

EC954-FQ38 User's Manual_V2.0

Edge Computer EC954-FQ38

Series User's Manual

(Compatible with Debian 11, IEOS V2.0.0 and above versions)

Version 2.0, January 2024

www.inhandnetworks.com.cn



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1 Introduction

This user manual is applicable to the Edge Computer EC954 series based on Arm architecture, and covers a complete set of instructions applicable to all supported models. Before referring to these chapters, please confirm if the hardware specifications of your computer model support the features/settings covered.

2 Hardware installation instructions

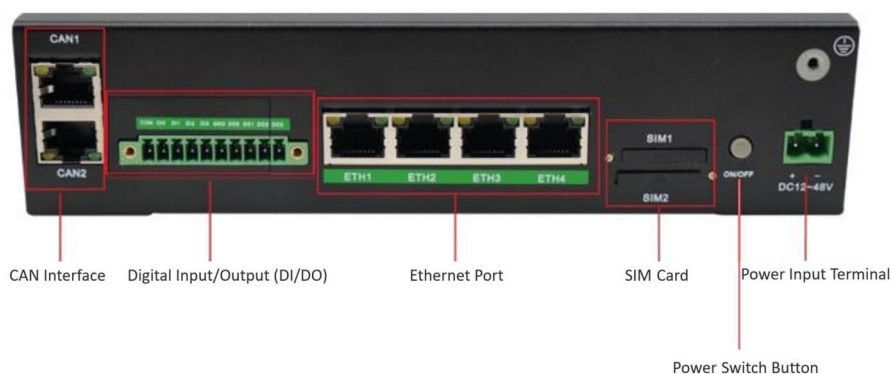
In this chapter, we will introduce the hardware installation instructions of the edge computer EC954 series based on Arm structure.

2.1 Introduction

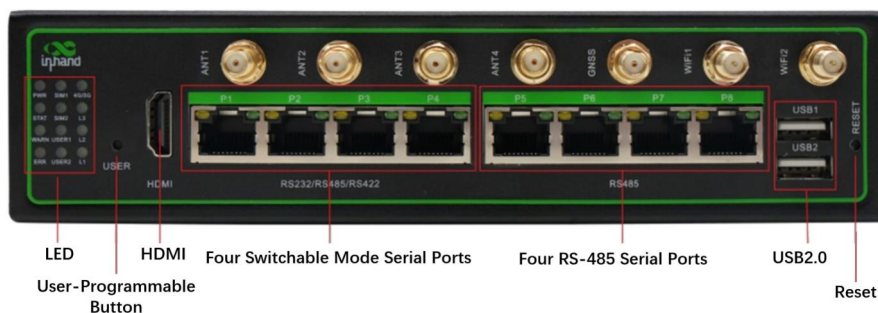
The following chapter takes the EC954 series as an example to describe the application of external connectors and pin assignments in the EC954 series.

2.2 EC954-FQ38 Panel

Top panel



Front panel



2.3 EC954-FQ38 External Connector

2.3.1 Ethernet

These are four RJ45 connectors for Ethernet connection



EC954-FQ38 has four RJ45 Ethernet ports and supports 10M/100M/1000M adaptive rates.

Green light: The LINK indicator light is on for a long time when the peer device has a 1000M interface, and off for a long time when the peer device has a 10/100M interface.

Yellow light: ACT light, flashing when there is data

2.3.2 Serial port

EC954-FQ38 supports 8 serial ports, with the first 4 channels supporting RS-232, RS-485, or RS-422 communication. The software is configurable, and the last 4 channels are fixed to RS-485



RJ45 pin number	RS-232	RS-422	RS-485
one	DSR	-	-
two	RTS	TxD+	-
three	GND	GND	GND
four	TxD	TxD-	-
five	RxD	RxD+	Data+
six	DCD	RxD-	Data-
seven	CTS	-	
eight	DTR	-	

2.3.3 CAN

EC954-FQ38 has a 2-way CAN bus interface and supports the CAN 2.0A/B standard. CAN2 is compatible with CAN FD and can reach a maximum speed of 5Mbps.



RJ45 pin number	RS-232	RS-422	RS-485
one	DSR	-	-
two	RTS	TxD+	-
three	GND	GND	GND
four	TxD	TxD-	-
five	RxD	RxD+	Data+
six	DCD	RxD-	Data-
seven	CTS	-	
eight	DTR	-	

2.3.4 Digital Input Interface

Interface identification	Function	Describe
COM	DI Common Port	4-way digital input DI, Dry contact status "1": Closed dry contact status "0": Open Isolation 3000VDC
DI0	Digital input interface 0	
DI1	Digital input interface No.1	
DI2	Digital input interface No.2	
DI3	Digital input interface No.3	

2.3.5 Digital Output Interface

Interface identification	function	describe
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GND	DO grounding terminal	4-channel digital output DO, Isolation 3000VDC
DO0	Digital output interface 0	
DO1	Digital output interface No.1	
DO2	Digital output interface No.2	
DO3	Digital output interface No.3	

2.3.6 USB

EC954-FQ38 provides two USB 2.0 Host interfaces.



2.3.7 LED



EC954-FQ38 has 12 LED lights that respectively indicate the power supply and system operation status.

Identification	Name	Definition
PWR	Power indicator light	Always on when powered on
STAT	System operation status indicator light	When the system starts up normally, the STATUS flashes. If there is an abnormality during the system startup phase that causes the system to fail to start; When the factory operation is not yet completed, the STATUS will be turned off for a long time.

WARN	Warning indicator light	When a warning exception occurs in the system and the system upgrade or factory restoration is not yet completed, the WARN light flashes.
ERR	Error indicator light	When a serious error occurs in the system and the system upgrade or factory recovery is not yet completed, the Error light flashes.
SIM1	SIM1 card indicator light,	When selecting SIM card 1 for dialing, it always lights up. When selecting SIM card 2 for dialing or turning off dialing, it stays off.
SIM2	SIM1 card indicator light, if selected, it remains on	When selecting SIM card 2 for dialing, it always lights up. When selecting SIM card 1 for dialing or turning off dialing, it stays off.
USER1	User programmable indicator light 1	Default off, can be programmed and controlled by the user
USER2	User programmable indicator light 2	Default off, can be programmed and controlled by the user
4G	Cellular network connection status indicator light	Always on after successful dialing
L1	Cellular network signal strength	See instructions for cellular network signal strength indicator lights
L2	Cellular network signal strength	
L3	Cellular network signal strength	

Cellular network signal strength indicator light

LED	No signal	Weak signal (RSSI<-90)	Signal medium (-90<=RSSI<-70)	Signal strength (RSSI>=-70)
L1	Extinction	bright	bright	bright

L2	Extinction	Extinction	bright	bright
L3	Extinction	Extinction	Extinction	bright

In addition to the combination of L1, L2, and L3 signal lights to indicate cellular signal strength, there is also a set of LED combinations to indicate the process of factory restoration.

LED	state
WARN	flicker
Error	flicker
STATUS	Extinguish

After restoring the factory settings, the system will undergo a restart. After the restart is completed, the factory reset is not complete. At this time, the WARN light and ERROR flash, and the STATUS goes out. In this state, the device cannot be powered off, otherwise it may cause some files to be lost and affect system functions. This state will last for 30 seconds. After the factory is restored, WARN and ERROR will turn off, and STATUS will flash.

2.3.8 User programmable buttons

EC954-FQ38 provides an API interface, which users can call to detect the status of programmable buttons and then implement their own button logic.



2.3.9 DC Input

EC954-FQ38 supports 12-48V DC input



2.3.10 SIM card slot

EC954-FQ38 supports 2 SIM card slots. SIM cards need to be installed in a power-off state. Simply press and insert the SIM card into the slot.



2.3.11 MicroSD card slot

EC954-FQ38 has a MicroSD card slot, and SD does not support hot swapping. It needs to be plugged and unplugged in the event of a power outage. After inserting the SD card and powering on the device, the system will automatically mount all partitions.

2.3.12 Factory Reset Button

There is a reset button for restoring the system to factory settings. Refer to ["Restore Factory Settings"](#) for operation.



2.3.13 On/Off button

EC954-FQ38 is equipped with an on/off button for power on/off.



2.3.14 Antenna interface

EC954-FQ38 has a total of 7 antenna interfaces, and the number of antennas standard for different models varies. The antennas are screwed into the corresponding antenna interfaces to complete antenna installation.



Identification	Name
ANT1	4G LTE main antenna
ANT2	4G LTE diversity receiving antenna
GNSS	GNSS antenna
WiFi1	WiFi antenna
WiFi2	WiFi antenna

Note: The device operating in the 5150-5250 MHz band, under RSS-247, The device is for indoor use only

2.3.15 mSATA hard drive interface

EC954-FQ38 supports mSata hard drives, which are not included by default at the factory. If users have high-capacity storage needs and need to purchase their own mSata hard drives, they can also consult InHand to purchase mSATA.

3 Introduction

In this chapter, we will introduce the basic configuration of the Edge Computer EC900 based on the Arm structure.

3.1 Connecting to EC900

You need a computer to connect to EC900 and log in to the command line interface. It can be connected through an Ethernet cable.

Factory default username and password:

Username: edge

Password: security@edge

EC900 devices default to creating root at the factory, but login is disabled. If you need to use the root user, please manually modify the system configuration and enter `sudo - s` to switch to the root user. The user edge is in the sudo group, so you can use `sudo` to execute system level commands under the edge user. For other details, please refer to the sudo mechanism section in Chapter 5.

Prompt

When the **command not found** appears, enter `sudo - s` to switch to the root user or use the `sudo` command to operate.

Take care

For security reasons, we recommend that you disable the default user account and create your own user account.

3.1.1 Connecting through SSH Console

EC900 supports SSH connection through Ethernet. Connect to EC900 using the following default IP address.

Port	Default IP
ETH 1	192.168.1.100
ETH 2	192.168.1.100
ETH 3	192.168.5.100

ETH 4

192.168.6.100

3.1.1.1 Linux users

Prompt

These steps apply to connecting to EC900 on a Linux PC. Please do not apply these steps to the EC900 device itself. Before running the ssh command, make sure to configure the Ethernet port IP address of the PC within a specific range. ETH1: 192.168.1.0/24, ETH2: 192.168.4.0/24, ETH3: 192.168.5.0/24, ETH4: 192.168.6.0/24.

Use the ssh command on a Linux PC to access the ETH1 port of EC900.

```
user@PC:~$ ssh edge@192.168.3.100
```

Enter **yes** to continue connecting.

```
The authenticity of host '192.168.3.100 (192.168.3.100)' can't be established.  
ECDSA key fingerprint is SHA256:jqiLREbTX6Ut2whNFdpLvCcQfM3KUnl3Ta7/dWppBCU.  
Are you sure you want to continue connecting (yes/no)? yes
```

When the interface displays the terminal prompt `edge@edge-computer:~\$`, indicating that shell commands can be entered, the connection is successful.

```
?IIIII      ?I  IIIIIIIIIII?      ?III
  IIII      IIII  ?IIIIIIIIIIIIIIIIIIII
    ?III      7IIIIIIII  IIIIIIIIIIIIIIIIIIIII
      II      I?IIIIIIIIII  IIIIIIIIIIIIIIIIIIIII
            IIIIIIIIIII?  ?IIIIIIIIIIIIIIIIIIII
              ?IIIIIIII  ?IIIIIIIIIIII?
II
II
II      ?b      Ib
      ?II      IIN
II  I?IIIII  ?IIIII?  IIIIII  IIIIII  $?IIIIIN
II  IIIIIIII  ?IIIIIII  ?IIIIIII  IIIIIIII?  IIIIIIIIN
II  II?  IIN  III  II  II  OII 8II  IIN
II  II?  IIN  III  II  III?II  II  II 8I?  IIN
II  II?  IIN  III  II  ZIIIIIIII  II  II 8I?  IIN
II  III  IIN  III  II  II?  II  II  II 8I?  IIN
II  III  IIN  III  II  ?II  II  II  II  II$  IIN
IIIIIII  IIIIIIII  II  ZIIIIIIIIII  II  7IIIIIIIN
      IIN
      IIN
      IIN
      IIN
      IIN
      NN

For further information check:
https://www.inhand.com.cn/ or https://www.inhandnetworks.com/

Last login: Tue Jan 17 16:48:58 2023 from 192.168.4.5
edge@edge-computer:~$
```

3.1.1.2 Windows users

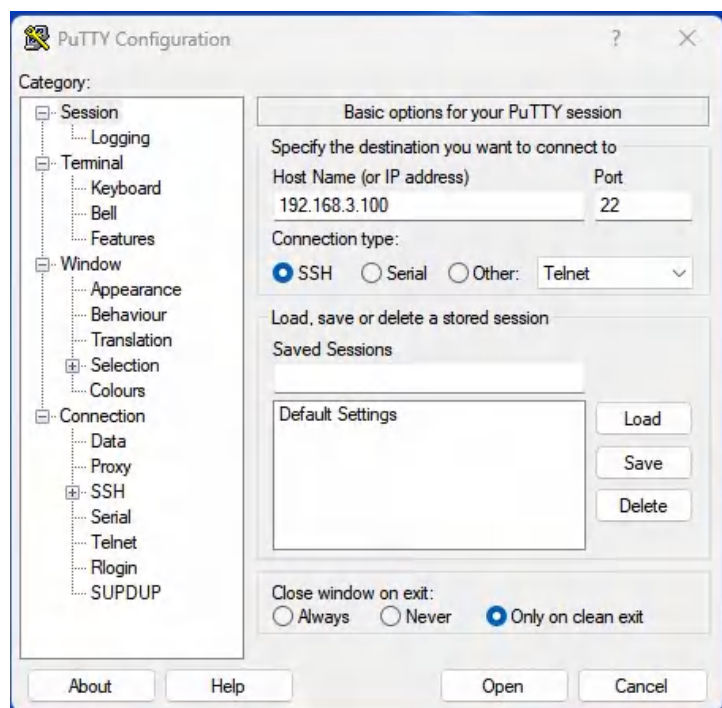
Prompt

These steps apply to connecting EC900 on a Windows PC. Please do not apply these steps to the EC900 device itself.

Please take the following steps on your Windows PC

Click on the link <http://www.chiark.greenend.org.uk/~Sgtatham/putty/download.html>, download PuTTY (free software), and establish the connection with the edge computer

EC900 in the way of SSH command in the Windows environment. The following figure is an example of using SSH connection:



3.2 User Account Management

3.2.1 Switch to root user

You can use the command `sudo - s` to switch to the root user. For security reasons, do not operate all commands under root privileges.

Prompt

Click on the link to get more information about the **sudo** command.

<https://wiki.debian.org/sudo>

Take care

You may receive a permission denied prompt when using certain pipes or redirection behaviors without root privileges. In this case, you must use `'sudo su - c'` instead of commands such as `'>','<','>>','<<'`, etc, and include single quotes for the complete command.

3.2.2 Creating and deleting user accounts

You can use the **useradd** and **userdel** commands to create and delete user accounts. Please make sure to use these commands on the main interface to set the relevant access permissions for this account. Here is an example of how to create test1 in the sudo group (the default login environment for test1 users is bash, and their home directory is /home/test1)

```
edge@edge-computer:~$ sudo useradd -m -G sudo -s /bin/bash test1
```

Change the password for test1, use the `passwd` command, enter the new password, and then

repeat the process to confirm the change

```
edge@edge-computer:~$ sudo passwd test1
New password:
Retype new password:
passwd: password updated successfully
```

If you want to delete user test1, use the command userdel

```
edge@edge-computer:~$ sudo userdel test1
```

3.2.3 Disable default user accounts

Take care

Before disabling the default account, you should first create a user account

Use the passwd command to lock the default user account and prevent edge users from logging in

```
edge@edge-computer:~$ sudo passwd -l edge
passwd: password expiry information changed.
```

Unlocking edge users

```
edge@edge-computer:~$ sudo passwd -u edge
passwd: password expiry information changed.
```

3.3 Network and System Management

EC954-FQ38 is based on the Debian 11 system, so it can use native Linux commands for network and system management; In order to facilitate user configuration, InHand has developed an IEOS system program that provides a web interface, allowing users to easily manage networks and systems through the web. However, it should be noted that when the IEOS function is enabled, IEOS will take over network and system management. At this time, using Linux native commands for network and system management may become ineffective; IEOS is enabled by default at the factory of the device. If users need to perform network and system management based on Linux native command lines, they need to first disable IEOS.

3.3.1 Web management based on IEOS

IEOS is a network management and system management program developed by InHand that runs on Linux systems. IEOS provides a web interface, allowing users to configure Ethernet IP addresses, cellular dialing, Wi-Fi Station, DHCP Client/Server, static routing, firewalls, and other network configurations through the web; You can also perform operations on system time, time zone, firmware upgrades, and system restarts; In addition, IEOS also supports integration with InHand's device management platform DeviceLive, allowing users to remotely monitor and manage EC954 devices through the DeviceLive platform.

IEOS adopts a design scheme that separates state and configuration, divided into three functional modules: network management, system management, and state. Only network and system related configurations can be performed under the network management menu and system management menu, and status information needs to be viewed uniformly on the status page.

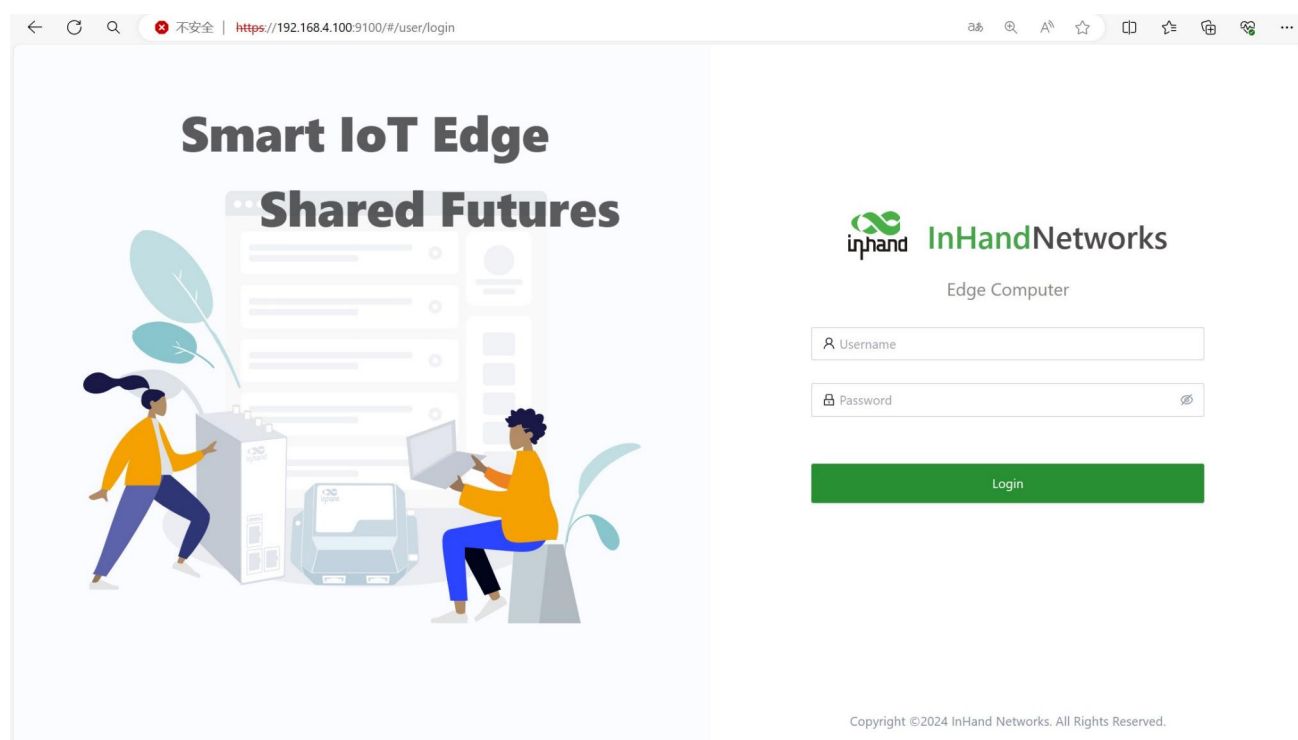
Important note: When using the IEOS program to manage network and system configurations, if Linux native commands are used at the same time, the two may affect each other, leading to abnormal running states. It is recommended that the configurations

supported by IEOS be managed through the IEOS web. For configurations not supported by IEOS, such as VPN, the configuration goals can be achieved by combining native Linux commands.

3.3.1.1 Logging into the web

Considering that the user's program may require the use of HTTP/HTTPS standard port number 80/443, IEOS uses port number 9100 as the port for HTTPS connection and does not support access through HTTP; When users access the web using HTTP, they will automatically redirect to using HTTPS. This document takes the default address 192.168.4100 through eth2 as an example for explanation. After entering 192.168.4100:9100 in the browser, the user will be redirected to the login page

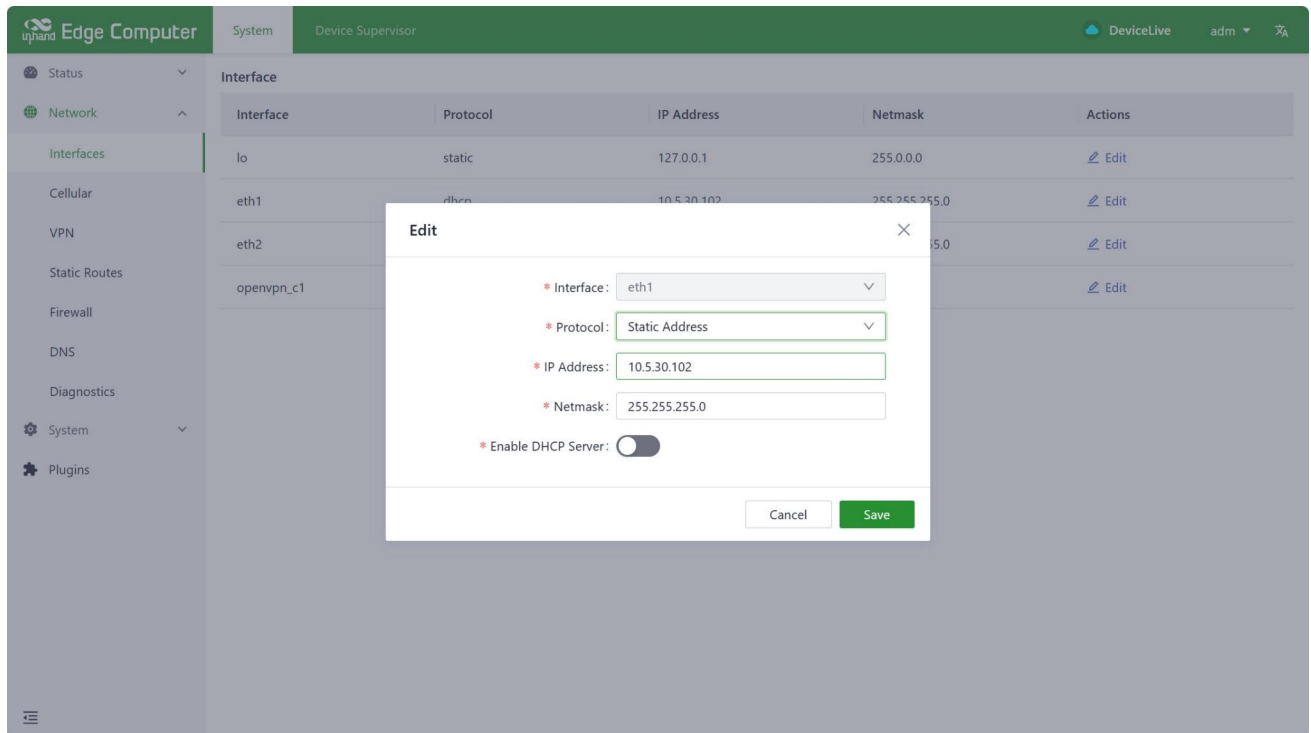
Important note: When the IEOS program is enabled, some port numbers will be reserved for internal communication, with a reserved port number range of 9100 to 9200. After enabling IEOS, customer programs should avoid using these port numbers, otherwise conflicts may occur and functional abnormalities may occur.



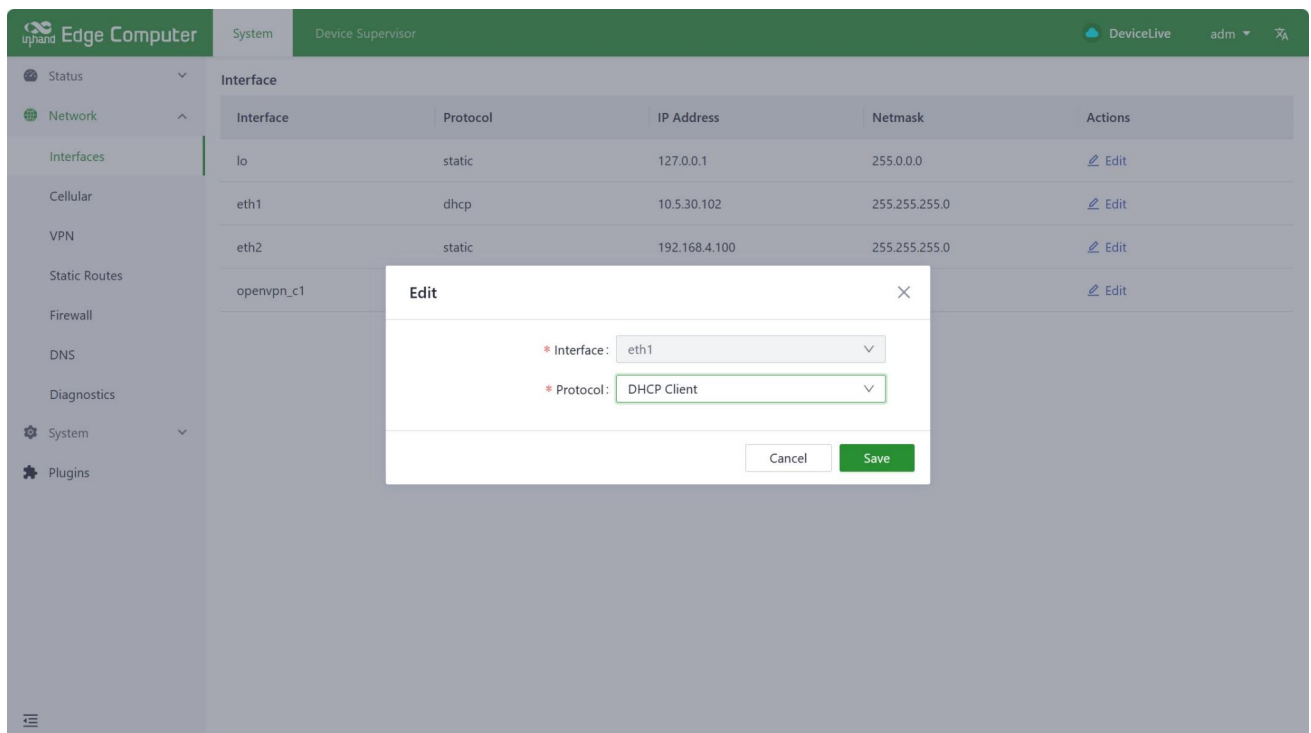
3.3.1.2 Network Management

3.3.1.2.1 Configure Ethernet interface

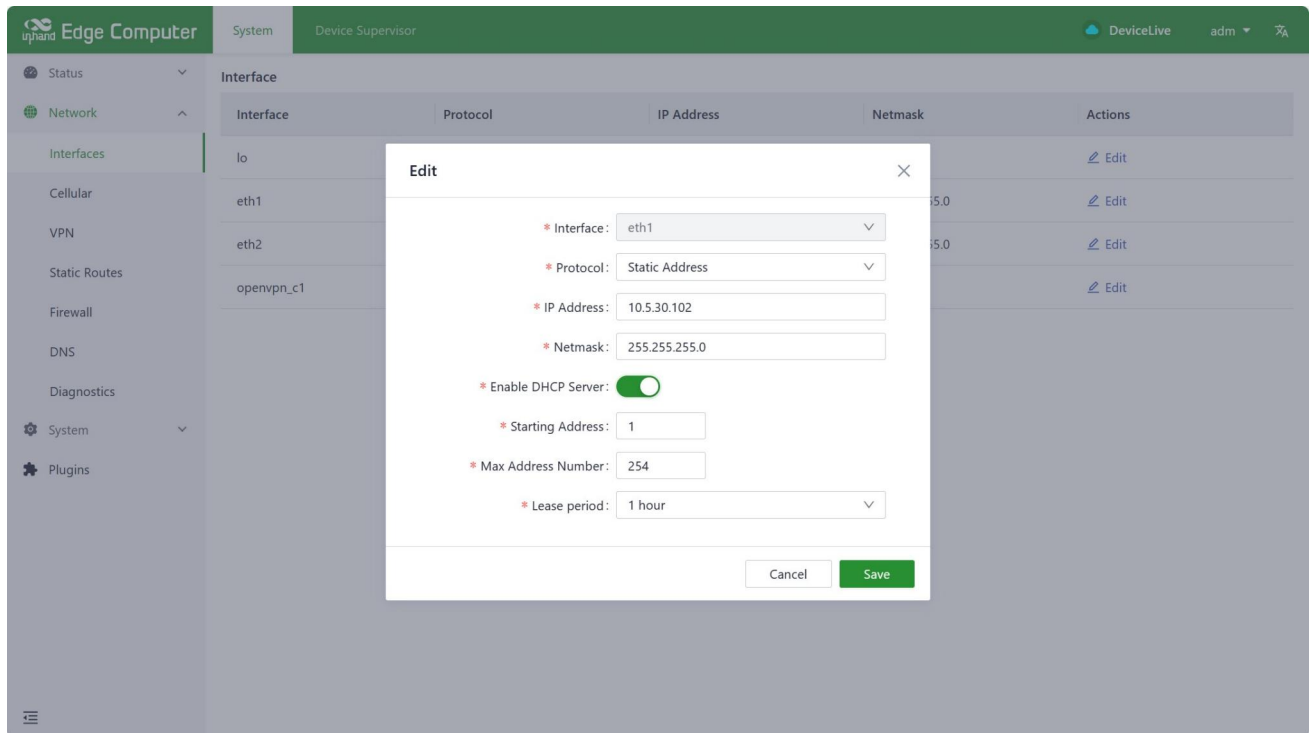
Configure static IP addresses for the eth1 interface



Configure DHCP Client for eth1 interface



Start the dhcp server function on the eth1 interface and assign addresses to the underlying devices of eth1



DHCP Server configuration parameter description:

Enable DHCP Server: Switch for DHCP Server functionality

Starting Address: The starting base address of the DHCP Server address pool, where network segment+starting address=the starting IP address of the address pool. In the screenshot, the network segment of eth1 is 192.168.1.0/24, and the base address is 1, so the starting address of the address pool is 192.168.1.1/24

Max Address Number: The maximum number of addresses in the address pool

Lease period: Lease period

3.3.1.2.2 Configure cellular dialing

The screenshot shows the 'Cellular' configuration page in the 'Device Supervisor' of an 'inhand Edge Computer'. The left sidebar contains navigation options: Status, Network (selected), Interfaces, Cellular (selected), VPN, Static Routes, Firewall, DNS, Diagnostics, System, and Plugins. The main content area is titled 'Cellular' and includes a toggle for 'Enabled' (which is turned on). Below this is a table for 'APN Profiles' with one entry: Index 1, APN '3gnet', Auth Method 'No Auth', and an 'Edit' link. Further down are settings for 'Network Mode' (set to 'Auto'), 'Enable Default Route' (turned on), and 'Metric' (set to '200'). There is also a 'Dual SIM Enabled' toggle (turned off) and a 'SIM1' section with an 'APN Profile' set to 'Auto'. At the bottom, there are links for 'ICMP Probes' and 'Advanced Settings'.

Cellular network parameter description:

Enable: switch for cellular function; The default is the enabled state.

APN Profiles: A set of dialing parameters used to configure APN, username, password, and authentication method information when dialing with a dedicated network card. If it is not a dedicated network card, there is usually no need to modify the configuration here. The dialing parameter set can add up to 10 records.

Network Mode: The cellular network format, which can choose from 3G, 4G and other related network formats, such as LTE, WCDMA, etc. If it is unclear which network standard to choose, choose automatic; The program will automatically select the most suitable network format. The default value is automatic.

Enable Default Route: Enable the add default route function. When enabled, a default route for the cellular port will be added after successful dialing. It is enabled by default.

Metric: The metric value of the default routing for cellular ports. When default routing is configured for cellular, Wi Fi, and Ethernet ports, the metric with the smallest value takes effect.

Dual SIM Enabled: ☒

Main SIM:

Max. Number of Dials:

SIM1

APN Profile:

SIM2

APN Profile:

Dual SIM enabled: enables the dual SIM feature. EC954 supports dual card single dial to improve network reliability. Two SIM cards need to be inserted into the device. After enabling this function, if the SIM card 1 fails to dial due to arrears, it will automatically switch to the SIM card 2 for dialing. The default is off.

Main SIM: The main SIM card will prioritize the selected SIM card for dialing. When dialing

fails a certain number of times, it will switch to another SIM card for dialing. By default, sim1 will be used for dialing first.

Max Number of Dials: After enabling the dual SIM single dial function, if the current SIM card reaches the specified number of dials, switch to another SIM card for dialing.

APN Profile: The dialing parameter set selected by the SIM card, with the default value being automatic. Usually, a dedicated network card needs to configure a dial-up parameter set and select the Index of the dial-up parameter set here.

PIN Code: The PIN code of the SIM card.

ICMP Probes ▾

ICMP Detection Server

* Detection Interval: Seconds (1-86400)

* Detection Timeout: Seconds (1-86400)

* Detection Max Retries:

Detection Strict: ☒

Wireless cellular networks are quite complex, and sometimes there may be false dial-up connections, where the dial-up status is successful but the target address cannot be pinged; When these situations occur, dialing again can restore normal operation. IEOS cellular dialing supports ICMP detection to detect fake connections. **It is recommended that customers using cellular networking enable ICMP detection, so that when false connections occur, they can quickly recover.**

ICMP detection parameters:

ICMP Detection Server Probes: ICMP detection address; Two detection addresses can be configured, and as long as one address is successfully detected, it indicates that there is no false connection in the cell. When both addresses are not configured, the ICMP detection function is turned off.

Detection Interval: How often should ICMP detection be conducted.

Detection Timeout: The ICMP detection timeout period. If no detection response message is received after waiting for a long time, it is considered that the detection has failed

Detection Max Retries: Maximum number of detections; When the detection fails and reaches this value, trigger a redial. Value range [1,5]

Detection Strict: Whether strict detection is enabled. When strict detection is turned off, the detection program will detect whether the messages received by the cellular interface have changed during each detection cycle. If there are changes, it indicates that the cellular network is connected, and ICMP messages will not be sent for detection, which can save some traffic; If detection is enabled, ICMP detection messages will be periodically sent regardless of whether the number of messages received by the cellular interface has changed. The default is off.

Advanced Settings ▾

Debug Mode enabled ☐

Enable Infinitely Redial ☒

Dial Interval: Seconds (0-3600)

Signal Query Interval: Seconds (0: disabled)

In advanced configuration, there are some uncommon setting options.

Debug Mode enabled: Whether to enable the debug function. After enabling it, some dial-up related debugging information will be added to the log, which is disabled by default.

Enable Infinitely Redial: Enable infinite redial. In some cases, dialing may be in an abnormal state and can be restored to normal by restarting the system; The default infinite redial is turned off. After a certain number of failed dials, the system will restart to try to recover. Due to dialing being enabled by default, some customers may fail to dial without inserting a SIM card, and the system may restart. In this case, unlimited redial can be enabled; This way, no matter how many times the dialing fails, the system will not restart.

Dial Interval: Dialing interval; But the time to wait before proceeding to the next dial when a dial fails.

Signal Query Interval: Signal query interval. When the signal is poor, false connections may occur; At this point, there is a certain probability that redialing can solve the problem of fake connections. The dial-up program will regularly check the signal strength, and the signal detection cycle is configured here.

3.3.1.2.3 Configure Wi Fi Station

WiFi

Enable Wi-Fi: ☒

Station Role: ☒ Client ☐ AP

* Client SSID:

Enable Default Route: ☒

* Metric:

Auth Method:

Encrypt Mode:

* WPA/WPA2 PSK Key:

SSID Scan

Channel	SSID	BSSID	Security	Signal(dBm)	Actions
---------	------	-------	----------	-------------	---------



No data

Enable Wi Fi: enable switch; Default Off

Client SSID: The ssid that needs to be connected, which can be manually entered; You can also obtain nearby accessible ssids by scanning the button

Enable Default Route: Whether to enable the add default route function. When enabled, a default route for the WLAN port will be added after a successful WiFi connection. It is enabled by default.

Metric: The metric value of the default routing for WiFi ports. When default routing is configured for cellular, Wi Fi, and Ethernet ports, the metric with the smallest value takes effect.

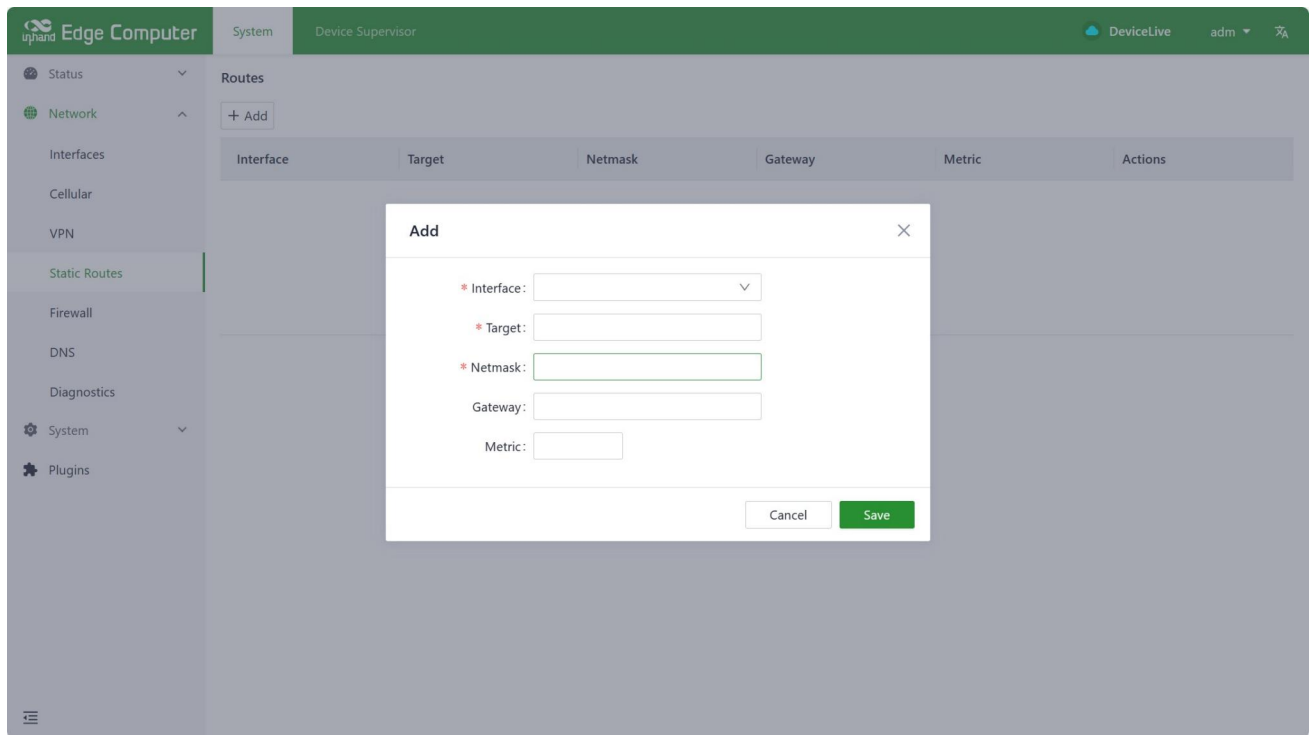
Auth Method: Authentication method, supports no authentication, WPA-PSK, WPA2-PSK, WPA-PSK/WPA2-PSK Mixed

Encrypt Mode: encryption method; Supports CCMP, TKIP, TKIP, and CCMP

WPA/WPA2 PSK Key: Key information

3.3.1.2.4 Configure static routing

The configuration here is for static routing of Ethernet. When default routing of Ethernet, cellular, and WiFi is configured simultaneously, the default routing with the lowest metric value takes effect. It is necessary to ensure that the metric value of the default route is different.



Static routing configuration parameters:

Interface: The outbound interface for static routing

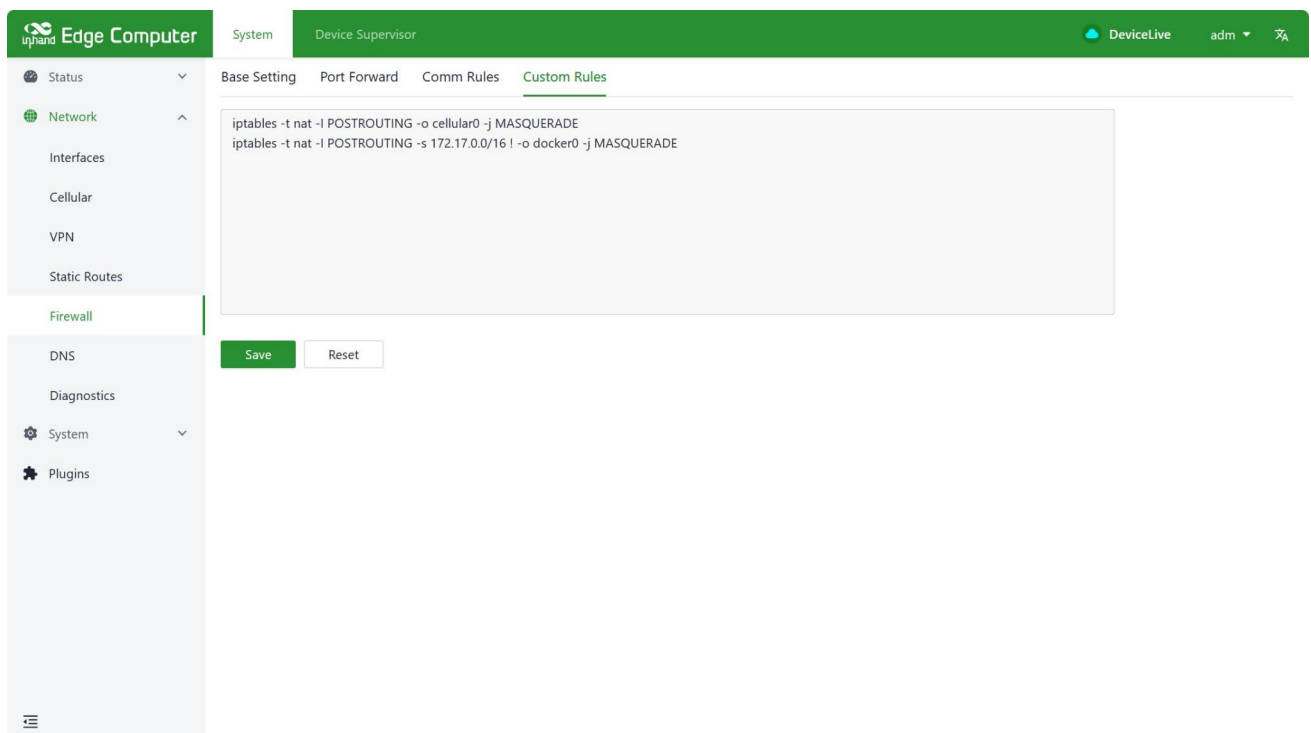
Target: Target network

Netmask: Target Netmask

Gateway: Next hop address

Metric: The metric value of static routing

3.3.1.2.5 Configure firewall



Currently, only the iptables command is supported for configuration.

3.3.1.2.6 Configure DNS

The screenshot shows the 'Edge Computer' configuration interface. The left sidebar lists various system settings: Status, Network, Interfaces, Cellular, VPN, Static Routes, Firewall, DNS (highlighted), Diagnostics, and System. The main panel is titled 'DNS' and contains two input fields for 'DNS Servers' with the values '114.114.114.114' and '8.8.8.8'. Below these fields is a '+ Add' button and two buttons, 'Save' and 'Reset'. A section titled 'Domain name hijacking' includes another '+ Add' button. At the bottom, there is a table with columns: Domain, IPv4, Comments, and Actions. The table is currently empty.

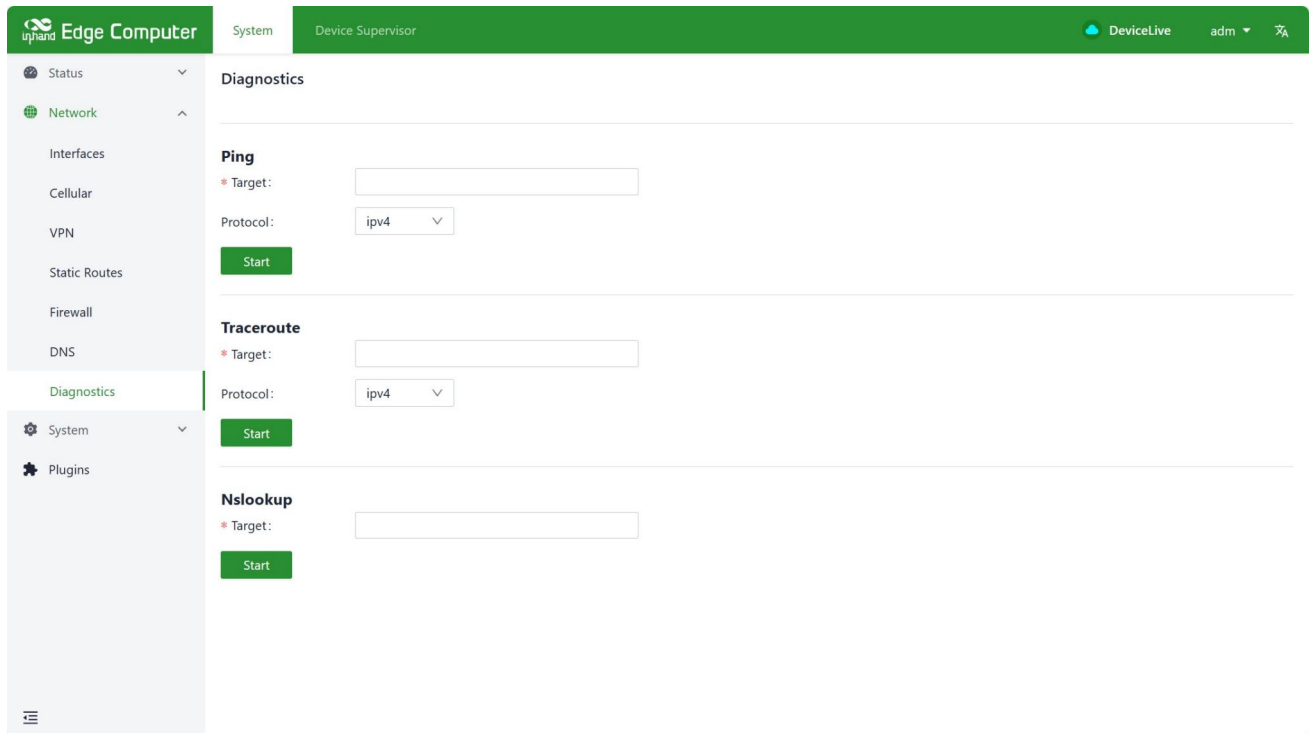
DNS servers: DNS server addresses, supporting up to 4 configurations

Domain name hijacking: Domain name hijacking function, which can achieve binding between IP addresses and domain names.

This screenshot shows the same 'DNS' configuration page as before, but with an 'Add' dialog box open in the foreground. The dialog has a title bar with a close button (X). It contains three input fields: 'Domain' (with a red asterisk indicating it is required), 'IPv4' (also with a red asterisk), and 'Comments'. At the bottom of the dialog are 'Cancel' and 'Save' buttons. The background configuration page is dimmed.

3.3.1.2.7 Network Diagnostics

Network diagnosis supports ping, traceroute, and nslookup functions.



3.3.1.3 System Management

3.3.1.3.1 Basic Configuration

Cloud management



Enabled: an enable switch for docking with the DeviceLive platform; DeviceLive is a remote monitoring and management platform for InHand devices;

Cloud Server: DeviceLive platform has 2 addresses; One is the address of the domestic platform, and the other is the address of the overseas platform; Choose which platform to connect to here.

Time zone and NTP client

Time

Timezone ⓘ:

UTC +08:00 China,Hong Kong,Taiwan,Western Au... ▼

NTP Client:

☒

* Sync cycle:

3600

Seconds (1-36000)

* NTP Server1:

0.debian.pool.ntp.org

⊖

* NTP Server2:

1.debian.pool.ntp.org

⊖

* NTP Server3:

2.debian.pool.ntp.org

⊖

* NTP Server4:

3.debian.pool.ntp.org

⊖

+ Add a Server

Save

Reset

Up to 10 NTP server addresses can be configured, and the program periodically sends synchronization requests to each server address in sequence. After successful synchronization, the system time is written to the RTC and synchronization requests are no longer sent to subsequent NTP servers.

In addition to using NTP to synchronize time, there is a synchronization button on the Device Info status page that allows for manual synchronization of time. However, this synchronization button is only displayed when the device time and local time (the time of accessing the computer used by the device) differ by more than 3 seconds.

Configuration File

Configuration File

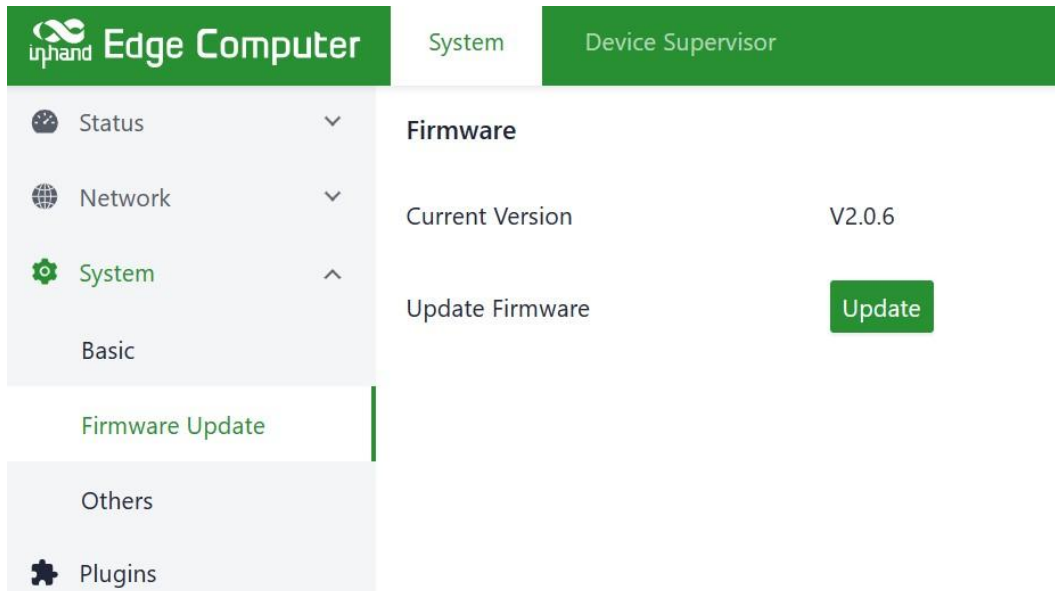
Import

Export

Restore Factory

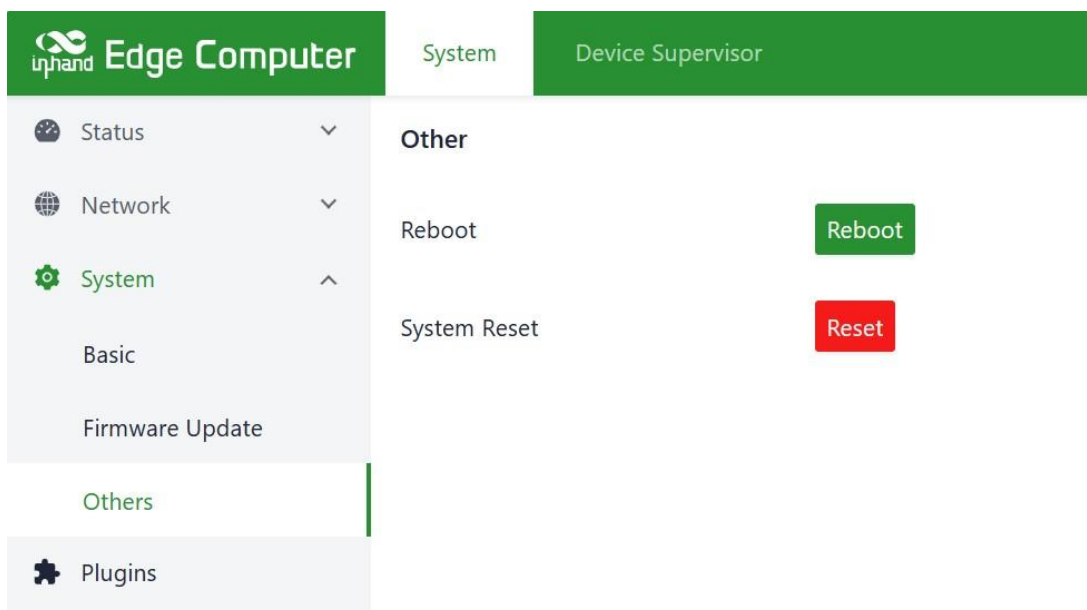
Here, configuration import, export, and factory recovery are supported.

3.3.1.3.2 Firmware Upgrade



The automatic restart option is disabled by default. After upgrading the firmware, the system needs to be manually restarted to take effect; After enabling the automatic restart option, the system will automatically restart after a successful firmware upgrade.

3.3.1.3.3 Others

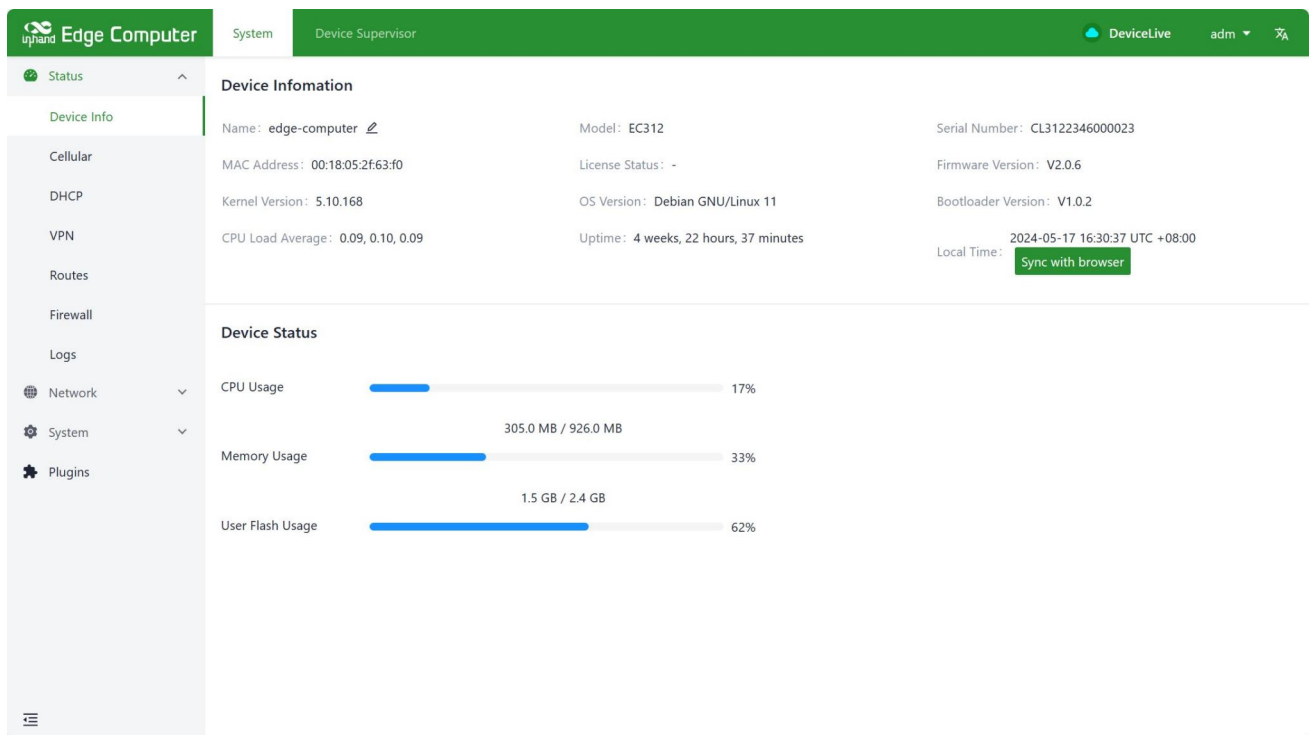


This page has two functions: system restart and system reset. Resetting the system requires careful use. Resetting the system function will restore the configuration and file system status of the system to be consistent with the factory settings, which means that the software installed by the user will also be cleared.

3.3.1.4 Status

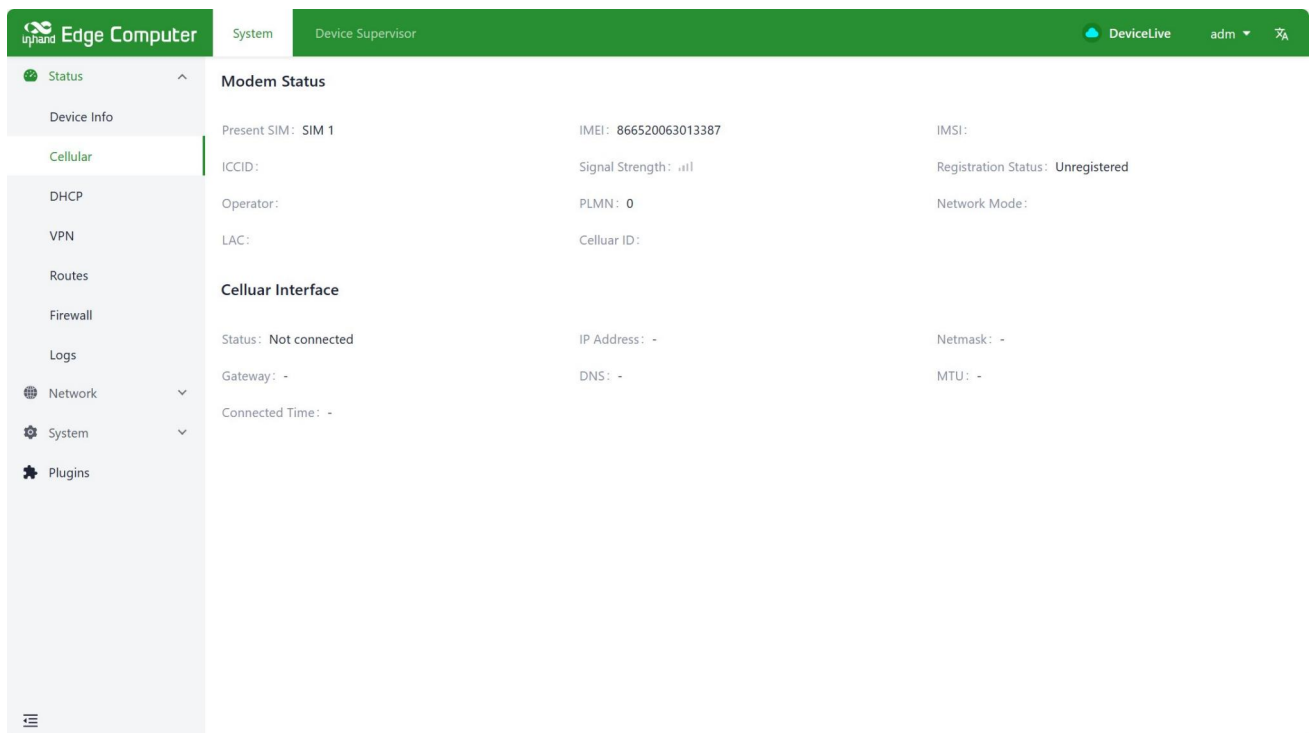
3.3.1.4.1 Equipment information

The device information status page displays the host name, device model, serial number, firmware version, kernel version, file system version, as well as an overview of CPU, memory, and disk space usage.



3.3.1.4.2 Cellular dialing status information

The cellular dialing status page displays the SIM card, IMEI, IMSI, ICCID, signal strength, as well as the IP address, DNS, and other information obtained during dialing.



3.3.1.4.3 Wi-Fi Station Status Information

The Wi-Fi status page displays the IP address, gateway, and DNS information obtained after a successful Wi Fi connection.

WiFi Status

Station Role: STA

Status: Not connected

Interface Name: -

IP Address: -

Netmask: -

Connected Time: -

Gateway: -

DNS: -

MTU: -

Signal strength: -

3.3.1.4.4 DHCP Server status information

The DHCP Server status page displays the IP address, client host name, client host MAC, and expiration time assigned to the device as a DHCP Server.

The screenshot shows the 'Edge Computer' interface with the 'Device Supervisor' tab selected. The left sidebar lists various system components, with 'DHCP' highlighted. The main content area is titled 'DHCP Allocation' and contains a table with the following columns: Hostname, Ip, Mac, and Lease Expiration Time. The table is currently empty, displaying a 'No data' message with a folder icon.

3.3.1.4.5 Routing status information

The routing status page displays information such as IPv4 direct routing, static routing, and routing neighbors.

The screenshot shows the 'Edge Computer' interface with the 'Device Supervisor' tab selected. The left sidebar lists various system components, with 'Routes' highlighted. The main content area is titled 'Routes' and contains two tables. The first table, 'Active IPv4 Routes', has columns: Interface, Target, IPv4 Gateway, and Metric. The second table, 'IPv4 Neighborhoods', has columns: IPv4 Address, MAC Address, and Interface.

Interface	Target	IPv4 Gateway	Metric
eth1	0.0.0.0	10.5.30.254	-
eth1	10.5.30.0/24	-	-
docker0	172.17.0.0/16	-	-
eth2	192.168.4.0/24	-	-

IPv4 Address	MAC Address	Interface
10.5.30.142	6c4b90:02:0fe3	eth1
10.5.30.123	e454e8:dc:80:f6	eth1
192.168.4.101	74:5d:22:b7:a3:28	eth2
10.5.30.58	8cec4b:d2:a1:7c	eth1
10.5.30.152	cc96:e5:46:58:fe	eth1
10.5.30.254	78:17:be:ca:0d:76	eth1
10.5.30.209	74:86:e2:1f:72:09	eth1

3.3.1.4.6 Firewall status information

The firewall status information displays filtering rules, IP address mapping rules, and other information.

Edge Computer

System

Device Supervisor

DeviceLive

adm

Status

Device Info

Cellular

DHCP

VPN

Routes

Firewall

Logs

Network

System

Plugins

filter nat mangle raw

Firewall List

Table:Filter

Chain INPUT (Policy: ACCEPT,Packets: 2448K,Traffic: 237M)

Packets	Traffic	Target	Protocol	In	Out	Source Address	Destination Address	Options
3702K	1569M	ACCEPT	all	lo	*	0.0.0.0/0	0.0.0.0/0	/* !fw3 */
3328K	1276M	input_rule	all	*	*	0.0.0.0/0	0.0.0.0/0	/* !fw3: Custom ...
879K	1039M	ACCEPT	all	*	*	0.0.0.0/0	0.0.0.0/0	ctstate RELATED...
658	34216	syn_flood	tcp	*	*	0.0.0.0/0	0.0.0.0/0	tcp flags:0x17/0...

Chain FORWARD (Policy: ACCEPT,Packets: 0,Traffic: 0)

Packets	Traffic	Target	Protocol	In	Out	Source Address	Destination Address	Options
0	0	forwarding_rule	all	*	*	0.0.0.0/0	0.0.0.0/0	/* !fw3: Custom ...
0	0	ACCEPT	all	*	*	0.0.0.0/0	0.0.0.0/0	ctstate RELATED...

3.3.1.4.7 Log information

The log page can view system logs, user logs, and set the level of logs to be viewed, including Error, Info, Debug, and other levels. Logs can also be downloaded locally.

inhand

Edge Computer

System

Device Supervisor

DeviceLive

adm

Status

Device Info

Cellular

DHCP

VPN

Routes

Firewall

Logs

Network

System

Plugins

Type: SystemLevel: ALLKey: SearchReset50 LinesNo Refresh

Level	Time	Content
Info	2024-05-17 16:35:42	dial[6723]:
Info	2024-05-17 16:35:42	dial[6723]:
Info	2024-05-17 16:35:42	dial[6723]: +CME ERROR: 10
Info	2024-05-17 16:35:42	dial[6723]:
Info	2024-05-17 16:35:42	dial[6723]:
Info	2024-05-17 16:35:42	dial[6723]: +CME ERROR: 10
Info	2024-05-17 16:35:42	dial[6723]:
Warning	2024-05-17 16:35:42	dial[6723]: execute AT+CPIN? failed!
Warning	2024-05-17 16:35:42	dial[6723]: Failed to check sim.
Warning	2024-05-17 16:35:42	dial[6723]: Check SIM card failed for more than 3 times,redial...
Warning	2024-05-17 16:35:42	dial[6723]: Check sim card failed!
Warning	2024-05-17 16:35:42	dial[6723]: Failed for 76 times, need restart modem!

Download Logs

3.3.2 Linux based command line management

When using the Linux command line for network and system configuration, the first step is to close the IEOS program. IEOS is managed through system ctl,

The way to close IEOS is as follows:

Systemctl stop ieos_daemon

This shutdown only takes effect for this startup. Even after the system restarts, the IEOS program will still start. The way to prevent the IEOS program from starting up is as follows:

Systemctl disable ieos_daemon

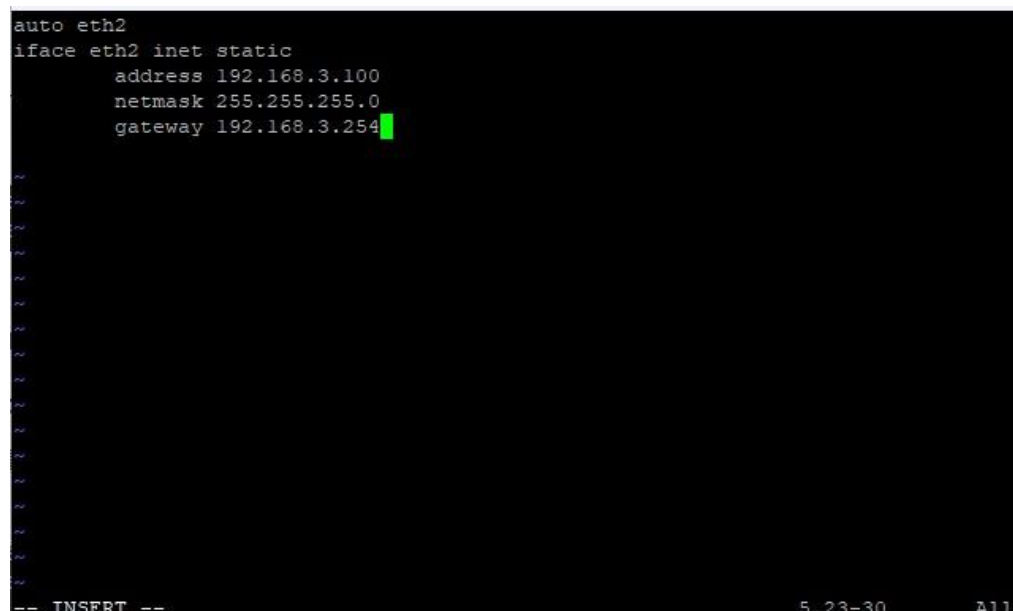
Important note: After disabling IEOS, wireless networking functions such as dial-up and Wi Fi require users to implement them based on native Linux commands, and it is also impossible to remotely manage devices through the DeviceLive platform.

3.3.2.1 Network Management

3.3.2.1.1 Set a static IP address

If you want to set a static IP address for EC954-FQ38, modify the corresponding network configuration file by using the commands `vim/etc/network/interfaces. d/eth1` or `vim/etc/ network/interfaces. d/eth2` to set the default gateway, address, network, and subnet mask for the Ethernet interface. Here is an example of setting a static IP for the eth2 port:

```
auto eth2
iface eth2 inet static
    address 192.168.3.100
    netmask 255.255.255.0
    gateway 192.168.3.254
```



After modifying the interface IP configuration, execute `/etc/init.d/networking restart` to restart the network service and make the configuration effective.

3.3.2.1.2 Set a dynamic IP address

If you want to set a dynamic IP address for EC954-FQ38, modify the corresponding network configuration file by using the command `vim/etc/network/interfaces. d/eth1` or `vim/etc/ network/interfaces. d/eth2`, and set it to DHCP after `inet` to automatically obtain the IP address.

Here is an example of setting a dynamic IP for the eth1 port.

```
auto eth1
iface eth1 inet dhcp
```

After modifying the interface IP configuration, execute `etc/init.d/networking restart` to restart the network service and make the configuration effective.

3.3.2.2 System management

3.3.2.2.1 Querying Firmware Version

To check the computer firmware version of EC954-FQ38, please type:

```
edge@edge-computer:~$ ecversion
EC954 version V2.0.0-beta.1
edge@edge-computer:~$
```

By adding the -a option, you can see the complete version information:

```
edge@edge-computer:~$ ecversion -a
EC954 version V2.0.0-beta.1 Build 2023127
edge@edge-computer:~$
```

3.3.2.2.2 Viewing available disk space

To determine the amount of available drive space, use the `df` command with the `-h` option. The system will return the amount of drive space decomposed by the file system. The available disk partition for users in EC954-FQ38 product is `/dev/mmcblk0p8`. Here is an example:

```
edge@edge-computer:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/mmcblk0p7  26M   14K   23M   1% /custom
/dev/mmcblk0p8  5.8G 241M   5.2G   5% /userdata
overlay         5.8G 241M   5.2G   5% /
devtmpfs        1.9G  8.0K   1.9G   1% /dev
tmpfs           2.0G   16K   2.0G   1% /tmp
tmpfs           2.0G    0   2.0G   0% /dev/shm
tmpfs           2.0G   18M   1.9G   1% /run
tmpfs           5.0M   4.0K   5.0M   1% /run/lock
tmpfs           2.0G    0   2.0G   0% /sys/fs/cgroup
tmpfs          391M   4.0K   391M   1% /run/user/108
tmpfs          391M   4.0K   391M   1% /run/user/1001
```

3.3.2.2.3 Query product model information

The devinfo tool can view product model information

```
edge@edge-computer:~$ sudo devinfo
model=EC942
alias=
serialnumber=CL9422343000019
partnumber=LQA8-W-G
```

3.3.2.2.4 Adjusting Time

EC954-FQ38 has two time settings. One is the system time, and the other is the RTC (Real Time Clock) time maintained by the hardware of EC954-FQ38. Use the date command to query the current system time or set a new system time. Use the hwclock command to query the current RTC time or set a new RTC time.

Use the command date MMDDhhmmYYYY to set the system time:

MM: Month

DD: Day

Hh: hour

Mm: minutes

YYYY: Year

```
edge@edge-computer:~$ sudo date 030115052023
Wed Mar  1 15:05:00 CST 2023
```

The following command can be used to set the RTC time to system time

```
edge@edge-computer:~$ sudo hwclock
2023-03-01 15:05:55.192961+08:00
```

Click on the following link to obtain more detailed information about dates and times:

<https://www.debian.org/doc/manuals/system-administrator/ch-sysadmin-time.html>

<https://wiki.debian.org/DateTime>

3.3.2.2.5 Setting Time Zone

There are two methods to configure the time zone of EC954-FQ38. One is to use the command tzselect. Another option is to use the /etc/localtime file.

3.3.2.2.6 Using the tzselect command

After typing the tzselect command, you will enter the region selection interface. First, select the approximate region (divided by continent or ocean) and enter the number in front of the continent or ocean

```

edge@edge-computer:~$ tzselect
Please identify a location so that time zone rules can be set correctly.
Please select a continent, ocean, "coord", or "TZ".
1) Africa
2) Americas
3) Antarctica
4) Asia
5) Atlantic Ocean
6) Australia
7) Europe
8) Indian Ocean
9) Pacific Ocean
10) coord - I want to use geographical coordinates.
11) TZ - I want to specify the time zone using the Posix TZ format.

```

Choose another country under that continent or ocean

```

#? 4
Please select a country whose clocks agree with yours.
1) Afghanistan      18) Israel           35) Palestine
2) Armenia           19) Japan            36) Philippines
3) Azerbaijan        20) Jordan           37) Qatar
4) Bahrain           21) Kazakhstan       38) Russia
5) Bangladesh        22) Korea (North)    39) Saudi Arabia
6) Bhutan            23) Korea (South)    40) Singapore
7) Brunei            24) Kuwait           41) Sri Lanka
8) Cambodia          25) Kyrgyzstan       42) Syria
9) China             26) Laos             43) Taiwan
10) Cyprus           27) Lebanon          44) Tajikistan
11) East Timor       28) Macau            45) Thailand
12) Georgia          29) Malaysia         46) Turkmenistan
13) Hong Kong        30) Mongolia         47) United Arab Emirates
14) India            31) Myanmar (Burma)  48) Uzbekistan
15) Indonesia        32) Nepal            49) Vietnam
16) Iran             33) Oman             50) Yemen
17) Iraq            34) Pakistan

```

Follow the above steps to obtain the Chinese time zone keyword Asia/Shanghai, and execute the following command to set the time zone

```

#? 9
Please select one of the following time zone regions.
1) Beijing Time
2) Xinjiang Time
#? 1

The following information has been given:

    China
    Beijing Time

Therefore TZ='Asia/Shanghai' will be used.
Selected time is now:  Wed Mar  1 15:07:31 CST 2023.
Universal Time is now: Wed Mar  1 07:07:31 UTC 2023.
Is the above information OK?
1) Yes
2) No
#? Yes
Please enter a number in range.
#? 1

You can make this change permanent for yourself by appending the line
    TZ='Asia/Shanghai'; export TZ
to the file '.profile' in your home directory; then log out and log in again.

Here is that TZ value again, this time on standard output so that you
can use the /usr/bin/tzselect command in shell scripts:
Asia/Shanghai

```

3.3.2.2.7 Using Localtime Files

The local time zone is stored in `/etc/localtime`, and if no value is set for the TZ environment variable, it is used by the GNU library for C (glibc). This file is either a copy of `/usr/share/zoneinfo/file`, or a symbolic link pointing to it. If EC954-FQ38 cannot find the `/usr/share/zoneinfo/file`, please download the time zone information file you need from the website ([https:// www.iana.org/time-zones](https://www.iana.org/time-zones)) And re link to the local time file in EC900.

Take care

After successfully downloading the required time zone information file, decompress it, and then use the `zic` command to compile and generate the corresponding binary file. The generated time zone file is `"/usr/share/zoneinfo/custom time zone file name"`.

4 Advanced configuration of 4 peripheral interfaces

In this chapter, we will introduce the advanced configuration of the peripheral interface of the edge computer EC900 based on the Arm structure.

4.1 Serial port

EC954-FQ38 has 8 serial ports, and the first 4 ports support multiple serial port modes including RS-232, RS-422, and RS-485. The default mode is RS-485, and the `ih_uart_ctl` command can be used to switch the serial port mode. The last four serial ports are fixed in RS-485 mode.

The device node corresponding to P1 is `/dev/ttyCOM1`

The device node corresponding to P2 is `/dev/ttyCOM2`

The device node corresponding to P3 is `/dev/ttyCOM3`

The device node corresponding to P4 is `/dev/ttyCOM4`

```
root@edge-computer:~# ih_uart_ctl
Usage:
    ih_uart_ctl [OPTIONS]

OPTIONS
    help
        Help info of how to use ih_uart_ctl command.

    port_num=<num>
        num:1,2,3,4
        1 --> /dev/ttyCOM1
        2 --> /dev/ttyCOM2
        3 --> /dev/ttyCOM3
        4 --> /dev/ttyCOM4
        show the port mode
        example: ih_uart_ctl port_num=1

    uart_mode=<num>
        num:0,1,2
        0 --> RS232
        1 --> RS485
        2 --> RS422
        set the uart port mode
        if you do not input port number, the default port num is 1
        example: ih_uart_ctl uart_mode=0
        example: ih_uart_ctl port_num=0 uart_mode=0
```

4.1.1 Changing Serial Port Settings

Viewing and Setting Serial Ports with the `STTY` Command

View detailed command content by typing `sudo stty -- help`:

```

edge@edge-computer:~$ sudo stty --help
Usage: stty [-F DEVICE | --file=DEVICE] [SETTING]...
or: stty [-F DEVICE | --file=DEVICE] [-a|--all]
or: stty [-F DEVICE | --file=DEVICE] [-g|--save]
Print or change terminal characteristics.

Mandatory arguments to long options are mandatory for short options too.
-a, --all          print all current settings in human-readable form
-g, --save         print all current settings in a stty-readable form
-F, --file=DEVICE open and use the specified DEVICE instead of stdin
--help            display this help and exit
--version          output version information and exit

Optional - before SETTING indicates negation. An * marks non-POSIX
settings. The underlying system defines which settings are available.

Special characters:
* discard CHAR    CHAR will toggle discarding of output
  eof CHAR        CHAR will send an end of file (terminate the input)
  eol CHAR        CHAR will end the line
* eol2 CHAR       alternate CHAR for ending the line
  erase CHAR       CHAR will erase the last character typed
  intr CHAR       CHAR will send an interrupt signal
  kill CHAR       CHAR will erase the current line
* lnext CHAR      CHAR will enter the next character quoted
  quit CHAR       CHAR will send a quit signal
* rprnt CHAR      CHAR will redraw the current line
  start CHAR      CHAR will restart the output after stopping it
  stop CHAR       CHAR will stop the output
  susp CHAR       CHAR will send a terminal stop signal
* swtch CHAR      CHAR will switch to a different shell layer
* werase CHAR     CHAR will erase the last word typed

Special settings:
  N               set the input and output speeds to N bauds
* cols N         tell the kernel that the terminal has N columns
* columns N      same as cols N
* [-]drain       wait for transmission before applying settings (on by default)
  ispeed N       set the input speed to N
* line N         use line discipline N
  min N          with -icanon, set N characters minimum for a completed read
  ospeed N       set the output speed to N
* rows N         tell the kernel that the terminal has N rows
* size           print the number of rows and columns according to the kernel
  speed          print the terminal speed
  time N         with -icanon, set read timeout of N tenths of a second

Control settings:
[-]clocal        disable modem control signals
[-]cread         allow input to be received
* [-]crtcts      enable RTS/CTS handshaking
  csN            set character size to N bits, N in [5..8]
[-]cstopb        use two stop bits per character (one with '-')
[-]hup           send a hangup signal when the last process closes the tty
[-]hupcl        same as [-]hup

[-]parenb        generate parity bit in output and expect parity bit in input
[-]parodd        set odd parity (or even parity with '-')
* [-]cmspar      use "stick" (mark/space) parity

```

Input settings:

```
[ - ]brkint      breaks cause an interrupt signal
[ - ]icrnl      translate carriage return to newline
[ - ]ignbrk     ignore break characters
[ - ]igncr      ignore carriage return
[ - ]ignpar     ignore characters with parity errors
* [ - ]imaxbel  beep and do not flush a full input buffer on a character
[ - ]inlcr      translate newline to carriage return
[ - ]inpck      enable input parity checking
[ - ]istrip     clear high (8th) bit of input characters
* [ - ]iutf8     assume input characters are UTF-8 encoded
* [ - ]iucLc     translate uppercase characters to lowercase
* [ - ]ixany     let any character restart output, not only start character
[ - ]ixoff      enable sending of start/stop characters
[ - ]ixon       enable XON/XOFF flow control
[ - ]parmrk     mark parity errors (with a 255-0-character sequence)
[ - ]tandem     same as [ - ]ixoff
```

Output settings:

```
* bsN           backspace delay style, N in [0..1]
* crN           carriage return delay style, N in [0..3]
* ffN           form feed delay style, N in [0..1]
* nlN           newline delay style, N in [0..1]
* [ - ]ocrnl    translate carriage return to newline
* [ - ]ofdel    use delete characters for fill instead of NUL characters
* [ - ]ofill    use fill (padding) characters instead of timing for delays
* [ - ]olcuc     translate lowercase characters to uppercase
* [ - ]onlcr     translate newline to carriage return-newline
* [ - ]onlret    newline performs a carriage return
* [ - ]onocr     do not print carriage returns in the first column
[ - ]opost      postprocess output
* tabN         horizontal tab delay style, N in [0..3]
* tabs         same as tab0
* -tabs        same as tab3
* vtN          vertical tab delay style, N in [0..1]
```

Local settings:

```
[ - ]crterase    echo erase characters as backspace-space-backspace
* crtkill       kill all line by obeying the echopr and echoe settings
* -crtkill      kill all line by obeying the echocrl and echok settings
* [ - ]ctlecho   echo control characters in hat notation ('^c')
[ - ]echo        echo input characters
* [ - ]echoctl   same as [ - ]ctlecho
[ - ]echoe       same as [ - ]crterase
[ - ]echoK       echo a newline after a kill character
* [ - ]echoke    same as [ - ]crtkill
[ - ]echoNL      echo newline even if not echoing other characters
* [ - ]echopr    echo erased characters backward, between '\ ' and '/'
* [ - ]extproc   enable "LINEMODE"; useful with high latency links
* [ - ]flusho    discard output
[ - ]icanon      enable special characters: erase, kill, werase, rprnt
[ - ]ixten       enable non-POSIX special characters
[ - ]isig        enable interrupt, quit, and suspend special characters
```

```
[ - ]noflsh      disable flushing after interrupt and quit special characters
* [ - ]prterase  same as [ - ]echopr
* [ - ]tostop    stop background jobs that try to write to the terminal
* [ - ]xcase     with icanon, escape with '\ ' for uppercase characters
```

```

Combination settings:
* [-]LCASE      same as [-]lcase
cbreak         same as -icanon
-cbreak        same as icanon
cooked         same as brkint ignpar istrip icrnl ixon opost isig
               icanon, eof and eol characters to their default values
-cooked        same as raw
crt            same as echoe echoctl echoke
dec            same as echoe echoctl echoke -ixany intr ^c erase 0177
               kill ^u
* [-]decctlq   same as [-]ixany
ek             erase and kill characters to their default values
evenp         same as parenb -parodd cs7
-evenp        same as -parenb cs8
* [-]lcase     same as xcase iuclc olcuc
litout        same as -parenb -istrip -opost cs8
-litout       same as parenb istrip opost cs7
nl            same as -icrnl -onlcr
-nl           same as icrnl -inlcr -igncr onlcr -ocrnl -onlret
oddp          same as parenb parodd cs7
-oddp         same as -parenb cs8
[-]parity     same as [-]evenp
pass8         same as -parenb -istrip cs8
-pass8        same as parenb istrip cs7
raw           same as -ignbrk -brkint -ignpar -parmrk -inpck -istrip
               -inlcr -igncr -icrnl -ixon -ixoff -icanon -opost
               -isig -iuclc -ixany -imaxbel -xcase min 1 time 0
-raw          same as cooked
sane          same as cread -ignbrk brkint -inlcr -igncr icrnl
               icanon iexten echo echoe echok -echonl -noflsh
               -ixoff -iutf8 -iuclc -ixany imaxbel -xcase -olcuc -ocrnl
               opost -ofill onlcr -onocr -onlret nl0 cr0 tab0 bs0 vt0 ff0
               isig -tostop -ofdel -echoprt echoctl echoke -flusho,
               all special characters to their default values

Handle the tty line connected to standard input. Without arguments,
prints baud rate, line discipline, and deviations from stty sane. In
settings, CHAR is taken literally, or coded as in ^c, 0x37, 0177 or
127; special values ^- or undef used to disable special characters.

GNU coreutils online help: <https://www.gnu.org/software/coreutils/>
Report stty translation bugs to <https://translationproject.org/team/>
Full documentation at: <https://www.gnu.org/software/coreutils/stty>
or available locally via: info '(coreutils) stty invocation'

```

4.1.2 Viewing Serial Port Information:

```

edge@edge-computer:~$ sudo stty -a -F /dev/ttyCOM1
speed 9600 baud; rows 0; columns 0; line = 0;
intr = ^C; quit = ^\; erase = ^?; kill = ^U; eof = ^D; eol = <undef>; eol2 = <undef>; swtch = <undef>; start = ^Q; stop = ^S;
susp = ^Z; rprnt = ^R; werase = ^W; lnext = ^V; discard = ^O; min = 1; time = 0;
-parenb -parodd -cmspar cs8 hupcl -cstopb cread clocal -crtcts
-ignbrk -brkint -ignpar -parmrk -inpck -istrip -inlcr -igncr icrnl ixon -ixoff -iuclc -ixany -imaxbel -iutf8
opost -olcuc -ocrnl onlcr -onocr -onlret -ofill -ofdel nl0 cr0 tab0 bs0 vt0 ff0
isig icanon iexten echo echoe echok -echonl -noflsh -xcase -tostop -echoprt echoctl echoke -flusho -extproc
edge@edge-computer:~$

```

4.1.3 Set the baud rate of the COM1 serial port:

Sudo stty - F /dev/ttyCOM1 ispeed 9600 ospeed 9600 cs8

4.1.4 Setting the Baud Rate of COM2 Serial Port

Sudo stty - F /dev/ttyCOM1 ispeed 9600 ospeed 9600 cs8

4.1.5 Setting the Baud Rate of COM3 Serial Port

Sudo stty - F /dev/ttyCOM3 ispeed 9600 ospeed 9600 cs8

4.1.6 Setting the Baud Rate of COM4 Serial Port

Sudo stty - F /dev/ttyCOM4 ispeed 9600 ospeed 9600 cs8

Take care

Detailed information about the stty command can be found at the following link

<http://www.gnu.org/software/coreutils/manual/coreutils.html>

4.2 USB interface

EC954-FQ38 provides two USB 2.0 Host interfaces, mainly used for expanding storage devices, connecting mice and keyboards

4.2.1 USB automatic mounting

EC954-FQ38 supports hot swapping of USB storage devices. It will automatically mount all partitions. EC954-FQ38 will partition all USB storage devices and mount them to the/mnt/path. The naming format for the mounting folder is usb1<node>_<num>. Among them,<node>is the device node name of the partition, and<num>can be a number from 0 to 9.

```
edge@edge-computer:~$ sudo mount|grep "/mnt"
overlay on /mnt type overlay (rw,relatime,lowerdir=/mnt,upperdir=/userdata/v1//mnt_
rw/upper,workdir=/userdata/v1//mnt_rw/work)
/dev/sda1 on /mnt/usb_sda1_0 type vfat (rw,nodev,noatime,fmask=0022,dmask=0022,code
page=936,iocharset=cp936,shortname=mixed,errors=remount-ro)
```

Take care

Before disconnecting a USB mass storage device, remember to enter the sync synchronization command to prevent data loss. When you disconnect the storage device, please exit from the/media/* directory. If you stay in/media/USB *, the automatic uninstallation process will fail. If this situation occurs, please type umount/media/USB * to manually uninstall the device

4.2.2 Automatic mounting of micro SD card

EC954-FQ38 supports micro SD storage cards but does not support hot swapping. It will automatically mount all partitions. EC954-FQ38 will partition all micro SD storage cards and mount them to the/mnt/path. The naming format for the mounting folder is sd_<node>_<num>. Among them,<node>is the device node name of the partition, and<num>is a number from 0 to 9.

```

edge@edge-computer:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        3.5G  2.7G  566M  83% /
devtmpfs         1.9G   8.0K   1.9G   1% /dev
/dev/mmcblk0p9   8.2G  473M   7.8G   6% /userdata
overlay          8.2G  473M   7.8G   6% /var
overlay          8.2G  473M   7.8G   6% /etc
overlay          8.2G  473M   7.8G   6% /home
overlay          8.2G  473M   7.8G   6% /root
overlay          8.2G  473M   7.8G   6% /sbin
overlay          8.2G  473M   7.8G   6% /bin
overlay          8.2G  473M   7.8G   6% /usr
overlay          8.2G  473M   7.8G   6% /lib
overlay          8.2G  473M   7.8G   6% /tmp
overlay          8.2G  473M   7.8G   6% /mnt
overlay          8.2G  473M   7.8G   6% /opt
overlay          8.2G  473M   7.8G   6% /media
overlay          8.2G  473M   7.8G   6% /system
overlay          8.2G  473M   7.8G   6% /boot
overlay          8.2G  473M   7.8G   6% /srv
overlay          8.2G  473M   7.8G   6% /vendor
tmpfs            1.9G   32K   1.9G   1% /dev/shm
tmpfs            1.9G   8.9M   1.9G   1% /run
tmpfs            5.0M   4.0K   5.0M   1% /run/lock
tmpfs            1.9G     0   1.9G   0% /sys/fs/cgroup
/dev/mmcblk0p7   126M   13M  107M  11% /oem
/dev/mmcblk1p2   3.7G  800M   2.8G  23% /mnt/sd_mmcblk1p2_0
/dev/mmcblk1p1    69M   26M   44M  37% /mnt/sd_mmcblk1p1_0
tmpfs            378M     0  378M   0% /run/user/108
tmpfs            378M     0  378M   0% /run/user/1001

```

4.2.3 mSATA hard drive automatic mounting

(1) Log in to the system, execute `sudo fdisk -l`, and locate your hard disk partition, as shown in the following image:/dev/sda1

```

edge@edge-computer:~$ sudo fdisk -l
Disk /dev/ram0: 4 MiB, 4194304 bytes, 8192 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes

Disk /dev/sda: 119.2 GiB, 128035676160 bytes, 250069680 sectors
Disk model: Lenovo SSD SL700
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x1a63708d

Device            Boot Start          End      Sectors   Size Id Type
/dev/sda1          2048 250069679 250067632 119.2G 83 Linux

Disk /dev/mmcblk0: 14.6 GiB, 15634268160 bytes, 30535680 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 902C0000-0000-4864-8000-6B9300002304

Device            Start          End      Sectors   Size Type
/dev/mmcblk0p1     16384         24575        8192      4M unknown
/dev/mmcblk0p2     24576         32767        8192      4M unknown
/dev/mmcblk0p3     32768         98303       65536     32M unknown
/dev/mmcblk0p4     98304        163839       65536     32M unknown
/dev/mmcblk0p5     163840       229375       65536     32M unknown
/dev/mmcblk0p6     229376      10715135    10485760    5G unknown
/dev/mmcblk0p7    10715136    10977279     262144    128M unknown
/dev/mmcblk0p8    10977280    13074431     2097152     1G unknown
/dev/mmcblk0p9    13074432    30535615    17461184    8.3G unknown

```

(2) Format the partition to the desired file system, such as ext4

```

edge@edge-computer:~$ sudo mkfs.ext4 /dev/sda1
mke2fs 1.44.5 (15-Dec-2018)
Discarding device blocks: done
Creating filesystem with 31258454 4k blocks and 7815168 inodes
Filesystem UUID: 59e1a7cf-0044-4453-9886-518aee27fc2a
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872

Allocating group tables: done
Writing inode tables: done
Creating journal (131072 blocks): done
Writing superblocks and filesystem accounting information: done

```

(3) Create a mount point, such as /mnt/sda1

(4) Edit the vi/etc/fstab file,

Add /dev/sda1/mnt/sda1 ext4 defaults, nofail, x-system. device timeout=1s 0 0 at the end of

the line, as shown in the following figure:

/Dev/sda1: Device partition, user needs to configure according to actual situation

/Mnt/sda1: Mount point, user needs to configure according to actual situation

The file system format of the etx4 hard disk partition needs to be configured by the user according to the actual situation

Default, nofail, x-systemd.device-timeout=1s 0 0 fixed configuration. It is recommended to use this configuration, and users can also modify it according to their needs.

```
UNCONFIGURED FSTAB FOR BASE SYSTEM
/dev/mmcblk0p7 /oem ext2 defaults 0 0
#/dev/mmcblk0p8 /userdata ext2 defaults 0 0
/dev/sda /mnt/sda ext4 defaults,nofail,x-systemd.device-timeout=60s 0 0
```

4.3 CAN bus interface

The CAN port of EC954-FQ38 supports two CAN buses, with CAN1 corresponding to device can0 and CAN2 corresponding to device can1

4.3.1 Configure Connection CAN1 Interface

By default, the CAN port will be initialized. If any other configuration is required, please use the IP link command to check the CAN device. To check the status of the CAN device, use the IP link command:

```
edge@edge-computer:~$ ip link show can0
2: can0: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10
    link/can
edge@edge-computer:~$
```

To configure CAN devices, please use IP link set can0 down to first shut down the device

Sudo IP link set can0 down

Then configure the bit rate (the following is an example of a 125k bit rate):

Sudo IP link set can0 type can bitrate 125000

Finally, restart the device

Sudo IP link set can0 up

4.3.2 Configure Connection CAN2 Interface

By default, the CAN port will be initialized. If any other configuration is required, please use the IP link command to check the CAN device. To check the status of the CAN device, use the IP link command:

```
edge@edge-computer:~$ ip link show can1
3: can1: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10
    link/can
edge@edge-computer:~$
```

To configure CAN devices, please use IP link set can1 down to first shut down the device

Sudo IP link set can1 down

Then configure the bit rate (the following is an example of a 125k bit rate):

IP link set can1 type can bitrate 125000 dbitrade 1250000 fd on

Finally, restart the device

Sudo IP link set can1 up

4.4 IO debugging

EC954-FQ38 supports 4-way DI and 4-way DO. When you want to use the IO port, please type the dio_mgmt command to control the input and output of IO. Usage of dio_mgmt:

```
edge@edge-computer:~$ sudo dio_mgmt
Usage:
    dio_mgmt <OPTIONS>

OPTIONS
    help
        Help info of how to use dio_mgmt.
    show <DI0|DI1|DI2|DI3|DO0|DO1|DO2|DO3>
        Show the status of digital IO.
    set <DO0|DO1|DO2|DO3> <LOW|HIGH>
        Set the status of digital out IO.
edge@edge-computer:~$
```

When you need to set a certain IO port to high or low, you can type the command dio_mgmt set D<I/O><number><HIGH/LOW>

```
edge@edge-computer:~$ sudo dio_mgmt set DO2 LOW
edge@edge-computer:~$ sudo dio_mgmt show DI0
LOW
edge@edge-computer:~$
```

Print the level information of the corresponding IO port by typing dio_mgmt show D<I/O><number>.

4.5 GPS

Some EC900 models integrate GPS modules internally, and the data serial port nodes are /dev/ttyS9.

If you want to view detailed GPS information, there are two ways to view it:

1. Set up serial port nodes using STTY, type CAT to directly output source data

```

edge@edge-computer:~$ sudo stty -F /dev/ttyS9 ispeed 115200 ospeed 115200 cs8
edge@edge-computer:~$ sudo cat /dev/ttyS9
$GNGGA,,,,,0,00,25.5,,,,,*64

$GNGLL,,,,,V,N*7A

$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02
$BDGSA,A,1,,,,,,,,,25.5,25.5,25.5*13
$GLGSA,A,1,,,,,,,,,25.5,25.5,25.5*1E
$GPGSV,1,1,00*79
$BDGSV,1,1,00*68
$GLGSV,1,1,00*65
$GNRMC,,V,,,,,,,,,N*4D
$GNVTG,,,,,,,,N*2E
$GNZDA,,,,,*56

```

2. Type the gnss command to directly output parsed information such as time, longitude, and latitude

```
edge@edge-computer:~$ sudo gnss
```

4.6 Power on/off button

4.6.1 Shutdown of equipment

1. Press and hold the power button for 8 seconds to turn off the device
2. You can use Linux commands to shut down all software running on the device and stop the system. However, after running this command, major components such as CPU, RAM, and storage devices will power down.

```
edge@edge-computer:~$ sudo shutdown -h now
```

4.6.2 Starting the equipment

Short press the power on button, and the system will perform the power on operation.

5 Security

In this chapter, we will introduce the security mechanism of the edge computer EC900 based on ARM architecture.

5.1 Sudo mechanism

In EC900, for better security, root users are prohibited from using it. Sudo is a program that allows system administrators to allow approved users to execute commands as root or other users. The most basic principle is to give as little privilege as possible to complete the work. Using sudo is safer than opening a session with root identity for many reasons, including:

- No need to know the root password (sudo will prompt the current user's password), ordinary user privileges can be granted

- It is easy to run commands that require privileges through sudo, and for the rest of the time, work as an unprivileged user to reduce the potential damage caused by incorrect operations.
- Some system level commands cannot be directly used by users, as shown in the following example output:

```
edge@edge-computer:~$ ifconfig
-bash: ifconfig: command not found
edge@edge-computer:~$ sudo ifconfig
br-97e4c72399e1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.18.0.1 netmask 255.255.0.0 broadcast 172.18.255.255
    inet6 fe80::42:eff:fe07:c8aa prefixlen 64 scopeid 0x20<link>
    ether 02:42:0e:07:c8:aa txqueuelen 0 (Ethernet)
    RX packets 663 bytes 81645 (79.7 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 595 bytes 107290 (104.7 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
    ether 02:42:c4:58:eb:69 txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

5.2 Firewall

Netfilter/iptables (hereinafter referred to as iptables) is an excellent and completely free packet filtering firewall tool that comes with the Nuix/Linux system. Its functions are very powerful, and it is very flexible to use. It can finely control the inflow, outflow, and flow of data packets through the server.

5.3 TPM2.0

TPM stands for Trusted Platform Module, which is a hardware security module designed to provide security and encryption capabilities for computer systems. It is a security microcontroller that can be embedded in computer systems or sold as a standalone hardware device. It includes an encryption coprocessor for storing encryption keys, digital certificates, and other secure data, as well as supporting multiple encryption algorithms and security protocols. On EC954-FQ38, the standard TPM2.0 protocol stack and TPM2.0 tools have been integrated for users to use.

6. System restoration to factory settings and updates

In this chapter, we will introduce how to restore the factory settings and update the edge computer EC900 based on the Arm structure.

6.1 Restoring Factory Settings

There are two methods to restore factory settings:

1. By typing a command, the system will automatically restart and restore factory settings.

```
edge@edge-computer:~$ sudo update reset
```

2. Restore factory settings through buttons:

- Press and hold the factory reset button for 10-20 seconds, and you will see that the warning light is on for a long time.
- After the warning light stays on, release the factory reset button.
- After releasing the factory reset button, the error light flashes a few times before the system starts to restart and perform factory reset
- After the system restarts, the warning and error lights flash and the status goes out; After about 30 seconds, when both the warn and error lights stop flashing and the status starts flashing, the system will complete the factory reset.

6.2 System Upgrade

Prepare a USB flash drive (micro SD card). If the USB drive (SD card) has multiple partitions, please use the first partition. It is recommended not to create multiple partitions. The partition of the USB drive (SD card) needs to be in FAT32 format. This document takes upgrading EC954-V2.0.0.img as an example for explanation.

- Create an empty ec900_img directory in the root directory of the USB drive (SD card), and place the EC954-V2.0.0.img file and md5.txt file published by inhand in the ec900_img directory.
- Confirm that there is only the MD5 hash value in the EC954-V2.0.0.img line in the md5.txt file. EC954 does not support OTA upgrades for multiple IMG images.
- Exit the USB drive (SD card) normally on the computer. Be careful not to directly remove the USB drive, and choose the "Exit" or "Eject" operation on the desktop.
- Insert the USB flash drive (SD card) into the target EC900 device. The target device will automatically verify the EC954-V2.0.0.img file and perform an OTA upgrade. During the upgrade process, the WARN and ERROR lights will be displayed accordingly. After WARN and ERROR return to normal, the upgrade operation will be completed. Due to the large size of the img file and the long upgrade time, please be patient and wait.
- After the upgrade is completed, EC900 will write the key information during the upgrade to the log file in the ec900_img directory. Please review the relevant documents.

7 Programming Guide

EC900 provides a JSON format device information description file. Customers who need to operate peripherals such as IO, LED, serial port, etc. can obtain the device node information of these peripherals by querying the device description information file.

Device description information file path:/tmp/ieos/etc/systeminfo.json, the content is as follows:

```
{
  "device_info":{
```

```
"model_info":{
  "model":"EC954",
  "pn":"IO-FQ58",
  "sn":"EC9540000011111",
  "oem":"inhand",
  "features":"","io;cell-FQ58;wlan;ble;gps;"
},
"software_info":{
  "boot_loader":"1.0.2",
  "kernel":"5.10.160-00001-g406d1811beab-dirty",
  "version":"V2.0.0-beta.1",
  "OS":"Debian GNU/Linux 11 (bullseye)"
},
"hardware_info":{
  "arch":"arm64",
  "soc":"rk3568",
  "interface":{
    "eth":[
      {
        "iface_name":"eth1",
        "iface_mac":"00:33:44:11:00:01"
      },
      {
        "iface_name":"eth2",
        "iface_mac":"00:33:44:11:00:02"
      },
      {
        "iface_name":"eth3",
        "iface_mac":"00:33:44:11:00:03"
      },
      {
        "iface_name":"eth4",
        "iface_mac":"00:33:44:11:00:04"
      }
    ],
    "wlan":[
      {
        "iface_name":"wlan0",
        "iface_mac":"94:A4:08:8A:30:CD"
      },
      {
        "iface_name":"wlan1",
        "iface_mac":"96:A4:08:8A:30:CD"
      }
    ],
    "ble":[
    ]
  },
  "gpio":[
    {
      "gpio_name":"cellular_power",
      "dev_node":"/sys/class/gpio/gpio0"
    },
  ],
}
```

```
{
  "gpio_name": "sim_switch",
  "dev_node": "/sys/class/gpio/gpio19"
},
{
  "gpio_name": "msata_power",
  "dev_node": "/sys/class/gpio/gpio20"
},
{
  "gpio_name": "gnss_power",
  "dev_node": "/sys/class/gpio/gpio110"
},
{
  "gpio_name": "ble_power",
  "dev_node": "/sys/class/gpio/gpio220"
}
],
"user_key": [
  {
    "user_key_name": "USER",
    "dev_node": "/sys/class/gpio/gpio95"
  }
],
"uart": [
  {
    "uart_name": "P1",
    "dev_node": "/dev/ttyO1"
  },
  {
    "uart_name": "P2",
    "dev_node": "/dev/ttyO2"
  },
  {
    "uart_name": "P3",
    "dev_node": "/dev/ttyO3"
  },
  {
    "uart_name": "P4",
    "dev_node": "/dev/ttyO4"
  },
  {
    "uart_name": "P5",
    "dev_node": "/dev/ttyO5"
  },
  {
    "uart_name": "P6",
    "dev_node": "/dev/ttyO6"
  },
  {
    "uart_name": "P7",
    "dev_node": "/dev/ttyO7"
  },
  {
```

```
    "uart_name": "P7",
    "dev_node": "/dev/ttyO8"
  }
],
"io": {
  "di": [
    {
      "di_name": "DI1",
      "dev_node": "/sys/class/gpio/gpio487"
    },
    {
      "di_name": "DI2",
      "dev_node": "/sys/class/gpio/gpio488"
    },
    {
      "di_name": "DI3",
      "dev_node": "/sys/class/gpio/gpio489"
    },
    {
      "di_name": "DI4",
      "dev_node": "/sys/class/gpio/gpio490"
    }
  ],
  "do": [
    {
      "di_name": "DO1",
      "dev_node": "/sys/class/gpio/gpio491"
    },
    {
      "di_name": "DO2",
      "dev_node": "/sys/class/gpio/gpio492"
    },
    {
      "di_name": "DO3",
      "dev_node": "/sys/class/gpio/gpio493"
    },
    {
      "di_name": "DO4",
      "dev_node": "/sys/class/gpio/gpio494"
    }
  ]
},
"led": [
  {
    "led_name": "USER1",
    "dev_node": "/sys/class/leds/user1"
  },
  {
    "led_name": "USER2",
    "dev_node": "/sys/class/leds/user2"
  },
  {
    "led_name": "4G/5G",
```

```

        "dev_node":"/sys/class/leds/cell"
    },
    {
        "led_name":"SIM1",
        "dev_node":"/sys/class/leds/sim1"
    },
    {
        "led_name":"SIM2",
        "dev_node":"/sys/class/leds/sim2"
    },
    {
        "led_name":"WARN",
        "dev_node":"/sys/class/leds/warn"
    },
    {
        "led_name":"ERROR",
        "dev_node":"/sys/class/leds/error"
    },
    {
        "led_name":"STATUS",
        "dev_node":"/sys/class/leds/status"
    },
    {
        "led_name":"L1",
        "dev_node":"/sys/class/leds/level1"
    },
    {
        "led_name":"L2",
        "dev_node":"/sys/class/leds/level2"
    },
    {
        "led_name":"L3",
        "dev_node":"/sys/class/leds/level3"
    }
    ]
}
}
}

```

7.1 IO Programming Guide

At present, there are a total of 8 IO interfaces on the device: for example, DI0~DI3 on the device panel have 4 input pins; DO0~DO3 have 4 output pins.

According to the device description information file/tmp/ieos/etc/systeminfo.json, the IO device nodes can be obtained as follows:

DI0~DI3-- **sys/class/gpio/gpio487~sys/class/gpio/gpio490**

DO0~DO3-- **sys/class/gpio/gpio491~sys/class/gpio/gpio494**

When you need to program IO interfaces, simply operate on the value value value under the backend device node (**sys/class/gpio/gpioxxx/value**)

Case:

When DO0 needs to output high voltage, it can directly **write 1** to **sys/class/gpio/gpio491/value**

Echo 1>/sys/class/gpio/gpio491/value

When you need to check the level of DI0, you can also directly check the value of **sys/class/gpio/gpio487/value**

Cat/sys/class/gpio/gpio487/value

Complete shell script:

```
#!/bin/bash

gpio491="/sys/class/gpio/gpio491/value"
gpio492="/sys/class/gpio/gpio492/value"
gpio493="/sys/class/gpio/gpio493/value"
gpio494="/sys/class/gpio/gpio494/value"
# To output a high level on DO0, you can directly write a '1' to sys/class/gpio/gpio491/value.
if [ -f "$gpio491" ]; then
    echo 1 > /sys/class/gpio/gpio491/value
else
    echo "no file exit "$gpio491
fi

# To output a low level on DO1, you should write '0' to sys/class/gpio/gpio491/value.
if [ -f "$gpio492" ]; then
    echo 0 > $gpio492
else
    echo "no file exit "$gpio492
fi

gpio487="/sys/class/gpio/gpio487/value"
gpio488="/sys/class/gpio/gpio488/value"
gpio489="/sys/class/gpio/gpio489/value"
gpio490="/sys/class/gpio/gpio490/value"
# To check the level of DI0, you can also directly view the value of `sys/class/gpio/gpio487/value`.
if [ -f "$gpio487" ]; then
    cat $gpio487
else
    echo "no file exit "$gpio487
fi
```

7.2 Led Programming Guide

On the device, users can use two lights, USER1 and USER2, for status prompts. Please check the light label to confirm the positions of USER1 and USER2 lights.

According to the device description information file/tmp/ieos/etc/systeminfo.json, it can be obtained that the USER1 and USER2 device nodes are:

User1:/sys/class/LEDs/user1

User2:/sys/class/LEDs/user2

There are some control files in the `/sys/class/leds/user1` directory used to control the properties and status of LEDs:

`/Sys/class/leds/user1/brightness`: This file is used to control whether the USER1 light is on or off. Writing 1 means it is always on, and writing 0 means it is always off.

`/Sys/class/leds/user1/trigger`: The trigger for the LED light, which can be written as timer to indicate the timer is triggered, and written as none to indicate the cancellation of the trigger.

`/Sys/class/leds/user1/delay_on`: This file represents the time when the LED light is on, in milliseconds.

`/Sys/class/leds/user1/delayed off`: This file represents the time when the LED light went out, in milliseconds.

If the trigger is configured for timed triggering, the value in brightness will no longer take effect and will automatically become 0.

Replacing user1 with user2 in the file path controls the operation of the USER2 light.

case:

When the USER1 light needs to stay on, write 1 to the brightness file

Echo 1>/sys/class/LEDs/user1/brightness

When the USER1 light needs to flash, write the timer to the trigger file and control the on and off times through delay_on and delay_off

```
# Start Timer
echo timer > /sys/class/leds/user1/trigger

# Light for 1 second
echo 1000 > /sys/class/leds/user1/delay_on

# Off for 1 second
echo 1000 > /sys/class/leds/user1/delay_off
```

Complete shell script:

```
#!/bin/bash

USER1_BRIGTHNESS="/sys/class/leds/user1/brightness"
USER1_TRIGGER="/sys/class/leds/user1/trigger"
USER1_DELAY_ON="/sys/class/leds/user1/delay_on"
USER1_DELAY_OFF="/sys/class/leds/user1/delay_off"

USER2_BRIGTHNESS="/sys/class/leds/user2/brightness"
USER2_TRIGGER="/sys/class/leds/user2/trigger"
```

```
USER2_DELAY_ON="/sys/class/leds/user2/delay_on"
```

```
USER2_DELAY_OFF="/sys/class/leds/user2/delay_off"
```

```
# Light Up USER1 LED
```

```
if [ -f "$USER1_BRIGTHNESS" ]; then
```

```
    echo 1 > $USER1_BRIGTHNESS
```

```
else
```

```
    echo "no file exit "$USER1_BRIGTHNESS
```

```
fi
```

```
# Light Up USER2 LED
```

```
if [ -f "$USER2_BRIGTHNESS" ]; then
```

```
    echo 1 > $USER2_BRIGTHNESS
```

```
else
```

```
    echo "no file exit "$USER2_BRIGTHNESS
```

```
fi
```

```
# Set USER1 LED to Blink
```

```
if [ -f "$USER1_TRIGGER" ]; then
```

```
    echo timer > $USER1_TRIGGER
```

```
else
```

```
    echo "no file exit "$USER1_TRIGGER
```

```
fi
```

```
# Set USER2 LED to Blink
```

```
if [ -f "$USER2_TRIGGER" ]; then
```

```
    echo timer > $USER2_TRIGGER
```

```
else
```

```
    echo "no file exit "$USER2_TRIGGER
```

```
fi
```

```
# Set USER1 LED to Illuminate for 1000ms
```

```
if [ -f "$USER1_DELAY_ON" ]; then
```

```
    echo 1000 > $USER1_DELAY_ON
```

```
else
```

```
    echo "no file exit "$USER1_DELAY_ON
```

```
fi
```

```
# Set USER1 LED to Turn Off for 1000ms
```

```
if [ -f "$USER1_DELAY_OFF" ]; then
```

```
    echo 1000 > $USER1_DELAY_OFF
```

```
else
```

```
    echo "no file exit "$USER1_DELAY_OFF
```

```

fi

# Set USER2 LED to illuminate for 1000ms
if [ -f "$USER2_DELAY_ON" ]; then
    echo 1000 > $USER2_DELAY_ON
else
    echo "no file exit "$USER2_DELAY_ON
fi

# Set USER2 LED to Turn Off for 1000ms
if [ -f "$USER2_DELAY_OFF" ]; then
    echo 1000 > $USER2_DELAY_OFF
else
    echo "no file exit "$USER2_DELAY_OFF
fi

# Disable USER1 LED Blinking
if [ -f "$USER1_TRIGGER" ]; then
    echo none > $USER1_TRIGGER
else
    echo "no file exit "$USER1_TRIGGER
fi

# 关Disable USER2 LED Blinking
if [ -f "$USER2_TRIGGER" ]; then
    echo none > $USER2_TRIGGER
else
    echo "no file exit "$USER2_TRIGGER
fi

```

7.3 Cross compilation

The user's own C/C++ program can be cross compiled using a cross compilation toolchain on the development machine, and then the target file can be uploaded to the EC954 device for execution.

Cross compilation tool compressed package: gcc-linaro-6.3.1-2017.05-x86_64-arch64 Linux gnu.tar.gz

Method for configuring environment variables for cross compilation toolchain:

- Unzip gcc-linaro 6.3.1-2017.05-x86_64-arch64 Linux gnu. tar. gz to/opt path on the development machine (you can also unzip to other paths, make corresponding adjustments when setting the PATH environment variable in step 2)
- Edit the ~/. bashrc file and add a line at the end of the file with PATH=\$PATH:/opt/gcc

linaro 6.3.1-2017.05-x86_64-arch64 Linux gnu/bin

- Execute `source ~/.bashrc` to make the environment variables effective on the current terminal; The newly opened terminal will automatically take effect.

Using the classic Hello World program as an example, create the following directory and files

```
mkdir ~/example
touch ~/example/hello.c
touch ~/example/Makefile
```

~/The content of the example/hello. c file is as follows:

```
#include <stdio.h>

int main(void)
{
    printf("hello, world!\n");
    return 0;
}
```

~/The content of the example/Makefile file is as follows:

```
# Define Target Filename and Source Filename
TARGET := hellworld
DIRS   := $(shell find . -maxdepth 3 -type d)
SRCS   := $(foreach dir,$(DIRS),$(wildcard $(dir)/*.c))
OBJS   := $(SRCS:.c=.o)

CC=aarch64-linux-gnu-gcc

# Define Compiler and Compilation Options
CFLAGS := -Wall -Wextra -g -Wno-unused-parameter

# Specify Default Target
all: $(TARGET)

# Declare Dependencies of Target Files and Compilation Commands
$(TARGET): $(OBJS)
    $(CC) $(CFLAGS) $(LIBS) $^ -o $@

# Formulate the Command to Compile Source Files into Target Files
%.o: %.c
    $(CC) $(CFLAGS) $(LIBS) -c $< -o $@

# Establish the Command to Remove Temporary Files
clean:
    rm -f $(TARGET) $(OBJS)

# Declare Pseudo-Target ".PHONY"
.PHONY: all clean
```

FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two

conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device , pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment

generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, installed and used in accordance with the instructions, may

cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure

The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with minimum distance 20cm

between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or

transmitter. The availability of some specific channels and/or operational frequency bands is

country dependent and firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

IC STATEMENT

This device complies with Industry Canada license-exempt RSS standard(s): Operation is subject to the following Two conditions:

- (1) this device may not cause interference, and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio

exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3 (B)

Avis d'Industrie Canada

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio

exem pts de licence L'exploitation est autorisée aux deux conditions suivantes:

- 1) l'appareil ne doit pas produire de brouillage; et
- 2) l'utillsateur de l'appareil doit accepter brouillage radioélectrique subi meme si le brouillage

est susceptible d'en compromettre le fonctionnement. mauvais fonctionnement de l'appareil.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

CAN NMB-3 (B)

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm

between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un

environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de

20cm de distance entre la source de rayonnement et votre corps.