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

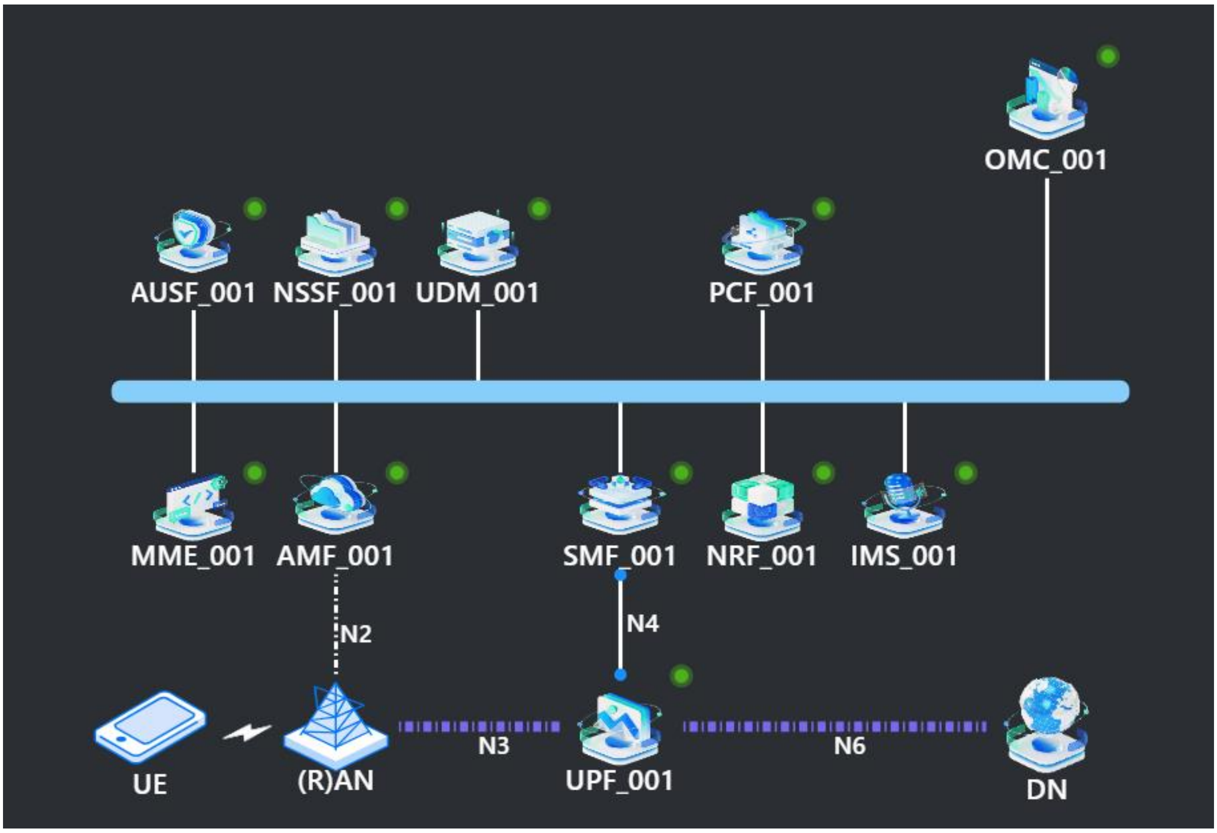
The software is shipped with the hardware and has been installed and tested before the delivery, or you can check the installation guide from OMC User Manual

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.

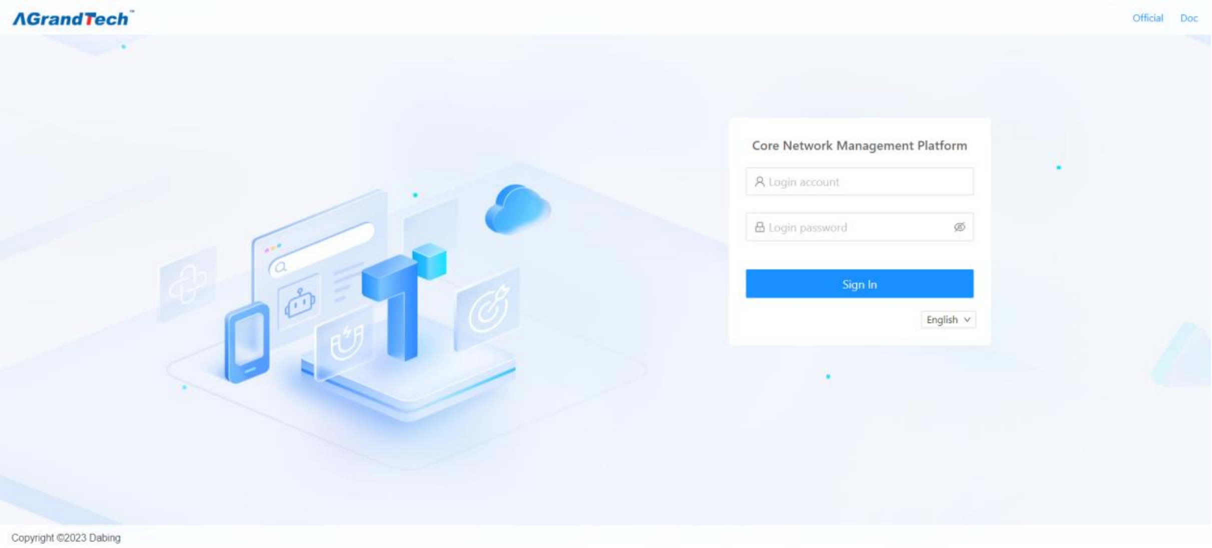
11. MME functions

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

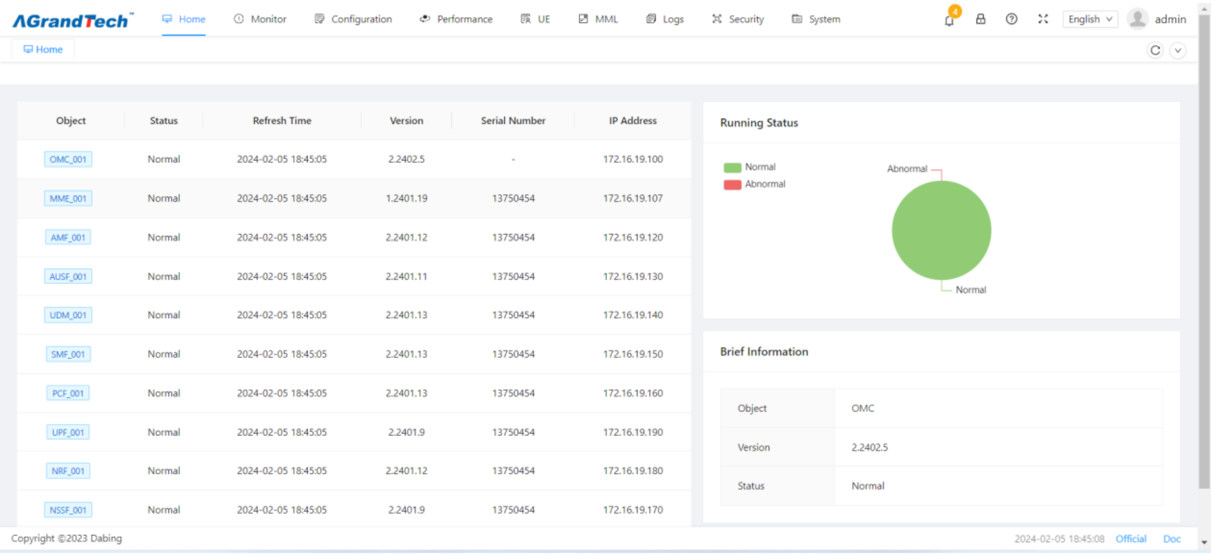
In the browser address bar, enter “http://<OMC Network Management IP>”to access the web management interface. The login interface is shown in the following figure



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:



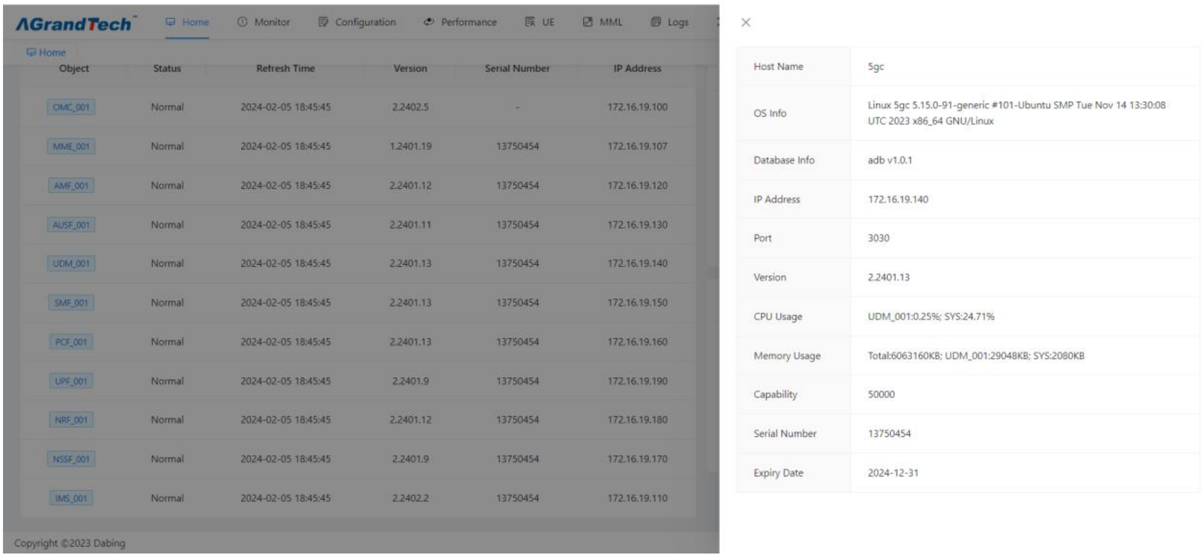
Object	Status	Refresh Time	Version	Serial Number	IP Address
OMC_001	Normal	2024-02-05 18:45:05	2.2402.5	-	172.16.19.100
MME_001	Normal	2024-02-05 18:45:05	1.2401.19	13750454	172.16.19.107
AMF_001	Normal	2024-02-05 18:45:05	2.2401.12	13750454	172.16.19.120
AUSF_001	Normal	2024-02-05 18:45:05	2.2401.11	13750454	172.16.19.130
UDM_001	Normal	2024-02-05 18:45:05	2.2401.13	13750454	172.16.19.140
SMF_001	Normal	2024-02-05 18:45:05	2.2401.13	13750454	172.16.19.150
PCF_001	Normal	2024-02-05 18:45:05	2.2401.13	13750454	172.16.19.160
UPF_001	Normal	2024-02-05 18:45:05	2.2401.9	13750454	172.16.19.190
NRF_001	Normal	2024-02-05 18:45:05	2.2401.12	13750454	172.16.19.180
NSSF_001	Normal	2024-02-05 18:45:05	2.2401.9	13750454	172.16.19.170

Brief Information

Object	OMC
Version	2.2402.5
Status	Normal

- 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 and memory usage and validity period, operating system, database, IP, port, user capacity etc.

The network element status display will refresh every 10 seconds:



Object	Status	Refresh Time	Version	Serial Number	IP Address
OMC_001	Normal	2024-02-05 18:45:45	2.2402.5	-	172.16.19.100
MME_001	Normal	2024-02-05 18:45:45	1.2401.19	13750454	172.16.19.107
AMF_001	Normal	2024-02-05 18:45:45	2.2401.12	13750454	172.16.19.120
AUSF_001	Normal	2024-02-05 18:45:45	2.2401.11	13750454	172.16.19.130
UDM_001	Normal	2024-02-05 18:45:45	2.2401.13	13750454	172.16.19.140
SMF_001	Normal	2024-02-05 18:45:45	2.2401.13	13750454	172.16.19.150
PCF_001	Normal	2024-02-05 18:45:45	2.2401.13	13750454	172.16.19.160
UPF_001	Normal	2024-02-05 18:45:45	2.2401.9	13750454	172.16.19.190
NRF_001	Normal	2024-02-05 18:45:45	2.2401.12	13750454	172.16.19.180
NSSF_001	Normal	2024-02-05 18:45:45	2.2401.9	13750454	172.16.19.170
IMS_001	Normal	2024-02-05 18:45:45	2.2402.2	13750454	172.16.19.110

Host Name	5gc
OS Info	Linux 5gc 5.15.0-91-generic #101-Ubuntu SMP Tue Nov 14 13:30:08 UTC 2023 x86_64 GNU/Linux
Database Info	adb v1.0.1
IP Address	172.16.19.140
Port	3030
Version	2.2401.13
CPU Usage	UDM_001:0.25%; SYS:24.71%
Memory Usage	Total:6063160KB; UDM_001:29048KB; SYS:2080KB
Capability	50000
Serial Number	13750454
Expiry Date	2024-12-31

3.3 Monitor

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.

Base Station 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.

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

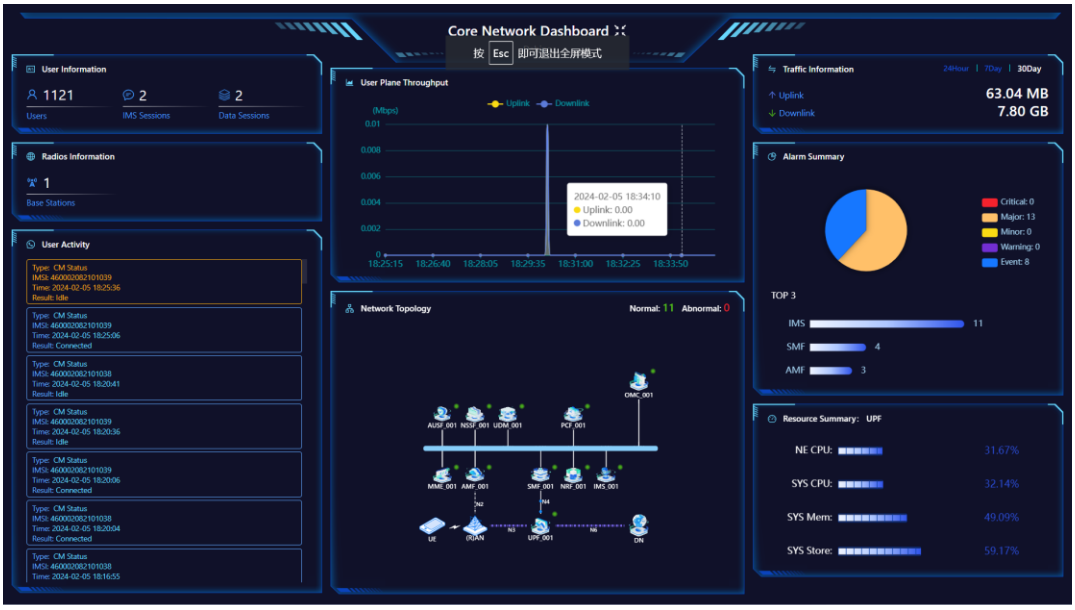
Network Topology: This module mainly displays the structure and composition of the core network, status information of each network element in the core network. Clicking on an element will show specific information such as the element's status, name, IP, version number, serial number, license expiration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

Traffic Information: 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 Statistics: 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.

Network Element Resource Status: 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.



Type: CM Status
IMSI: 460002082101039
Time: 2024-02-05 18:25:36
Result: Idle

Type: CM Status
IMSI: 460002082101039
Time: 2024-02-05 18:25:06
Result: Connected

Type: CM Status
IMSI: 460002082101038
Time: 2024-02-05 18:20:41
Result: Idle

Type: CM Status
IMSI: 460002082101039
Time: 2024-02-05 18:20:36
Result: Idle

Type: CM Status
IMSI: 460002082101039
Time: 2024-02-05 18:20:06
Result: Connected

Type: CM Status
IMSI: 460002082101038
Time: 2024-02-05 18:20:04
Result: Connected

Type: CM Status
IMSI: 460002082101038
Time: 2024-02-05 18:16:55

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
Critical	Critical	Services are affected.	The fault must be rectified

		Corrective measures must be taken immediately.	immediately. Otherwise, services may be interrupted or the system may break down.
Major	Major	Services are affected. If the fault is not rectified in a timely manner, serious consequences may occur.	Major alarms need to be handled in time. Otherwise, important services will be affected.
Minor	Minor	The impact on services is minor. Corrective measures are required to prevent serious faults.	You need to find out the cause of the alarm and rectify the fault.
Warning	Warning	Potential or imminent fault that affects services is detected, but services are not affected.	Warning alarms are handled based on network and NE running status.

Alarm status:

Status Name	Status	Description
Alarm Status	Confirm and Not Confirm	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.
Clear Status	Cleared and Uncleared	The initial clearance status is **Uncleared**. When a fault that causes an alarm is rectified, a clearance notification is automatically reported to Alarm Management and the clearance status changes to **Cleared**. For some alarms, clearance notifications cannot be automatically reported. You need to manually clear these alarms after corresponding faults are rectified. The background color of cleared alarms is green.

Event Alarm Types

Name	Description
Communication Alarm	A fault on the communication system, such as a network cable disconnection or network equipment fault.

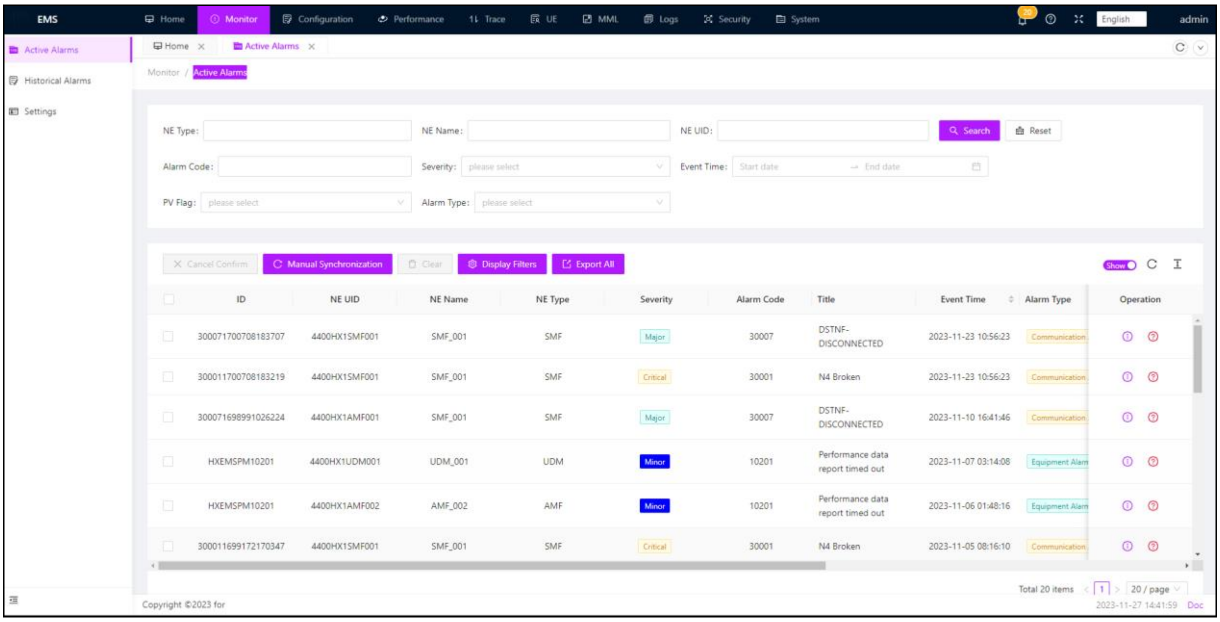
Equipment Alarm	A fault on the equipment
Processing Failure Alarm	An error or exception that occurs during processing, for example, the database is abnormal or the NE exits abnormally.
Environmental Alarm	A fault on the environment of the equipment room, such as a power supply fault or overheated CPU.
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

Active alarms include **Uncleared** and **Not Confirm** alarms, **Confirm** and **Uncleared** alarms, **Not Confirm** and **Cleared** 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.

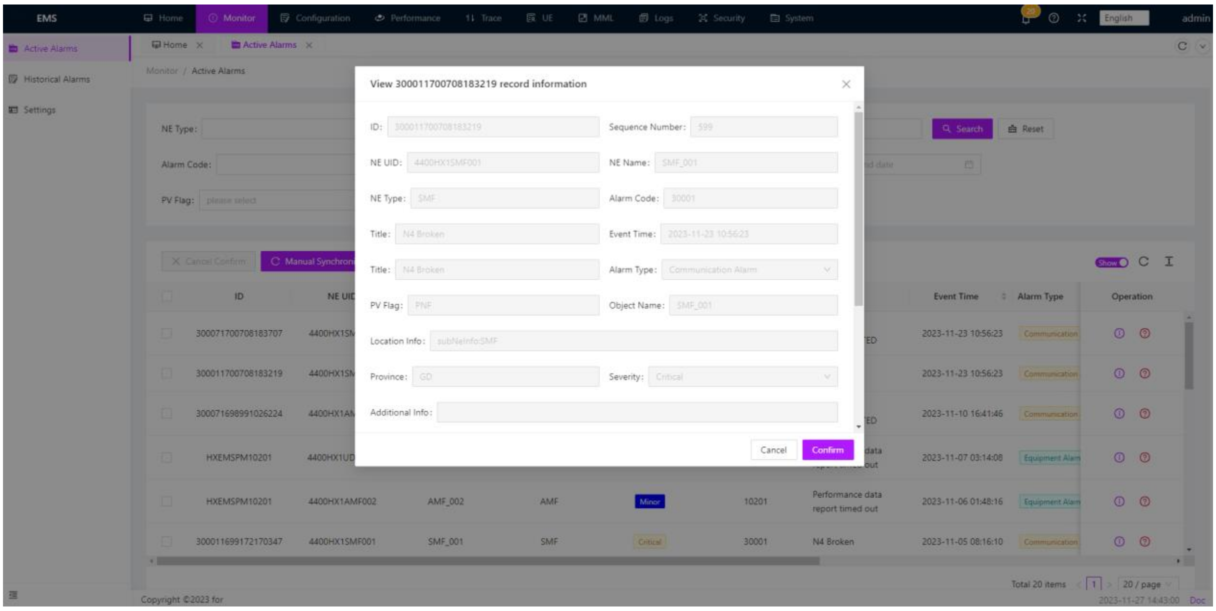
Current active alarm list：



NE Type:
NE Name:
NE UID:
Alarm Code:
Severity: please select
Event Time: Start date → End date
PV Flag: please select
Alarm Type: please select

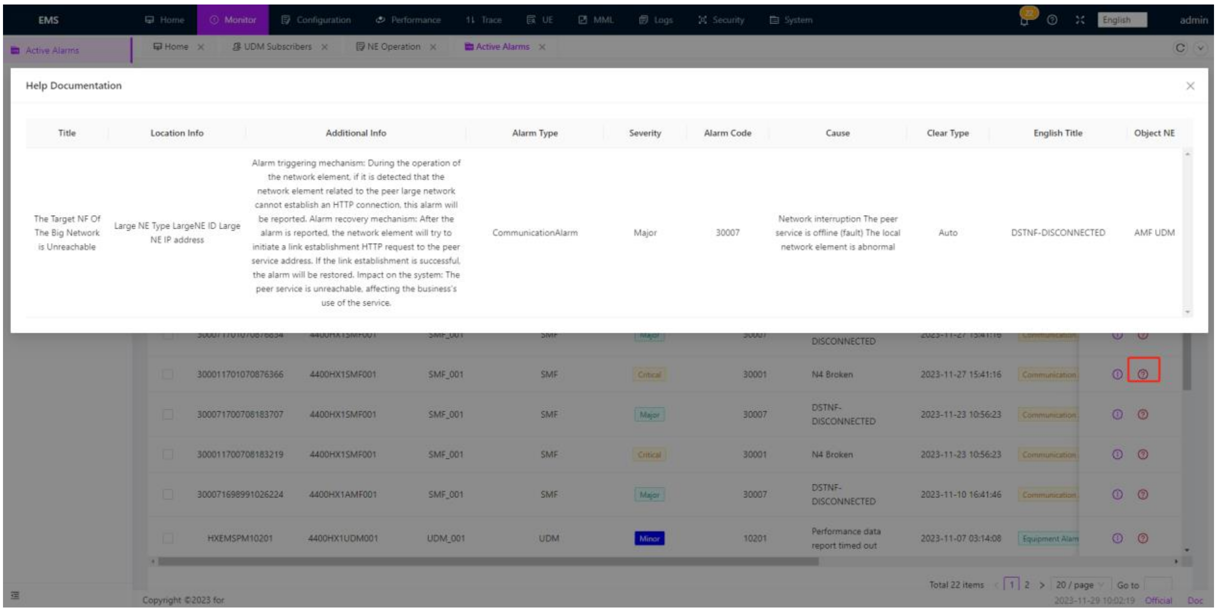
ID	NE UID	NE Name	NE Type	Severity	Alarm Code	Title	Event Time	Alarm Type	Operation
300071700708183707	4400HX1SMF001	SMF_001	SMF	Major	30007	DSTNF-DISCONNECTED	2023-11-23 10:56:23	Communication	
300011700708183219	4400HX1SMF001	SMF_001	SMF	Critical	30001	N4 Broken	2023-11-23 10:56:23	Communication	
300071698991026224	4400HX1AMF001	SMF_001	SMF	Major	30007	DSTNF-DISCONNECTED	2023-11-10 16:41:46	Communication	
HXEMSPM10201	4400HX1UDM001	UDM_001	UDM	Minor	10201	Performance data report timed out	2023-11-07 03:14:08	Equipment Alarm	
HXEMSPM10201	4400HX1AMF002	AMF_002	AMF	Minor	10201	Performance data report timed out	2023-11-06 01:48:16	Equipment Alarm	
300011699172170347	4400HX1SMF001	SMF_001	SMF	Critical	30001	N4 Broken	2023-11-05 08:16:10	Communication	

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.



View 300011700708183219 record information

ID:	300011700708183219	Sequence Number:	599
NE UID:	4400HX1SMF001	NE Name:	SMF_001
NE Type:	SMF	Alarm Code:	30001
Title:	N4 Broken	Event Time:	2023-11-23 10:56:23
Title:	N4 Broken	Alarm Type:	Communication Alarm
PV Flag:	PNF	Object Name:	SMF_001
Location Info:	subNeInfo:SMF		
Province:	GD	Severity:	Critical
Additional Info:			



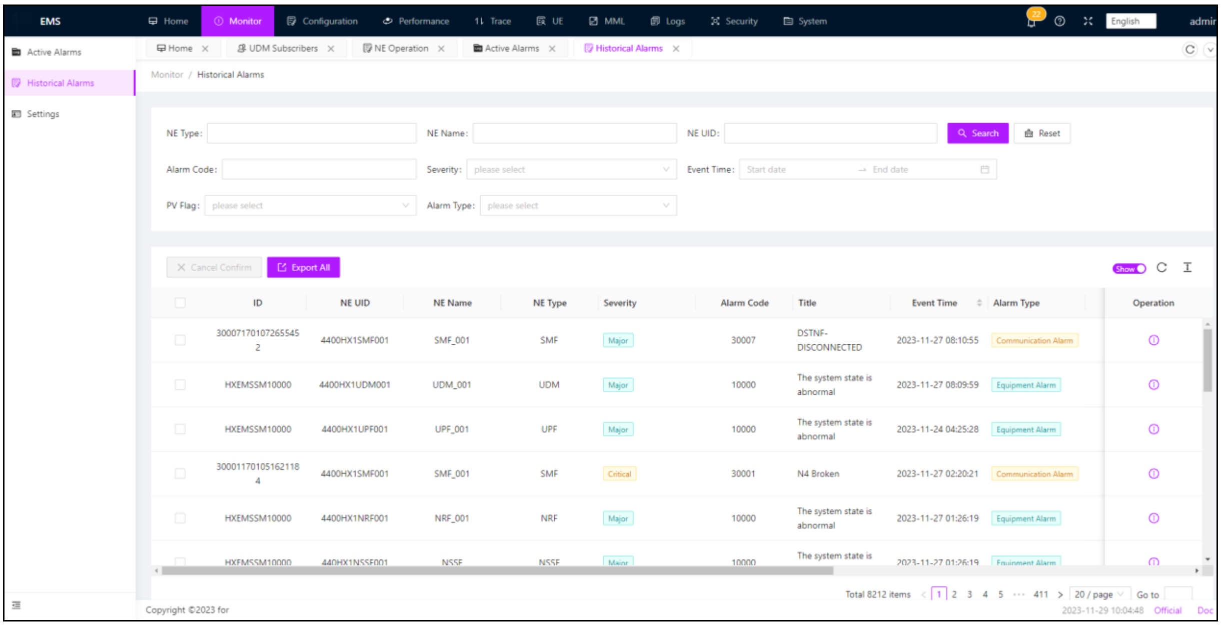
Help Documentation

Title	Location Info	Additional Info	Alarm Type	Severity	Alarm Code	Cause	Clear Type	English Title	Object NE
The Target NF Of The Big Network is Unreachable	Large NE Type LargeNE ID Large NE IP address	Alarm triggering mechanism: During the operation of the network element, if it is detected that the network element related to the peer large network cannot establish an HTTP connection, this alarm will be reported. Alarm recovery mechanism: After the alarm is reported, the network element will try to initiate a link establishment HTTP request to the peer service address. If the link establishment is successful, the alarm will be restored. Impact on the system: The peer service is unreachable, affecting the business's use of the service.	CommunicationAlarm	Major	30007	Network interruption The peer service is offline (fault) The local network element is abnormal	Auto	DSTNF-DISCONNECTED	AMF UDM

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.

If you have set the current alarm lifecycle, the Confirm and Cleared alarms are displayed on the **Current Alarms** page for a period of time. After the lifecycle ends, the Confirm and Cleared alarms are moved to the historical alarm list.



	ID	NE UID	NE Name	NE Type	Severity	Alarm Code	Title	Event Time	Alarm Type	Operation
□	300071701072655452	4400HX1SMF001	SMF_001	SMF	Major	30007	DSTNF-DISCONNECTED	2023-11-27 08:10:55	Communication Alarm	ⓘ
□	HXEMSSM10000	4400HX1UDM001	UDM_001	UDM	Major	10000	The system state is abnormal	2023-11-27 08:09:59	Equipment Alarm	ⓘ
□	HXEMSSM10000	4400HX1UPF001	UPF_001	UPF	Major	10000	The system state is abnormal	2023-11-24 04:25:28	Equipment Alarm	ⓘ
□	300011701051621184	4400HX1SMF001	SMF_001	SMF	Critical	30001	N4 Broken	2023-11-27 02:20:21	Communication Alarm	ⓘ
□	HXEMSSM10000	4400HX1NRF001	NRF_001	NRF	Major	10000	The system state is abnormal	2023-11-27 01:26:19	Equipment Alarm	ⓘ
□	HXEMSSM10000	440HX1NSSF001	NSSF	NSSF	Major	10000	The system state is	2023-11-27 01:26:19	Equipment Alarm	ⓘ

Total 8212 items < 1 2 3 4 5 ··· 411 > 20 / page Go to

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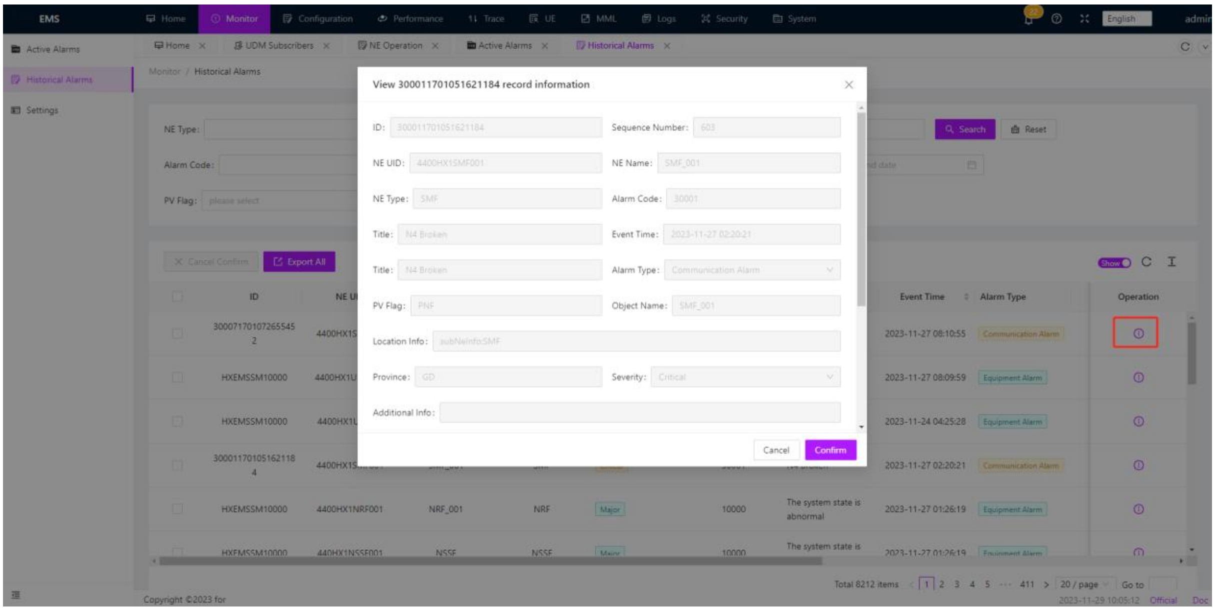
2023-11-29 10:04:48 Official Doc



View 300011701051621184 record information

ID: 300011701051621184
Sequence Number: 603
NE UID: 4400HX1SMF001
NE Name: SMF_001
NE Type: SMF
Alarm Code: 30001
Title: N4 Broken
Event Time: 2023-11-27 02:20:21
Title: N4 Broken
Alarm Type: Communication Alarm
PV Flag: PNF
Object Name: SMF_001
Location Info: subNeInfo:SMF
Province: GD
Severity: Critical
Additional Info:

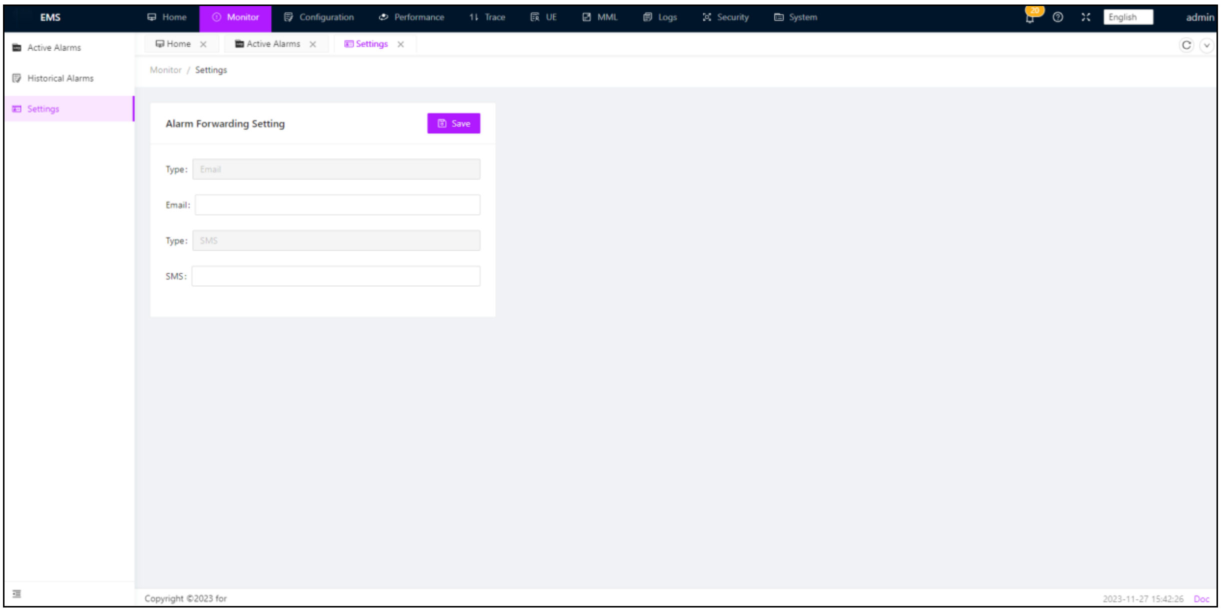
3.3.2.3 Settings

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.



Alarm Forwarding Setting

Type: Email

Email:

Type: SMS

SMS:

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.

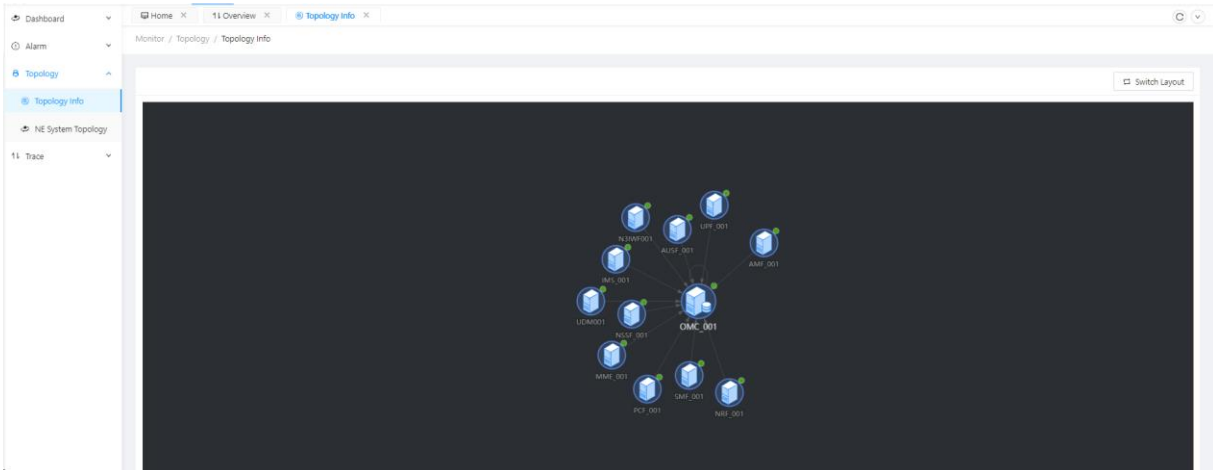
3.3.3.1 Topology Info

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.



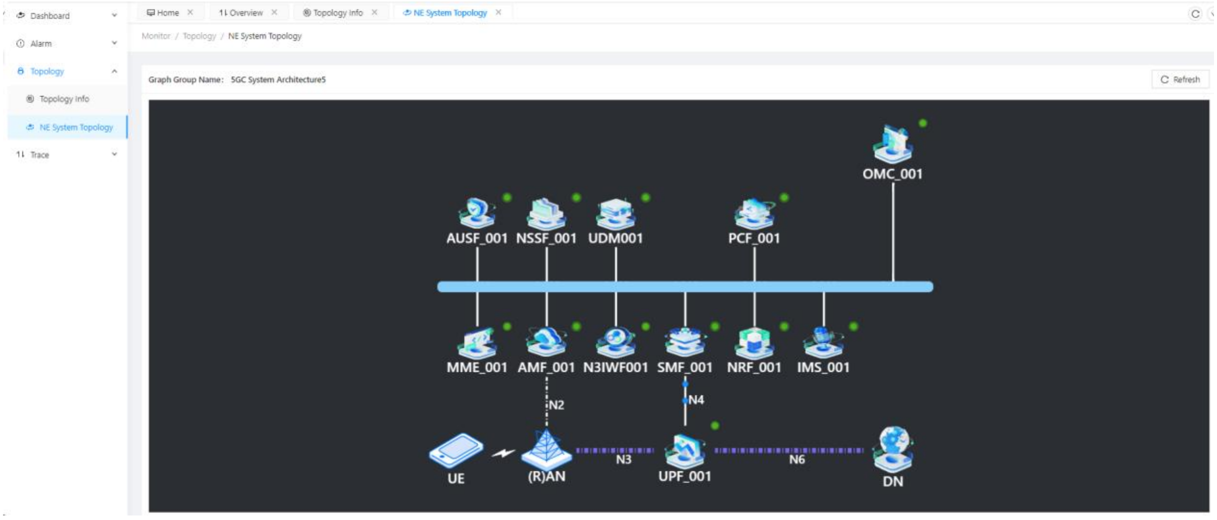
3.3.3.2 NE Topology

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.



Graph Group Name: 5GC System Architecture5

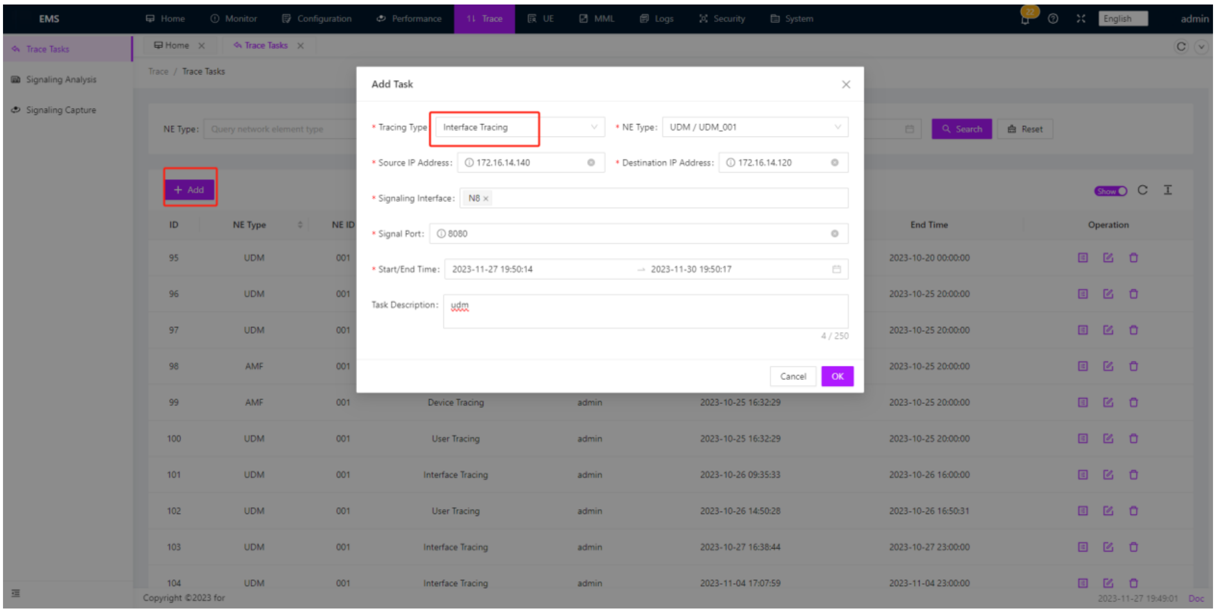
3.3.4 Trace

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 Trace Task

The trace task is the basis of the core network trace management and is used to monitor and analyze specific core network business processes. In trace management related to user data management (UDM), trace tasks can be classified into interface trace, device trace, and user trace.

Interface Tracing：



Add Task

* Tracing Type: Interface Tracing

* NE Type: UDM / UDM_001

* Source IP Address: 172.16.14.140

* Destination IP Address: 172.16.14.120

* Signaling Interface: N8

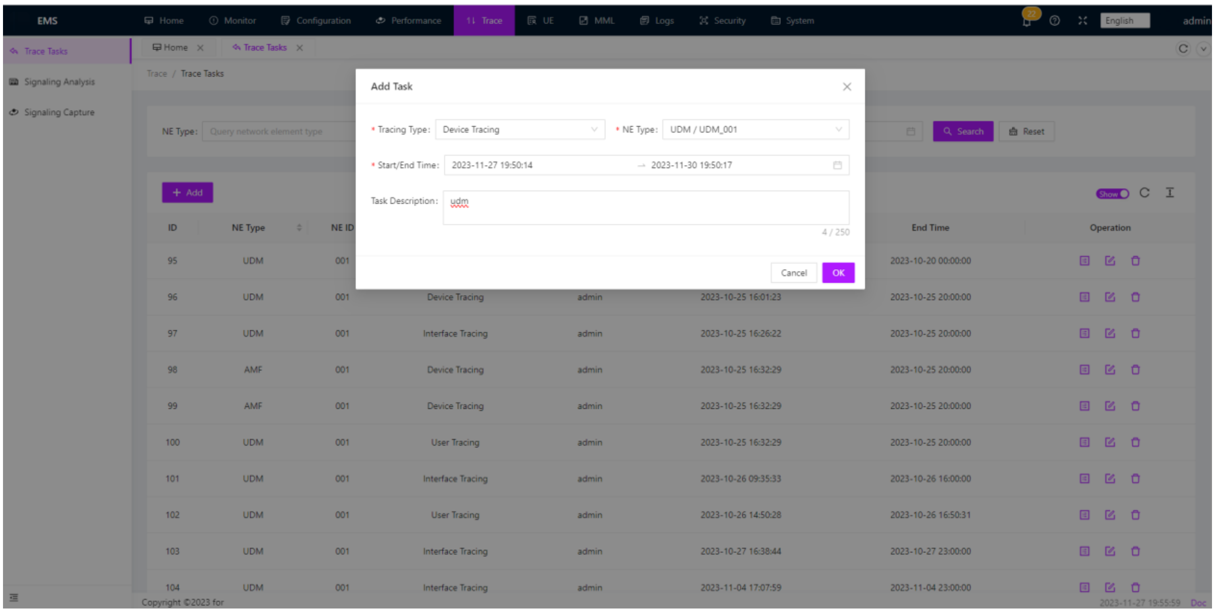
* Signal Port: 8080

* Start/End Time: 2023-11-27 19:50:14 → 2023-11-30 19:50:17

Task Description: udm

4 / 250

Device Tracing:



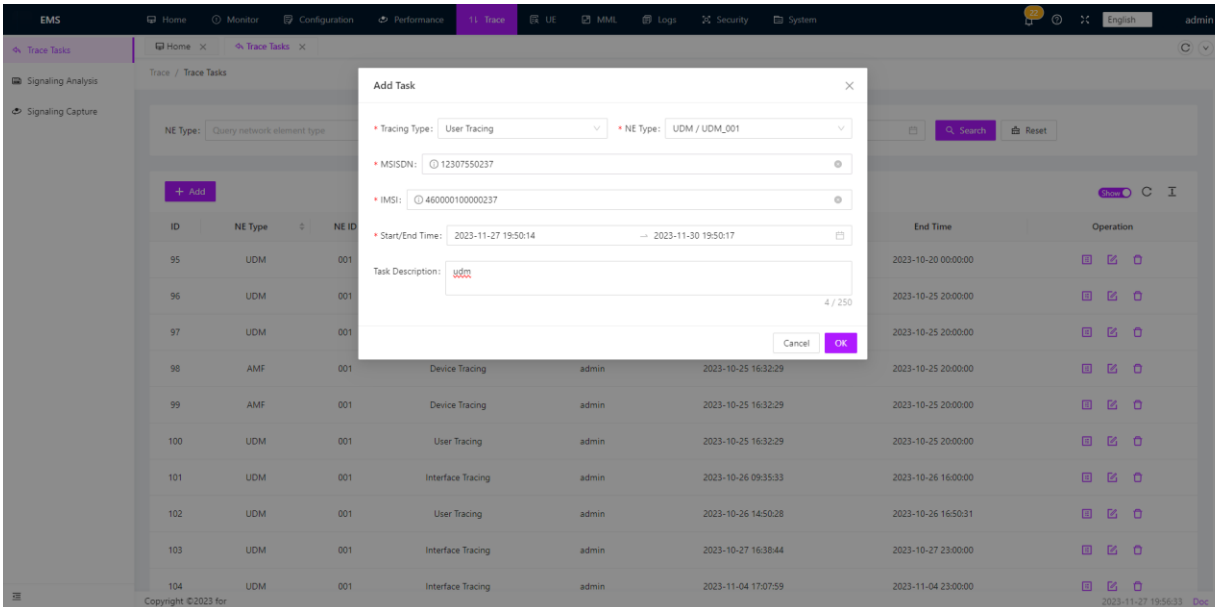
Add Task

- * Tracing Type: Device Tracing
- * NE Type: UDM / UDM_001
- * Start/End Time: 2023-11-27 19:50:14 → 2023-11-30 19:50:17
- Task Description: udm (4 / 250)

Cancel OK

ID	NE Type	NE ID				End Time	Operation
95	UDM	001				2023-10-20 00:00:00	
96	UDM	001	Device Tracing	admin	2023-10-25 16:01:23	2023-10-25 20:00:00	
97	UDM	001	Interface Tracing	admin	2023-10-25 16:26:22	2023-10-25 20:00:00	
98	AMF	001	Device Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
99	AMF	001	Device Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
100	UDM	001	User Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
101	UDM	001	Interface Tracing	admin	2023-10-26 09:35:33	2023-10-26 16:00:00	
102	UDM	001	User Tracing	admin	2023-10-26 14:50:28	2023-10-26 16:50:31	
103	UDM	001	Interface Tracing	admin	2023-10-27 16:38:44	2023-10-27 23:00:00	
104	UDM	001	Interface Tracing	admin	2023-11-04 17:07:59	2023-11-04 23:00:00	

User Tracing:



Add Task

- * Tracing Type: User Tracing
- * NE Type: UDM / UDM_001
- * MSISDN: 12307550237
- * IMSI: 460000100000237
- * Start/End Time: 2023-11-27 19:50:14 → 2023-11-30 19:50:17
- Task Description: udm (4 / 250)

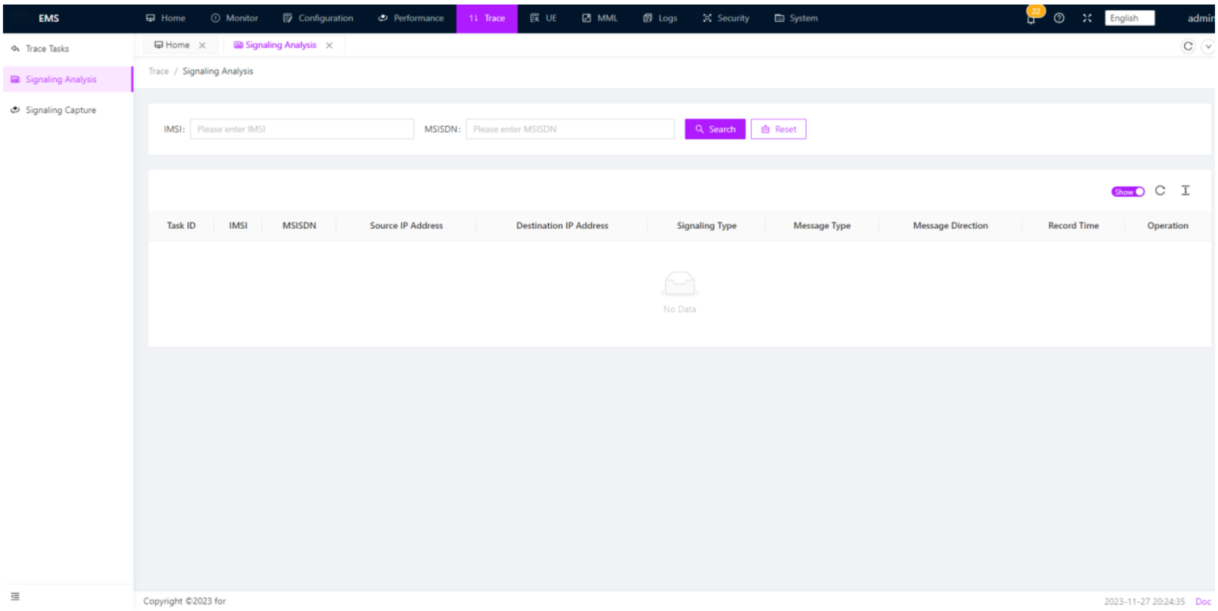
Cancel OK

ID	NE Type	NE ID				End Time	Operation
95	UDM	001				2023-10-20 00:00:00	
96	UDM	001				2023-10-25 20:00:00	
97	UDM	001				2023-10-25 20:00:00	
98	AMF	001	Device Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
99	AMF	001	Device Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
100	UDM	001	User Tracing	admin	2023-10-25 16:32:29	2023-10-25 20:00:00	
101	UDM	001	Interface Tracing	admin	2023-10-26 09:35:33	2023-10-26 16:00:00	
102	UDM	001	User Tracing	admin	2023-10-26 14:50:28	2023-10-26 16:50:31	
103	UDM	001	Interface Tracing	admin	2023-10-27 16:38:44	2023-10-27 23:00:00	
104	UDM	001	Interface Tracing	admin	2023-11-04 17:07:59	2023-11-04 23:00:00	

3.3.4.2 Signaling Analysis

Signaling analysis is to monitor and analyze signaling data transmitted by the core network in real time, and extract valuable information and indicators from it. By in-depth analysis of signaling data, you can discover network performance problems, faults, and anomalies in a timely manner, and provide references for fault diagnosis and performance optimization. (Remember to set the gtpUri as omc ip at

/usr/local/omc/etc/restconf.yaml and enable trace in udm at /usr/local/etc/udm/udmcfg.yaml)

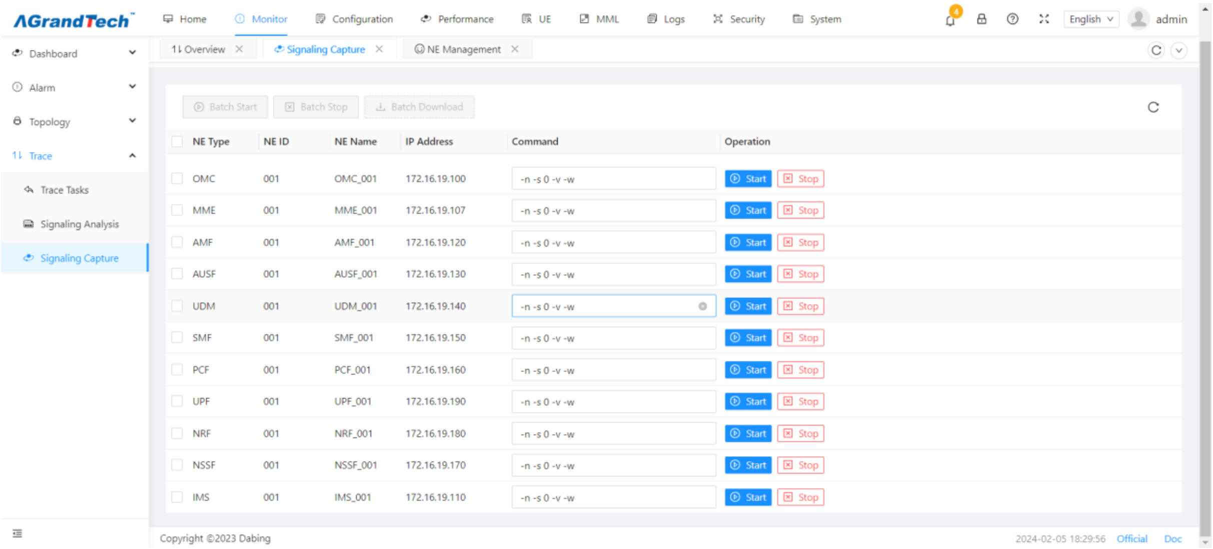


Task ID	IMSI	MSISDN	Source IP Address	Destination IP Address	Signaling Type	Message Type	Message Direction	Record Time	Operation

3.3.4.3 Signaling Capture

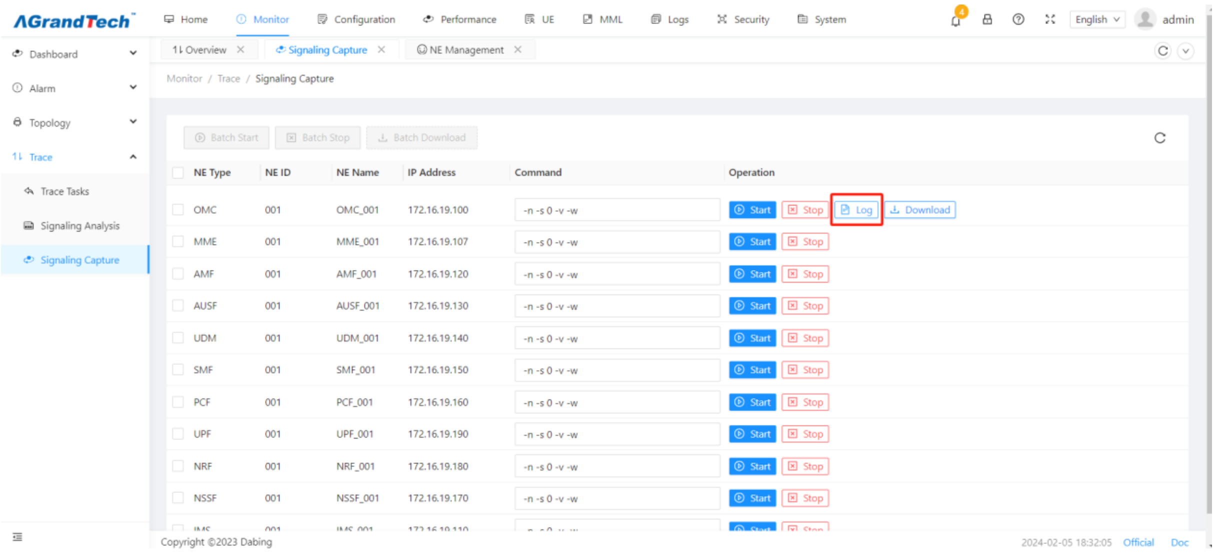
Signaling capture: Signaling capture refers to capturing and recording specific signaling traffic in the core network for subsequent analysis and debugging. Through signaling capture, the operator can conduct detailed inspection and analysis of the relevant signaling when there is a problem, help locate 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.



NE Type	NE ID	NE Name	IP Address	Command	Operation
OMC	001	OMC_001	172.16.19.100	-n -s 0 -v -w	Start Stop
MME	001	MME_001	172.16.19.107	-n -s 0 -v -w	Start Stop
AMF	001	AMF_001	172.16.19.120	-n -s 0 -v -w	Start Stop
AUSF	001	AUSF_001	172.16.19.130	-n -s 0 -v -w	Start Stop
UDM	001	UDM_001	172.16.19.140	-n -s 0 -v -w	Start Stop
SMF	001	SMF_001	172.16.19.150	-n -s 0 -v -w	Start Stop
PCF	001	PCF_001	172.16.19.160	-n -s 0 -v -w	Start Stop
UPF	001	UPF_001	172.16.19.190	-n -s 0 -v -w	Start Stop
NRF	001	NRF_001	172.16.19.180	-n -s 0 -v -w	Start Stop
NSSF	001	NSSF_001	172.16.19.170	-n -s 0 -v -w	Start Stop
IMS	001	IMS_001	172.16.19.110	-n -s 0 -v -w	Start Stop

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.



NE Type	NE ID	NE Name	IP Address	Command	Operation
OMC	001	OMC_001	172.16.19.100	-n -s 0 -v -w	Start Stop Log Download
MME	001	MME_001	172.16.19.107	-n -s 0 -v -w	Start Stop
AMF	001	AMF_001	172.16.19.120	-n -s 0 -v -w	Start Stop
AUSF	001	AUSF_001	172.16.19.130	-n -s 0 -v -w	Start Stop
UDM	001	UDM_001	172.16.19.140	-n -s 0 -v -w	Start Stop
SMF	001	SMF_001	172.16.19.150	-n -s 0 -v -w	Start Stop
PCF	001	PCF_001	172.16.19.160	-n -s 0 -v -w	Start Stop
UPF	001	UPF_001	172.16.19.190	-n -s 0 -v -w	Start Stop
NRF	001	NRF_001	172.16.19.180	-n -s 0 -v -w	Start Stop
NSSF	001	NSSF_001	172.16.19.170	-n -s 0 -v -w	Start Stop
IMS	001	IMS_001	172.16.19.110	-n -s 0 -v -w	Start Stop

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.

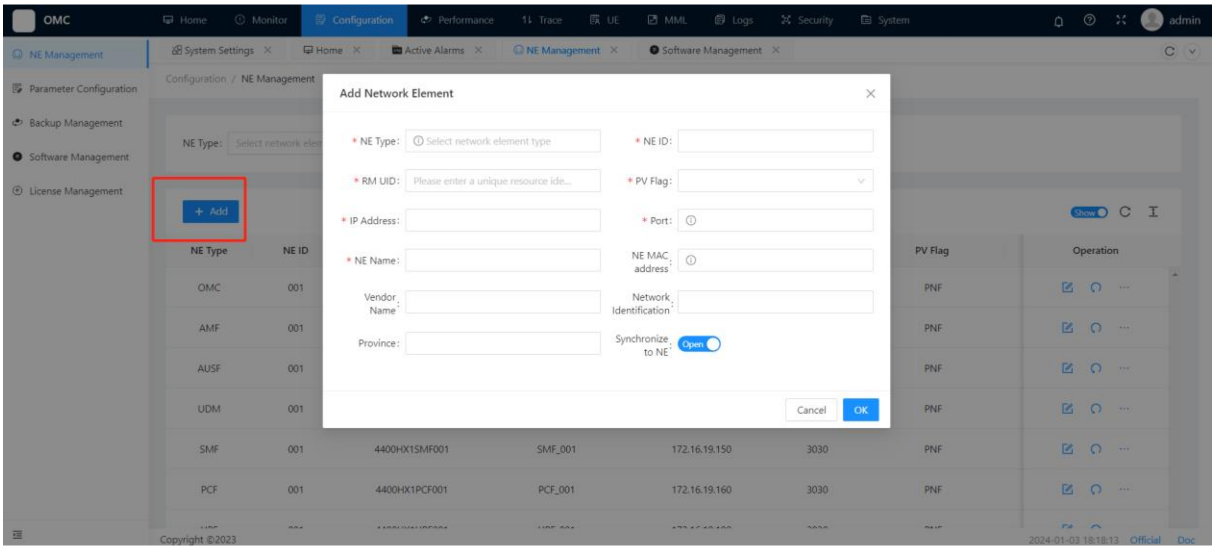
In summary, Network Element Management is an essential part of 5G core network management, ensuring that network infrastructure operates according to predetermined performance and efficiency standards.

The operation part is as follows:

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

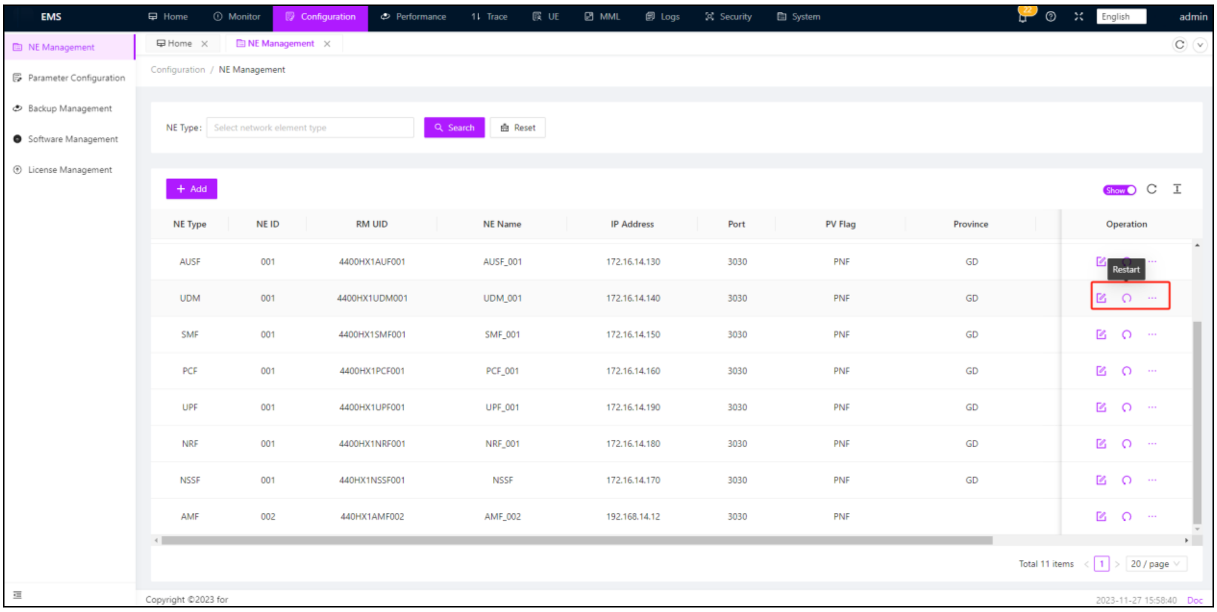
- NE Type
- NE ID
- RM UID
- PV Flag
- Port（Generally set to 3030）
- IP Address
- NE Name

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

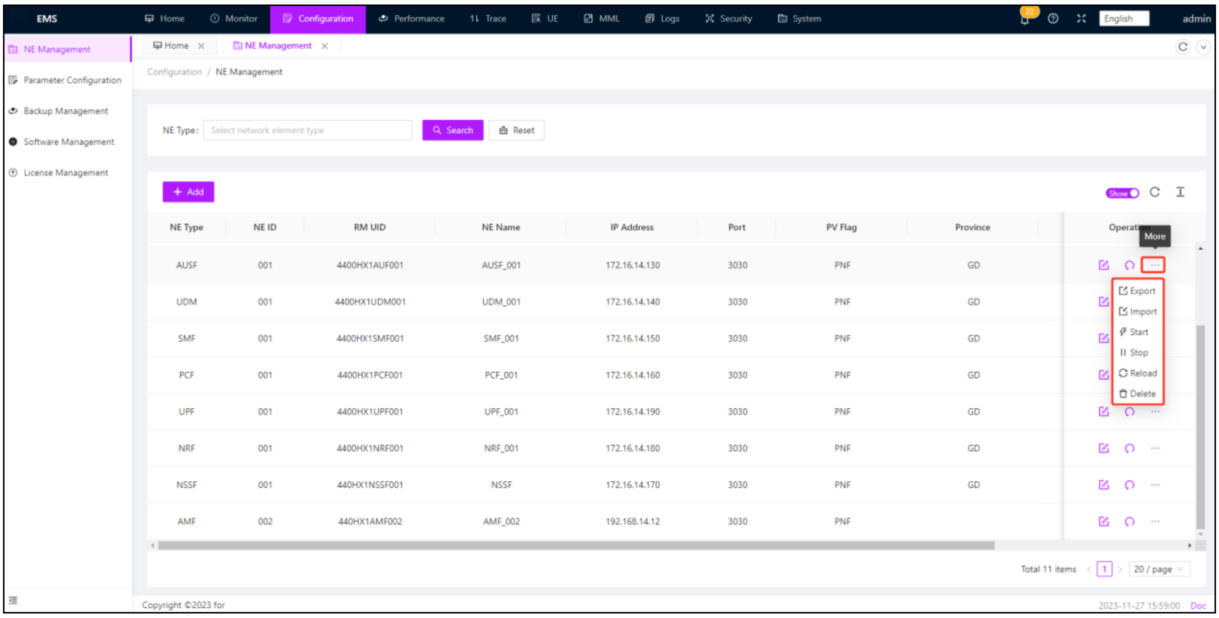


NE Type	NE ID					PV Flag	Operation
OMC	001					PNF	
AMF	001					PNF	
AUSF	001					PNF	
UDM	001					PNF	
SMF	001	4400HX1SMF001	SMF_001	172.16.19.150	3030	PNF	
PCF	001	4400HX1PCF001	PCF_001	172.16.19.160	3030	PNF	

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.



NE Type	NE ID	RM UID	NE Name	IP Address	Port	PV Flag	Province	Operation
AUSF	001	4400HX1AUF001	AUSF_001	172.16.14.130	3030	PNF	GD	
UDM	001	4400HX1UDM001	UDM_001	172.16.14.140	3030	PNF	GD	
SMF	001	4400HX1SMF001	SMF_001	172.16.14.150	3030	PNF	GD	
PCF	001	4400HX1PCF001	PCF_001	172.16.14.160	3030	PNF	GD	
UPF	001	4400HX1UPF001	UPF_001	172.16.14.190	3030	PNF	GD	
NRF	001	4400HX1NRF001	NRF_001	172.16.14.180	3030	PNF	GD	
NSSF	001	440HX1NSSF001	NSSF	172.16.14.170	3030	PNF	GD	
AMF	002	440HX1AMF002	AMF_002	192.168.14.12	3030	PNF		

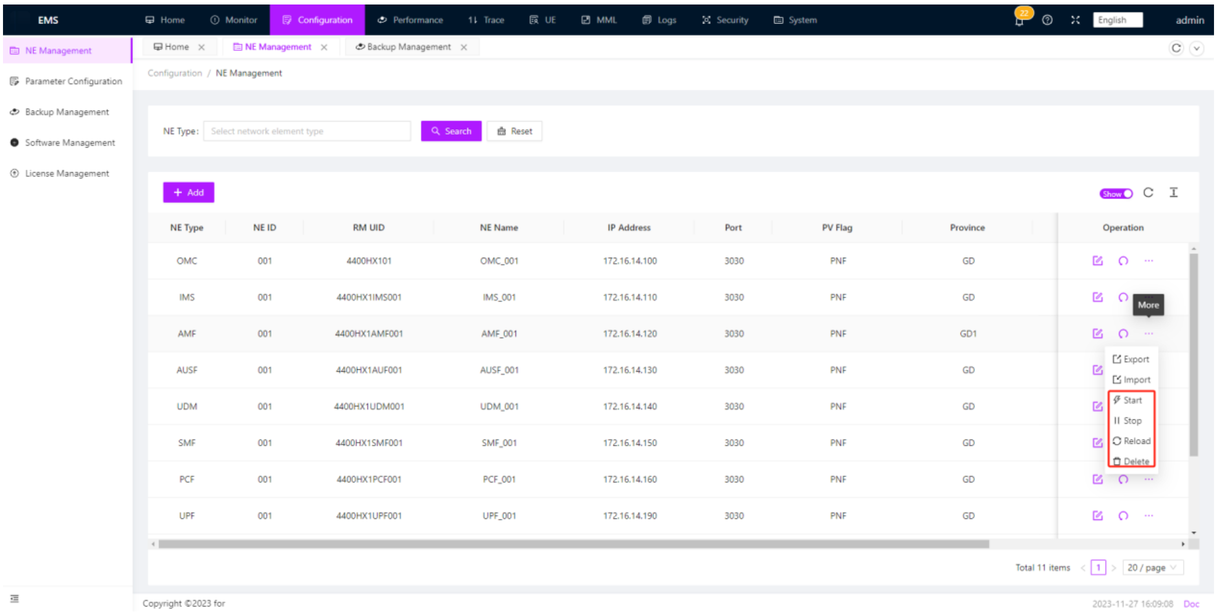


NE Type	NE ID	RM UID	NE Name	IP Address	Port	PV Flag	Province	Operation
AUSF	001	4400HX1AUF001	AUSF_001	172.16.14.130	3030	PNF	GD	
UDM	001	4400HX1UDM001	UDM_001	172.16.14.140	3030	PNF	GD	
SMF	001	4400HX1SMF001	SMF_001	172.16.14.150	3030	PNF	GD	
PCF	001	4400HX1PCF001	PCF_001	172.16.14.160	3030	PNF	GD	
UPF	001	4400HX1UPF001	UPF_001	172.16.14.190	3030	PNF	GD	
NRF	001	4400HX1NRF001	NRF_001	172.16.14.180	3030	PNF	GD	
NSSF	001	440HX1NSSF001	NSSF	172.16.14.170	3030	PNF	GD	
AMF	002	440HX1AMF002	AMF_002	192.168.14.12	3030	PNF		

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.



NE Type: Select network element type

NE Type	NE ID	RM UID	NE Name	IP Address	Port	PV Flag	Province	Operation
OMC	001	4400HX101	OMC_001	172.16.14.100	3030	PNF	GD	
IMS	001	4400HX1IMS001	IMS_001	172.16.14.110	3030	PNF	GD	
AMF	001	4400HX1AMF001	AMF_001	172.16.14.120	3030	PNF	GD1	
AUSF	001	4400HX1AUF001	AUSF_001	172.16.14.130	3030	PNF	GD	
UDM	001	4400HX1UDM001	UDM_001	172.16.14.140	3030	PNF	GD	
SMF	001	4400HX1SMF001	SMF_001	172.16.14.150	3030	PNF	GD	
PCF	001	4400HX1PCF001	PCF_001	172.16.14.160	3030	PNF	GD	
UPF	001	4400HX1UPF001	UPF_001	172.16.14.190	3030	PNF	GD	

Total 11 items 1 20 / page

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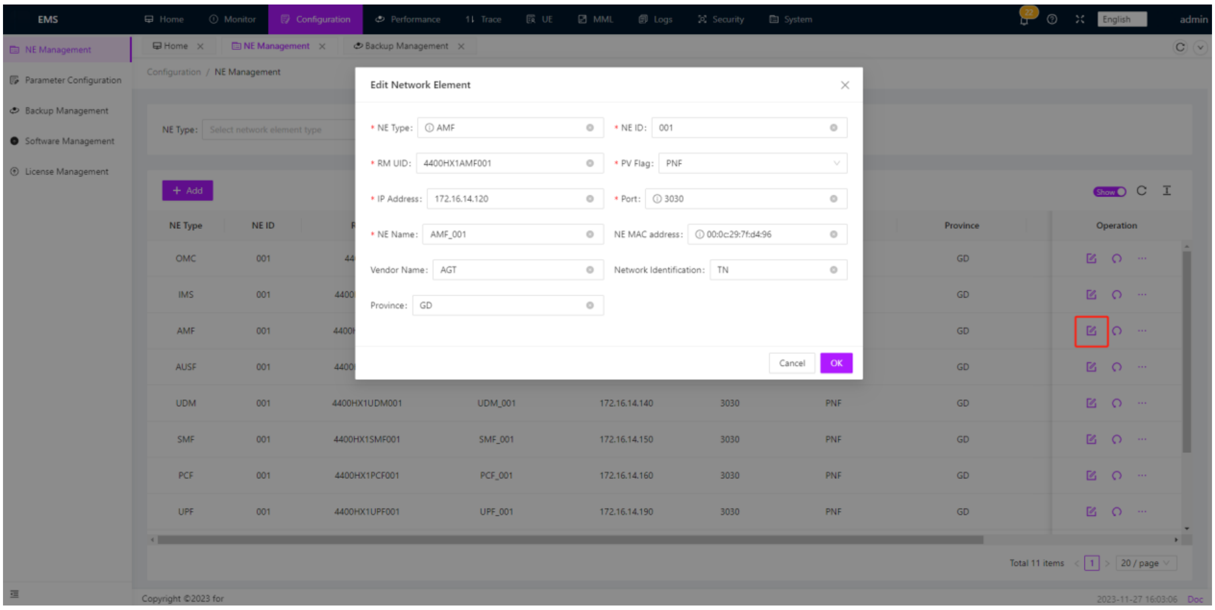
On the right side of the network element, you can click the modify icon ✎ to modify the network element



Edit Network Element

* NE Type: AMF	* NE ID: 001
* RM UID: 4400HX1AMF001	* PV Flag: PNF
* IP Address: 172.16.14.120	* Port: 3030
* NE Name: AMF_001	NE MAC address: 00:0c:29:7f:d4:96
Vendor Name: AGT	Network Identification: TN
Province: GD	

Cancel OK

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.

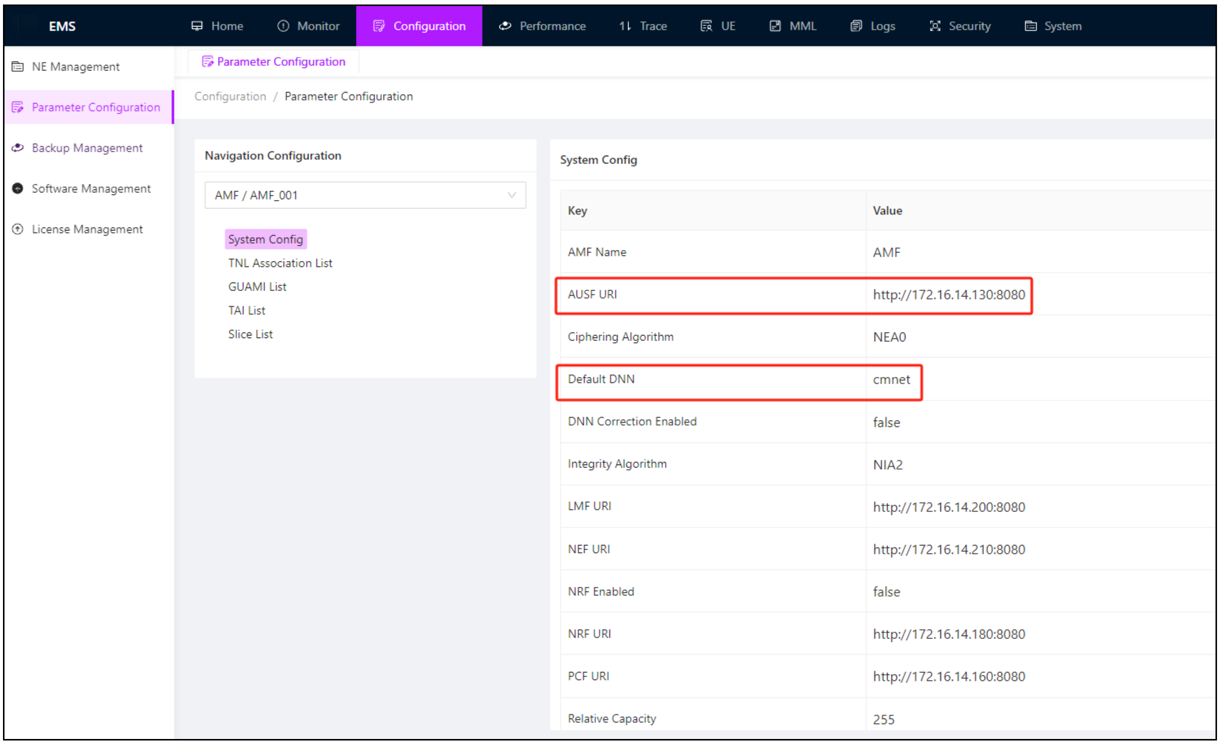
Efficiency is the key to network health and functionality.

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.

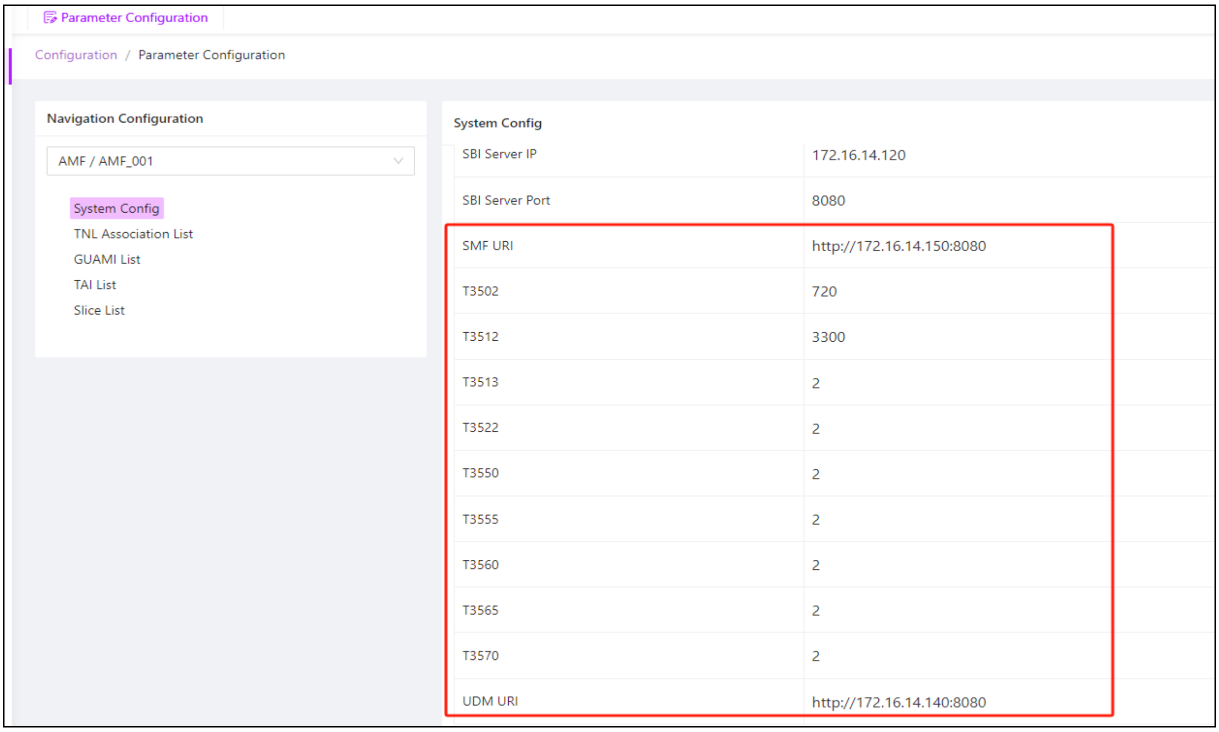
On the value, click to modify it, or a modification mark will appear on the right side of some places, click to modify it. Select the corresponding network element to obtain configuration information or modify it.

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.

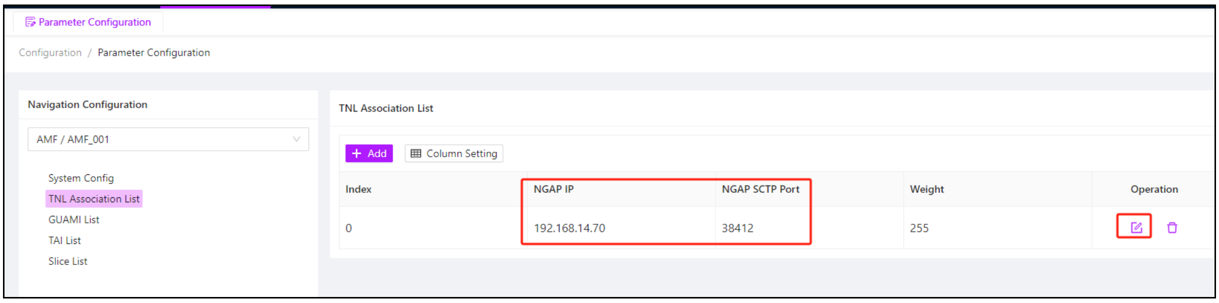


Key	Value
AMF Name	AMF
AUSF URI	http://172.16.14.130:8080
Ciphering Algorithm	NEA0
Default DNN	cmnet
DNN Correction Enabled	false
Integrity Algorithm	NIA2
LMF URI	http://172.16.14.200:8080
NEF URI	http://172.16.14.210:8080
NRF Enabled	false
NRF URI	http://172.16.14.180:8080
PCF URI	http://172.16.14.160:8080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



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

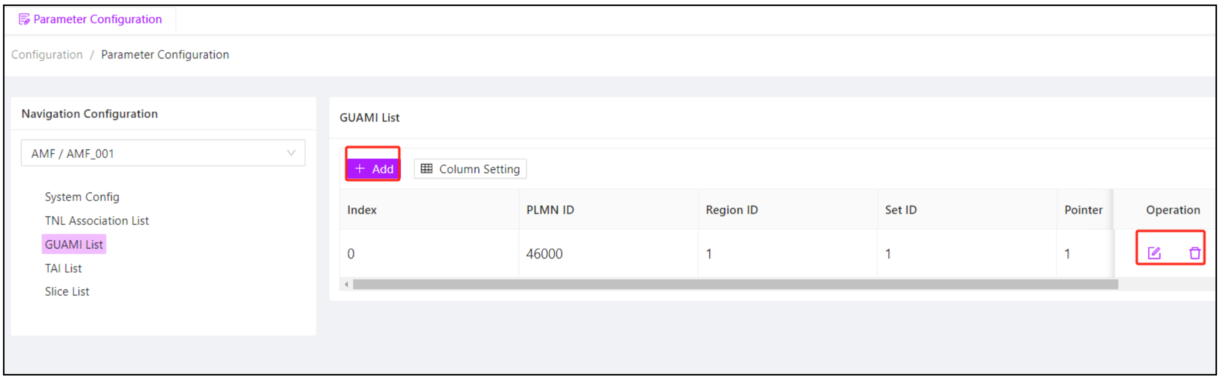
2、**TNL Association List**: in the TNL Association List, you can modify the N2 IP and NGAP SCTP Port, which are used to interconnect with gNB.



TNL Association List

Index	NGAP IP	NGAP SCTP Port	Weight	Operation
0	192.168.14.70	38412	255	

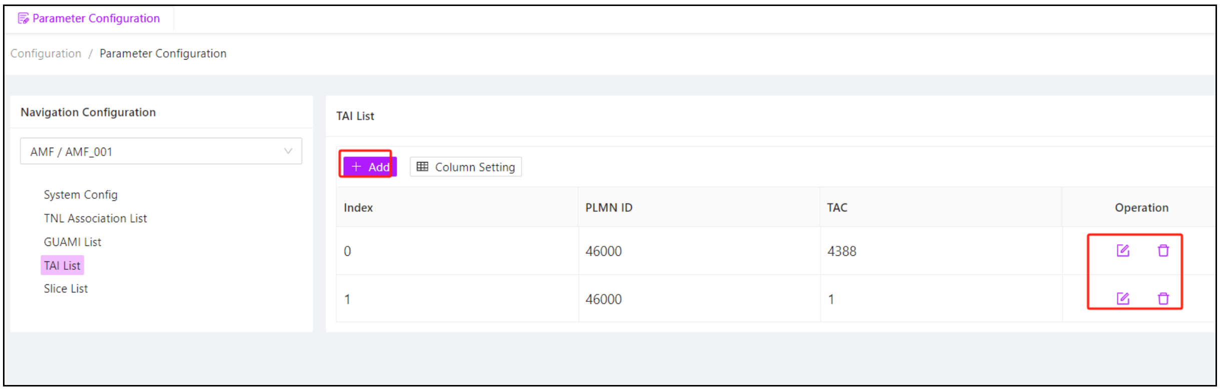
3、**GUAMI List:** GUAMI List can be modified, added, and deleted. When a user device attempts to access or manage mobility, the network determines the required AMF based on the AMF ID in the GUAMI list and routes the relevant control signaling to the corresponding AMF.



GUAMI List

Index	PLMN ID	Region ID	Set ID	Pointer	Operation
0	46000	1	1	1	

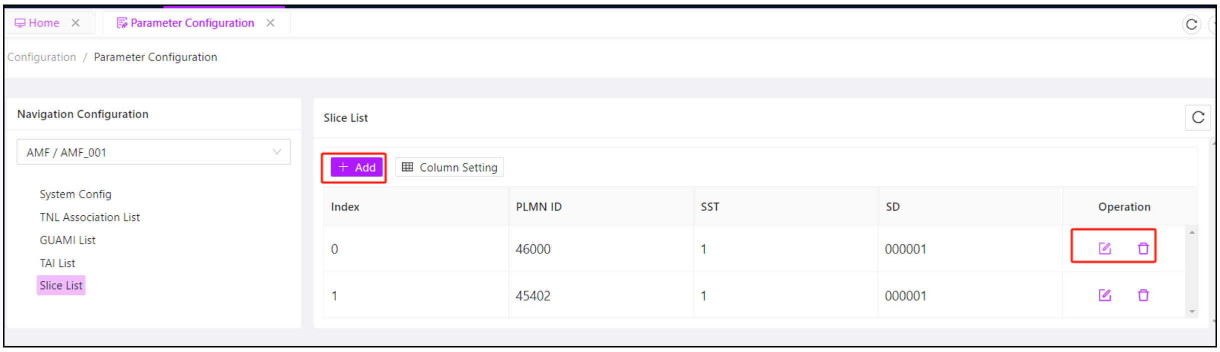
4、**TAI List**: In the TAI List, you can modify, add, and delete TAC corresponding to PLMN, PLMN and TAC correspond to base stations. If the AMF is incorrectly filled, the connection between the AMF and the base station may be interrupted.



TAI List

Index	PLMN ID	TAC	Operation
0	46000	4388	
1	46000	1	

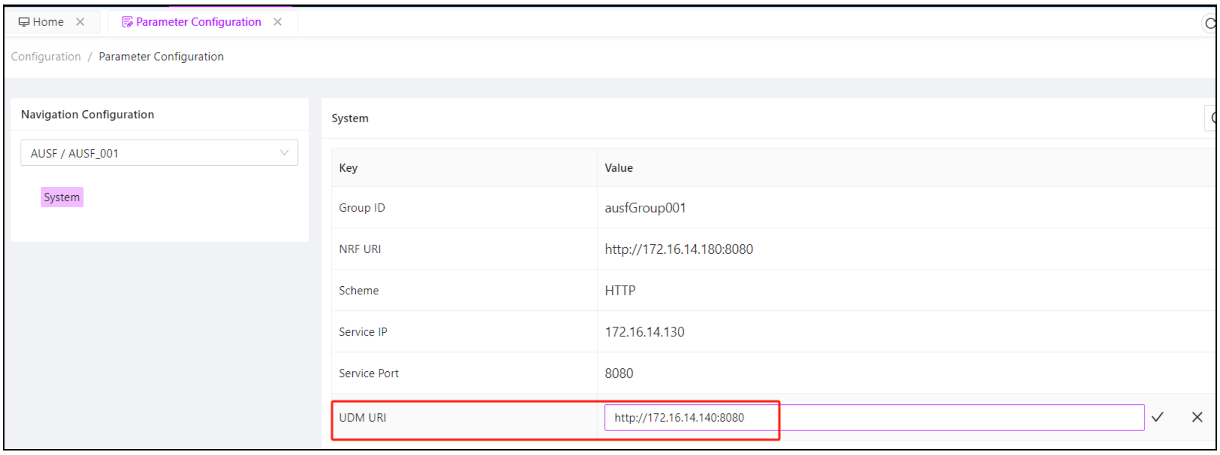
5、**Slice List**: In the Slice List, you can modify the slice information corresponding to the PLMN, which is the slice that the AMF allows to access



Index	PLMN ID	SST	SD	Operation
0	46000	1	000001	
1	45402	1	000001	

3.4.2.2 AUSF

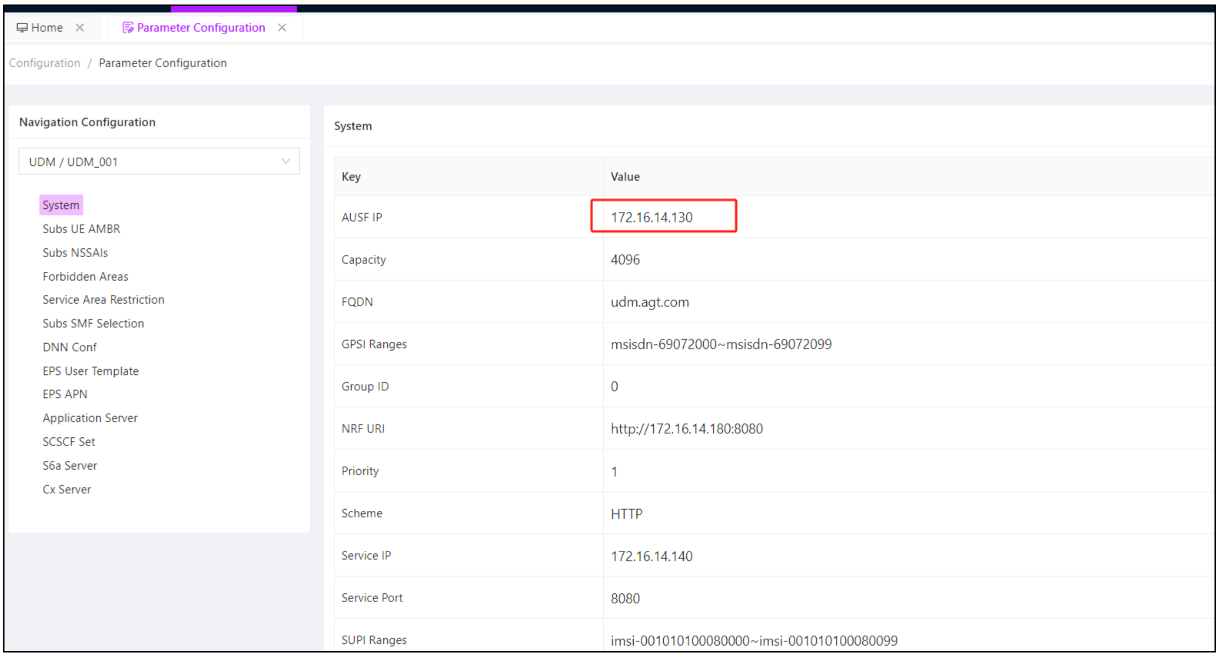
1、**System**:In the AUSF configuration file, change the UDM URI and configure the UDM IP address for interconnection with the AUSF:



Key	Value
Group ID	ausfGroup001
NRF URI	http://172.16.14.180:8080
Scheme	HTTP
Service IP	172.16.14.130
Service Port	8080
UDM URI	http://172.16.14.140:8080

3.4.2.3 UDM

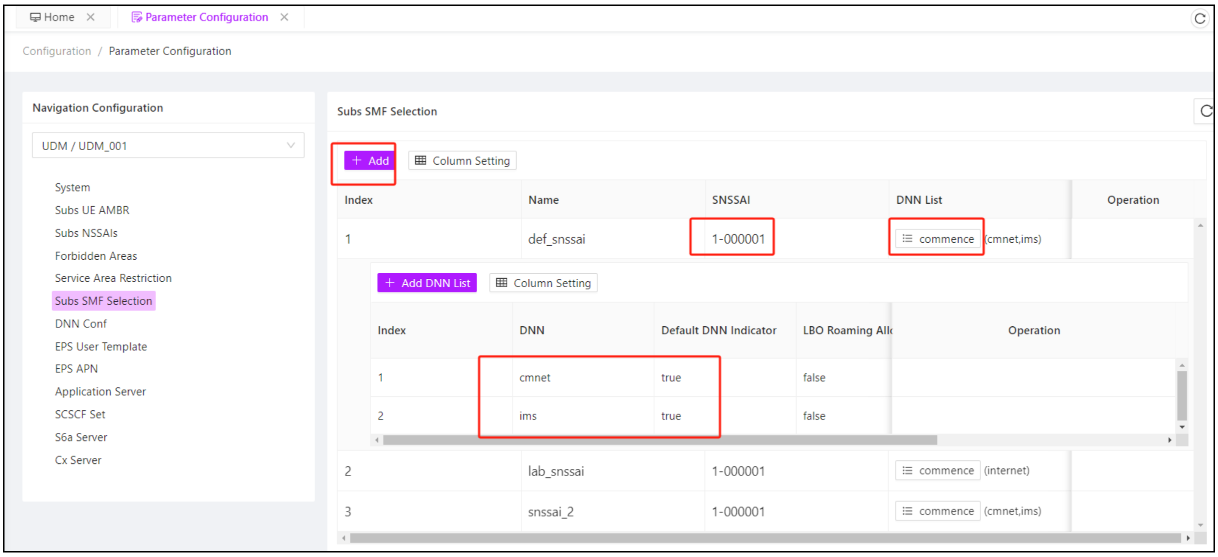
1、 **System**: the operator mainly modifies the AUSF IP here



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

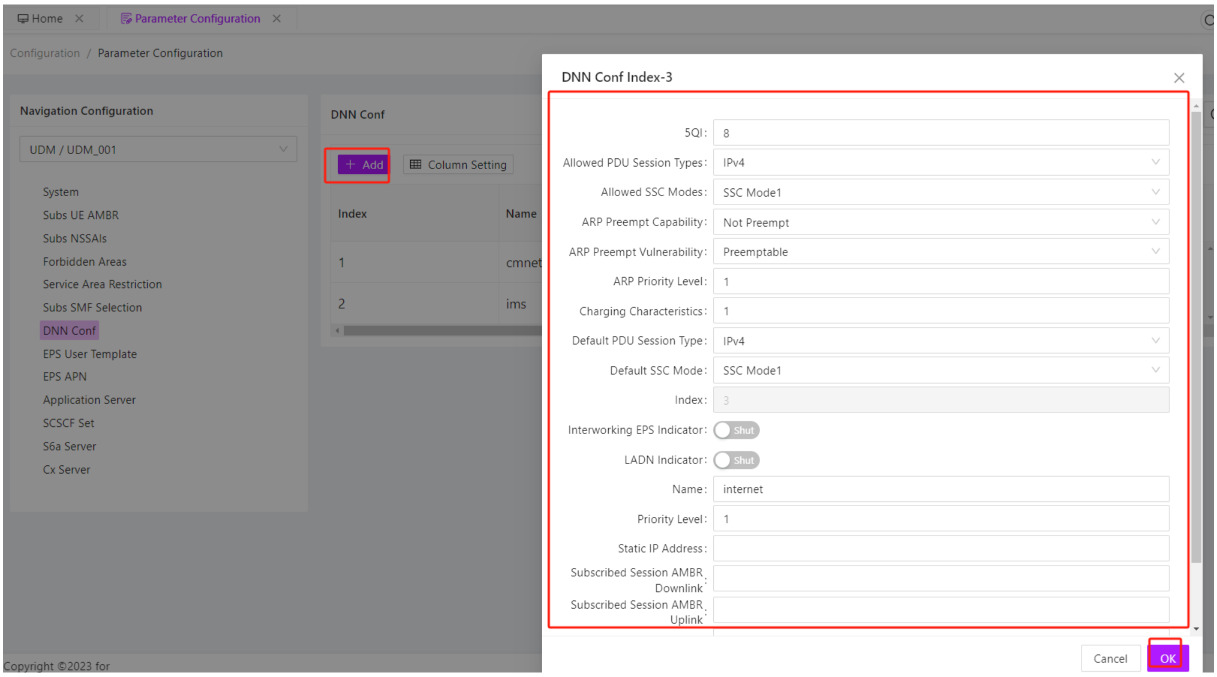


Subs SMF Selection

Index	Name	SNSSAI	DNN List	Operation
1	def_snssai	1-000001	commence (cmnet,ims)	
2	lab_snssai	1-000001	commence (internet)	
3	snssai_2	1-000001	commence (cmnet,ims)	

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

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.

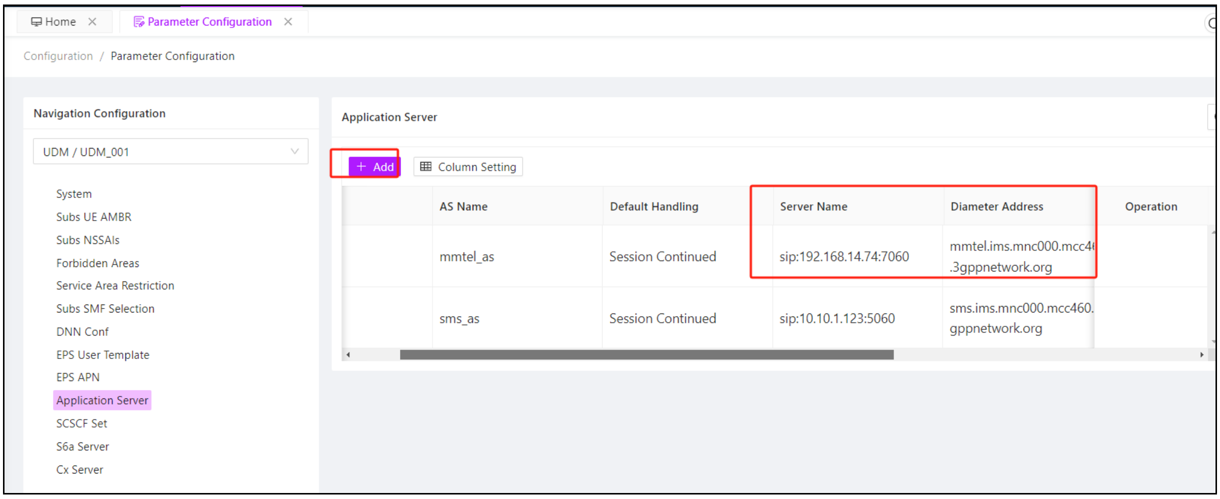


Index	Name
1	cmnet
2	ims

DNN Conf Index-3

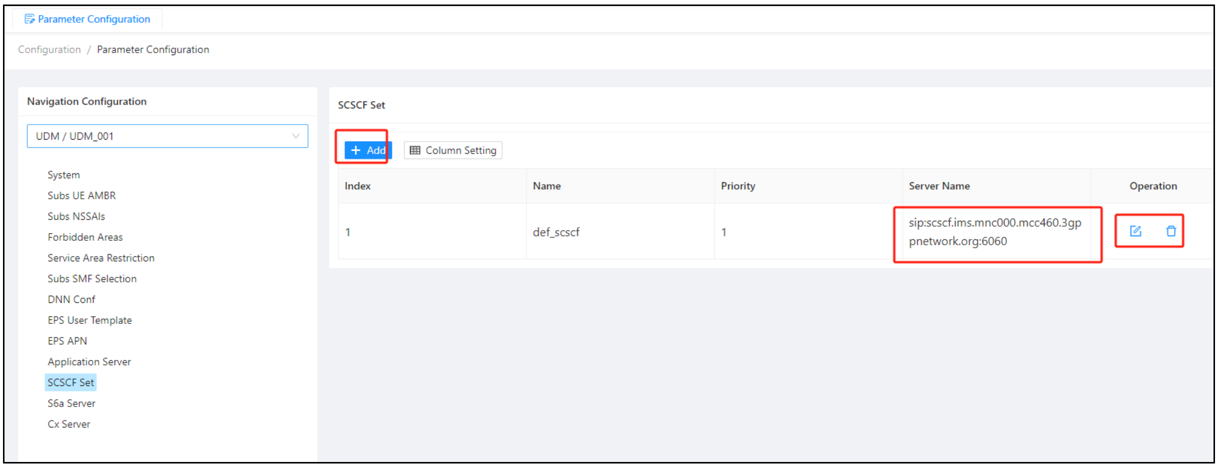
5QI: 8
Allowed PDU Session Types: IPv4
Allowed SSC Modes: SSC Mode1
ARP Preempt Capability: Not Preempt
ARP Preempt Vulnerability: Preemptable
ARP Priority Level: 1
Charging Characteristics: 1
Default PDU Session Type: IPv4
Default SSC Mode: SSC Mode1
Index: 3
Interworking EPS Indicator: Shut
LADN Indicator: Shut
Name: internet
Priority Level: 1
Static IP Address:
Subscribed Session AMBR Downlink:
Subscribed Session AMBR Uplink:

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.



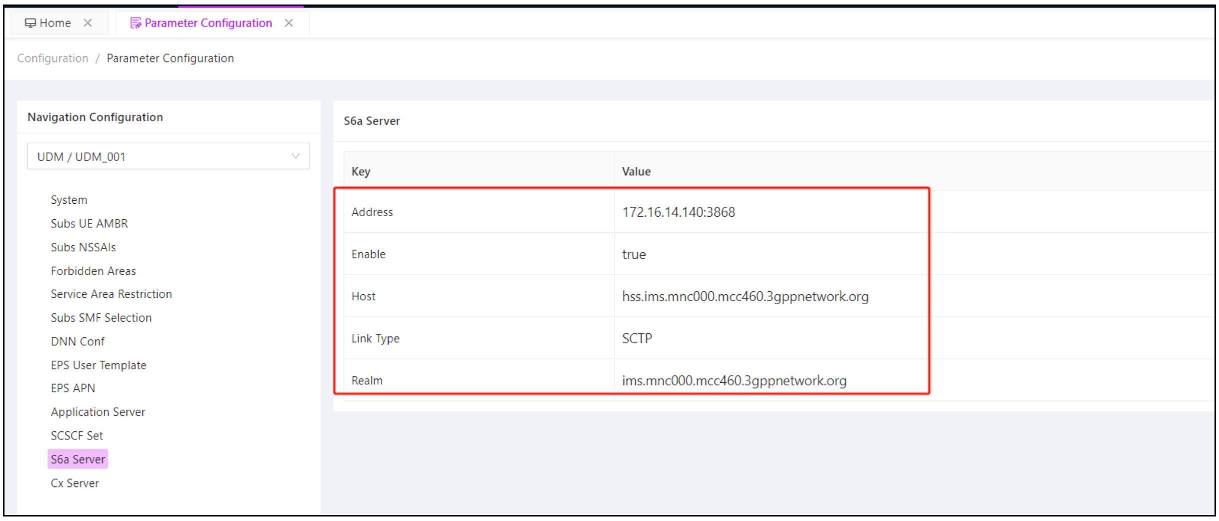
AS Name	Default Handling	Server Name	Diameter Address	Operation
mmtel_as	Session Continued	sip:192.168.14.74:7060	mmtel.ims.mnc000.mcc4 .3gppnetwork.org	
sms_as	Session Continued	sip:10.10.1.123:5060	sms.ims.mnc000.mcc460. gppnetwork.org	

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



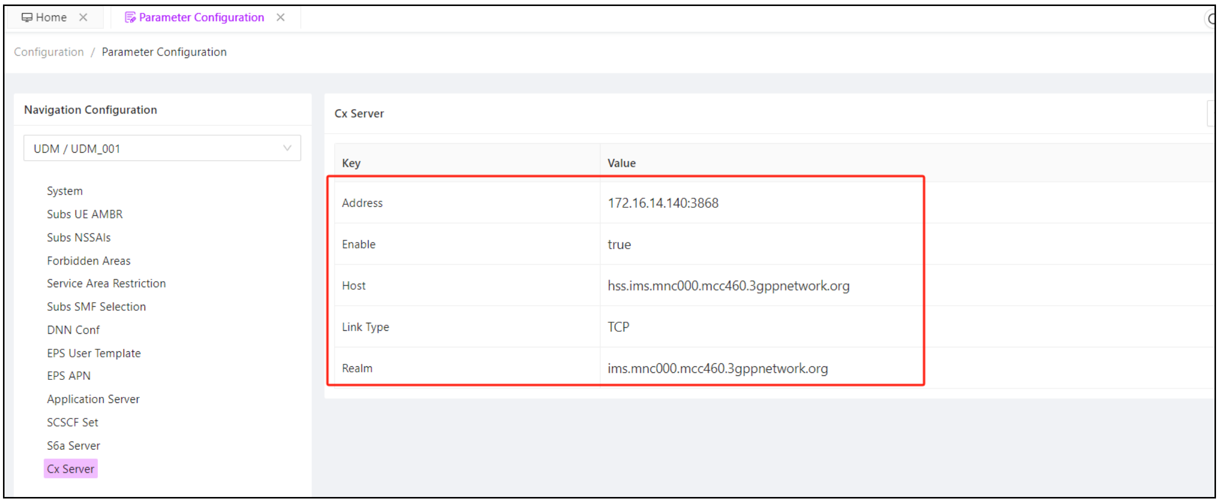
Index	Name	Priority	Server Name	Operation
1	def_scscf	1	sip:scscf.ims.mnc000.mcc460.3gppnetwork.org:6060	

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



Key	Value
Address	172.16.14.140:3868
Enable	true
Host	hss.ims.mnc000.mcc460.3gppnetwork.org
Link Type	SCTP
Realm	ims.mnc000.mcc460.3gppnetwork.org

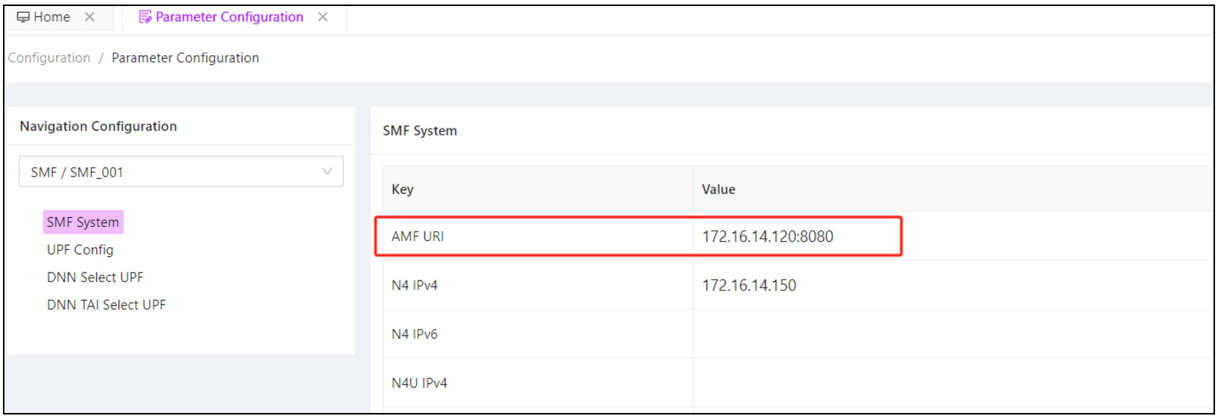
7、Cx Server: the operator mainly switches on the Cx port corresponding to the IMS and changes the corresponding host



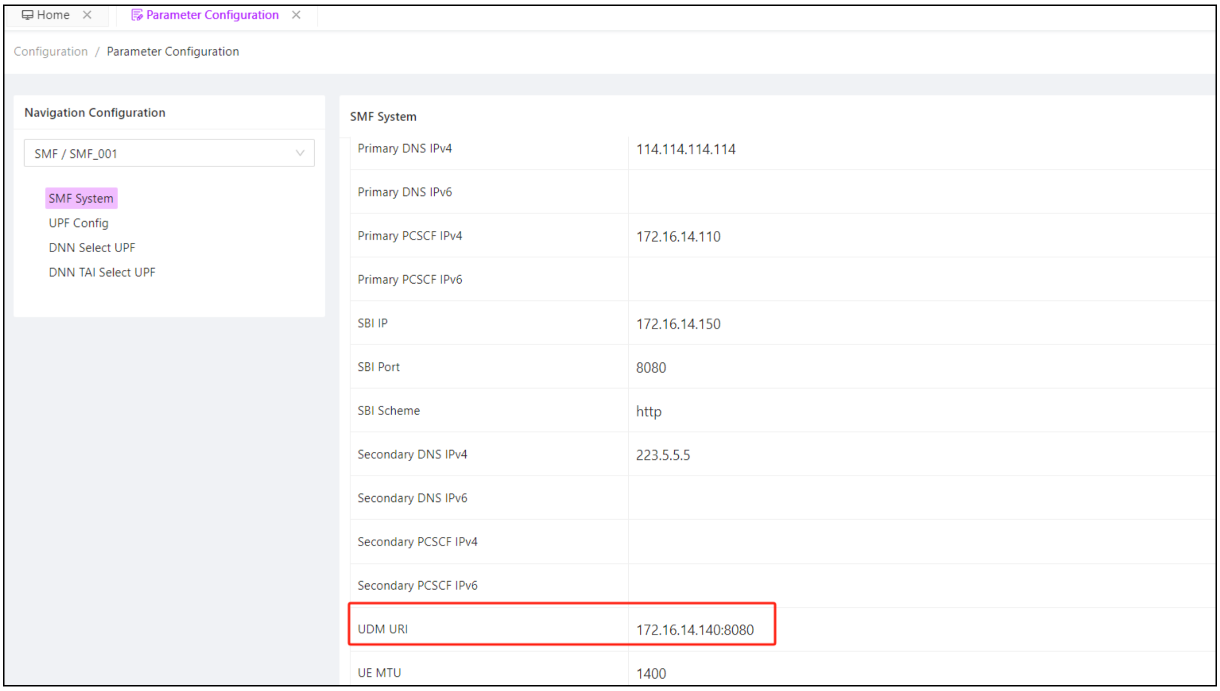
Key	Value
Address	172.16.14.140:3868
Enable	true
Host	hss.ims.mnc000.mcc460.3gppnetwork.org
Link Type	TCP
Realm	ims.mnc000.mcc460.3gppnetwork.org

3.4.3.4 SMF

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

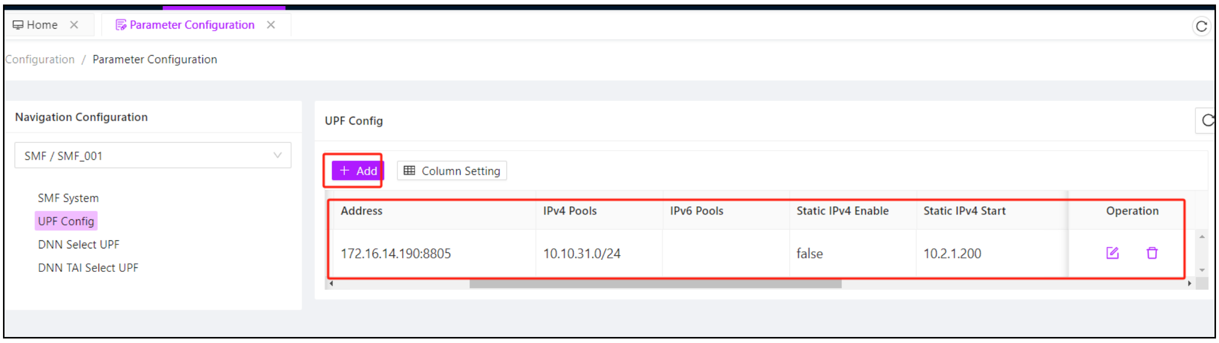


Key	Value
AMF URI	172.16.14.120:8080
N4 IPv4	172.16.14.150
N4 IPv6	
N4U IPv4	



Primary DNS IPv4	114.114.114.114
Primary DNS IPv6	
Primary PCSCF IPv4	172.16.14.110
Primary PCSCF IPv6	
SBI IP	172.16.14.150
SBI Port	8080
SBI Scheme	http
Secondary DNS IPv4	223.5.5.5
Secondary DNS IPv6	
Secondary PCSCF IPv4	
Secondary PCSCF IPv6	
UDM URI	172.16.14.140:8080
UE MTU	1400

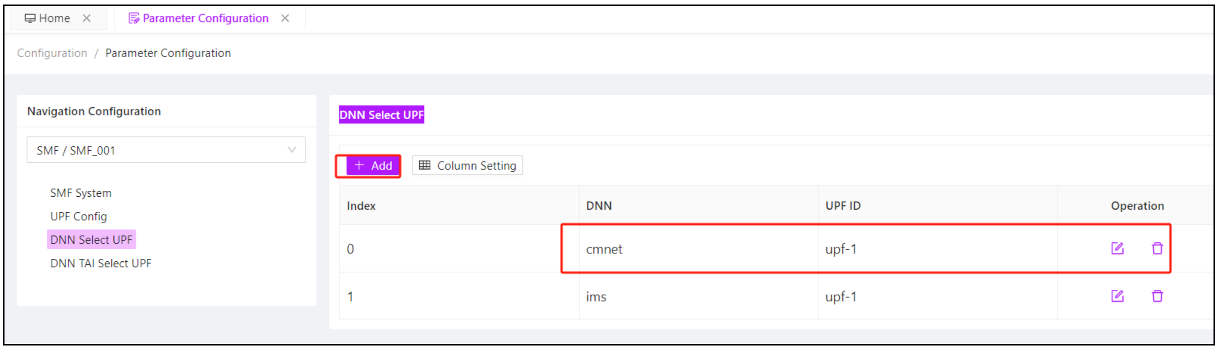
2、**UPF Config**: the operator can configure the UPF IP corresponding to the SMF in UPF config, set the IP address pool assigned to the UE, and set the static IP address.



Address	IPv4 Pools	IPv6 Pools	Static IPv4 Enable	Static IPv4 Start	Operation
172.16.14.190:8805	10.10.31.0/24		false	10.2.1.200	

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

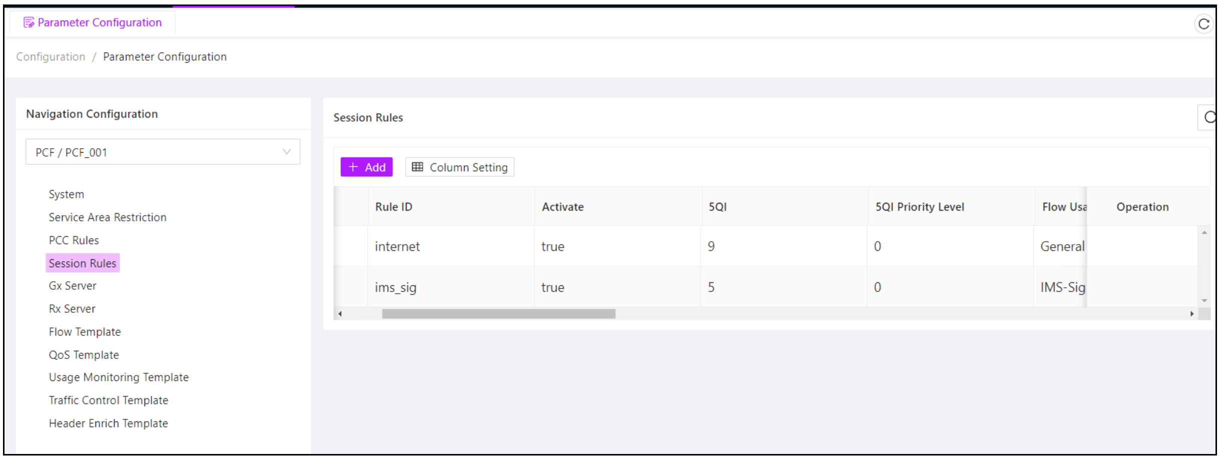
UPF.



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

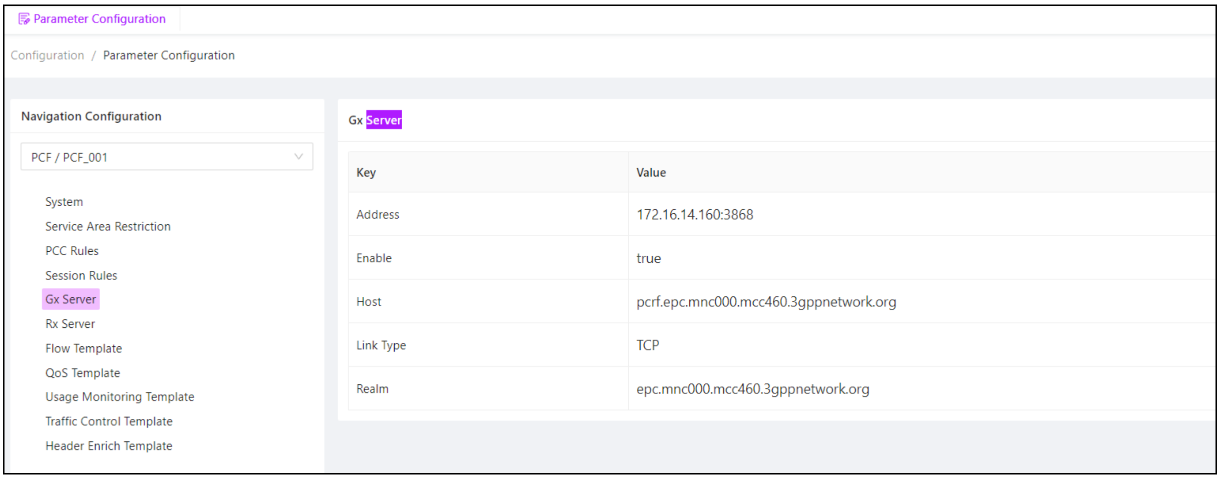
3.4.4.5 PCF

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



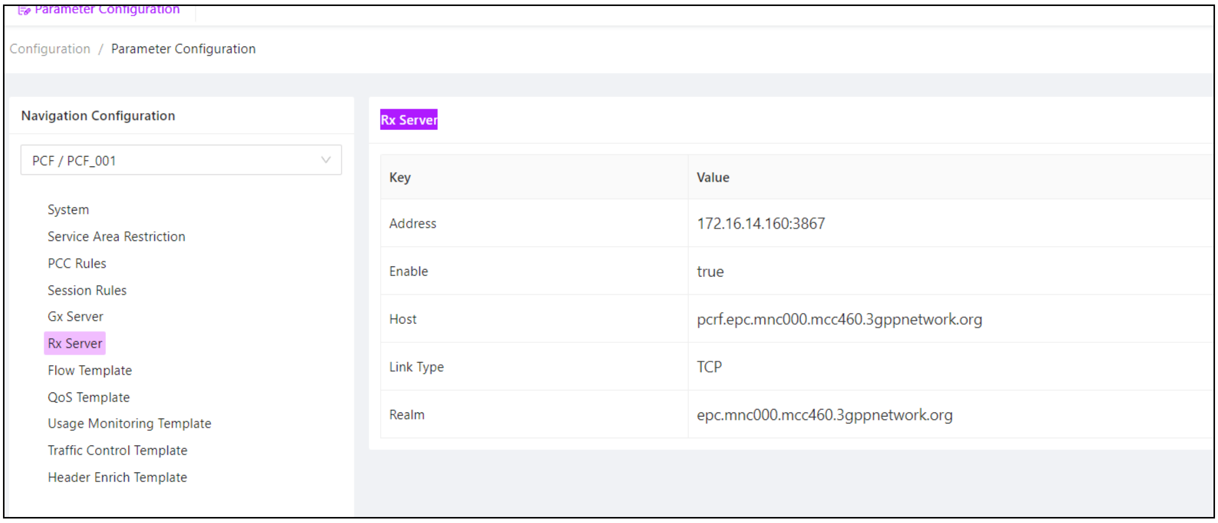
Rule ID	Activate	5QI	5QI Priority Level	Flow Usa	Operation
internet	true	9	0	General	
ims_sig	true	5	0	IMS-Sig	

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



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

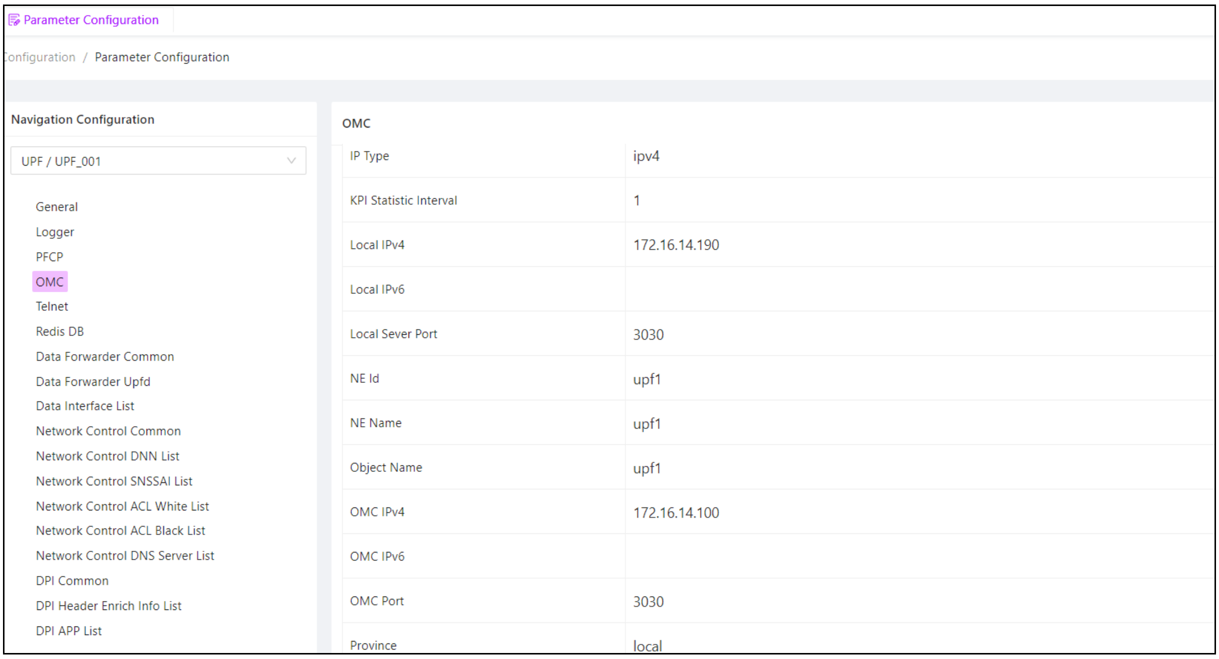
3、Rx Server: The operator can configure Rx Server parameters including Rx switch, host, etc



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

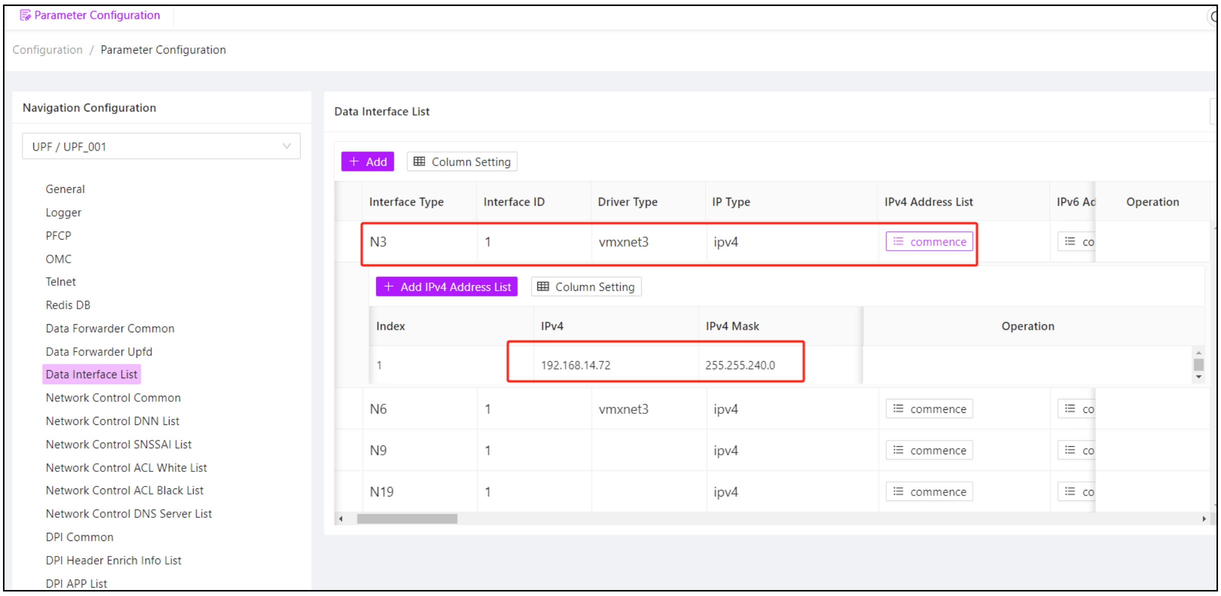
3.4.4.6 UPF

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



IP Type	ipv4
KPI Statistic Interval	1
Local IPv4	172.16.14.190
Local IPv6	
Local Sever 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.

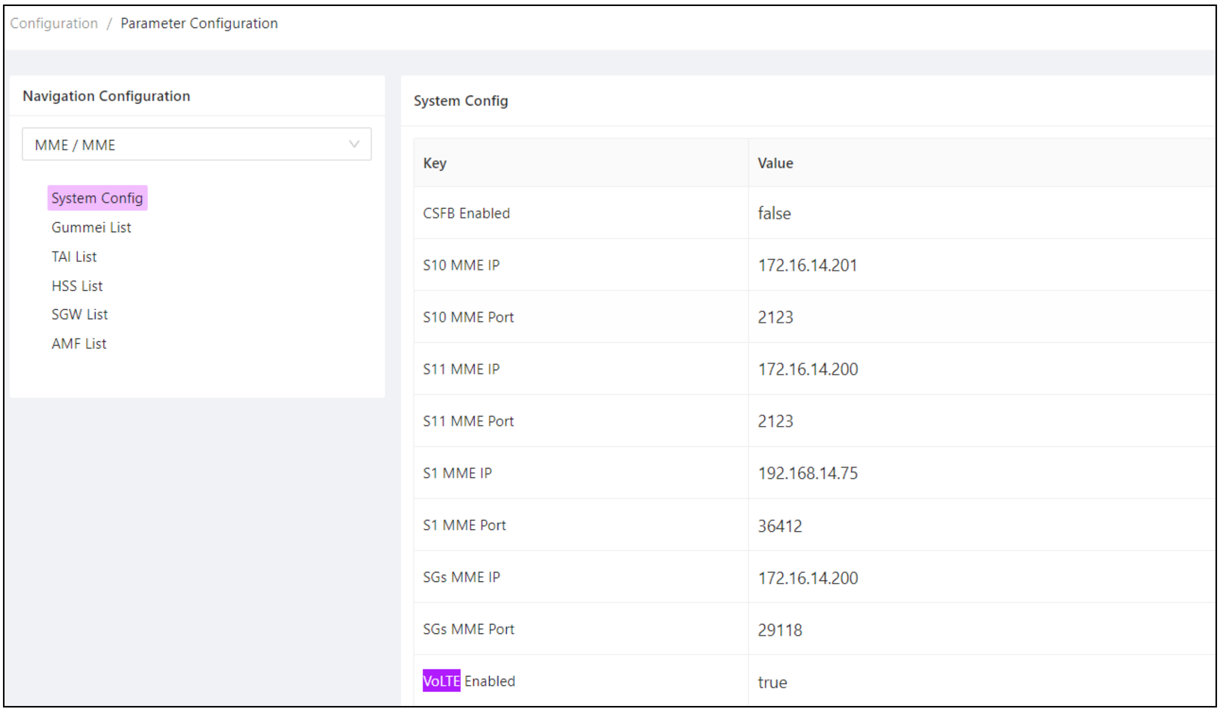


Interface Type	Interface ID	Driver Type	IP Type	IPv4 Address List	IPv6 Ad	Operation
N3	1	vmxnet3	ipv4	commence	co	
N6	1	vmxnet3	ipv4	commence	co	
N9	1		ipv4	commence	co	
N19	1		ipv4	commence	co	

Index	IPv4	IPv4 Mask	Operation
1	192.168.14.72	255.255.240.0	

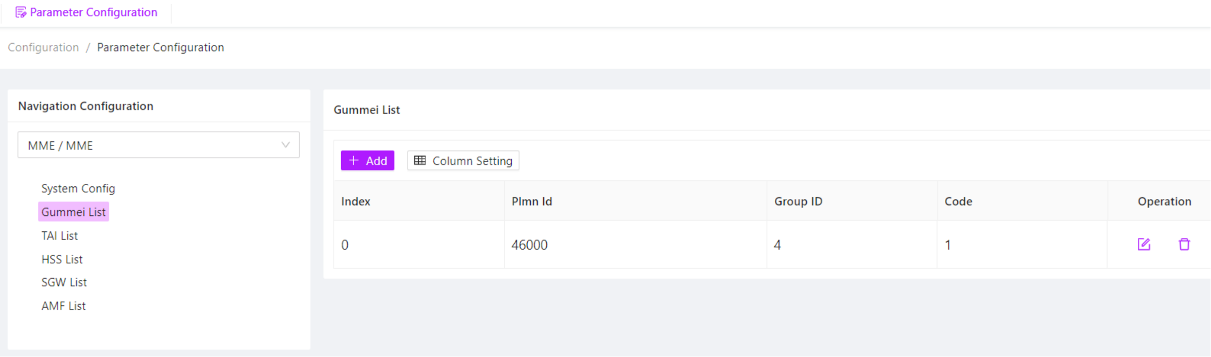
3.4.4.7 MME

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



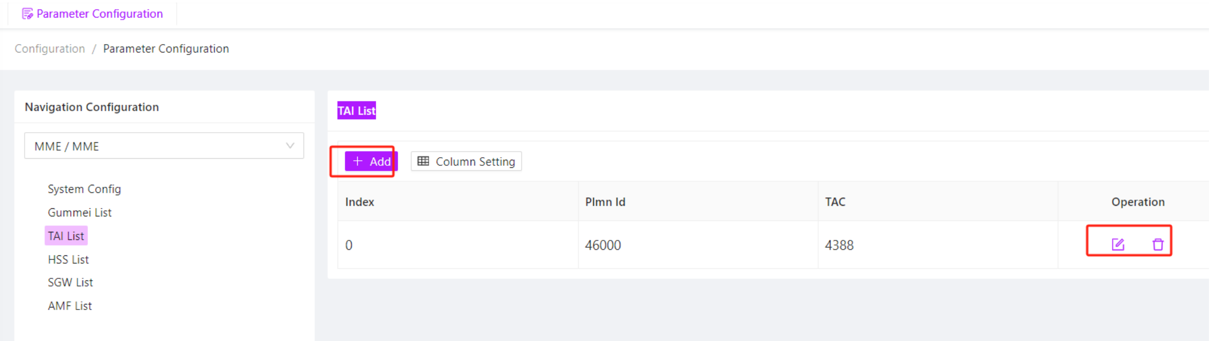
Key	Value
CSFB Enabled	false
S10 MME IP	172.16.14.201
S10 MME Port	2123
S11 MME IP	172.16.14.200
S11 MME Port	2123
S1 MME IP	192.168.14.75
S1 MME Port	36412
SGs MME IP	172.16.14.200
SGs MME Port	29118
VoLTE Enabled	true

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



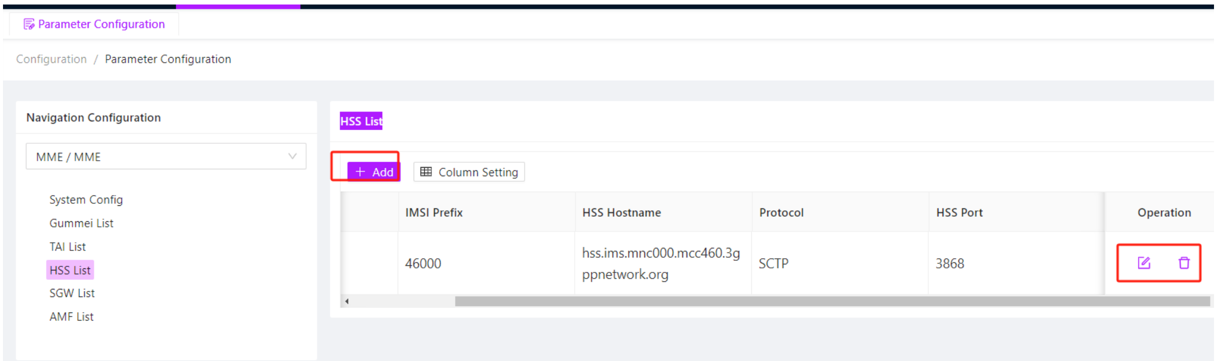
Index	Plmn Id	Group ID	Code	Operation
0	46000	4	1	

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



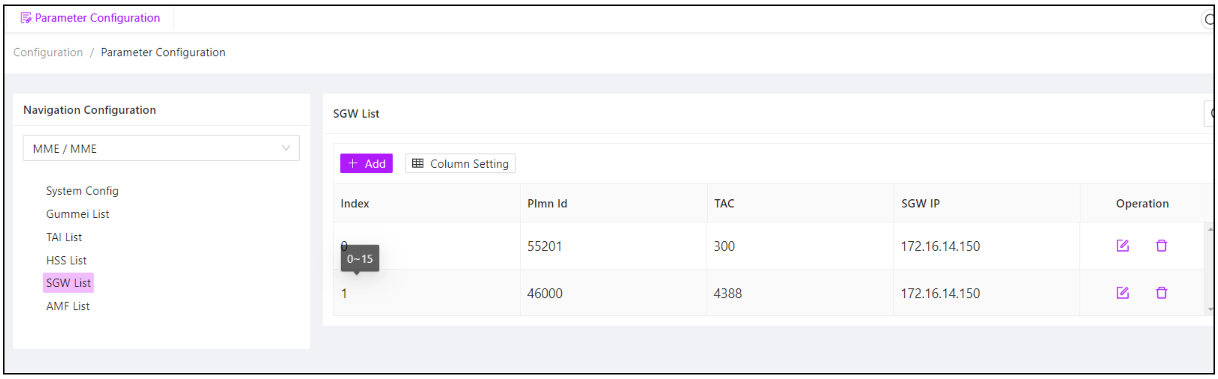
Index	Plmn Id	TAC	Operation
0	46000	4388	

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



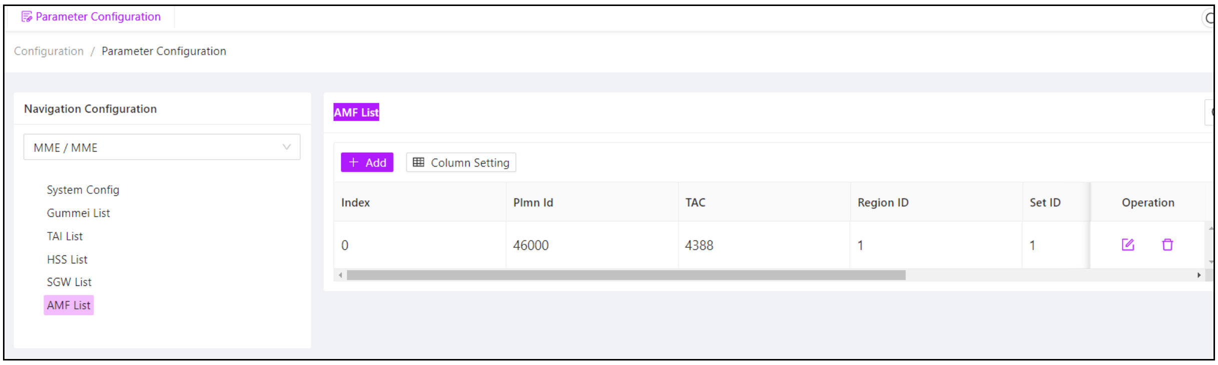
IMSI Prefix	HSS Hostname	Protocol	HSS Port	Operation
46000	hss.ims.mnc000.mcc460.3gppnetwork.org	SCTP	3868	

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



Index	Plmn Id	TAC	SGW IP	Operation
0	55201	300	172.16.14.150	
1	46000	4388	172.16.14.150	

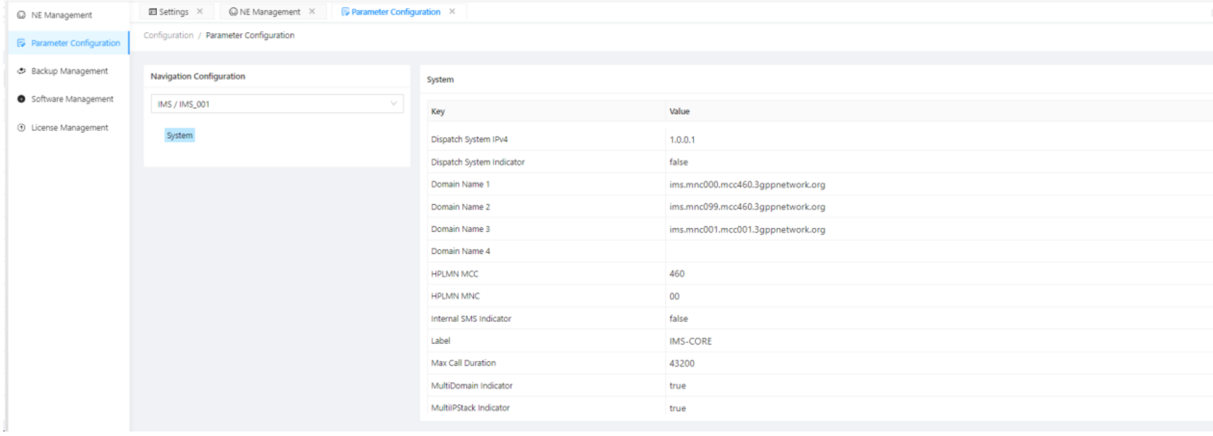
6、**AMF List**: The main configuration of the operator here is the information of the AMF interoperable with the MME, including the AMF, PLMN, TAC, etc.



Index	Plmn Id	TAC	Region ID	Set ID	Operation
0	46000	4388	1	1	

3.4.4.8 IMS

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



Key	Value
Dispatch System IPv4	1.0.0.1
Dispatch System Indicator	false
Domain Name 1	ims.mnc000.mcc460.3gppnetwork.org
Domain Name 2	ims.mnc099.mcc460.3gppnetwork.org
Domain Name 3	ims.mnc001.mcc001.3gppnetwork.org
Domain Name 4	
HPLMN MCC	460
HPLMN MNC	00
Internal SMS Indicator	false
Label	IMS-CORE
Max Call Duration	43200
MultiDomain Indicator	true
MultiIPStack Indicator	true

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 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.

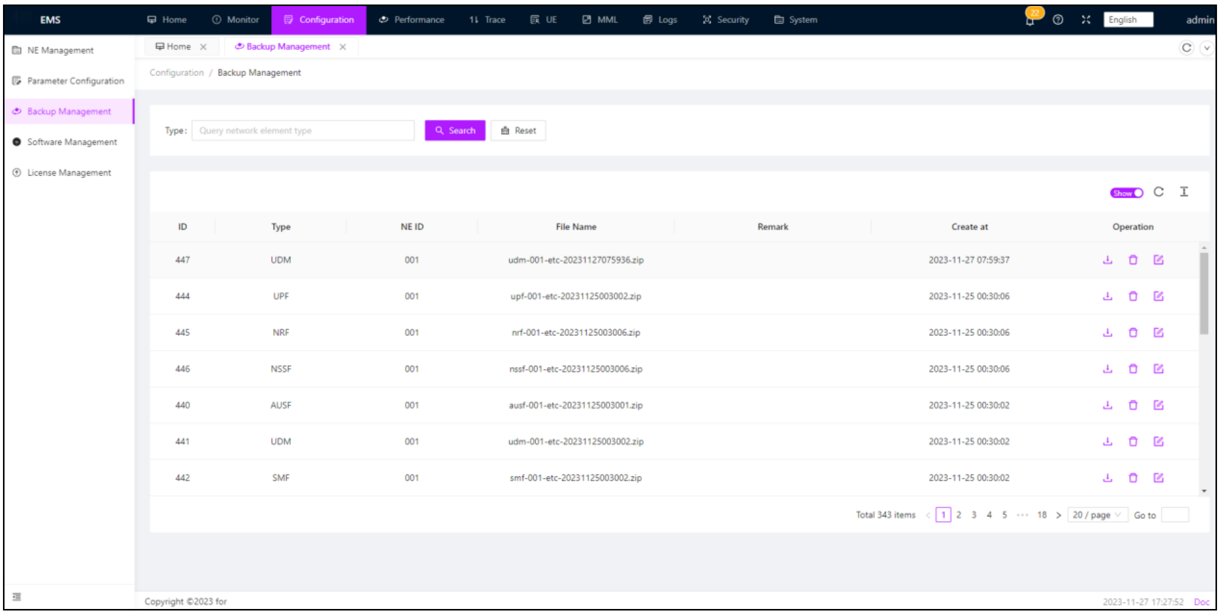
Backup management ensures the reliability of 5G network services and the security of data, and is a key strategy for delivering continuous business services.

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.



Type: Query network element type

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

Total 343 items < 1 2 3 4 5 ··· 18 > 20 / page Go to

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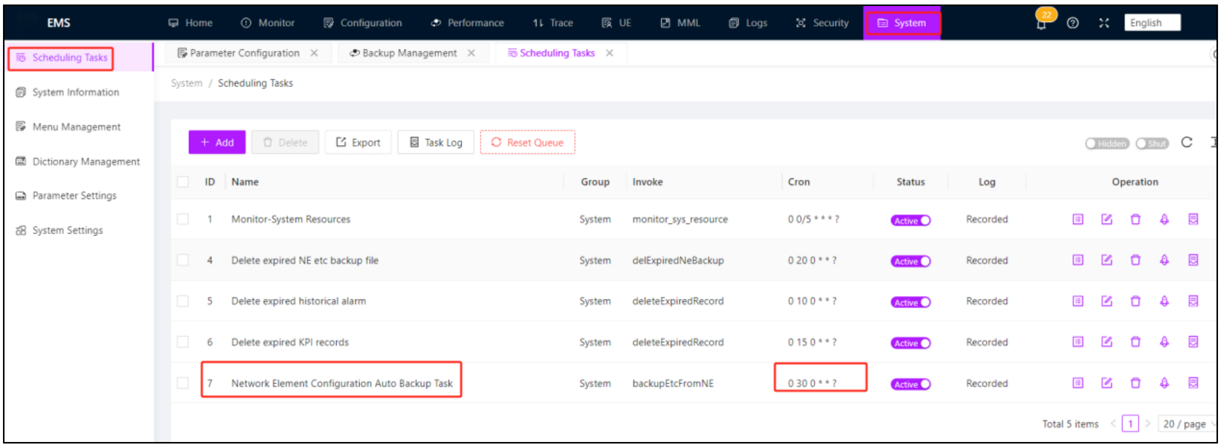
2023-11-27 17:27:52 Doc



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

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:

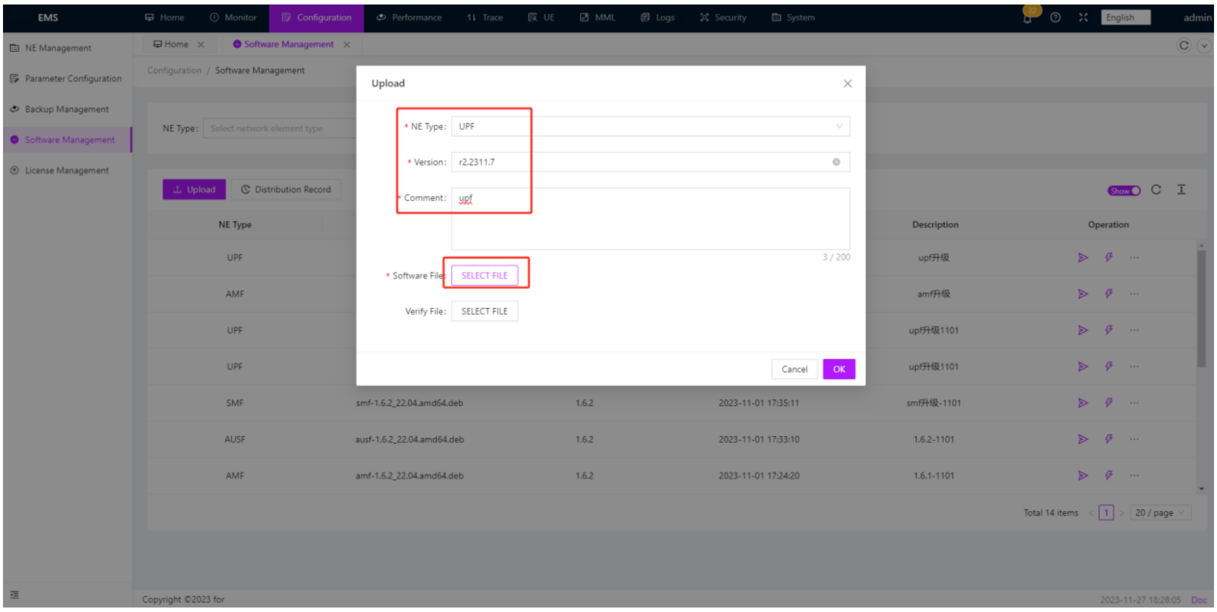
Rollback: Select the network element that needs to roll back the software and perform the rollback operation. Network operation and maintenance personnel can operate through the "Back" button on the management system interface.

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



Upload

* NE Type: UPF

* Version: r2.2311.7

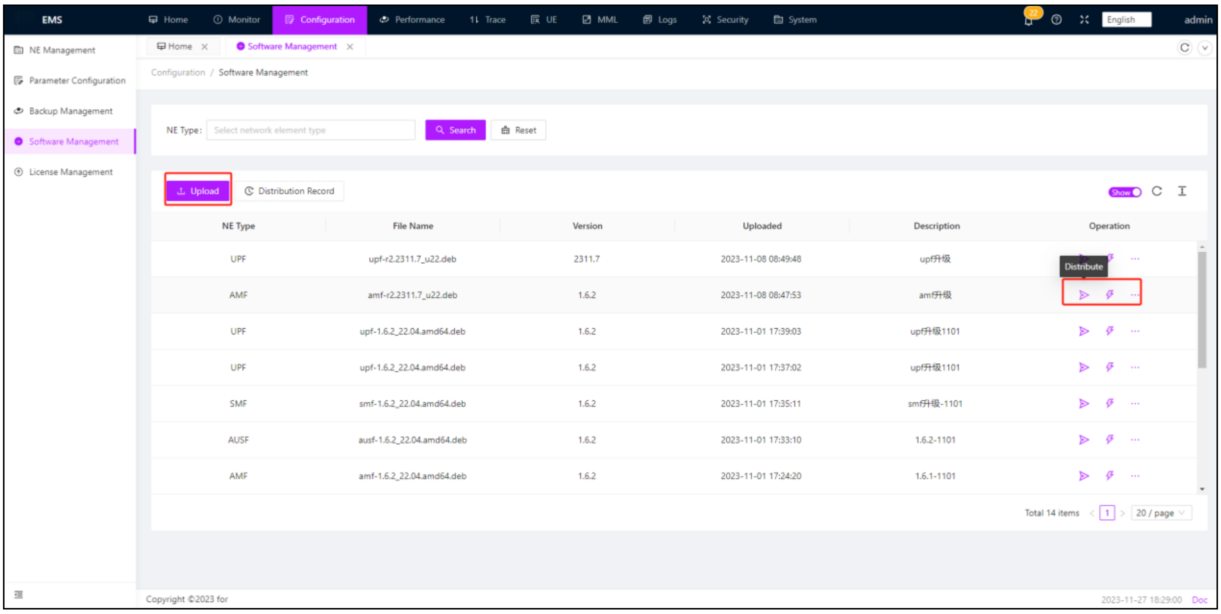
* Comment: upf

3 / 200

* Software File: SELECT FILE

Verify File: SELECT FILE

Cancel OK



NE Type: Select network element type

NE Type	File Name	Version	Uploaded	Description	Operation
UPF	upf-r2.2311.7_u22.deb	2311.7	2023-11-08 08:49:48	upf升级	
AMF	amf-r2.2311.7_u22.deb	1.6.2	2023-11-08 08:47:53	amf升级	
UPF	upf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:39:03	upf升级1101	
UPF	upf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:37:02	upf升级1101	
SMF	smf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:35:11	smf升级-1101	
AUSF	ausf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:33:10	1.6.2-1101	
AMF	amf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:24:20	1.6.1-1101	

Total 14 items 1 20 / page

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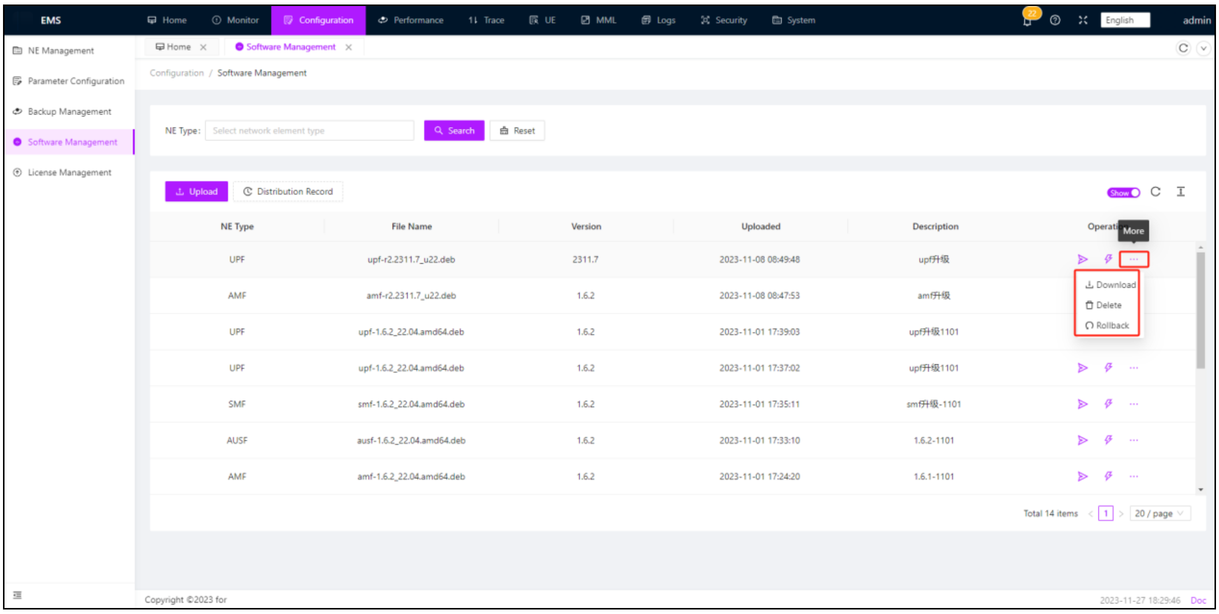
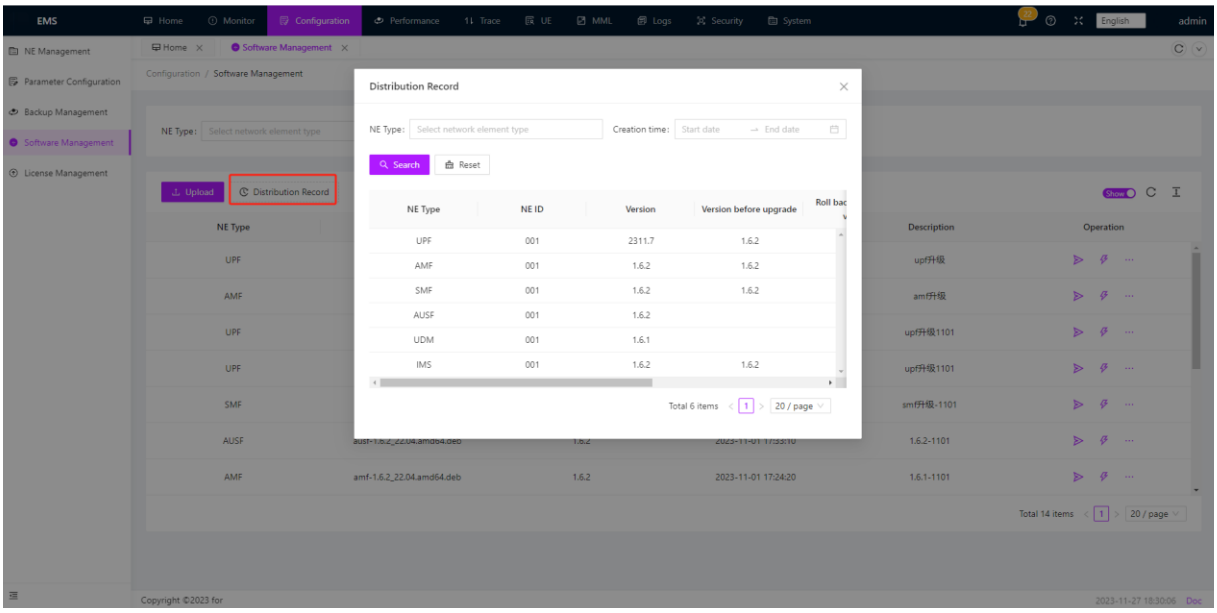


NE Type	File Name	Version	Uploaded	Description
UPF	upf-r2.2311.7_u22.deb	2311.7	2023-11-08 08:49:48	upf升级
AMF	amf-r2.2311.7_u22.deb	1.6.2	2023-11-08 08:47:53	amf升级
UPF	upf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:39:03	upf升级1101
UPF	upf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:37:02	upf升级1101
SMF	smf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:35:11	smf升级-1101
AUSF	ausf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:33:10	1.6.2-1101
AMF	amf-1.6.2_22.04.amd64.deb	1.6.2	2023-11-01 17:24:20	1.6.1-1101

Can view the distribution records of each network element



NE Type	NE ID	Version	Version before upgrade
UPF	001	2311.7	1.6.2
AMF	001	1.6.2	1.6.2
SMF	001	1.6.2	1.6.2
AUSF	001	1.6.2	
UDM	001	1.6.1	
IMS	001	1.6.2	1.6.2

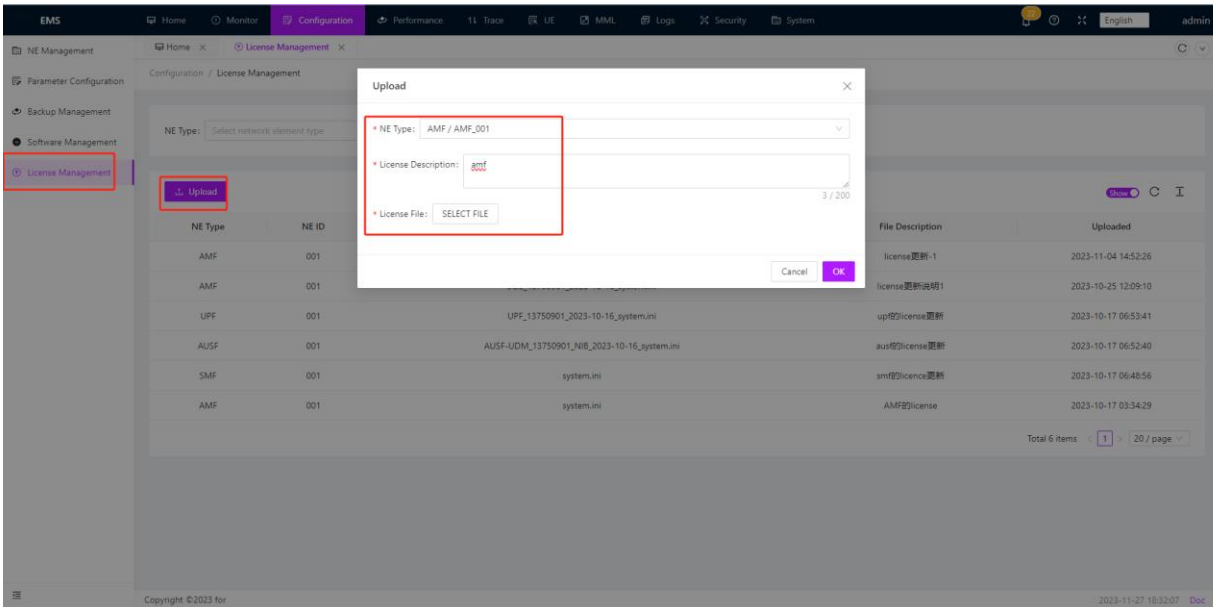
3.4.5 License Management

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.



NE Type: Select network element type

Upload

* NE Type: AMF / AMF_001

* License Description: amf

3 / 200

* License File: SELECT FILE

NE Type	NE ID		File Description	Uploaded
AMF	001		license更新-1	2023-11-04 14:52:26
AMF	001	[illegible]	license更新说明1	2023-10-25 12:09:10
UPF	001	UPF_13750901_2023-10-16_system.ini	upf的license更新	2023-10-17 06:53:41
AUSF	001	AUSF-UDM_13750901_NIB_2023-10-16_system.ini	ausf的license更新	2023-10-17 06:52:40
SMF	001	system.ini	smf的licence更新	2023-10-17 06:48:56
AMF	001	system.ini	AMF的license	2023-10-17 03:34:29

Total 6 items 1 20 / page

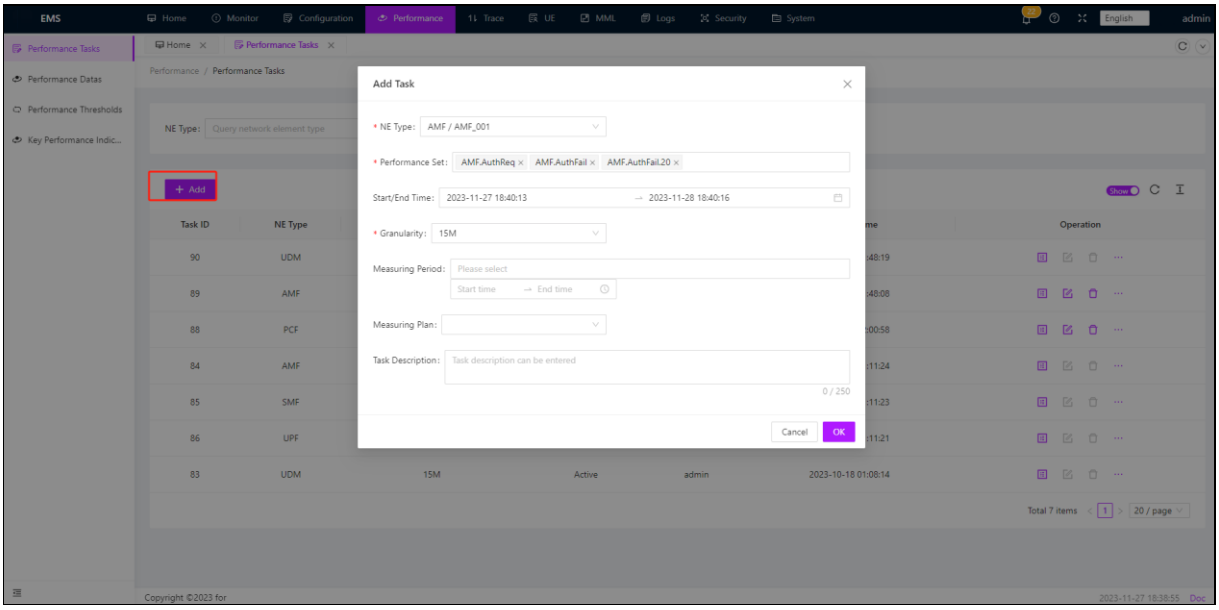
3.5 Performance

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 Performance Tasks

Performance Tasks: This function is to ensure the geological reliability of the network by monitoring the performance indicators of each core network element, performing performance evaluation and analysis. You can create different performance tasks for different NE. You can set the start and end time of the task. The granularity of the counter statistics can be divided into four types: 15 minutes, 30 minutes, 1 hour, and 24 hours

If creating an AMF task, configure the corresponding measurement tasks based on network element AMF, measurement parameters, measurement granularity, measurement period, etc. After creating the task, click “activate” on the right side. If the task is interrupted, you can click “stop task”. After creating a task, the details on the right side of each task can be viewed to provide specific information about the task being created.



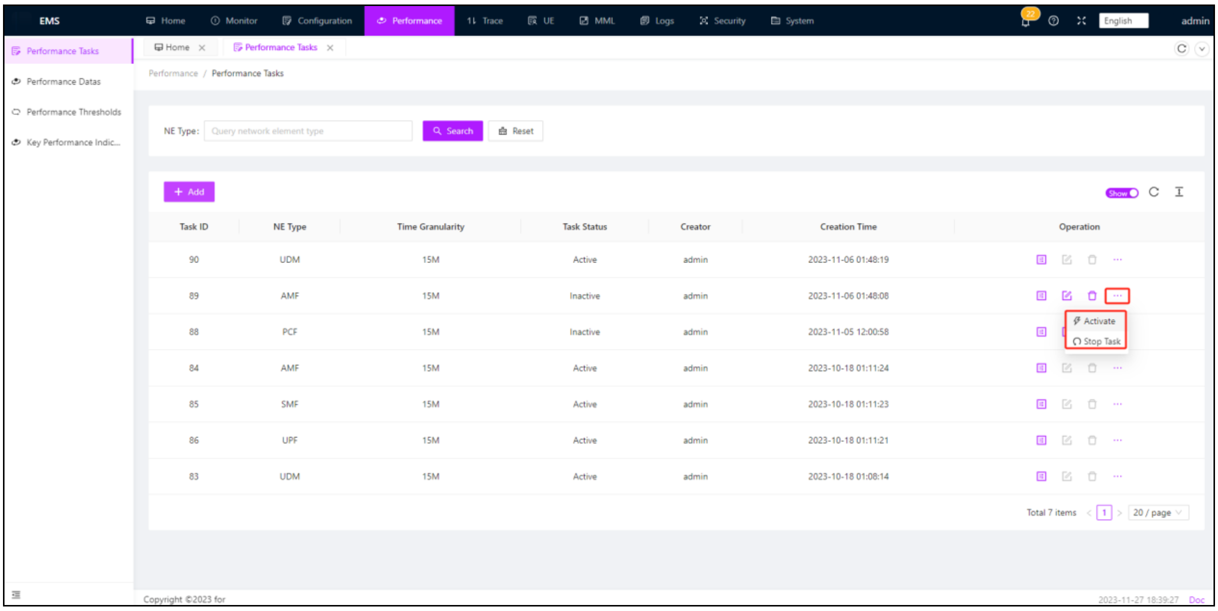
Add Task

- * NE Type: AMF / AMF_001
- * Performance Set: AMF.AuthReq × AMF.AuthFail × AMF.AuthFail.20 ×
- Start/End Time: 2023-11-27 18:40:13 → 2023-11-28 18:40:16
- * Granularity: 15M
- Measuring Period: Please select
  Start time → End time
- Measuring Plan:
- Task Description: Task description can be entered
  0 / 250

Cancel OK

Task ID	NE Type
90	UDM
89	AMF
88	PCF
84	AMF
85	SMF
86	UPF
83	UDM

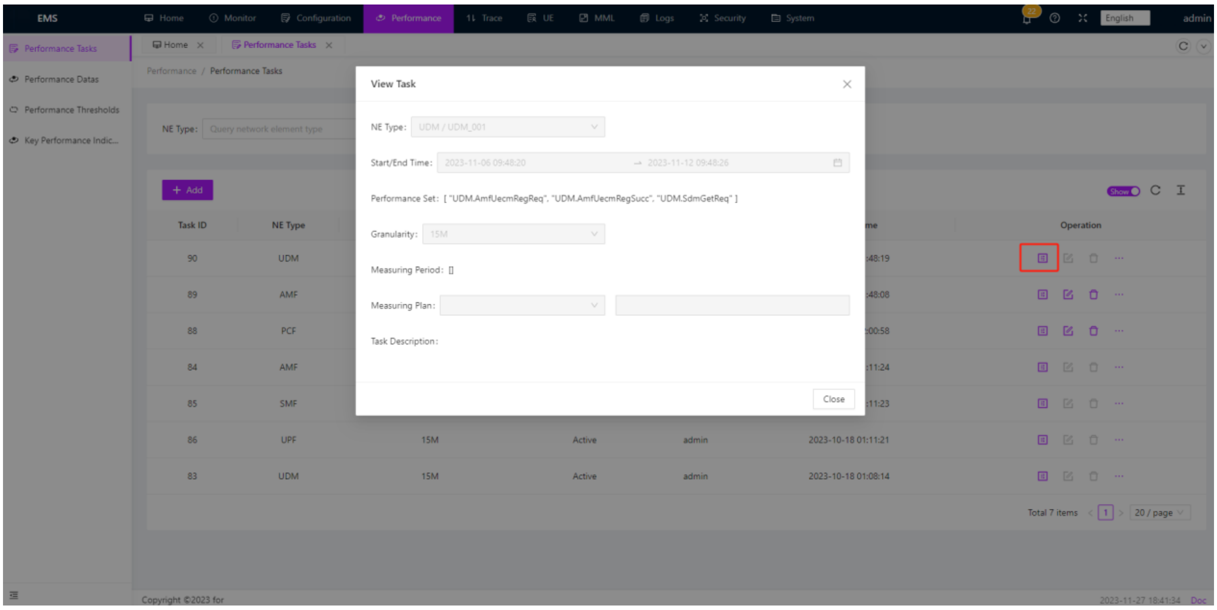
83 UDM 15M Active admin 2023-10-18 01:08:14



NE Type: Query network element type

Task ID	NE Type	Time Granularity	Task Status	Creator	Creation Time	Operation
90	UDM	15M	Active	admin	2023-11-06 01:48:19	
89	AMF	15M	Inactive	admin	2023-11-06 01:48:08	
88	PCF	15M	Inactive	admin	2023-11-05 12:00:58	
84	AMF	15M	Active	admin	2023-10-18 01:11:24	
85	SMF	15M	Active	admin	2023-10-18 01:11:23	
86	UPF	15M	Active	admin	2023-10-18 01:11:21	
83	UDM	15M	Active	admin	2023-10-18 01:08:14	

Total 7 items 1 20 / page



View Task

NE Type: UDM / UDM_001

Start/End Time: 2023-11-06 09:48:20 → 2023-11-12 09:48:26

Performance Set: ["UDM.AmfUecmRegReq", "UDM.AmfUecmRegSucc", "UDM.SdmGetReq"]

Granularity: 15M

Measuring Period: []

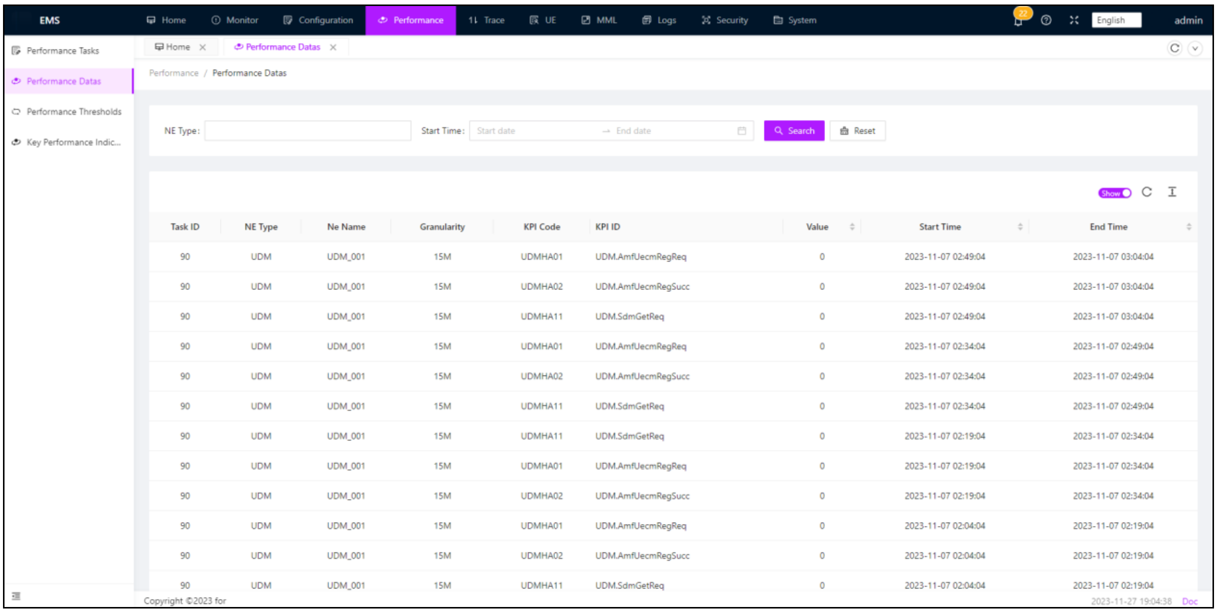
Measuring Plan:

Task Description:

3.5.2 Performance Data

Performance data refers to collecting and recording performance indicators of core NE in different time periods, and then analyzing and displaying the data. Performance data shows the metrics measured in the performance tasks created in the performance tasks

Network element measurement tasks can be formulated based on measurement tasks, and corresponding statistical indicator item values can be viewed based on network element type and task ID:



Task ID	NE Type	Ne Name	Granularity	KPI Code	KPI ID	Value	Start Time	End Time
90	UDM	UDM_001	15M	UDMHA01	UDM.AmfUecmRegReq	0	2023-11-07 02:49:04	2023-11-07 03:04:04
90	UDM	UDM_001	15M	UDMHA02	UDM.AmfUecmRegSucc	0	2023-11-07 02:49:04	2023-11-07 03:04:04
90	UDM	UDM_001	15M	UDMHA11	UDM.SdmGetReq	0	2023-11-07 02:49:04	2023-11-07 03:04:04
90	UDM	UDM_001	15M	UDMHA01	UDM.AmfUecmRegReq	0	2023-11-07 02:34:04	2023-11-07 02:49:04
90	UDM	UDM_001	15M	UDMHA02	UDM.AmfUecmRegSucc	0	2023-11-07 02:34:04	2023-11-07 02:49:04
90	UDM	UDM_001	15M	UDMHA11	UDM.SdmGetReq	0	2023-11-07 02:34:04	2023-11-07 02:49:04
90	UDM	UDM_001	15M	UDMHA11	UDM.SdmGetReq	0	2023-11-07 02:19:04	2023-11-07 02:34:04
90	UDM	UDM_001	15M	UDMHA01	UDM.AmfUecmRegReq	0	2023-11-07 02:19:04	2023-11-07 02:34:04
90	UDM	UDM_001	15M	UDMHA02	UDM.AmfUecmRegSucc	0	2023-11-07 02:19:04	2023-11-07 02:34:04
90	UDM	UDM_001	15M	UDMHA01	UDM.AmfUecmRegReq	0	2023-11-07 02:04:04	2023-11-07 02:19:04
90	UDM	UDM_001	15M	UDMHA02	UDM.AmfUecmRegSucc	0	2023-11-07 02:04:04	2023-11-07 02:19:04
90	UDM	UDM_001	15M	UDMHA11	UDM.SdmGetReq	0	2023-11-07 02:04:04	2023-11-07 02:19:04

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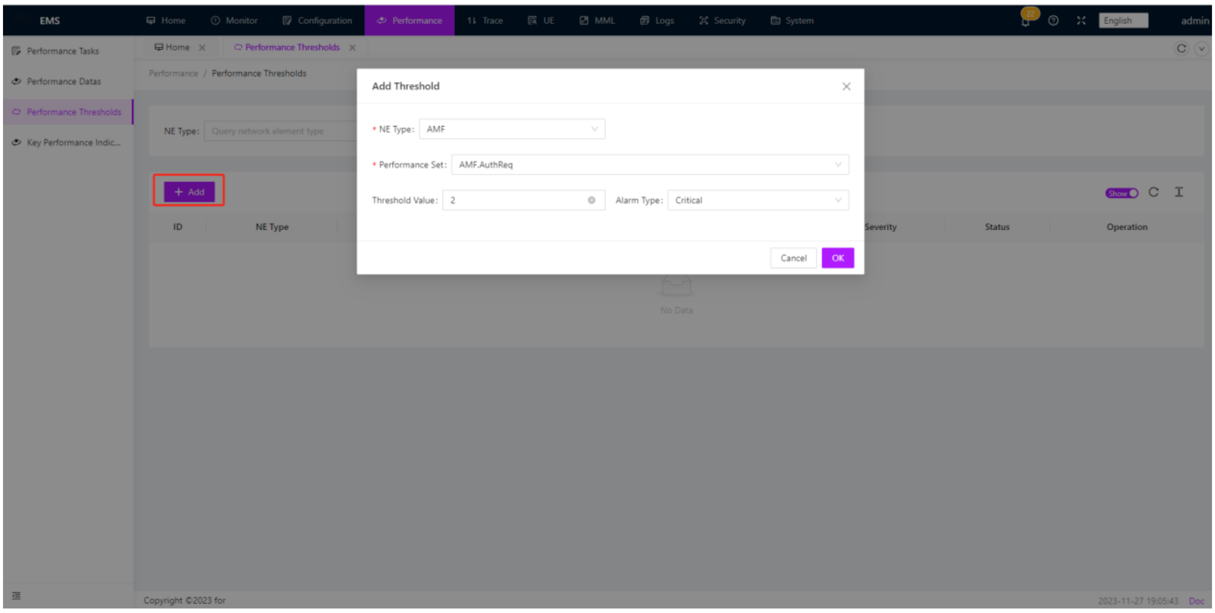
2023-11-27 19:04:38 Doc

3.5.3 Performance Thresholds

Performance threshold: The performance threshold refers to a normal range and a warning range for performance data to detect anomalies in a timely manner. The performance threshold must be set based on the current network load, topology, requirements, and device performance.

OMC monitors performance measurement items defined by performance thresholds and generates business quality alerts to alert business anomalies when performance measurement data exceeds the threshold. The generated alarms will be displayed in the active alarms and historical alarms in the monitor

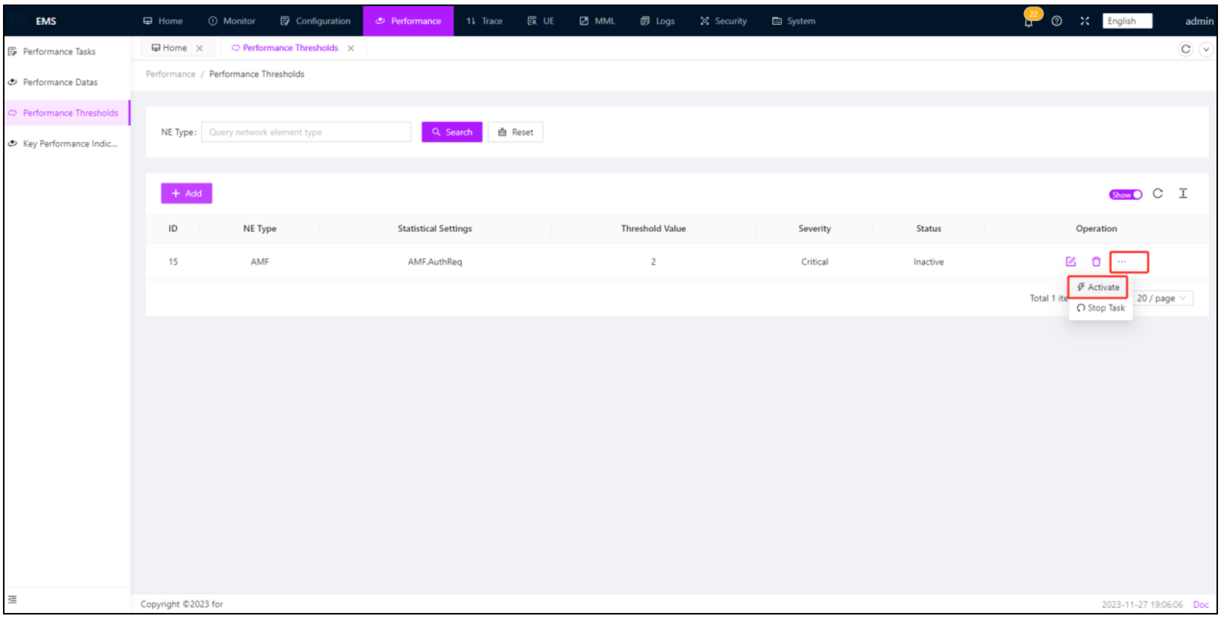


Add Threshold

- * NE Type: AMF
- * Performance Set: AMF.AuthReq
- Threshold Value: 2
- Alarm Type: Critical

Cancel OK

Activate after successfully adding tasks

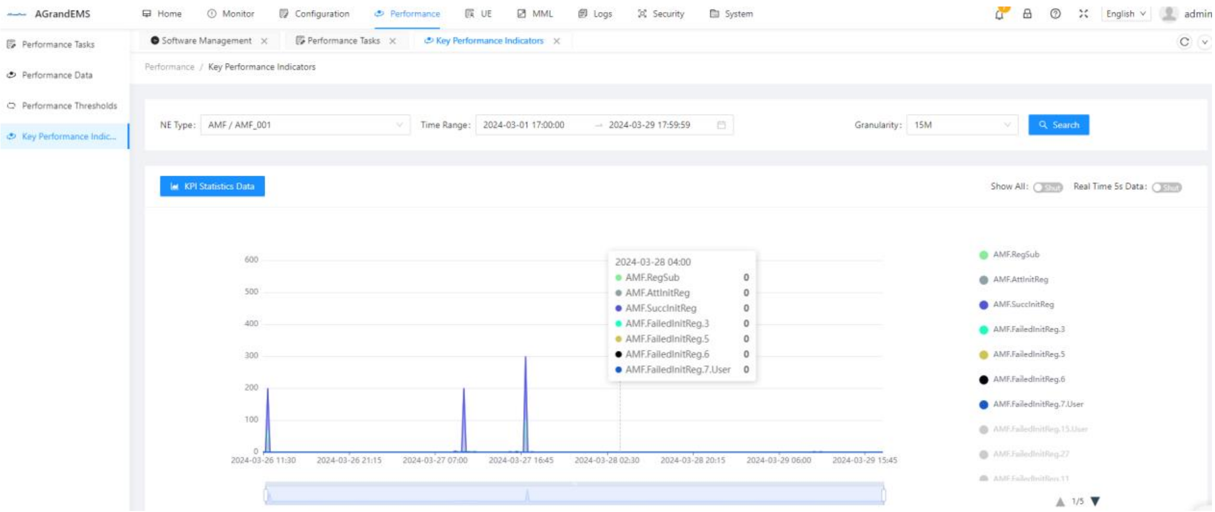


NE Type: Query network element type

ID	NE Type	Statistical Settings	Threshold Value	Severity	Status	Operation
15	AMF	AMF.AuthReq	2	Critical	Inactive	···

3.5.4 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.



NE Type: AMF / AMF_001

Time Range: 2024-03-01 17:00:00 → 2024-03-29 17:59:59

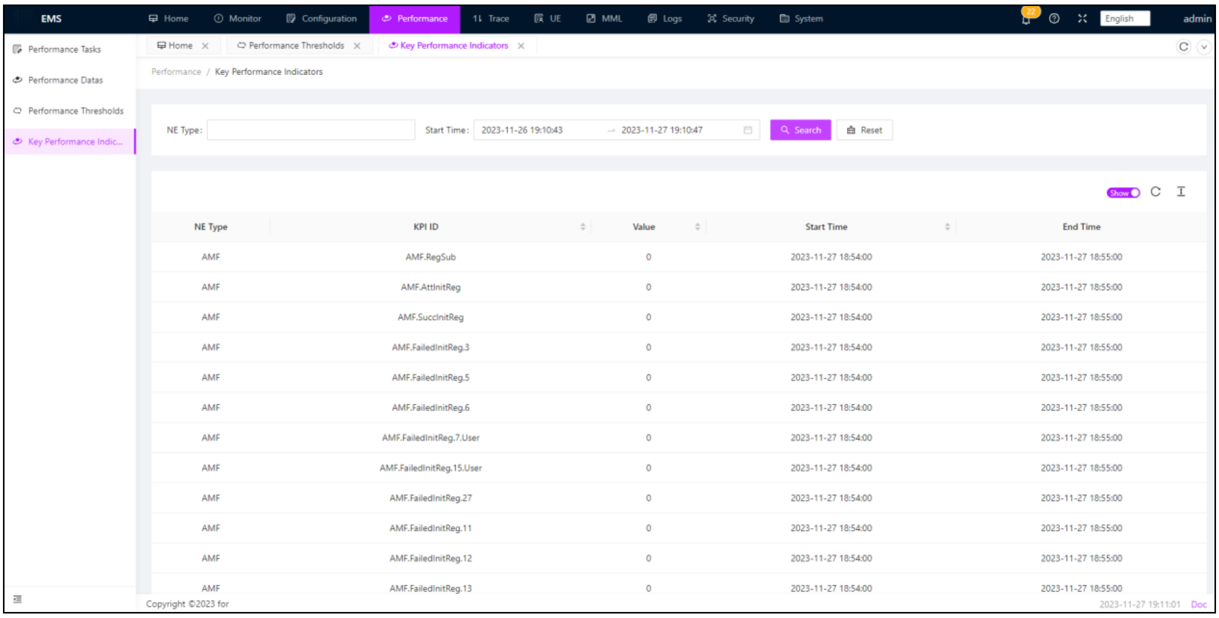
Granularity: 15M

Show All: Shut

Real Time 5s Data: Shut

2024-03-28 04:00

AMF.RegSub	0
AMF.AttInitReg	0
AMF.SuccInitReg	0
AMF.FailedInitReg.3	0
AMF.FailedInitReg.5	0
AMF.FailedInitReg.6	0
AMF.FailedInitReg.7.User	0



NE Type:

Start Time: 2023-11-26 19:10:43 → 2023-11-27 19:10:47

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

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2023-11-27 19:11:01 Doc

3.6 UE

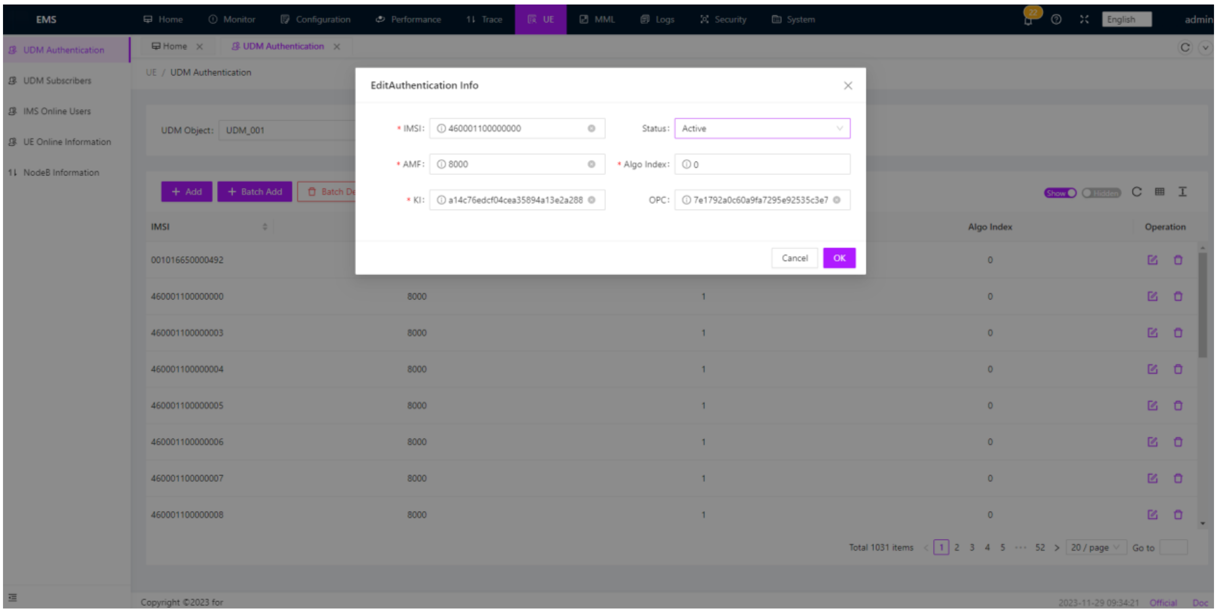
Core network terminal management refers to the management and control of terminal devices in the core network to ensure the security and smooth operation of the network. The core network terminal management includes the UDM authentication and UDM subscribers in the User data management (UDM), and the 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 Object: UDM_001

EditAuthentication Info

* IMSI:	460001100000000	Status:	Active
* AMF:	8000	* Algo Index:	0
* KI:	a14c76edcf04cea35894a13e2a288	OPC:	7e1792a0c60a9fa7295e92535c3e7

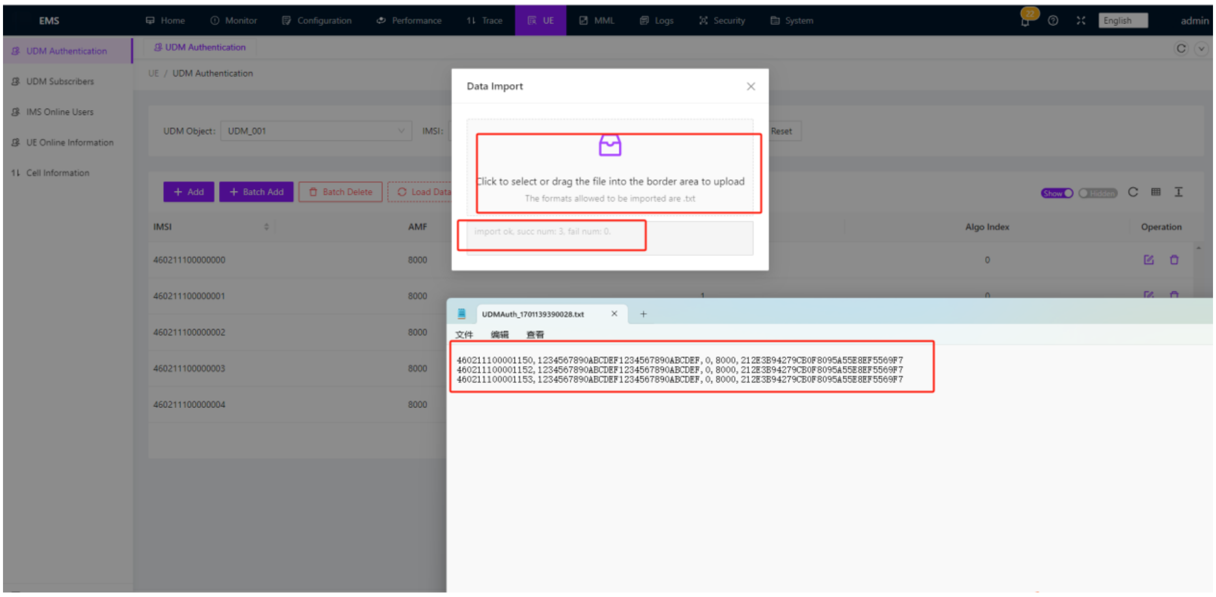
IMSI			Algo Index	Operation
001016650000492			0	
460001100000000	8000	1	0	
460001100000003	8000	1	0	
460001100000004	8000	1	0	
460001100000005	8000	1	0	
460001100000006	8000	1	0	
460001100000007	8000	1	0	
460001100000008	8000	1	0	

Total 1031 items < 1 2 3 4 5 ··· 52 > 20 / page Go to

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.



Click to select or drag the file into the border area to upload

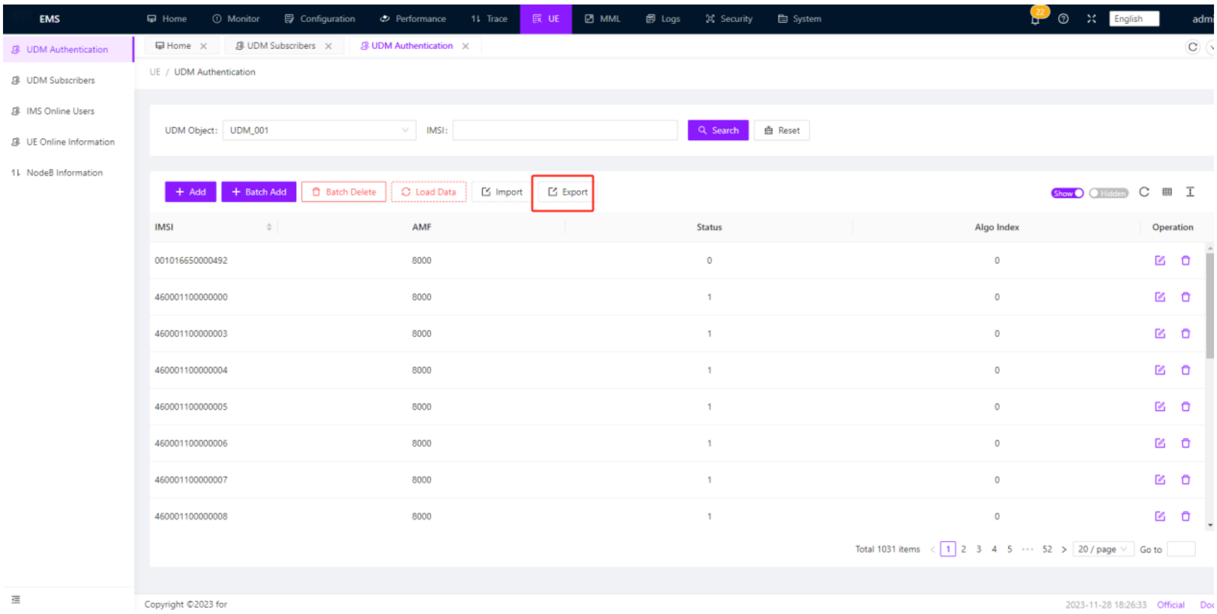
The formats allowed to be imported are .txt

import ok, succ num: 3, fail num: 0.

IMSI	AMF
460211100000000	8000
460211100000001	8000
460211100000002	8000
460211100000003	8000
460211100000004	8000

```
460211100001150,1234567890ABCDEF1234567890ABCDEF,0,8000,212E3B94279CB0F8095A55E8EF5569F7
460211100001152,1234567890ABCDEF1234567890ABCDEF,0,8000,212E3B94279CB0F8095A55E8EF5569F7
460211100001153,1234567890ABCDEF1234567890ABCDEF,0,8000,212E3B94279CB0F8095A55E8EF5569F7
```

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

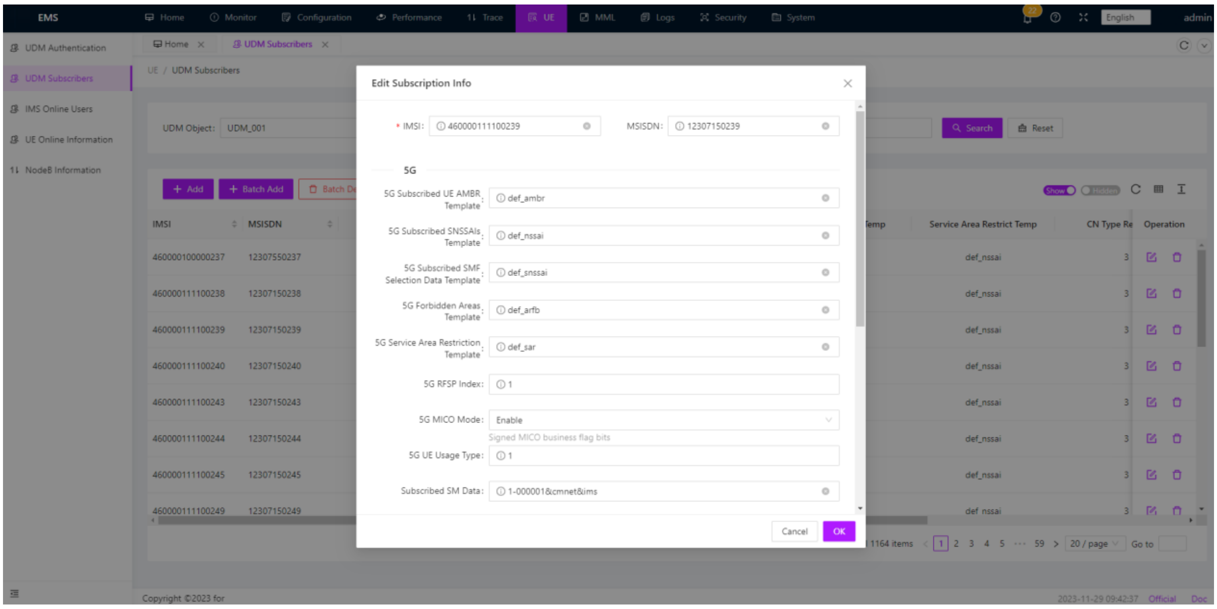


IMSI	AMF	Status	Algo Index	Operation
001016650000492	8000	0	0	
460001100000000	8000	1	0	
460001100000003	8000	1	0	
460001100000004	8000	1	0	
460001100000005	8000	1	0	
460001100000006	8000	1	0	
460001100000007	8000	1	0	
460001100000008	8000	1	0	

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



Edit Subscription Info

* IMSI: 460000111100239 MSISDN: 12307150239

5G

5G Subscribed UE AMBR Template: def_ambr

5G Subscribed SNSSAIs Template: def_nssai

5G Subscribed SMF Selection Data Template: def_snssai

5G Forbidden Areas Template: def_arfb

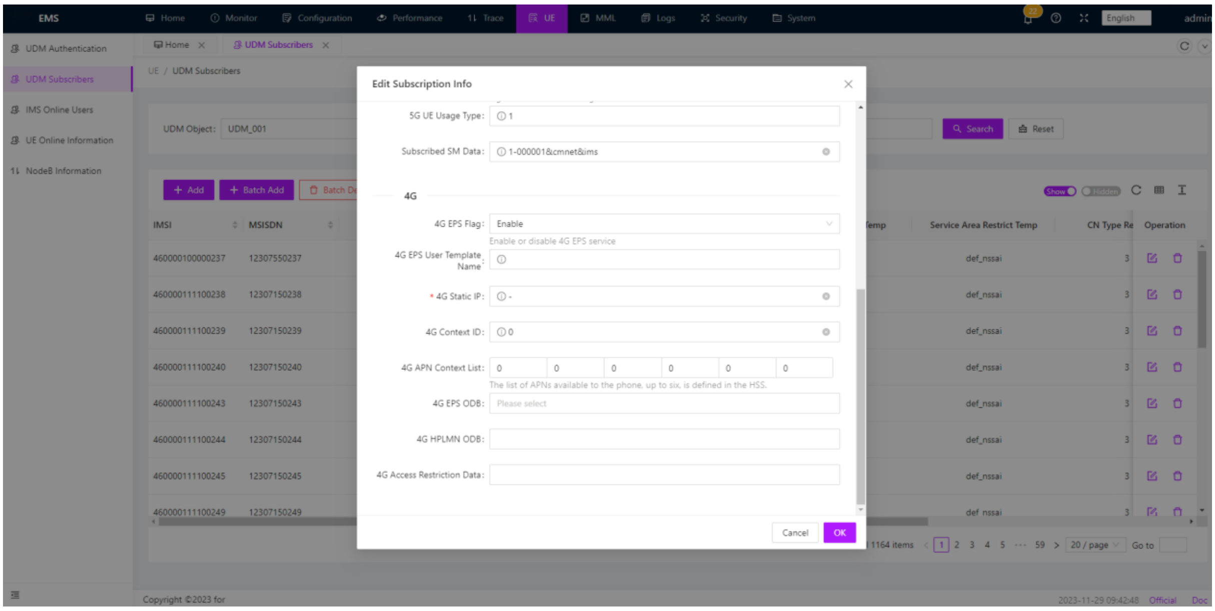
5G Service Area Restriction Template: def_sar

5G RFSP Index: 1

5G MICO Mode: Enable
Signed MICO business flag bits

5G UE Usage Type: 1

Subscribed SM Data: 1-000001&cmnet&ims



Edit Subscription Info

5G UE Usage Type: 1

Subscribed SM Data: 1-000001&cmnet&ims

4G

4G EPS Flag: Enable
Enable or disable 4G EPS service

4G EPS User Template Name:

* 4G Static IP: -

4G Context ID: 0

4G APN Context List: 0 0 0 0 0 0
The list of APNs available to the phone, up to six, is defined in the HSS.

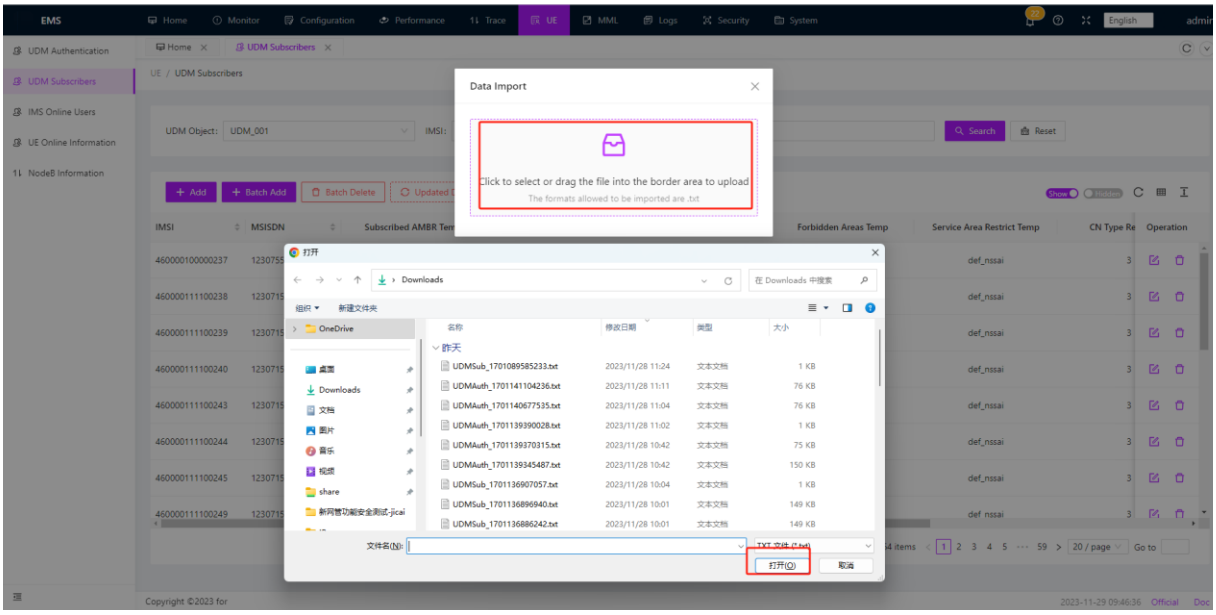
4G EPS ODB: Please select

4G HPLMN ODB:

4G Access Restriction 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.

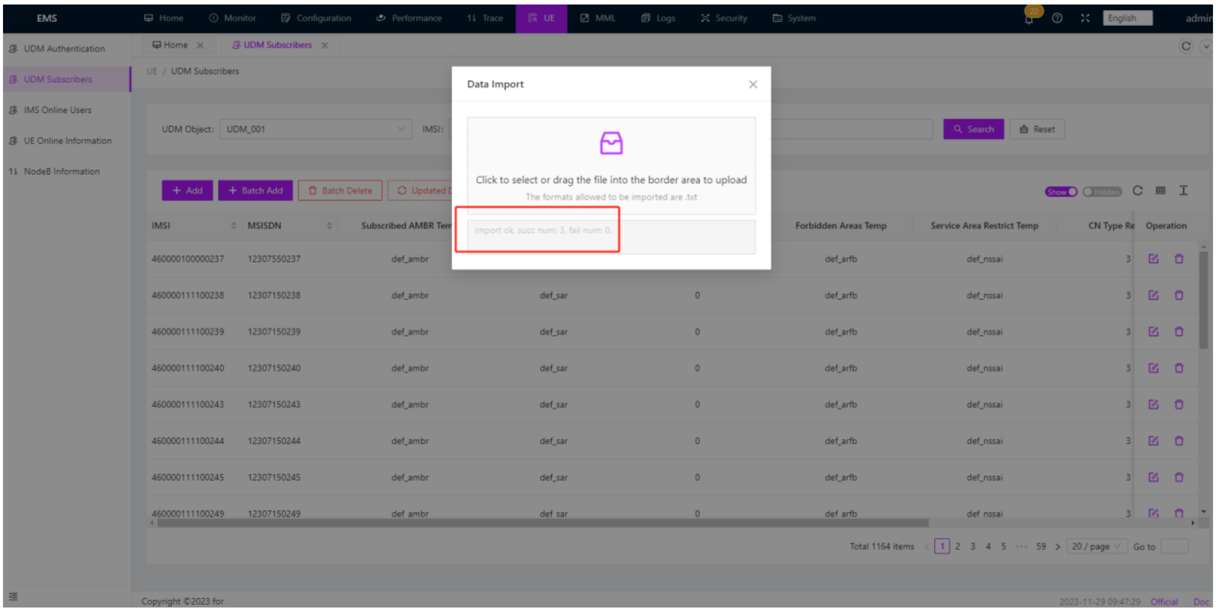


Data Import

Click to select or drag the file into the border area to upload

The formats allowed to be imported are .txt

名称	修改日期	类型	大小
昨天			
UDMSub_1701089585233.txt	2023/11/28 11:24	文本文档	1 KB
UDMAuth_1701141104236.txt	2023/11/28 11:11	文本文档	76 KB
UDMAuth_1701140677535.txt	2023/11/28 11:04	文本文档	76 KB
UDMAuth_1701139390028.txt	2023/11/28 11:02	文本文档	1 KB
UDMAuth_1701139370315.txt	2023/11/28 10:42	文本文档	75 KB
UDMAuth_1701139345487.txt	2023/11/28 10:42	文本文档	150 KB
UDMSub_1701136907057.txt	2023/11/28 10:04	文本文档	1 KB
UDMSub_1701136896940.txt	2023/11/28 10:01	文本文档	149 KB
UDMSub_1701136886242.txt	2023/11/28 10:01	文本文档	149 KB



Data Import

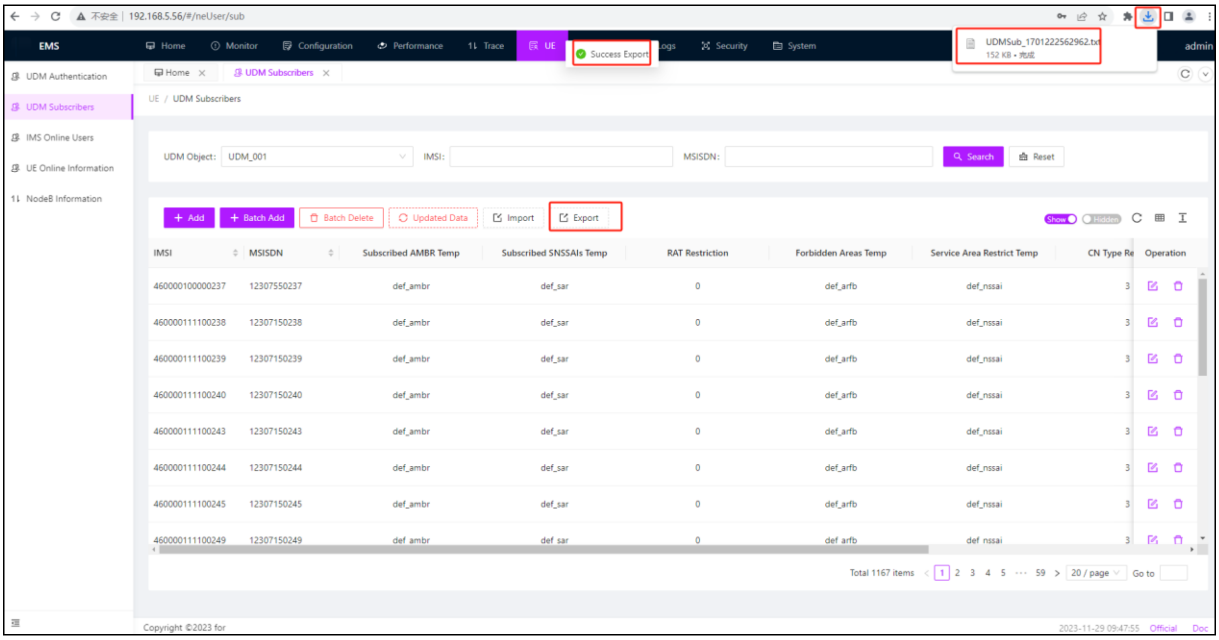
Click to select or drag the file into the border area to upload

The formats allowed to be imported are .txt

import ok: succ num: 3, fail num: 0.

IMSI	MSISDN	Subscribed AMBR Tem			Forbidden Areas Temp	Service Area Restrict Temp	CN Type Re	Operation
460000100000237	12307550237	def_ambr			def_arfb	def_nssai	3	
460000111100238	12307150238	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100239	12307150239	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100240	12307150240	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100243	12307150243	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100244	12307150244	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100245	12307150245	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100249	12307150249	def_ambr	def_sar	0	def_arfb	def_nssai	3	

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



192.168.5.56/#/neUser/sub

Success Export

UDMSub_1701222562962.txt 152 KB • 完成

UDM Object: UDM_001 IMSI: MSISDN:

IMSI	MSISDN	Subscribed AMBR Temp	Subscribed SNSSAIs Temp	RAT Restriction	Forbidden Areas Temp	Service Area Restrict Temp	CN Type Re	Operation
460000100000237	12307550237	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100238	12307150238	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100239	12307150239	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100240	12307150240	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100243	12307150243	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100244	12307150244	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100245	12307150245	def_ambr	def_sar	0	def_arfb	def_nssai	3	
460000111100249	12307150249	def_ambr	def_sar	0	def_arfb	def_nssai	3	

Total 1167 items 1 2 3 4 5 ··· 59 20 / page Go to

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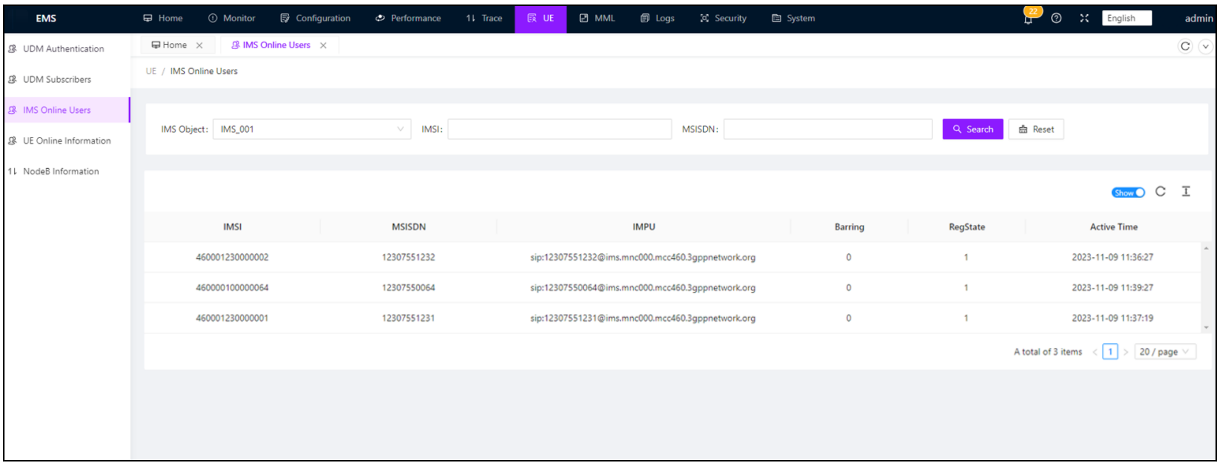
3.6.3 IMS Online Users

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.



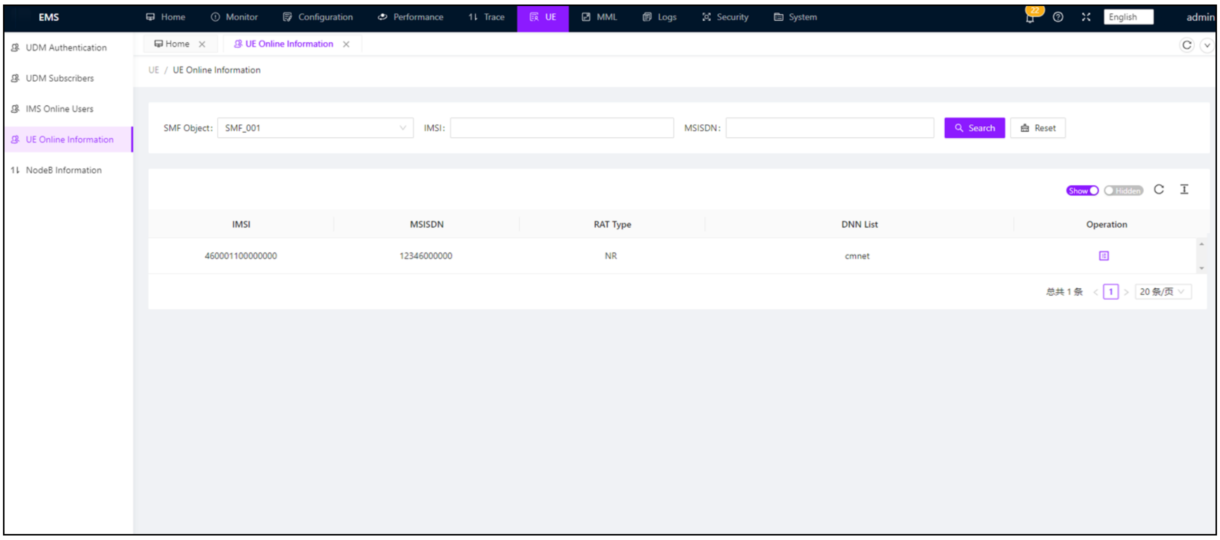
IMS Object: IMS_001 IMSI: MSISDN:

IMSI	MSISDN	IMPU	Barring	RegState	Active Time
460001230000002	12307551232	sip:12307551232@ims.mnc000.mcc460.3gppnetwork.org	0	1	2023-11-09 11:36:27
460000100000064	12307550064	sip:12307550064@ims.mnc000.mcc460.3gppnetwork.org	0	1	2023-11-09 11:39:27
460001230000001	12307551231	sip:12307551231@ims.mnc000.mcc460.3gppnetwork.org	0	1	2023-11-09 11:37:19

A total of 3 items 1 20 / page

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



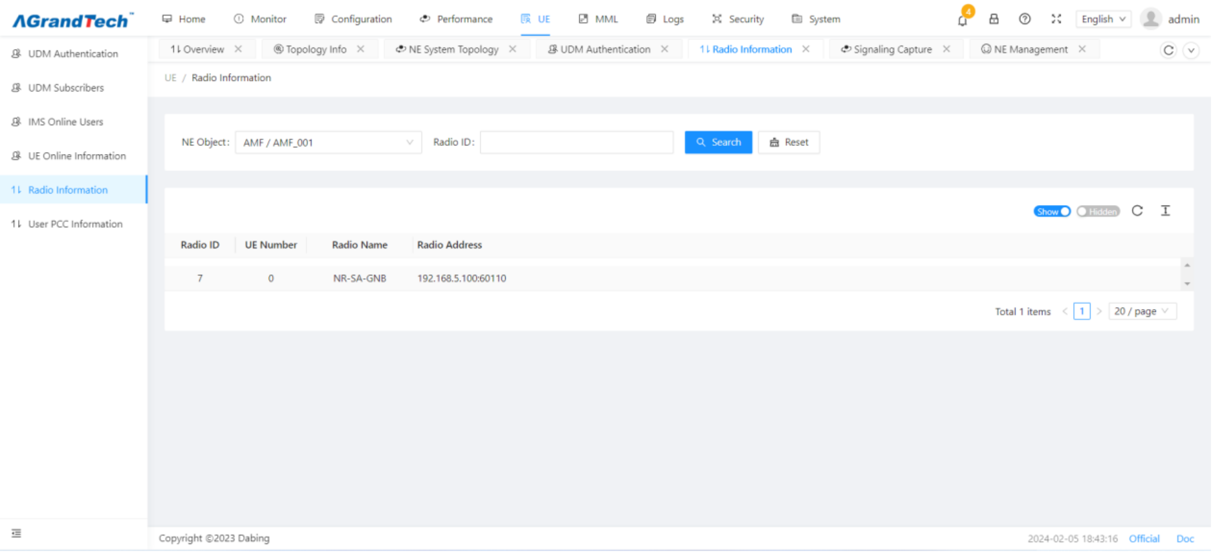
SMF Object: SMF_001 IMSI: MSISDN:

IMSI	MSISDN	RAT Type	DNN List	Operation
460001100000000	12346000000	NR	cmnet	▤

总共 1 条 < 1 > 20 条/页

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.



NE Object: AMF / AMF_001 Radio ID:

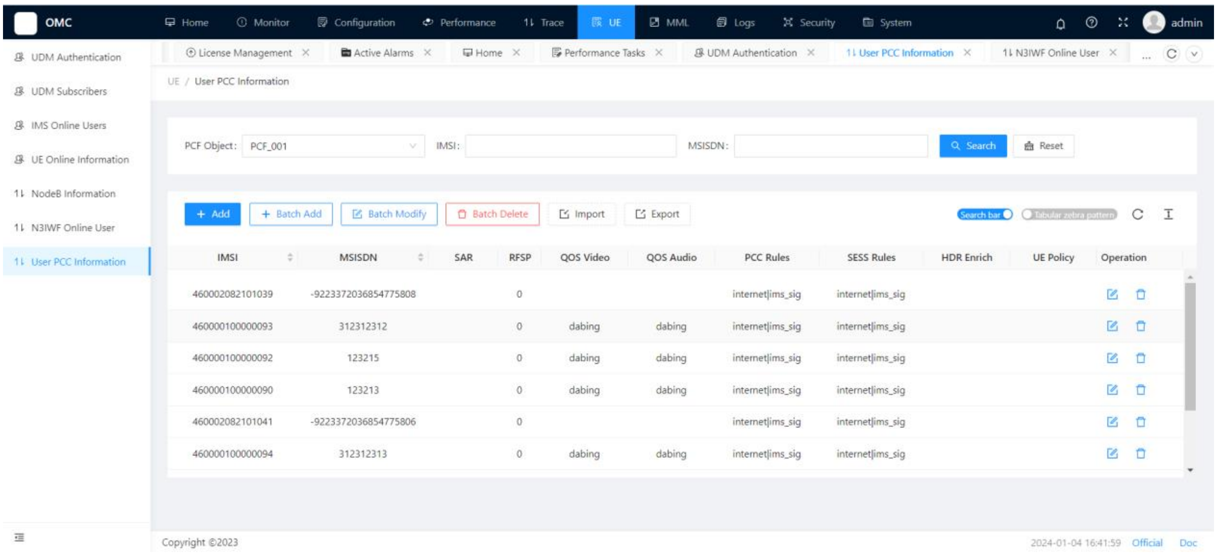
Radio ID	UE Number	Radio Name	Radio Address
7	0	NR-SA-GNB	192.168.5.100:60110

Total 1 items < 1 > 20 / page

Copyright ©2023 Dabing 2024-02-05 18:43:16

3.6.6 User PCC Information

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



PCF Object: PCF_001 IMSI: MSISDN:

IMSI	MSISDN	SAR	RFSP	QOS Video	QOS Audio	PCC Rules	SESS Rules	HDR Enrich	UE Policy	Operation
460002082101039	-9223372036854775808		0			internet|ims_sig	internet|ims_sig			
460000100000093	312312312		0	dabing	dabing	internet|ims_sig	internet|ims_sig			
460000100000092	123215		0	dabing	dabing	internet|ims_sig	internet|ims_sig			
460000100000090	123213		0	dabing	dabing	internet|ims_sig	internet|ims_sig			
460002082101041	-9223372036854775806		0			internet|ims_sig	internet|ims_sig			
460000100000094	312312313		0	dabing	dabing	internet|ims_sig	internet|ims_sig			

2024-01-04 16:41:59

3.7 MML

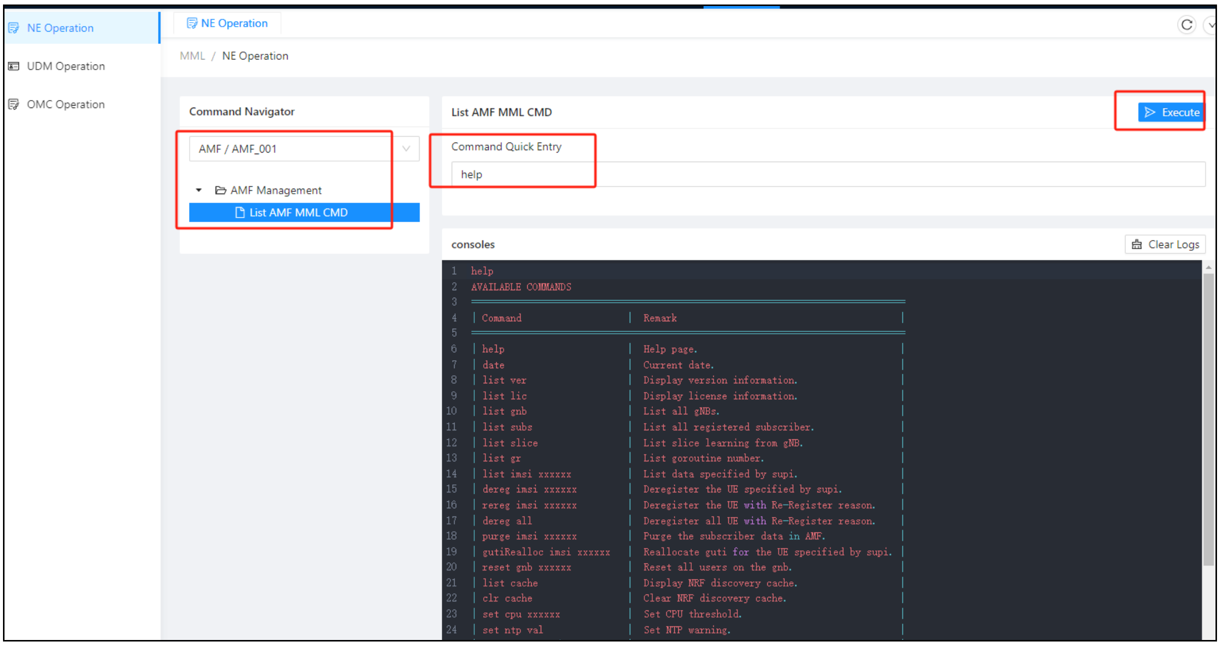
MML (Man-Machine Language) management refers to the method of managing and configuring various parts of the core network by using specific command languages. MML management covers NE operation, UDM operation, and OMC operation.

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

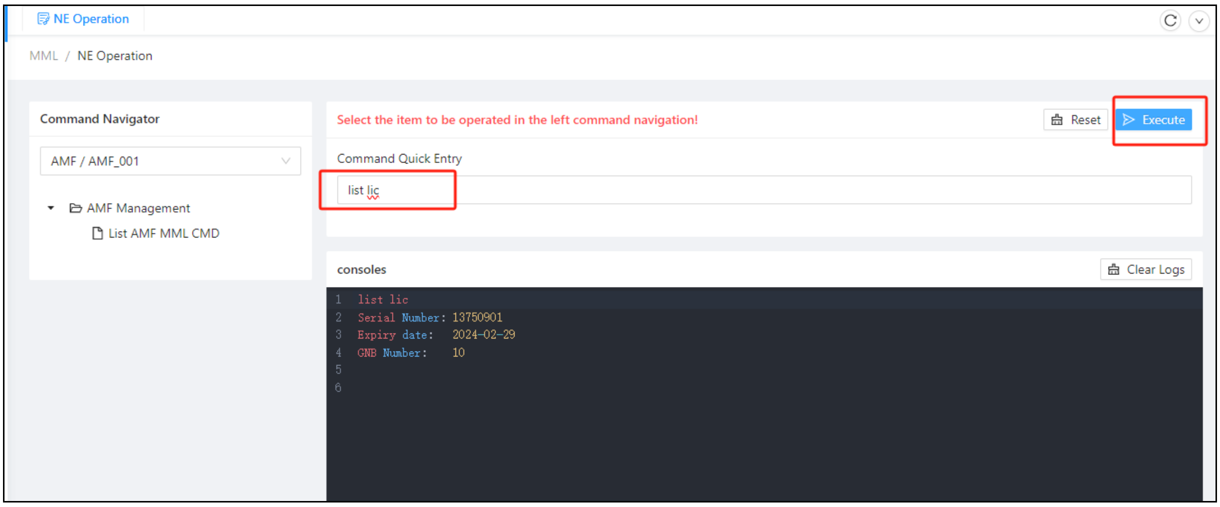
NE manage and configure core network elements through MML commands. Network element operations can query and configure the data information of each network element, such as querying the license information and version information of the network element, querying the access base station information in 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.



Command Quick Entry: help

```
help
AVAILABLE COMMANDS
=========================================================================
| Command                    | Remark                                    |
=========================================================================
| help                       | Help page.                                |
| date                       | Current date.                             |
| list ver                   | Display version information.              |
| list lic                   | Display license information.              |
| list gnb                   | List all gNBs.                            |
| list subs                  | List all registered subscriber.           |
| list slice                 | List slice learning from gNB.             |
| list gr                    | List goroutine number.                    |
| list imsi xxxxxx           | List data specified by supi.              |
| dereg imsi xxxxxx          | Deregister the UE specified by supi.      |
| rereg imsi xxxxxx          | Deregister the UE with Re-Register reason.|
| dereg all                  | Deregister all UE with Re-Register reason.|
| purge imsi xxxxxx          | Purge the subscriber data in AMF.         |
| gutiRealloc imsi xxxxxx    | Reallocate guti for the UE specified by supi.|
| reset gnb xxxxxx           | Reset all users on the gnb.               |
| list cache                 | Display NRF discovery cache.              |
| clr cache                  | Clear NRF discovery cache.                |
| set cpu xxxxxx             | Set CPU threshold.                        |
| set ntp val                | Set NTP warning.                          |
```



Select the item to be operated in the left command navigation!

Command Quick Entry: list lic

```
list lic
Serial Number: 13750901
Expiry date:   2024-02-29
GNB Number:    10
```

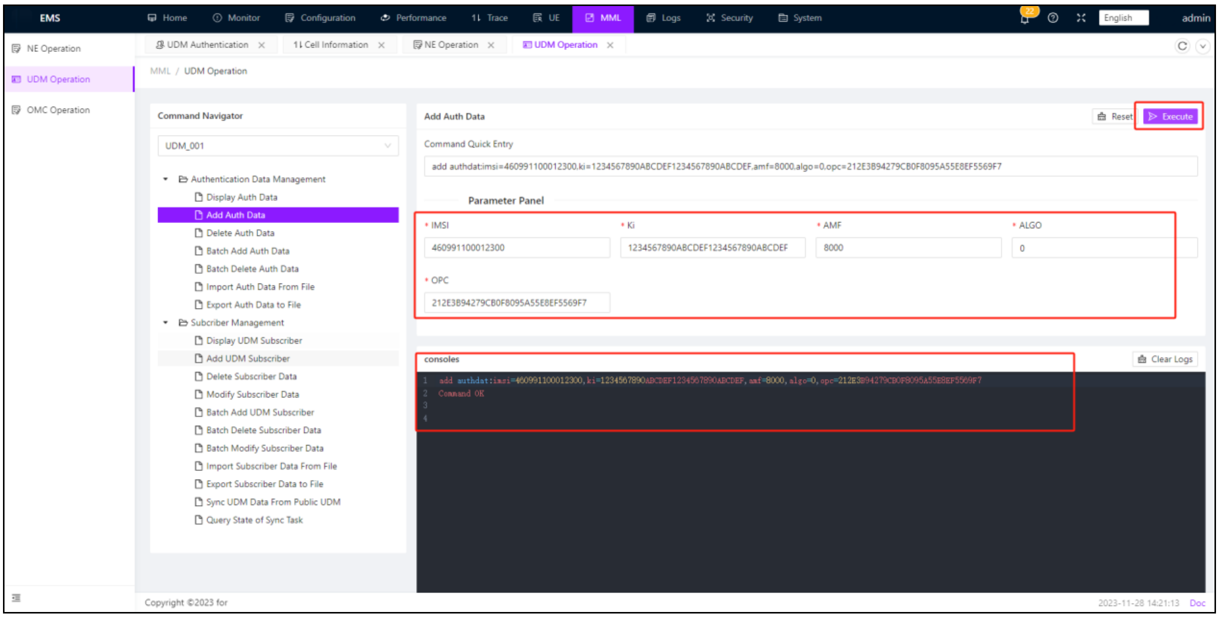
3.7.2 UDM Operation

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 Auth Data

Command Quick Entry

```
add authdat:imsi=460991100012300,ki=1234567890ABCDEF1234567890ABCDEF,amf=8000,algo=0,opc=212E3B94279CB0F8095A55E8EF5569F7
```

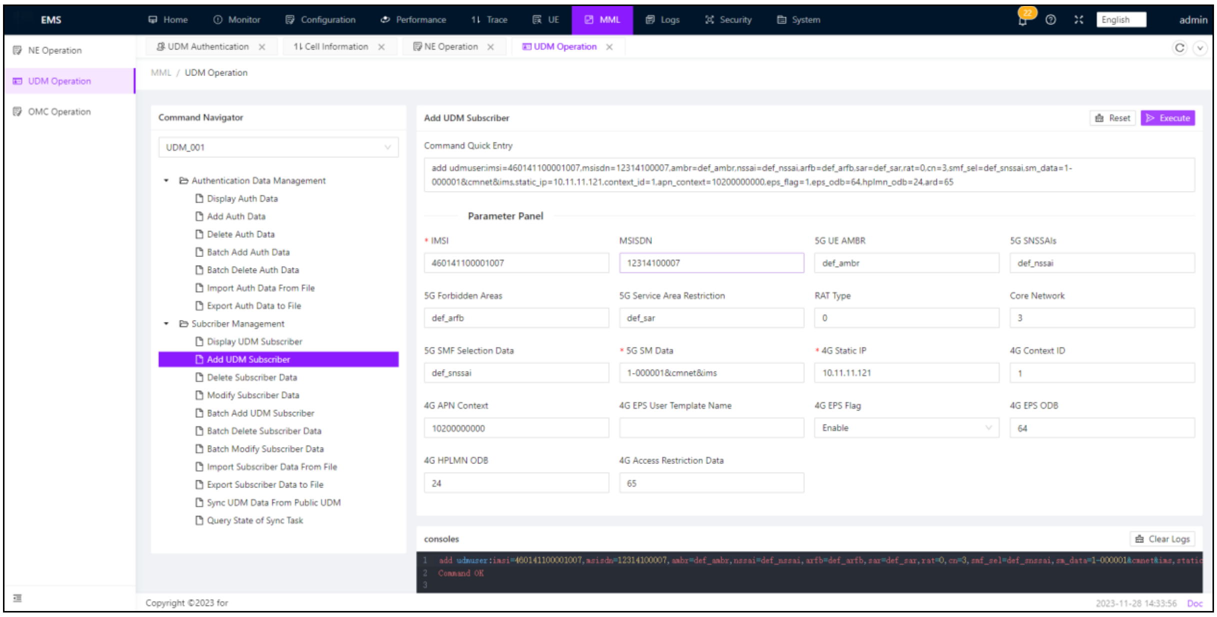
Parameter Panel

* IMSI	* Ki	* AMF	* ALGO
460991100012300	1234567890ABCDEF1234567890ABCDEF	8000	0
* OPC			
212E3B94279CB0F8095A55E8EF5569F7			

consoles

```
add authdat:imsi=460991100012300,ki=1234567890ABCDEF1234567890ABCDEF,amf=8000,algo=0,opc=212E3B94279CB0F8095A55E8EF5569F7
Command OK
```

Add UDM Subscriber data as follows:



Add UDM Subscriber

Command Quick Entry

```
add udmuser:imsi=460141100001007,msisdn=12314100007,ambr=def_ambr,nssai=def_nssai,arfb=def_arfb,sar=def_sar,rat=0,cn=3,smf_sel=def_snssai,sm_data=1-000001&cmnet&ims,static_ip=10.11.11.121,context_id=1,apn_context=10200000000,eps_flag=1,eps_odb=64,hplmn_odb=24,ard=65
```

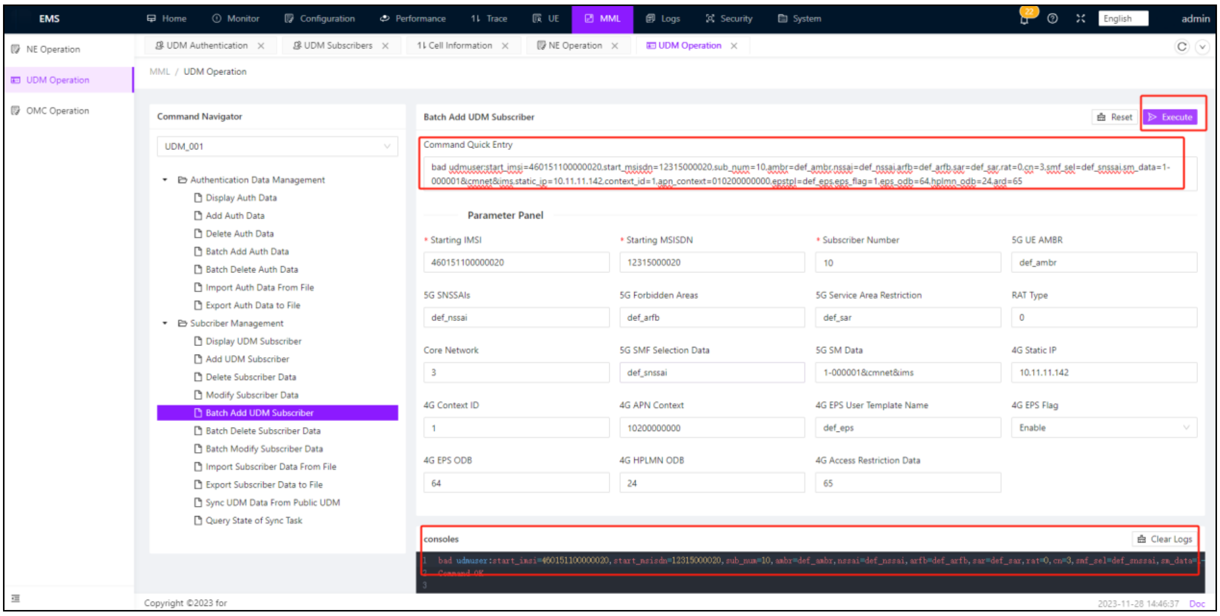
Parameter Panel

* IMSI	MSISDN	5G UE AMBR	5G SNSSAIs
460141100001007	12314100007	def_ambr	def_nssai
5G Forbidden Areas	5G Service Area Restriction	RAT Type	Core Network
def_arfb	def_sar	0	3
5G SMF Selection Data	* 5G SM Data	* 4G Static IP	4G Context ID
def_snssai	1-000001&cmnet&ims	10.11.11.121	1
4G APN Context	4G EPS User Template Name	4G EPS Flag	4G EPS ODB
10200000000		Enable	64
4G HPLMN ODB	4G Access Restriction Data		
24	65		

consoles

```
add udmuser:imsi=460141100001007,msisdn=12314100007,ambr=def_ambr,nssai=def_nssai,arfb=def_arfb,sar=def_sar,rat=0,cn=3,smf_sel=def_snssai,sm_data=1-000001&cmnet&ims,static
Command OK
```

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



Command Quick Entry

```
bad udmuser:start_imsi=460151100000020,start_msisdn=12315000020,sub_num=10,ambr=def_ambr,nssai=def_nssai,arfb=def_arfb,sar=def_sar,rat=0,cn=3,smf_sel=def_snssai,sm_data=1-000001&cmnet&ims,static_ip=10.11.11.142,context_id=1,apn_context=010200000000,epstpl=def_eps,eps_flag=1,eps_odb=64,hplmn_odb=24,ard=65
```

Parameter Panel

* Starting IMSI	* Starting MSISDN	* Subscriber Number	5G UE AMBR
460151100000020	12315000020	10	def_ambr
5G SNSSAIs	5G Forbidden Areas	5G Service Area Restriction	RAT Type
def_nssai	def_arfb	def_sar	0
Core Network	5G SMF Selection Data	5G SM Data	4G Static IP
3	def_snssai	1-000001&cmnet&ims	10.11.11.142
4G Context ID	4G APN Context	4G EPS User Template Name	4G EPS Flag
1	10200000000	def_eps	Enable
4G EPS ODB	4G HPLMN ODB	4G Access Restriction Data	
64	24	65	

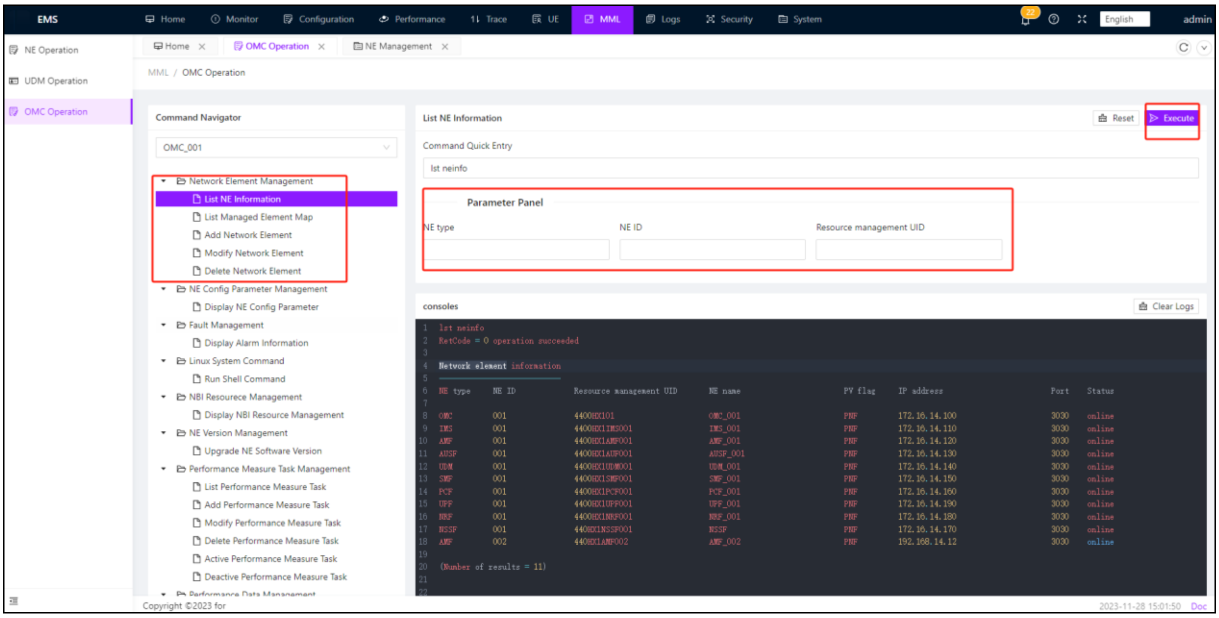
consoles

```
bad udmuser:start_imsi=460151100000020,start_msisdn=12315000020,sub_num=10,ambr=def_ambr,nssai=def_nssai,arfb=def_arfb,sar=def_sar,rat=0,cn=3,smf_sel=def_snssai,sm_data=
Command OK
```

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:



Command Quick Entry

```
lst neinfo
```

Parameter Panel

NE type

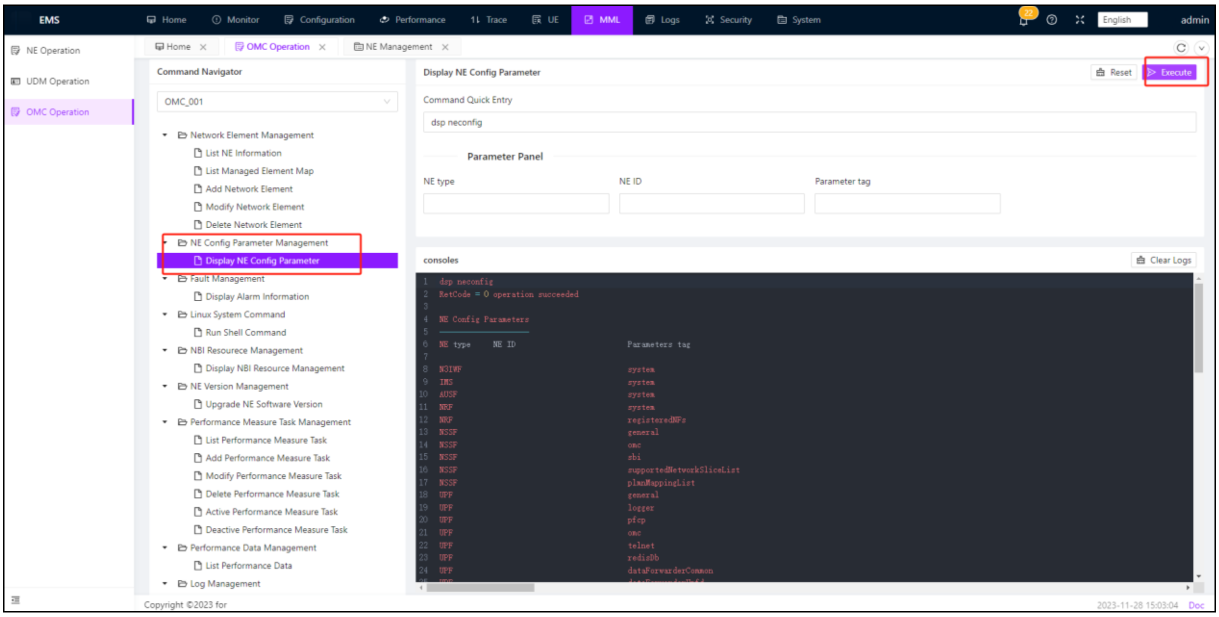
NE ID

Resource management UID

consoles

```
lst neinfo
RetCode = 0 operation succeeded

Network element information

NE type    NE ID      Resource management UID   NE name          PV flag   IP address        Port   Status

OMC        001        4400HX101                  OMC_001          PNF       172.16.14.100     3030   online
IMS        001        4400HX1IMS001              IMS_001          PNF       172.16.14.110     3030   online
AMF        001        4400HX1AMF001              AMF_001          PNF       172.16.14.120     3030   online
AUSF       001        4400HX1AUF001              AUSF_001         PNF       172.16.14.130     3030   online
UDM        001        4400HX1UDM001              UDM_001          PNF       172.16.14.140     3030   online
SMF        001        4400HX1SMF001              SMF_001          PNF       172.16.14.150     3030   online
PCF        001        4400HX1PCF001              PCF_001          PNF       172.16.14.160     3030   online
UPF        001        4400HX1UPF001              UPF_001          PNF       172.16.14.190     3030   online
NRF        001        4400HX1NRF001              NRF_001          PNF       172.16.14.180     3030   online
NSSF       001        440HX1NSSF001              NSSF             PNF       172.16.14.170     3030   online
AMF        002        440HX1AMF002               AMF_002          PNF       192.168.14.12     3030   online

(Number of results = 11)
```

NE Config Parameter Management:



Display NE Config Parameter

Command Quick Entry: dsp neconfig

Parameter Panel

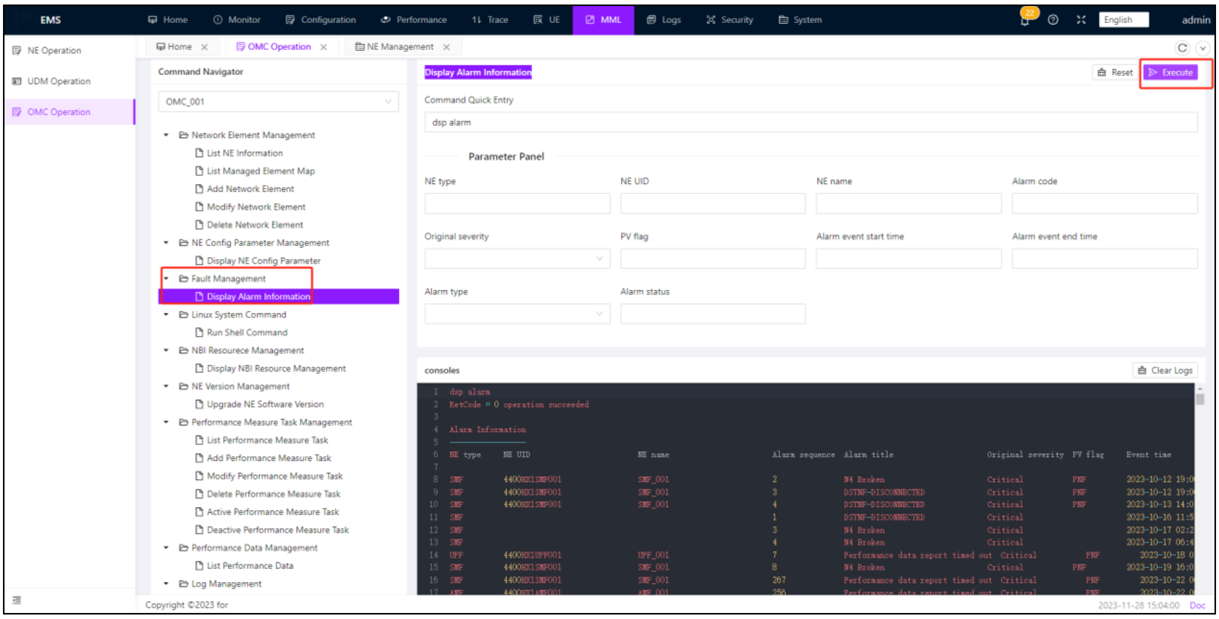
NE type | NE ID | Parameter tag

consoles

```
dsp neconfig
RetCode = 0 operation succeeded

NE Config Parameters

NE type     NE ID                          Parameters tag

N3IWF                                      system
IMS                                        system
AUSF                                       system
NRF                                        system
NRF                                        registeredNFs
NSSF                                       general
NSSF                                       omc
NSSF                                       sbi
NSSF                                       supportedNetworkSliceList
NSSF                                       plmnMappingList
UPF                                        general
UPF                                        logger
UPF                                        pfcp
UPF                                        omc
UPF                                        telnet
UPF                                        redisDb
UPF                                        dataForwarderCommon
```

2023-11-28 15:03:04

Fault Management:



Display Alarm Information

Command Quick Entry: dsp alarm

Parameter Panel

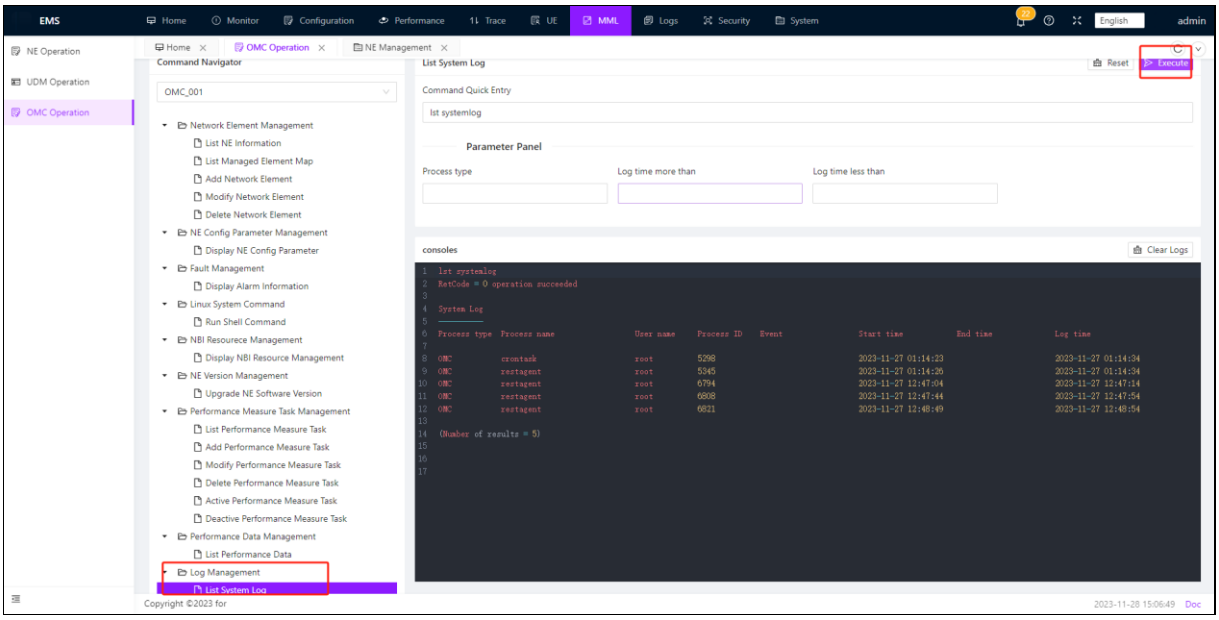
NE type | NE UID | NE name | Alarm code
Original severity | PV flag | Alarm event start time | Alarm event end time
Alarm type | Alarm status

consoles

```
dsp alarm
RetCode = 0 operation succeeded

Alarm Information

NE type    NE UID            NE name          Alarm sequence  Alarm title                     Original severity  PV flag   Event time

SMF        4400HX1SMF001     SMF_001          2               N4 Broken                       Critical           PNF       2023-10-12 19:0
SMF        4400HX1SMF001     SMF_001          3               DSTNF-DISCONNECTED              Critical           PNF       2023-10-12 19:0
SMF        4400HX1SMF001     SMF_001          4               DSTNF-DISCONNECTED              Critical           PNF       2023-10-13 14:0
SMF                                           1               DSTNF-DISCONNECTED              Critical                     2023-10-16 11:5
SMF                                           3               N4 Broken                       Critical                     2023-10-17 02:2
SMF                                           4               N4 Broken                       Critical                     2023-10-17 06:4
UPF        4400HX1UPF001     UPF_001          7               Performance data report timed out  Critical          PNF       2023-10-18 0
SMF        4400HX1SMF001     SMF_001          8               N4 Broken                       Critical           PNF       2023-10-19 16:0
SMF        4400HX1SMF001     SMF_001          267             Performance data report timed out  Critical          PNF       2023-10-22 0
```

2023-11-28 15:04:00

Log Management:



OMC_001

Command Quick Entry: lst systemlog

```
lst systemlog
RetCode = 0 operation succeeded

System Log
──────────
Process type  Process name            User name   Process ID   Event            Start time           End time            Log time

OMC           crontask                root        5298                          2023-11-27 01:14:23                      2023-11-27 01:14:34
OMC           restagent               root        5345                          2023-11-27 01:14:26                      2023-11-27 01:14:34
OMC           restagent               root        6794                          2023-11-27 12:47:04                      2023-11-27 12:47:14
OMC           restagent               root        6808                          2023-11-27 12:47:44                      2023-11-27 12:47:54
OMC           restagent               root        6821                          2023-11-27 12:48:49                      2023-11-27 12:48:54

(Number of results = 5)
```

3.8 Logs

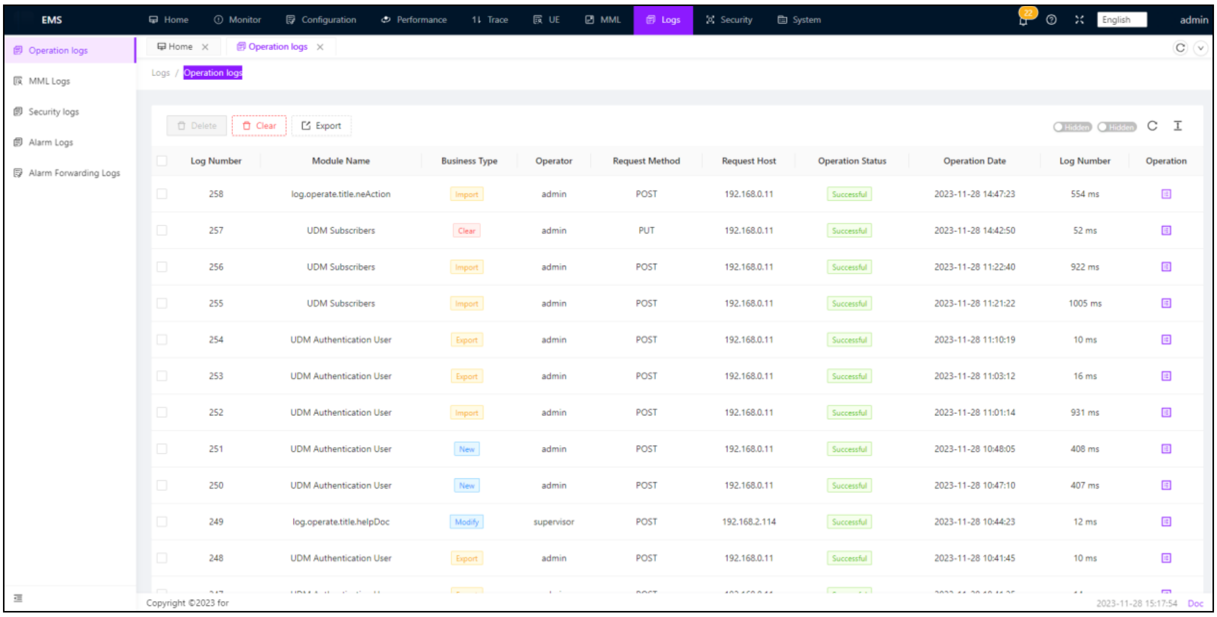
Core network Logs management is a critical part of network uptime maintenance, allowing managers to track the status of various parts of the core network, record potential problems, and perform troubleshooting and performance analysis. Logs management covers operation logs, MML logs, security logs, alarm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

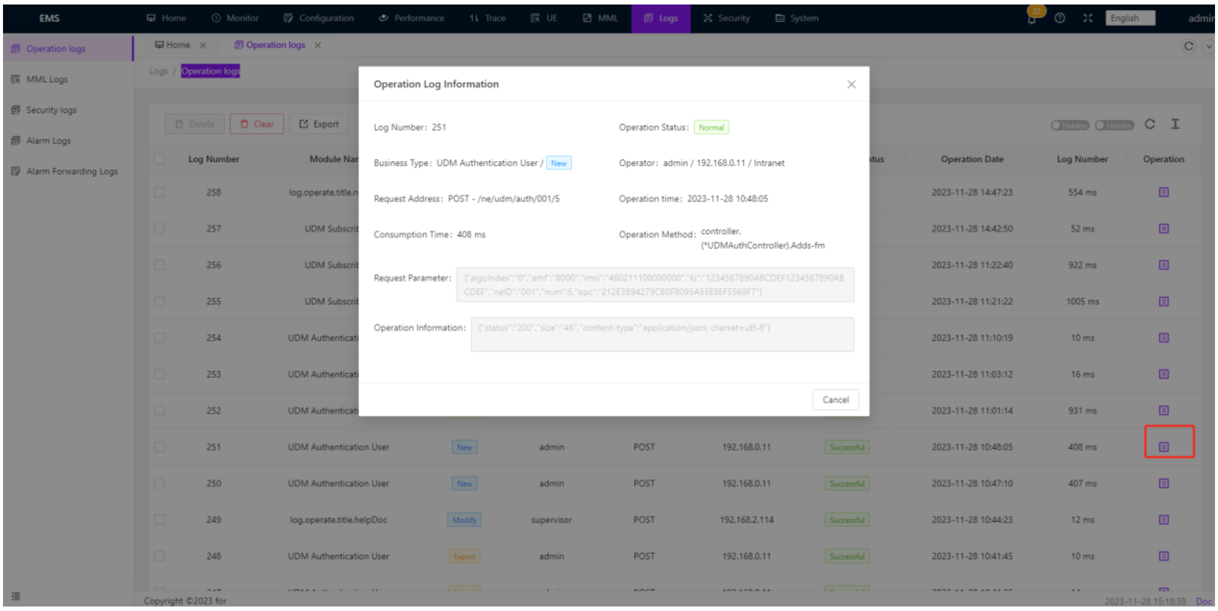
3.8.1 Operation logs

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.neAction	Import	admin	POST	192.168.0.11	Successful	2023-11-28 14:47:23	554 ms	
257	UDM Subscribers	Clear	admin	PUT	192.168.0.11	Successful	2023-11-28 14:42:50	52 ms	
256	UDM Subscribers	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:22:40	922 ms	
255	UDM Subscribers	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:21:22	1005 ms	
254	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 11:10:19	10 ms	
253	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 11:03:12	16 ms	
252	UDM Authentication User	Import	admin	POST	192.168.0.11	Successful	2023-11-28 11:01:14	931 ms	
251	UDM Authentication User	New	admin	POST	192.168.0.11	Successful	2023-11-28 10:48:05	408 ms	
250	UDM Authentication User	New	admin	POST	192.168.0.11	Successful	2023-11-28 10:47:10	407 ms	
249	log.operate.title.helpDoc	Modify	supervisor	POST	192.168.2.114	Successful	2023-11-28 10:44:23	12 ms	
248	UDM Authentication User	Export	admin	POST	192.168.0.11	Successful	2023-11-28 10:41:45	10 ms	



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

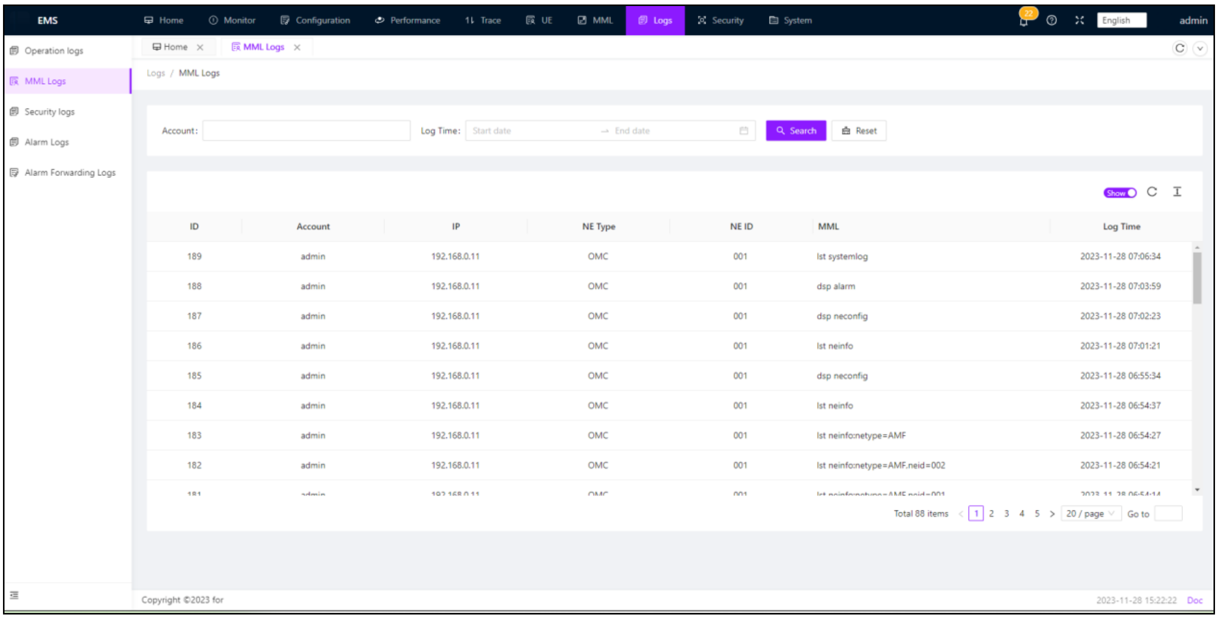
Operation Method: controller.(*UDMAuthController).Adds-fm

Request Parameter: {"algoIndex":"0","amf":"8000","imsi":"460211100000000","ki":"1234567890ABCDEF1234567890ABCDEF","neID":"001","num":5,"opc":"212E3894279CB0F8095A55E8EF5569F7"}

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

3.8.2 MML Logs

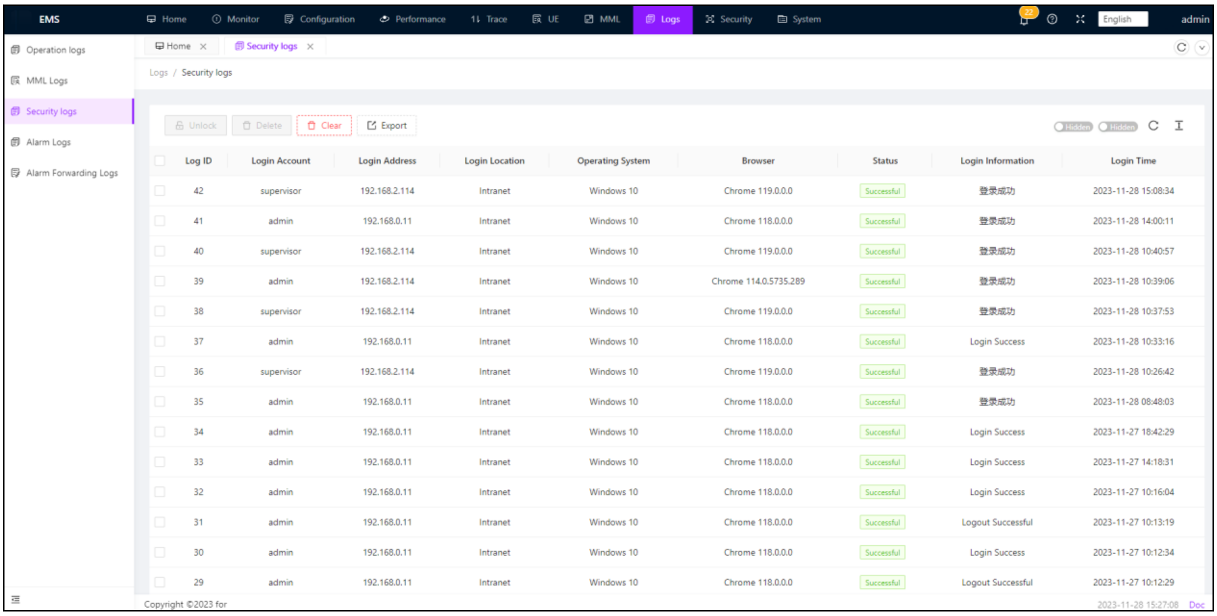
MML logs record operations performed using MML commands. This includes any parameter configuration, status query, etc., which is very helpful for auditing configuration changes of the core network, identifying configuration errors, fault tracing, etc.



ID	Account	IP	NE Type	NE ID	MML	Log Time
189	admin	192.168.0.11	OMC	001	lst 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	lst 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	lst neinfo	2023-11-28 06:54:37
183	admin	192.168.0.11	OMC	001	lst neinfo:netype=AMF	2023-11-28 06:54:27
182	admin	192.168.0.11	OMC	001	lst neinfo:netype=AMF.neid=002	2023-11-28 06:54:21
181	admin	192.168.0.11	OMC	001	lst neinfo:netype=AMF.neid=001	2023-11-28 06:54:14

3.8.3 Security logs

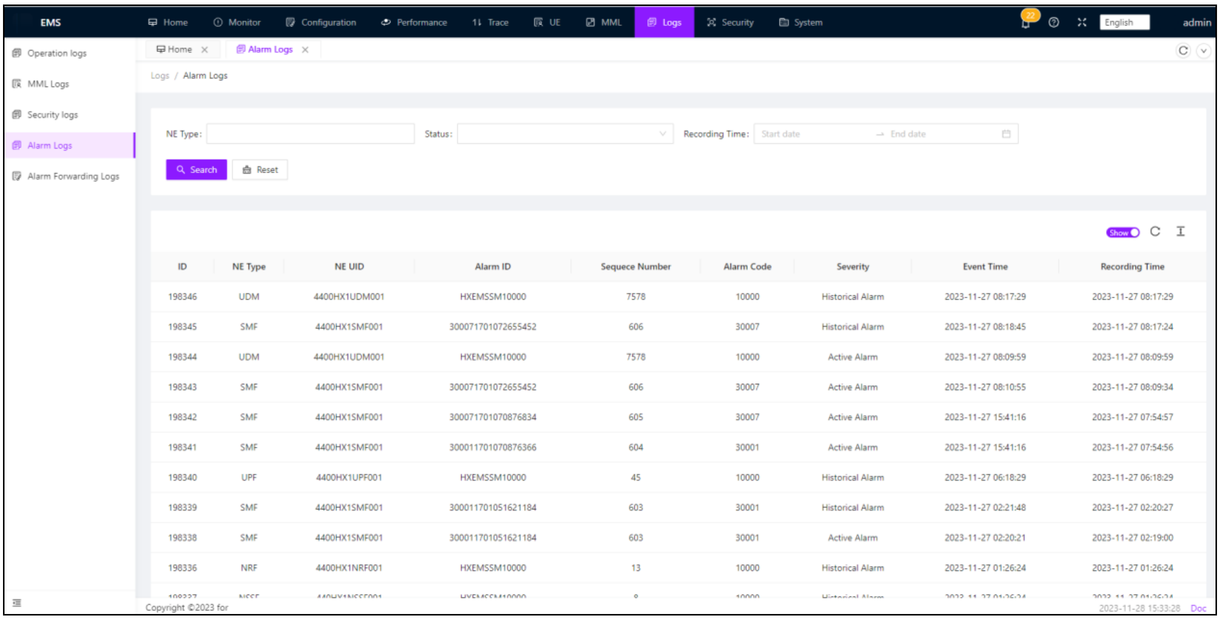
Security logs record user login information, including login account, IP address, operating system, login time, and status. It is used to monitor and ensure the security of the core network, as well as to analyze and find security problems when they occur.



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 14:18:31
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

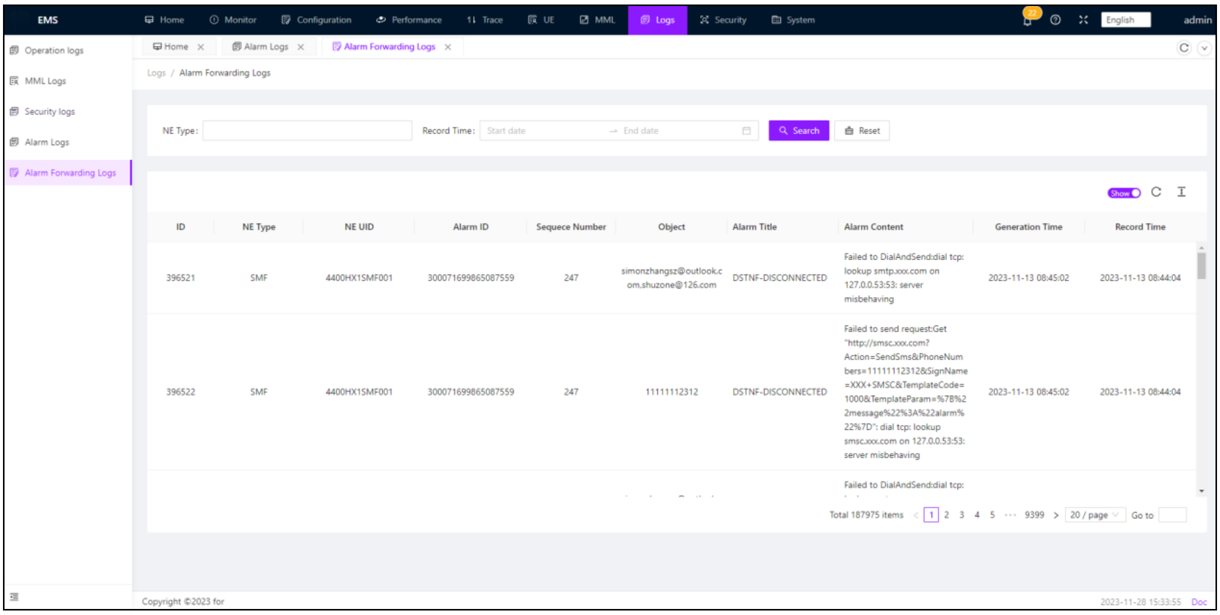
Alarm logs record all information about system faults, exceptions, or important events, including activation alarms and historical alarms, so that O&M personnel can quickly locate and rectify existing problems.



ID	NE Type	NE UID	Alarm ID	Sequece 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

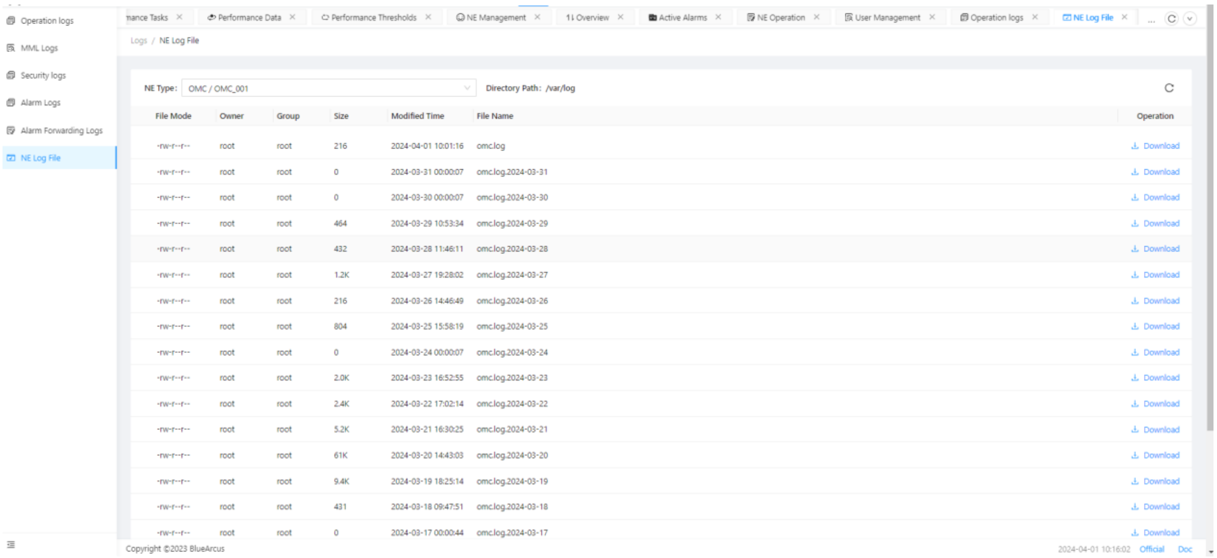
The alarm forwarding log records all the alarm events that are forwarded. It is useful for the administrator to track and handle alarms and check whether alarms are correctly routed to the target processing system.



ID	NE Type	NE UID	Alarm ID	Sequece 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 DialAndSend:dial tcp: lookup smtp.xxx.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://smsc.xxx.com?Action=SendSms&PhoneNumbers=11111112312&SignName=XXX+SMSC&TemplateCode=1000&TemplateParam=%7B%22message%22%3A%22alarm%22%7D": dial tcp: lookup smsc.xxx.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.



NE Type: OMC / OMC_001 Directory Path: /var/log

File Mode	Owner	Group	Size	Modified Time	File Name	Operation
-rw-r--r--	root	root	216	2024-04-01 10:01:16	omc.log	Download
-rw-r--r--	root	root	0	2024-03-31 00:00:07	omc.log.2024-03-31	Download
-rw-r--r--	root	root	0	2024-03-30 00:00:07	omc.log.2024-03-30	Download
-rw-r--r--	root	root	464	2024-03-29 10:53:34	omc.log.2024-03-29	Download
-rw-r--r--	root	root	432	2024-03-28 11:46:11	omc.log.2024-03-28	Download
-rw-r--r--	root	root	1.2K	2024-03-27 19:28:02	omc.log.2024-03-27	Download
-rw-r--r--	root	root	216	2024-03-26 14:46:49	omc.log.2024-03-26	Download
-rw-r--r--	root	root	804	2024-03-25 15:58:19	omc.log.2024-03-25	Download
-rw-r--r--	root	root	0	2024-03-24 00:00:07	omc.log.2024-03-24	Download
-rw-r--r--	root	root	2.0K	2024-03-23 16:52:55	omc.log.2024-03-23	Download
-rw-r--r--	root	root	2.4K	2024-03-22 17:02:14	omc.log.2024-03-22	Download
-rw-r--r--	root	root	5.2K	2024-03-21 16:30:25	omc.log.2024-03-21	Download
-rw-r--r--	root	root	61K	2024-03-20 14:43:03	omc.log.2024-03-20	Download
-rw-r--r--	root	root	9.4K	2024-03-19 18:25:14	omc.log.2024-03-19	Download
-rw-r--r--	root	root	431	2024-03-18 09:47:51	omc.log.2024-03-18	Download
-rw-r--r--	root	root	0	2024-03-17 00:00:44	omc.log.2024-03-17	Download

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3.9 Security

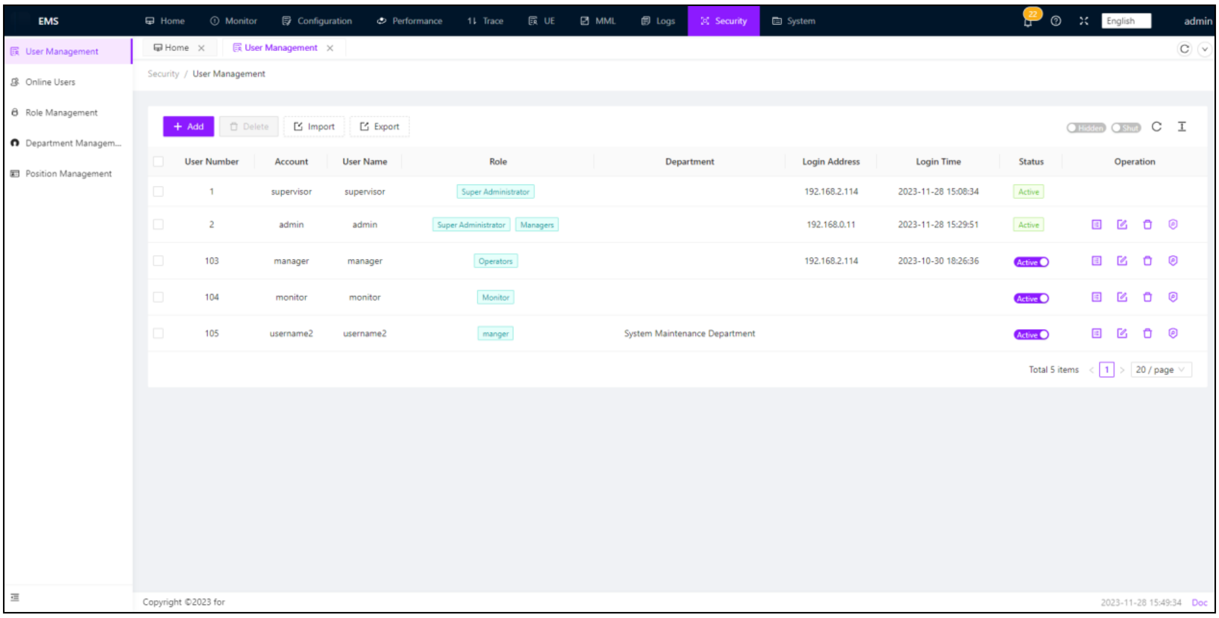
Core network security management refers to the management and permission control of users on the core network to ensure network security and protect the system from unauthorized access or malicious attacks. Core network security management includes user management, online user management, role management,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



User Number	Account	User Name	Role	Department	Login Address	Login Time	Status	Operation
1	supervisor	supervisor	Super Administrator		192.168.2.114	2023-11-28 15:08:34	Active	
2	admin	admin	Super Administrator Managers		192.168.0.11	2023-11-28 15:29:51	Active	
103	manager	manager	Operators		192.168.2.114	2023-10-30 18:26:36	Active	
104	monitor	monitor	Monitor				Active	
105	username2	username2	manger	System Maintenance Department			Active	

Total 5 items 1 20 / page

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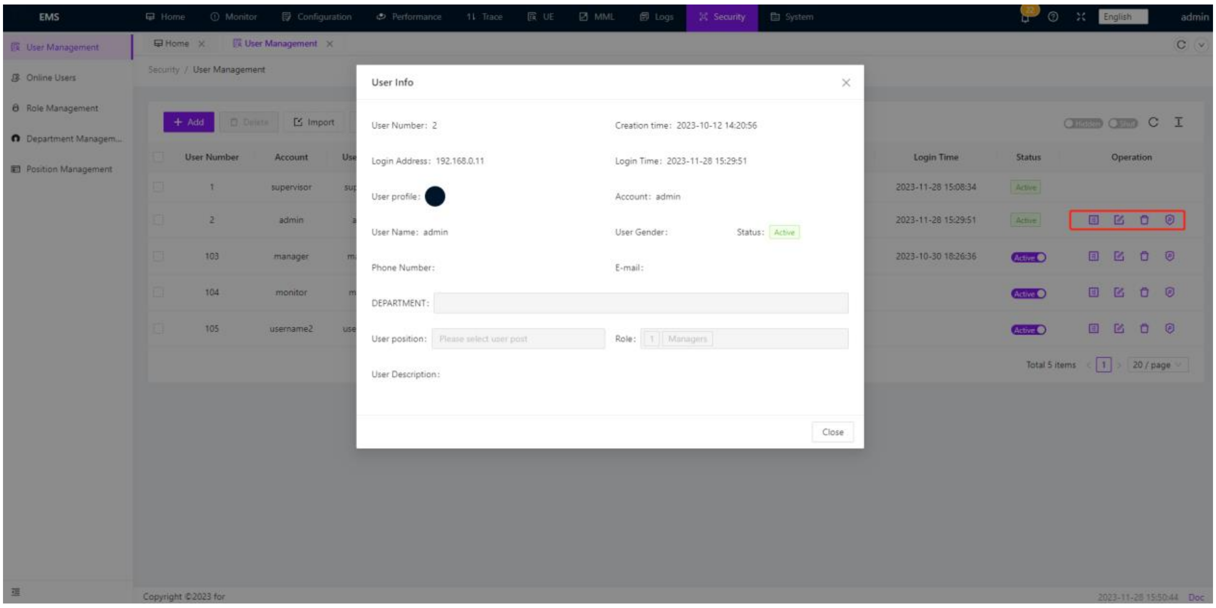
2023-11-28 15:49:34 Doc

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:



User Info

User Number：2

Creation time：2023-10-12 14:20:56

Login Address：192.168.0.11

Login Time：2023-11-28 15:29:51

User profile：

Account：admin

User Name：admin

User Gender：

Status：Active

Phone Number：

E-mail：

DEPARTMENT：

User position：Please select user post

Role：1 Managers

User Description：

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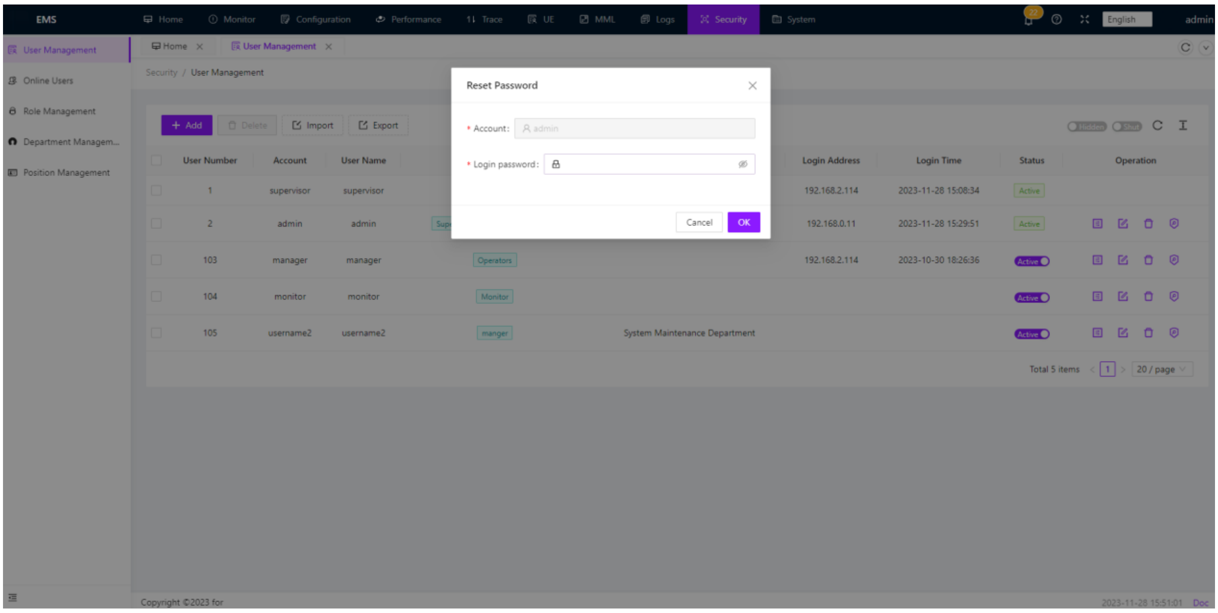
2023-11-28 15:50:44 Doc



Reset Password

* Account: admin

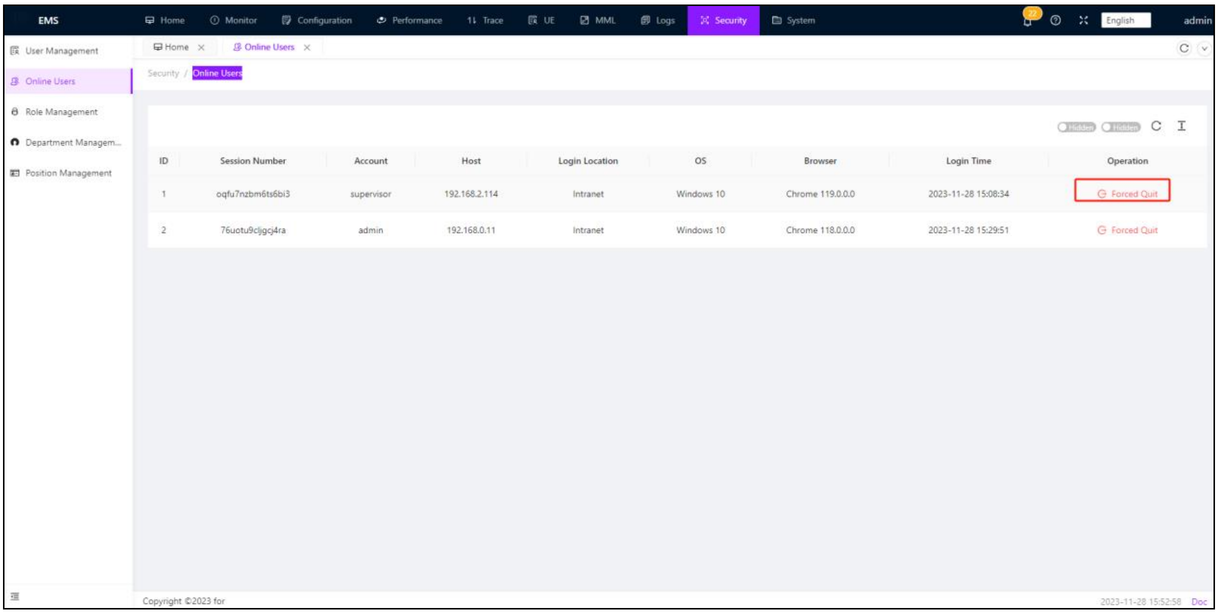
* Login password:

Cancel OK

User Number	Account	User Name			Login Address	Login Time	Status
1	supervisor	supervisor			192.168.2.114	2023-11-28 15:08:34	Active
2	admin	admin	Sup		192.168.0.11	2023-11-28 15:29:51	Active
103	manager	manager	Operators		192.168.2.114	2023-10-30 18:26:36	Active
104	monitor	monitor	Monitor				Active
105	username2	username2	manger	System Maintenance Department			Active

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.

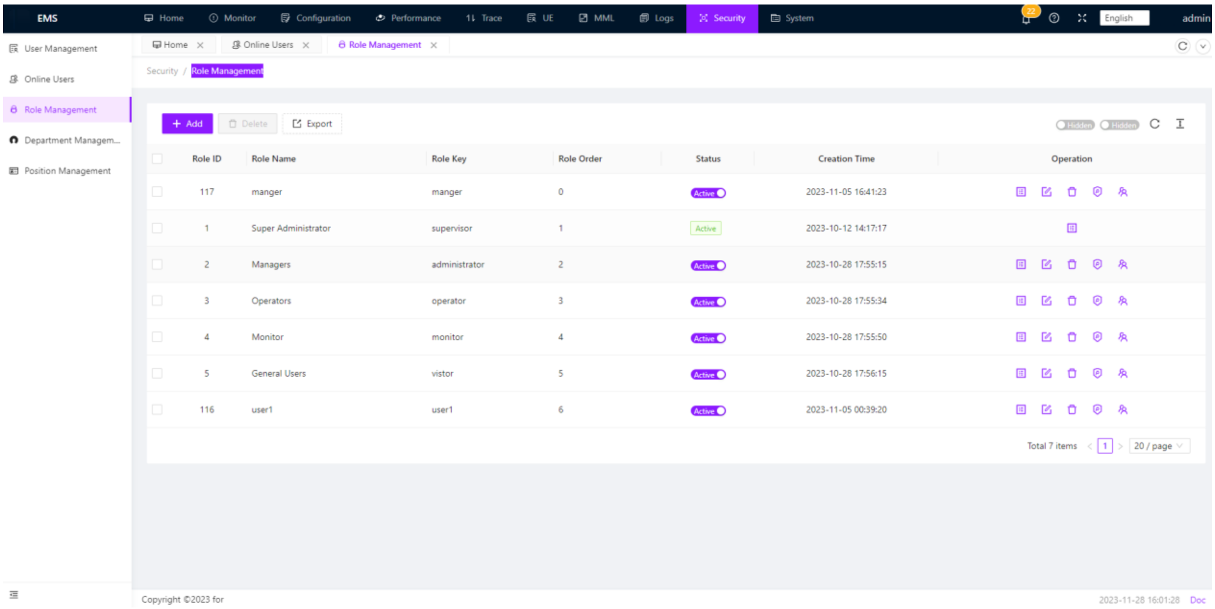


ID	Session Number	Account	Host	Login Location	OS	Browser	Login Time	Operation
1	oqfu7nzbm6ts6bi3	supervisor	192.168.2.114	Intranet	Windows 10	Chrome 119.0.0.0	2023-11-28 15:08:34	Forced Quit
2	76uotu9cljgcj4ra	admin	192.168.0.11	Intranet	Windows 10	Chrome 118.0.0.0	2023-11-28 15:29:51	Forced Quit

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:



Role ID	Role Name	Role Key	Role Order	Status	Creation Time	Operation
117	manger	manger	0	Active	2023-11-05 16:41:23	
1	Super Administrator	supervisor	1	Active	2023-10-12 14:17:17	
2	Managers	administrator	2	Active	2023-10-28 17:55:15	
3	Operators	operator	3	Active	2023-10-28 17:55:34	
4	Monitor	monitor	4	Active	2023-10-28 17:55:50	
5	General Users	vistor	5	Active	2023-10-28 17:56:15	
116	user1	user1	6	Active	2023-11-05 00:39:20	

Total 7 items 1 20 / page

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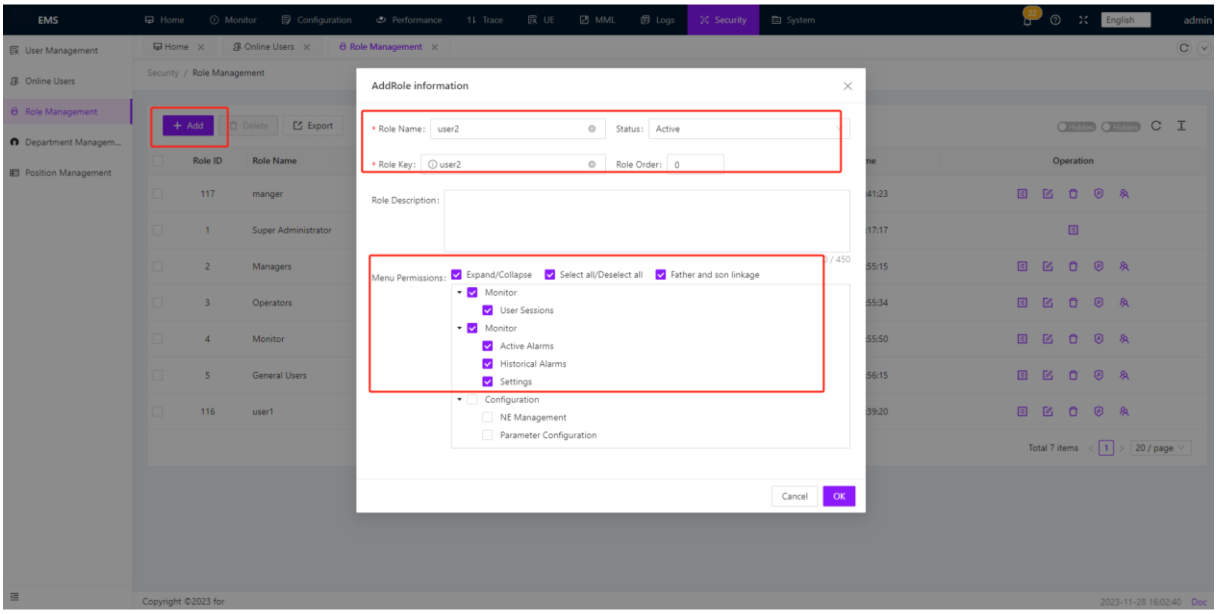
2023-11-28 16:01:28 Doc

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


AddRole information

* Role Name: user2

Status: Active

* Role Key: user2

Role Order: 0

Role Description:

0 / 450

Menu Permissions: ☑ Expand/Collapse ☑ Select all/Deselect all ☑ Father and son linkage

- ☑ Monitor
  - ☑ User Sessions
- ☑ Monitor
  - ☑ Active Alarms
  - ☑ Historical Alarms
  - ☑ Settings
- □ Configuration
  - □ NE Management
  - □ Parameter Configuration

Cancel OK

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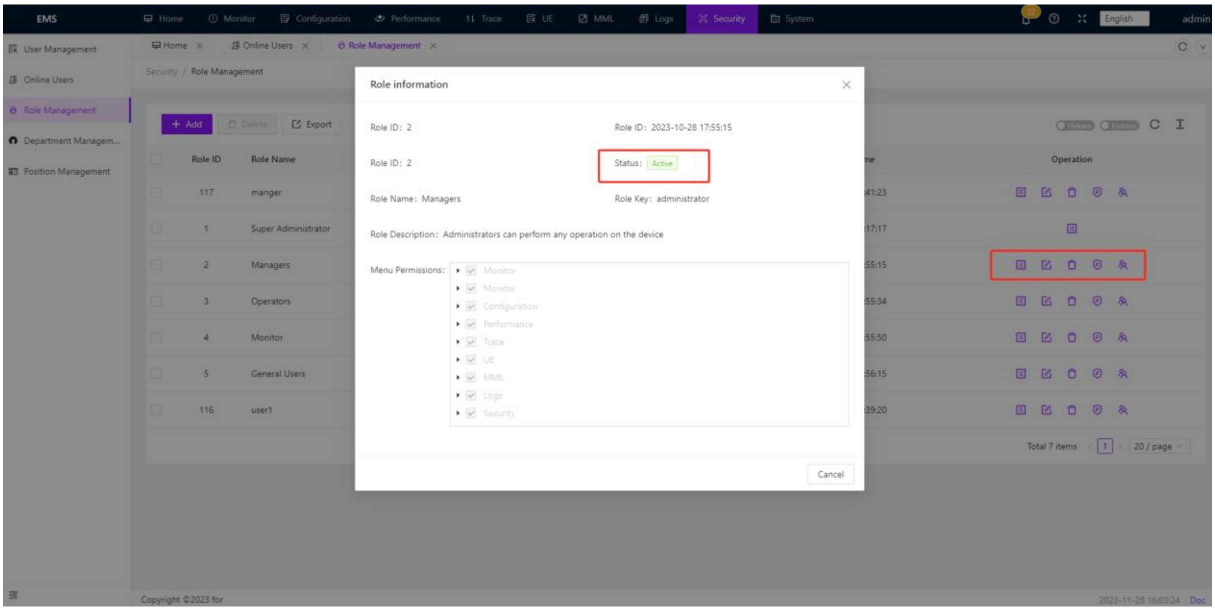
2023-11-28 16:02:40 Doc

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:



Role ID	Role Name
117	manger
1	Super Administrator
2	Managers
3	Operators
4	Monitor
5	General Users
116	user1

Role information

Role ID：2

Role ID：2023-10-28 17:55:15

Role ID：2

Status：Active

Role Name：Managers

Role Key：administrator

Role Description：Administrators can perform any operation on the device

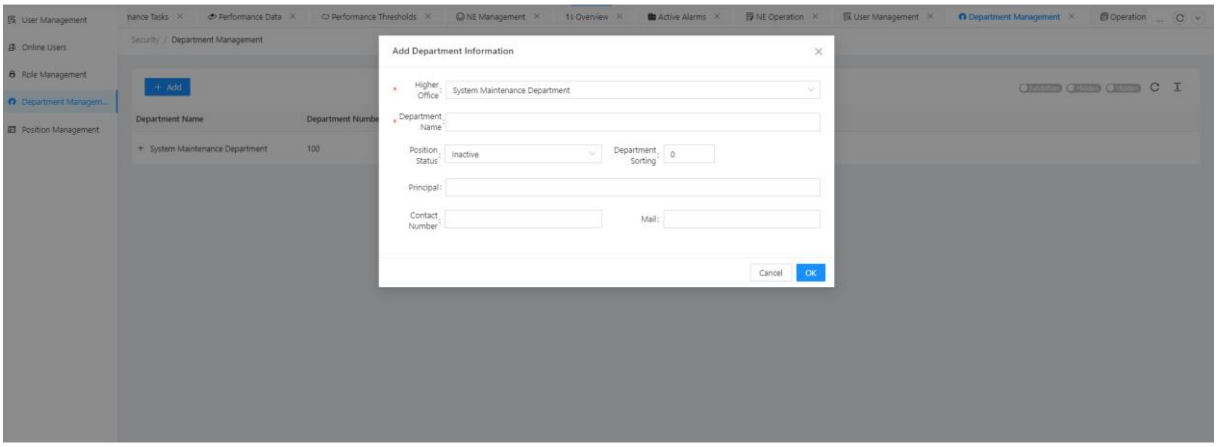
Menu Permissions：
- ☑ Monitor
- ☑ Monitor
- ☑ Configuration
- ☑ Performance
- ☑ Trace
- ☑ UE
- ☑ MML
- ☑ Logs
- ☑ Security

Cancel

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:



Department Name	Department Numbe
System Maintenance Department	100

Add Department Information

* Higher Office: System Maintenance Department

* Department Name:

Position Status: Inactive

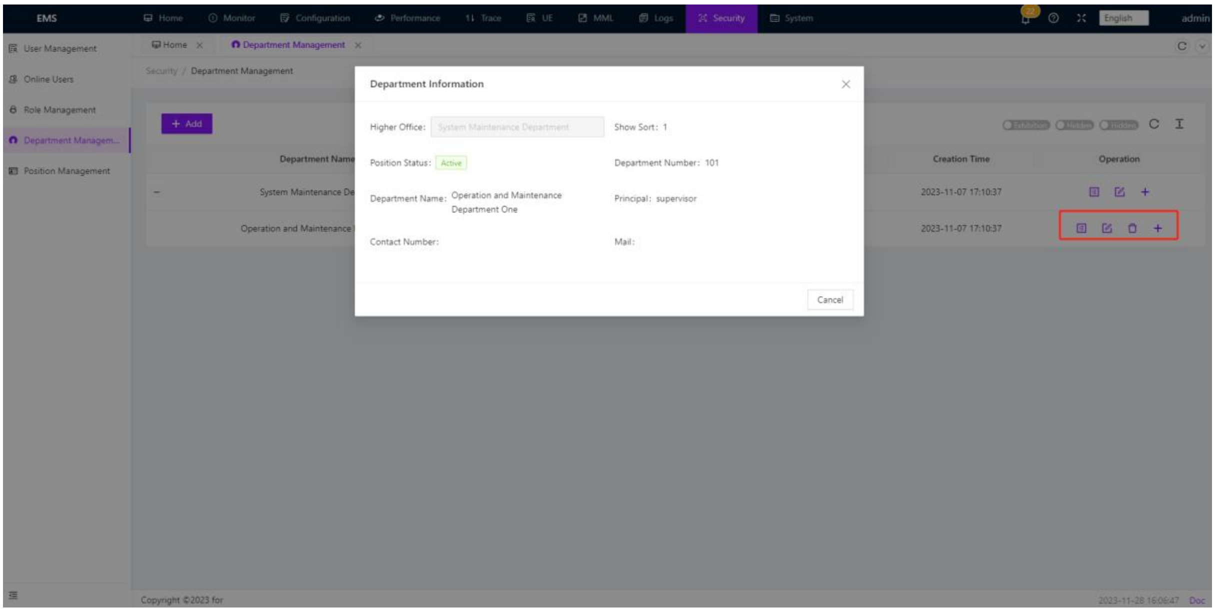
Department Sorting: 0

Principal:

Contact Number:

Mail:

Cancel OK



Department Information

Higher Office: System Maintenance Department

Show Sort: 1

Position Status: Active

Department Number: 101

Department Name: Operation and Maintenance Department One

Principal: supervisor

Contact Number:

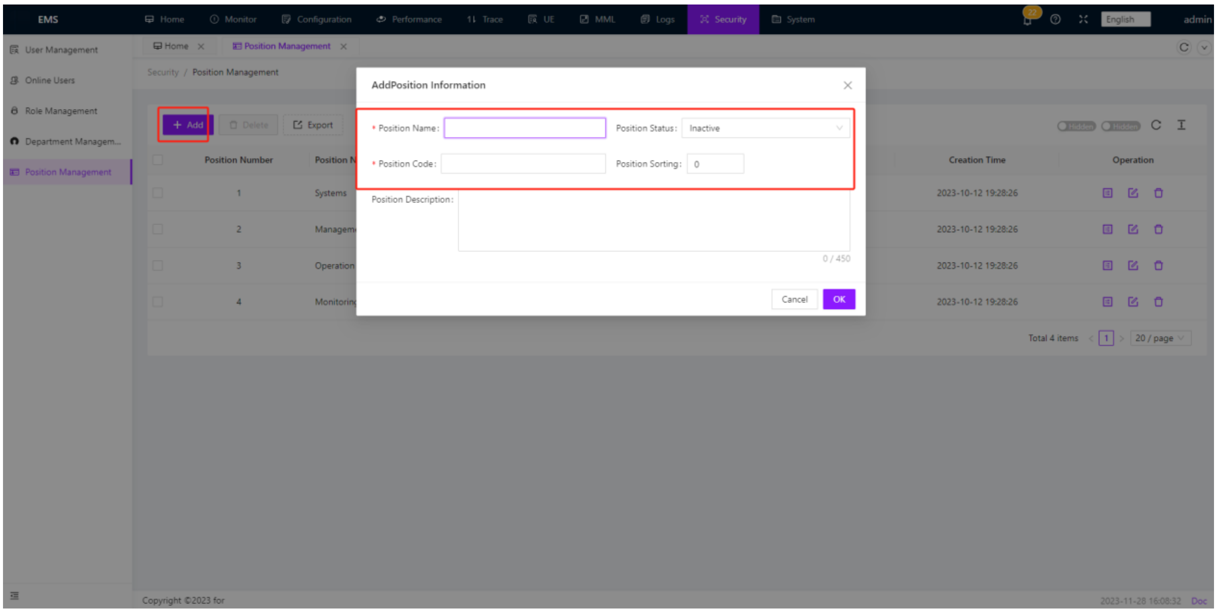
Mail:

Cancel

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:



Position Number	Position N	Creation Time	Operation
1	Systems	2023-10-12 19:28:26	
2	Managem	2023-10-12 19:28:26	
3	Operation	2023-10-12 19:28:26	
4	Monitorin	2023-10-12 19:28:26	

AddPosition Information

* Position Name:

Position Status: Inactive

* Position Code:

Position Sorting: 0

Position Description:

0 / 450

Cancel OK

3.10 System

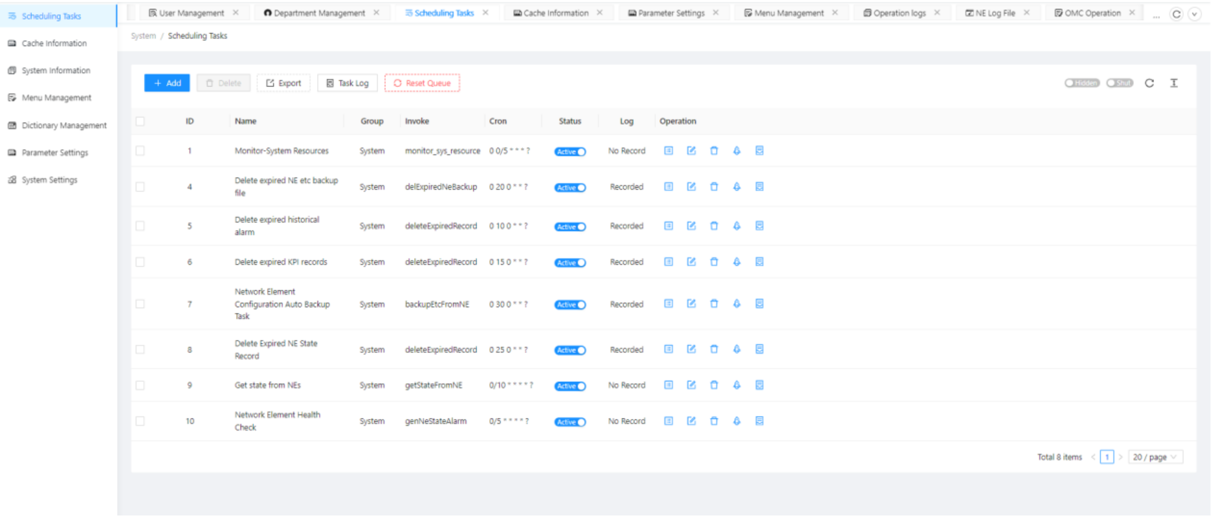
Core network system management refers to the management and maintenance of the functions and configurations of the core network system. It mainly includes scheduling tasks, cache information, system information, menu management, dictionary management, parameter setting, system setting, and so on.

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 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	
4	Delete expired NE etc backup file	System	delExpiredNeBackup	0 20 0 * * ?	Active	Recorded	
5	Delete expired historical alarm	System	deleteExpiredRecord	0 10 0 * * ?	Active	Recorded	
6	Delete expired KPI records	System	deleteExpiredRecord	0 15 0 * * ?	Active	Recorded	
7	Network Element Configuration Auto Backup Task	System	backupEtcFromNE	0 30 0 * * ?	Active	Recorded	
8	Delete Expired NE State Record	System	deleteExpiredRecord	0 25 0 * * ?	Active	Recorded	
9	Get state from NEs	System	getStateFromNE	0/10 * * * * ?	Active	No Record	
10	Network Element Health Check	System	genNeStateAlarm	0/5 * * * * ?	Active	No Record	

Total 8 items 1 20 / page

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.

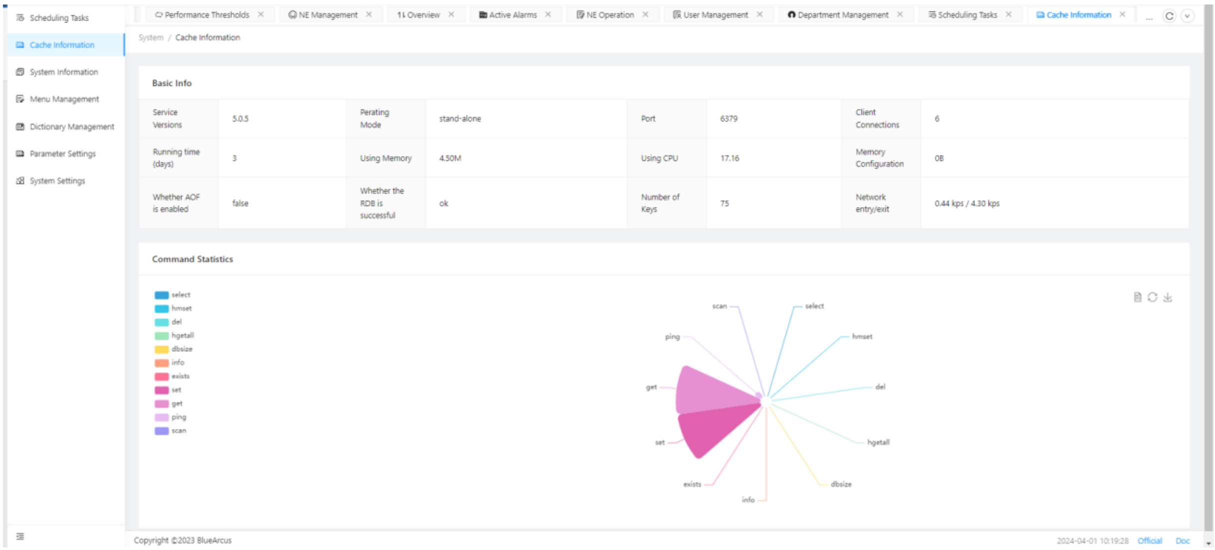
Obtain network element status information: This task is responsible for periodically obtaining status information of various network elements in the core network, including but not limited to device operational status, connection status, resource utilization, etc. Obtaining and real-time monitoring network 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.

3.10.2 Cache Information

Cache information allows you to view relevant information in the cache database, including basic database information and statistics on command execution data.



Basic Info

Service Versions	5.0.5	Perating Mode	stand-alone	Port	6379	Client Connections	6
Running time (days)	3	Using Memory	4.50M	Using CPU	17.16	Memory Configuration	0B
Whether AOF is enabled	false	Whether the RDB is successful	ok	Number of Keys	75	Network entry/exit	0.44 kps / 4.30 kps

Command Statistics

3.10.3 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.

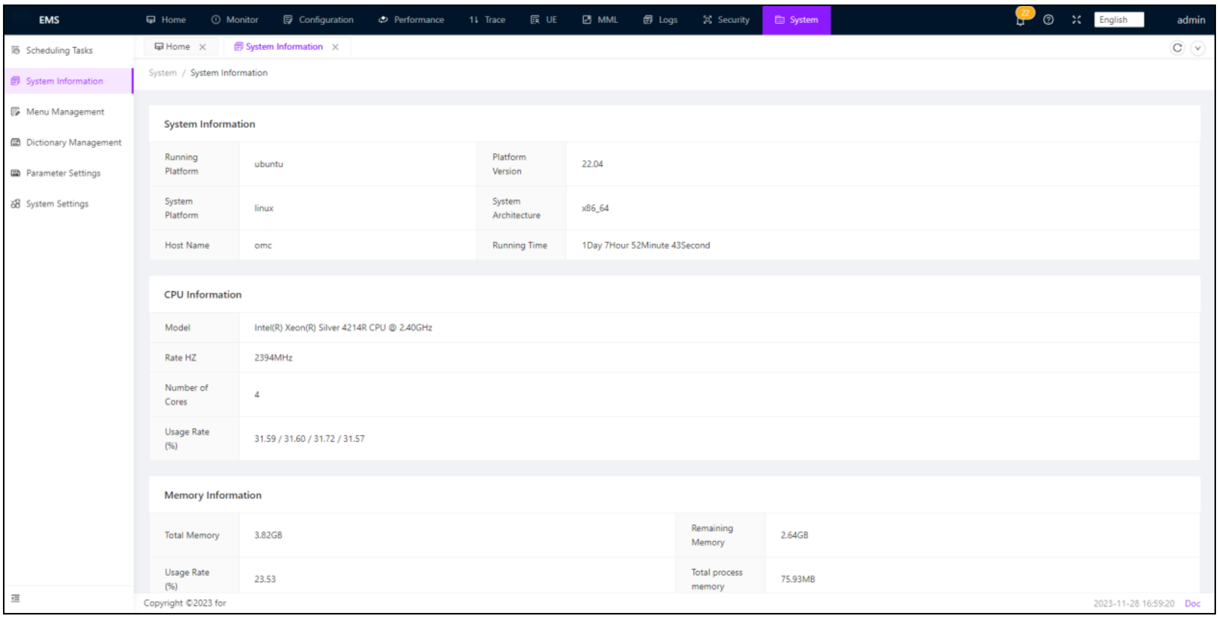
3. Memory Information: Memory information management includes overall memory capacity, current usage, cache and buffer occupancy, and memory swapping. Memory leaks or resource constraints can be detected through this information, ensuring that the system does not suffer performance degradation due to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



System Information

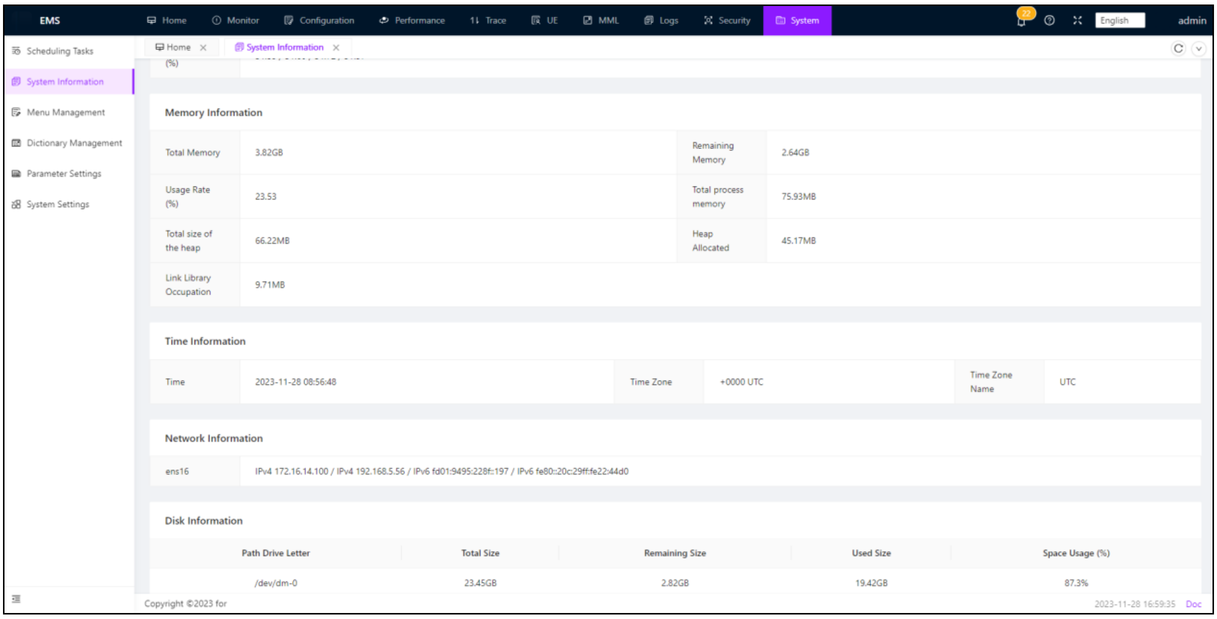
Running Platform	ubuntu	Platform Version	22.04
System Platform	linux	System Architecture	x86_64
Host Name	omc	Running Time	1Day 7Hour 52Minute 43Second

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	75.93MB



Memory Information

Total Memory	3.82GB	Remaining Memory	2.64GB
Usage Rate (%)	23.53	Total process memory	75.93MB
Total size of the heap	66.22MB	Heap Allocated	45.17MB
Link Library Occupation	9.71MB		

Time Information

Time	2023-11-28 08:56:48	Time Zone	+0000 UTC	Time Zone Name	UTC

Network Information

ens16	IPv4 172.16.14.100 / IPv4 192.168.5.56 / IPv6 fd01:9495:228f::197 / IPv6 fe80::20c:29ff:fe22:44d0

Disk Information

Path Drive Letter	Total Size	Remaining Size	Used Size	Space Usage (%)
/dev/dm-0	23.45GB	2.82GB	19.42GB	87.3%

3.10.4 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.

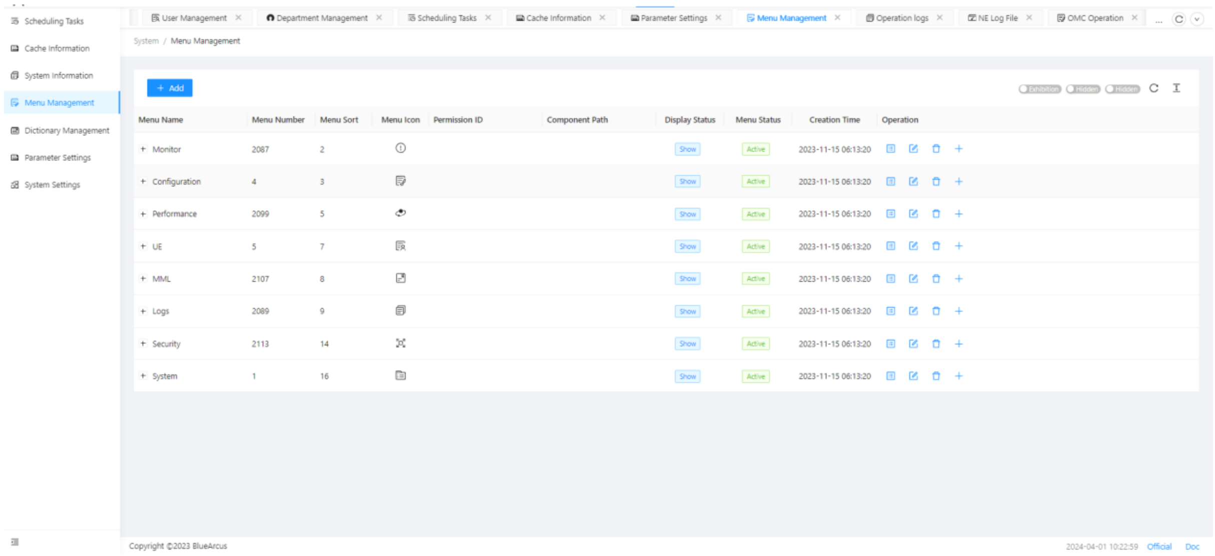
2. Delete Menu Items: When a function becomes obsolete or is no longer needed, administrators can remove related options from the menu, helping to avoid clutter on the interface and ensuring the relevance and simplicity of the user interface.

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	

3.10.5 Dictionary Management

Dictionary management functionality refers to the tools used by system administrators to maintain various predefined data dictionaries within the system. Data dictionaries consist of a specific set of standard values that play a role in standardizing and normalizing system operations, such as defining user genders, menu statuses, and task statuses. This function is a critical part of system configuration because many system logics and user interfaces rely on these dictionary data.

The 20 dictionaries listed currently provide the foundational data structures necessary for system operation, including:

- User Gender: Includes gender options such as male, female, undisclosed, etc.
- Menu Status: Determines if menu items are visible, disabled, etc.
- System Switch: Contains the on/off status of system functions.
- Task Status: Different stages of task execution, such as pending, in progress, completed.
- Task Group: Used to categorize tasks by organization or category.
- System Yes/No: A generic binary dictionary typically with options for yes and no.
- Operation Type: Describes the types of operations users or systems can perform.
- System Status: Reflects the current operational status of the system.

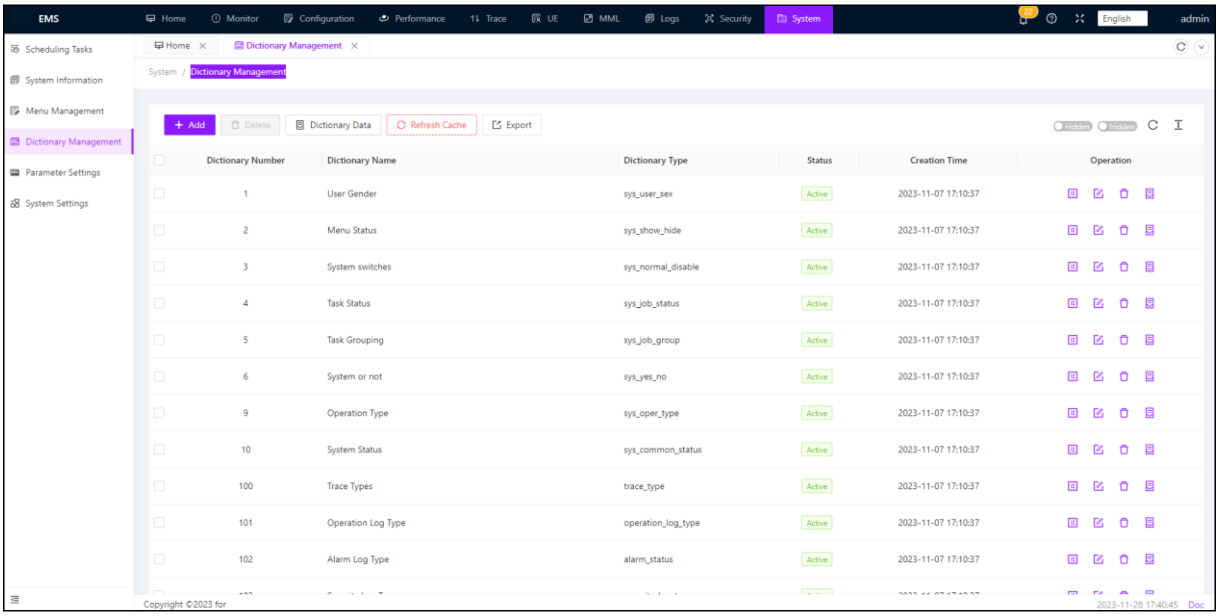
- Tracking Type: Defines types of activities or changes that can be tracked.
- Operation Log Type: Used to categorize different operation logs.
- Alarm Log Type: Classifies alarm log entries.
- Security Log Type: Defines log types related to security events.
- NE Software Version Status: Describes the status of network element software versions.
- Multilanguage - English: Manages English translation dictionaries supported by the management system.
- Multilanguage - Chinese: Manages Chinese translation dictionaries supported by the management system.
- System Role Data Scope: Determines the data access scope of roles within the system.
- Active Alarm Type: Classifies active alarm information.
- Alarm Clearing Type: Includes types of who and how alarms are cleared.
- Severity Level: Defines severity levels of issues.

Administrators should be able to perform the following management operations on dictionary data:

- Homepage Status: Modify pie chart colors for normal and abnormal network elements as needed.
- CDR SIP Response Code Category Type: Defines category types represented by different SIP protocol response codes, such as normal hang-up, forbidden, not found, request terminated, request timeout, internal server error, service unavailable, server timeout, rejection, not acceptable, accepted, etc.
- CDR Call Type: Defines different call types for CDR, such as voice, video, SMS, etc.
- UE Event Authentication Code Type: Records different authentication states that a user device may encounter during the authentication process, such as success, network failure, air interface failure, MAC failure, synchronization failure, non-acceptance of non-5G authentication, response failure, unknown, etc.
- UE Event Type: Records various events that a user device may experience, such as authentication, logout, CM status, etc.

- UE Event CM Status: Records different states that a user device may encounter in connection management, such as connected, idle, inactive, etc.

Maintaining the integrity of dictionary data is crucial for system stability and data consistency. Additionally, administrators often need to ensure that modifications to dictionaries are audited to maintain operational transparency and traceability.



Dictionary Number	Dictionary Name	Dictionary Type	Status	Creation Time	Operation
1	User Gender	sys_user_sex	Active	2023-11-07 17:10:37	
2	Menu Status	sys_show_hide	Active	2023-11-07 17:10:37	
3	System switches	sys_normal_disable	Active	2023-11-07 17:10:37	
4	Task Status	sys_job_status	Active	2023-11-07 17:10:37	
5	Task Grouping	sys_job_group	Active	2023-11-07 17:10:37	
6	System or not	sys_yes_no	Active	2023-11-07 17:10:37	
9	Operation Type	sys_oper_type	Active	2023-11-07 17:10:37	
10	System Status	sys_common_status	Active	2023-11-07 17:10:37	
100	Trace Types	trace_type	Active	2023-11-07 17:10:37	
101	Operation Log Type	operation_log_type	Active	2023-11-07 17:10:37	
102	Alarm Log Type	alarm_status	Active	2023-11-07 17:10:37	

3.10.6 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.

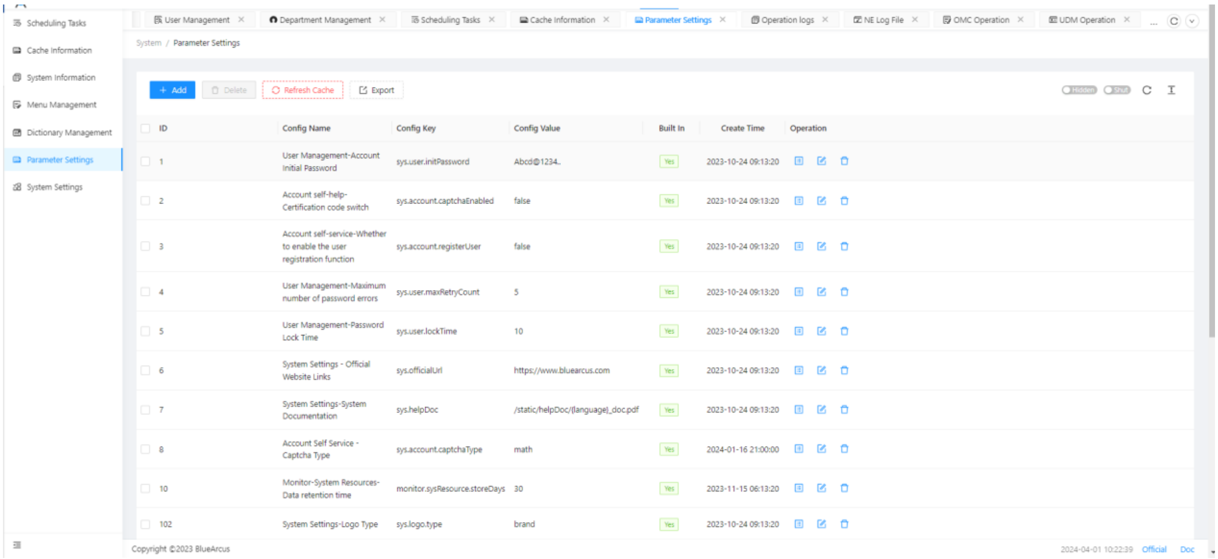
For these parameters, administrators typically need the following functions:

- 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.



ID	Config Name	Config Key	Config Value	Built In	Create Time
1	User Management-Account Initial Password	sys.user.initPassword	Abcd@1234..	Yes	2023-10-24 09:13:20
2	Account self-help-Certification code switch	sys.account.captchaEnabled	false	Yes	2023-10-24 09:13:20
3	Account self-service-Whether to enable the user registration function	sys.account.registerUser	false	Yes	2023-10-24 09:13:20
4	User Management-Maximum number of password errors	sys.user.maxRetryCount	5	Yes	2023-10-24 09:13:20
5	User Management-Password Lock Time	sys.user.lockTime	10	Yes	2023-10-24 09:13:20
6	System Settings - Official Website Links	sys.officialUrl	https://www.bluearcus.com	Yes	2023-10-24 09:13:20
7	System Settings-System Documentation	sys.helpDoc	/static/helpDoc/{language}_doc.pdf	Yes	2023-10-24 09:13:20
8	Account Self Service - Captcha Type	sys.account.captchaType	math	Yes	2024-01-16 21:00:00
10	Monitor-System Resources-Data retention time	monitor.sysResource.storeDays	30	Yes	2023-11-15 06:13:20
102	System Settings-Logo Type	sys.logo.type	brand	Yes	2023-10-24 09:13:20

3.10.7 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.

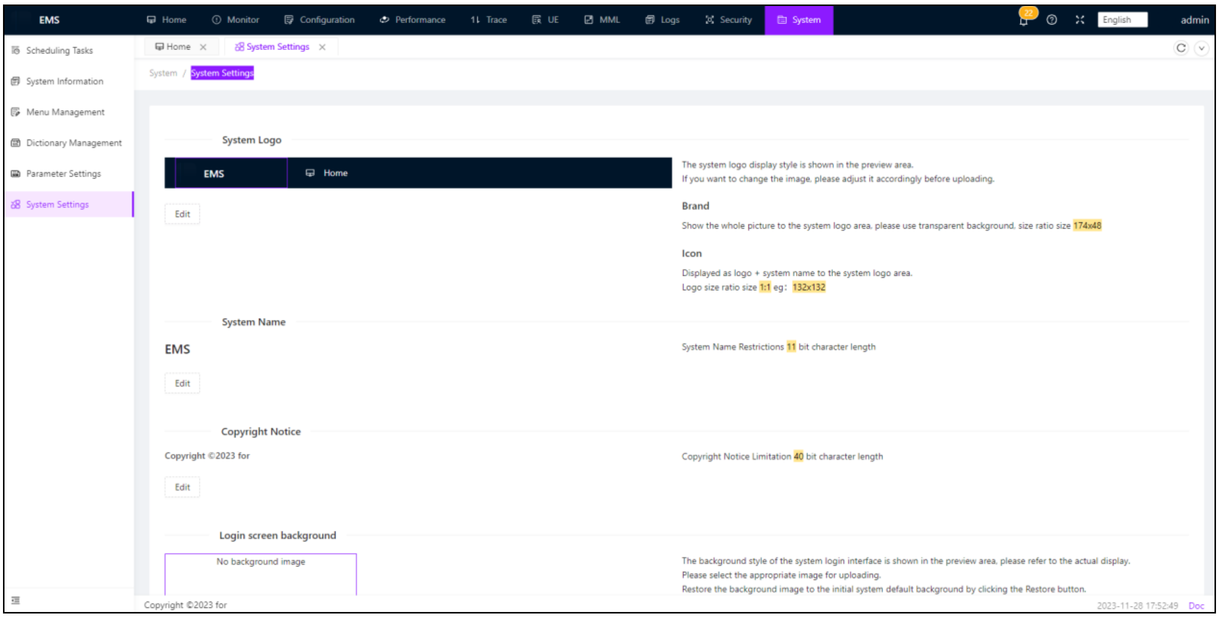
- Change System Name: This option enables administrators to modify the display name of the system, which will appear in the browser's title bar, login interface, the top of the system interface, and possible system notification emails. Through this setting, administrators can customize the system name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



System Logo

The system logo display style is shown in the preview area.
If you want to change the image, please adjust it accordingly before uploading.

Brand

Show the whole picture to the system logo area, please use transparent background, size ratio size 174x48

Icon

Displayed as logo + system name to the system logo area.
Logo size ratio size 1:1 eg: 132x132

System Name

EMS

System Name Restrictions 11 bit character length

Copyright Notice

Copyright ©2023 for

Copyright Notice Limitation 40 bit character length

Login screen background

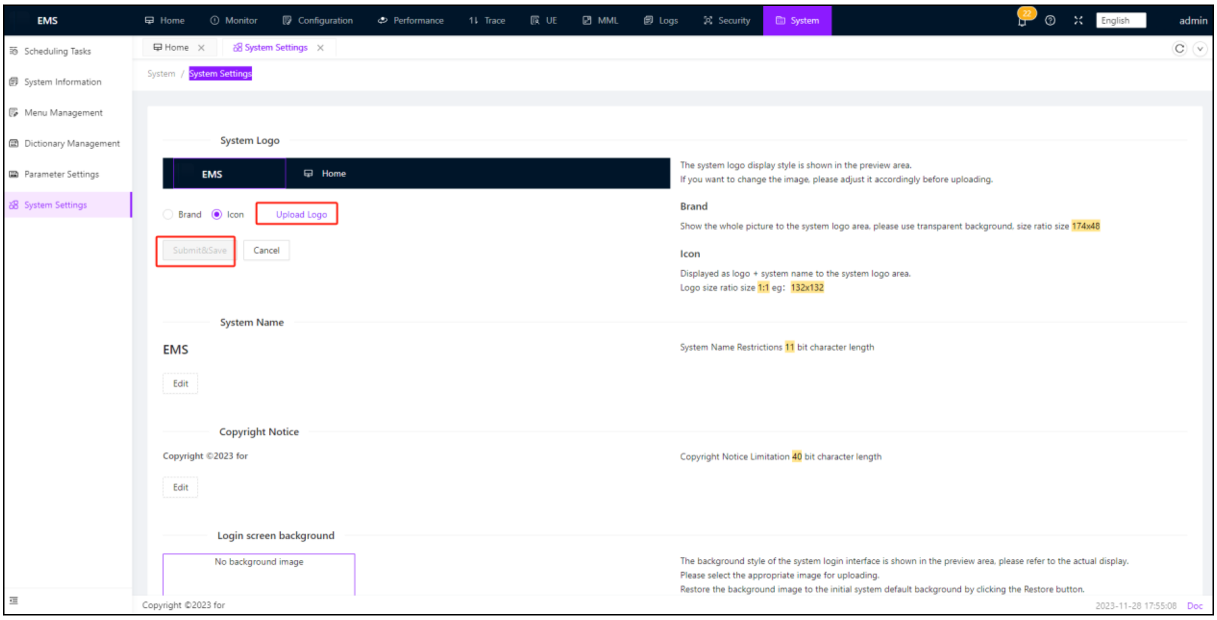
No background image

The background style of the system login interface is shown in the preview area, please refer to the actual display.
Please select the appropriate image for uploading.
Restore the background image to the initial system default background by clicking the Restore button.

Copyright ©2023 for

2023-11-28 17:52:49

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



System Logo

The system logo display style is shown in the preview area.
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Icon

Displayed as logo + system name to the system logo area.
Logo size ratio size 1:1 eg: 132x132

System Name

EMS

System Name Restrictions 11 bit character length

Copyright Notice

Copyright ©2023 for

Copyright Notice Limitation 40 bit character length

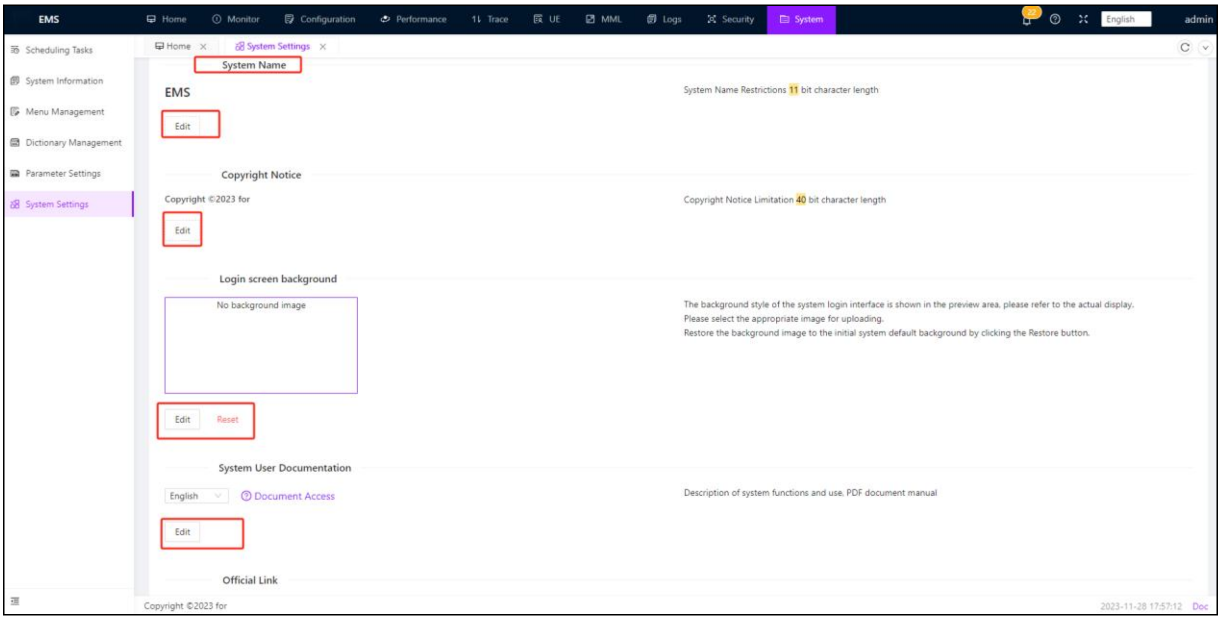
Login screen background

The background style of the system login interface is shown in the preview area, please refer to the actual display.
Please select the appropriate image for uploading.
Restore the background image to the initial system default background by clicking the Restore button.

Copyright ©2023 for

2023-11-28 17:55:08

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:



System Name

EMS

System Name Restrictions 11 bit character length

Copyright Notice

Copyright ©2023 for

Copyright Notice Limitation 40 bit character length

Login screen background

The background style of the system login interface is shown in the preview area, please refer to the actual display.
Please select the appropriate image for uploading.
Restore the background image to the initial system default background by clicking the Restore button.

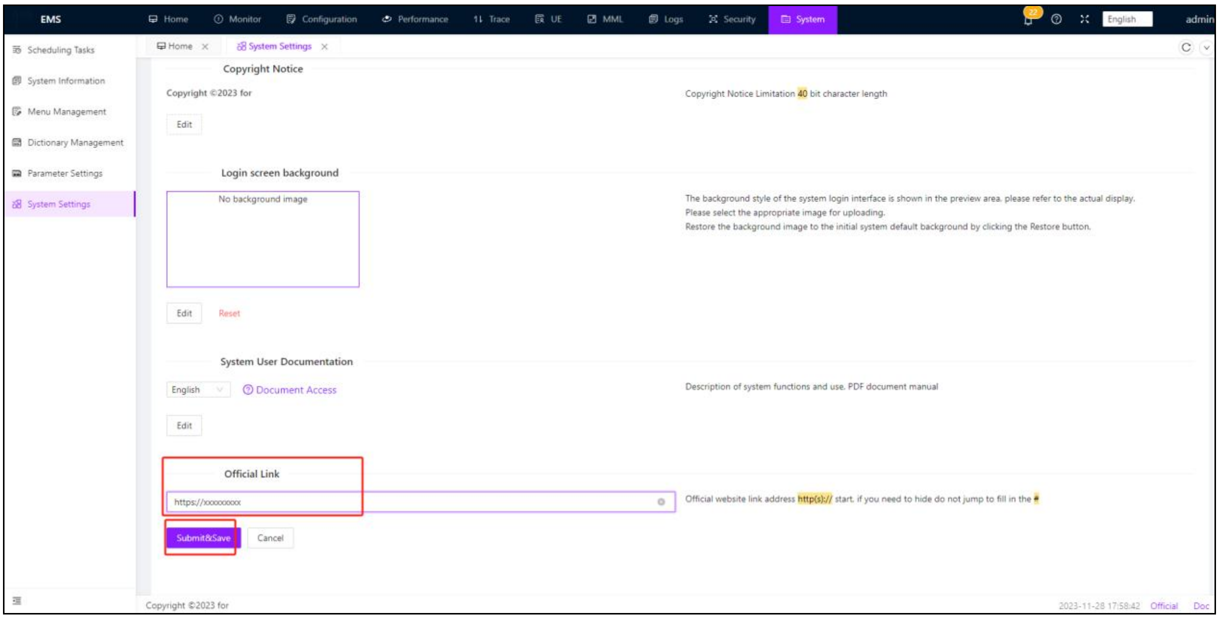
System User Documentation

Description of system functions and use, PDF document manual

Official Link

Copyright ©2023 for

2023-11-28 17:57:12



Copyright Notice

Copyright ©2023 for

Copyright Notice Limitation 40 bit character length

Login screen background

No background image

The background style of the system login interface is shown in the preview area. please refer to the actual display.
Please select the appropriate image for uploading.
Restore the background image to the initial system default background by clicking the Restore button.

System User Documentation

English

Description of system functions and use. PDF document manual

Official Link

https://xxxxxxxxx

Official website link address http(s):// start. if you need to hide do not jump to fill in the #

Copyright ©2023 for

2023-11-28 17:58:42

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

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