz+20MHz, 20MHz+20MHz (contiguous/non-contiguous)
Antenna Structure		4 Antennas (2 carrier, 2x2 MIMO)
GPS Antenna		Fc = 1575.42MHz, Gain < 2.0dBi
Capacity	Maximum Active User	16 user (RRC Connected) Per Cell (Total 32User)
Interface	Ethernet Port	RJ-45 x 1
Power	Input	802.3at (PoE+, 24W)
Size (W x H x D)		305 x 305 x 80 (mm)
Weight		≤ 2.2kg

5. Web Terminal

5.1. Operator UI

The Operator UI is an OAM feature that operates on the web interface so that operators can access small cells. The purpose of the function is to enable easier allow operators to setup and check small cell without knowledge on architecture of small cell.

Operators can quickly check the status of small cells through web browsers such as Chrome, Firefox and IE, and can also use device management commands such as reboot, factory reset and firmware update.

5.2. Layout

5.2.1. Architecture of Menu

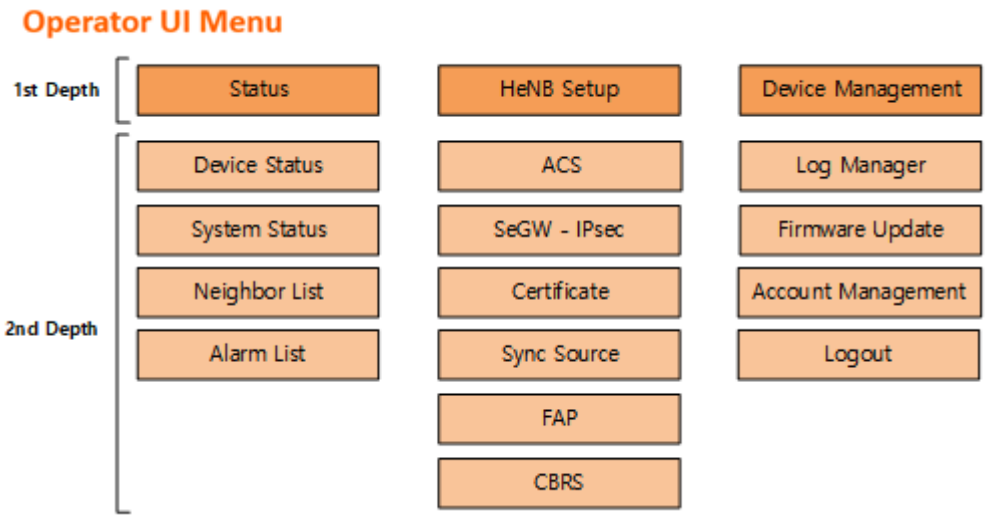

Figure 17. Operator UI Menu

5.2.2. Actual View

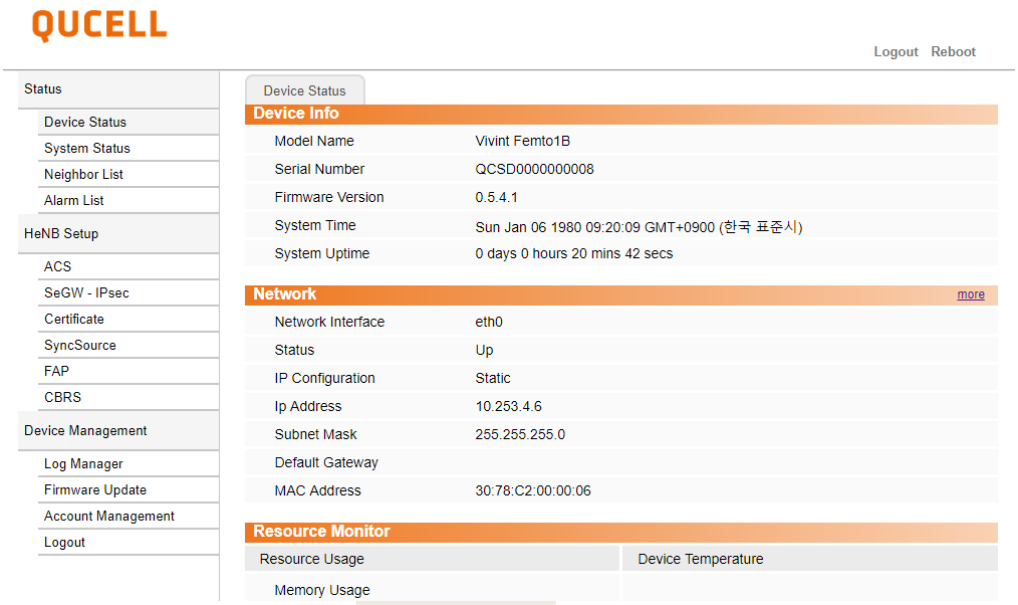

Figure 18. UI View

If an operator successfully logs in, the above figure will be displayed. The left side of the figure (blue) shows menu for accessing each view. On the right side of the figure (red), the operator can check HeNB's status, and set parameters, and run device management commands.

5.3. How to Access

5.3.1. Access via Web Browser

To access small cell, please enter the following URL in the address bar of a web browser. The URL needs to input 'https://' in front of the IP address. (https://10.253.4.60:~~50000~~/qucell/login)

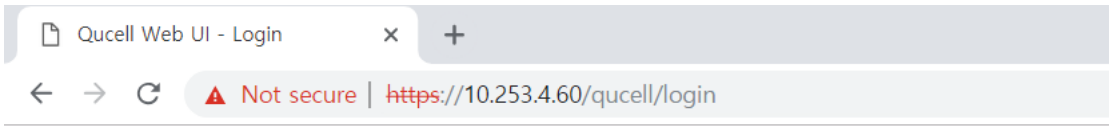

Figure 19-1. Operator UI URL

5.3.2. Login

Please enter the username and the password managed by a security administrator.

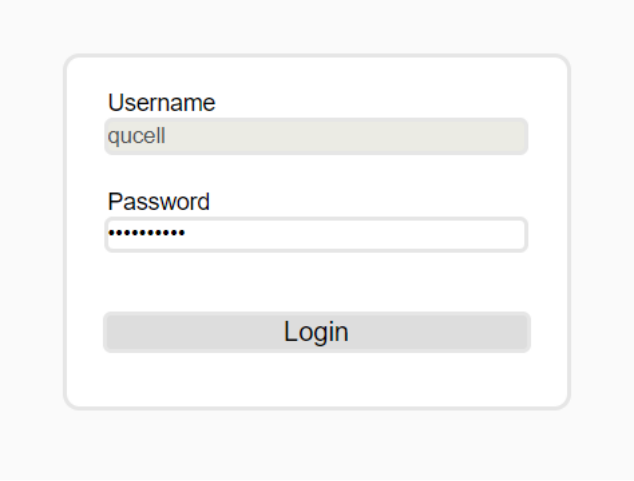

Figure 19-2. Operator UI Login

5.3.3. Password

- Password Change

Password can be changed in the 'Account Management' page.

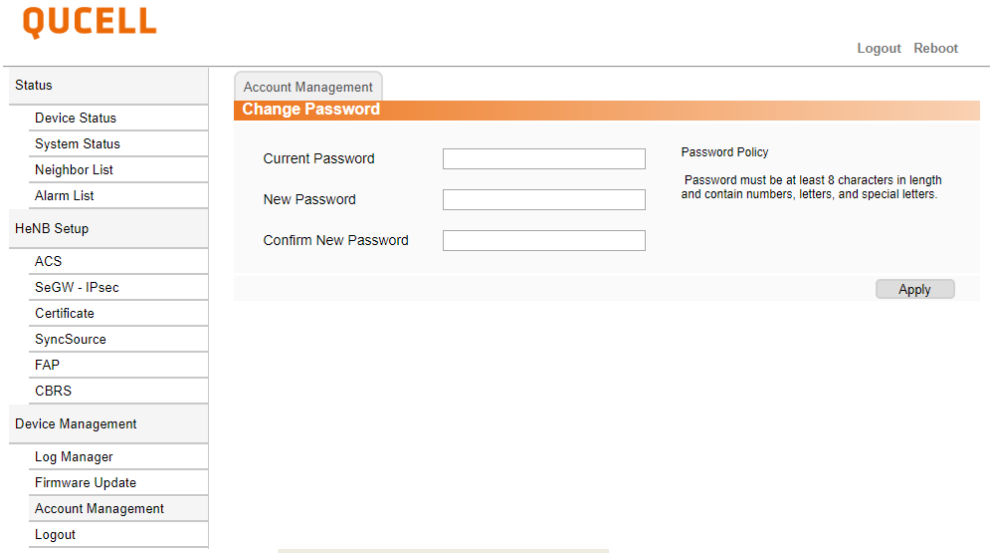

Figure 19-3. Change Password

- Password Rules

The password must conform to the following rules

- Must be at least 8 characters long.
- Must contain at least one alphabet letter. {a~z, A~Z}
- Must contain at least one special character. {~, !, @, #, $, %, ^, &, *, (,), _, +}
- Must contain at least one number. {0~9}

5.3.4. Logout

Here are three cases where a session is logged out.

1. When 'Logout' button on the header is clicked

Figure 19-4. Operator UI Logout

2. When no command in Operator UI for 5 minutes
3. When a new session is logged in (Note that the existing session is immediately logged out.)

5.4. How to Use

5.4.1. Parameter Setting

An example of changing the SyncSource explains how to set the parameters by Operator UI.

1. Click 'SyncSource' button on the menu.

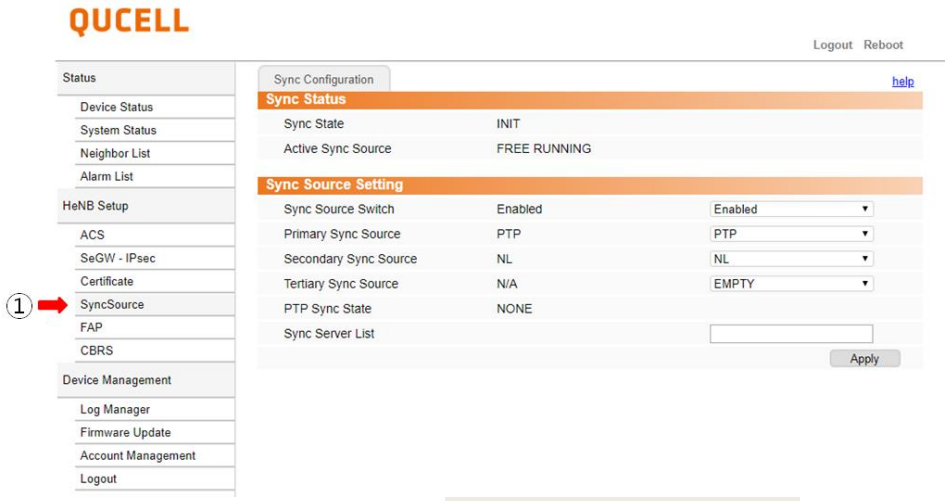

Figure 20-1. 'SyncSource' button

2. Set the SyncSource parameters you want to change in each field.
3. Click 'Apply' button.

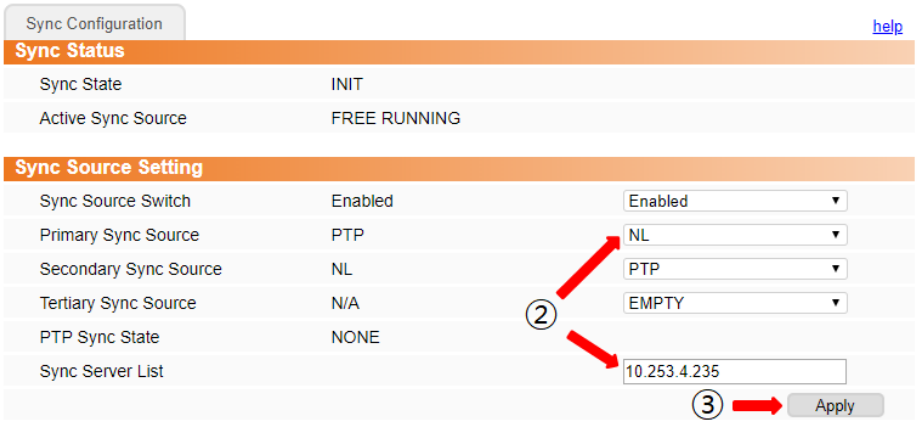

Figure 20-2. Sync Source Setting

4. Click 'OK' button in the popup window or 'Reboot' button on the header.

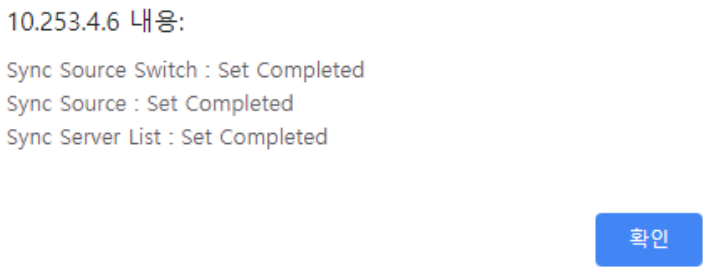

Figure 20-3. popup window1

5. If changing target parameter needs reboot, system will popup window below. Click 'OK' button and femto will reboot.

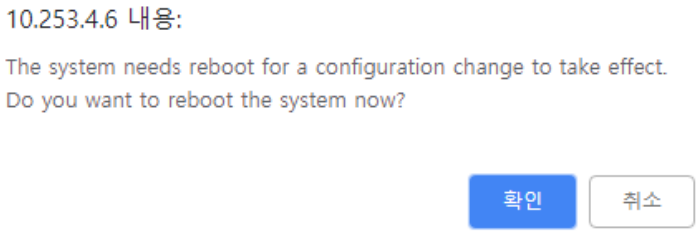

Figure 20-4. popup window2

5.4.2. Reboot

You can run 'Reboot' using Operator UI.

- **Change Boot Side and Reboot**

1. Click 'Firmware Update' button on the menu.

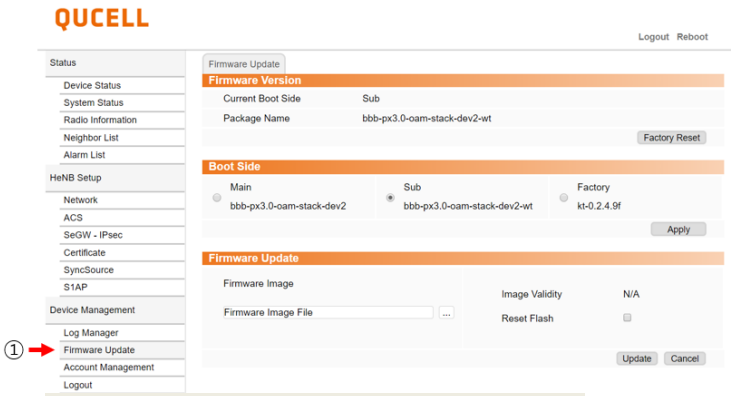

Figure 21-1. Change Boot side and Reboot menu

2. Select the boot side.
3. Click 'Apply' button.

Figure 21-2. Select boot side

4. Click 'OK' button in the popup window.

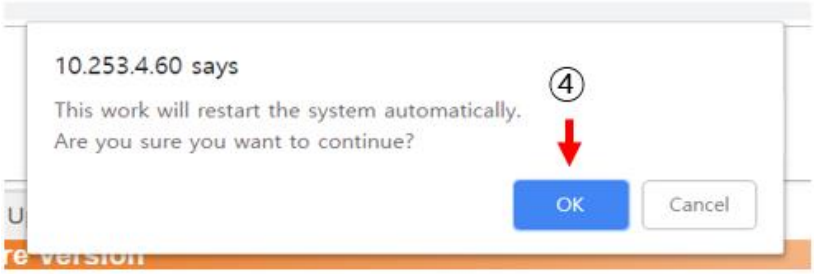

Figure 21-3. boot side popup

- **Immediate Reboot**

1. Click 'Reboot' button on the header.

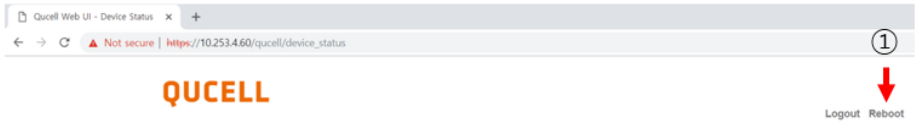

Figure 22-1. reboot button

2. Click 'OK' button in the popup window.

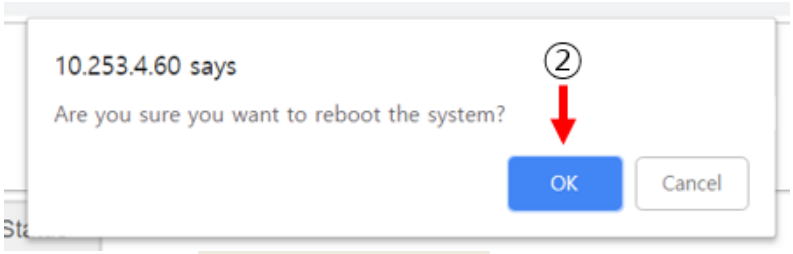

Figure 22-2. reboot popup

5.4.3. Factory Reset

1. Click 'Firmware Update' button on the menu

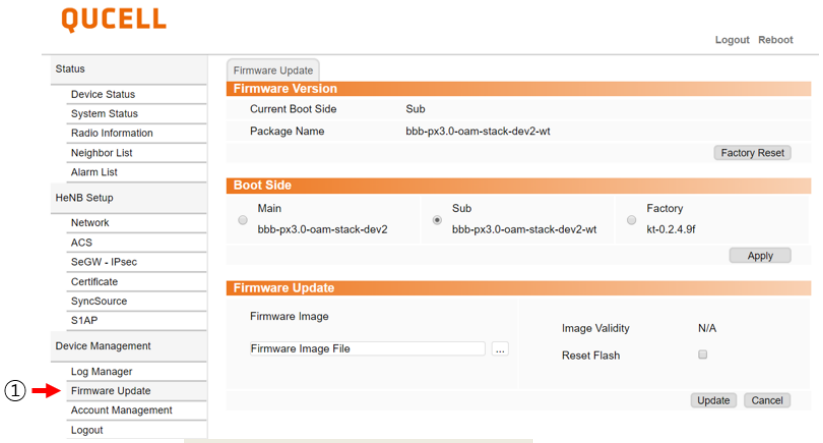

Figure 23-1. Factory reset menu

2. Click 'Factory Reset' button on 'Firmware Version' pane.

Figure 23-2. Factory Reset button

5.4.4. Log Download

1. Click 'Log Manager' button on the menu

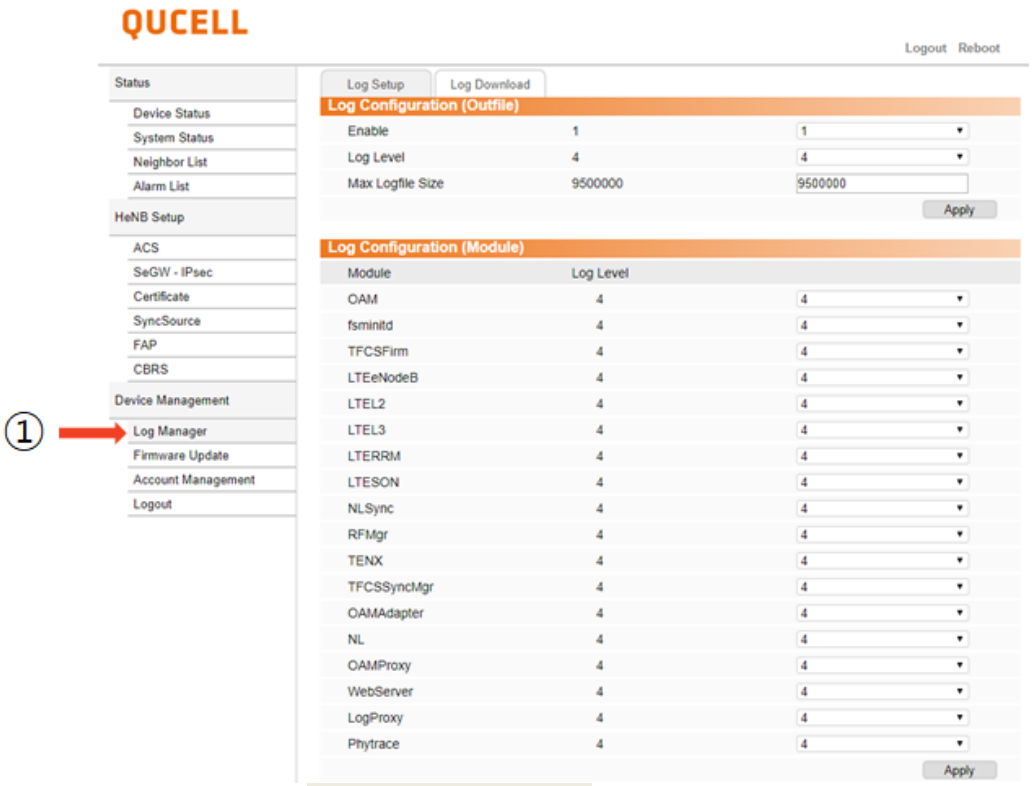

Figure 24-1. Log Manager

2. Set the log level from 0 to 5 for each log file and click 'Apply' button.

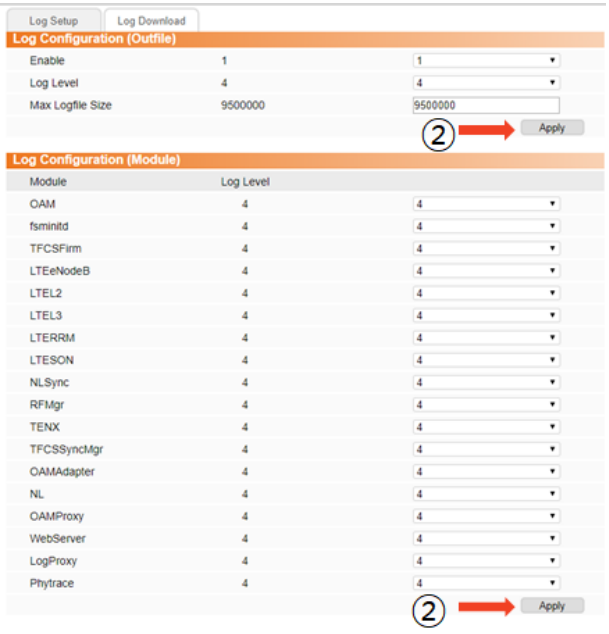

Figure 24-2. Log Level

3. Click 'Download Selected Files' or 'Download All Files' button.

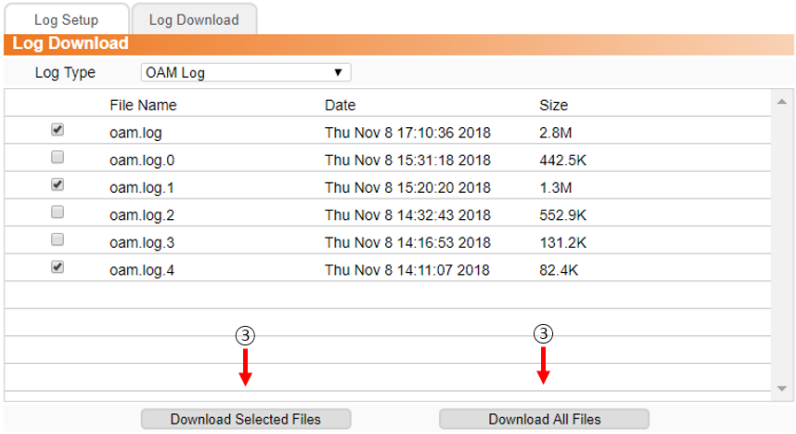

Figure 24-3. Log Download

4. Check the files downloaded.

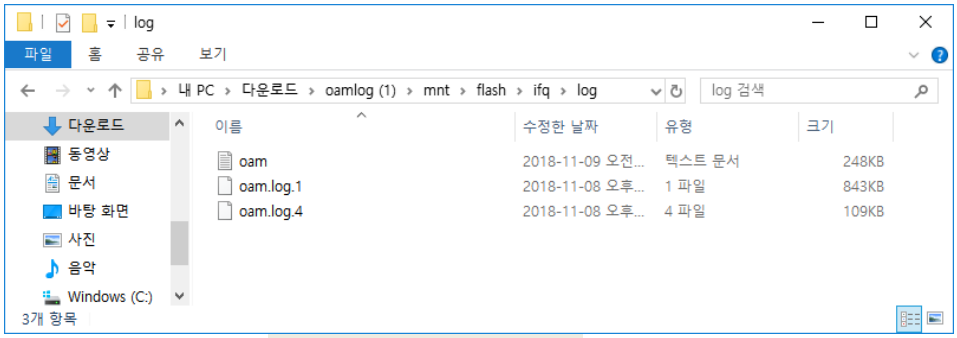

Figure 24-4. file downloaded

6. CLI

6.1. Data Model Configuration

You can confirm and change data model parameter. Enter the following command.

- # idm oam

The numbers after 'OAM' means firmware version of your device.

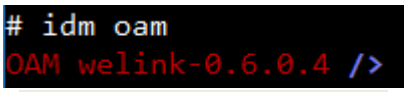

Figure 25-1. 'idm oam' Command

Move to the directory where the parameter which you want to change or confirm is located. For example, if you want to change 'Device.ManagementServer.Username' parameter, move to /Device/ManagementServer/ directory.

You can see the sub-parameters of Device.ManagementServer object using 'ls' command.

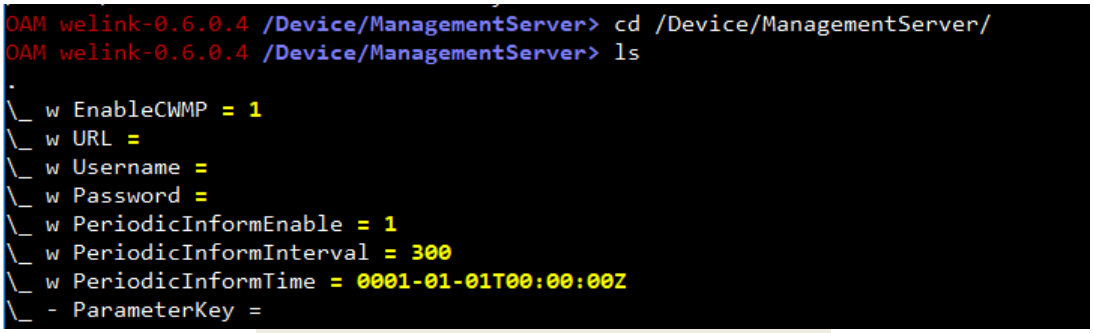

Figure 25-2. Data Model Value Change using CLI - 1

Enter the 'set' command with 'parameter name'='value' as bellow. For example, if you want to change 'Username' into 'administrator', enter the following command.

- OAM 0.x.x.x /> set Username= administrator

You can verify whether set command has applied using 'ls' command.

```
OAM welink-0.6.0.4 /Device/ManagementServer> set Username=administrator
OAM welink-0.6.0.4 /Device/ManagementServer> ls
.
\_ w EnableCWMP = 1
\_ w URL =
\_ w Username = administrator
\_ w Password =
\_ w PeriodicInformEnable = 1
\_ w PeriodicInformInterval = 300
\_ w PeriodicInformTime = 0001-01-01T00:00:00Z
\_ - ParameterKey =
```

Figure 25-3. Data Model Value Change using CLI - 2

You can exit idm oam using 'exit' command

```
OAM welink-0.6.0.4 /Device/ManagementServer> exit
#
```

Figure 25-4. Exit CLI

6.2. HeNB Status Check

You can check HeNB status using 'status' command. The status information which you can check is as follows.

```
OAM welink-0.6.0.4 /> status
Initiate: complete
WAN IP: up 172.20.169.50
Virtual IP: disabled
CWMP: disabled
CWMP Session Count: estab:0, succ:0, retry:0
Sync Manager State: DISP
Active Sync Source: FREE RUNNING

FAPService
  Started: 1
  StackRunning: 1
  Availability: 1
  Number of Active MMEs: 1
  Number of UEs: 0
  Cell[0]
    AdminState: 1
    OpState:    1
    RFTxStatus: 1
  Cell[1]
    AdminState: 1
    OpState:    1
    RFTxStatus: 1
```

Figure 25-5. 'status' command

7. Firmware Update

7.1 Firmware Update Procedure

You can update a firmware of the small cell by following the procedure below.

1. Click 'Firmware Update' button on the menu

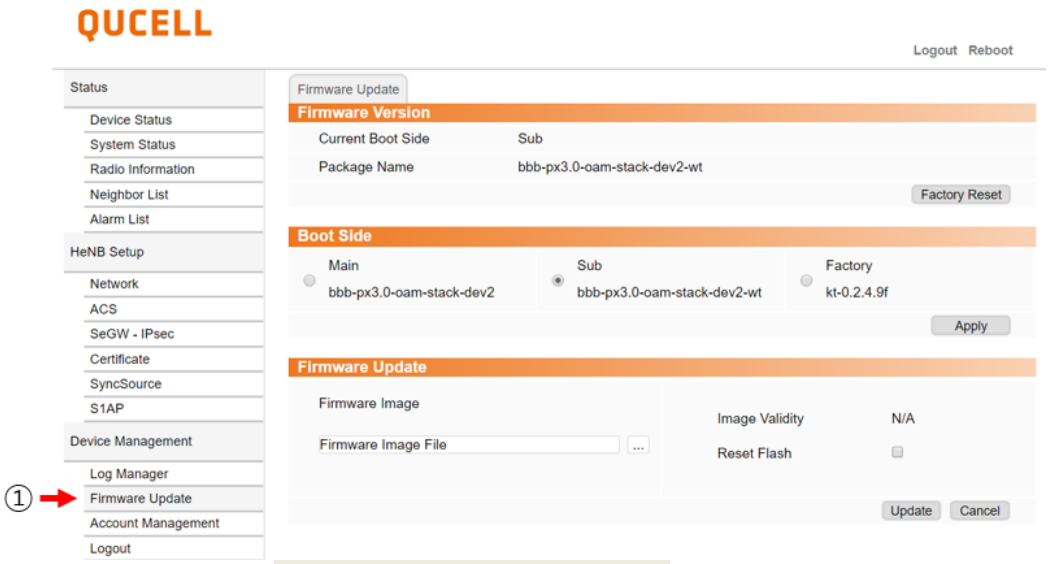

Figure 26-1. Firmware Update menu

2. Select a firmware file for small cell.
3. Click 'Update' button.

Figure 26-2. Select firmware file and update

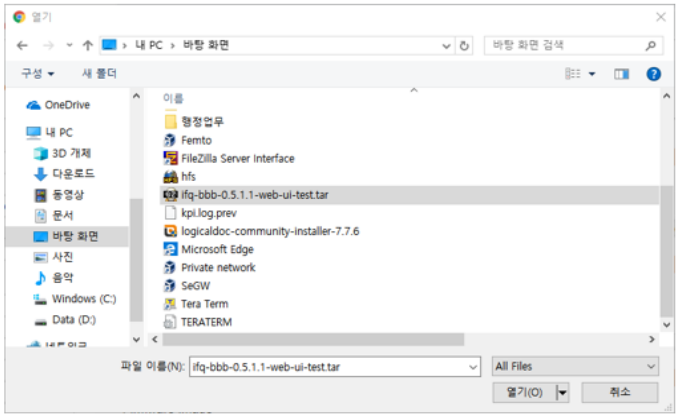

Figure 26-3. Select firmware Image

4. Check the name of the updated firmware package.

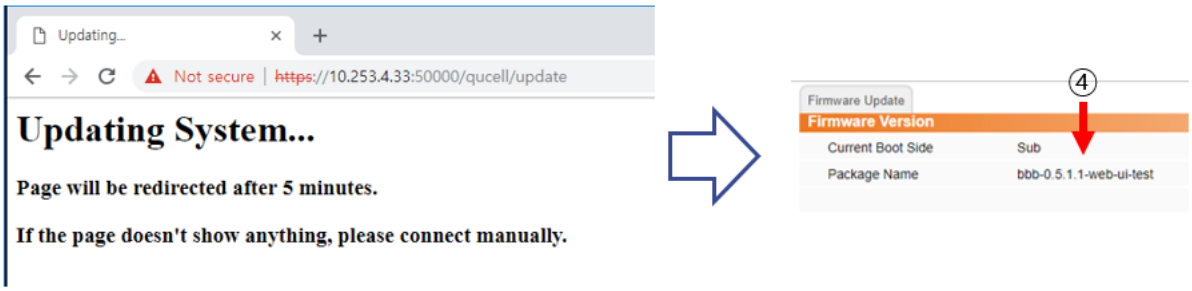

Figure 26-4. Update Check

8. LED Operation

8.1 LED Operation Description and Scenario

Normal Operation Status

In normal operation status, all LED is displayed by Cyan LED. The LED operation scenario is as follows.

Table 3. LTE Small Cell LED Status in Normal Operation

Normal Status	LED Name				
	Power	Internet		Service	
	G	G	R	G	R
Power On	ON	OFF		OFF	
IPsec with SeGW	ON	Blinking		OFF	
HeNB Boot Sequence Complete (Cell Setup Complete)	ON	ON		ON	
Traffic in Progress	ON	ON		Blinking	
SW Update	Blinking	Blinking		Blinking	
HeNB has been locked by HeMS	ON	ON		OFF	

Power LED represents the 'Power On' or 'Power Off' by whether the Green LED On or not. And, Internet LED represents IPsec status by whether Green LED Blinking or not. Internet LED also shows the Cell setup status by whether Green LED On or not. Service LED represents whether traffic from UE exist or not by whether Green LED Blinking or not. Service LED also represents whether 'AdminState' has been changed to false from HeMS or not by LED OFF state.
In addition, S/W updating can be known by blinking all Green LEDs.

Alarm Status

Alarms are grouped by their similarity and each alarm group is represented by the LED states. There are ten alarm groups to represent alarm status by LED. The alarm groups are classified in alphabetical order from Group A to J.

Alarm Groups	Alarms	Perceived Severity
Group A	Ethernet Port Error	Critical
Group B	SeGW Connection Failure	Critical
	IPSec Tunnel Down	Critical
Group C	Management Server Connection Failure	Critical
Group D	Backhaul Bandwidth Measurement Failure	Critical
	Backhaul Quality Measurement Failure	Critical
	Low Backhaul Bandwidth	Critical
	Backhaul Service Affected	Critical
	Backhaul Capacity Limited	Critical
Group E	DHCP Failure	Critical
	NTP Server Connection Failure	Critical
	DNS Failure	Critical
Group F	Frequency Out of Synchronization	Critical
	Frequency Synchronization Failure	Critical
Group G	RRC SCTP Association Failure	Critical
	Critical Configuration Failure	Critical
Group H	CPU Overload Error	Critical
	Memory Overload Error	Critical
	Disk Full	Critical
	Service Process Error	Critical
Group I	PCI Selection Failure	Critical
	PCI Conflict with Neighbor Cell	Critical
	PCI Conflict with 2nd Tier Neighbor Cell	Critical
	RSI Conflict with Neighbor Cell	Critical
Group J	High Temperature	Major
	Low Temperature	Major

Each alarm group is represented by the following LED states which uses Red LED to indicate there are raised alarms.

Alarm Group	LED Name				
	Power	Internet		Service	
	G	G	R	G	R
Group A	N/D	ON		N/D	
Group B	N/D	Blinking		N/D	
Group C	N/D	R1/G1		N/D	
Group D	N/D	R2/G1		N/D	
Group E	N/D	R3/G1		N/D	
Group F	N/D	N/D		ON	
Group G	N/D	N/D		Blinking	
Group H	N/D	N/D		R1/G1	
Group I	N/D	N/D		R2/G1	
Group J	N/D	N/D		R3/G1	

* Note: N/D was used to indicate 'Not dependent on' which means those LED states doesn't have an effect on the Alarm status.

LED states for alarm groups are designed not to have a dependency between each LEDs (Power / Internet / Service). By checking the LED states of each LED, the user can know the status of the HeNB. In addition, if multiple alarms occur from other alarm groups at the same time, LED state of Alarm Group which has higher priority is displayed. The priority of Alarm Group of Internet LED is Group A is the highest and Group E is the lowest. The priority of Alarm Group of Service LED is Group F is the highest and Group J is the lowest.

FCC - statement

This device complies with part 96.
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device should be installed and operated with minimum 20 cm between the radiator and your body.

Professional installation instruction

1. Installation personal

This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

2. Installation location

The product shall be installed at a location where the radiating antenna can be kept 20cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

3. Installation procedure

Please refer to user's manual for the detail.

4. Warning

Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in relevant rules. The violation of the rule could lead to serious federal penalty.