

Intercell Dual-Carrier TDD Enterprise Small Cell
Configuration Guide

Platform FSM

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1. The initial configuration

1.1 Configuration overview

1.1.1 The configuration process

After the base station is powered on, data configuration is required for the base station so as to access the user and provide the user with voice and data services. The configuration process of the base station is shown in figure 11. Figure 11. Configuration process-

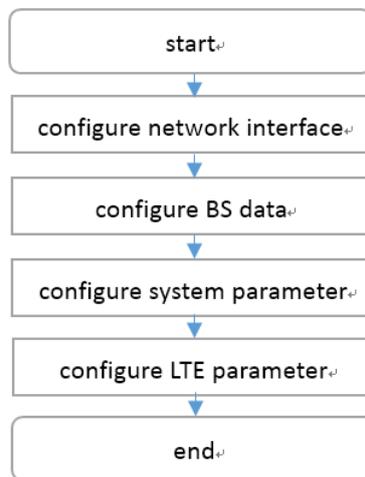


Figure 11. Configuration process-

1.1.2 Network port connection instructions

Base station Ethernet interface includes LAN interface and WAN interface.

- LAN port is usually connected with local area network, which is used for the user to log into the base station in the local network and directly configure or maintain the base station.
- WAN port is usually used for data transmission between base station and operator's core network.

1.1.3 Data preparation

Before the configuration of the base station, data planning is required. Configuration data includes local parameters and docking parameters, which shall be determined after consensus with the customer according to the actual deployment situation, including transmission network address, wireless parameters, software version, etc.

If you need to configure the cell quickly, please refer to "1.3 quick configuration".

1.2 Log in to the Web client

1.2.1 Web client environment requirements

The client computer requirements are shown in table 11. Table 11 client environment requirements-1

Table 11 client environment requirements-1

project	requirements
The CPU	Intel Core above 2GHz
memory	More than 2 g RAM
The hard disk	Not less than 100 MB of available space
The operating system	<ul style="list-style-type: none">• Microsoft: Windows XP, Windows Vista, or Windows7• Mac: MacOS x 10.5 or above
Display resolution	Above 1024*768 pixels
The browser	Chrome 6 or later

1.2.2 Set the client computer

Before logging into the Web client, firstly set the IP address of the client computer and ensure that the client computer is connected to the base station. Take Windows 7 as an example.

1. Click start > control panel, and in the pop-up window click network and Internet.
2. Click view network status and tasks, and in the window that pops up, click local connections.
3. In the pop-up local connection status dialog box, click properties to pop up local connection properties.
4. Select Internet protocol version (TCP/IPV4), click properties, and the pop-up window looks like figure 12. Figure 12 sets the client IP address-1

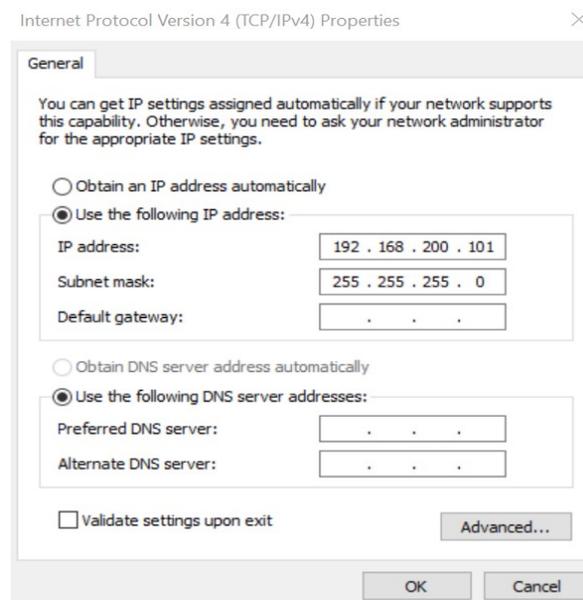


Figure 12 sets the client IP address-1

5. Select the IP address below.
6. Enter the IP address, subnet mask, and default gateway, and click ok.
 - IP address: 192.168.200. XXX: (the recommended value of XXX is 100~199)



Note: since the IP address of the base station LAN port has been preset as "192.168.200.200", other addresses need to be used.

- Subnet mask: 255.255.255.0
 - Default gateway: not required
7. Perform ping 192.168.200.200 in the command line window to check whether the network is connected between the client computer and the device.

1.2.3 Log into the Web maintenance page

1. Enter `https://192.168.200.200` in the browser address bar and click "sing in" to open the Web client login page, as shown in figure 14. Figure 14 login base station Web page-

User name: admin

Password: MikroTik

192.168.200.200 is the initial IP address of the LAN interface.

Sign in

`https://192.168.200.200`

Username

Password

Figure 14 login base station Web page-

1.3 Quick initial configuration

Rapid configuration is to configure the cell parameters of the base station, including the working mode of the base station, cell identification, working frequency band, frequency point, etc., which needs to be set according to network planning data.

1. Select "management-> Cell" in the navigation bar to set basic parameters of the base station, as shown in figure 15 16 17.

Information

Management

Cell

Debug

Factory

HeMS

Network

Performance

Security

Synchronization

Upgrade

Access Control

Data Model

Management -- Cell Configuration

AdminState: <input checked="" type="checkbox"/> Enable	EnbType: <input type="radio"/> MACRO ENB <input checked="" type="radio"/> HOME ENB
Duplex Mode: <input type="radio"/> FDD <input checked="" type="radio"/> TDD	TAC: <input type="text" value="10"/>
SecGWServer: <input type="text"/>	S1RetryMaxNum: <input type="text" value="10"/>
S1SigLinkServer: <input type="text" value="192.168.101.121"/>	S1Status: Success
AssocStatus: Active	

PLMNID

Cell1

Cell2

CellIdentity: <input type="text" value="257"/>	OpState: true
UeNumber: <input type="text" value="0"/>	VolteUeNumber: <input type="text" value="0"/>
CandidateARFCNList: <input type="text" value="42590"/>	CandidatePCIList: <input type="text" value="0..503"/>
EARFCNDLInUse: <input type="text" value="42590"/>	EARFCNULInUse: <input type="text" value="42590"/>
FreqBandIndicator: <input type="text" value="42"/>	PhyCellIDInUse: <input type="text" value="297"/>
DL Bandwidth: <input type="text" value="100"/>	UL Bandwidth: <input type="text" value="100"/>
ReferenceSignalPower: <input type="text" value="-10"/>	PAGain: <input type="text" value="0"/>
SubFrameAssignment: <input type="text" value="2"/>	SpecialSubframePatterns: <input type="text" value="7"/>
AntennaPortsCount: <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 4	RxAntennaPortsCount: <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 4

FIG. 15 quick setting of base station basic parameters-cell1

- Information
- Management
- Cell
- Debug
- Factory
- HeMS
- Network
- Performance
- Security
- Synchronization
- Upgrade
- Access Control
- Data Model

Management -- Cell Configuration

AdminState: <input checked="" type="checkbox"/> Enable	EnbType: <input type="radio"/> MACRO ENB <input checked="" type="radio"/> HOME ENB
Duplex Mode: <input type="radio"/> FDD <input checked="" type="radio"/> TDD	TAC: <input type="text" value="10"/>
SecGWServer: <input type="text"/>	S1RetryMaxNum: <input type="text" value="10"/>
S1SigLinkServer: <input type="text" value="192.168.101.121"/>	S1Status: Success
AssocStatus: Active	

CellIdentity: <input type="text" value="258"/>	OpState: true
UeNumber: <input type="text" value="0"/>	VolteUeNumber: <input type="text" value="0"/>
CandidateARFCNList: <input type="text" value="42788"/>	CandidatePCIList: <input type="text" value="0..503"/>
EARFCNDLInUse: <input type="text" value="42788"/>	EARFCNULInUse: <input type="text" value="42788"/>
FreqBandIndicator: <input type="text" value="42"/>	PhyCellIDInUse: <input type="text" value="16"/>
DL Bandwidth: <input type="text" value="100"/>	UL Bandwidth: <input type="text" value="100"/>
ReferenceSignalPower: <input type="text" value="-10"/>	PAGain: <input type="text" value="0"/>
SubFrameAssignment: <input type="text" value="2"/>	SpecialSubframePatterns: <input type="text" value="7"/>
AntennaPortsCount: <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 4	RxAntennaPortsCount: <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 4

FIG. 16 quick setting of base station basic parameters-cell2

Information

Management

Cell

Debug

Factory

HeMS

Network

Performance

Security

Synchronization

Upgrade

Access Control

Data Model

Management -- Cell Configuration

AdminState: <input checked="" type="checkbox"/> Enable	EnbType: <input type="radio"/> MACRO ENB <input checked="" type="radio"/> HOME ENB
Duplex Mode: <input type="radio"/> FDD <input checked="" type="radio"/> TDD	TAC: <input type="text" value="10"/>
SecGWServer: <input type="text"/>	S1RetryMaxNum: <input type="text" value="10"/>
S1SigLinkServer: <input type="text" value="192.168.101.121"/>	S1Status: Success
AssocStatus: Active	

PLMNID

Cell1

Cell2

Primary PLMNID No:	<input type="text" value="1"/>
PLMNID1:	<input checked="" type="checkbox"/> Enable <input type="text" value="46000"/>
PLMNID2:	<input type="checkbox"/> Enable <input type="text"/>
PLMNID3:	<input type="checkbox"/> Enable <input type="text"/>
PLMNID4:	<input type="checkbox"/> Enable <input type="text"/>
PLMNID5:	<input type="checkbox"/> Enable <input type="text"/>
PLMNID6:	<input type="checkbox"/> Enable <input type="text"/>

FIG. 17 quick setting of base station basic parameters-PLMN

The basic parameters are described in table 12. Table 12 quick setting parameter description-2

Table 12 quick setting parameter description-2

The parameter name	instructions
AdminState	Cell state control switch.(check enable when all basic parameters are configured) <ul style="list-style-type: none"> Check Enable: protocol stack to set up cell, base station RF work; Uncheck Enable: protocol stack delete cell, base station RF shutdown;
EnbType	ENB type, MARCO and HOME
Duplex Mode	Duplex mode, default is TDD
TAC	Set the tracking area code where the base station is located to define the sending range of paging messages.TAC is Assigned by the operator. Value range: 0~65535
PLMN ID	PLMN ID of cell ownership
S1SigLinkServer	The IP address of MME. It should be consistent with the IP address of MME on the core network side. <ul style="list-style-type: none"> Support to configure up to 32 MME addresses;

The parameter name	instructions
	<ul style="list-style-type: none"> Multiple MME addresses are separated by English commas
CellIdentity	<p>The Cell ID.</p> <ul style="list-style-type: none"> When the eNB type is MARCO, it is the same as the eNB ID (20bits); When the eNB type is HOME, it is the value of eNB ID moved 8bits to the left and Cell ID and operation, that is, eNB ID*256+Cell ID (28bits);
OpState	<p>Cell working status.</p> <ul style="list-style-type: none"> When the cell is successfully established and the RF works, the state is "true"; The Opstate is False when Adminstate is not enabled or the cell is not successfully established.
CandidateARFCNList	<p>Absolute frequency point list.(multiple frequency points are separated by English commas)</p> <ul style="list-style-type: none"> If only one frequency point is configured, the base station use this frequency point to establish the cell; If multiple frequency points are configured, the base station selects frequency points according to SON's self-configuration function and establishes the cell.
CandidatePCIList	<p>PCI list.(multiple PCI is separated by English commas)</p> <ul style="list-style-type: none"> If only one PCI is configured, the base station will use this PCI to establish cell. If multiple PCI is configured, the base station selects PCI according to SON's PCI self-configuration function and establishes the cell
EARFCNDLInUse/ EARFCNULInUse	<p>The actual uplink and downlink absolute frequency points used by the base station</p>
FreqBandIndicator	<p>The frequency band in which the base station operates</p>
PhyCellIDInUse	<p>The PCI that Base station actually uses</p>
DL Bandwidth / UL Bandwidth	<p>The number of PRBS of the bandwidth (the uplink and downlink bandwidth should be the same)</p> <ul style="list-style-type: none"> The 5MHz bandwidth is 25 The 10MHz bandwidth is 50 The 15MHz bandwidth is 75 The 20MHz bandwidth is 100
ReferenceSignalPower	<p>Reference signal power.(maximum value is 9)</p> <ul style="list-style-type: none"> For a single rf port, the actual output power is ReferenceSignalPower+31 with dBm unit, such as -10+31=21dBm
PAGain	<p>PA gain value, the integrated base station is set to "0"</p>
AntennaPortsCount	<p>Number of base station antennas, usually configured as "2" (MIMO)</p>
RxAntennaPortsCount	<p>The number of antennas a base station USES for receiving, usually configured as "2" (MIMO)</p>
SubFrameAssignment	<p>SubFrame configuration, refer to 3GPP TS36.211. Support configuration: 1/2/3/4/5/6</p>
SpecialSubframePatterns	<p>Special Subframe configuration, refer to 3GPP TS36.211 Support configuration: 1/2/3/4/5/6/7/8/9</p>

- After setting basic base station parameters in table 1-2, click "Submit" to Submit.



Note: some parameter changes (such as bandwidth, etc.) will cause the base station to restart, just wait for the restart to complete.

- After basic parameter configuration is submitted, check "Enable" of "AdminState"

2. Transport network configuration

2.1 Configure the network interface

2.1.1 Configure WAN interface

WAN interface is the external communication interface of base station, which is mainly used to connect base station with external devices, such as OMC, MME, gateway and other devices. It supports the configuration of multiple vlans to dock with different devices.

Select "management-> Network"->IP in the navigation bar and WAN interface configuration is shown in figure 21

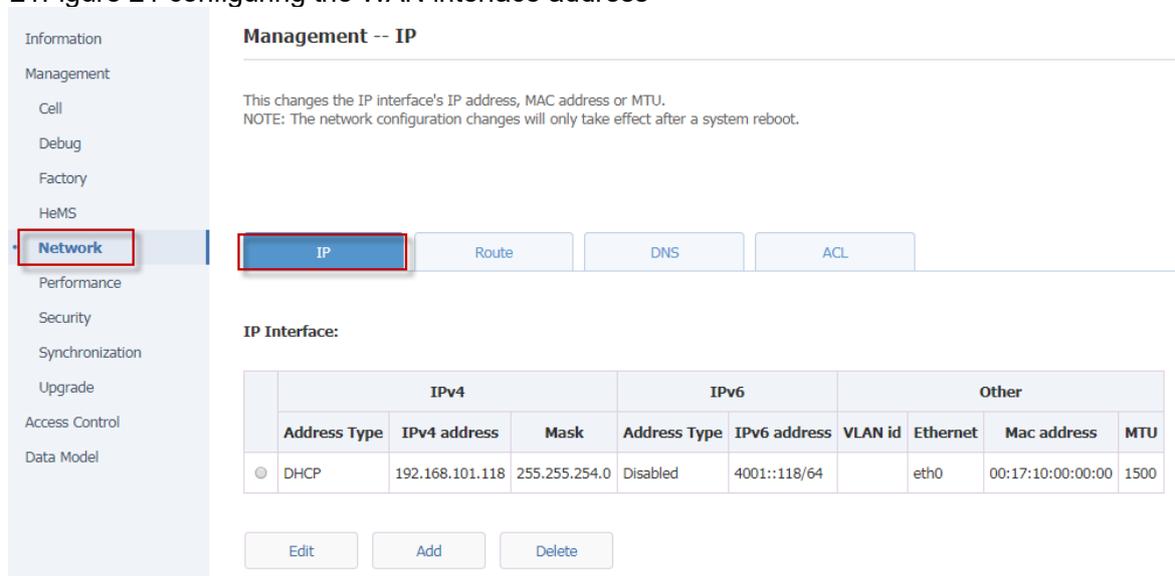


Figure 21 configuring the WAN interface address-

Table 21 parameters description of WAN interface IPv4-

The parameter name	instructions
The Address Type	The mode for WAN interface to obtain IPv4 address.Support: <ul style="list-style-type: none"> DHCP: dynamically obtaining IP address, no other parameters need to be configured; Static: IP address and mask need to be configured; Disabled: closes the function of WAN port IPv4 protocol. It is not recommended to select.
IPv4 address	The IPv4 address of the WAN interface. <ul style="list-style-type: none"> In DHCP mode, it is allocated by DHCP server. Static mode requires manual configuration;
Mask	IPv4 subnet mask for the WAN interface. <ul style="list-style-type: none"> In DHCP mode, it is allocated by DHCP server. Static mode requires manual configuration;

Table 22. Specification of IPv6 parameters of WAN interface-

The parameter name	instructions
Origin	WAN interface to get IPv6 address.Support: <ul style="list-style-type: none"> DHCPv6: dynamically obtain IP address, no need to configure other parameters; Static mode: IPv6 address and mask need to be configured; Disabled: turns off IPv6 protocol function of WAN port (turns off IPv6 protocol by default);
IPv6 address	IPv6 address and mask of WAN interface. <ul style="list-style-type: none"> In DHCPv6 mode, it is assigned by DHCPv6 server. Static mode requires manual configuration;

Table 23 description of other common parameters of WAN interface-

The parameter name	instructions
The Mac address	MAC address of WAN interface
MTU	MTU size of WAN interface

2.1.2 Configure LAN interface

LAN interface is the local maintenance interface of the base station, which is mainly used for the local maintenance and configuration of the base station.

The default IP address for the LAN interface is 192.168.200.200, which is usually left as the default configuration.

2.1.3 Configure IPv4 routing

Select "management-> Network->Route" in the navigation bar .The Route configuration page, as shown in figure 22Figure 21 configuring the WAN interface address-

Management -- Route

This manually adds, deletes or edits the route.
All the network configures will be effective after rebooting.

IP **Route** DNS ACL

Router Information:

IPv4Forwarding							IPv6Forwarding				
Enable	Status	Route Type	Dest IP Address	Dest Subnet Mask	Gateway IP Address	Ethernet	Enable	Status	Dest IPv6 Prefix	Next Hop	Ethernet
<input checked="" type="radio"/>	Enabled	Default	0.0.0.0	0.0.0.0	192.168.100.1	eth0	Disabled	Disabled			

Edit Add Delete

Figure 22. The Route configuration -

1. In the newly added routing instance, add an IPv4 forwarding instance, as shown in figure 23.

Information
Management
Cell
Debug
Factory
HeMS
• **Network**
Performance
Security
Synchronization
Upgrade
Access Control
Data Model

Management -- Route

This manually adds, deletes or edits the route.
All the network configures will be effective after rebooting.

IP Route DNS ACL

Router Information:

IPv4Forwarding							IPv6Forwarding				
Enable	Status	Route Type	Dest IP Address	Dest Subnet Mask	Gateway IP Address	Ethernet	Enable	Status	Dest IPv6 Prefix	Next Hop	Ethernet
<input checked="" type="radio"/>	Enabled	Default	0.0.0.0	0.0.0.0	192.168.100.1	eth0	Disabled	Disabled			

Edit Add Delete

Figure 23. Add an IPv4 forwarding instance-

2. Configure route items

1) Add the default route, as shown in the figure.

Information
Management
Cell
Debug
Factory
HeMS
• **Network**
Performance
Security
Synchronization
Upgrade
Access Control
Data Model

Management -- Network

You can add/delete/change the dns manually.
All the network configures will be effective after rebooting.

Router information:

Router ID: NEW

IPv4Forwarding	Enable:	<input checked="" type="checkbox"/> Enable
	StaticRoute:	<input type="checkbox"/> Enable
	DestIPAddress:	0.0.0.0
	DestSubnetMask:	0.0.0.0
	GatewayIPAddress:	192.168.3.1
	Ethernet:	eth0 ▼
Origin:	Static	
IPv6Forwarding	Enable:	<input type="checkbox"/> Enable
	DestIPPrefix:	4001::118 64
	NextHop:	4001::118
	Ethernet:	none ▼
	Origin:	Static

Submit Back

Figure 24. Add a default route-

2) Add segment routing, as shown in the figure.

- Information
- Management
- Cell
- Debug
- Factory
- HeMS
- Network
- Performance
- Security
- Synchronization
- Upgrade
- Access Control
- Data Model

Management -- Network

You can add/delete/change the dns manually.

All the network configures will be effective after rebooting.

Router information:

Router ID:	NEW
IPv4Forwarding	Enable: <input checked="" type="checkbox"/> Enable
	StaticRoute: <input checked="" type="checkbox"/> Enable
	DestIPAddress: <input type="text" value="10.11.12.2"/>
	DestSubnetMask: <input type="text" value="255.255.255.0"/>
	GatewayIPAddress: <input type="text" value="10.11.12.1"/>
	Ethernet: <input type="text" value="eth0"/>
Origin: Static	
IPv6Forwarding	Enable: <input type="checkbox"/> Enable
	DestIPPrefix: <input type="text" value="4001::118"/> <input type="text" value="64"/>
	NextHop: <input type="text" value="4001::118"/>
	Ethernet: <input type="text" value="none"/>
	Origin: Static

Figure 25 add segment routing-

Table 25 main route configuration parameters-3

The parameter name	instructions
The Enable	Route item switches. Check to enable, check to not enable.
The StaticRoute	Check this if the configured route is network segment route; If the configured route is the default route, this item is not checked;
DestIPAddress	Destination IP address.
DestSubnetMask	The subnet mask for the destination IP address.
GatewayIPAddress	Gateway IP address to destination IP address.
Ethernet	Select "eth0"

2.2 Configure the NTP service

Select "management-> Synchronization" in the navigation bar and enter the NTP/Time Settings page, as shown in the figure below.

Management -- Ntp and Time

if using NTP to set system time, please enter at least one NTP server address.
if you set the system time manually but NTP is enabled, The system time will be recovered to NTP time when NTP sync successful.

Timezone follows IEEE 1003.1 (POSIX). It should be like "CST-8" for China Time.

The offset in Timezone is positive if the local time zone is west of the Prime Meridian and negative if it is east.

Synchronization GPS PTP/ACR Shiffer **NTP/Time**

NTP Setting:

NtpStatus	Synchronized
NtpServer1	202.112.29.82
NtpServer2	202.118.1.81
NtpServer3	ntp2.aliyun.com
NtpServer4	ntp3.aliyun.com
NtpServer5	cn.ntp.org.cn
SecGWAddr	

Submit

Figure 26 NTP configuration-

Configure the NTP server parameters as shown in the following table. Table 39 NTP server parameters-

Table 39 NTP server parameters-

The parameter name	instructions
The NTP Server	The domain name or IP address of the NTP server. (multiple configurations are available)

2.3 Configure base station X2 function

Data model path: Device. Services. FAPService. 1. X_OUI_X2.

DataModel -- Device

Root Path: Device. search clear

DB tree

- Device
 - Services
 - FAPService
 - FAPService.1
 - Capabilities
 - FAPControl
 - AccessMgmt
 - CellConfig
 - REM
 - Transport
 - X_D837BE_L2Para
 - X_D837BE_X2**
 - X_D837BE_HEX0
 - X_D837BE_PTP
 - X_D837BE_RF
 - X_D837BE_TFCS
 - X_D837BE_NISync
 - X_D837BE_Serial
 - X_D837BE_SON
 - X_D837BE_ENBMeas
 - X_D837BE_UE
 - X_D837BE_Status
 - X_D837BE_Private
 - FAPService.2

Device.Services.FAPService.1.X_D837BE_X2.

X2Enable	<input checked="" type="checkbox"/> Enable	boolean
X2EnbIdListPresent	<input type="checkbox"/> Enable	boolean
X2EnbIdList	0	unsignedInt(32[0:1048575])
X2SigLinkPort	36422	unsignedInt([:65535])
X2SigLocalPort	41427	unsignedInt([:65535])
EnbConfigTransTimerLength	0	unsignedInt([0:3600])
X2SetupRetryCount	3	unsignedInt([0:255])
NoX2SetupMsgFlag	<input checked="" type="checkbox"/> Enable	boolean
ResourceStatusCmd	NULL	string

submit drop

Figure 27 configures the X2 functionality-

Table 311 X2 functional parameters-

The parameter name	instructions
X2Enable	X2 function switch, on by default.
X2SigLinkPort	X2 connection port, default 36422.

2.4 Configure network management connection

Select "management-> HeMS" in the navigation bar, as shown in the figure.

The screenshot shows a web interface for "Management -- HeMS Configuration". On the left is a navigation menu with items: Information, Management, Cell, Debug, Factory, HeMS (highlighted with a red box), Network, Performance, Security, Synchronization, Upgrade, Access Control, and Data Model. The main content area is titled "Management -- HeMS Configuration" and contains the following sections:

- Configure HeMS Connection**: Select TLS version and certificates for HeMS Connection.
- HeMS Connection:**
 - HeMS Address: [Text input field]
 - Username: [Text input field]
 - Password: [Text input field]
 - SecGWServer: [Text input field]
 - Periodic Inform: Enable
 - Periodic Inform Interval: [Text input field with value 1800]
- Device Connection:**
 - Connection Request URL: http://10.98.100.37:30005/
 - Connection Request username: [Text input field]
 - Connection Request password: [Text input field]
 - Connection Request Authentication: Enable
- TLS Version:**
 - TLSVersion: [Dropdown menu with value None]

Figure 28 configuration of network administrator-

Table 312 network management parameters-

The parameter name	instructions
The HeMS address	Network address
The HeMS username	Network administrator user name
The HeMS password	Administrator password

3. Configure base station parameters

3.1 Set encryption and integrity protection algorithms

Set the data encryption and integrity protection algorithm of PDCP sub-layer.

1. "Choose" Database "in the navigation bar, input Device. Services. FAPService. 1. CellConfig. LTE. EPC." enter the configuration page, as shown. Error: Reference source not found



Note: the following security parameters do not normally need to be modified, leaving the default values!

Figure 31 sets up encryption and integrity protection algorithms-

2. The security parameters are described, as shown in table 31. Table 31 safety parameters description-

Table 31 safety parameters description-

The parameter name	instructions
AllowedCipheringAlgorithmList	Encryption algorithms. Value range: • 128-eea1, 128-eea2, 128-eea3, EEA0 The default value is: 128-eea1
AllowedIntegrityProtectionAlgorithmList	Integrity protection algorithm. Value range: • 128-EIA1, 128-EIA2, 128-EIA3, EIA0 The default value is: 128-eia1

3.2 Configure base station mobility parameters

3.2.1 Neighbor cell is found by air port listening mode

The base station has the self-discovery and self-configuration function of the intra frequency adjacent

cell, inter frequency adjacent cell and inter system adjacent cell based on air port interception. It needs to be used in combination with 3.2.1.1 or 3.2.1.2. Everytime when the base station reboot it will execute the interception process to add neighbor cells.

1. Enable neighborhood self-discovery and frequency point self-measurement functions based on air port interception, as shown in figure 32. Error: Reference source not found

Data model path:

Device. Services. FAPService. 1. FAPControl. LTE. SelfConfig. SONConfigParam. SnifferForANREnable

Device. Services. FAPService. 1. FAPControl. LTE. SelfConfig. SONConfigParam. SnifferForMeasurementEnable

Device. Services. FAPService. 1. FAPControl. LTE. SelfConfig. SONConfigParam. GERANSnifferEnable

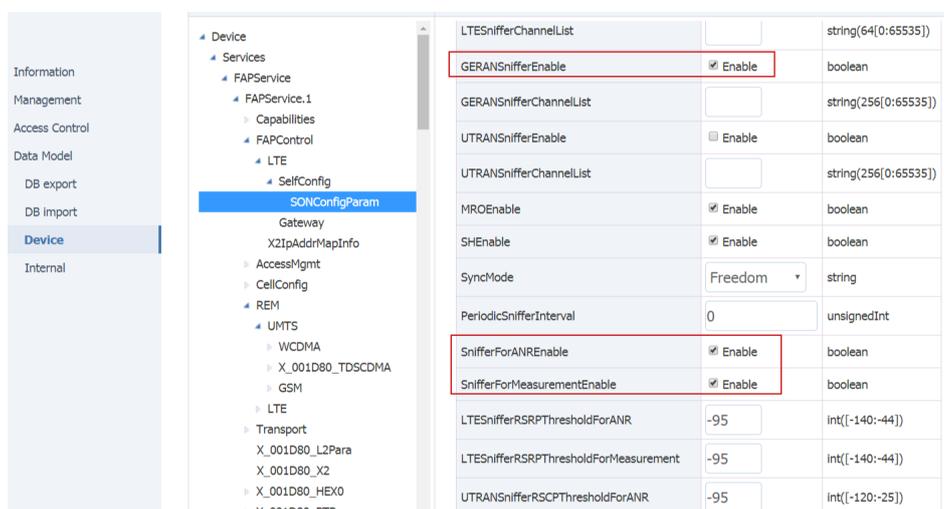


FIG. 33 enables neighborhood self-discovery and frequency point self-measurement function switch based on air port interception-

Table 32 parameter description-

The parameter name	instructions
SnifferForANREnable	Neighborhood self-discovery function switch based on air port interception. (default enable)
SnifferForMeasurementEnable	Frequency point self-measurement function switch based on air port interception. (default enable)
GERANSnifferEnable	GSM neighborhood self - discovery function switch based on air - port interception. <ul style="list-style-type: none"> • Default is off

3.2.1.1 Air- port interception for LTE adjacent cell

1. Set the LTE band or frequency point to listen for.

Data model path:

Device. Services. FAPService. 1. REM. LTE. REMPLMNList

Device. Services. FAPService. 1. REM. LTE. EUTRACarrierARFCNDLLList

Device. Services. FAPService. 1. REM. LTE. ScanOnBoot (note that if you want to scan frequency points or PLMN this switch to turn on)

DataModel -- Device

Root Path:

DB tree	Device.Services.FAPService.1.REM.LTE.	
Device	InServiceHandling	Immediate string
Services	ScanOnBoot	<input checked="" type="checkbox"/> Enable boolean
FAPService	ScanPeriodically	<input type="checkbox"/> Enable boolean
FAPService.1	PeriodicInterval	0 unsignedInt
Capabilities	PeriodicTime	0001-01-01T00:00:00 dateTime
FAPControl	REMPLMNList	string(32)
AccessMgmt	REMBandList	string(32)
CellConfig	EUTRACarrierARFCNDLLList	42590,427 string(64[0:262143])
REM	ScanTimeout	0 unsignedInt
UMTS	ScanStatus	Success string
WCDMA	ErrorDetails	NULL string
X_D837BE_TDSCDMA	LastScanTime	2020-03-12T12:31:17 dateTime
GSM	MaxCellEntries	unsignedInt(32)
LTE		
Cell		
CarrierMeas		
Transport		
X_D837BE_L2Para		
X_D837BE_X2		
X_D837BE_HEX0		
X_D837BE_PTP		
X_D837BE_RF		
X_D837BE_TFCS		
X_D837BE_NISync		

Figure 33 sets the listening LTE frequency point-

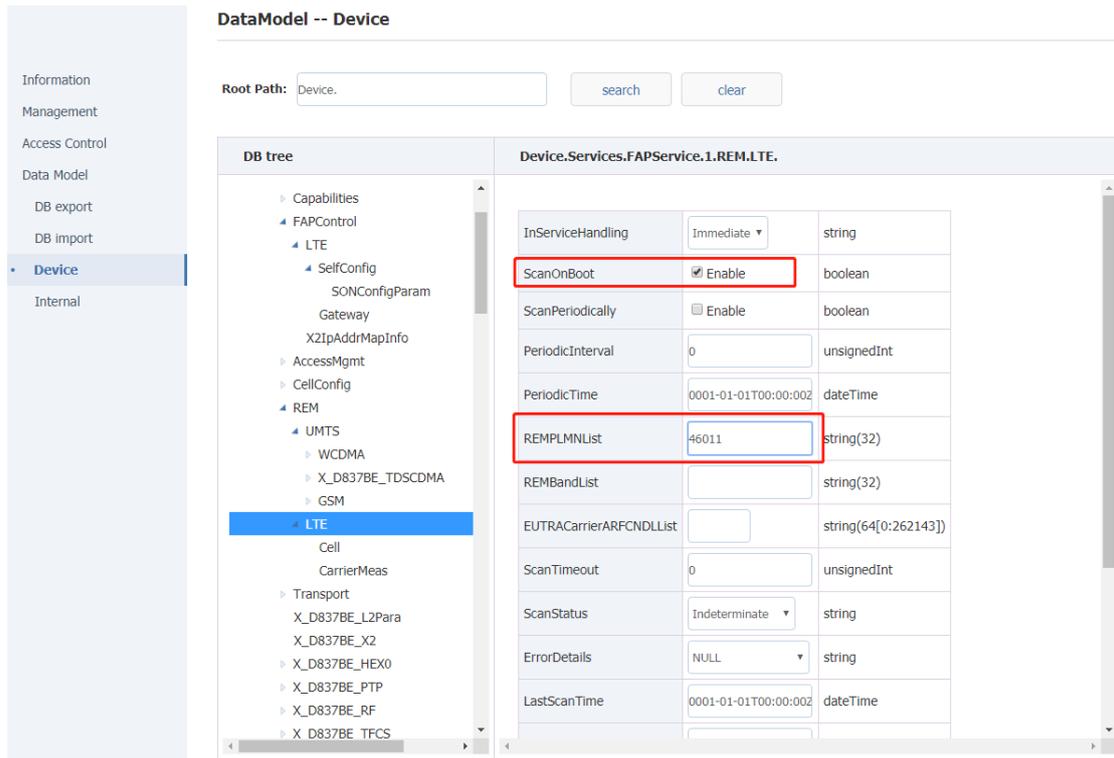


Figure 34 sets up listening for PLMN-

Table 34 configuration description of LTE neighborhood scan parameters-

The parameter name	instructions
EUTRACarrierARFCNDLList	Scanning frequency points, commonly used frequency points include: 100,1825
REPLMNList	Add the PLMN ID of the scan

2. Listen for scan results, as shown in the figure below.

Data model path: Device. Services. FAPService. 1. REM. LTE. The Cell

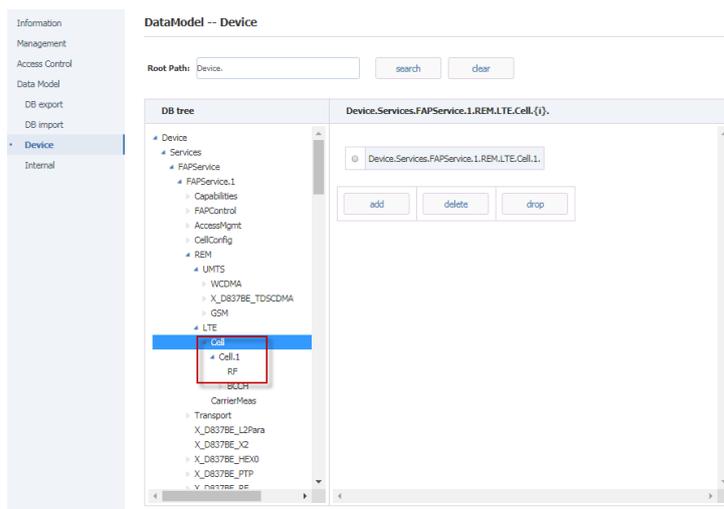


Figure 35 shows the results of the air port listening scan-

3. The adjacent cell added by an air port listener is shown in the figure.

Adjacent cell discovered by air port listening method are added to the relational table of the base station.

Data model path: Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborListInUse.



Note: Some scanned LTE cells are not added to the neighbor relationship table of the base station, which is because the RSRP of the scanned LTE cells is too weak. You can add these cells to the neighbor relationship table by properly adjusting the threshold value (LTSnifferRSRPThresholdForANR), see table 3.5.. Table 35 whether the LTE adjacent area listened to is used as the judgment statement of base station adjacent area-

Data model path:

Device.Services.FAPService.1.FAPControl.LTE.SelfConfig.SONConfigParam.LTSnifferRSRPThresholdForANR

Table 35 whether the LTE adjacent area listened to is used as the judgment statement of base station adjacent area-

The parameter name	Value range	instructions
LTSnifferRSRPThresholdForANR	44] [- 140: -	This is the RSRP threshold that LTE adjacent cell scanned can be used as a relation. The default value is -95, which can be adjusted according to the actual situation

3.2.1.2 Air port interception for WCDMA adjacent cell (limited qualcomm platform products)

1. Enable WCDMA air port listening function

Data model path:

Device. Services. FAPService. 1. REM. UMTS. WCDMA. ScanOnBoot

2. Set the WCDMA parameters to listen for

Data model path:

Device. Services. FAPService. 1. REM. UMTS. WCDMA. REMPLMNList

Device. Services. FAPService. 1. REM. UMTS. WCDMA. REMBandList

Device. Services. FAPService. 1. REM. UMTS. WCDMA. UARFCNDLList

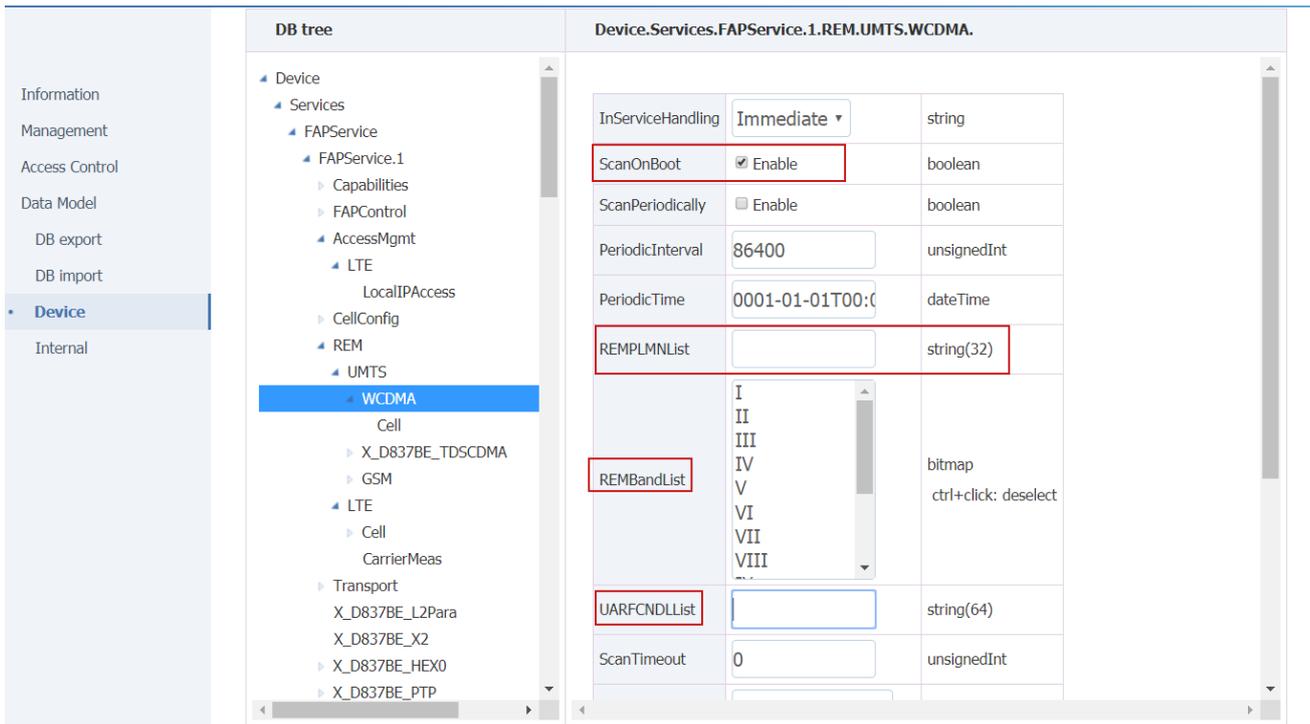


Table 36 WCDMA neighborhood scanning parameter configuration-

The parameter name	instructions
Device. Services. FAPService. 1. REM. UMTS. WCDMA. ScanOnBoot	WCDMA air port listening switch.Zero: disable;1: enabled
Device. Services. FAPService. 1. REM. UMTS. WCDMA. REMPLMNList	Input the operator's PLMN, the base station will screen the adjacent areas scanned, and only retain the adjacent areas in the REMPLMNList.
Device. Services. FAPService. 1. REM. UMTS. WCDMA. REMBandList	Scan the WCDMA frequency band, generally do not need to scan the frequency band, put this empty.
Device. Services. FAPService. 1. REM. UMTS. WCDMA. UARFCNDLLList	Scan the WCDMA frequency point.

3. Listen for scan results, as shown in the figure below.

Data model path: Device. Services. FAPService. 1. REM. UMTS. WCDMA. Cell

Information
Management
Access Control
Data Model
DB export
DB import
Device
Internal

Root Path:

DB tree Device.Services.FAPService.1.REM.UMTS.WCDMA.Cell.{i}

- Device
 - Services
 - FAPService
 - FAPService.1
 - Capabilities
 - FAPControl
 - LTE
 - SelfConfig
 - SONConfigParam
 - Gateway
 - X2IpAddrMapInfo
 - AccessMgmt
 - LTE
 - LocalIPAccess
 - CellConfig
 - REM
 - UMTS
 - WCDMA
 - Cell**
 - X_D837BE_TDSCDMA
 - GSM
 - LTE
 - Cell

No instance is added yet.

4. WCDMA adjacent region added by air port listening mode is shown in the figure.

Adjacent areas discovered by air port listening method are added to the adjacent area relational table of the base station.

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborListInUse. InterRATCell. UMTS. {i}.



Note: Some scanned 3G cells are not added to the neighbor relationship table of the base station, which is because the RSCP of the scanned 3G cells is too weak. You can add these cells to the neighbor relationship table by properly adjusting the threshold value.

(LTESnifferRSRPThresholdForANR) see table 35. Table 35 whether the LTE adjacent area listened to is used as the judgment statement of base station adjacent area-

Data model path:

Device.Services.FAPService.1.FAPControl.LTE.SelfConfig.SONConfigParam.UTRANSnifferRSCPThresholdForANR.

Table 35 whether WCDMA adjacent region listened to is used as base station adjacent region judgment statement-

| The parameter name | Value range | instructions |
|--|---------------|---|
| Device. Services. FAPService. 1. FAPControl. LTE. SelfConfig. SONConfigParam. UTRANSnifferRSCPThresholdForANR. | 44] [- 140: - | This is the RSCP threshold that 3G adjacent cell scanned can be used as a relation. The default value is -95, which can be adjusted according to the actual situation |

3.2.1.3 Air port interception for GSM adjacent cell

4. Enable GSM air port listening function

Data model path:

Device. Services. FAPService. 1. REM. UMTS. GSM. ScanOnBoot

5. Set the listening GSM parameter

Data model path:

Device. Services. FAPService. 1. REM. UMTS. GSM. REMPLMNList

Device. Services. FAPService. 1. REM. UMTS. GSM. REMBandList

Device. Services. FAPService. 1. REM. UMTS. GSM. ARFCNList

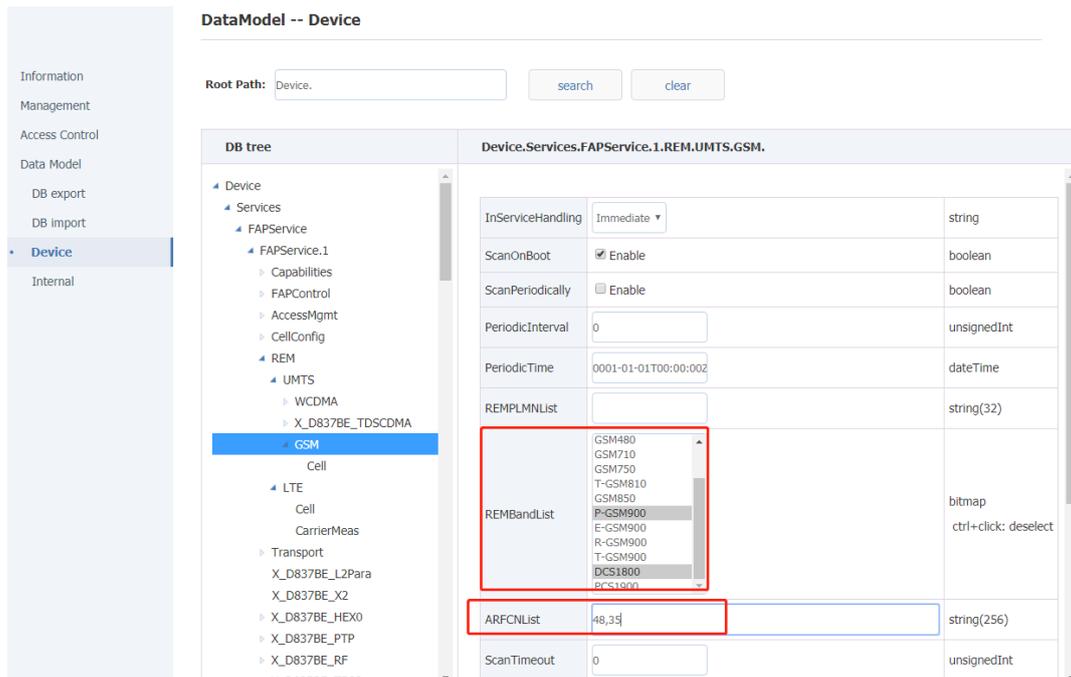


Figure 37 sets the listening GSM band or frequency point-

Table 36 GSM neighboring area scanning parameter configuration instructions-

| The parameter name | instructions |
|--|--|
| Device. Services. FAPService. 1. REM. UMTS. GSM. ScanOnBoot | GSM air port listening switch.Zero: disable;1: enabled |
| Device. Services. FAPService. 1. REM. UMTS. GSM. REMPLMNList | Input the operator's PLMN, the base station will screen the adjacent areas scanned, and only retain the adjacent areas in the REMPLMNList. |
| Device. Services. FAPService. 1. REM. UMTS. GSM. REMBandList | The GSM band is scanned. In general, there is no need to scan the band. |
| Device. Services. FAPService. 1. REM. UMTS. GSM. ARFCNList | Scan the GSM frequency point. |

6. GSM cell scan results, as shown in the figure.Error: Reference source not found

Data model path: Device. Services. FAPService. 1. REM. UMTS. GSM. The Cell.

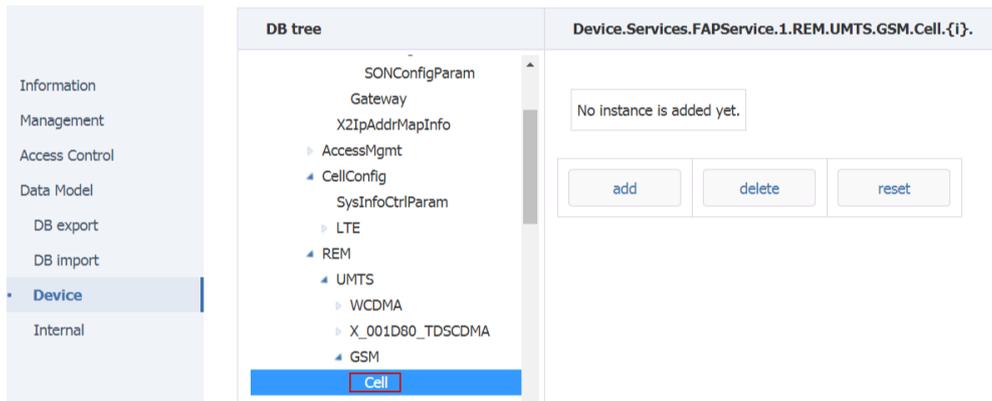


FIG. 39 GSM cell scan results-

7. Add GSM neighbors by using an empty port listener, as shown in the figure.

Adjacent areas discovered by air listening are added to the list of adjacent areas of the base station.

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborListInUse. InterRATCell. GSM.



Note: Some scanned 2G cells are not added to the neighbor relationship table of the base station, which is because the RSSI of the scanned 2G cells is too weak. You can add these cells to the neighbor relationship table by properly adjusting the threshold value

(GERANSnifferRSSIThresholdForANR), as shown in table 37. Table 37 whether the GSM adjacent region listened to is the judgment statement of base station adjacent region-

Data model path:

Device. Services. FAPService. 1. FAPControl. LTE. SelfConfig. SONConfigParam. GERANSnifferRSSIThresholdForANR

Table 37 whether the GSM adjacent region listened to is the judgment statement of base station adjacent region-

| The parameter name | Value range | instructions |
|---------------------------------|-------------|---|
| GERANSnifferRSSIThresholdForANR | [48] - 110: | This is the RSSI threshold that 2G adjacent cell scanned can be used as a relation. The default value is -95, which can be adjusted according to the actual situation |

3.2.2 Manually configure adjacent cells

When manually configuring adjacent cell, the adjacent cell list of base station shall be configured firstly. After enabling the adjacent cell, it will be added to the adjacent cell relation table of the base station as the effective adjacent area.

1. Manually configure the neighborhood by setting up the neighborhood list.

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborList.

2. Enabled neighbors in the neighborhood list are added to the base station's neighborhood table.

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborListInUse.

3.2.2.1 Manually configure LTE neighbors

1. Manually configure the neighborhood list

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborList.

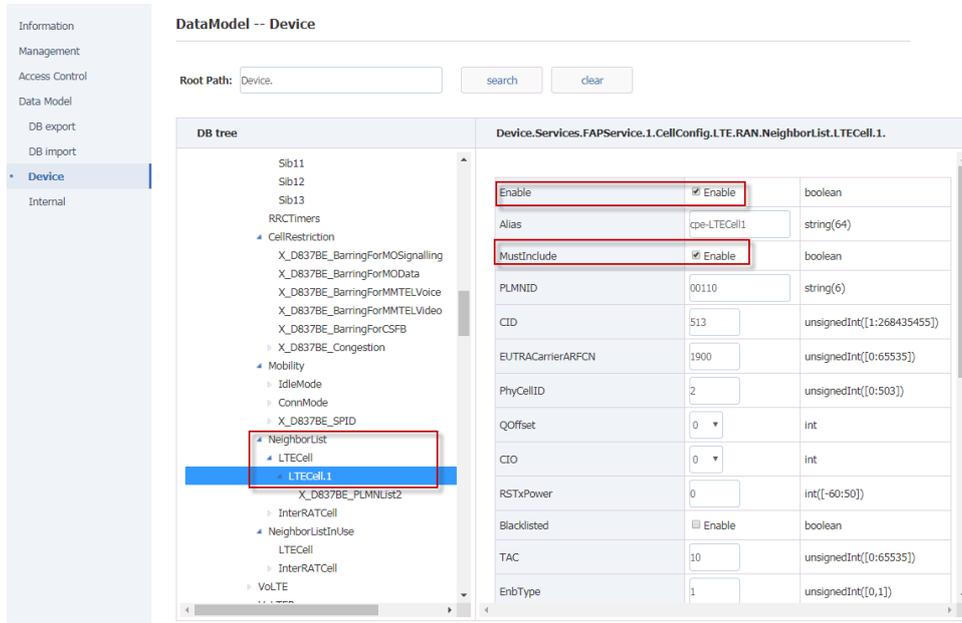


Figure 310 manually add LTE adjacent area-

- After setting LTE neighborhood information, select "submit" to submit;
- Main parameters are described in the following table.

Table 38 specification of LTE neighborhood parameter configuration-

| The parameter name | instructions |
|--------------------|--|
| The Enable | Adjacent enable switch
0: invalid neighborhood;1: effective neighborhood |
| Alias | Keep the default |
| MustInclude | Whether to include the neighbor table switch
0: not added to neighborhood relational table;1: is added to the neighborhood relationship table |
| PLMNID | Adjacent regions PLMN ID |
| CID | Neighborhood community ID,
<ul style="list-style-type: none"> When the neighborhood type is Home, the length is 28 bits When the neighborhood type is Marco, the length is 20 bits (that is, eNodeB ID) |
| EUTRACarrierARFCN | Neighborhood absolute frequency |
| PhyCellID | Adjacent regions PCI |
| QOffset | Neighborhood migration, Idle mode cell re - selection, the larger the easier to re - selection to this cell |
| The CIO | Neighborhood offset, connection mode cell switching, the larger the easier to switch to this cell |
| RSTxPower | Reference signal power of adjacent region |
| Blacklisted | Turns off by default. If enabled, this neighborhood will not be a switching target for UE |
| TAC | Adjacent regions TAC |

| | |
|----------------------------------|---|
| EnbType | 0: hong station, 1: small station |
| X_18396E_NoRemove | Disabled by default. If enabled, this neighborhood will not be automatically removed from the InUse list |
| X_18396E_NoX2 | Default off.
<ul style="list-style-type: none"> If enabled, the base station will not establish an X2 connection with this neighborhood |
| X_18396E_NoX2HO | Default off.
<ul style="list-style-type: none"> If enabled, the base station will not be switched with the adjacent area via the X2 interface |
| X_18396E_AccessMode | Neighborhood Access mode, default is Open Access |
| X_18396E_CSGID | CSG ID of adjacent area, default does not need to be filled in |
| X_18396E_BlacklistedSIB | This is turned off by default, corresponding to BlackCellList in SIB4 or 5 |
| X_18396E_AntennaPortsCount | Number of adjacent antenna ports |
| X_18396E_DLBandwidth | Adjacent downlink bandwidth |
| X_18396E_SubFrameAssignment | Neighborhood sub-frame ratio |
| X_18396E_SpecialSubframePatterns | Neighborhood special subframe mode |

3.2.2.2 Manually configure 3G neighbors

1. Manually configure the 3G neighborhood list

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborList. InterRATCell. UMTS.

The screenshot shows a configuration interface with a sidebar on the left containing menu items: Information, Management, Access Control, Data Model, DB export, DB import, Device (highlighted), and Internal. The main area is titled 'Root Path: Device.' and contains a 'DB tree' on the left and a configuration table on the right. The 'DB tree' shows a hierarchy where 'Device' is expanded to 'NeighborList' > 'InterRATCell' > 'UMTS' > 'UMTS.1'. The configuration table on the right has the following fields:

| Field | Value | Type |
|----------------------|--|------------------------|
| Enable | <input checked="" type="checkbox"/> Enable | boolean |
| Alias | cpe-UMTS1 | string(64) |
| MustInclude | <input checked="" type="checkbox"/> Enable | boolean |
| PLMNID | 00110 | string(6) |
| RNCID | 0 | unsignedInt([0:65535]) |
| CID | 1 | unsignedInt([0:65535]) |
| LAC | 0 | unsignedInt([0:65535]) |
| RAC | 0 | unsignedInt([0:255]) |
| URA | 0 | unsignedInt([0:65535]) |
| UARFCNUL | 9763 | unsignedInt([0:16383]) |
| UARFCNDL | 10713 | unsignedInt([0:16383]) |
| PCPICHScramblingCode | 0 | unsignedInt([0:511]) |

Figure 311 manually add 3G neighborhood-

2. After setting 3G neighborhood information, select "submit" to submit;

- Main parameters are described in the following table.

Table 39 UMTS neighborhood parameter configuration description-

| The parameter name | instructions |
|----------------------|--|
| The Enable | Entry enable switch, need enable |
| Alias | Keep the default |
| MustInclude | Mandatory include switch, need enable |
| PLMNID | Adjacent regions PLMN ID |
| RNCID | Adjacent regions RNC ID |
| CID | Adjacent regions C - ID |
| LAC | Adjacent regions LAC |
| The RAC | Adjacent regions RAC |
| URA | Adjacent regions URA |
| UARFCNUL | Line frequency points on |
| UARFCNDL | The line frequency point |
| PCPICHScramblingCode | scrambler |
| PCPICHtxPower | PCPICH transmitting power, multiplied by 0.1 is the actual value, in dBm |

3.2.2.3 Configure GSM neighborhood

- Manually configure the GSM neighborhood list

Data model path:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborList. InterRATCell. GSM.

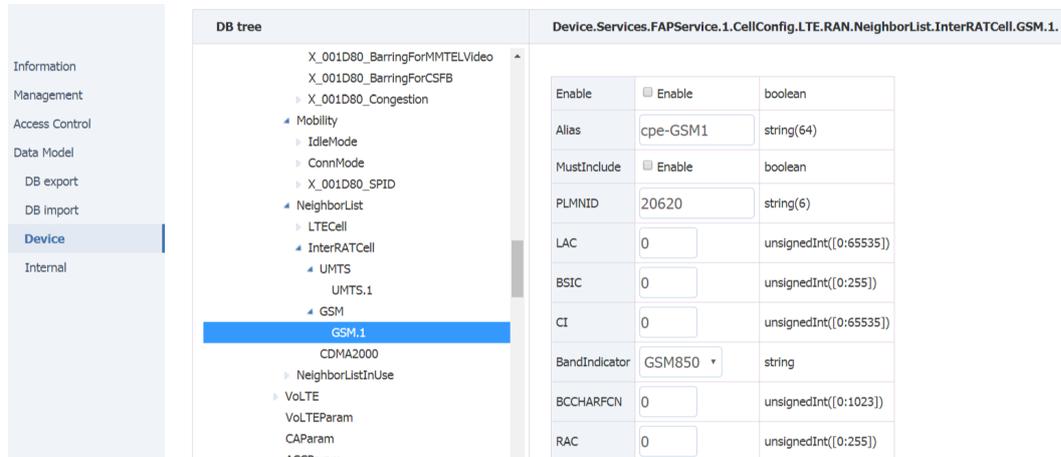


Figure 312 add GSM neighborhood manually-

- After setting the GSM neighborhood information, select "submit" to submit;
- Main parameters are described in table 310. Table 310 GSM neighborhood parameter configuration instructions-4

Table 310 GSM neighborhood parameter configuration instructions-4

| The parameter name | instructions |
|--------------------|---------------------------------------|
| The Enable | Entry enable switch, need enable |
| Alias | |
| MustInclude | Mandatory include switch, need enable |
| PLMNID | Adjacent regions PLMN ID |
| LAC | Adjacent regions LAC |

| | |
|---------------|---|
| BSIC | Bit 7:6 - not used ("00")
Bit 5:3-ncc (PLMN Color Code)
Bit 2:0-bcc (BS color code) |
| CI | Adjacent regions Cell ID |
| BandIndicator | Adjacent band indication |
| BCCHARFCN | Adjacent regions frequency points |
| The RAC | Adjacent regions RAC |

3.2.3 Mobility parameters configuration

1. The base station handover decision mainly uses the following events:

A1 event: indicates that the signal quality of the service community is higher than a certain threshold. When UE reports this event, the base station stops the measurement of different frequency/different system;

A2 event: indicates that the signal quality of the service community is below a certain threshold. When UE reports this event, the base station starts the measurement of different frequency/different system.

A3 event: indicates that the quality of the same frequency/different frequency neighborhood is higher than that of the service community. When UE reports this event, the base station initiates the same frequency/different frequency switching request.

B1 event: indicates that the quality of the neighboring area of the different system is higher than a certain threshold. When UE reports this event, the base station starts the eSRVCC switching request based on the uplinking service quality.

B2 event: it means that the quality of the service community is below a certain threshold and the quality of the neighboring area of the different system is above a certain threshold. When UE reports this event, the base station initiates the overcover-based eSRVCC switching request.

2. The data model configuration item corresponding to the above events is:

Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. EUTRA. A1MeasureCtrl

Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. EUTRA. A2MeasureCtrl

Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. EUTRA. A3MeasureCtrl

Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. IRAT. B1MeasureCtrl

Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. IRAT. B2MeasureCtrl

3.2.3.1 Start different frequency/system measurement

1. The base station starts the different frequency/different system measurement triggered by A2 events. As shown in the figure, there are 11 groups of configurations of A2 events, and the ones to be concerned are 1 to 7, which are respectively used in different scenarios: Error: Reference source not found

- A2MeasureCtrl.1: measurement of different frequencies
- A2MeasureCtrl.2: 3G measurement (with LTE data service)
- A2MeasureCtrl.3: 2G measurement (with LTE data service)
- Blind A2MeasureCtrl. 4:3 g
- Blind A2MeasureCtrl. 5:2 g
- A2MeasureCtrl.6: 3G measurement (with LTE voice service)
- A2MeasureCtrl.7: 2G measurement (with LTE voice service)

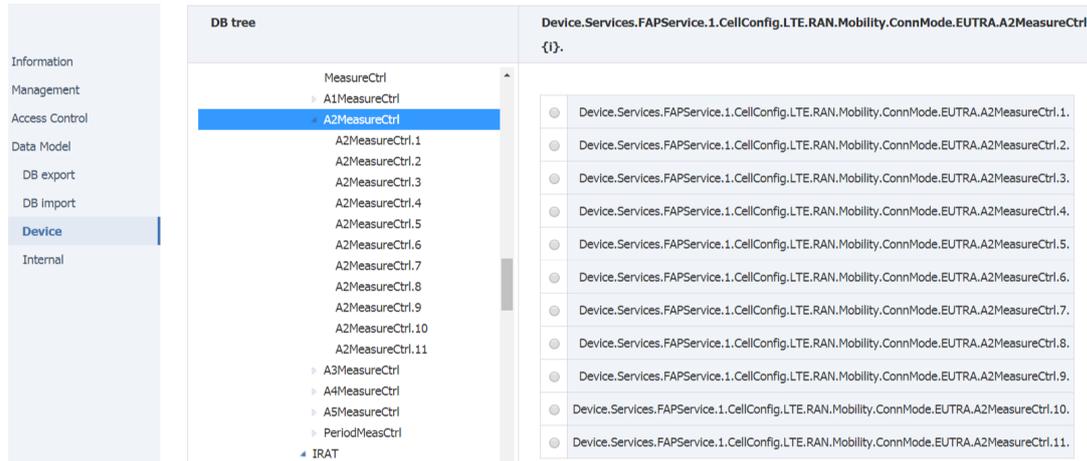


Figure 313 A2 event-

2. Regarding the parameter configuration of A2 event, take the common different frequency measurement scenario as an example.

A2 event will be triggered when UE's measurement results of primary plot are less than $a2thresholdsrp - hysteresis$ (both are actual converted values, as shown in figure 314, $45 - 140 - 2 * 0.5 = -96$ dBm) and are maintained longer than TimeToTrigger, and report continuously with ReportInterval. Error: Reference source not found See table 311 for parameter description. Table 311 A2 event configuration instructions-5

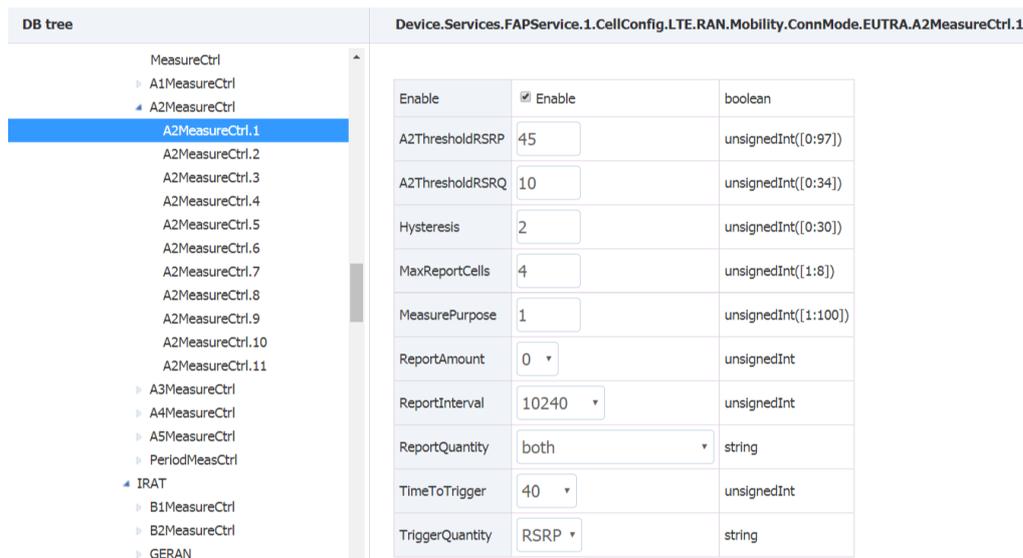


Figure 314 A2 event parameters-

Table 311 A2 event configuration instructions-5

| The parameter name | instructions |
|--------------------|--------------|
|--------------------|--------------|

| | |
|-----------------|--|
| The Enable | |
| A2ThresholdRSRP | A2 RSRP trigger threshold, after subtracting 140, is the actual value (in dBm) |
| A2ThresholdRSRQ | |
| Hysteresis | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| MaxReportCells | |
| MeasurePurpose | |
| ReportAmount | Number of reports, 0 is infinite |
| ReportInterval | Report interval, in ms |
| ReportQuantity | Report the amount |
| TimeToTrigger | Trigger time in ms |
| TriggerQuantity | Trigger, default to RSRP |

3.2.3.2 Stop different frequency/system measurement

1. The measurement of base station stopping different frequency/different system is triggered by A1 events, as shown in figure 248. A1 events have a total of 11 configurations, and the ones to be concerned are 1 to 5, which are respectively used in different scenarios: Figure 248 A1 event -2

A1MeasureCtrl.1: measurement of different frequencies

A1MeasureCtrl.2: 3G measurement (with LTE data service)

A1MeasureCtrl.3: 2G measurement (with LTE data service)

A1MeasureCtrl.4: 3G measurement (with LTE voice service)

A1MeasureCtrl.5: 2G measurement (LTE voice service exists)

Figure 248 A1 event-2

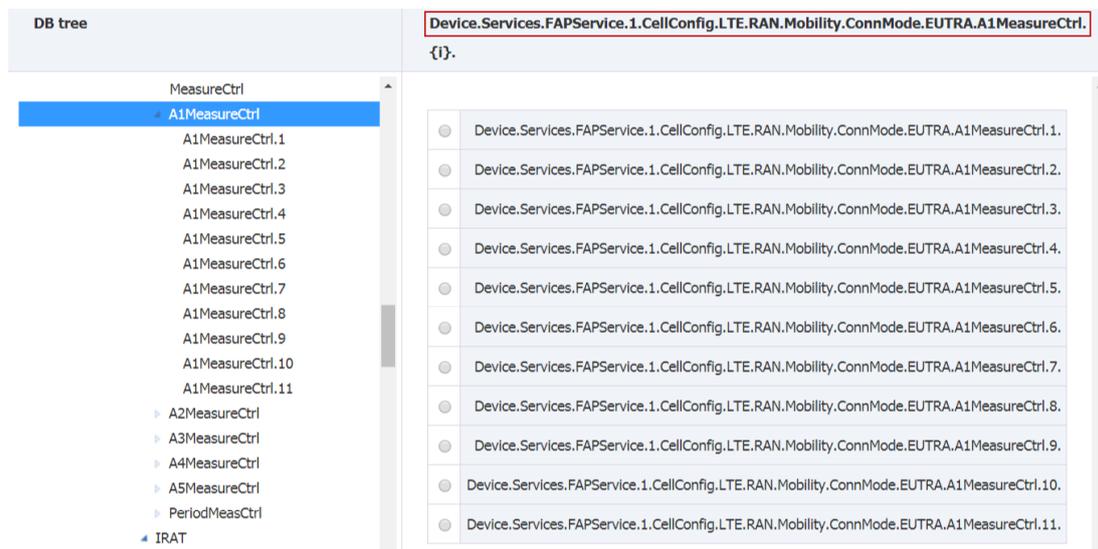


Figure 315 A1 event-

2. The parameter configuration of A1 event is taken as an example.

A1 event will be triggered when UE measurement results of primary plot are larger than $A1ThresholdRSRP + Hysteresis$ (both are actual values after conversion, as shown in FIG. 249, $55 - 140 + 2 * 0.5 = -84$ dBm) and maintain time greater than TimeToTrigger, and report continuously with

ReportInterval.Error: Reference source not foundSee table 318 for parameter description.Table 312 A1 event configuration notes-6

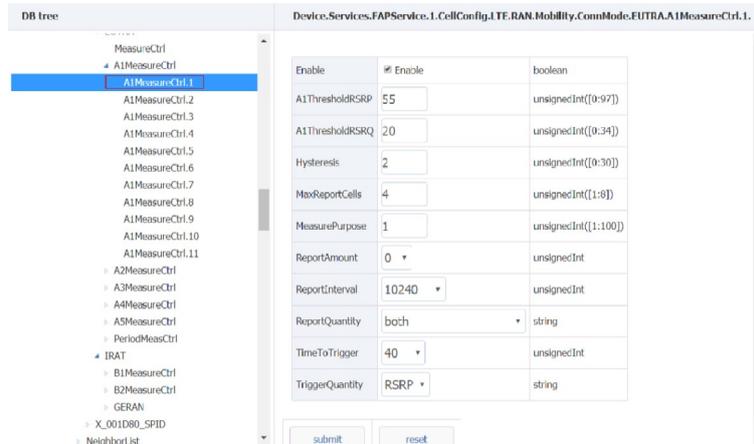


Figure 316 A1 event parameters-

Table 312 A1 event configuration notes-6

| The parameter name | instructions |
|--------------------|--|
| The Enable | |
| A1ThresholdRSRP | A1 RSRP trigger threshold, which is the actual value (in dBm) after subtraction of 140 |
| A1ThresholdRSRQ | |
| Hysteresis | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| MaxReportCells | |
| MeasurePurpose | |
| ReportAmount | Number of reports, 0 is infinite |
| ReportInterval | Report interval, in ms |
| ReportQuantity | Report the amount |
| TimeToTrigger | Trigger time in ms |
| TriggerQuantity | Trigger, default to RSRP |



Note: a2thresholdrsrp-hysteresis should be lower than a1thresholdrsrp-hysteresis, otherwise UE will repeatedly report A1, A2 events.

3.2.3.3 LTE same/different frequency handover

1. LTE same-frequency/different-frequency switching is triggered by A3 events. As shown in figure 317, there are two groups of configurations of A3 events, which are used in different scenarios:Error: Reference source not found

A3MeasureCtrl.1: measurement of same frequency

A3MeasureCtrl.2: measurement of different frequencies



Figure 317 A3 events-

- The trigger condition of A3 is: where Mn and Mp are the measurement results of UE on adjacent area and main area respectively, Ofn and Ofp are frequency offset of adjacent area and main area respectively (default is 0), Ocn and Ocp are offset of adjacent area and main area respectively (default is 0), Off is A3Offset, Hys is Hysteresis. $Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$. Therefore, when the measurement results of UE on the adjacent area are larger than A3Offset + Hysteresis when compared with the main plot (both are actual values after conversion, as shown in FIG. 251, $4 * 0.5 + 2 * 0.5 = 3dB$) and the maintenance time is longer than TimeToTrigger, A3 events will be triggered and report continuously with ReportInterval as interval. Error: Reference source not found See table 313 for parameter description. Table 313 A3 event configuration notes-7

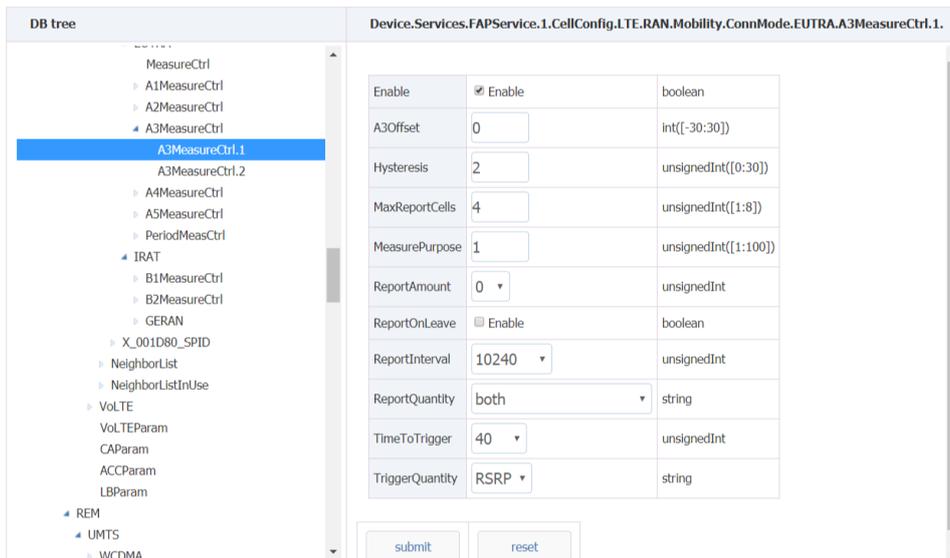


Figure 318 A3 event parameters-

Table 313 A3 event configuration notes-7

| The parameter name | instructions |
|--------------------|---|
| The Enable | |
| A3Offset | A3 offset, multiplied by 0.5, is the actual value (in dB). |
| Hysteresis | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| MaxReportCells | |
| MeasurePurpose | |
| ReportAmount | Number of reports, 0 is infinite |
| ReportOnLeave | |
| ReportInterval | Report interval, in ms |
| ReportQuantity | Report the amount |

| | |
|-----------------|--------------------------|
| TimeToTrigger | Trigger time in ms |
| TriggerQuantity | Trigger, default to RSRP |

3.2.3.4 Overlay based eSRVCC

1. Overlay based eSRVCC switch is triggered by event B2, as shown in figure 252. There are 4 sets of configurations of B2 event for different purposes. The overlay based eSRVCC switch is triggered by B2MeasureCtrl.Error: Reference source not found

B2MeasureCtrl.1 :3G measurement (LTE data service exists)

B2MeasureCtrl.2 :2G measurement (LTE data service exists)

B2MeasureCtrl 3 :3G measurement (LTE voice service exists)

B2MeasureCtrl.4 :2G measurement (LTE voice service exists)

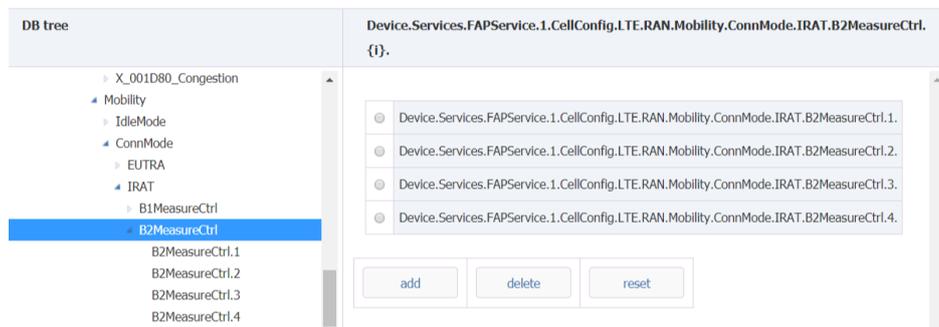


Figure 319 B2 event-

2. B2 indicates that the quality of service community is below a certain threshold and the quality of neighboring areas of different systems is above a certain threshold. When UE reports B2MeasureCtrl.4 event, the base station initiates the overlay based eSRVCC switching request.
3. After receiving the measurement report of A2MeasureCtrl 7, the base station starts the measurement corresponding to B2MeasureCtrl 4.
4. When the measurement result of UE on the main plot was less than $b2threshold1eutrarsrp - hysteresis$ (both were actual values after conversion, as shown below, $42 - 140 - 2 * 0.5 = -99$ dBm), and the measurement result of UE on the GSM neighborhood was larger than $B2Threshold2GERAN + hysteresis - ofn$ (both were actual values after conversion, Ofn default was 0, as shown in figure 253, $20 - 110 + 2 * 0.5 = -89$ dbm).Error: Reference source not foundAnd if it stays longer than TimeToTrigger, B2 events will be triggered and reported continuously at ReportInterval.Error: Reference source not found

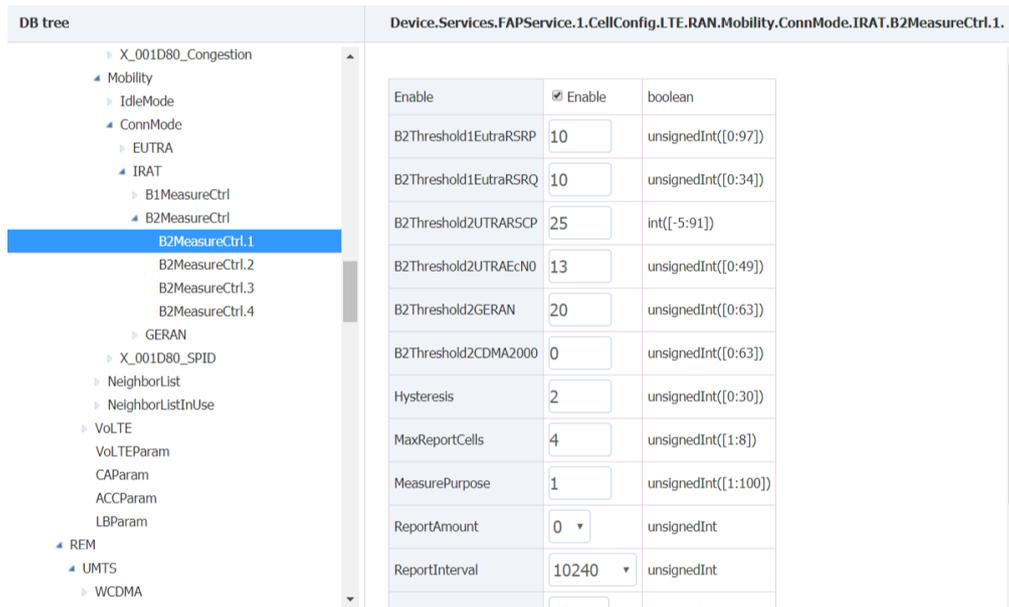


Figure 320 B2 event parameter configuration-

Table 314 B2 event configuration instructions-

| The parameter name | instructions |
|-----------------------|--|
| The Enable | Enable switch, on by default |
| B2Threshold1EutraRSRP | B2 EUTRA RSRP trigger threshold, after subtraction of 140, is the actual value (in dBm) |
| B2Threshold1EutraRSRQ | |
| B2Threshold2UTRARSCP | |
| B2Threshold2UTRAEcN0 | |
| B2Threshold2GERAN | B2 GERAN triggers the threshold. After subtracted by 110, it is the actual value (in dBm). |
| B2Threshold2CDMA2000 | |
| Hysteresis | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| MaxReportCells | |
| MeasurePurpose | |
| ReportAmount | Number of reports, 0 is infinite |
| ReportInterval | Report interval, in ms |
| TimeToTrigger | Trigger time in ms |

3.2.3.5 ESRVCC based on uplink service quality

- The eSRVCC switch based on upline service quality is triggered by event B1, as shown in figure 321. There are 4 sets of B1 configurations for different purposes. The eSRVCC switch based on upline service quality is triggered by B1MeasureCtrl. Error: Reference source not found

B1MeasureCtrl.1 :3G measurement (with LTE data service)

B1MeasureCtrl.2 :2G measurement (with LTE data service)

B1MeasureCtrl.3 :3G measurement (with LTE voice service)

B1MeasureCtrl.4 :2G measurement (LTE voice service exists)

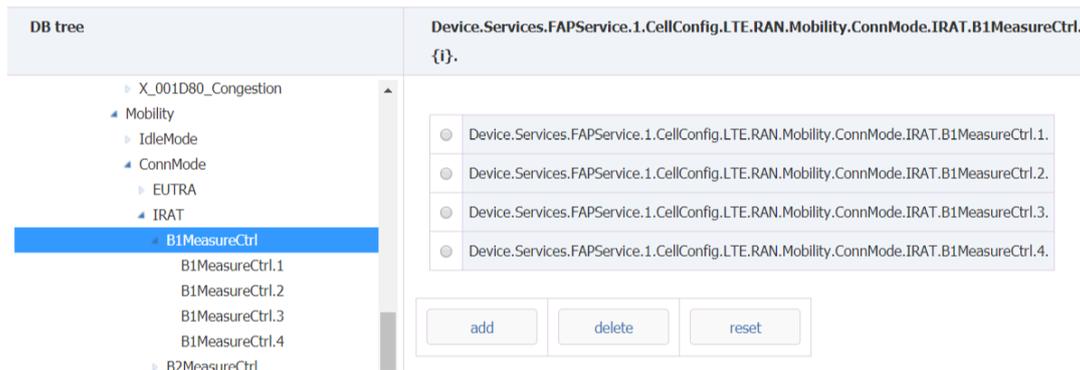


Figure 321 B1 event-

- When the service quality of VoLTE falls below the threshold, the base station issues measurement and control based on B1MeasureCtrl 4 event to GSM adjacent area. This function is turned off by default and needs to be enabled by SrvccUIQosEnable, as shown in figure 322. Error: Reference source not found. See table 221 for parameter descriptions. Table 315 VoLTE service quality control configuration instructions-

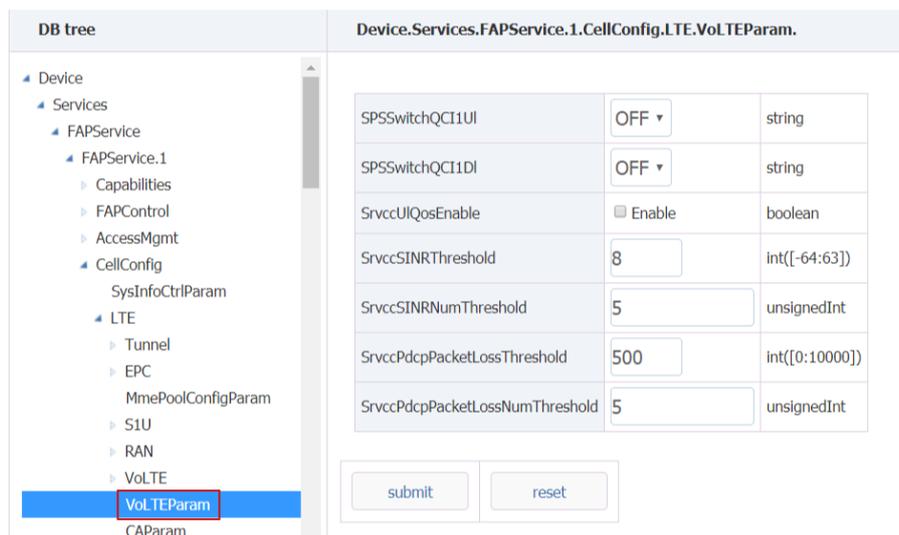


Figure 322 VoLTE business quality monitoring configuration-

Table 315 VoLTE service quality control configuration instructions-

| The parameter name | instructions |
|----------------------------------|---|
| SrvccUIQosEnable | VoLTE service quality eSRVCC monitoring switch, off by default |
| SrvccSINRThreshold | SINR monitoring threshold |
| SrvccSINRNumThreshold | The number of times below the SINR monitoring threshold, after which eSRVCC is triggered |
| SrvccPdcPpPacketLossThreshold | PDCP packet loss threshold |
| SrvccPdcPpPacketLossNumThreshold | The number of times below the PDCP packet loss threshold, after which eSRVCC is triggered |

- After receiving the B1MeasureCtrl.4 measurement report, the base station triggers eSRVCC based on uplink service quality. B1 is the trigger formula, where Mn is the measurement result of GSM neighborhood, Ofn is the frequency deviation of GSM (default: 0), Thresh is B1ThresholdGERAN, Hys is Hysteresis, so when UE's measurement result of GSM neighborhood is larger than B1ThresholdGERAN+ Hysteresis (both are actual values after conversion, as shown in figure 256,

20-110+2*0.5= -89dbm), and the retention time is greater than TimeToTrigger. Mn+Ofn – Hys>ThreshError: Reference source not foundThe B1 event will be triggered and will be reported continuously at ReportInterval. Table 316 B1 event configuration instructions-

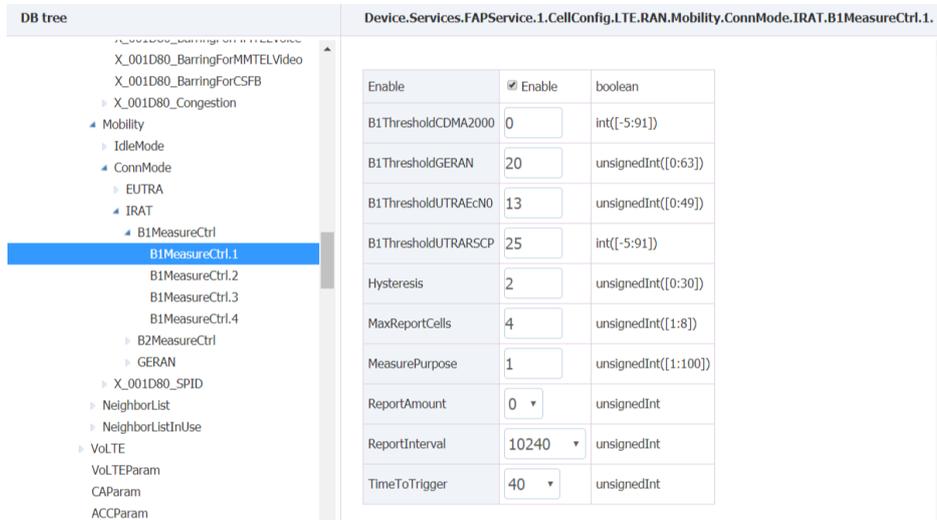


Figure 323 B1 event parameters-

Table 316 B1 event configuration instructions-

| The parameter name | Value range | instructions |
|--------------------------|-------------|---|
| The Enable | | |
| B1ThresholdCDMA2000
0 | [- 1] goes | |
| B1ThresholdGERAN | [3] 0-6 | B1 GERAN trigger threshold, after subtracted by 110, is the actual value (in dBm) |
| B1ThresholdUTRAEcN0 | [0:49] | |
| B1ThresholdUTRARSCP | [- 1] goes | |
| Hysteresis | [0:30] | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| MaxReportCells | [8] | |
| MeasurePurpose | [1:100] | |
| ReportAmount | | Number of reports, 0 is infinite |
| ReportInterval | | Report interval, in ms |
| TimeToTrigger | | Trigger time in ms |



Note: eNB shall correctly configure the measurement of A2 with different systems for UE (when the RSRP of the terminal downlink is at a good level, the reporting of A2 with different systems will not be triggered, but at this time, the service quality of VoLTE is below the threshold, and the measurement and control of B1 events will be triggered).

3.2.3.6 CSFB configuration

If UE does not support VoLTE, or USIM does not turn on VoLTE function, or LTE cell signal is very poor, then it will fall back to 2G when receiving calls. In this case, the base station releases the phone and carries redirectedCarrierInfo on the RRCConnectionRelease to indicate UE back down to 2G. There are two sources of GSM frequency points configured when falling back:

1. Device. Services. FAPService. 1. CellConfig. LTE. RAN. Mobility. ConnMode. IRAT. GERAN. GERANFreqGroup., as shown in figure 324. Error: Reference source not found Please refer to the following table for parameter description.

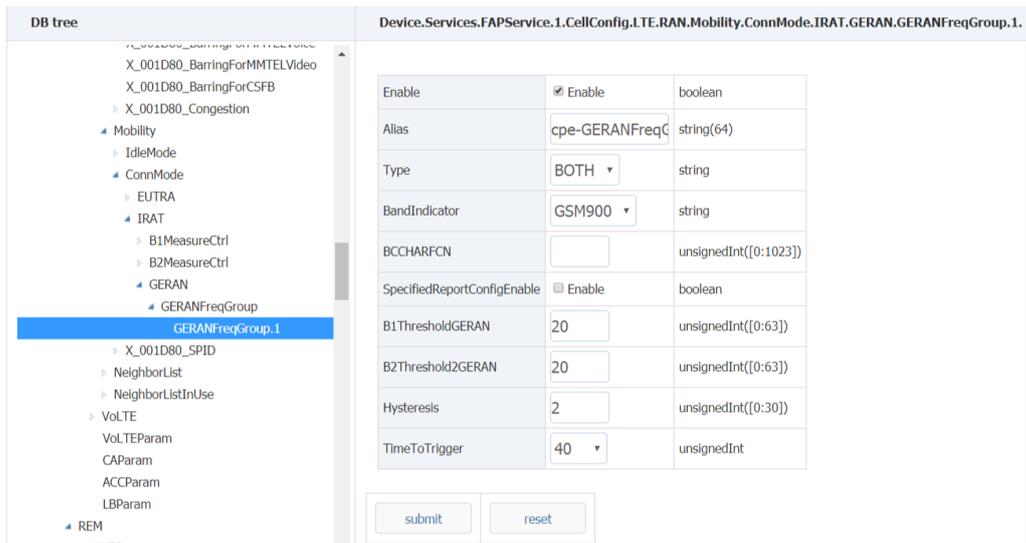


FIG. 324 CSFB frequency points-

Table 317 GERANFreqGroup configuration instructions-

| The parameter name | instructions |
|-----------------------------|---|
| The Enable | Can make the switch |
| Alias | |
| The Type | Default to BOTH, CSFB and SRVCC |
| BandIndicator | Band indicates |
| BCCHARFCN | Frequency point |
| SpecifiedReportConfigEnable | Special configuration enables each frequency point to configure different B1 and B2 event threshold, and this function is turned off by default |
| B1ThresholdGERAN | B1 GERAN trigger threshold, after subtracted by 110, is the actual value (in dBm) |
| B2Threshold2GERAN | B2 GERAN triggers the threshold. After subtracted by 110, it is the actual value (in dBm). |
| Hysteresis | Trigger hysteresis, multiplied by 0.5, is the actual value (in unit dB) |
| TimeToTrigger | Trigger time in ms |

2. Device. Services. FAPService. 1. CellConfig. LTE. RAN. NeighborListInUse. InterRATCell. GSM.

FIG. 325 CSFB frequency point -1-

Table 318 GSM neighborhood frequency point configuration-

| The parameter name | instructions |
|--------------------|---|
| PLMNID | Adjacent regions PLMN ID |
| LAC | Adjacent regions LAC |
| BSIC | Bit 7:6 - not used ("00")
Bit 5:3-ncc (PLMN Color Code)
Bit 2:0-bcc (BS color code) |
| CI | Adjacent regions Cell ID |
| BandIndicator | Adjacent band indication
GSM850
GSM900
DCS1800
PCS1900 |
| BCCHARFCN | Adjacent regions frequency points |
| The RAC | Adjacent regions RAC |
| RSSI | RSSI GERAN carrier |
| Timestamp | Last measured timestamp |

3.3 Configure base station synchronization parameters

Clock synchronization refers to the strict and specific relationship between signals in terms of frequency or time. In digital communication networks

The purpose of synchronization is to keep the difference in clock frequency or time between communication devices throughout the network within a reasonable error range. To avoid the deterioration of transmission performance caused by the inaccurate timing of receiving/sending signals in the transmission system.

Clock synchronization includes frequency synchronization and time synchronization. TDD systems are time division multiplexing and must use time Synchronization, so as to avoid interference between base stations and UEs.

3.3.1 Overview

1. The base station supports three synchronization modes. When the synchronization mode switching function is turned on, the base station can switch among the three synchronization modes.

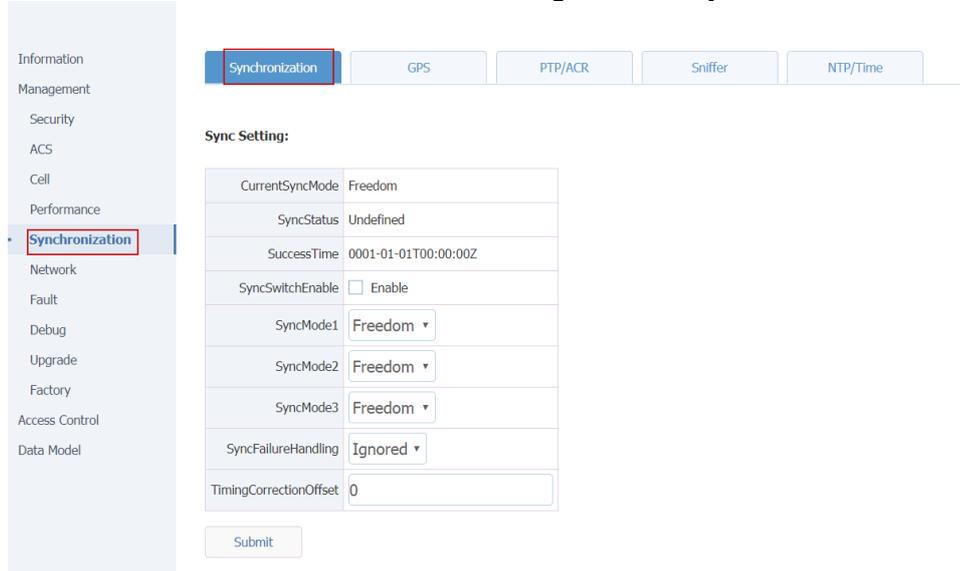


Figure 326 synchronization mode-

| Synchronous technology | Frequency synchronization | Time synchronization | advantages | disadvantages |
|------------------------|---------------------------|----------------------|---|---|
| GPS/RGPS | ✓ | ✓ | Each small base station is equipped with GPS/RGPS independently, without network support. | Need to increase GPS/RGPS hardware, as well as installation and maintenance costs, high cost. |
| The IEEE 1588 v2 | ✓ | ✓ | <ol style="list-style-type: none"> 1. If frequency synchronization is only implemented, it can support transmission across data network and has low requirements for intermediate equipment. 2. Can realize frequency synchronization and time synchronization, and can support the clock requirements of LTE TDD. 3. Standard | <ol style="list-style-type: none"> 1. If time synchronization is to be achieved, all intermediate network equipment shall be upgraded to support IEEE1588 protocol. 2. Clock recovery quality is susceptible to data network delay, jitter and packet loss. |

| | | | | |
|-----------------|---|---|---|------------------------------|
| | | | protocol, which can support interconnection between manufacturers through different profiles. | |
| Lip sync | ✓ | X | No additional hardware, no network support | Only synchronizing frequency |



Note:

- SyncMode1, SyncMode2 and SyncMode3 are not used at present.
- Air port synchronization can only synchronize the frequency, generally need to cooperate with the NTP function.

2. The synchronization mode corresponds to parameters, as shown in the table. Table 319 synchronization mode-

Table 319 synchronization mode-

| synchronously | instructions |
|----------------------|---|
| Freedom | Free mode, which means no synchronization |
| IEEE1588V2 | 1588 clock synchronization, need to configure frame offset |
| Sniffer | Sniffer synchronization, which synchronizes directly with macro stations, does not require configuration of frame offsets |
| GPS | GPS synchronization, need to configure frame offset |

3. Synchronize configuration parameters, as shown in the table.

Table 320 synchronization mode parameters-

| parameter | instructions |
|---------------------|--|
| SyncSwitchEnable | Sync source toggle. Default off. |
| SyncFailureHandling | <p>How the base station handles synchronization failures</p> <ul style="list-style-type: none"> • Default: Ignore: Ignore synchronization failure; • Restart: failure of synchronization will delete cell retry; • Reboot: failure of synchronization will restart the base station to retry; |

3.3.2 GPS synchronization

1. The base station needs external GPS antenna.
2. Set the synchronization mode to "GPS";
3. Configure frame migration according the operter plan, as shown in figure 327, and the calculation method of frame migration is shown in table 321. Error: Reference source not found Table 321 frame migration parameter description-

The screenshot displays the configuration page for GPS synchronization. The 'Sync Setting:' section contains the following parameters:

| | |
|------------------------|---------------------------------|
| CurrentSyncMode | Freedom |
| SyncStatus | Undefined |
| SuccessTime | 0001-01-01T00:00:00Z |
| SyncSwitchEnable | <input type="checkbox"/> Enable |
| SyncMode1 | GPS |
| SyncMode2 | Freedom |
| SyncMode3 | Freedom |
| SyncFailureHandling | Ignored |
| TimingCorrectionOffset | 0 |

Figure 327 GPS synchronization configuration-

Table 321 frame migration parameter description-

| The parameter name | instructions |
|------------------------|--|
| TimingCorrectionOffset | Time synchronization frame offset, Chip(1/30.72us), valid for GNSS and IEEE1588V2.If the macro station is 700us ahead of the GPS frame header, then the frame offset should be 700*30.72=21504. (the macro station here is of the same frequency band) |

4. After parameter configuration is completed, click "Submit";
5. Restart base station and perform GPS synchronization.
6. After the base station restarts, query the GPS synchronization status, as shown in the figure below.

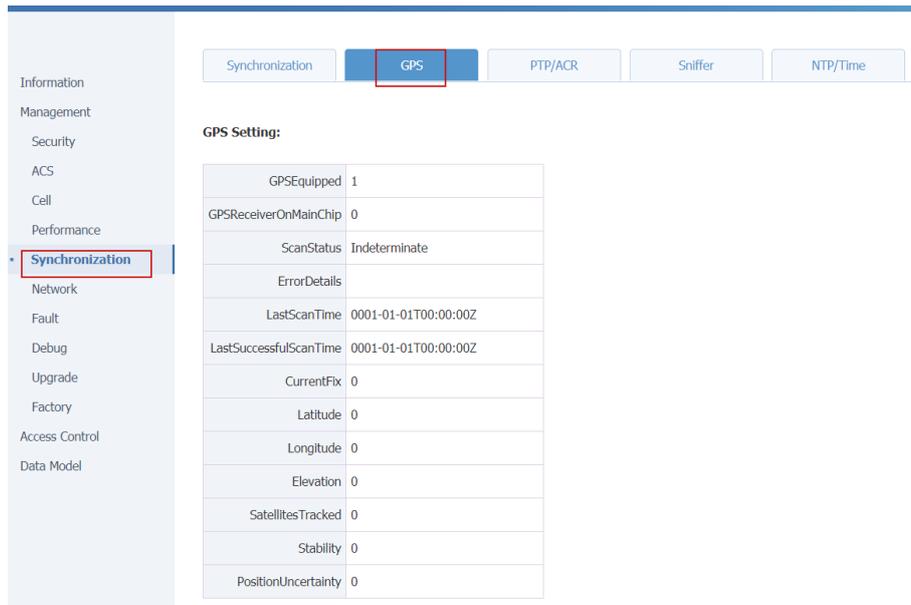


Figure 328 GPS synchronization status-

3.3.3 IEEE1588v2 synchronization

1. There are 1588 clock synchronization signals in the network environment of the base station.
2. 1588 PTPv2 is divided into two modes: multicast and unicast. The configuration of multicast mode is shown in figure 3-30.
 - Select "Ethernet" for Transport;
 - Role select "Slave";

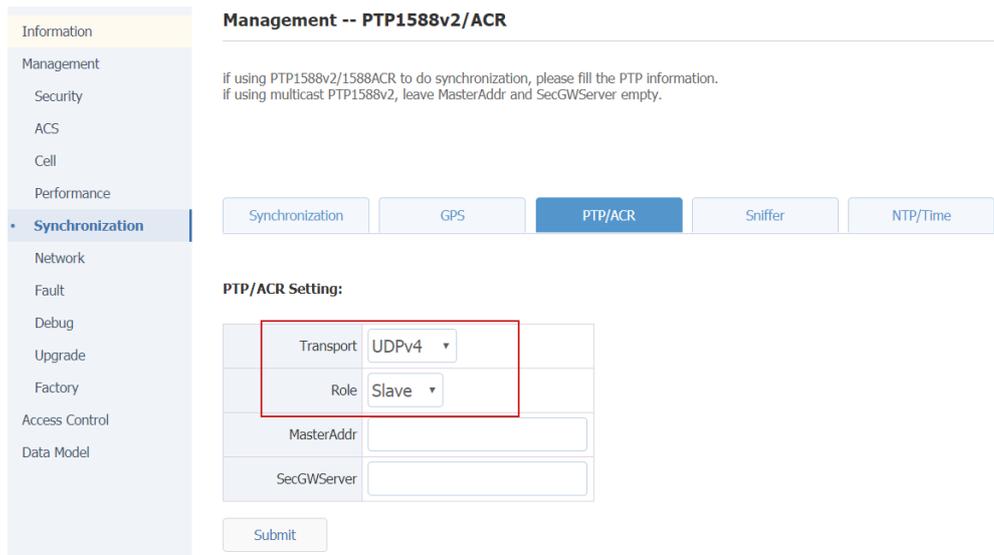


FIG. 329 1588 PTPv2 multicast mode-

3. The 1588 PTPv2 unicast mode configuration is shown in figure 3-31.

- Select "Ethernet" for Transport;
- Role select "Slave";
- MasterAddr fill in the IP address of the master clock;
- In the PTP over IPsec scenario, you need to specify the security gateway address. SecGWServer fill in the security gateway IP address.

Management -- PTP1588v2/ACR

if using PTP1588v2/1588ACR to do synchronization, please fill the PTP information.
if using multicast PTP1588v2, leave MasterAddr and SecGWServer empty.

Synchronization GPS **PTP/ACR** Sniffer NTP/Time

PTP/ACR Setting:

| | |
|-------------|----------------|
| Transport | Ethernet ▾ |
| Role | Slave ▾ |
| MasterAddr | 192.168.100.40 |
| SecGWServer | 10.98.100.40 |

Submit

Figure 330 1588 PTPv2 unicast mode-

4. For configuring frame offset, see the frame offset configuration instructions in table 3-21
5. After setting the above synchronization parameters, set the synchronization mode to "PTP1588";



Note: after modifying the synchronization mode, the base station takes effect by restarting and performs the synchronization.

Synchronization GPS PTP/ACR Sniffer NTP/Time

Sync Setting:

| | |
|------------------------|---------------------------------|
| CurrentSyncMode | Freedom |
| SyncStatus | Undefined |
| SuccessTime | 0001-01-01T00:00:00Z |
| SyncSwitchEnable | <input type="checkbox"/> Enable |
| SyncMode1 | PTP1588 ▾ |
| SyncMode2 | Freedom ▾ |
| SyncMode3 | Freedom ▾ |
| SyncFailureHandling | Ignored ▾ |
| TimingCorrectionOffset | 0 |

Submit

Figure 331 1588 PTPv2 synchronization configuration-

- Restart the base station and perform 1588PTP synchronization;
- After the base station restarts, check the synchronization status, as shown in the figure below.

| Sync Setting: | |
|------------------------|---------------------------------|
| CurrentSyncMode | PTP1588 |
| SyncStatus | Indeterminate |
| SuccessTime | 2019-01-15T10:13:43.723Z |
| SyncSwitchEnable | <input type="checkbox"/> Enable |
| SyncMode1 | PTP1588 |
| SyncMode2 | Freedom |
| SyncMode3 | Freedom |
| SyncFailureHandling | Ignored |
| TimingCorrectionOffset | 0 |

Figure 332 1588 PTPv2 synchronization status-

3.3.4 Sniffer synchronization

- Configure the frequency points for Sniffer, as shown in the figure.

| Sniffer Setting: | |
|-------------------|---------------------------------|
| CheckRSPEnable | <input type="checkbox"/> Enable |
| CheckBWEnable | <input type="checkbox"/> Enable |
| EARFCNDLList | 42590,42788 |
| DonorBWThreshold | 50 |
| DonorRSPThreshold | 9 |
| SuccessRatType | Null |
| SuccessArfcn | 0 |
| SuccessPci | 0 |

Figure 333 setting of the same step frequency of Sniffer-

- Set the synchronization mode to "Sniffer";

The screenshot shows the 'Synchronization' configuration page. The left sidebar lists various system management categories, with 'Synchronization' selected. The main content area has tabs for 'Synchronization', 'GPS', 'PTP/ACR', 'Sniffer', and 'NTP/Time'. The 'Sync Setting' section contains a table of parameters:

| | |
|------------------------|---------------------------------|
| CurrentSyncMode | Freedom |
| SyncStatus | Undefined |
| SuccessTime | 0001-01-01T00:00:00Z |
| SyncSwitchEnable | <input type="checkbox"/> Enable |
| SyncMode1 | Sniffer |
| SyncMode2 | Freedom |
| SyncMode3 | Freedom |
| SyncFailureHandling | Ignored |
| TimingCorrectionOffset | 0 |

A red box highlights the 'SyncMode1' dropdown menu, which is currently set to 'Sniffer'. A 'Submit' button is located at the bottom of the configuration area.

Figure 334. Sniffer synchronization configuration-

3. After the configuration of synchronization parameters is completed, restart the base station and perform synchronization;
4. After the base station restarts, check the air port synchronization status, as shown in the figure below.

The screenshot shows the 'Synchronization' configuration page after a restart. The left sidebar is the same as in Figure 334. The main content area has tabs for 'Synchronization', 'GPS', 'PTP/ACR', 'Sniffer', and 'NTP/Time'. The 'Sync Setting' section contains a table of parameters:

| | |
|------------------------|---------------------------------|
| CurrentSyncMode | Sniffer |
| SyncStatus | Success |
| SuccessTime | 2019-01-15T11:31:32.797Z |
| SyncSwitchEnable | <input type="checkbox"/> Enable |
| SyncMode1 | Sniffer |
| SyncMode2 | Freedom |
| SyncMode3 | Freedom |
| SyncFailureHandling | Ignored |
| TimingCorrectionOffset | 0 |

The 'SyncStatus' is now 'Success' and the 'SuccessTime' is '2019-01-15T11:31:32.797Z'. A 'Submit' button is located at the bottom of the configuration area. Above the table, there is a note: "you can choose the sync mode here. if you choose ptp1588 or gps, then ntp disabled."

3.3.5 The free mode

1. Set synchronization mode to "Freedom";
2. In free mode, the base station will not synchronize with any synchronous source, relying only on

its own crystal oscillator to ensure frequency deviation.

4. Configure system parameters

4.1.1 Software version upgrade

Select "management-> Upgrade" in the navigation bar to enter the version Upgrade page, as shown in the figure. Figure 41 version upgrade-

Management -- Firmware Upgrade

This page lets you update the eNB's firmware. During the firmware upgrade, the eNB will be rebooted. Force upgrade option lets the eNB force to update partition even though the image not changed.

NOTE: It can take few minutes for a reboot to take place.

Firmware Upgrade

Software version:

| | |
|----------|---|
| Firmware | V1.0.0 |
| Platform | FSM9955.PP.3.0.8(r8.5.0.6@194145.3.223293.2),FSM9955.DV.3.0.8(r8.5.0.6) |

Firmware upgrade:

Force upgrade

选择文件 | 未选择任何文件

Submit

Figure 41 version upgrade-

4.1.1.1 Software upgrade

1. Click "Browser file", select the upgrade file and upload it to the base station.
2. Click Submit to upgrade.
3. The base station restarts and performs the audit, waiting for approximately 3-5min. After successful upgrade, the page will be prompted accordingly.
4. The updated version can be confirmed through the "Information" page of the base station.

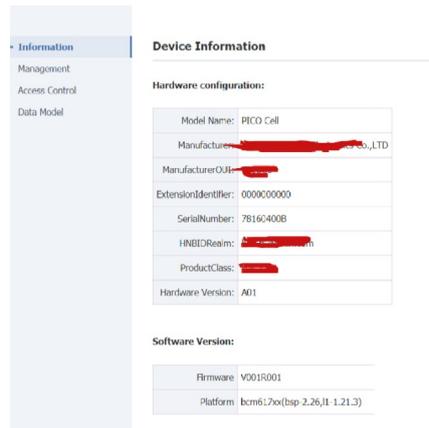


Figure 42 confirms the updated version-

4.1.1.2 Version back

1. In the event that the base station firmware upgrade fails, the base station will automatically revert back to the available version prior to the upgrade.
2. It is also possible to upgrade back to the previous version through the normal version upgrade operation.

4.1.2 System file backup

4.1.2.1 Import/export configuration files

1. Select "Data Model" in the navigation bar and enter the DB import/export page, as shown in the figure. Error: Reference source not found

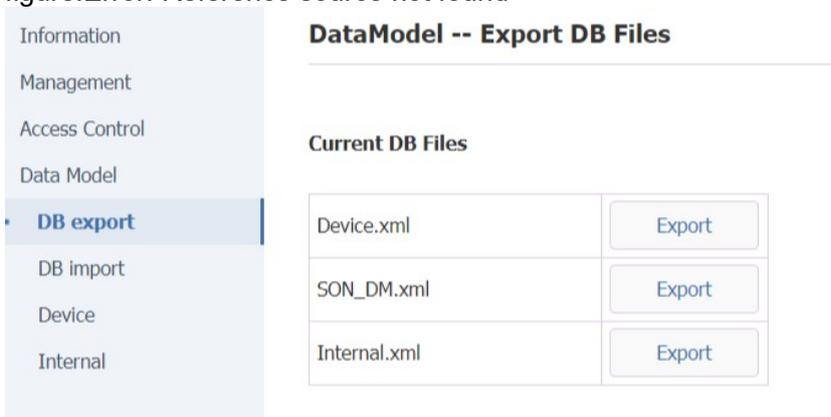


Figure 43 DB export import-

2. Export/Import to Export and Import data files.

4.1.2.2 Export log file

1. Select "management-> Debug" in the navigation bar to enter the log operation interface, as shown in the figure.

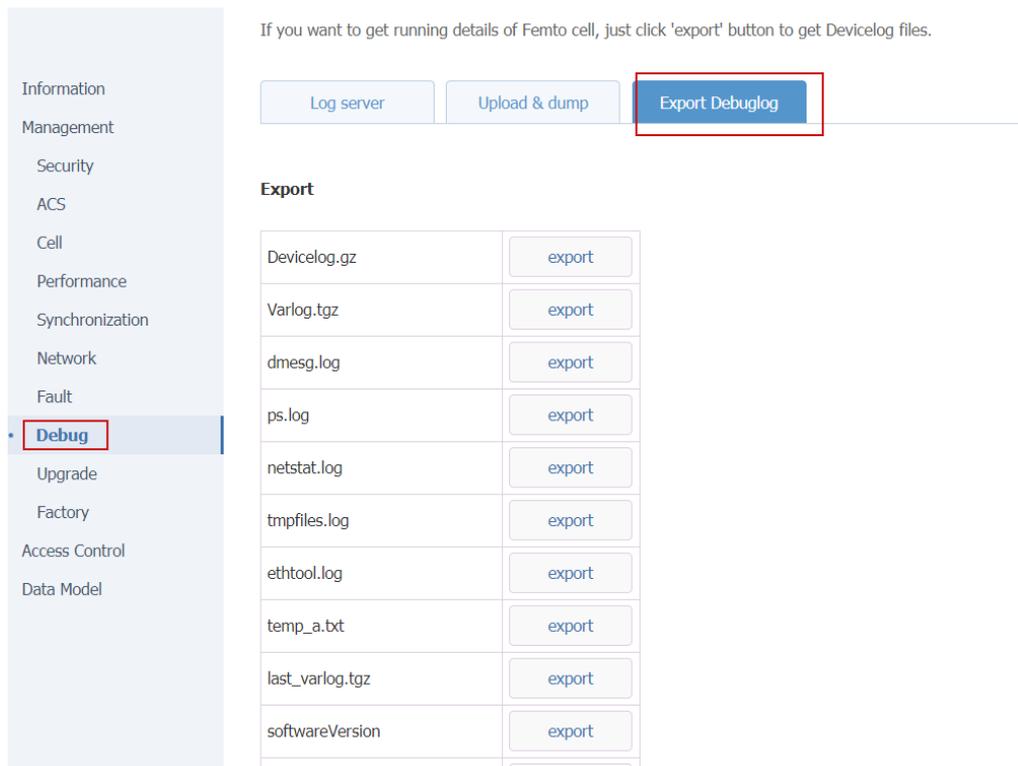
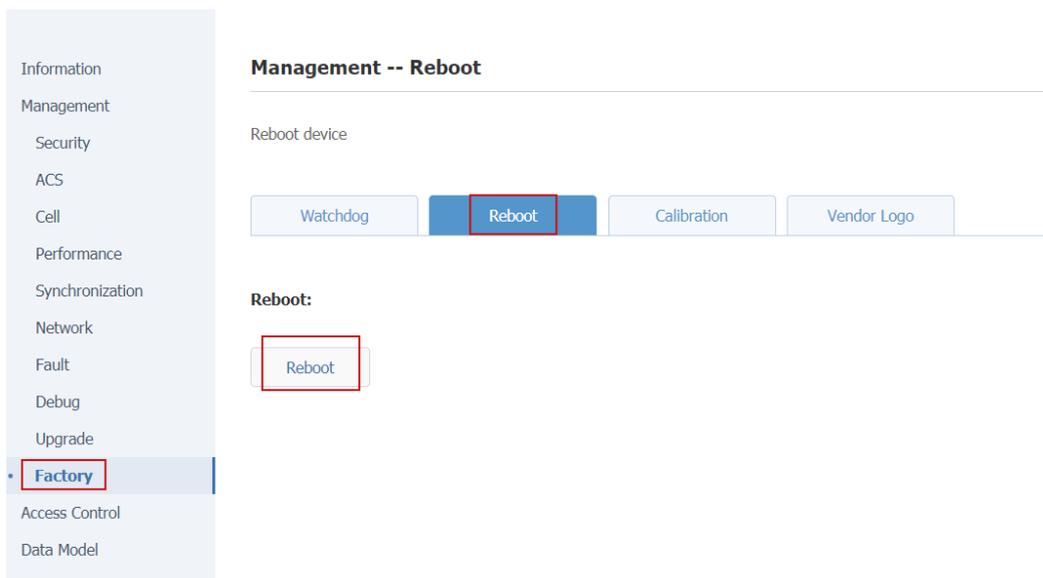


Figure 44 exports the log file-

2. Select the log you want to Export, and click "Export".
3. Save the log file locally by selecting the save path in the download dialog box that pops up.

4.1.3 Restart the base station

1. Select "management-> Factory" in the navigation bar.
2. Click "Reboot" to restart the base station.
3. Base station restarts usually take 3 to 5 minutes.



5. Common debugging function

5.1 The Trace log function

5.1.1 Capture base station logs using a dedicated logviewer tool

The configuration is shown in the figure.

1. Enter the IP address of the crawl log PC.
2. Click Submit to Submit.

Figure 51 sets the logviewer address-

Table 51 parameter description-

| The parameter name | instructions |
|--------------------|------------------------------------|
| The IP Address | Run the PC IP address of logviewer |

5.1.2 Upload the logviewer log automatically

Sometimes the logviewer tool is not easy to install, consider having the base station upload the logviewer source file directly to the specified server

Then use the logviewer tool to view it

1. Turn on automatic upload
Device. X_D837BE_DebugMgmt. Upload. Enable = 1
2. Set the automatic upload cycle
Device. X_D837BE_DebugMgmt. Upload. PeriodicTraceUploadInterval
3. Choose "VendorTraces" for cyclical upload strategy
Device. X_D837BE_DebugMgmt. Upload. PeriodicUploadPolicy = VendorTraces

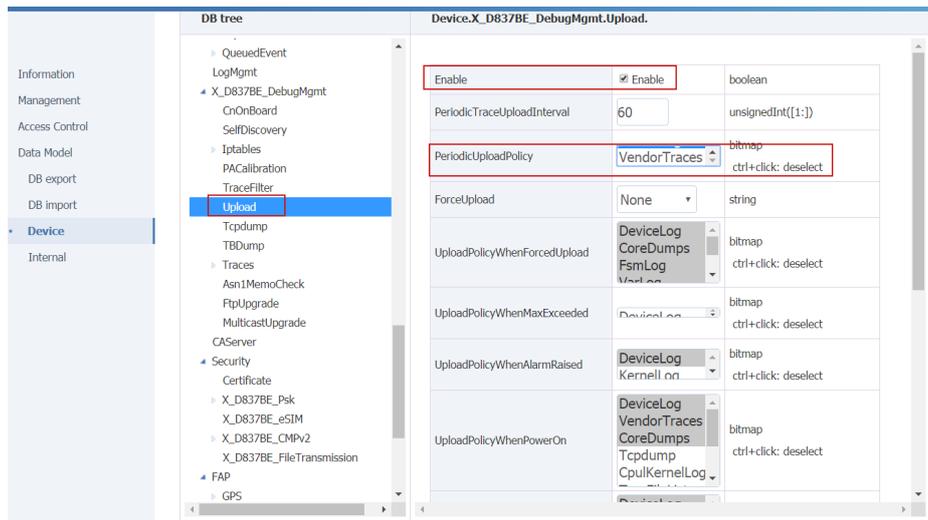


Figure 52 turn on the automatic upload log function-

4. Set upload server address and authentication information.

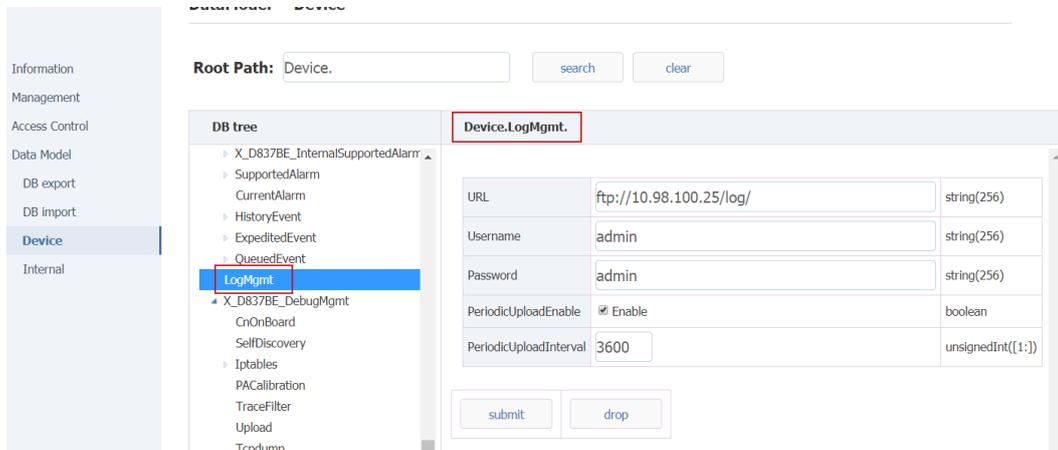


Figure 53 sets upload server parameters-

Table 53 parameter description-

| The parameter name | instructions |
|----------------------|--|
| The URL | Log automatic upload path.
Such as: ftp://10.98.100.80/log/ |
| The Username | Server username |
| The Password | Server password |
| PeriodicUploadEnable | Cycle automatically upload enable switch |

5.2 Other Trace logs are automatically uploaded

Base station supports the function of automatic log uploading, which can upload log files to FTP server. As shown in the figure.

Figure 54 automatically uploads Trace log Settings-

Table 54 parameter description-

| The parameter name | instructions |
|---------------------|-------------------------------|
| The Enable | Can make the switch |
| The Upload URL | FTP server address |
| Upload the Username | FTP server user name |
| Upload the Password | FTP server password |
| Upload the Policy | Log upload policy, by default |

5.3 TCP Dump function

Base station supports opening TCP Dump function to grab base station network interface messages. This is shown below.

1. Choose Interface;
2. Select the corresponding protocol in Filter Type. If other types of packets (such as icmp) are to be captured, select OTHERS and Expression to fill in icmp.
3. Check the Enable;
4. After configuration, click Submit, as shown in figure 6-3.
5. Export the tcpdump file through the Web interface, as shown in figure 6-4;
6. Wireshark looks at tcpdump, as shown in figure 6-5.
 - Open tcpdump.rar. Open the tcpdump.log file with wireshark.

Figure 54 TCP Dump Settings-

| File Name | Action |
|--------------------|--------|
| Devicelog.gz | export |
| Varlog.tgz | export |
| dmesg.log | export |
| ps.log | export |
| netstat.log | export |
| tmpfiles.log | export |
| tcpdump.tar | export |
| fsm.log | export |
| provisioning.xml | export |
| last_fsm.log.gz | export |
| softwareVersion | export |

Figure 56 exports the tcpdump file-

Export tcpdump.log file to desktop and open with Wireshark.

Figure 55 shows the tcpdump file-

Table 55 parameter description-

| The parameter name | instructions |
|--------------------|---|
| The Enable | Can make the switch |
| Interface | Base station network interface, through the drop-down selection |
| The Filter Type | Common catch types |

| | |
|---------------------|---|
| | <ul style="list-style-type: none"> Check "OTHERS" when filtering other types of messages |
| A Filter Expression | When fetching messages other than the usual type, fill in, such as icmp. |

5.4 Telnet function

For security reasons, the Telnet function of the base station is turned off by default. The Telnet function of the power base station can be configured by modifying the data model configuration, as shown in figure 5-8.

1. Check the "TelnetEnable" Enable identification;
2. Click submit for the configuration to take effect.
3. After the configuration is committed, the Telnet function is enabled. The base station can be accessed by Telnet.

User name: root

Password: Mikrotik



Note: the Telnet function fails after the base station is restarted and needs to be reenabled.

Root Path:

DB tree

- └─ faultMgmt
 - └─ X_001D80_InternalSupportedAlarm
 - └─ SupportedAlarm
 - └─ CurrentAlarm
 - └─ HistoryEvent
 - └─ ExpeditedEvent
 - └─ QueuedEvent
 - └─ LogMgmt
 - └─ X_001D80_DebugMgmt
 - └─ CnOnBoard
 - └─ SelfDiscovery
 - └─ Iptables
 - └─ PACalibration
 - └─ TraceFilter
 - └─ Upload
 - └─ Tcpdump
 - └─ TBDump
 - └─ Traces
 - └─ Asn1MemoCheck
 - └─ FtpUpgrade
 - └─ MulticastUpgrade
 - └─ CAServer
 - └─ Security
 - └─ Certificate

Device.X_001D80_DebugMgmt.

| | | |
|---------------------------|--|----------------------|
| CalibrationEnable | <input type="checkbox"/> Enable | boolean |
| TelnetdEnable | <input checked="" type="checkbox"/> Enable | boolean |
| DropbearEnable | <input type="checkbox"/> Enable | boolean |
| LoginDisable | <input type="checkbox"/> Enable | boolean |
| BootDelay | <input type="text" value="1"/> | unsignedInt |
| EnableMailboxWakeupCheck | <input type="checkbox"/> Enable | boolean |
| MailboxWakeupCheckTimeLen | <input type="text" value="100"/> | unsignedInt([0:500]) |
| EnableUeLinkAdaptMeas | <input checked="" type="checkbox"/> Enable | boolean |
| UeLinkAdaptMeasInterval | <input type="text" value="10"/> | int([1:10]) |
| EnableUeInfoLog | <input checked="" type="checkbox"/> Enable | boolean |
| UeInfoLogInterval | <input type="text" value="1"/> | int([1:]) |
| TtiWatchDogTimeout | <input type="text" value="150"/> | int([100:500]) |
| EnableShmDebug | <input type="checkbox"/> Enable | boolean |

Figure 56enable base station Telnet function-