
Core Network OMC Operation Manual

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1 About this manual

This manual is the 5G core network management manual, mainly describing the system's software and hardware environment, system functions, operation guides, common problems and solutions. The manual can provide guidance for network management in terms of maintenance, status monitoring, element configuration, abnormal alarms, statistical reports, and other related operations.

Abbreviations

abbreviation	English explanation
OMC	Operations & Maintenance Centre
NFV	Network Function Virtualization
VNF	Virtualized Network Function
PNF	Physical Network Function
GUI	Graphic User Interface
IMS	IP Multi-media Subsystem
CS	Circuit Switched
DRA	Diameter Routing Agent
VoLTE	Voice over LTE
TCE	Trace Collection Entity
EPC	Evolved Packet Core
NB-IOT	Narrow Band Internet of Things
SMSC	Short Message Service Center
MMSC	Multimedia Messaging Service Center
IP-SM-GW	IP-Short Message-Gateway
ISMG	Internet Short Message Gateway
SCP	Service Control Point
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
AMF	Access and Mobility Management Function
SMF	Session Management Function
UPF	User Plane Function
UDM	Unified Data Management
AUSF	Authentication Server Function
PCF	Policy Control Function
NRF	Network Repository Function
NSSF	Network Slice Selection Function
IWF	Interworking Function
NSSMF	Network Slice Subnet Management Function
5GMC	5G Message Center

1.1 Hardware Environment

5GC and network management support physical machine, local virtualization or cloud deployment, the following is a basic function of the 5GC core network (support

multiple base stations) hardware specifications recommended:

NF	Memory(G)	Hard disk(G)	Vcpu	Remark
AMF	4	100	4	
SMF	4	100	4	
AUSF	4	100	4	
UDM	4	100	4	
UPF	8	100	8	
PCF	4	100	4	
NSSF	4	100	4	
NRF	4	100	4	
OMC	8	100	4	

The Dell PowerEdge R640 server is recommended and the specifications are as follows:

Configuration	Specification	Quantity
CPU	24 cores x Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz	>=20
Memory	2666MT/s RDIMMs	64G
Hard disk	10K RPM SAS 12Gbps 512n 2.5-inch hot swappable hard disk	2TB*2
Network card	Intel Ethernet I350 QP 1Gb network sub card	1
Video interface	Front: Video, 1 x USB2.0 interface, USB3.0 available, dedicated iDRAC Direct USB Rear: Video, serial port, 2 x USB3.0, dedicated waiting network port	1

1.2 Software Environment

The system runs on VMWare ESXi + Linux VMs.

1.3 Software Installation

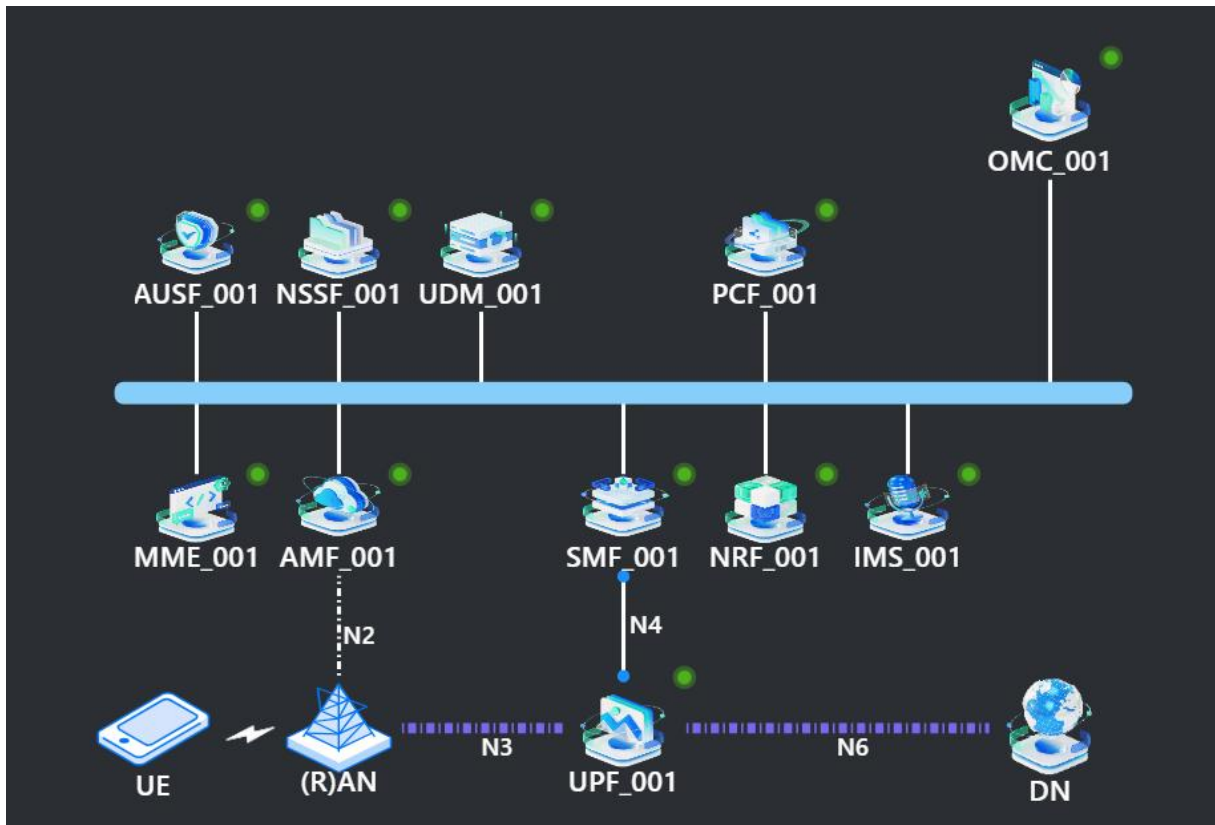
The software is shipped with the hardware and has been installed and tested before the delivery, or you can check the installation guide from OMC User Manual

1.4 Software Uninstallation

You can check the uninstallation guide from OMC User Manual

2 System functions

2.1 Overall architecture of the system core network



The information exchange between network management and 5GC network elements is mainly achieved through the HTTP protocol.

2.2 Function Introduction

1. OMC network management function

Management and maintenance, status monitoring, network element configuration, abnormal alarms, statistical reports, etc.

2. AMF functions

Complete mobility management, NAS MM signalling processing, NAS SM signalling routing, security context management, etc.

3. AUSF functions

Complete the authentication function for user access.

4. UDM functions

Manage and store subscription data and authentication data.

5. SMF functions

Complete session management, UE IP address allocation and management, UPF selection and control, etc

6. UPF functions

Complete the processing of different user planes.

7. PCF functions

Support the development of a unified policy framework and provide policy rules.

8. NRF functions

Support service discovery function, receive NF discovery requests from NF instances, and provide the information of the discovered NF instance to another NF instance for policy rules.

9. NSSF functions

Support network slicing selection function.

10. IMS functions

Support multimedia functional requirements.

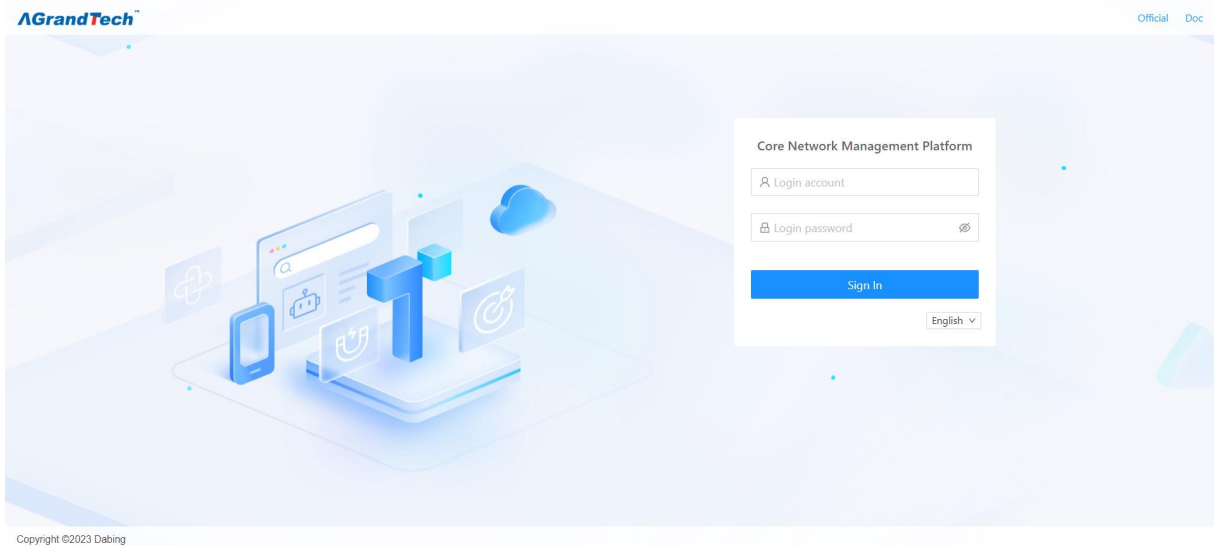
11. MME functions

It is the network element of the EPC core network control plane, responsible for the signalling processing part.

3 Operation Guide

3.1 Login to OMC

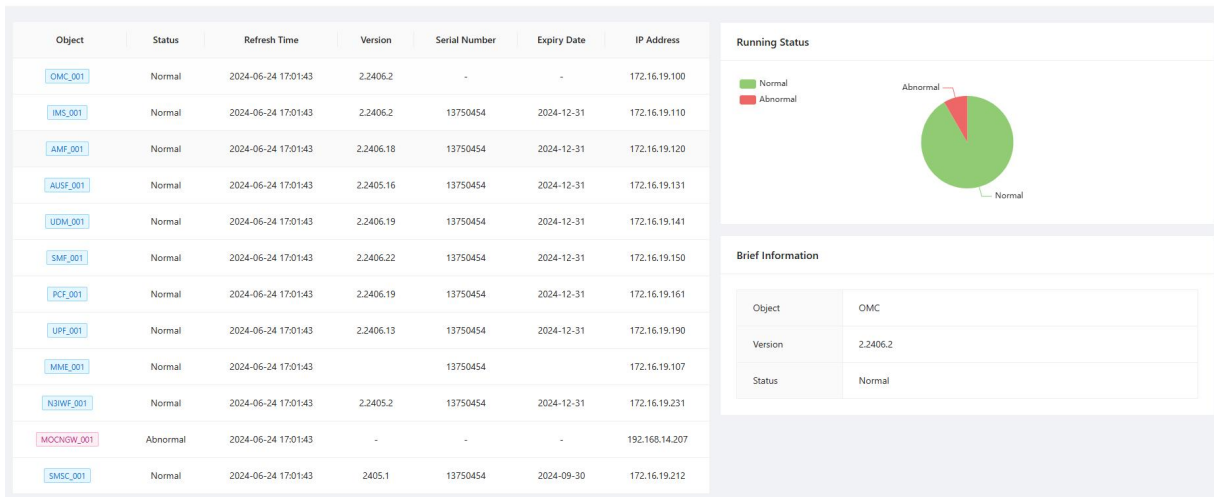
In the browser address bar, enter “http://<OMC Network Management IP>”to access the web management interface. The login interface is shown in the following figure. It is recommended to use Google, Firefox, or Microsoft Edge for browsing.



3.2 System Status:

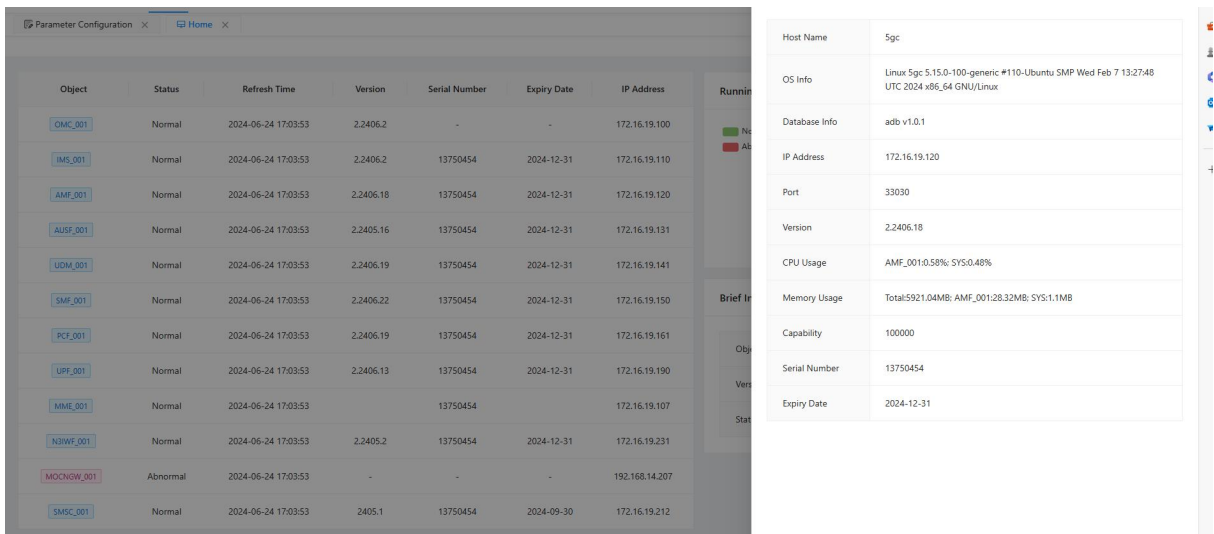
3.2.1 Network Element Status:

- After logging into the interface, the system status of all network elements will be automatically displayed, including element name and ID, running status, update time, version, license serial number and IP address:



- After clicking on the network element in the home page, the detailed information of the network element can be viewed on the right side of the window, such as CPU, memory usage, validity period, operating system, database, IP, port and user capacity etc.

The network element status display will refresh every 10 seconds:



3.3 Monitor

This section introduces the monitoring mechanism of OMC, including dashboards, alarm monitoring, topology, and tracking.

3.3.1 Dashboard

The dashboard is a key tool for monitoring and managing the core network. It provides real-time data and statistics on user information, base station online information, user activities, user plane throughput, network topology, traffic information, alarm statistics, and resource status of each network element to help administrators with network operation and troubleshooting. The main modules and functions are as follows:

User Information: This module is used to count the number of users, IMS sessions, Data sessions. The user count statistics are for the core network UDM's contracted users. Clicking on it will take you to the UDM's contracted user interface where you can view specific user information. IMS session count is used to count the number of users registered on IMS. Clicking on it will take you to the IMS online user interface where you can view specific IMS registered user information. Data session count is the total number of user sessions. Clicking on it will take you to UE online information where you can view specific session information.

Online Information: This module shows statistics on the number of online 4/5G base stations and 4/5G online users. Clicking on it will take you to the base station information interface where you can view specific online base station and user information.

User Activity: This module mainly counts the CDR information of users and displays specific user activity information.

UPF Throughput: This module mainly counts the real-time uplink and downlink throughput in the UPF, i.e., the user's real-time speed.

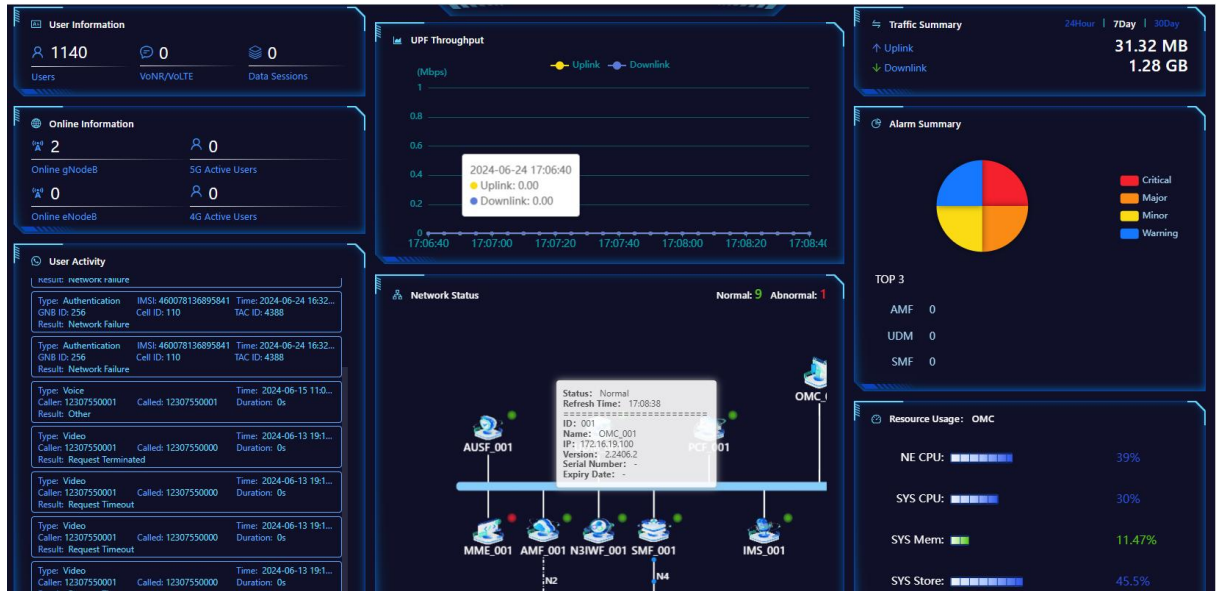
Network Status: This module mainly displays the structure and composition of the core network, status information of each network element in the core network. Clicking on an element will show specific information such as the element's status, name, IP, version number, serial number, license expiration date, etc. Clicking on the network topology will take you to a separate network topology interface.

Traffic Summary: It calculates the total uplink and downlink traffic in the user plane of the network, providing information on total traffic over 24 hours/7 days/30 days.

Alarm Summary: This module mainly counts the total number of historical alarms and active alarms in the network. It categorizes alarms into severe, major, minor, warning, and event levels, displaying the top 3 elements with the highest alarm counts.

Resource Usage: It shows the resource utilization of each network element, including CPU utilization, system CPU utilization, system memory utilization, system storage utilization, etc.

The OMC dashboard integrates various monitoring data and analysis functions to help administrators understand the network status in real-time, quickly identify issues, optimize network resource allocation, thereby improving network performance and user experience.







3.3.2 Alarms

If there is a fault in the system or network element, OMC will immediately detect and report an alarm, generate corresponding level alarms based on the severity of the fault, and use different colours (customizable) and sounds to remind. After the fault is eliminated, the corresponding alarm will also be automatically cleared in the historical alarm.

Alarm management enables O&M personnel to monitor and manage alarms or events reported by the system or NE. Alarm management provides various monitoring and handling rules and notifies O&M personnel of faults. In this way, network faults can be efficiently monitored, quickly located, and handled, ensuring proper service running. The alarm severity indicates the severity, importance, and urgency of a fault. It helps O&M personnel quickly identify the importance of an alarm, take corresponding handling policies, and change the severity of an alarm as required.

Alarm severity

Alarm Severity	Default Color	Description	Handling Policy
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Critical		<p>Services are affected.</p> <p>Corrective measures must be taken immediately.</p>	<p>The fault must be rectified immediately.</p> <p>Otherwise, services may be interrupted or the system may break down.</p>
Major		<p>Services are affected. If the fault is not rectified in a timely manner, serious consequences may occur.</p>	<p>Major alarms need to be handled in time.</p> <p>Otherwise, important services will be affected.</p>
Minor		<p>The impact on services is minor.</p> <p>Corrective measures are required to prevent serious faults.</p>	<p>You need to find out the cause of the alarm and rectify the fault.</p>
Warning		<p>Potential or imminent fault that affects services is detected, but services are not affected.</p>	<p>Handle alarms based on the operational status of the network and network elements.</p>

Alarm status:

Status Name	Status	Description
Alarm Status	Confirm and Not Confirm	<p>The initial alarm status is Not Confirm. A user who views a not confirm alarm and plans to handle it can confirm the alarm. When an alarm is confirmed, its status changes to Confirm. An confirmed alarm can be set to not confirm when the alarm is not handled temporarily but requires attention or other users will handle it. When an alarm is not confirmed, its status is restored to Not Confirm. Users can also configure auto confirm rules to automatically confirm alarms.</p>
Clear Status	Manually Cleared and Automatically Cleared	<p>If the admin clear the alarm manually in the active alarm, it will display as Manually Cleared. If there's a clear alarm reported by the NE, it will display as Automatically Cleared in the historical alarm.</p>

Event Alarm Types

Name	Description
Communication Alarm	<p>A fault on the communication system, such as a network cable disconnection or network equipment fault.</p>
Equipment Alarm	<p>A fault on the equipment</p>
Processing Failure Alarm	<p>An error or exception that occurs during processing, for example, the database is abnormal or the NE exits abnormally.</p>

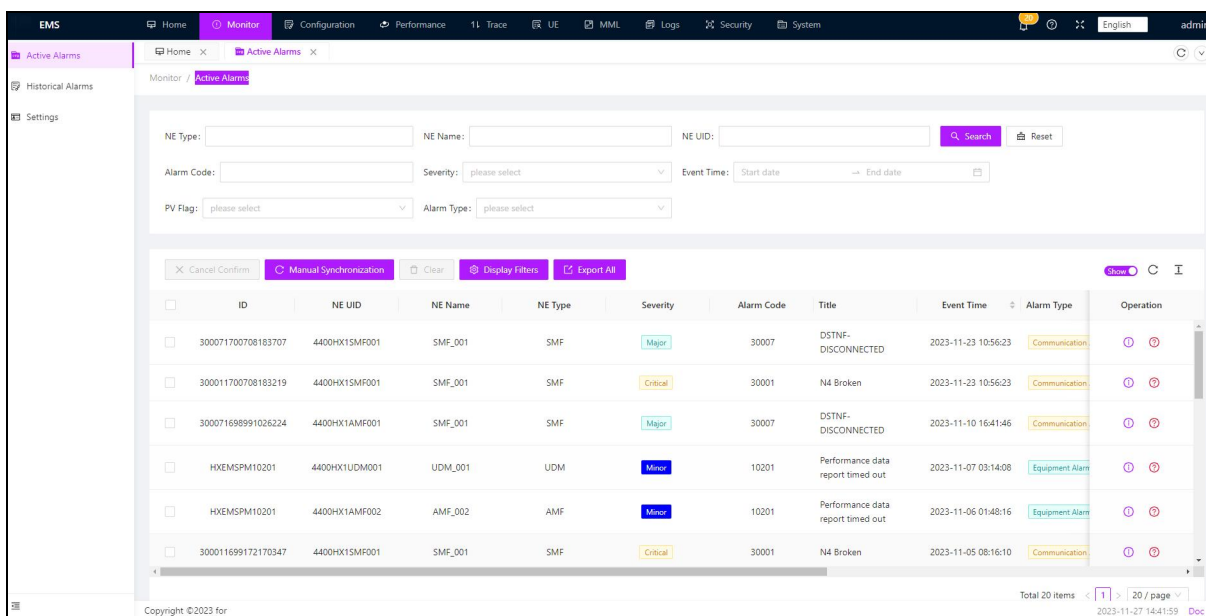
Environmental Alarm	A fault on the environment of the equipment room, such as a power supply fault or overheated CPU.
Quality of Service Alarm	It usually refers to the alarm of abnormal conditions that occur when the quality of service in the core network is monitored and managed.

3.3.2.1. Active Alarms

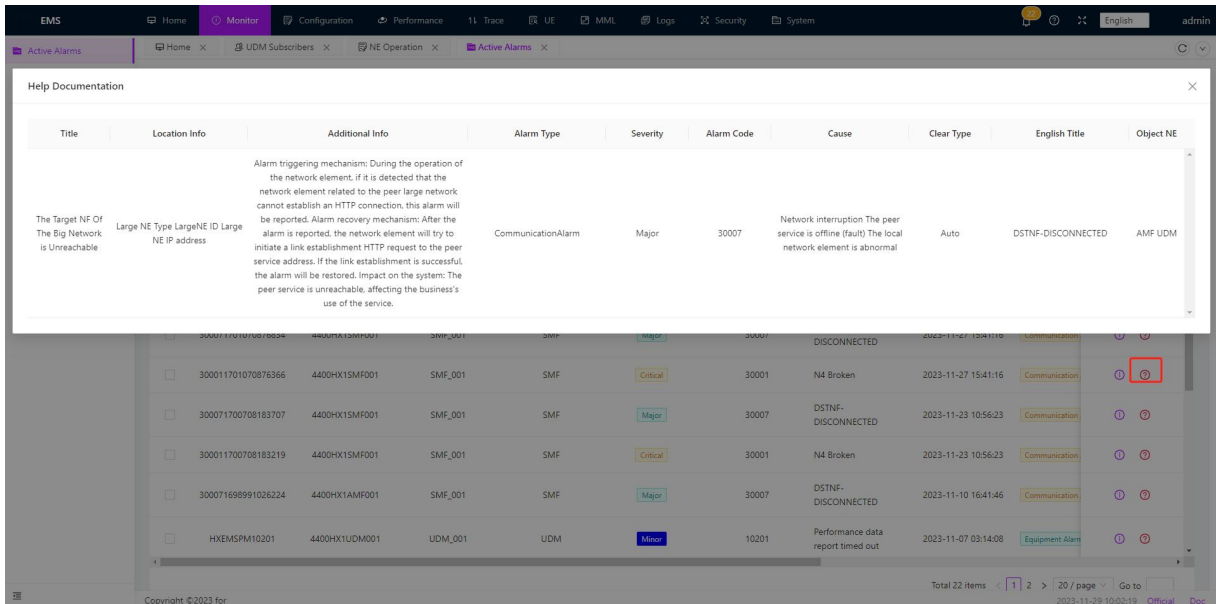
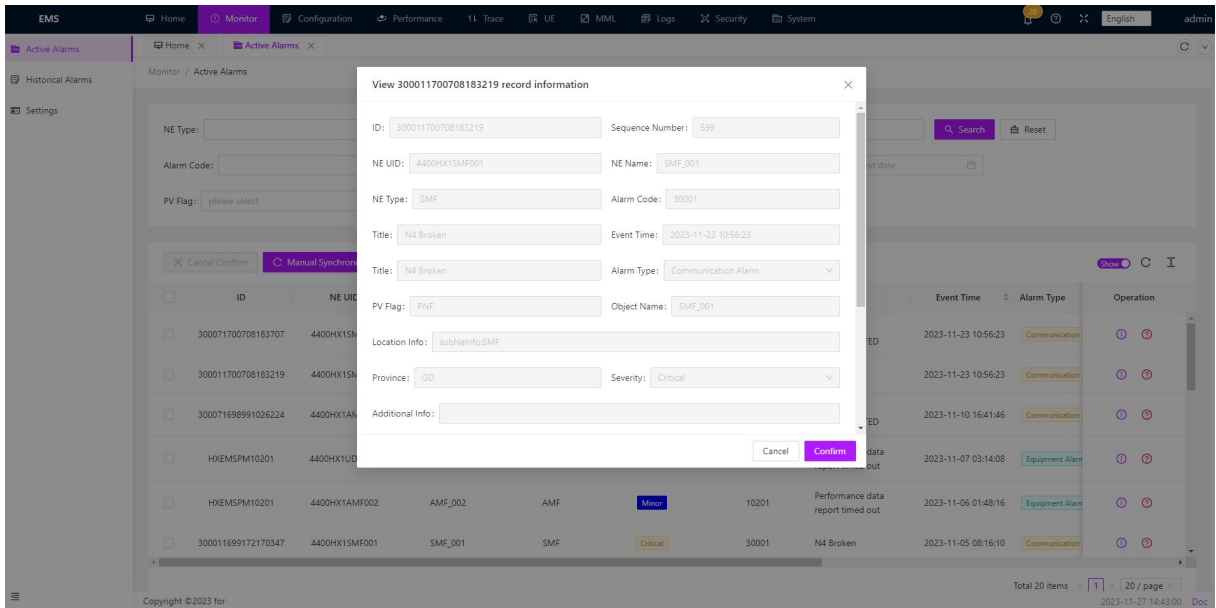
When monitoring current alarms, you can identify faults in time, operate accordingly, and notify O&M personnel of these faults.

The operator can perform alarm search, filtering, automatic confirmation, export functions, and view detailed alarm information.

Current active alarm list:

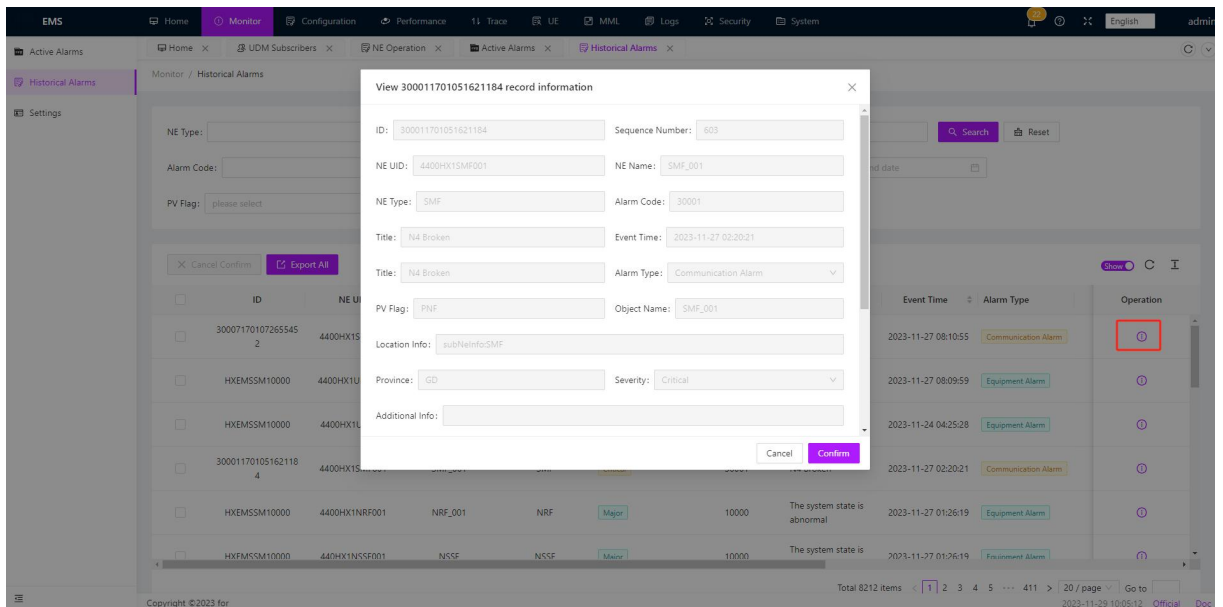
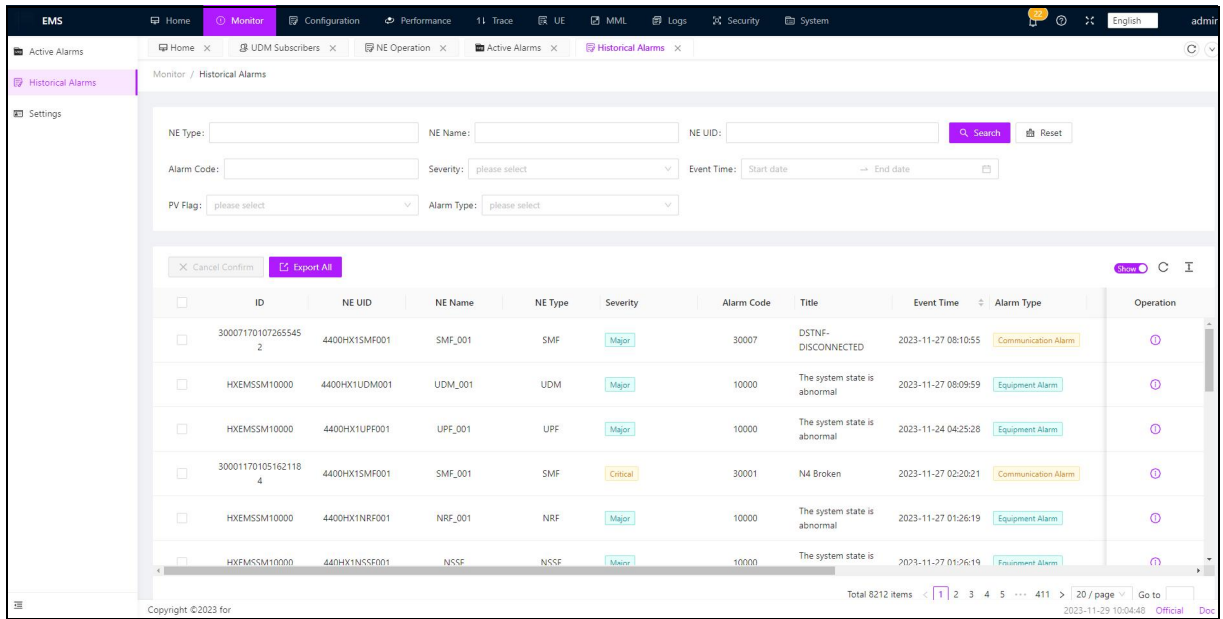


Synchronously display the current number of active alarms in the upper right corner of the window; on the right side of each alarm, there is a detailed alarm information and relevant help documents for alarms.



3.3.2.2. Historical Alarms

Confirm and Cleared alarms are historical alarms, Not Confirm and Cleared alarms are historical alarms also. You can analyze historical alarms to optimize system performance.



3.3.2.3. Event Notification

All NE service startup events will be saved in the event notification.

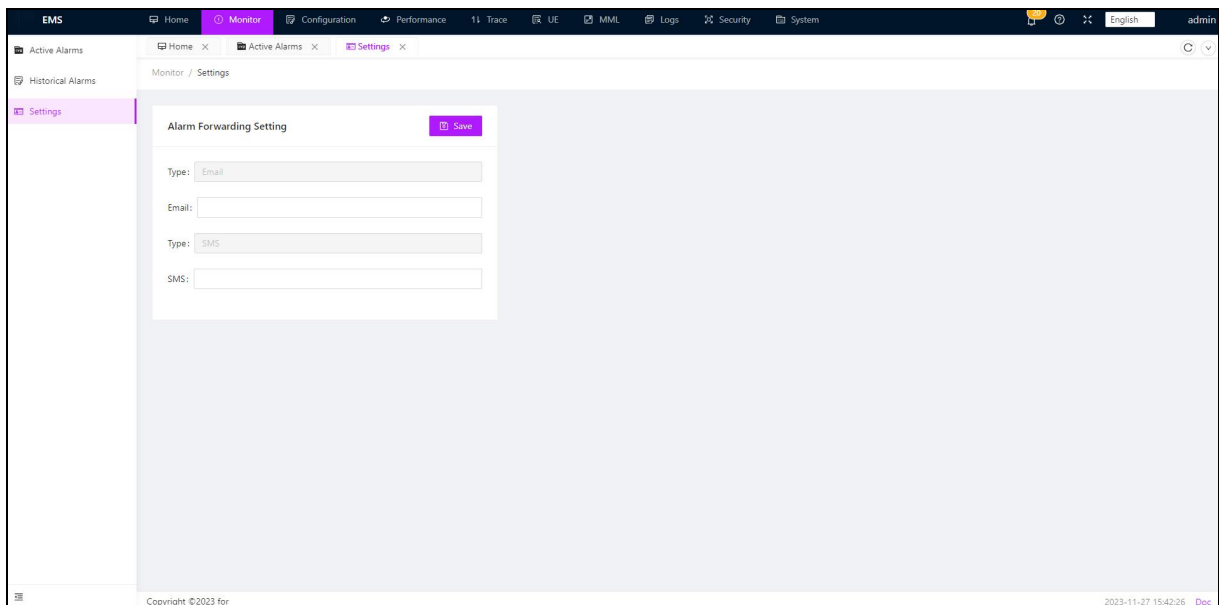
3.3.2.4 Settings

Alarm Forwarding is a technology and mechanism used to monitor and manage the core network. Core network equipment and systems need to maintain normal operation at all times to provide stable and efficient services. However, due to various reasons, such as equipment failure, network congestion, configuration errors, etc., the core network may experience abnormal conditions or failures.

The purpose of alarm forwarding on the core network is to discover and handle faults or exceptions on the core network in a timely manner to ensure network reliability and service continuity. When a device or system in the core network is faulty or abnormal, the device or system generates an alarm. Through the monitoring and detection of the alarm system, the alarm information can be automatically forwarded to the network operator or the technical personnel with network maintenance responsibilities, so that they can take measures to rectify the fault in time

Alarm forwarding on the core network is a key technology. By forwarding alarm information on the core network in a timely manner, the fault detection and handling efficiency can be improved to ensure the stable operation and service quality of the core network. It is essential for the normal operation of network operators and the good experience of users.

The operator can configure the alarm forwarding interface settings to redirect to the target email before setting an alarm, which can be multiple target email addresses at the same time. As shown in the figure, fill in the email address for the alarm forwarding email.



3.3.3 Topology

The OMC topology is a key tool for showing the core network structure and networking methods. It includes two parts: topology information and network element

topology networking, aiming to provide a comprehensive understanding of the network structure and element status.

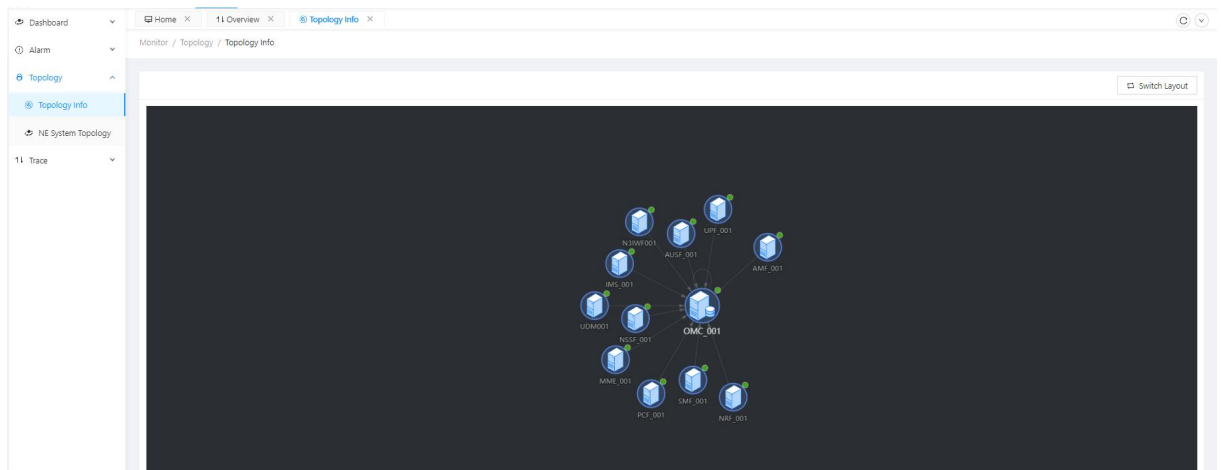
3.3.3.1 Topology Info

The topology information section mainly functions as follows:

Displays all network elements connected to the OMC, including base stations, core network devices, etc.

The status of the network elements is indicated by lights, with green indicating normal and red indicating abnormal.

Clicking on each network element allows you to view detailed information such as the element's status, IP address, element name, version, serial number, and license expiration date.



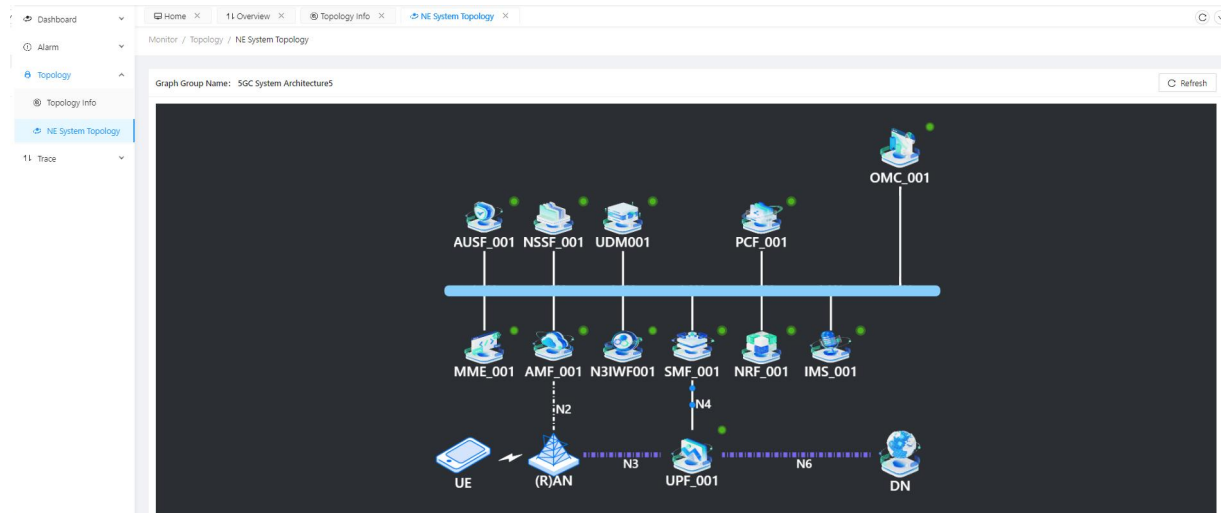
3.3.3.2 NE Topology

The network element topology networking section mainly functions as follows:

Displays the networking methods and connection relationships from user equipment (UE) to base stations and then to the core network.

Similarly, the status of the network elements is indicated by lights, with green indicating normal and red indicating abnormal.

Clicking on each network element allows you to view detailed information, including status, IP address, name, version, serial number, and license expiration date.



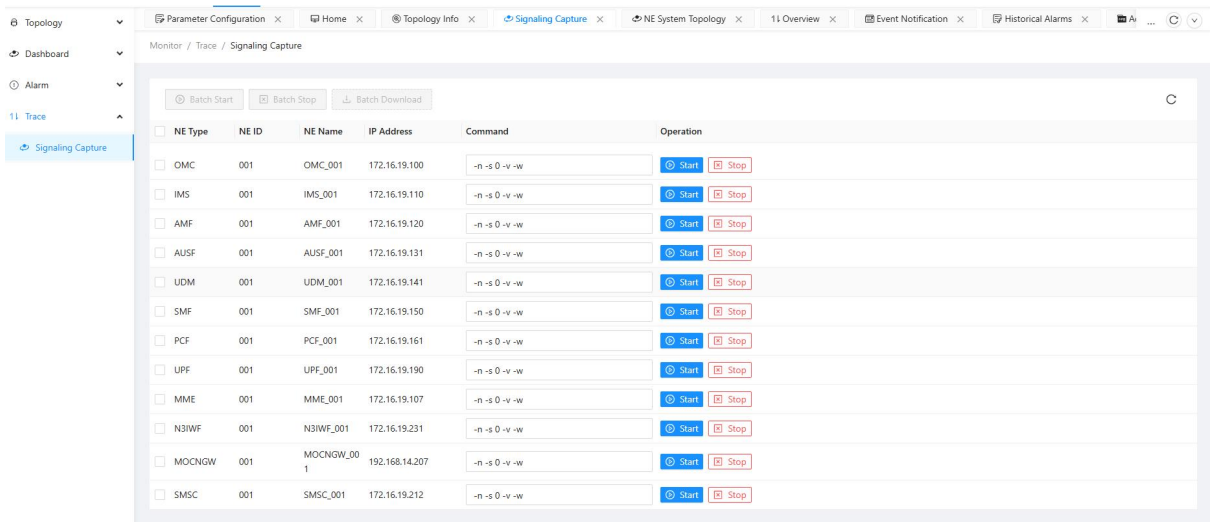
3.3.4 Trace

Trace management refers to the management method of monitoring and analysing key business processes and signalling in the core network. It realizes real-time monitoring and troubleshooting of core network by establishing tracking task, analysing signalling and capturing signalling. In trace management, **currently trace tasks related to user data management (UDM) can only be established**, including interface trace, device trace, and user trace.

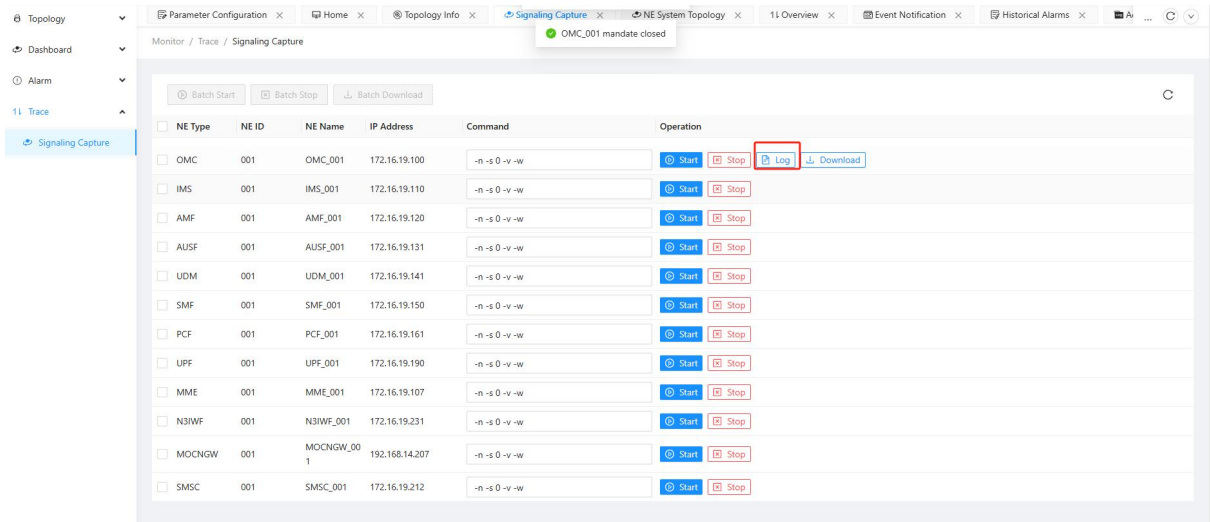
3.3.4.1 Signaling Capture

Signaling capture: Signaling capture refers to capturing and recording specific signaling traffic in the core network for subsequent analysis and debugging. Through signaling capture, the operator can conduct detailed inspection and analysis of the relevant signaling when there is a problem, help locate the cause of the fault, and formulate targeted solutions. At present, signaling capture of each NE can be realized.

On the signaling capture screen, select the NE for which the signaling is to be captured, enter or choose capture command, and click “Start”. You can click “Stop” to stop capturing and download the pcap file.



After the packet capture is completed, you can view the packet capture result via “Log”, the name of the packet capture, and the number of captured packets.



3.4 Configuration

This document describes common configuration operations and how to view NE configuration information. This includes NE management, Parameter management, Backup management, Software management and License management.

3.4.1 NE Management

Network Element Management (NEM) is a key part of the core network management system. It's responsible for monitoring and controlling various network elements like AMF, SMF, UDM, PCF, AUSF, UPF, IMS, MME, NRF, NSSF, etc. Through NEM, operators

can ensure the continuous and reliable operation of the network. NEM covers the entire lifecycle of network elements, including configuration, monitoring, maintenance, and optimization.

- Adding, deleting, and modifying network elements: The management system provides an intuitive user interface for operators to add new elements to expand the network or remove old elements when necessary. Users can use a graphical interface to architect the network through drag-and-drop components or use automation scripts for batch operations.
- Stopping, starting, and restarting operations: The OSS provides control to stop, start, and restart network devices. These operations are usually used for routine maintenance or applying new configurations. The management system includes security protocols and processes to ensure smooth operations and avoid unnecessary network interruptions.
- Importing and exporting network element configurations: Network administrators can export critical configuration files for backup and quickly recover in case of data loss or failure. Similarly, new configuration files can be imported into network elements for quick updates and deployment of new network settings. Import and export operations usually support standardized formats like XML or JSON for cross-platform configuration management.
- Modifying network element details: From internal identifiers, resource identifiers to vendor and location information, the management system makes it easy to modify and update these details. Changing the orientation, IP, ports, etc. can be done directly through the UI or through API for automation. It can also involve parameter adjustments to optimize network performance and capacity.


Administrators also need to pay attention to changes in information like network element names, physical addresses, and network identifiers to ensure the network map remains up to date. They can also set logical classifications like service provinces for network elements to achieve more detailed network management.

Additionally, with the development of Network Function Virtualization (NFV), the management system can differentiate between Physical Network Functions (PNF) and Virtual Network Functions (VNF) and manage them separately. This provides additional

flexibility for network operations as VNFs can be rapidly deployed and scaled to adapt to changing traffic demands.

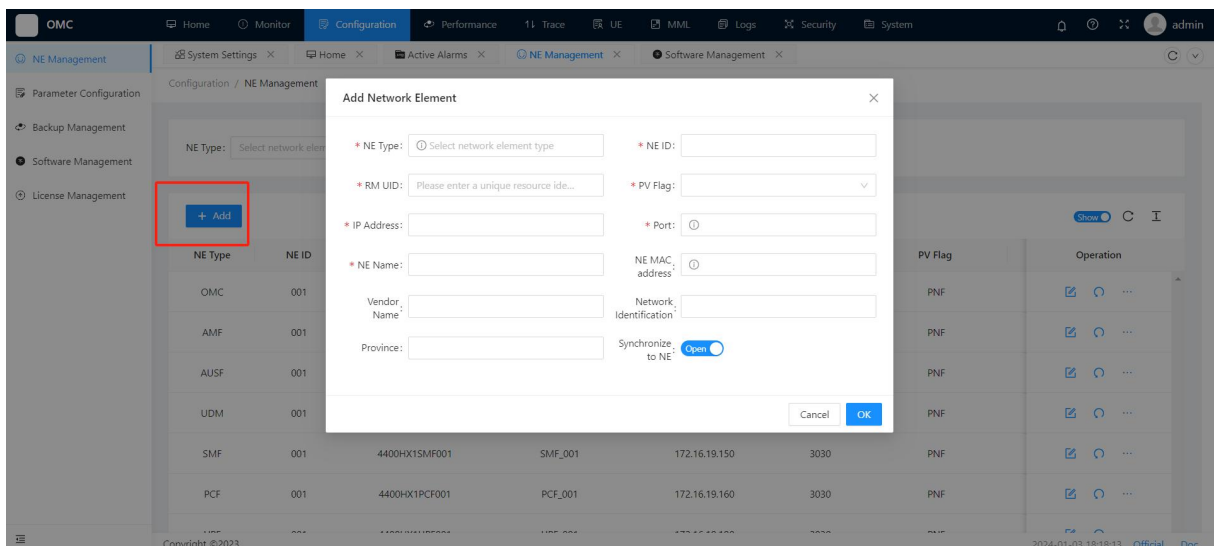
In summary, Network Element Management is an essential part of 5G core network management, ensuring that network infrastructure operates according to predetermined performance and efficiency standards.

The operation part is as follows:

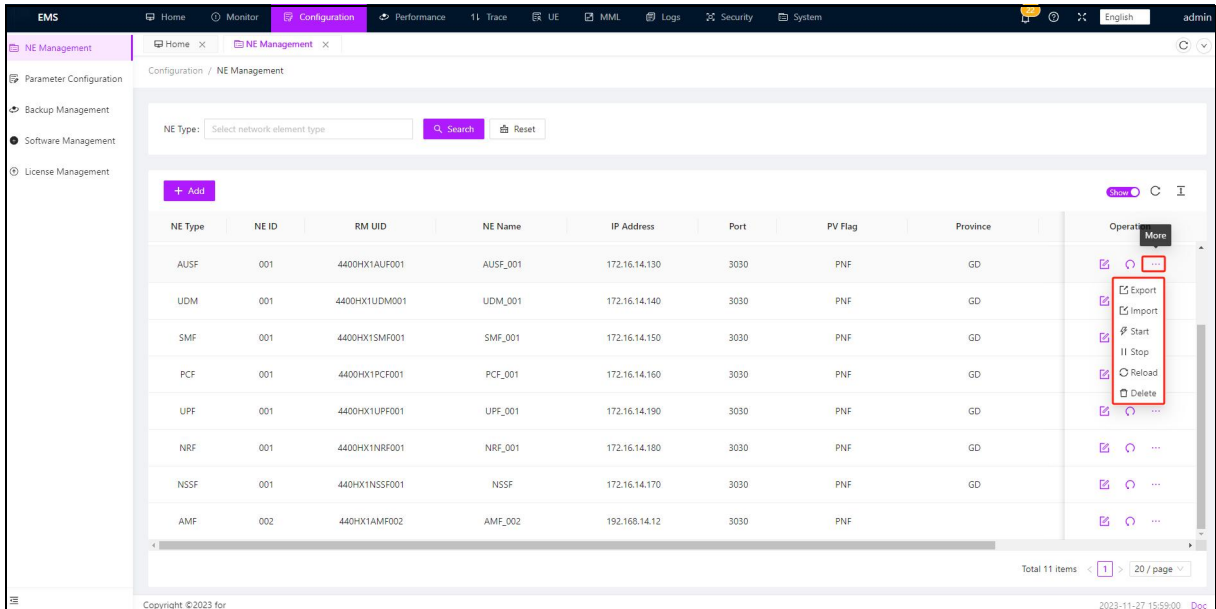
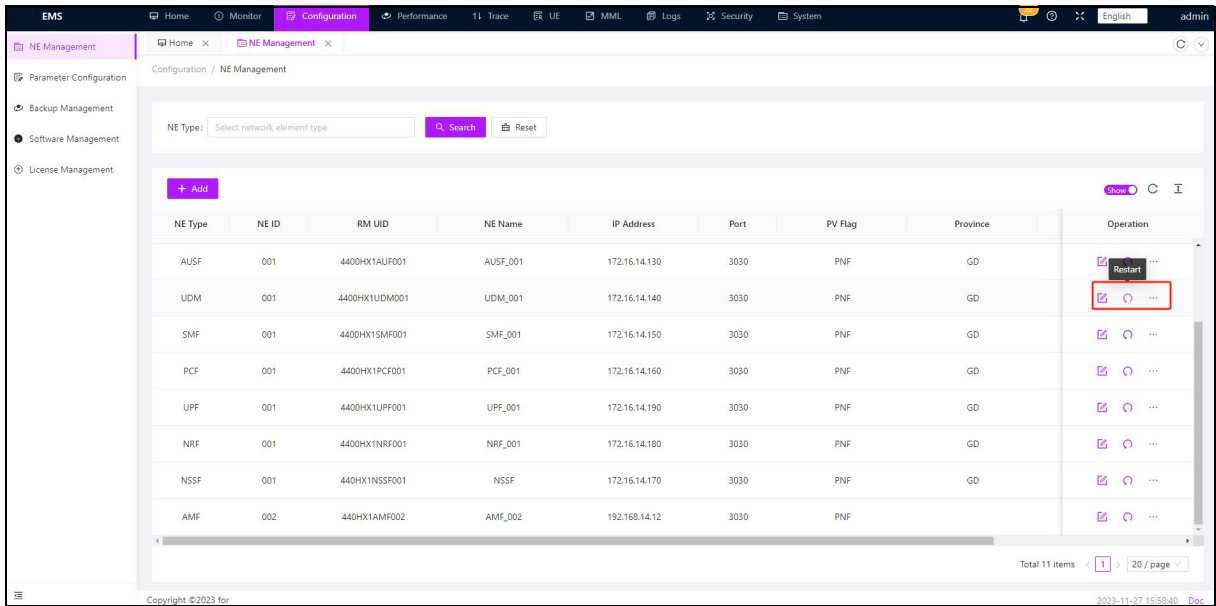
Click on  to add the NE. The following parameters need to be consistent with the network element configuration:

- NE Type
- NE ID
- RM UID
- PV Flag
- Port (Generally set to 3030)
- IP Address
- NE Name

The above is a required field when adding a new network element



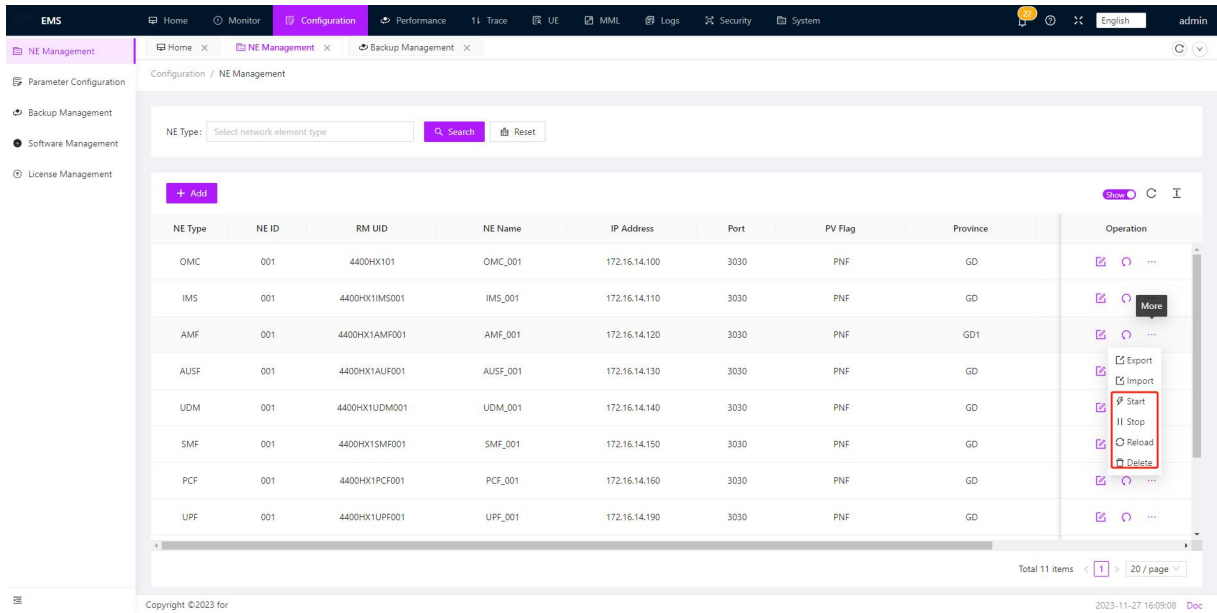
The right side of each network element is configured with functions for restarting, starting, stopping, reloading, deleting, as well as importing and exporting network element configurations.




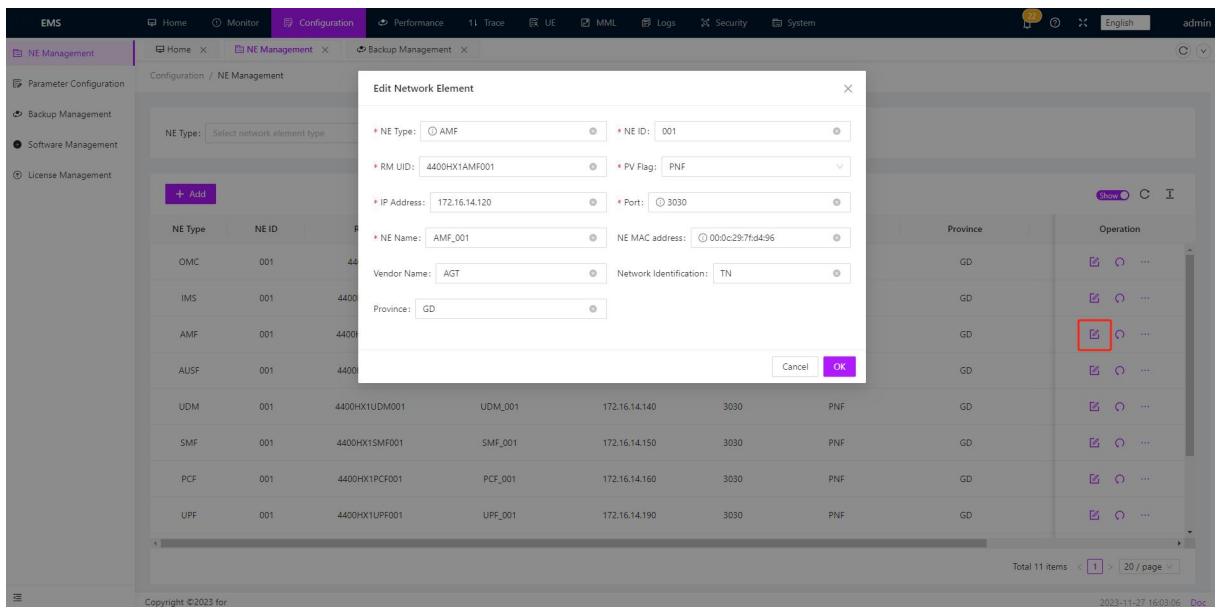
Export: After exporting the network element configuration, it can be queried in the backup management.

Import: Click **“Import”** to import the configuration of the network element. Select Server File to import the previous backup files on the server. Select Local File to import the local files.

The operator can click **“Start”** in **“More”** to start running the network element, click **“Stop”** to stop running the network element, click **“Reload”** to reset the network element parameters, and click **“Delete”** to delete the network element.



On the right side of the network element, you can click the modify icon  to modify the network element



3.4.2 Parameter Configuration.

Parameter configuration is a key link in optimizing 5G core network performance and services.

1. Function overview: Parameter configuration allows network administrators to finely adjust the operating parameters of each network element in the core network. it involves

to all aspects of the network, from data transmission rates to signal processing strategies, from security protocols to access control lists

(ACLs). The flexibility and atomicity of parameter configuration are key indicators to measure the maturity of the 5G network management operating system.

2. Add, delete, and modify network element parameters: In network operations, it is sometimes necessary to introduce new parameters to support new technologies.

or service policy; sometimes it is necessary to delete old parameters to optimize network performance or comply with new specifications; sometimes it is necessary to modify

Modify existing parameters to adapt to changes in network quality or customer needs. These operations are performed in the network management system of the 5G core network

This can be done manually via a graphical user interface (GUI) or automatically via a command line interface (CLI) or API.

Animation. Parameter changes are often triggered by real-time monitoring of network status, which requires a high degree of real-time performance in the network management system.

and sensitivity.

3. The configuration takes effect quickly: In traditional network systems, parameter changes often require restarting the network element before the configuration can take effect.

effect. This is no longer necessary in a 5G environment. Modern network management systems can implement hot changes, allowing parameter configuration changes to

Can take effect immediately without restarting. This immediate function is essential to maintain the highest timeliness of the network.

is important and ensures that service will not be interrupted due to configuration changes.

4. Parameter configuration challenges and automation: In the highly complex 5G core network, manual parameter adjustment may no longer be possible. Reality therefore relies more on intelligent tools and automated strategies. Predefined

strategies and machine learning models can be based on Realize automatic tuning based on real-time data flow and network performance indicators. Automated parameter configuration not only improves efficiency, but also improves accuracy and reduces network failures that may be caused by configuration errors. At the same time, the automation strategy must include relevant. Appropriate security mechanisms to prevent misconfiguration and network attacks.

5. Parameter audit and compliance: In order to ensure that the network complies with prescribed policies and standards, parameter configuration is an important method.

The focus is on auditing and compliance checks. Network management systems usually include audit logs and compliance reporting functions to ensure that all configuration

Configuration changes are logged and can be traced. These records are critical when troubleshooting network issues or performing security audits.

Parameter configuration This function corresponds to the configuration parameters of each network element. This function determines the operation quality and performance of the 5G core network.

Efficiency is the key to network health and functionality.

The following is an example of common network element configuration modifications. When modifications are required, place the mouse on the modification where the modification mark appears.

On the value, click to modify it, or a modification mark will appear on the right side of some places, click to modify it. Select the corresponding network element to obtain configuration information or modify it.

3.4.2.1 AMF

1、System Config: in the System Config of the AMF, the AUSF URI, UDM URI and SMF URI are mainly changed for connecting to the AUSF and UDM and SMF, the Default DNN is changed for connecting to the DNN, and some timers, such as 3512, are modified.

EMS Home Monitor Configuration Performance 1 Trace UE MML Logs Security System

NE Management Parameter Configuration Configuration / Parameter Configuration

Parameter Configuration

Backup Management

Software Management

License Management

Navigation Configuration

AMF / AMF_001

System Config

TNL Association List

GUAMI List

TAI List

Slice List

Key	Value
AMF Name	AMF
AUSF URI	http://172.16.14.130:8080
Ciphering Algorithm	NEA0
Default DNN	cmnet
DNN Correction Enabled	false
Integrity Algorithm	NIA2
LMF URI	http://172.16.14.200:8080
NEF URI	http://172.16.14.210:8080
NRF Enabled	false
NRF URI	http://172.16.14.180:8080
PCF URI	http://172.16.14.160:8080
Relative Capacity	255

Parameter Configuration Configuration / Parameter Configuration

Navigation Configuration

AMF / AMF_001

System Config

TNL Association List

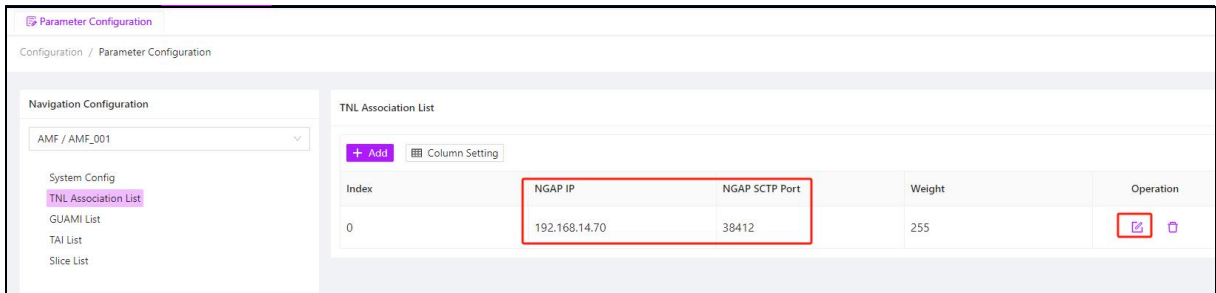
GUAMI List

TAI List

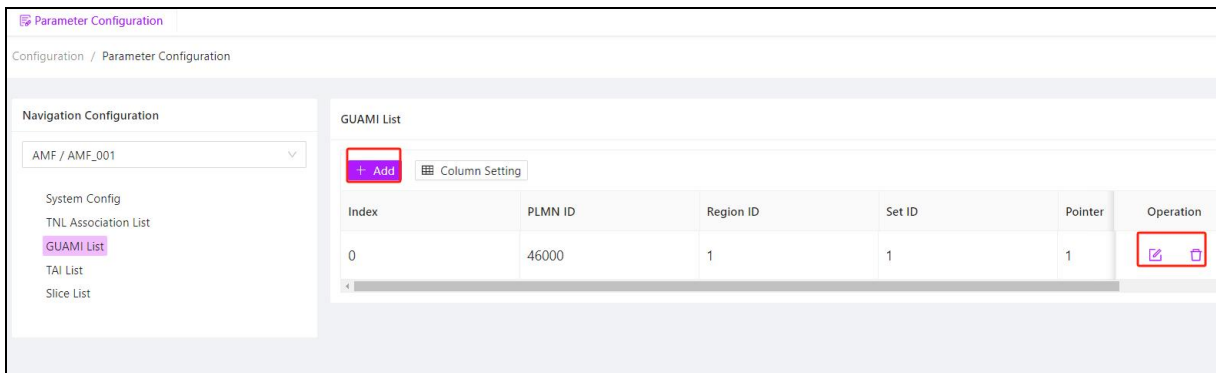
Slice List

SBI Server IP	172.16.14.120
SBI Server Port	8080
SMF URI	http://172.16.14.150:8080
T3502	720
T3512	3300
T3513	2
T3522	2
T3550	2
T3555	2
T3560	2
T3565	2
T3570	2
UDM URI	http://172.16.14.140:8080

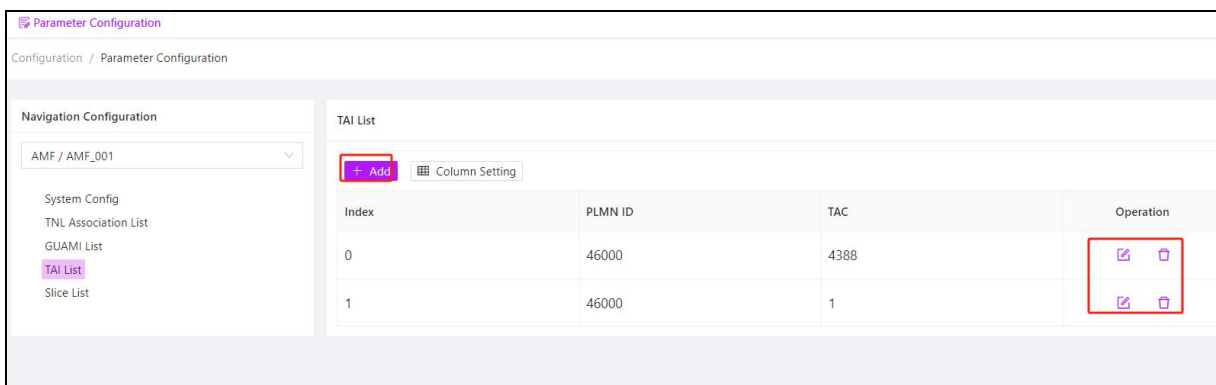
2、TNL Association List: in the TNL Association List, you can modify the N2 IP and NGAP SCTP Port, which are used to interconnect with gNB.



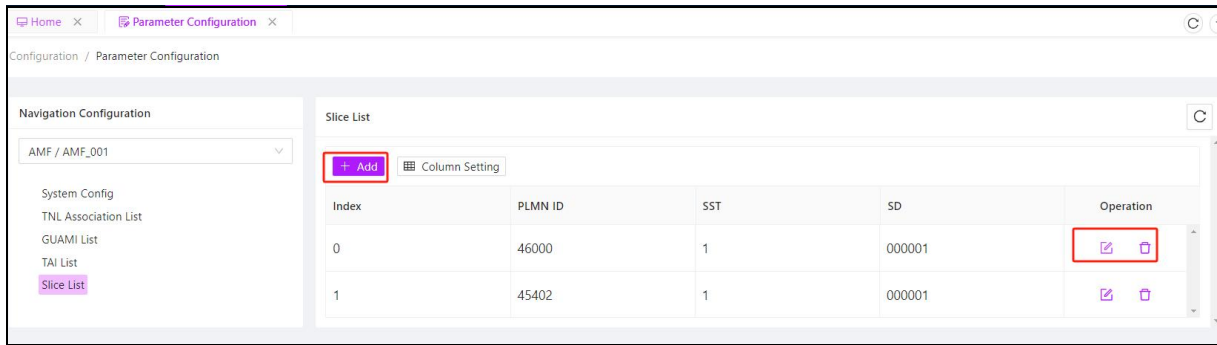
3、 **GUAMI List:** GUAMI List can be modified, added, and deleted. When a user device attempts to access or manage mobility, the network determines the required AMF based on the AMF ID in the GUAMI list and routes the relevant control signaling to the corresponding AMF.



4、 **TAI List:** In the TAI List, you can modify, add, and delete TAC corresponding to PLMN, PLMN and TAC correspond to base stations. If the AMF is incorrectly filled, the connection between the AMF and the base station may be interrupted.

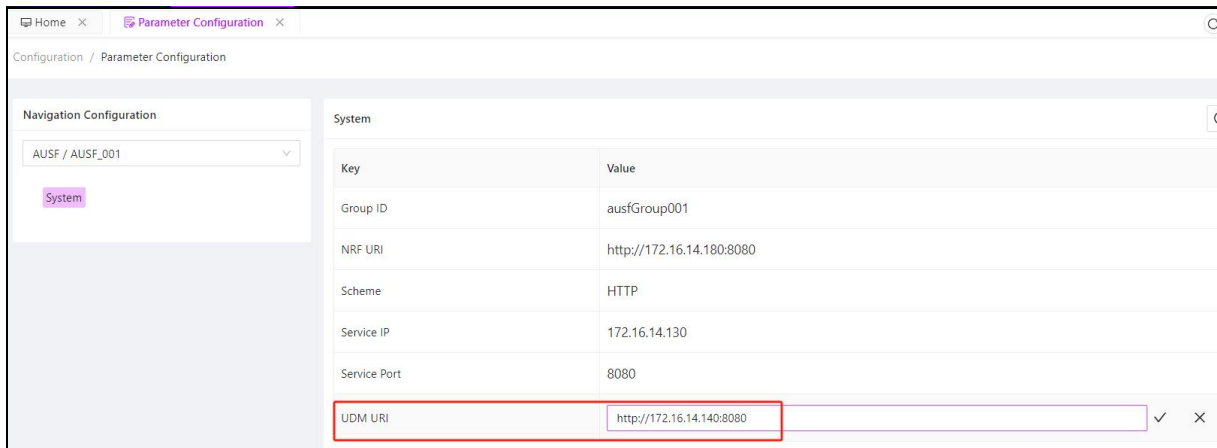


5、 **Slice List:** In the Slice List, you can modify the slice information corresponding to the PLMN, which is the slice that the AMF allows to access



3.4.2.2 AUSF

1、**System:** In the AUSF configuration file, change the UDM URI and configure the UDM IP address for interconnection with the AUSF:



3.4.2.3 UDM

1、**System:** the operator mainly modifies the AUSF IP here

Configuration / Parameter Configuration

Navigation Configuration

UDM / UDM_001

System

Key	Value
AUSF IP	172.16.14.130
Capacity	4096
FQDN	udm.agt.com
GPSI Ranges	msisdn-69072000~msisdn-69072099
Group ID	0
NRF URI	http://172.16.14.180:8080
Priority	1
Scheme	HTTP
Service IP	172.16.14.140
Service Port	8080
SUPI Ranges	imsi-001010100080000~imsi-001010100080099

2、Subs SMF Selection: the operator here mainly refers to the DNN corresponding to the slice information in session management

Configuration / Parameter Configuration

Navigation Configuration

UDM / UDM_001

Subs SMF Selection

+ Add Column Setting

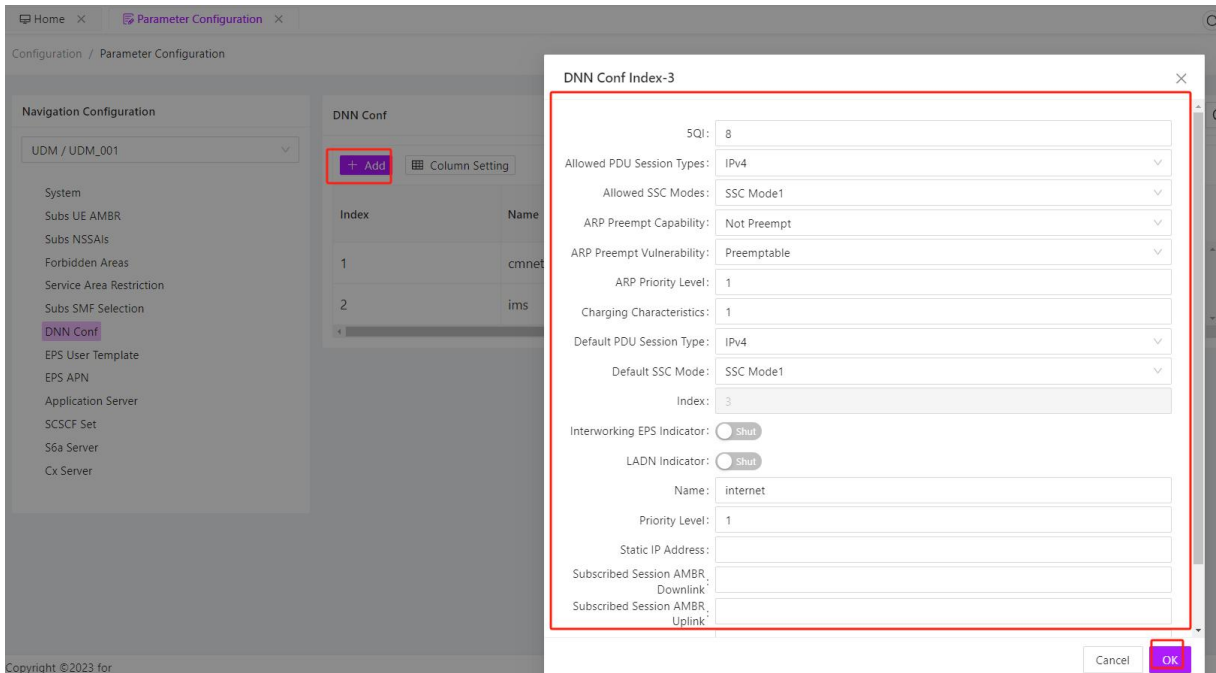
Index	Name	SNSSAI	DNN List	Operation
1	def_snssai	1-000001	cmnet (cmnet,ims)	

+ Add DNN List Column Setting

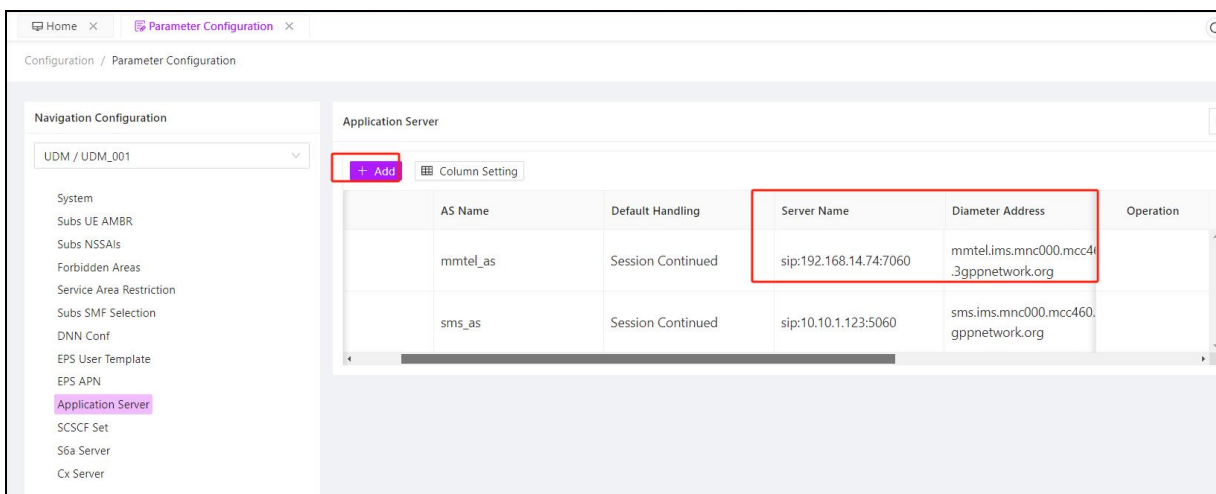
Index	DNN	Default DNN Indicator	LBO Roaming All	Operation
1	cmnet	true	false	
2	ims	true	false	

2	lab_snssai	1-000001	cmnet (internet)	
3	snssai_2	1-000001	cmnet (cmnet,ims)	

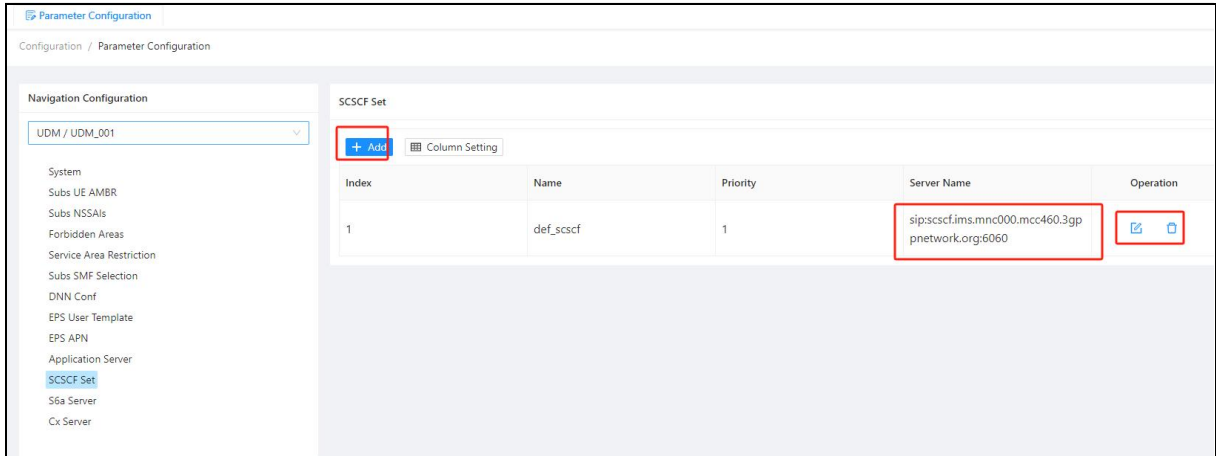
3、DNN Conf: Operators need to add, delete, and modify DNNs connected to UE. They can add different DNNs as required and modify the parameter settings for different DNNs, such as the Default SSC Mode and Subscribed Session AMBR Uplink, and so on.



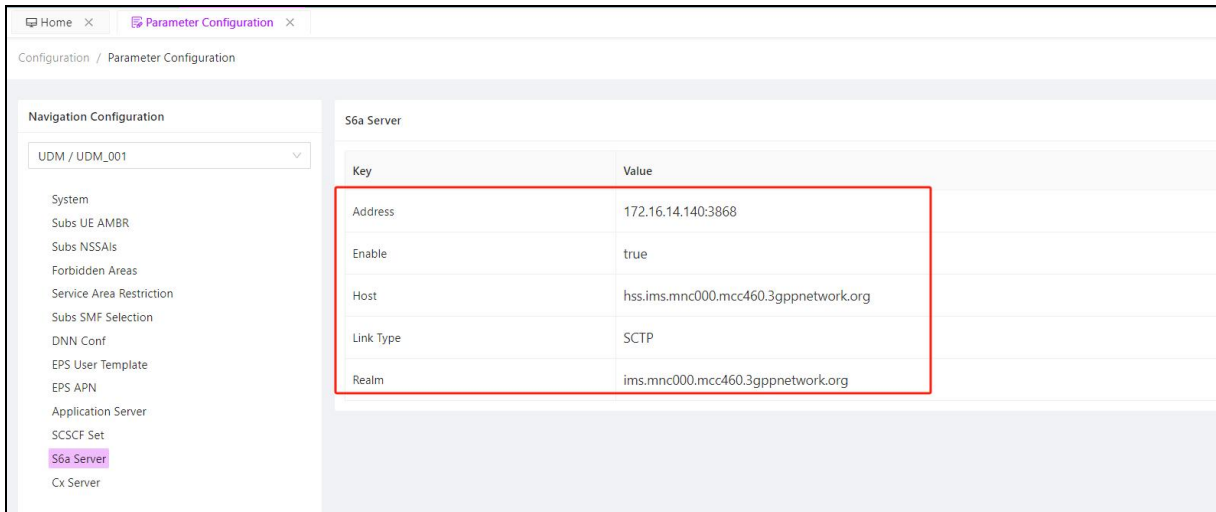
4、 Application Server: the operator's main focus here is to add or modify MMTEL_AS corresponding to IMS data, modify the IP address of sip in Server Name and Diameter Address.



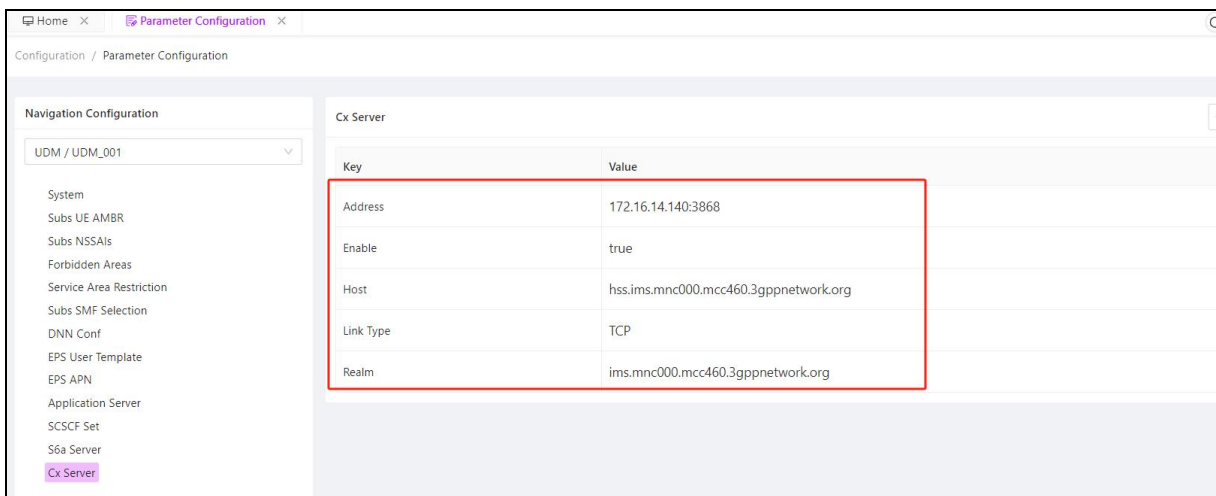
5、 SCSCF Set: the operator's main task here is to modify the SIP data of SCSCF corresponding to IMS.



6、S6a Server: the operator mainly switches on the interface with s6a and modifies host

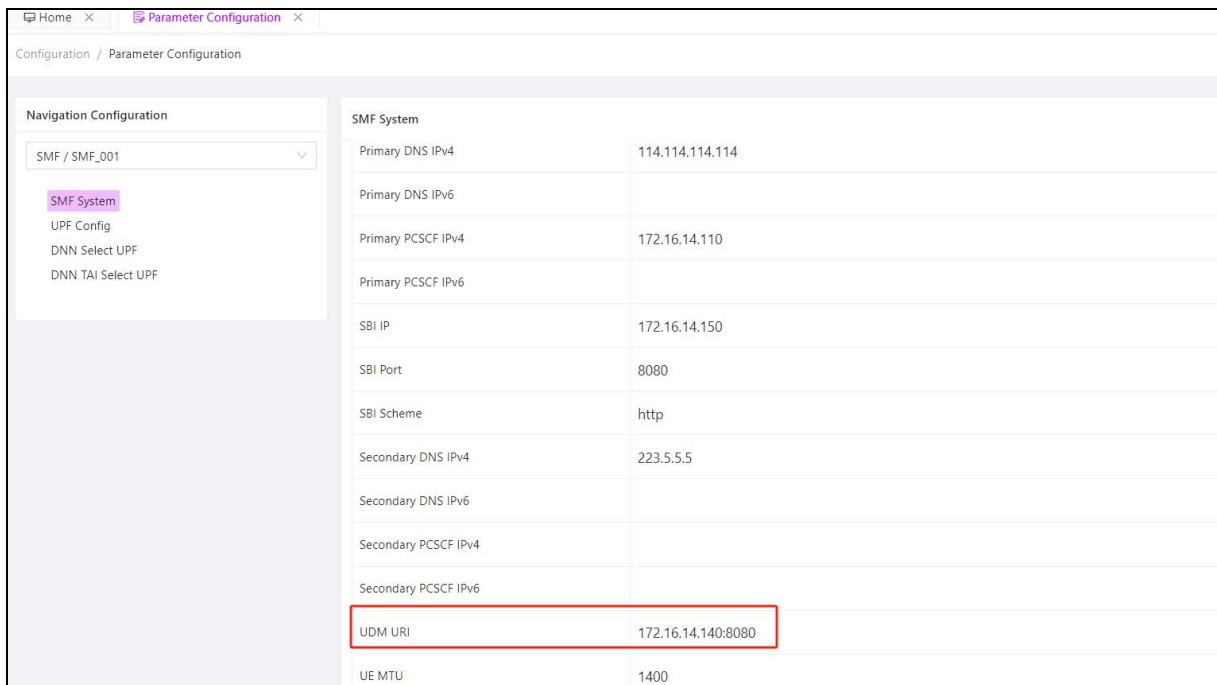
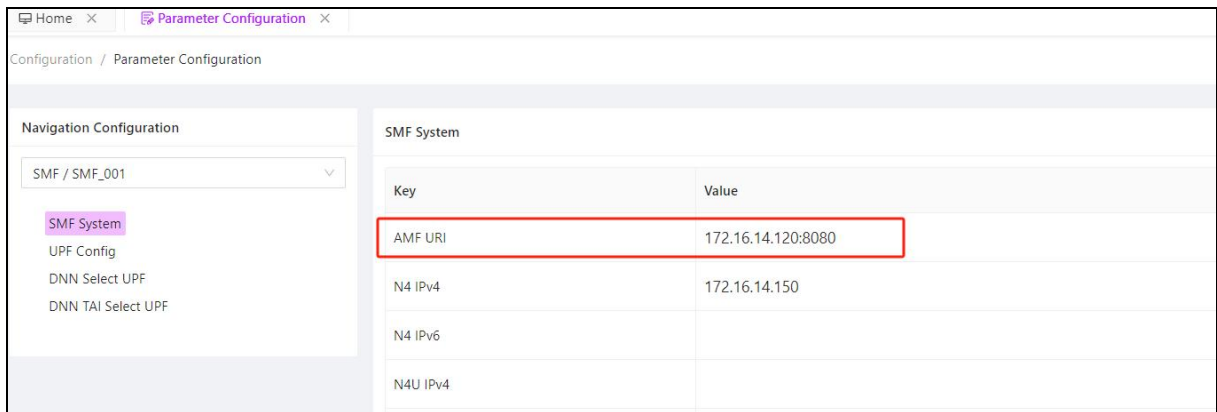


7、Cx Server: the operator mainly switches on the Cx port corresponding to the IMS and changes the corresponding host

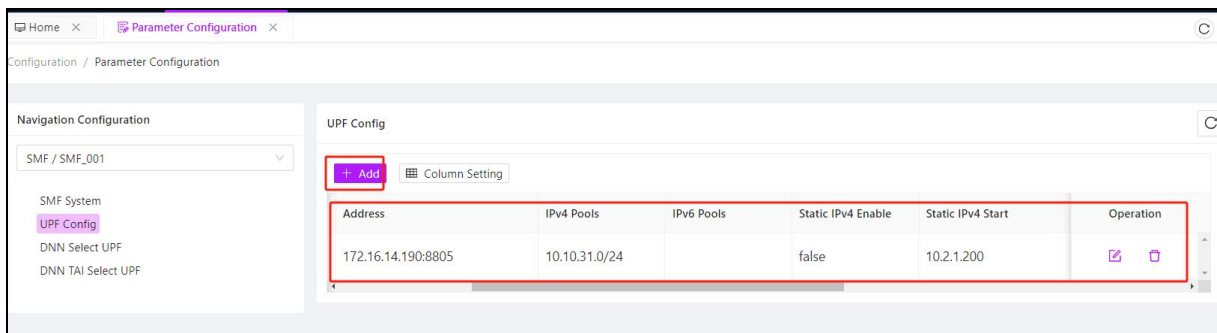


3.4.3.4 SMF

1、SMF System: the operator's main task here is to modify AMF URI and UDM URI



2、UPF Config: the operator can configure the UPF IP corresponding to the SMF in UPF config, set the IP address pool assigned to the UE, and set the static IP address.



3、DNN Select UPF: the operator can configure different DNN to correspond to different

UPF.

Configuration / Parameter Configuration

Navigation Configuration

SMF / SMF_001

- SMF System
- UPF Config
- DNN Select UPF**
- DNN TAI Select UPF

DNN Select UPF

+ Add Column Setting

Index	DNN	UPF ID	Operation
0	cmnet	upf-1	
1	ims	upf-1	

3.4.4.5 PCF

1、 Session Rules: Operators can configure different session rules and modify 5QI and AMBR Downlink parameters of corresponding rules

Configuration / Parameter Configuration

Navigation Configuration

PCF / PCF_001

- System
- Service Area Restriction
- PCC Rules
- Session Rules**
- Gx Server
- Rx Server
- Flow Template
- QoS Template
- Usage Monitoring Template
- Traffic Control Template
- Header Enrich Template

Session Rules

+ Add Column Setting

Rule ID	Activate	5QI	5QI Priority Level	Flow Usage	Operation
internet	true	9	0	General	
ims_sig	true	5	0	IMS-Sig	

2、 Gx Server: The operator can configure Gx Server parameters including Gx switch, host, etc

Configuration / Parameter Configuration

Navigation Configuration

PCF / PCF_001

- System
- Service Area Restriction
- PCC Rules
- Session Rules
- Gx Server**
- Rx Server
- Flow Template
- QoS Template
- Usage Monitoring Template
- Traffic Control Template
- Header Enrich Template

Gx Server

+ Add Column Setting

Key	Value
Address	172.16.14.160:3868
Enable	true
Host	pcrf.epc.mnc000.mcc460.3gppnetwork.org
Link Type	TCP
Realm	epc.mnc000.mcc460.3gppnetwork.org

3、 Rx Server: The operator can configure Rx Server parameters including Rx switch, host,

etc

The screenshot shows the 'Parameter Configuration' page for 'PCF / PCF_001'. The left sidebar lists various configuration categories, with 'Rx Server' highlighted. The main content area displays a table of parameters for the Rx Server.

Key	Value
Address	172.16.14.160:3867
Enable	true
Host	pcrf.epc.mnc000.mcc460.3gppnetwork.org
Link Type	TCP
Realm	epc.mnc000.mcc460.3gppnetwork.org

3.4.4.6 UPF

1、OMC: The operator can set OMC-related parameters, such as the IP address and port of the OMC

The screenshot shows the 'Parameter Configuration' page for 'UPF / UPF_001'. The left sidebar lists various configuration categories, with 'OMC' highlighted. The main content area displays a table of parameters for the OMC.

Key	Value
IP Type	ipv4
KPI Statistic Interval	1
Local IPv4	172.16.14.190
Local IPv6	
Local Server Port	3030
NE Id	upf1
NE Name	upf1
Object Name	upf1
OMC IPv4	172.16.14.100
OMC IPv6	
OMC Port	3030
Province	local

2、Data Interface List: the operator can configure the parameters of N3/N6/N9/N19, including IP, Driver Type, MAC Address, Interface PCI, Gateway IPv4, etc.

Parameter Configuration

Configuration / Parameter Configuration

Navigation Configuration

UPF / UPF_001

- General
- Logger
- PFCP
- OMC
- Telnet
- Redis DB
- Data Forwarder Common
- Data Forwarder Upfd
- Data Interface List**
- Network Control Common
- Network Control DNN List
- Network Control SNSSAI List
- Network Control ACL White List
- Network Control ACL Black List
- Network Control DNS Server List
- DPI Common
- DPI Header Enrich Info List
- DPI APP List

Data Interface List

+ Add Column Setting

Interface Type	Interface ID	Driver Type	IP Type	IPv4 Address List	IPv6 Ac	Operation
N3	1	vmxnet3	ipv4	commence	co	

+ Add IPv4 Address List Column Setting

Index	IPv4	IPv4 Mask	Operation
1	192.168.14.72	255.255.240.0	

N6	1	vmxnet3	ipv4	commence	co	
N9	1		ipv4	commence	co	
N19	1		ipv4	commence	co	

3.4.4.7 MME

1、 **System Config:** The operator mainly configures the IP and ports of S10, S11, S1, SGs, and VolTE switches can be configured

Configuration / Parameter Configuration

Navigation Configuration

MME / MME

- System Config**
- Gummei List
- TAI List
- HSS List
- SGW List
- AMF List

System Config

Key	Value
CSFB Enabled	false
S10 MME IP	172.16.14.201
S10 MME Port	2123
S11 MME IP	172.16.14.200
S11 MME Port	2123
S1 MME IP	192.168.14.75
S1 MME Port	36412
SGs MME IP	172.16.14.200
SGs MME Port	29118
VolTE Enabled	true

2、 **Gummei List:** The operator mainly configures the parameters of GUMMEI List, including PLMN and Group ID.

Parameter Configuration

Configuration / Parameter Configuration



Navigation Configuration

MME / MME

- System Config
- Gummei List
- TAI List
- HSS List
- SGW List
- AMF List

Gummei List

+ Add Column Setting

Index	Plmn Id	Group ID	Code	Operation
0	46000	4	1	 

3、 TAI List: The operator mainly configures the TAC corresponding to the PLMN that can access the core network

Parameter Configuration

Configuration / Parameter Configuration



Navigation Configuration

MME / MME

- System Config
- Gummei List
- TAI List
- HSS List
- SGW List
- AMF List

TAI List

+ Add Column Setting

Index	Plmn Id	TAC	Operation
0	46000	4388	 

4、 HSS List: The main configuration of the operator here is the HSS Hostname interconnecting with the MME

Parameter Configuration

Configuration / Parameter Configuration



Navigation Configuration

MME / MME

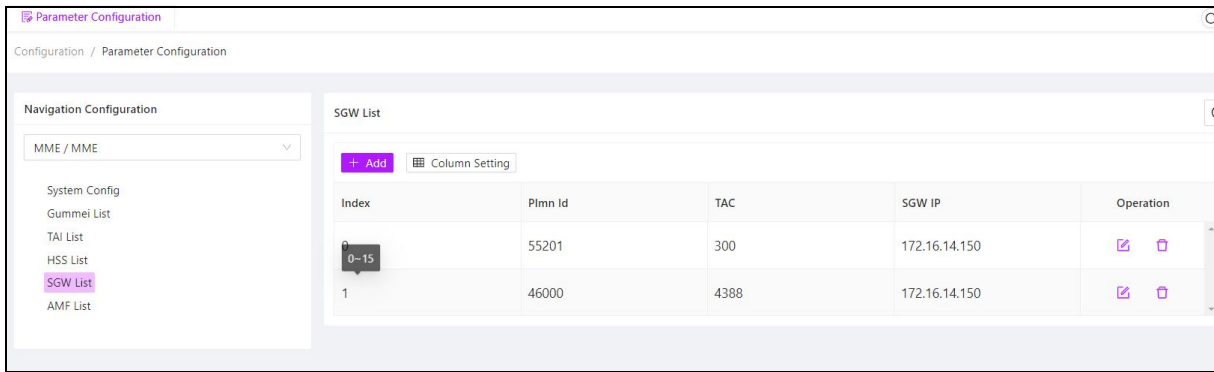
- System Config
- Gummei List
- TAI List
- HSS List
- SGW List
- AMF List

HSS List

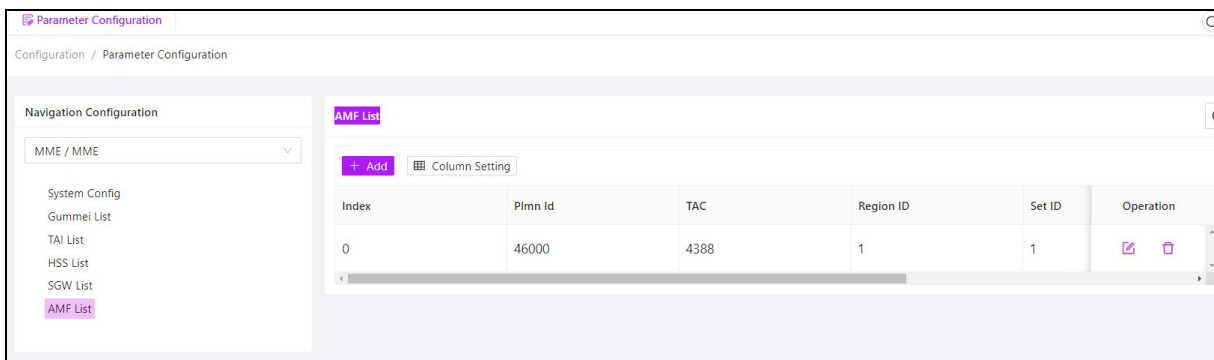
+ Add Column Setting

Index	IMSI Prefix	HSS Hostname	Protocol	HSS Port	Operation
0	46000	hss.ims.mnc000.mcc460.3gppnetwork.org	SCTP	3868	 

5、 SGW List: The operator mainly configures the IP, TAC and plmn of the SGW that interconnects with the MME.

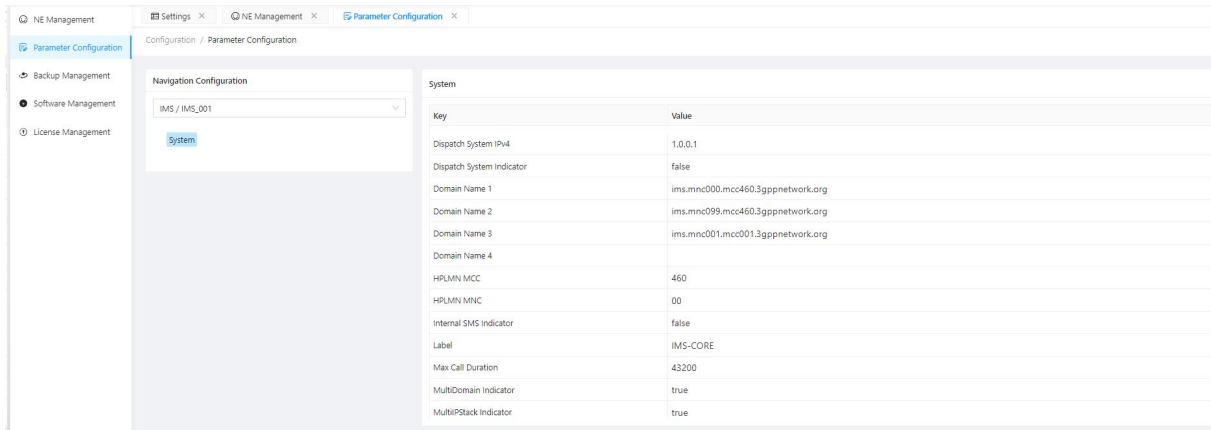


6、 AMF List: The main configuration of the operator here is the information of the AMF interoperable with the MME, including the AMF, PLMN, TAC, etc.



3.4.4.8 IMS

1. System: We can modify plmn and domain in the IMS system settings.



3.4.3 Backup Management

Backup management is a core component of any IT infrastructure management, and it is especially important in core networks because it ensures that services can be quickly restored in the event of data loss, failure, or other catastrophic events. The following backup management is described in detail:

1. The importance of backup strategy

An effective backup strategy requires comprehensive consideration of the value of data, recovery time objectives (RTO), data recovery point objective (RPO) and business continuity requirements. Strategy development, but also need to weigh the frequency and cost of backup. For example, more frequent backups can reduce data loss, but at the same time will also increase the cost of storage and resources.

2. Full versus incremental backups

A full backup means copying all selected data sets, which consumes more time and storage resources, but is simpler to restore. Although it consumes more time and storage resources, it is easier to restore. An incremental backup copies only the data that has changed since the last backup. This saves storage space and backup time, but the recovery process can be more complex and time-consuming because it requires all previous incremental backups to work together.

3. Automatic Backup

Modern 5G network management systems can automate backup tasks to minimize human error and ensure regular backups. This may include daily or weekly scheduling of tasks, as well as backups triggered based on specific events or conditions, such as before a major update. The configuration backup is now set to occur daily at 0:30am for all network elements.

4. Fault Tolerance

A good backup management system should be fault-tolerant to ensure that even if part of the backup process fails, the system can recover and complete the backup as much as possible. System can also recover and complete the backup task as far as possible. It can verify the accuracy of the backup file through checksums or other integrity checks. file accuracy.

5. Backup Storage

The storage of backup data is equally important. Backups should be stored in a safe and reliable location, and preferably geographically separated from the production environment location, in order to protect the data from physical disasters. Often, local, network, or cloud storage solutions are often used, sometimes even in combination to provide additional security.

6. Recovery Processes

A well-prepared backup strategy also needs to be able to guide an efficient data recovery process. This means that in the event of a failure, you must be able to quickly locate the proper backup quickly locate the appropriate backup set and follow a predetermined procedure to get the system back up and running. In addition, regular recovery In addition, regular recovery drills are valuable to validate the effectiveness of backups and ensure that the team is familiar with the recovery process.

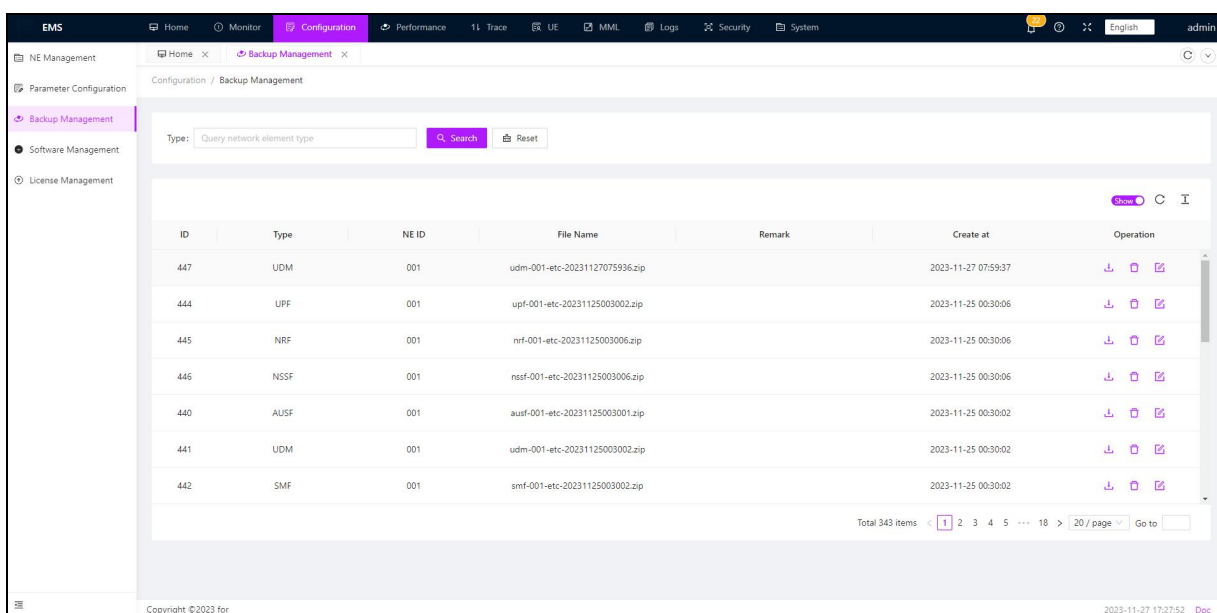
Backup management ensures the reliability of 5G network services and the security of data, and is a key strategy for delivering continuous business services.

Strategies.

Currently, backup management for network elements typically consists of automatic system backups and manual backups.

Manual Backup: Manual backup is mainly the backup file obtained after the export operation of the network element in the network element management. The exported configuration file will be displayed in the backup management.

Auto Backup: In Auto Backup, the system realizes automatic backup and scheduling management for network element backup. You can configure the backup task under the scheduling task configured by the system. configure the backup task under the scheduling task configured by the system. Currently, the configuration file of each network element is backed up once a day at 00:30.



The screenshot displays the EMS Backup Management interface. The left sidebar shows navigation options: NE Management, Parameter Configuration, Backup Management (selected), Software Management, and License Management. The main content area shows a search bar with the text 'Query network element type' and a 'Search' button. Below the search bar is a table with the following columns: ID, Type, NE ID, File Name, Remark, Create at, and Operation. The table contains seven rows of backup records. At the bottom of the table, it indicates 'Total 343 Items' and a pagination control showing '1 / 20 / page'.

ID	Type	NE ID	File Name	Remark	Create at	Operation
447	UDM	001	udm-001-etc-20231127075936.zip		2023-11-27 07:59:37	Download, Refresh, Edit
444	UPF	001	upf-001-etc-20231125003002.zip		2023-11-25 00:30:06	Download, Refresh, Edit
445	NRF	001	nrf-001-etc-20231125003006.zip		2023-11-25 00:30:06	Download, Refresh, Edit
446	NSSF	001	nssf-001-etc-20231125003006.zip		2023-11-25 00:30:06	Download, Refresh, Edit
440	AUSF	001	ausf-001-etc-20231125003001.zip		2023-11-25 00:30:02	Download, Refresh, Edit
441	UDM	001	udm-001-etc-20231125003002.zip		2023-11-25 00:30:02	Download, Refresh, Edit
442	SMF	001	smf-001-etc-20231125003002.zip		2023-11-25 00:30:02	Download, Refresh, Edit

ID	Name	Group	Invoke	Cron	Status	Log	Operation
1	Monitor-System Resources	System	monitor_sys_resource	0 0/5 * * * ?	Active	Recorded	[Icons]
4	Delete expired NE etc backup file	System	delExpiredNeBackup	0 20 0 * * ?	Active	Recorded	[Icons]
5	Delete expired historical alarm	System	deleteExpiredRecord	0 10 0 * * ?	Active	Recorded	[Icons]
6	Delete expired KPI records	System	deleteExpiredRecord	0 15 0 * * ?	Active	Recorded	[Icons]
7	Network Element Configuration Auto Backup Task	System	backupEtcFromNE	0 30 0 * * ?	Active	Recorded	[Icons]

3.4.4 Software Management

Software management is the process of managing and upgrading the software of each network element in the network, and ensuring that the stability and functionality of the network is upgraded and functionality upgrades are carried out smoothly. Network element upgrades are very important in a network to bring new features and performance improvements, as well as to It also fixes known problems and vulnerabilities.

Software Version Management: Manages the software version of each network element. This includes logging and managing the current software version running on each network element, as well as the status of new versions. This includes recording and managing the current software version running on each network element, as well as the release and upgrade schedule for new versions.

Software Upgrade Plan: Create a reasonable upgrade plan based on the software updates and upgrades provided. You can start by uploading the network elements that need to be upload the network elements that need to be upgraded to the server, and then upgrade them as needed.

Rollback and downgrade management: When problems or unexpected situations occur during the software upgrade process, you need to set up a rollback and downgrade strategy to ensure that the corresponding network elements can be upgraded. strategies to ensure that the corresponding network elements can be rolled back.

Software upgrade process:

Upload software: Upload the new version of network element software to the software library of the core network management system.

Distribute software: Select the upgrade operation for the target network element in the management system, which is usually started by clicking a "Delivery" button.

Activate software: After the software is released, to complete the upgrade process, you often need to activate the software. This is accomplished by clicking "Activate", a step that usually triggers a reboot of the network element to use the new software version.

Software rollback process:

If the upgraded software has problems or does not meet your needs, you can roll back to the previous version of the software through the following steps:

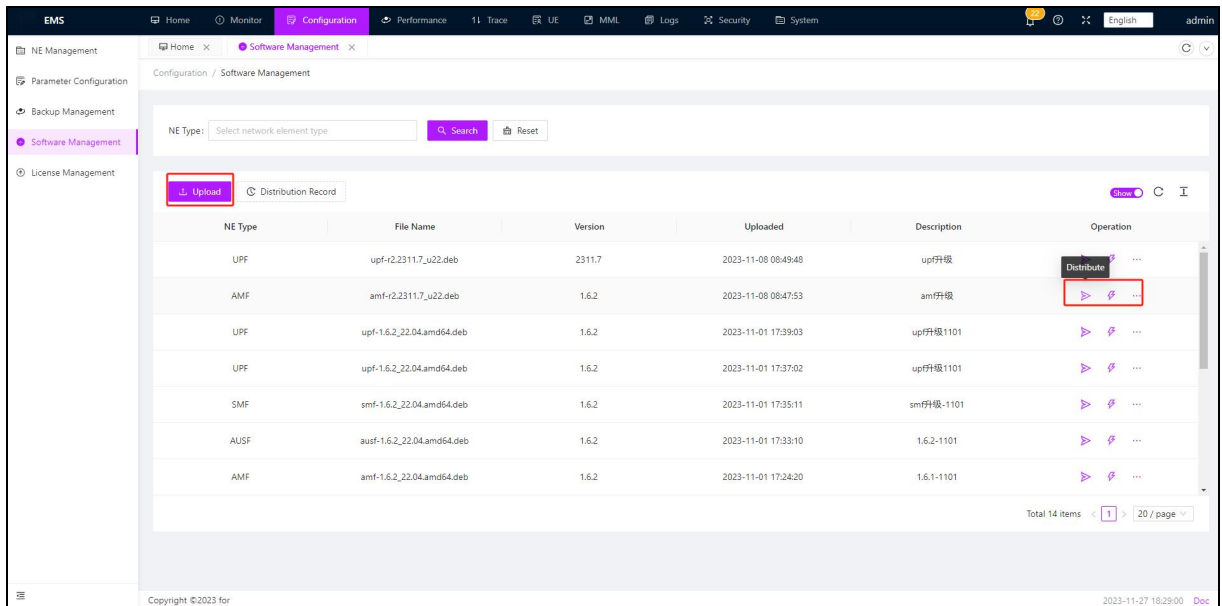
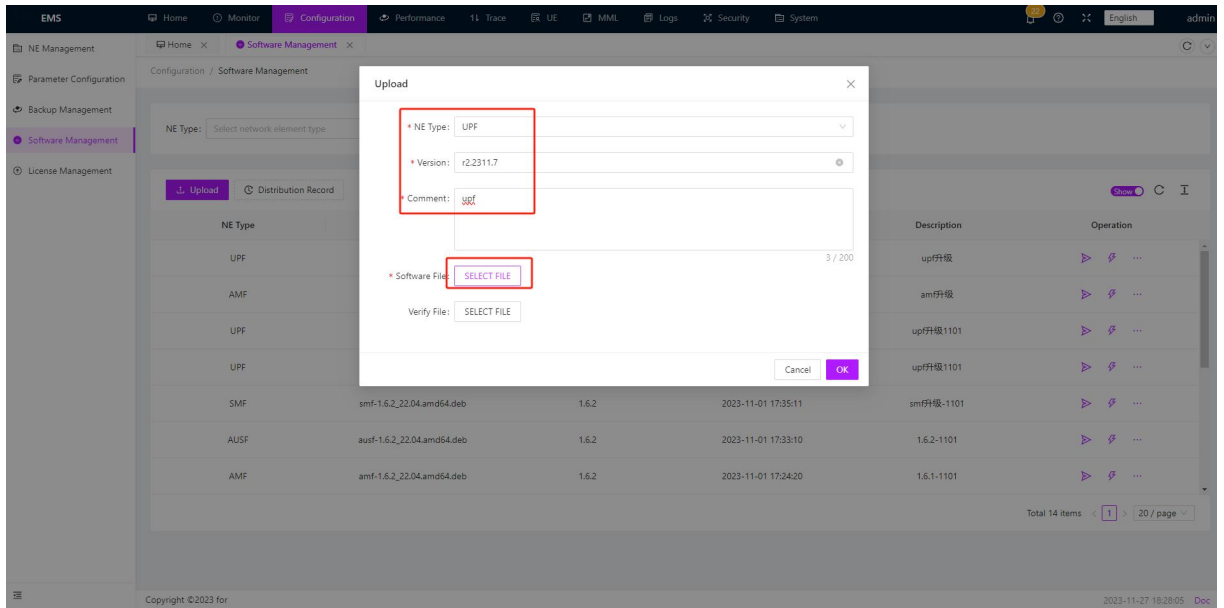
Rollback: Select the network element that needs to roll back the software and perform the rollback operation. Network operation and maintenance personnel can operate through the "Back" button on the management system interface.

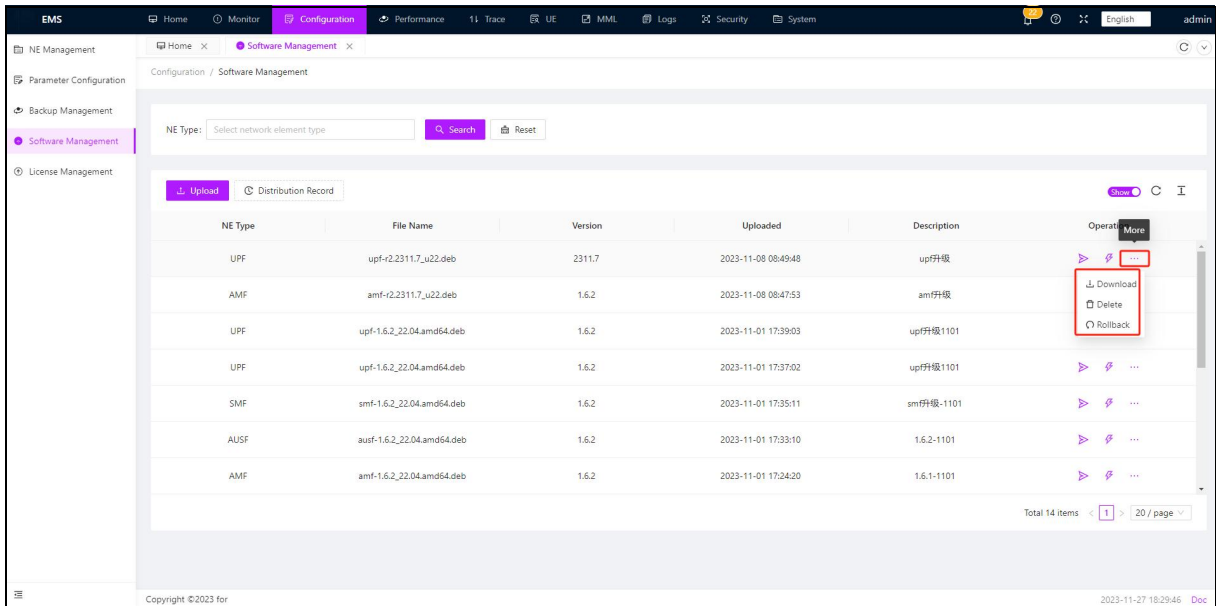
During this entire process, administrators can monitor and record each software upgrade or rollback operation through the management system.

Distribution records: Operation records of software upgrades or rollbacks are usually recorded by the system for audit and review when necessary. Administrators can view all executed operation records in the "Distribution Records" section, including detailed information such as time, operator, and results.

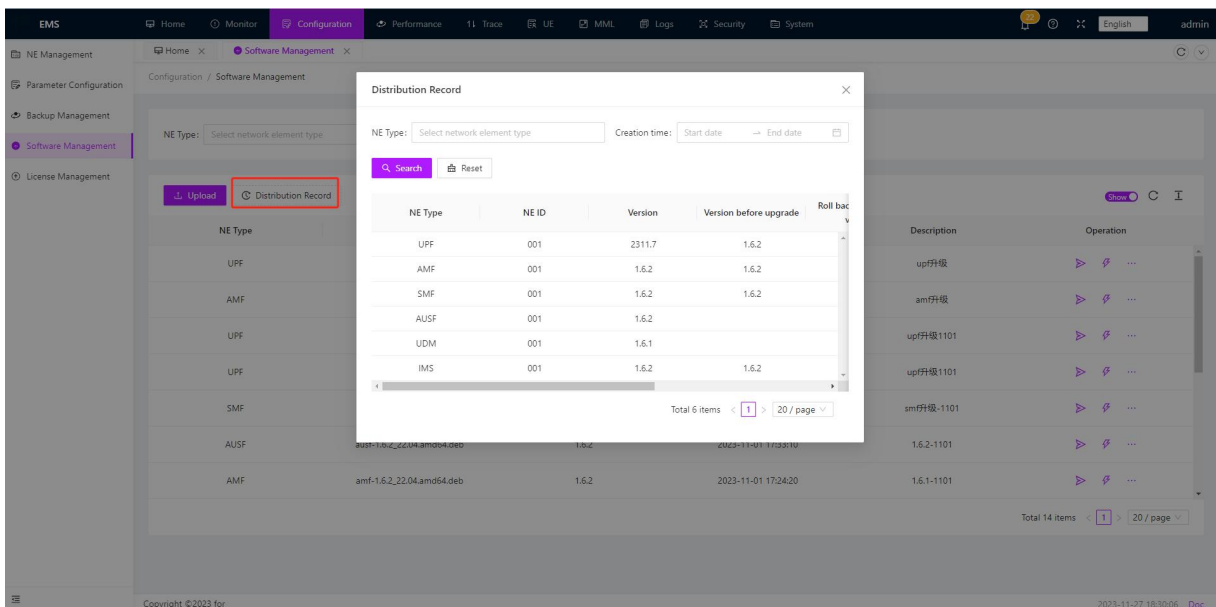
This software management process is an important part of core network operation and maintenance to ensure that network element software is running in the latest version and in the best condition. Through the software management interface, the operation and maintenance team can easily upgrade and maintain the network element software to ensure the stability and security of the network.

Operation: Upload->Distribute->Activate/Rollback





Can view the distribution records of each network element



3.4.5 License Management

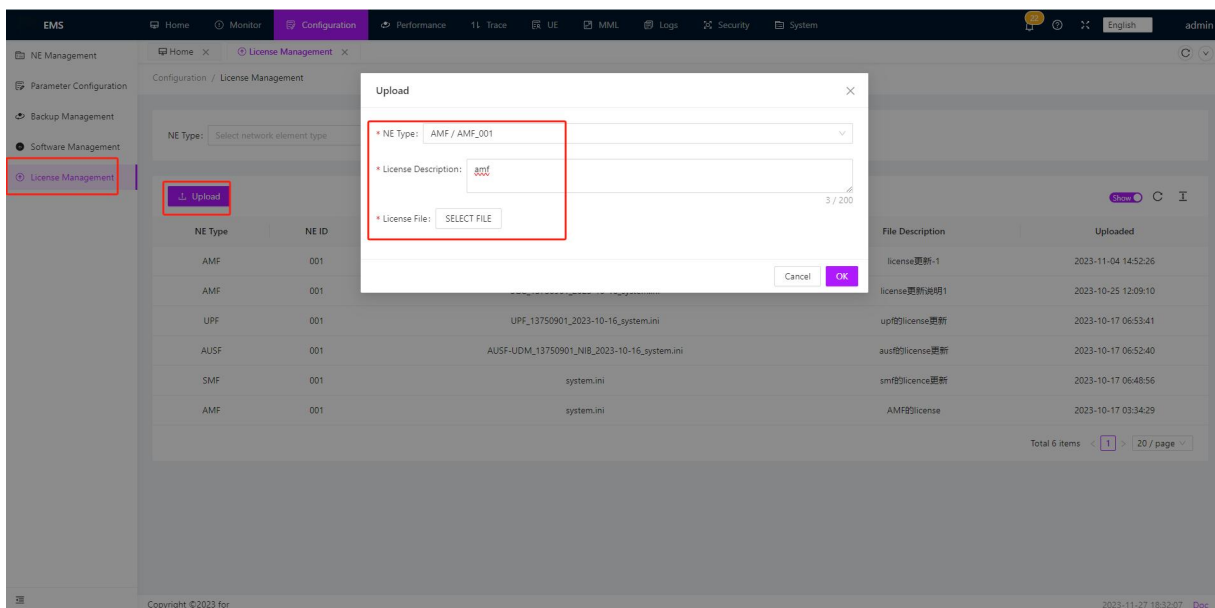
License management is used to manage and update licenses of NE to ensure compliance and resource management efficiency of network operators. A License of an NE is a certificate of network function authorization, which determines the functions and service capabilities of the NE.

License management records and manages the license information of each NE, including the license type, validity period and authorization functions. This is very

important to accurately grasp the license status of each network element and reasonably plan and manage network resources.

Effective License management ensures compliance and validity of network devices and functions, properly manages network resources, and improves network stability and performance. This is very important for providing high-quality 5G services and optimizing the efficiency of network resource utilization.

Operation: Click Upload, enter NE Type and License Description, click SELECT FILE, select the updated license file to upload, and click OK to complete the update.

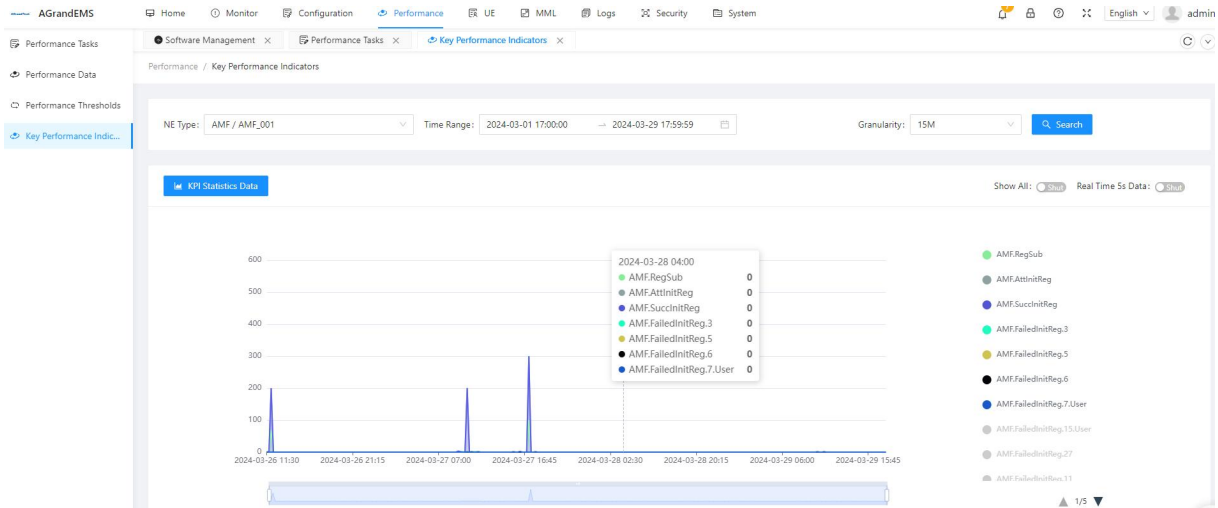


3.5 Performance

Performance management refers to the management and monitoring of the performance of the core network to ensure the efficient operation and reliability of the network. Core network performance management collects and analyses performance data on a regular basis to ensure standardization of network geology and timely detection of problems and their root causes. It mainly includes four aspects: performance tasks, performance data, performance thresholds, and key performance indicators.

3.5.1 Key Performance Indicators

Key performance indicators: Key performance indicators of core NE, which directly affect network stability and user experience. By monitoring important performance indicators, you can find performance problems in time and take appropriate measures to ensure efficient network operation and user satisfaction.



The screenshot shows the EMS Performance / Key Performance Indicators dashboard. The interface includes a navigation bar with options like Home, Monitor, Configuration, Performance, UE, MML, Logs, Security, and System. The main content area displays a table of KPI data for NE Type 'AMF' and Time Range '2023-11-26 19:10:43' to '2023-11-27 19:10:47'. The table lists various KPIs and their values, all of which are zero.

NE Type	KPI ID	Value	Start Time	End Time
AMF	AMF.RegSub	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.AttInitReg	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.SuccInitReg	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.3	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.5	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.6	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.7.User	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.15.User	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.27	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.11	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.12	0	2023-11-27 18:54:00	2023-11-27 18:55:00
AMF	AMF.FailedInitReg.13	0	2023-11-27 18:54:00	2023-11-27 18:55:00

3.6 UE

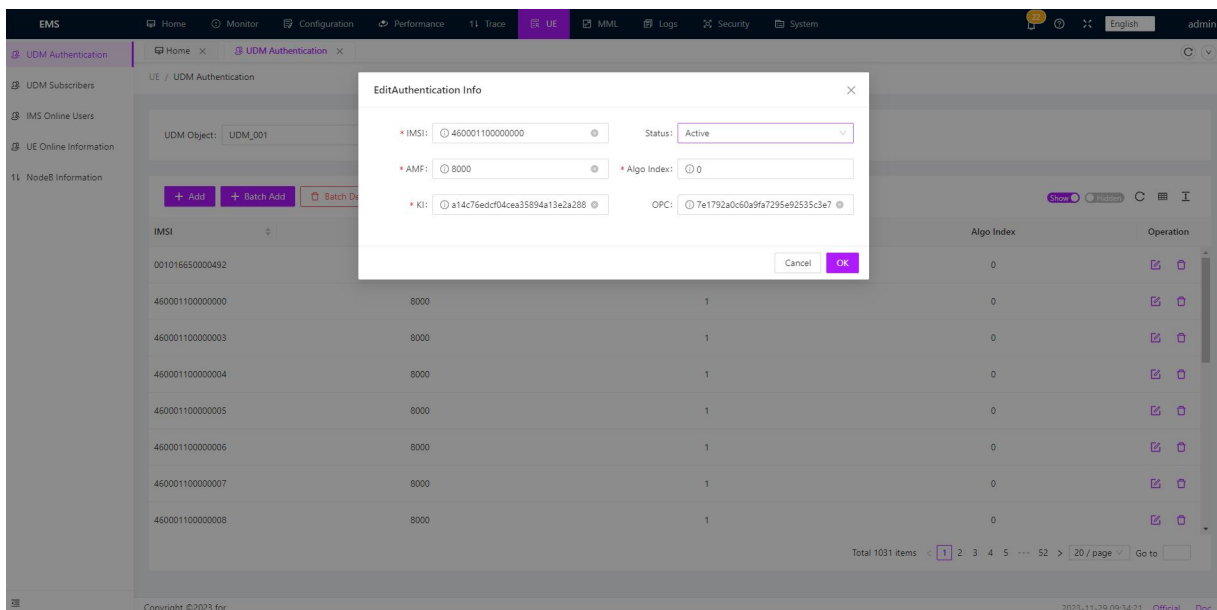
Core network terminal management refers to the management and control of terminal devices in the core network to ensure the security and smooth operation of the network. The core network terminal management includes the UDM authentication and UDM subscribers in the User data management (UDM), and the management of IMS online users, UE online information, and NODEB information.

Through effective core network terminal management, operators can ensure the security and reliability of terminal equipment, improve the stability and performance of the network, and provide users with high-quality services and good user experience. At the same time, terminal management can also help operators optimize the utilization of network resources, improve network operational efficiency and cost control.

3.6.1 UDM Authentication

The UDM authentication data is the authentication information of terminal devices stored in the User Data management (UDM). The data includes the KI information and OPC information of terminals, and is used for secure authentication and authentication between terminals and the core network. The core network terminal management can add, modify, and delete authentication data individually or in batches to ensure the accuracy and timeliness of authentication information.

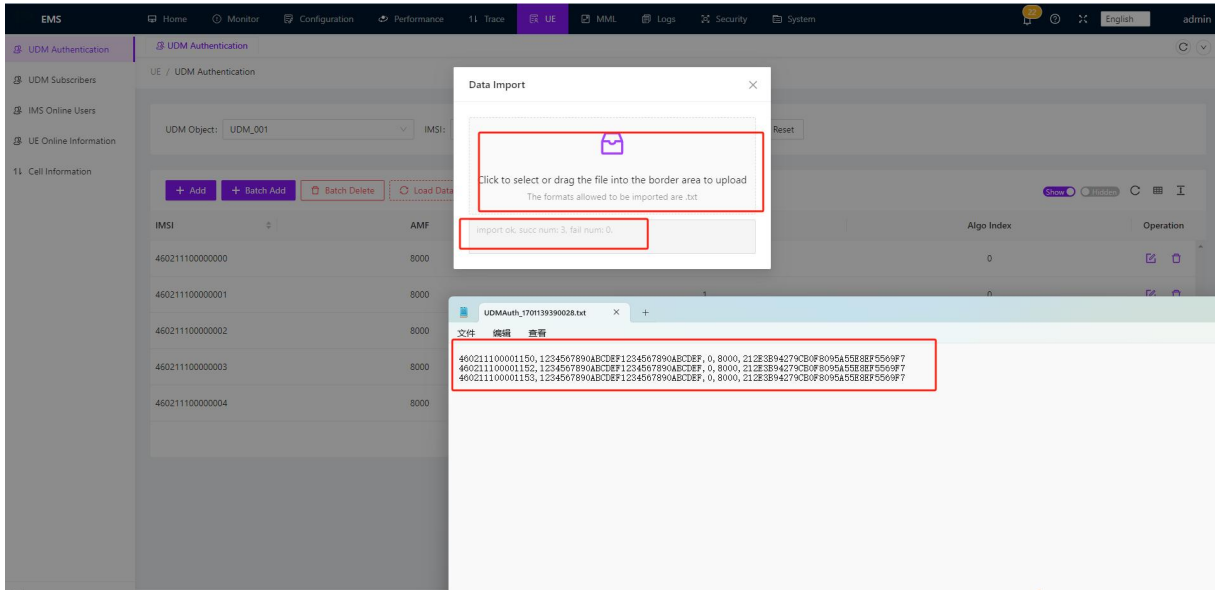
Click  , you can view and modify IMSI's ki, OPC, and other parameters



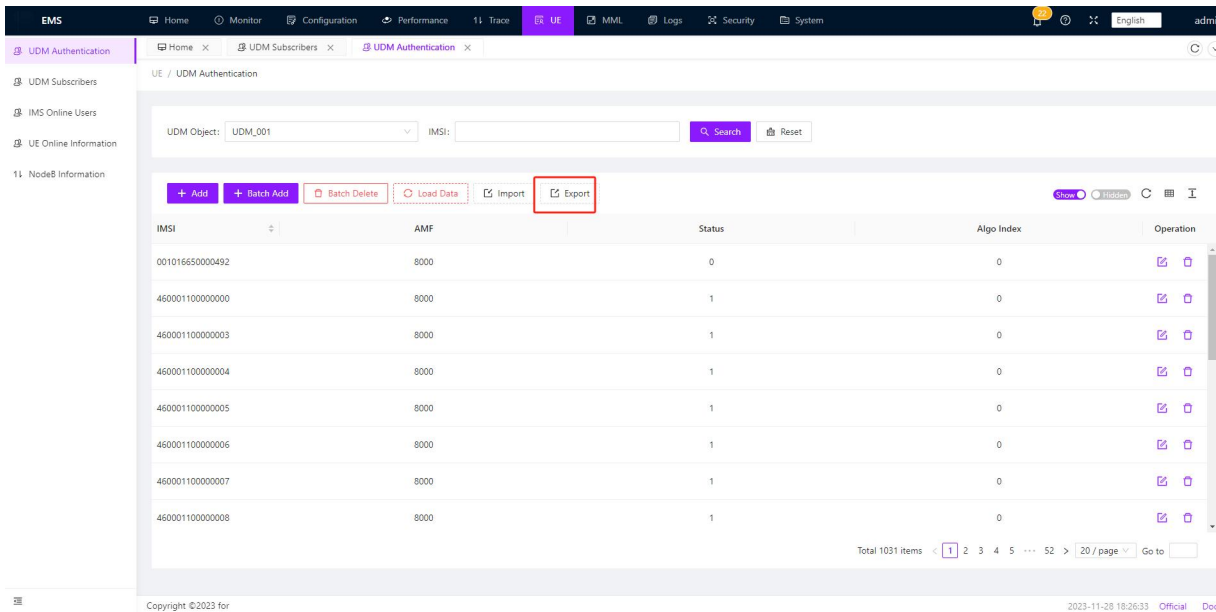
UDM authentication users can be added individually, added in batches, deleted individually, and deleted in batches. Items marked with * are mandatory. After filling them, click OK to proceed.

The operator can import or export individual or batch data using a txt file.
Import: Click **“Import”**, click on the window that pops up, then select the file you want to import. Once confirmed, a prompt will appear below indicating whether the import

was successful.



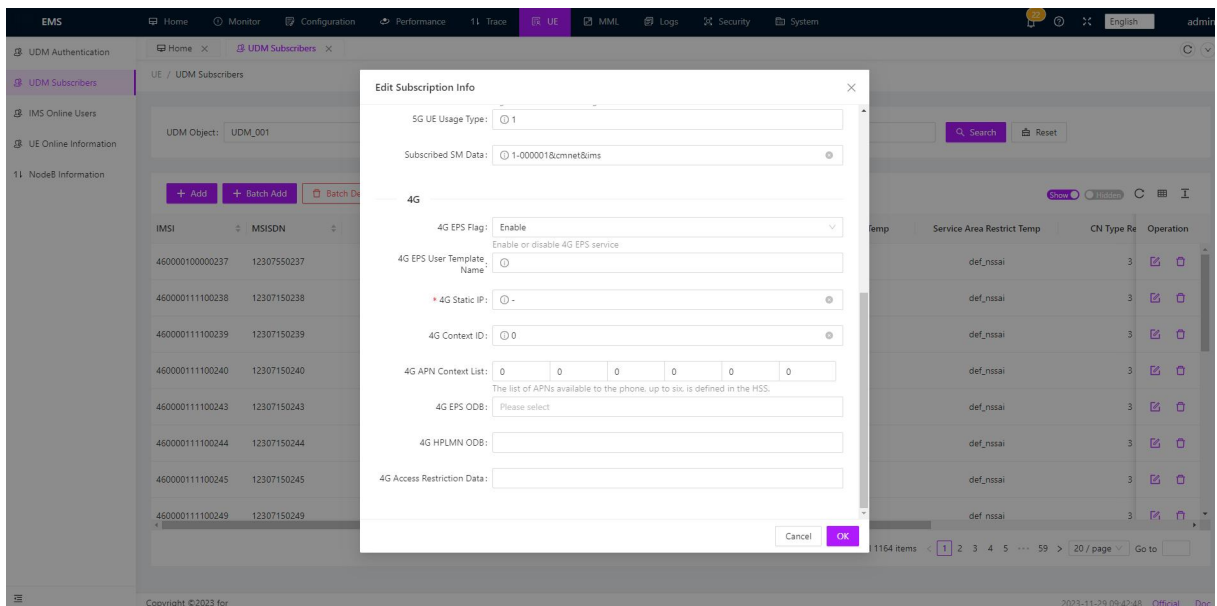
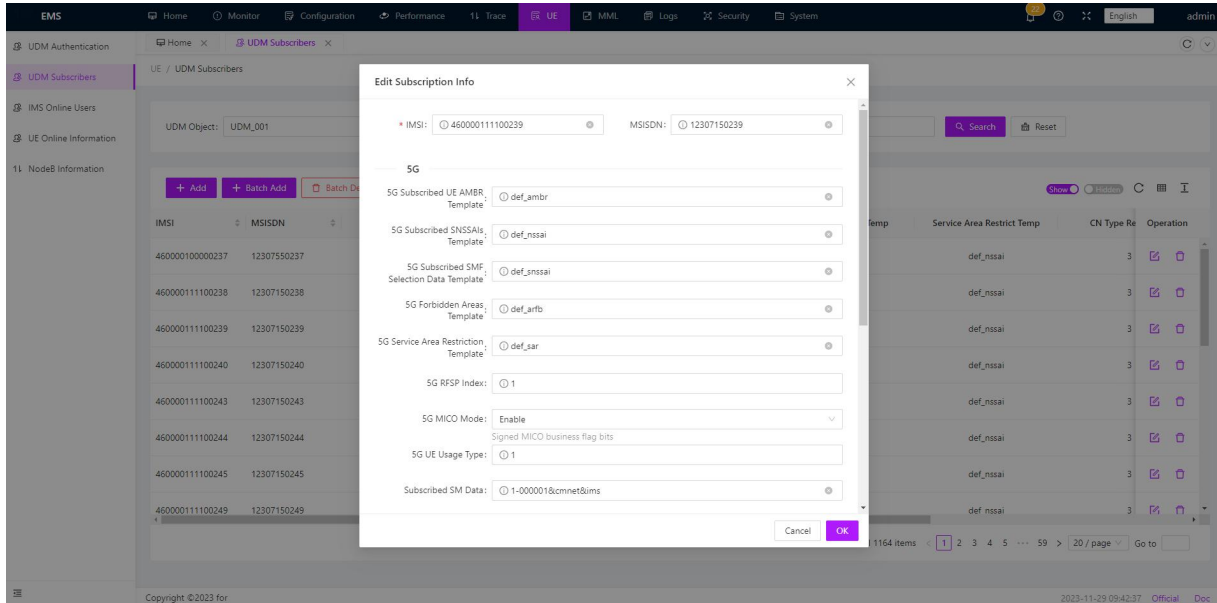
Export: Click the "Export", the system will export the file and automatically download it.



3.6.2 UDM Subscribers

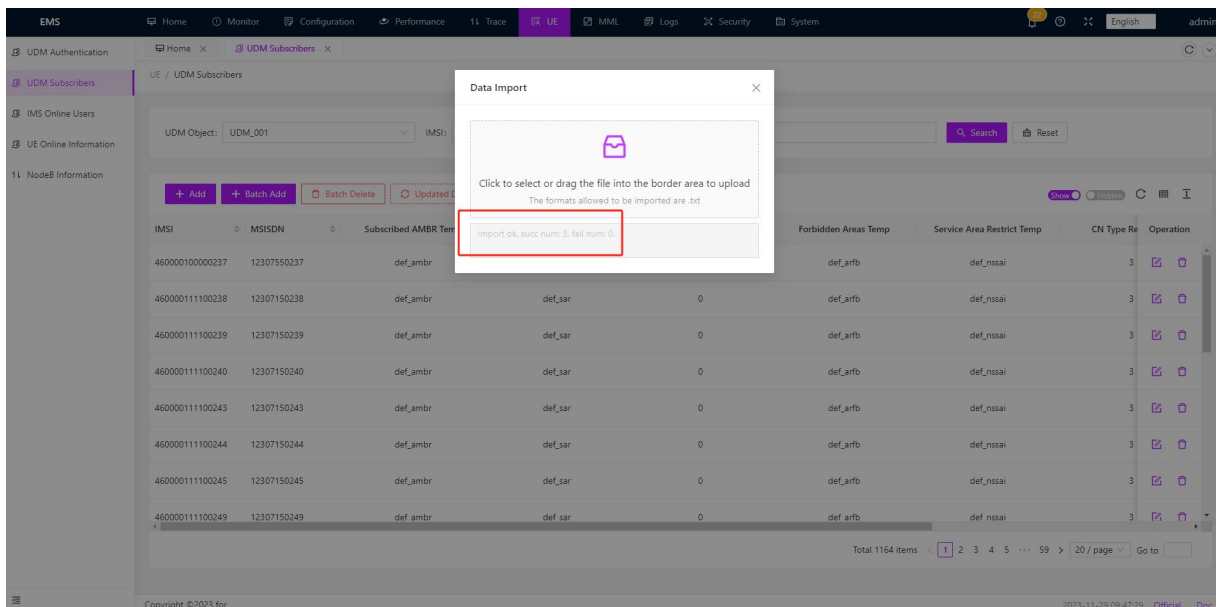
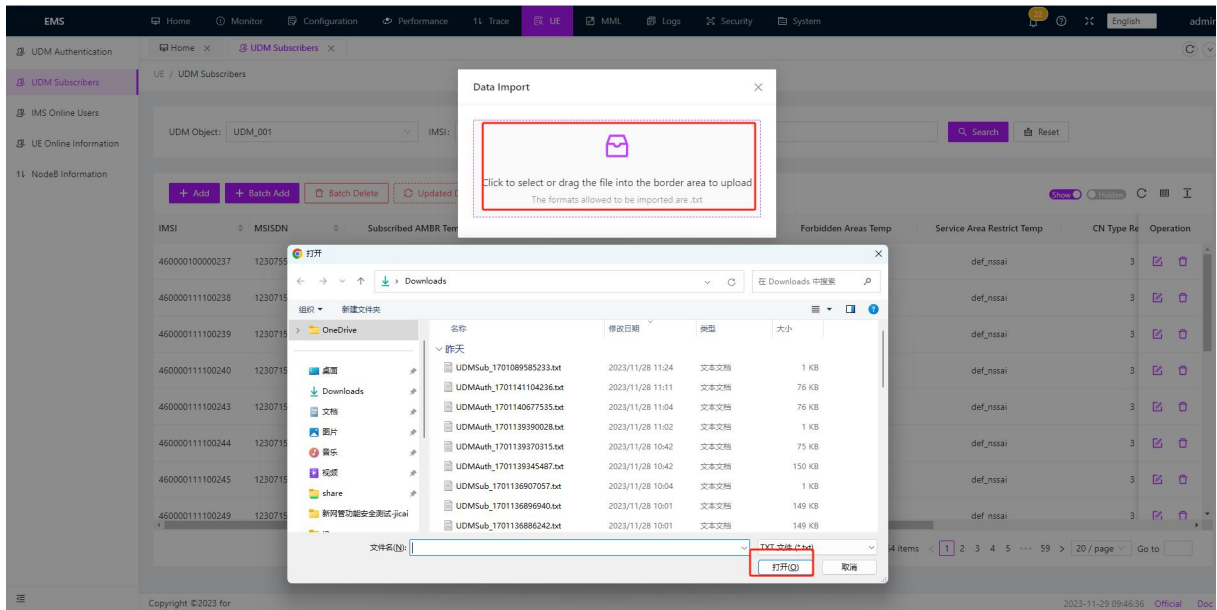
UDM subscriber is the user information of the terminal device stored in UDM. These data include the user's IMSI, MSISDN, SM-DATA, 4G static IP, 4G context list, etc., and are used for user identification and service management of the core network. Core network terminal management can add, modify and delete subscriber data individually or in batches to ensure the integrity and updateability of user information.

Click the modify button on the right to view more detailed user data and make modifications, such as modifying static IP data. Here you can view UDM contract user data, including imsi, msisdn, sm-date, Eps flag and other data

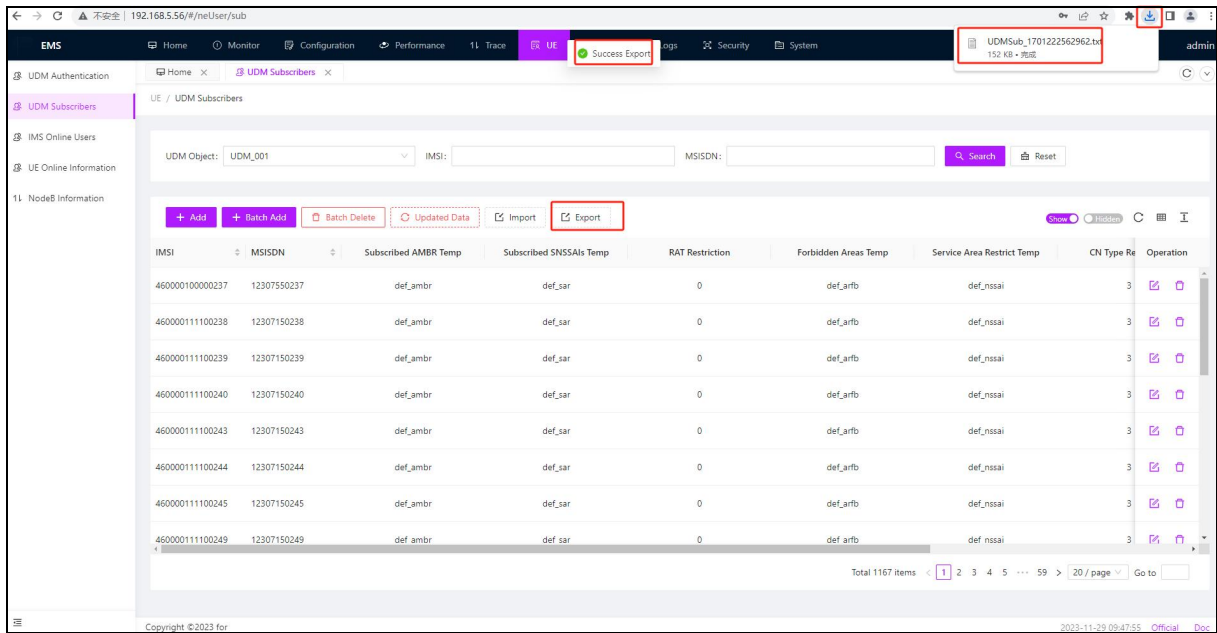


Can import and export UDM Subscribers data:

Import: Click **"Import"**, click on the window that pops up, then select the file you want to import. Once confirmed, a prompt will appear below indicating whether the import was successful.

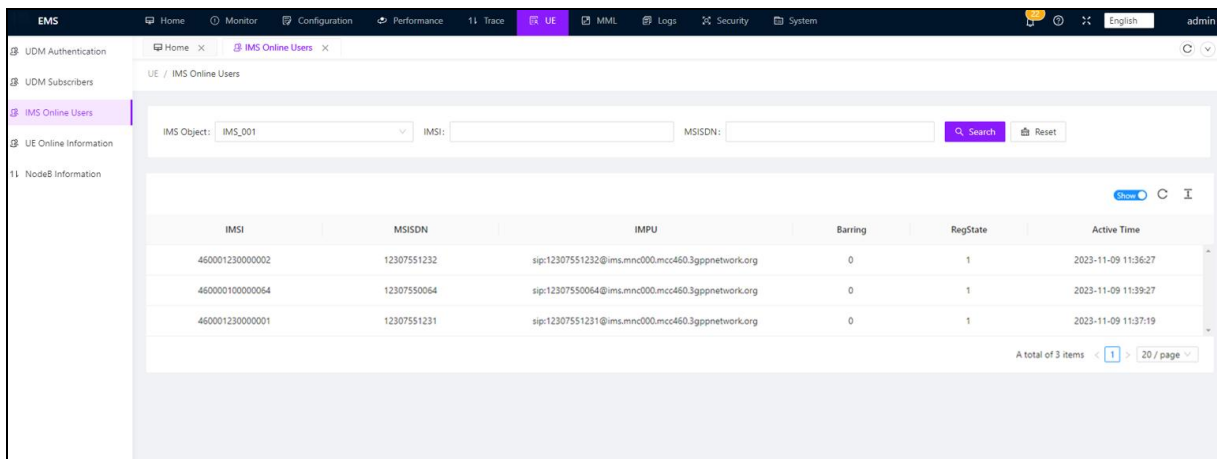


Export: Click the "Export", the system will export the file and automatically download it.



3.6.3 IMS Online Users

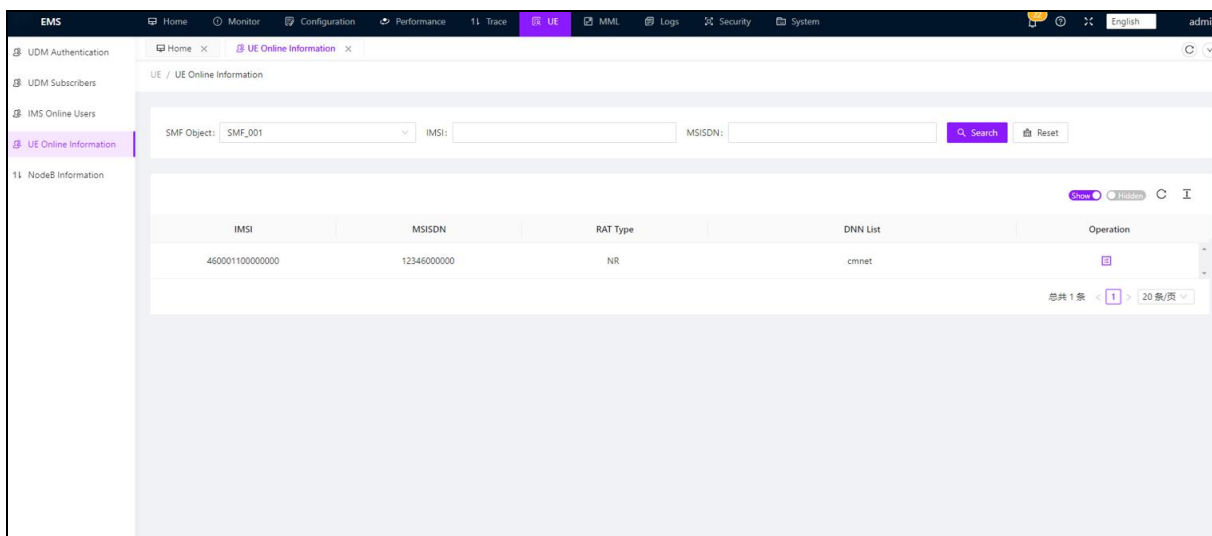
An IMS online user refers to an online user on the core network of the IP-based multimedia subsystem (IMS). Core network terminal management monitors and manages IMS online users, including the number of online users, user IMSI, MSISDN, registration loading, and activation time, to ensure proper allocation of network resources and optimize performance.



3.6.4 UE Online Information

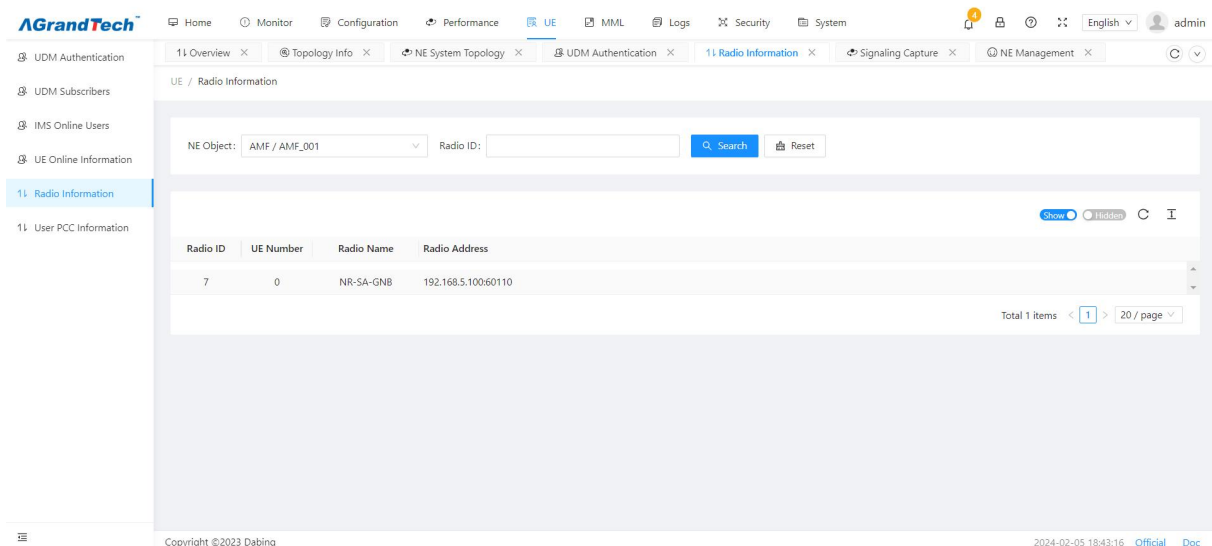
UE online information refers to the online status and connection status of terminal devices in the core network. Core network terminal management can monitor the

online status of terminals in real time. Users registered in SMF can view UE information such as IMSI, MSISDN, RAT Type, and DNN List



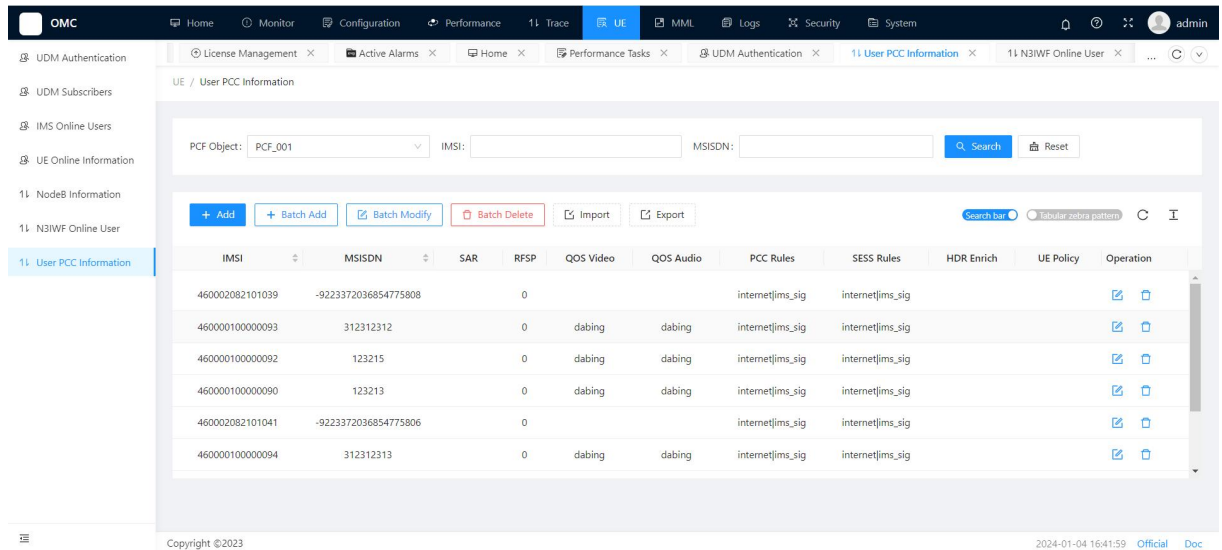
3.6.5 Radio Information

Radio information refers to the relevant information of radios in the core network, including the IP, ID, name of the 4G and 5G radios and the number of UE of the access radios. OMC can manage the information of radios connected to AMF, so that operators can better understand the number and information of radios connected to AMF.



3.6.6 User PCC Information

User policy control information can set different PCC Rules and SESS Rules for different users.



3.7 MML

MML (Man-Machine Language) management refers to the method of managing and configuring various parts of the core network by using specific command languages. MML management covers NE operation, UDM operation, and OMC operation.

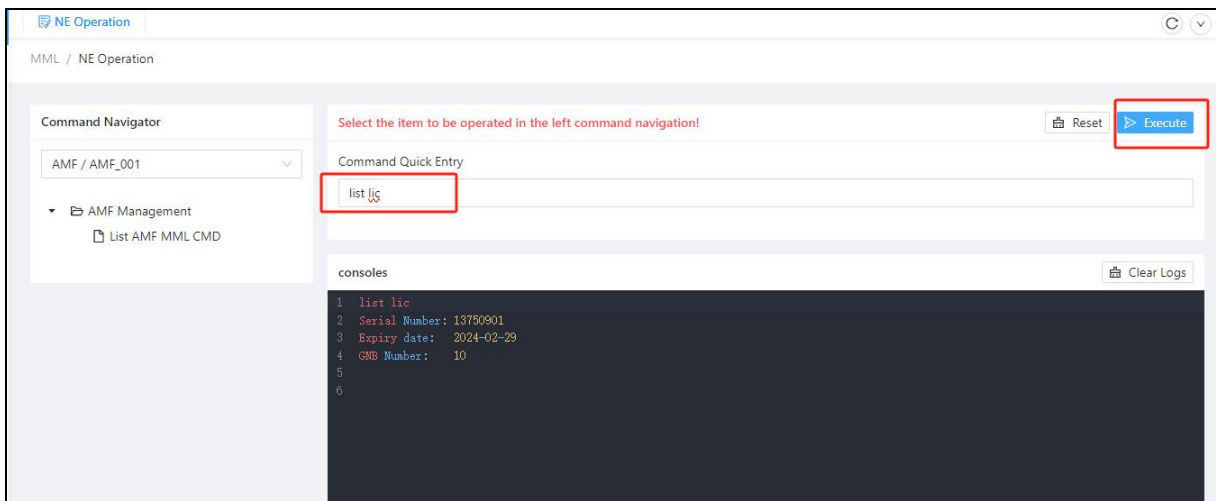
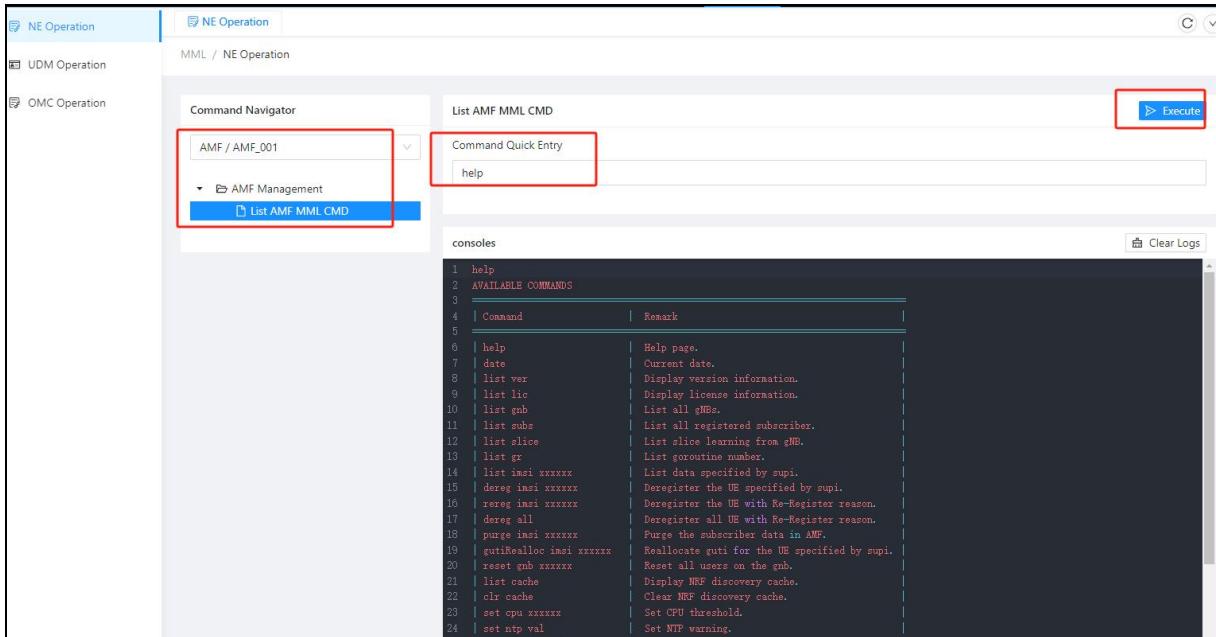
Through MML management, operators can manage and configure the core network to ensure the stable operation and high performance of the network. MML commands are flexible and scalable, and can be customized and configured according to specific network needs and operator requirements. At the same time, MML management also requires operators to have the appropriate technology and knowledge to ensure the accuracy and safety of management operations.

3.7.1 NE Operation

NE manage and configure core network elements through MML commands. Network element operations can query and configure the data information of each network element, such as querying the license information and version information of the network element, querying the access base station information in AMF, adding and deleting user data in batches in UDM, etc. Through MML commands, operators can flexibly and accurately configure network elements of the entire core network to meet network performance requirements.

Operation steps: Select the network element that needs to be operated in the

network element operation interface, click "List XXX MML CMD" below, and then click "Execute" on the right side. A console will pop up below, and the console will display operation commands and command explanations of the network element. Click "Clear Logs" to clear the console. If you need to enter a command, enter the command in the box below "Command Quick Entry", such as entering "list lic", and then click "Execute", the corresponding result will appear in the console.



3.7.2 UDM Operation

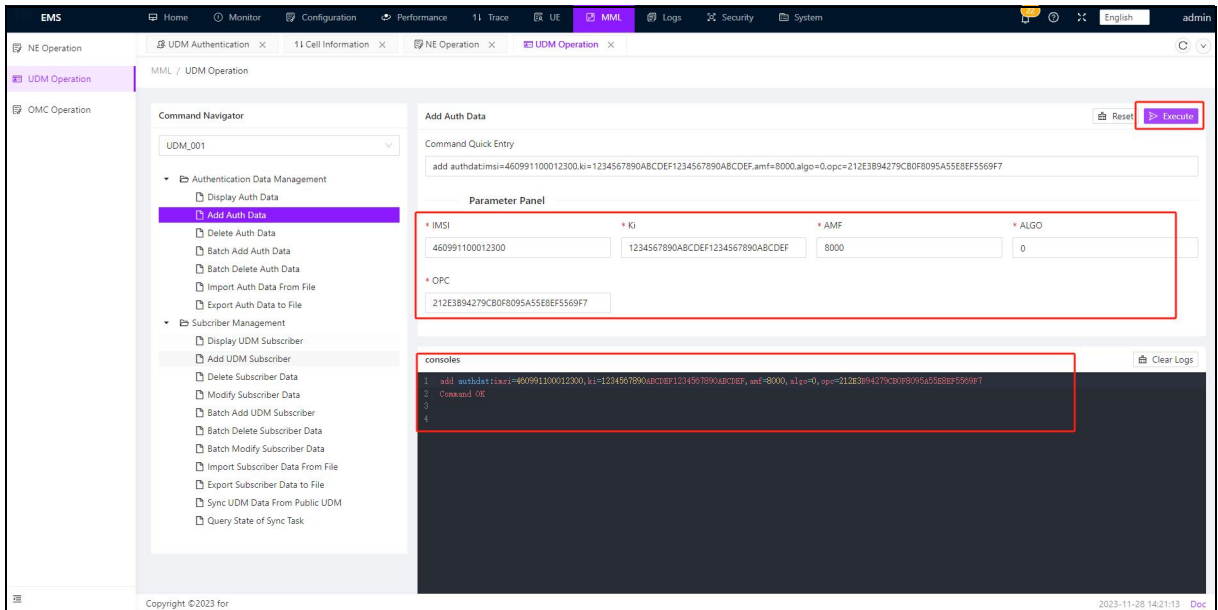
The UDM operation are mainly configured for user data management (UDM). This section describes how to configure UDM authentication information, including the identity and key information of the terminal device, to ensure the correct security

authentication. At the same time, UDM operation also include the configuration of UDM subscribers, including user identity information, subscription information, and service configuration.

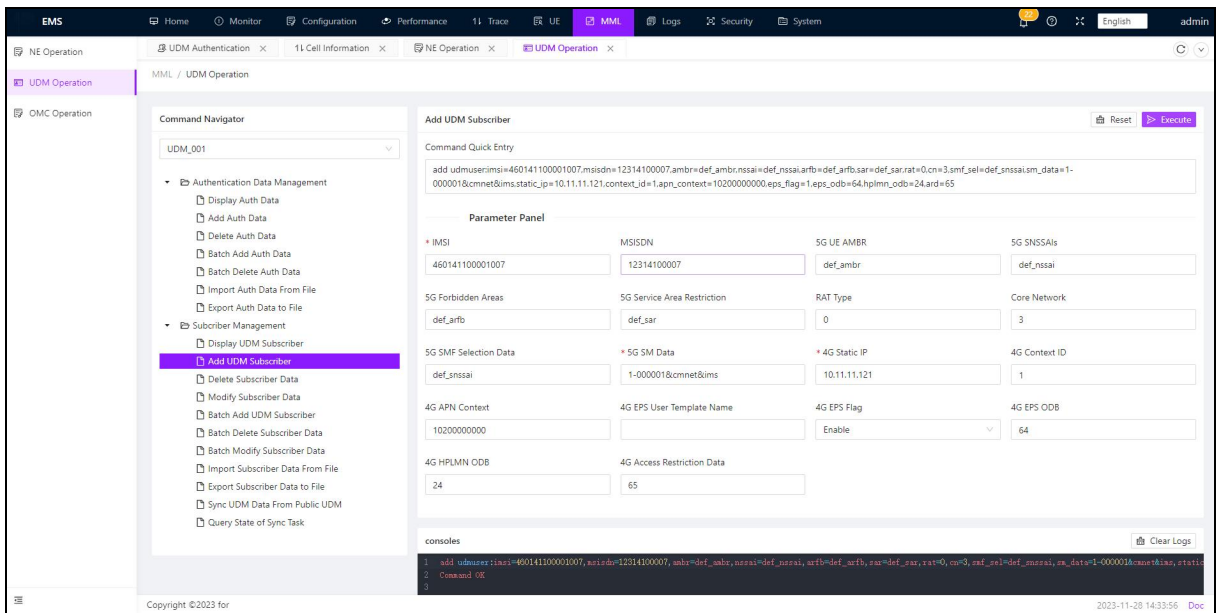
You can operate on UDM subscribers' data and authentication data, including adding, deleting, batch adding, batch deleting user data, and authentication data. The functions of each command are as follows: click on the command with a red * mark as a required field, and then click "Execute" in the upper right corner. The result is displayed in the black window below.

MML Commd
Export Subscriber Data to File
Display UDM Subscriber
Add UDM Subscriber
Delete Subscriber Data
Modify Subscriber Data
Batch Add UDM Subscriber
Batch Delete Subscriber Data
Batch Modify Subscriber Data
Import Subscriber Data From File
Upload Subscriber Data
Sync UDM Data From Public UDM
Query State of Sync Task
Display Auth Data
Add Auth Data
Delete Auth Data
Batch Add Auth Data
Batch Delete Auth Data
Import Auth Data From File
Export Auth Data to File

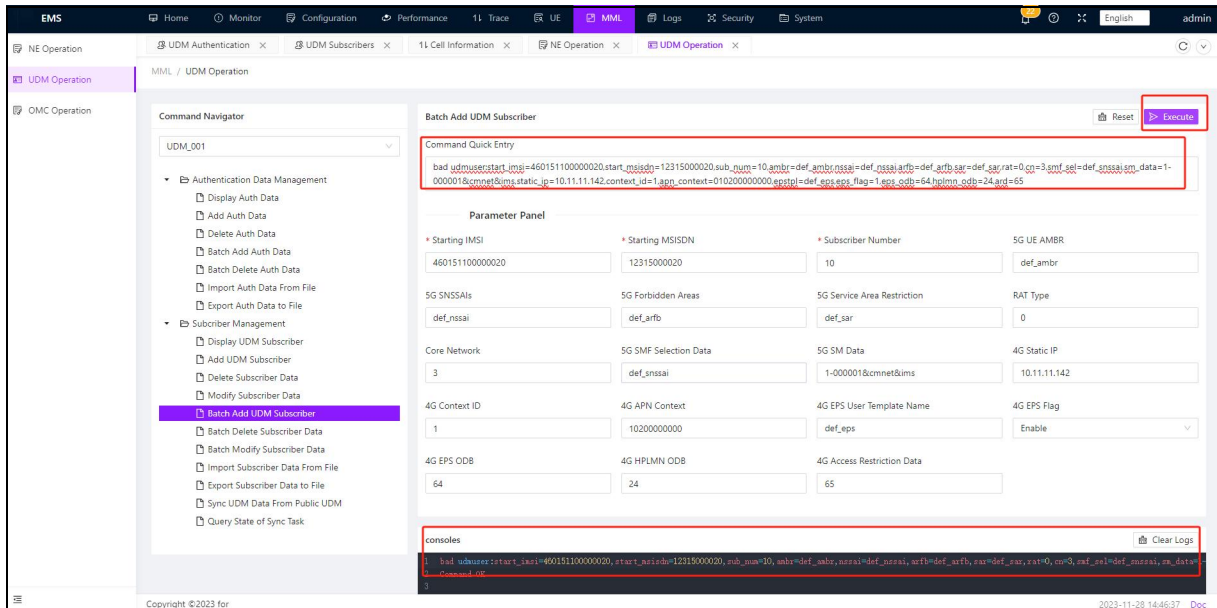
Add UDM Auth data as follows:



Add UDM Subscriber data as follows:



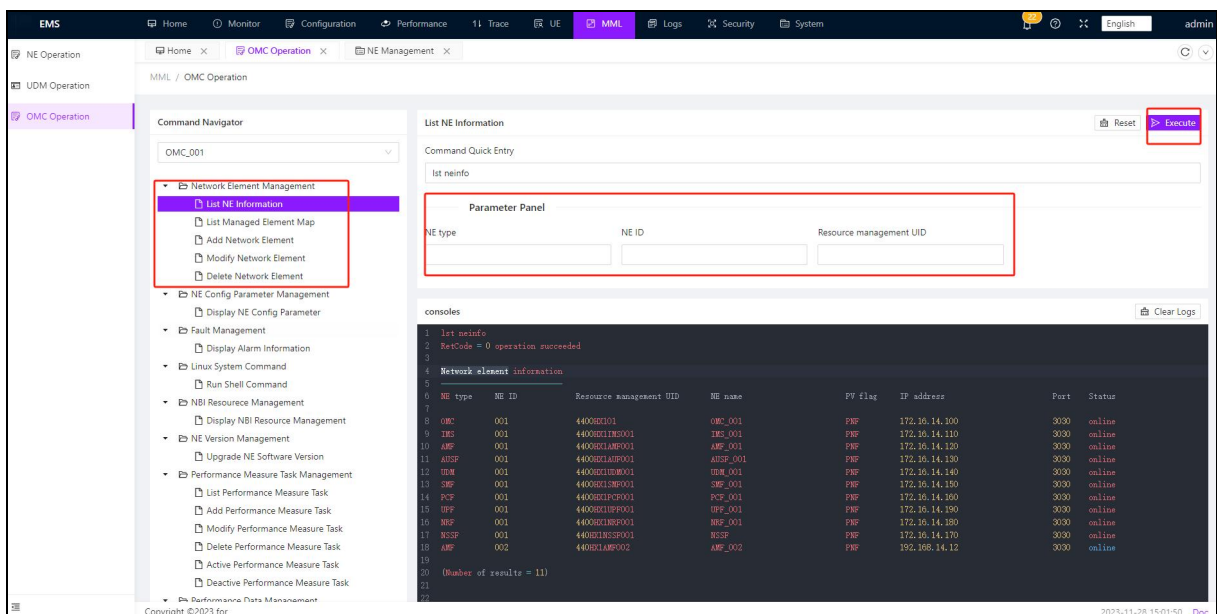
The operator can also enter the MML command in the box below “Command Quick Entry” and click execute:



3.7.3 OMC Operation

OMC operates and manages the management parts of the core network. This includes the management of NEs, such as adding, deleting, and modifying NE information. Manage NE configuration parameters, for example, query NE configuration parameters. Perform fault management operations, such as querying alarms of NEs such as AMF. Performance management operations, such as the collection and analysis of performance data; Perform system management operations, such as querying the system information of NEs such as AMF.

NE Management:



NE Config Parameter Management:

The screenshot shows the EMS interface for 'Display NE Config Parameter'. The 'Command Navigator' on the left has 'Display NE Config Parameter' selected. The main area shows a 'Command Quick Entry' field with 'dsp reconfig', a 'Parameter Panel' with input fields for NE type, NE ID, and Parameter tag, and a 'consoles' window displaying the command output.

```

1 dsp reconfig
2 RetCode = 0 operation succeeded
3
4 NE Config Parameters
5
6 NE type      NE ID      Parameters tag
7
8 R11FP       system
9 R12         system
10 R13        system
11 R14        system
12 R15        registeredDfP
13 R16        general
14 R17        omc
15 R18        obj
16 R19        supportedNetworkSlicelist
17 R20        planMappingList
18 R21        general
19 R22        loggers
20 R23        pifp
21 R24        omc
22 R25        telnet
23 R26        redial
24 R27        dataForwarderDomain
  
```

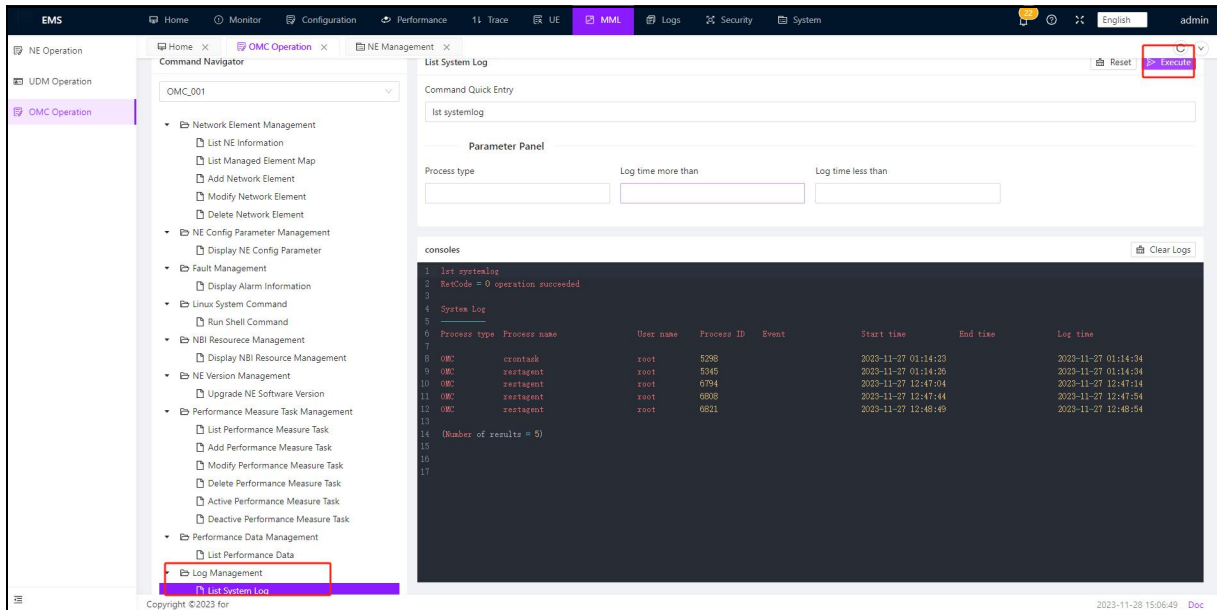
Fault Management:

The screenshot shows the EMS interface for 'Display Alarm Information'. The 'Command Navigator' on the left has 'Display Alarm Information' selected. The main area shows a 'Command Quick Entry' field with 'dsp alarm', a 'Parameter Panel' with input fields for NE type, NE UID, NE name, Alarm code, Original severity, PV flag, Alarm event start time, Alarm event end time, Alarm type, and Alarm status, and a 'consoles' window displaying the command output.

```

1 dsp alarm
2 RetCode = 0 operation succeeded
3
4 Alarm Information
5
6 NE type      NE UID      NE name      Alarm sequence  Alarm title      Original severity  PV flag      Event time
7
8 SFP         4400B01SFP001  SFP_001      2              M4 Broken        Critical          FWP         2023-10-12 19:08
9 SFP         4400B01SFP001  SFP_001      3              DSTMN-DISCONNECTED  Critical          FWP         2023-10-13 19:08
10 SFP        4400B01SFP001  SFP_001      4              DSTMN-DISCONNECTED  Critical          FWP         2023-10-13 16:04
11 SFP        4400B01SFP001  SFP_001      1              DSTMN-DISCONNECTED  Critical          FWP         2023-10-16 11:55
12 SFP        4400B01SFP001  SFP_001      3              M4 Broken        Critical          FWP         2023-10-17 02:21
13 SFP        4400B01SFP001  SFP_001      4              M4 Broken        Critical          FWP         2023-10-17 08:04
14 SFP        4400D11SFP001  SFP_001      7              Performance data report timed out  Critical          FWP         2023-10-18 0:00
15 SFP        4400D11SFP001  SFP_001      8              M4 Broken        Critical          FWP         2023-10-18 10:00
16 SFP        4400D11SFP001  SFP_001      207            Performance data report timed out  Critical          FWP         2023-10-22 0:00
17 SFP        4400D11SFP001  SFP_001      256            Performance data report timed out  Critical          FWP         2023-10-22 0:00
  
```

Log Management:



3.8 Logs

Core network Logs management is a critical part of network uptime maintenance, allowing managers to track the status of various parts of the core network, record potential problems, and perform troubleshooting and performance analysis. Logs management covers operation logs, MML logs, security logs, alarm logs, and alarm forwarding logs.

Logs management is an important support for efficient and accurate operation and maintenance, and plays a very important role in ensuring the stable operation of the core network, protecting network security and optimizing network performance. In practice, Logs management generally needs to be combined with the corresponding log analysis tools, through the comprehensive analysis of a variety of logs, in order to play the maximum value.

3.8.1 Operation logs

Operation logs record detailed information about operations performed by O&M personnel on network devices or systems, such as data change, system configuration, and account management. These logs can be used for analyzing system health, troubleshooting, and auditing.

The operator can view the operation records related to network management, and

specific operation information can be seen in the details on the right side.

Log Number	Module Name	Business Type	Operator	Request Method	Request Host	Operation Status	Operation Date	Log Number	Operation
258	log.operate.title.addAction	Import	admin	POST	192.168.0.11	Successful	2023-11-28 14:47:23	554 ms	[icon]
257	UDM Subscribers	Clear	admin	PUT	192.168.0.11	Successful	2023-11-28 14:42:50	52 ms	[icon]
256	UDM Subscribers	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:22:40	922 ms	[icon]
255	UDM Subscribers	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:21:22	1005 ms	[icon]
254	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 11:10:19	10 ms	[icon]
253	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 11:03:12	16 ms	[icon]
252	UDM Authentication User	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:01:14	931 ms	[icon]
251	UDM Authentication User	New	admin	POST	192.168.0.11	Successful	2023-11-28 10:48:05	408 ms	[icon]
250	UDM Authentication User	New	admin	POST	192.168.0.11	Successful	2023-11-28 10:47:10	407 ms	[icon]
249	log.operate.title.helpDoc	Modify	supervisor	POST	192.168.2.114	Successful	2023-11-28 10:44:23	12 ms	[icon]
248	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 10:41:45	10 ms	[icon]

Operation Log Information

Log Number: 251 Operation Status: Normal

Business Type: UDM Authentication User / New Operator: admin / 192.168.0.11 / Intranet

Request Address: POST - /ne/udm/auth/001/5 Operation time: 2023-11-28 10:48:05

Consumption Time: 408 ms Operation Method: controller.(UDMAuthController).Adds-fm

Request Parameters: [{"algIndex": "0", "amf": "8000", "imsi": "460211100000001", "kqi": "1234567890ABCDEF1234567890ABCDEF", "imei": "001", "num": "5", "opp": "212E3B94279C80F895A55E8EF569F7"}]

Operation Information: [{"status": "200", "size": "46", "content-type": "application/json; charset=utf-8"}]

Cancel

3.8.2 MML Logs

MML logs record operations performed using MML commands. This includes any parameter configuration, status query, etc., which is very helpful for auditing configuration changes of the core network, identifying configuration errors, fault tracing, etc.

ID	Account	IP	NE Type	NE ID	MML	Log Time
189	admin	192.168.0.11	OMC	001	list systemlog	2023-11-28 07:06:34
188	admin	192.168.0.11	OMC	001	dsp alarm	2023-11-28 07:03:59
187	admin	192.168.0.11	OMC	001	dsp neconfig	2023-11-28 07:02:23
186	admin	192.168.0.11	OMC	001	list neinfo	2023-11-28 07:01:21
185	admin	192.168.0.11	OMC	001	dsp neconfig	2023-11-28 06:55:34
184	admin	192.168.0.11	OMC	001	list neinfo	2023-11-28 06:54:37
183	admin	192.168.0.11	OMC	001	list neinfo neinfo=AMF	2023-11-28 06:54:27
182	admin	192.168.0.11	OMC	001	list neinfo neinfo=AMF,neid=002	2023-11-28 06:54:21
181	admin	192.168.0.11	OMC	001	list neinfo neinfo=AMF,neid=001	2023-11-28 06:54:14

3.8.3 Security logs

Security logs record user login information, including login account, IP address, operating system, login time, and status. It is used to monitor and ensure the security of the core network, as well as to analyze and find security problems when they occur.

Log ID	Login Account	Login Address	Login Location	Operating System	Browser	Status	Login Information	Login Time
42	supervisor	192.168.2.114	Intranet	Windows 10	Chrome 119.0.0.0	Successful	登录成功	2023-11-28 15:08:34
41	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	登录成功	2023-11-28 14:00:11
40	supervisor	192.168.2.114	Intranet	Windows 10	Chrome 119.0.0.0	Successful	登录成功	2023-11-28 10:40:57
39	admin	192.168.2.114	Intranet	Windows 10	Chrome 114.0.5735.289	Successful	登录成功	2023-11-28 10:39:06
38	supervisor	192.168.2.114	Intranet	Windows 10	Chrome 119.0.0.0	Successful	登录成功	2023-11-28 10:37:53
37	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Login Success	2023-11-28 10:33:16
36	supervisor	192.168.2.114	Intranet	Windows 10	Chrome 119.0.0.0	Successful	登录成功	2023-11-28 10:26:42
35	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	登录成功	2023-11-28 08:48:03
34	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Login Success	2023-11-27 18:42:29
33	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Login Success	2023-11-27 14:16:31
32	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Login Success	2023-11-27 10:16:04
31	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Logout Successful	2023-11-27 10:13:19
30	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Login Success	2023-11-27 10:12:34
29	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	Successful	Logout Successful	2023-11-27 10:12:29

3.8.4 Alarm Logs

Alarm logs record all information about system faults, exceptions, or important events, including activation alarms and historical alarms, so that O&M personnel can quickly locate and rectify existing problems.

ID	NE Type	NE UID	Alarm ID	Sequence Number	Alarm Code	Severity	Event Time	Recording Time
198346	UDM	4400HX1UDM001	HXEMSSM10000	7578	10000	Historical Alarm	2023-11-27 08:17:29	2023-11-27 08:17:29
198345	SMF	4400HX1SMF001	300071701072655452	606	30007	Historical Alarm	2023-11-27 08:18:45	2023-11-27 08:17:24
198344	UDM	4400HX1UDM001	HXEMSSM10000	7578	10000	Active Alarm	2023-11-27 08:09:59	2023-11-27 08:09:59
198343	SMF	4400HX1SMF001	300071701072655452	606	30007	Active Alarm	2023-11-27 08:10:55	2023-11-27 08:09:34
198342	SMF	4400HX1SMF001	300071701070876834	605	30007	Active Alarm	2023-11-27 15:41:16	2023-11-27 07:54:57
198341	SMF	4400HX1SMF001	300011701070876366	604	30001	Active Alarm	2023-11-27 15:41:16	2023-11-27 07:54:56
198340	UPF	4400HX1UPF001	HXEMSSM10000	45	10000	Historical Alarm	2023-11-27 06:18:29	2023-11-27 06:18:29
198339	SMF	4400HX1SMF001	300011701051621184	603	30001	Historical Alarm	2023-11-27 02:21:48	2023-11-27 02:20:27
198338	SMF	4400HX1SMF001	300011701051621184	603	30001	Active Alarm	2023-11-27 02:20:21	2023-11-27 02:19:00
198336	NRF	4400HX1NRF001	HXEMSSM10000	13	10000	Historical Alarm	2023-11-27 01:26:24	2023-11-27 01:26:24

3.8.5 Alarm Forwarding Logs

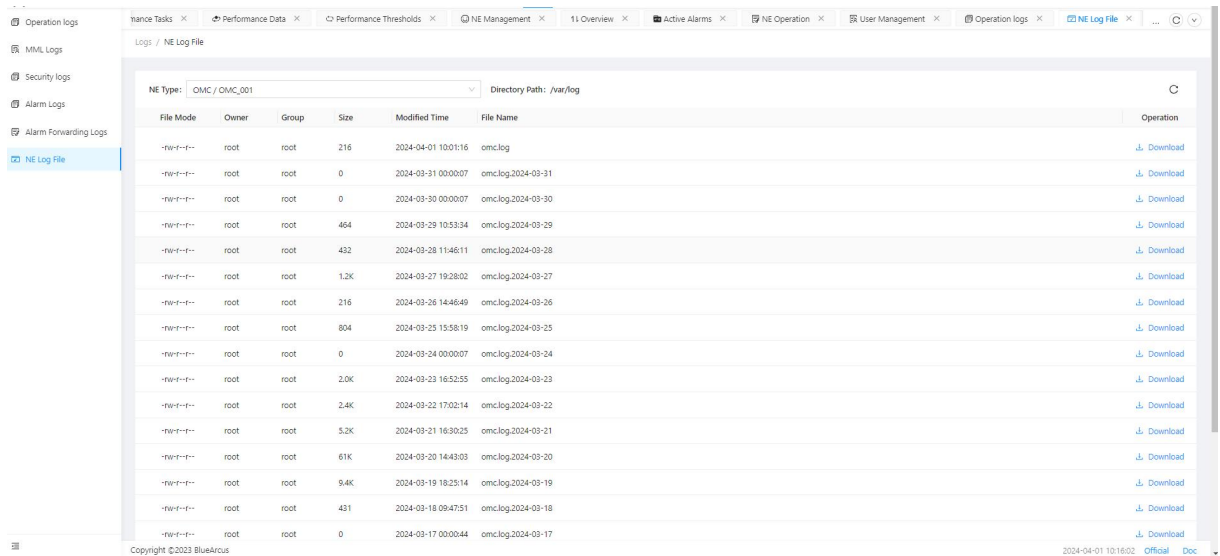
The alarm forwarding log records all the alarm events that are forwarded. It is useful for the administrator to track and handle alarms and check whether alarms are correctly routed to the target processing system.

ID	NE Type	NE UID	Alarm ID	Sequence Number	Object	Alarm Title	Alarm Content	Generation Time	Record Time
396521	SMF	4400HX1SMF001	300071699865087559	247	simonzhangsz@outlook.com;shuzone@126.com	DSTNF-DISCONNECTED	Failed to DialAndSendSms: tcp: lookup smtp.ooxx.com on 127.0.0.53:53: server misbehaving	2023-11-13 08:45:02	2023-11-13 08:44:04
396522	SMF	4400HX1SMF001	300071699865087559	247	11111112312	DSTNF-DISCONNECTED	Failed to send request: Get "http://smscxoox.com?Action=SendSms&PhoneNumbers=11111112312&SignName=XXX+SMSC&TemplateCode=1000&TemplateParam=%7B%22message%22%3A%22alarm%22%7D": dial tcp: lookup smscxoox.com on 127.0.0.53:53: server misbehaving	2023-11-13 08:45:02	2023-11-13 08:44:04

3.8.6 NE Logs

The network element log files are used to download logs from each network element. Based on the click time, refresh to get the network element log in real-time. After selecting a network element, all real-time logs related to that network element will be

displayed below. Click on the right side to download, and click on the refresh icon in the upper right corner to get real-time log updates.



3.9 Security

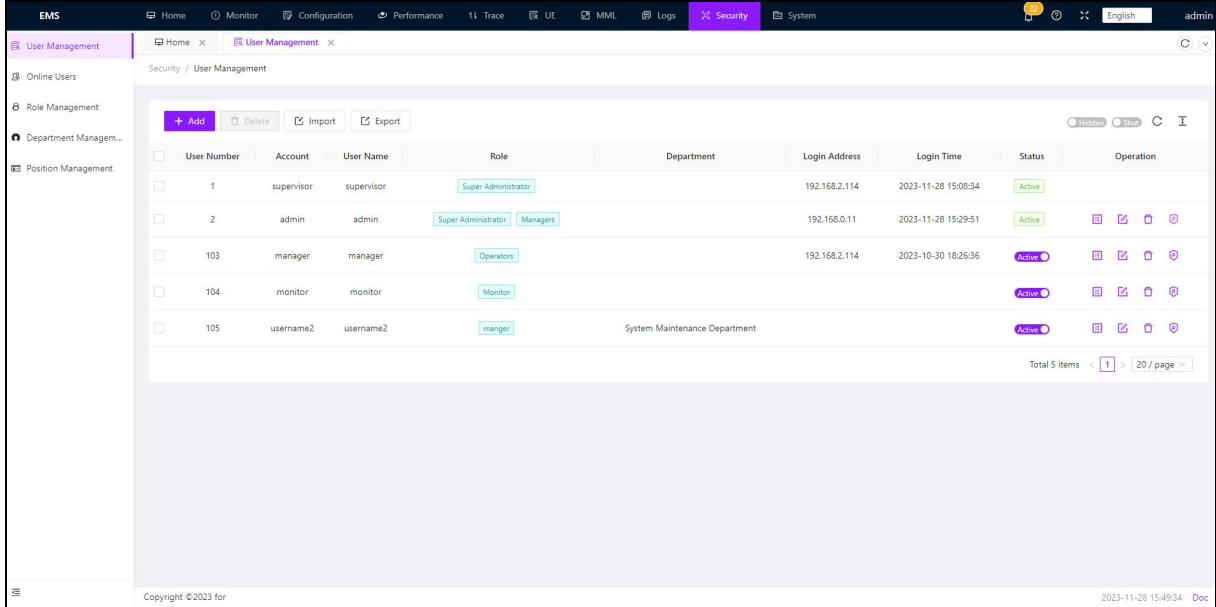
Core network security management refers to the management and permission control of users on the core network to ensure network security and protect the system from unauthorized access or malicious attacks. Core network security management includes user management, online user management, role management, department management and position management.

3.9.1 User Management

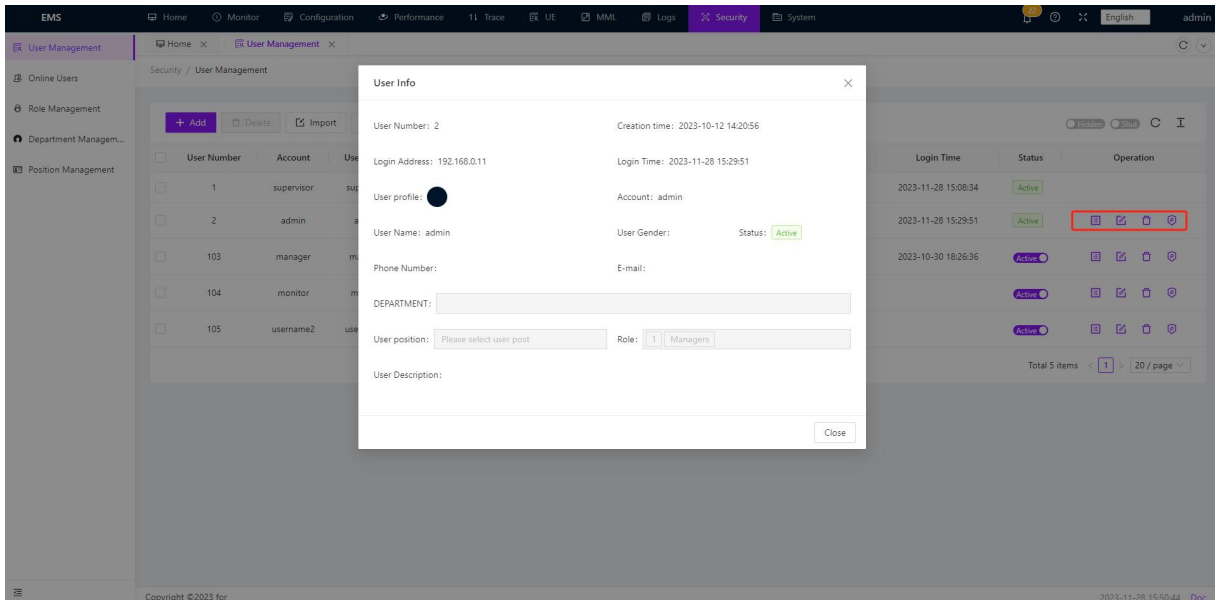
User management is to manage and control the login users in the core network. Administrators can add, modify, and delete login users, and set user information and permissions. By default, the core network provides default users such as supervisor, admin, manager, and monitor. Each user has different rights. For example, supervisor is the super administrator, admin has the rights of the administrator and super administrator, manager has the rights of the operation and maintenance personnel, and monitor has the rights of the monitoring personnel. User management ensures that only authorized users can access and operate the core network.

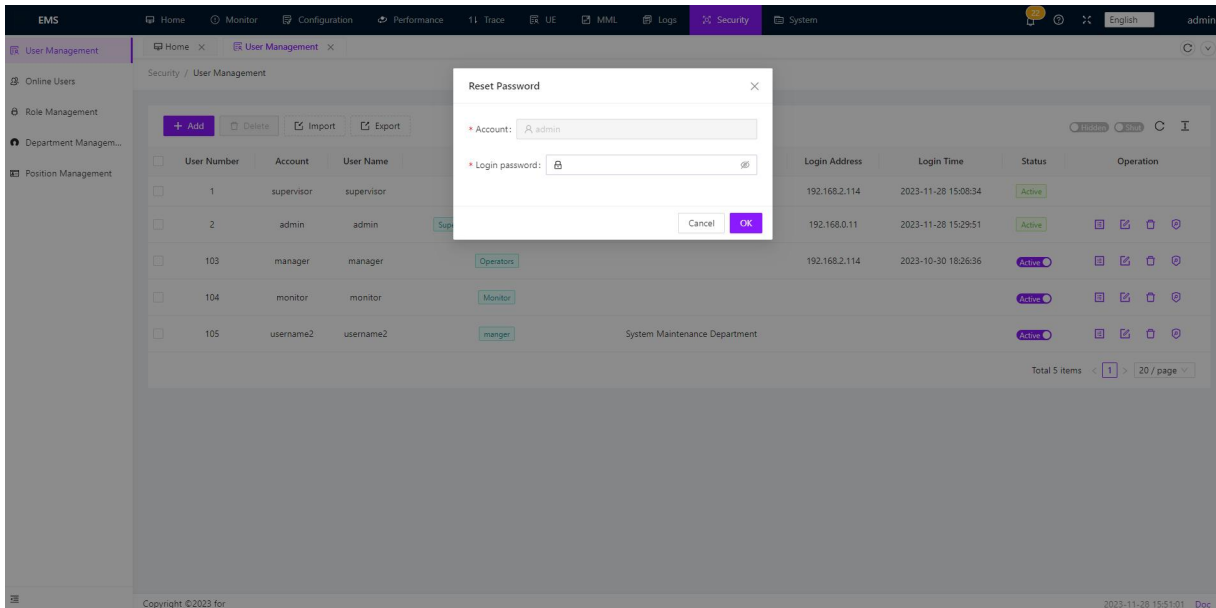
The operator can view user related information and operate to add, delete, and modify user information (“admin” and “supervisor” are super management users). Note that only high-privileged users can delete low-privileged users.

Click “Add” to add a logged-in user. Different user positions can be set according to needs, and different user permissions can be added. For specific permissions, please refer to Role Management:



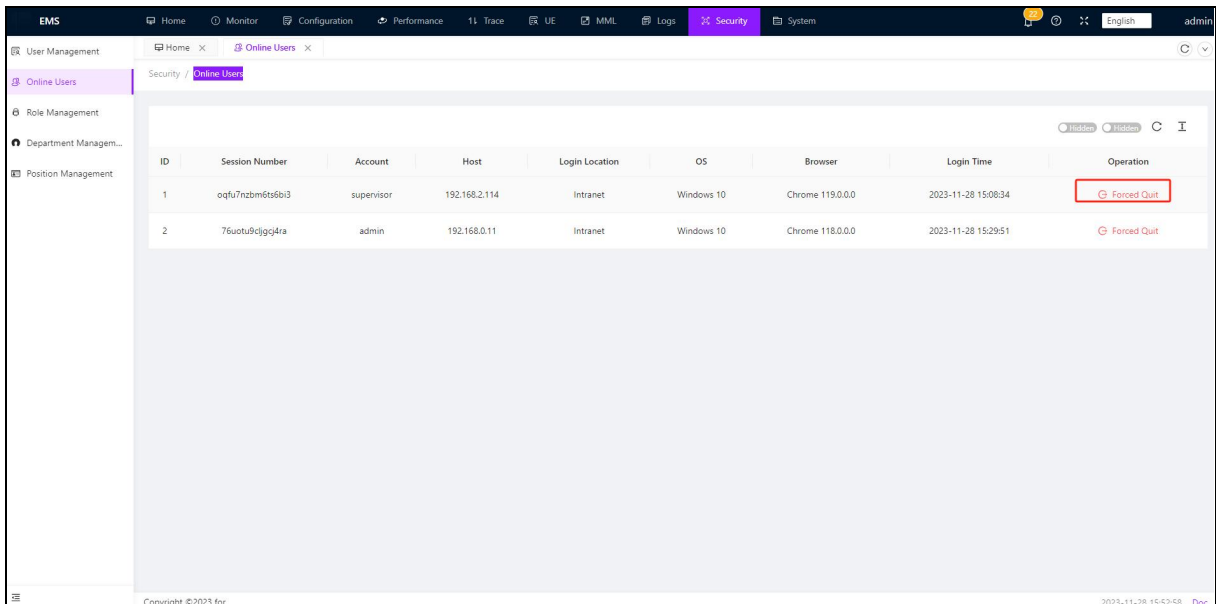
Users can be imported and exported, and import templates can be downloaded to add user data. On the right side, specific detailed information of the user can be viewed, and the user password can be modified:





3.9.2 Online Users

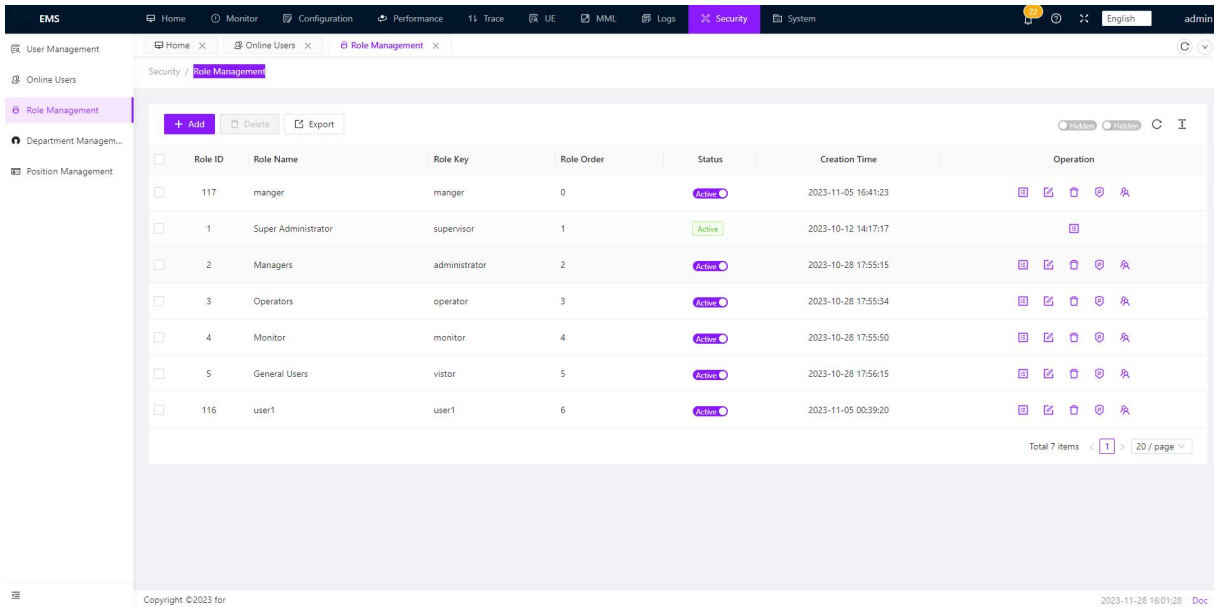
Online user management is used to monitor and manage users currently logged in to the core network. The administrator can view information about online users, such as the account name, host IP address, operating system, and login time. Online user management also provides strong logout operations. Administrators can terminate the login sessions of specified users to ensure the security of the core network.



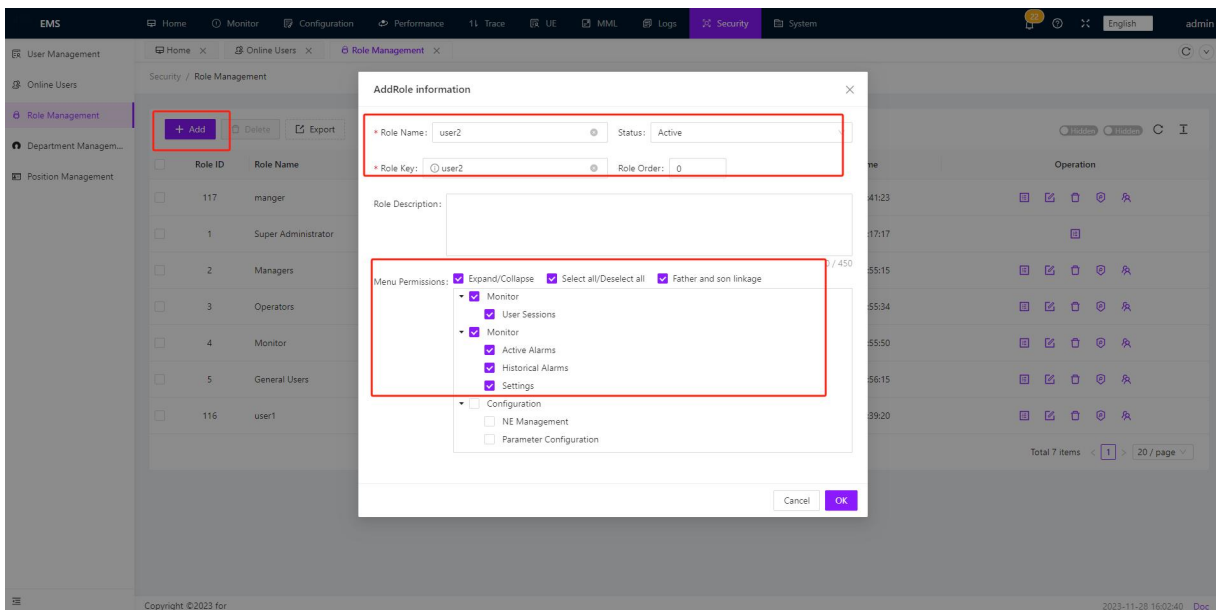
3.9.3 Role Management

Role management: Role management assigns specific roles and rights to different users. The administrator can create different role names and assign permissions to each role. Roles can be customized to meet the rights requirements of different users. Through role management, you can effectively control the access rights of users and achieve fine control of permissions.

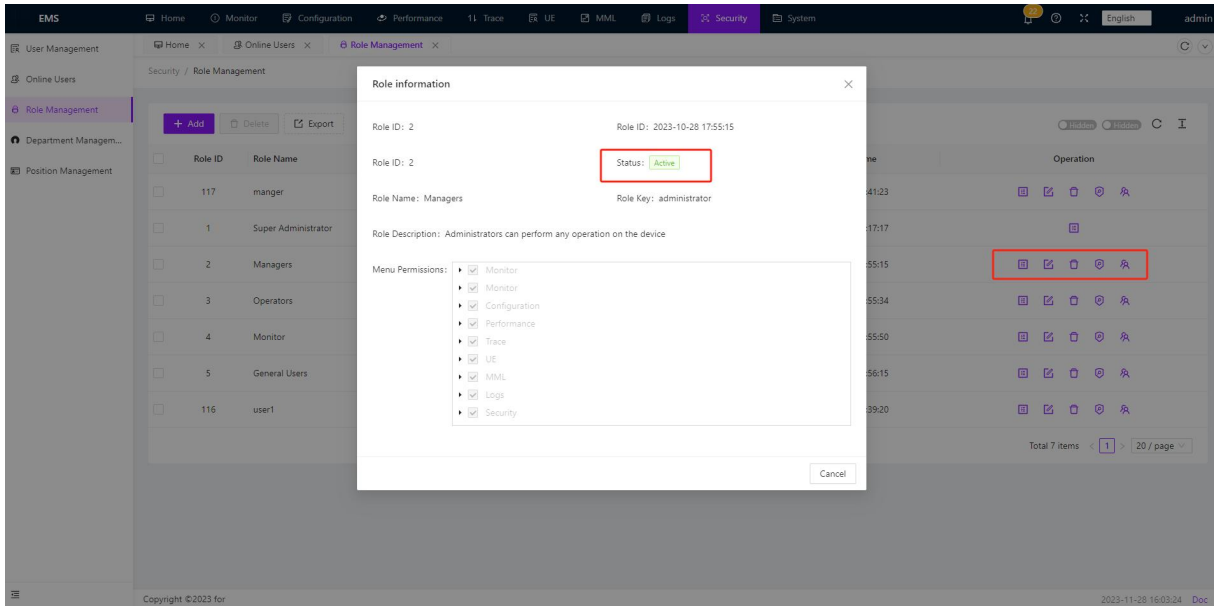
The operator can view role related information and perform operations such as adding, deleting, and modifying. The operator can also add role permission sets:



Add role information and assign different menu permissions to different roles as needed:



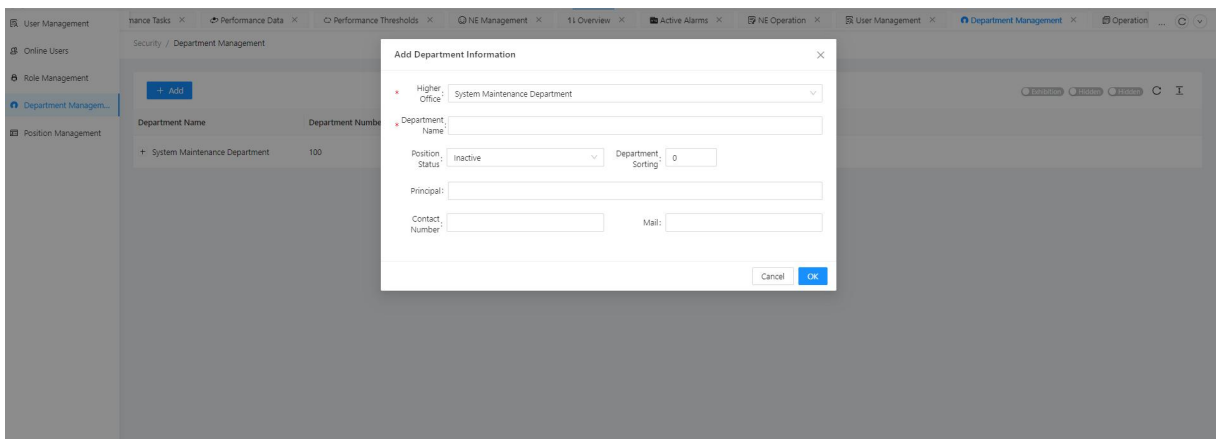
On the right side of the character name, the operator can view the specific menu permissions for each role and perform modification and deletion operations:

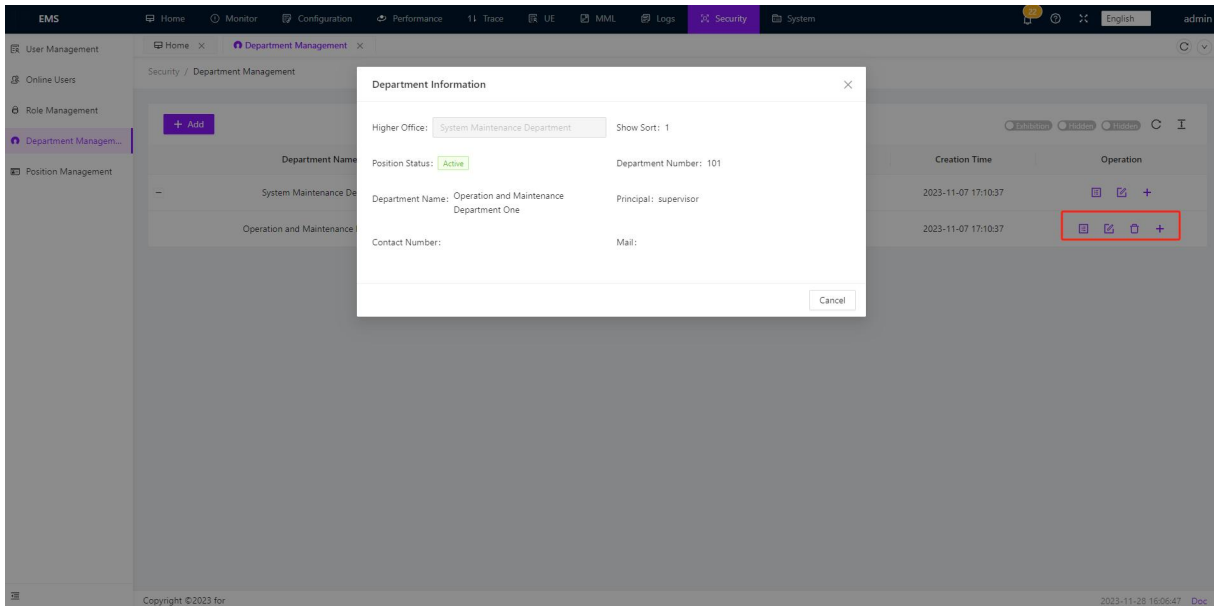


3.9.4 Department Management

Department management is used to organize and classify users in the core network. Administrators can create and manage different departments and assign users to different departments. With department management, you can easily divide and manage the rights of different departments and users, making permission control more flexible and orderly.

The operator can see the department categories, create different departments as needed, and assign different departments to different users:

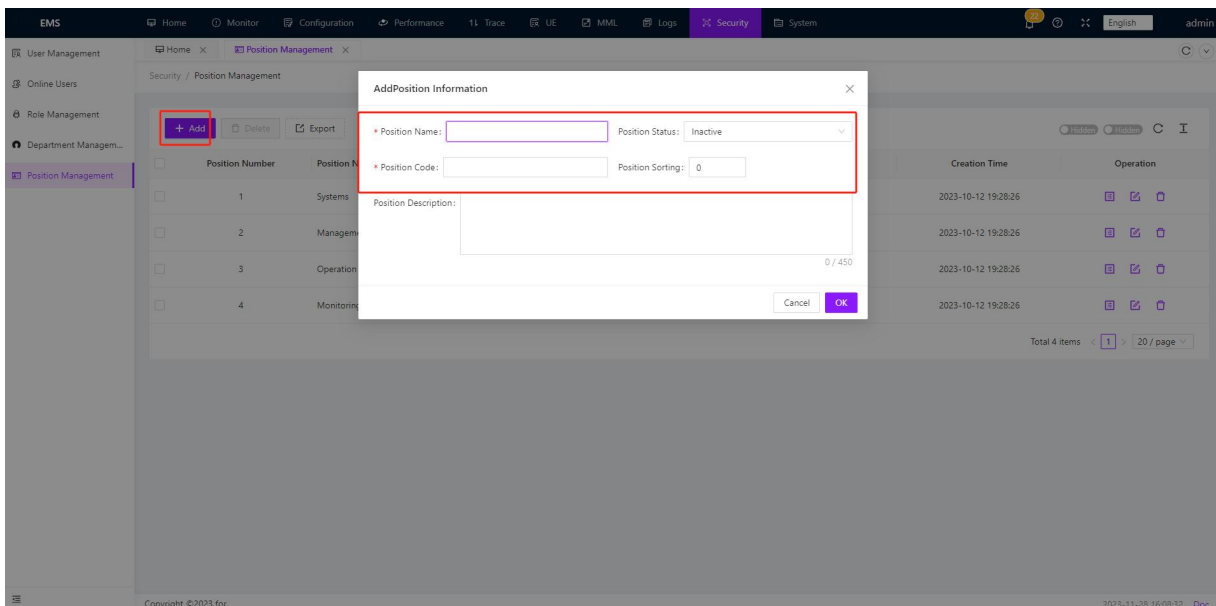




3.9.5 Position Management

Position management is to manage the duties or positions of the core network users. Administrators can create and manage different jobs and assign users to corresponding jobs. Post management can help realize the division of responsibilities and authority of users, so as to better manage the security and operation of the core network.

The operator can see different position names and search, add, delete, and modify positions:



3.10 System

Core network system management refers to the management and maintenance of the functions and configurations of the core network system. It mainly includes scheduling tasks, cache information, system information, menu management, dictionary management, parameter setting, system setting, and so on.

With core network system management, administrators can flexibly configure and manage core network systems to meet service requirements and improve system availability and security. Administrators can customize configurations based on actual conditions to ensure stable running and efficient maintenance of the system.

3.10.1 System Information

System information management is another key component of core network system management. Through system information management, administrators can easily access critical performance metrics and hardware status of the system. Here are the system information that may be involved in core network management:

1. System Information: This part includes basic data such as the type of operating system, version, system boot time, current number of online users, and the overall health status of the system. It provides administrators with a high-level overview of the system, helping in making daily operational decisions.

2. CPU Information: The performance of the processor directly affects the efficiency of the core network system. System information management needs to display data such as CPU model, number of cores, usage rate, and temperature. By monitoring CPU usage in real-time, administrators can promptly identify and resolve potential bottleneck issues that may affect system performance.

3. Memory Information: Memory information management includes overall memory capacity, current usage, cache and buffer occupancy, and memory swapping. Memory leaks or resource constraints can be detected through this information, ensuring that the system does not suffer performance degradation due to insufficient memory.

4. Time Information: Accurate system time is crucial for logging, task scheduling, and multi-device collaboration. System information management will display the current system time, time synchronization status, and connection status with the time server.

5. Network Information: Information that manages the system's network performance and connection status, including network card status, IP addresses, data packet transfer rates, network latency, and the usage status of various network protocols. This helps ensure stable and reliable network connections, as well as timely detection and handling of network-related issues.

6. Disk Information: Storage status is equally important for core network systems. System information management needs to include disk usage, file system type, read/write rates, and available space. Proper disk management can prevent system problems caused by insufficient storage space.

System information management is usually displayed through a centralized dashboard or console, which allows real-time monitoring of each of the above sections and provides intuitive charts and warning mechanisms for administrators to easily identify and resolve potential issues. In addition, long-term tracking and analysis of historical performance data help in planning future resource needs and system upgrades.

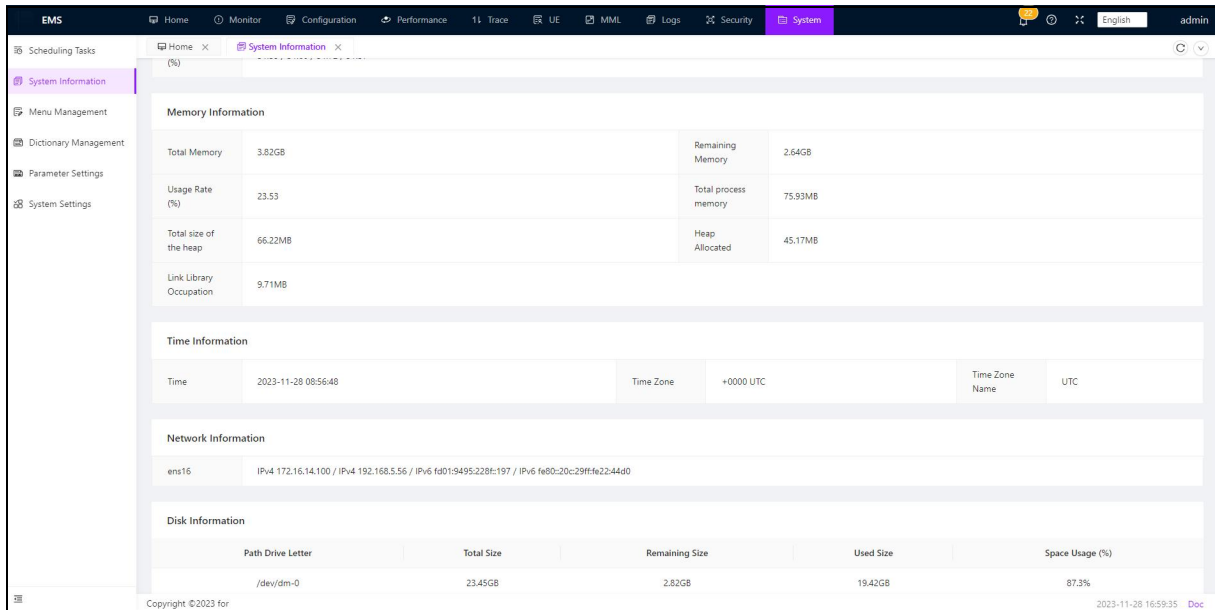
The screenshot displays the EMS System Information dashboard. The interface includes a top navigation bar with tabs for Home, Monitor, Configuration, Performance, Trace, UE, MML, Logs, Security, and System. A left sidebar contains menu items like System Information, Menu Management, Dictionary Management, Parameter Settings, and System Settings. The main content area is titled 'System / System Information' and contains three sections: System Information, CPU Information, and Memory Information.

System Information			
Running Platform	ubuntu	Platform Version	22.04
System Platform	linux	System Architecture	x86_64
Host Name	omc	Running Time	1Day 7Hour 52Minute 43Second

CPU Information	
Model	Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
Rate HZ	2394MHz
Number of Cores	4
Usage Rate (%)	31.59 / 31.60 / 31.72 / 31.57

Memory Information			
Total Memory	3.82GB	Remaining Memory	2.64GB
Usage Rate (%)	23.53	Total process memory	75.95MB

Copyright ©2023 for 2023-11-28 16:59:20 Dec



3.10.2 Menu Management

Menu management is a central feature in core network system management that allows administrators to customize and optimize user interface (UI) navigation to meet the specific needs of users and permission groups. Menu items in the management system are usually multi-level, providing paths and options to access various parts of the system. Good menu management can enhance user experience and simplify system operation processes.

Here are the functions of menu management:

1. **Add Menu Items:** Allows administrators to add new options or functions to the system menu. For example, if a new analysis tool or reporting feature is introduced, the administrator can add an entry for that tool under the appropriate menu category for users to access.
2. **Delete Menu Items:** When a function becomes obsolete or is no longer needed, administrators can remove related options from the menu, helping to avoid clutter on the interface and ensuring the relevance and simplicity of the user interface.
3. **Modify Menu Items:** To ensure the logic and user-friendliness of the menu, it is necessary to rename, reorder, or change the position of menu items in the menu structure from time to time. Menu management should allow administrators to make these adjustments easily.

4. Menu Item Permission Management: Grant users the ability to access specific menu items based on their roles and permissions. This means that some users may only see menu options necessary for their work, rather than all options in the system. This helps reduce the risk of errors and protect sensitive data.

5. Customize Menu Style: Allows customization of the menu's appearance, such as colors, fonts, and icons, to maintain consistency with the company's brand identity or simplify the user interface.

To efficiently manage menus, a visual drag-and-drop interface tool is very useful, allowing non-technical administrators to easily manage and organize the menu structure. Backup and restore functions for menu configuration files should also be provided in case errors occur during modification and a rollback to a previous version is needed. It is also essential to ensure the adaptability of menu management functions, meaning menus should remain clear and user-friendly on different devices and screen sizes, especially on mobile devices.

Menu Name	Menu Number	Menu Sort	Menu Icon	Permission ID	Component Path	Display Status	Menu Status	Creation Time	Operation
+ Monitor	2087	2	🕒			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ Configuration	4	3	⚙️			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ Performance	2099	5	📊			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ UE	5	7	📶			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ MML	2107	8	📄			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ Logs	2089	9	📄			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ Security	2113	14	🔒			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +
+ System	1	16	📄			Show	Active	2023-11-15 06:13:20	🔍 📄 🗑️ +

3.10.3 Scheduling Tasks

Task scheduling management is an important aspect of core network system management, allowing network administrators to automate repetitive tasks, ensuring the system runs smoothly while reducing manual intervention. An efficient scheduling system can perform a variety of tasks on schedule, ensuring optimal resource utilization and network stability.

In the initial setup, the following five scheduling tasks can be established.

ID	Name	Group	Invoke	Cron	Status	Log	Operation
1	Monitor-System Resources	System	monitor_sys_resource	0 0/5 * * * ?	Active	No Record	[Log] [Refresh] [Delete] [Add]
4	Delete expired NE etc backup file	System	delExpiredNeBackup	0 20 0 * * ?	Active	Recorded	[Log] [Refresh] [Delete] [Add]
5	Delete expired historical alarm	System	deleteExpiredRecord	0 10 0 * * ?	Active	Recorded	[Log] [Refresh] [Delete] [Add]
6	Delete expired KPI records	System	deleteExpiredRecord	0 15 0 * * ?	Active	Recorded	[Log] [Refresh] [Delete] [Add]
7	Network Element Configuration Auto Backup Task	System	backupEtcFromNE	0 30 0 * * ?	Active	Recorded	[Log] [Refresh] [Delete] [Add]
8	Delete Expired NE State Record	System	deleteExpiredRecord	0 25 0 * * ?	Active	Recorded	[Log] [Refresh] [Delete] [Add]
9	Get state from NEs	System	getStateFromNE	0/10 * * * * ?	Active	No Record	[Log] [Refresh] [Delete] [Add]
10	Network Element Health Check	System	genNeStateAlarm	0/5 * * * * ?	Active	No Record	[Log] [Refresh] [Delete] [Add]

Monitoring - System Resources: This item is for collecting CPU/IO/Word resources, which can be used to view and modify the average interval 5-minute resource status of the system. After clicking on the log on the right side of the task, you can view the specific refresh time of the system resources each time, also you can modify them.

Delete expired network element backup files: This option allows you to view and modify the time of the expired network element ETC backup files. After reaching the time, record and delete them. The parameter passed in indicates that the backup files will be retained for 60 days, with a deletion time of 0:20. Click on the log on the right to view the history of deleting expired network element backup files before

Delete expired historical alarm: This option allows you to view and modify the time of the expired historical alarm records. Once the time is reached, the records will be deleted. The parameter duration: 90 is passed in to retain the historical alarm records for 90 days, with a deletion time of 0:10. Click on the log on the right to view the history of deleting expired alarm records before.

Delete expired KPI records: This option allows you to view and modify the time of the expired gold indicator record. Once the time is reached, the record will be deleted. Duration: 15 indicates that the gold indicator record will be retained for 15 days, and the deletion time is 0:15 after 39 days. Click on the log on the right to view the history of deleting gold indicator records before.

Network element configuration automatic backup task: The automatic backup time of the network element can be viewed and modified. In the Cron expression in the figure, "0 30 0 * *?" indicates that the backup is performed at 0:30 every day. Backup history can be viewed in the scheduling log.

Delete expired network element status records: This task aims to regularly clean up expired network element status records stored in the database to ensure data cleanliness and efficiency. Expired network element status records may occupy a significant amount of storage space and lead to inaccuracies in data analysis and queries. By regularly deleting expired network element status records, the database load can be reduced, improving system performance and data accuracy.

Obtain network element status information: This task is responsible for periodically obtaining status information of various network elements in the core network, including but not limited to device operational status, connection status, resource utilization, etc. Obtaining and real-time monitoring network element status information can help operations personnel promptly identify device failures or anomalies, enabling them to take appropriate measures for fault resolution or performance optimization, ensuring the stable operation of the network.

Network element health status inspection: This task aims to periodically inspect the health status of various network elements in the core network to assess device operation and performance. Inspection content includes checks on hardware status, software operation, interface connectivity, as well as the collection and analysis of performance parameters. Through network element health status inspections, potential fault risks and performance bottlenecks can be identified, allowing for proactive prevention and maintenance work to ensure the healthy and stable operation of core network devices.

Task scheduling management also requires a user-friendly interface to allow administrators to easily create, configure, monitor, and manage these tasks. It should provide logging functionality to review the historical operation of each task. Additionally, notifications of task execution results are essential to ensure administrators can promptly understand task execution status and intervene when necessary.

3.10.4 Parameter Settings

The parameter setting function is a key part of managing any core network system, allowing administrators to configure and maintain various parameters that the system

relies on to operate. Its flexibility is crucial for being able to adjust the system to meet the specific needs of the organization. Parameters can be divided into several main categories: user management, system settings, and monitoring.

1. User Management:

- Initial Account Password: Defines the default password assigned when a user creates an account.
- Maximum Password Error Attempts: Sets the maximum number of attempts for entering the password incorrectly.
- Password Lock Time: The duration for which the account is locked after exceeding the password input limit.
- Self-Service Account - Verification Code Switch: Enables or disables the verification code function to enhance login security.
- Self-Service Account - Enable User Registration Function: Determines whether users are allowed to register their accounts.
- Self-Service Account - Verification Code Type: Defines the type of verification code.

2. System Settings:

- Official Website Link: Sets the link to the organization's official website.
- System Usage Documentation: Specifies the location or link to the system usage instructions document.
- Logo Type: Selects the type of system logo (e.g., icon or brand).
- Logo File - Icon: Uploads and manages the logo file used as a system icon.
- Logo File - Brand: Uploads and manages the logo file used as a brand identifier.
- Login Screen Background: Sets the background image or color of the login screen.
- System Name: Configures the system name displayed on the interface.
- Copyright Statement: Inputs system copyright information and declaration text.
- Internationalization Switch: Enables internationalization switching for versions.
- Default Language for Internationalization: Sets the default language version after internationalization.

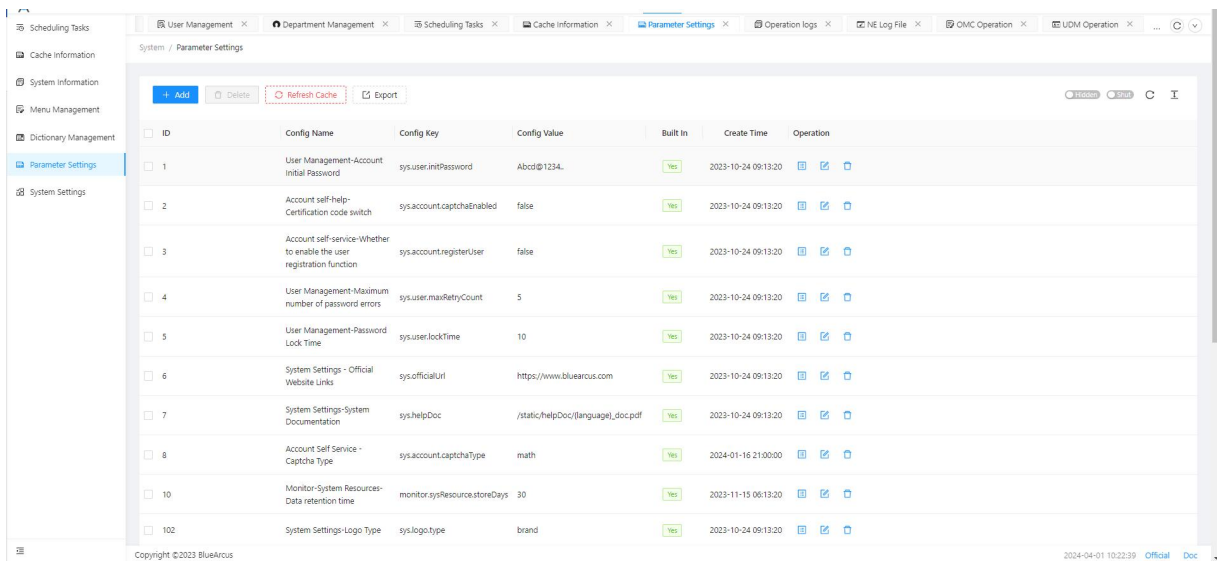
- System Settings - Screen Lock Timeout Duration: Sets the screen lock timeout duration for the OMC network management system, in seconds, when there is no activity.

3. Monitoring:

- System Resources - Data Retention Period: Sets the retention period for system monitoring data.

For these parameters, administrators typically need the following functions:

- Modify and Save: Change parameter values and save updates.
- Permission Management: Ensure that only users with appropriate permissions can modify critical parameters.
- History Records and Tracking: Track parameter change history and audit modification operations.
- Import/Export Configuration: Allow administrators to backup parameter configurations or quickly restore parameter settings from a configuration file.



3.10.5 System Settings

In a network management operating system, the "System Settings" is a crucial module that offers a range of configuration options, allowing administrators to personalize the system to meet specific needs and preferences. These settings impact the system's appearance, behavior, access permissions, and user experience. Typically, only administrators have access to this section to ensure system stability and security.

The goal of system settings is to provide enough flexibility so that administrators can adjust and maintain the system without compromising overall performance and user experience.

System settings can involve modifying the system logo, changing the system name, copyright statement, login interface, system usage documentation, and official website link.

- **Modify System Logo:** This function allows administrators to upload a new logo image to replace the existing one on the system interface. This feature usually supports common image formats (e.g., .jpg, .png) and may have requirements for image size and resolution to ensure compatibility and visual effect across different devices and resolutions.

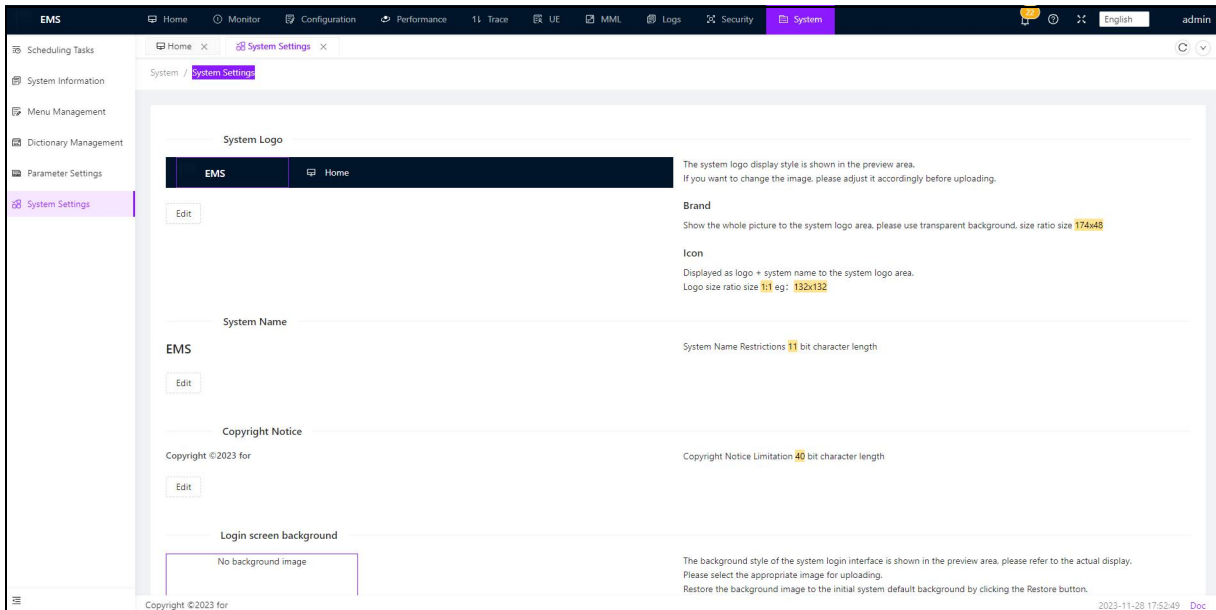
- **Change System Name:** This option enables administrators to modify the display name of the system, which will appear in the browser's title bar, login interface, the top of the system interface, and possible system notification emails. Through this setting, administrators can customize the system name to align with the organization's or company's brand.

- **Copyright Statement:** Here, administrators can edit and update the copyright information at the bottom of the system to ensure that the copyright statement is up-to-date and accurate. It typically includes the copyright symbol, year, and the name of the company or individual holding the copyright.

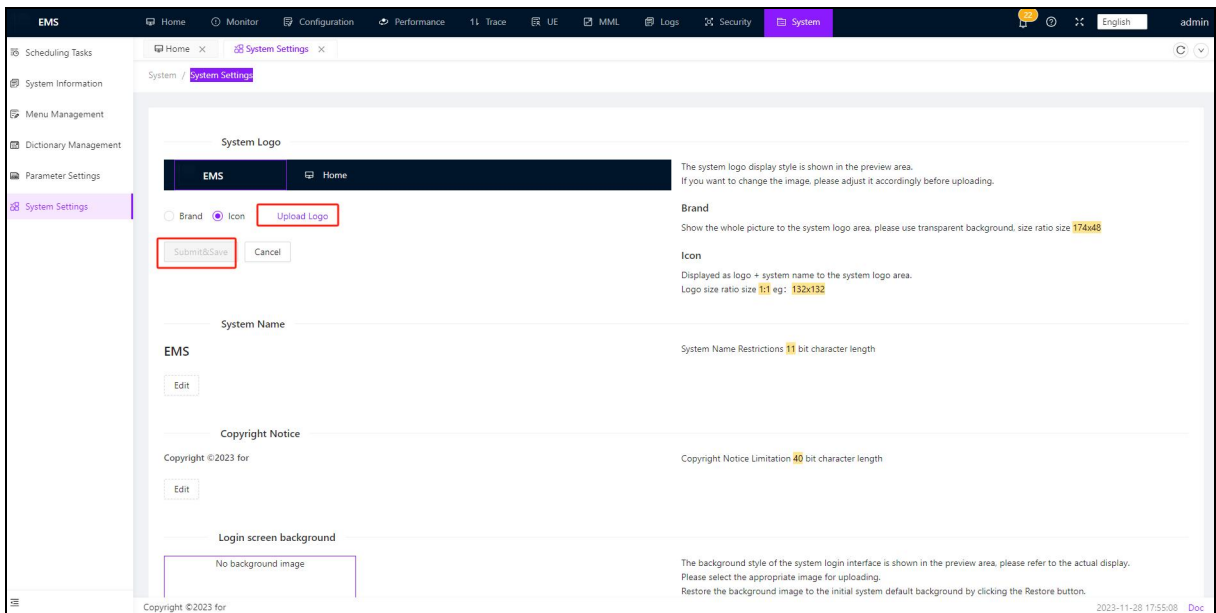
- **Login Interface:** System settings may provide options for administrators to customize the appearance of the login interface, such as changing the background image or color, adjusting the layout, or adding additional information.

- **System Usage Documentation and Official Website Link:** Administrators can set the link to the system usage manual document here so that users can access it directly through the system. Additionally, if there is an official website or support community, relevant links can also be set in this section for user convenience.

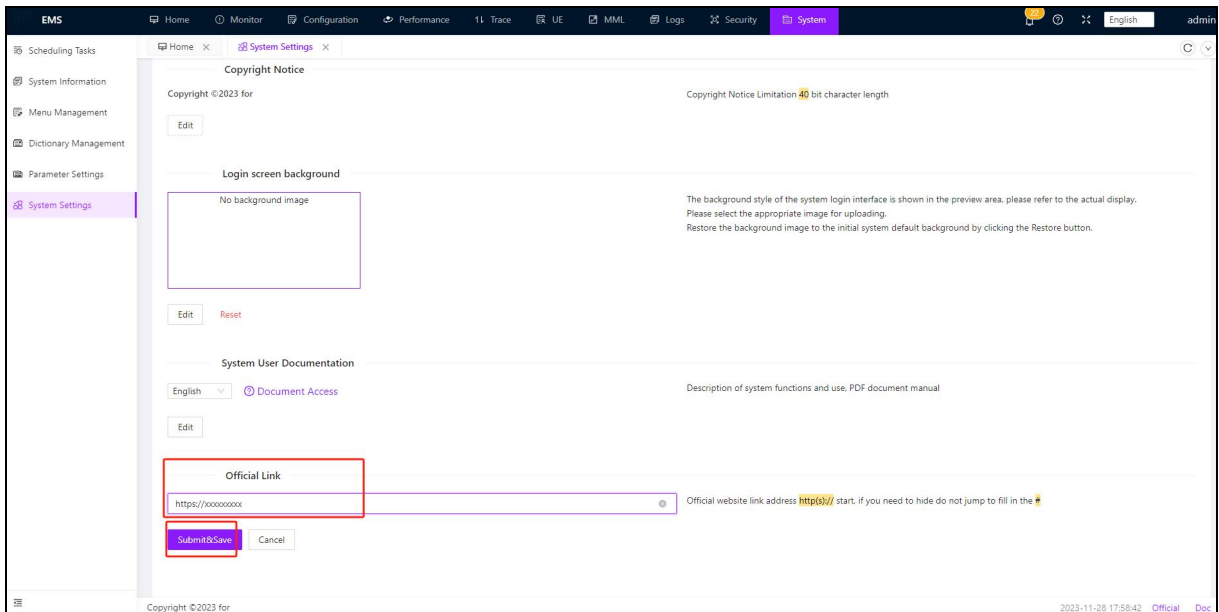
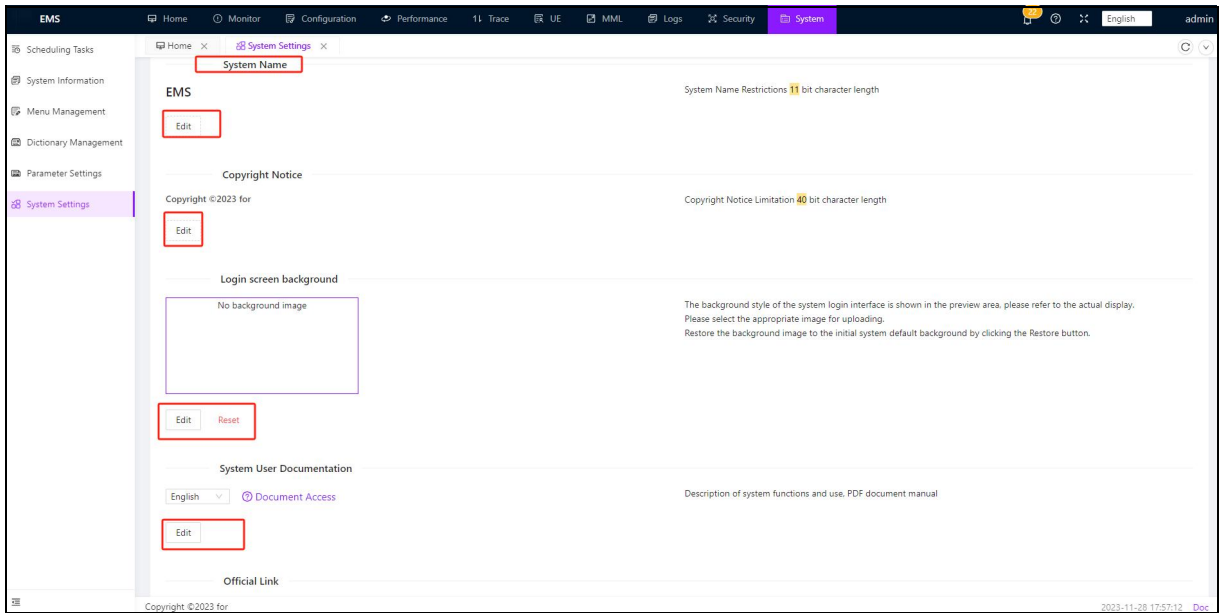
- **Internationalization Switch:** Administrators can set internationalization language switching here, determining whether to display internationalization switching.



The operator can change the system logo by clicking "Edit"->"Upload Logo", selecting the logo image, and then clicking "Submit&Save" to change the logo



Below, The operator can modify the system name, modify the copyright statement, modify the background of the login interface, click edit and modify, and then click submit and save:



4 How to get help

You can contact our technical support and after-sales by phone or email.

5 The practices and principles of after-sales service for this software system

After the software is handed over to the user, our company will provide support and track after-sales service in accordance with the contract agreement. If there is no agreement, we will provide after-sales service in accordance with the relevant national

product regulations.

6 Frequently Asked Questions and Answers

SN	Problem	Solution
1	Partial browser operation and display abnormalities	Suggest using Google Chrome browser or Microsoft Edge (chrome kernel) version; Clear browser cache.
2	The network element cannot be added successfully	Check if the OAM configuration switch on the network element side is turned on
3	Core network function configuration operation	Refer to 5GC maintenance manual

7 Copyright Statement

This manual is the intellectual property of our company and is protected by law. No individual or company may engage in illegal piracy. The core network software products described in the manual are the intellectual property of our company and are protected by law. No individual or company may engage in illegal piracy and use.