

Application Note

Cellular Setting for RobustOS

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Chapter 1 Introduction

1.1 Overview

RobustOS (hereinafter referred to as “the ROS”) is a new operating system for Robustel's IoT gateway released in 2015. It is a modular and open software platform which could support third party development based on SDK/API. Meanwhile, it supports different routing and VPN protocols for different application scenarios. This newer platform provides a different web configuration interface than the existing platform.

This application note has been written for customer with a good understanding of Robustel products. It shows customer how to configure Cellular settings to access specific ISP network or band on RobustOS.

This application note applies to the ROS firmware of R2000 and R3000. However, the followings will take R2000 as an example

1.2 Assumptions

The features of cellular link manager have been fully tested. This application note has been written by technically competent engineer who is familiar with the Robustel products and the application requirements.

This application note is based on:

- Product model: Robustel GoRugged R2000, an industrial cellular VPN router
- Firmware version: R2000_ROS_v2.0.6
- Configuration: This application note assumes the Robustel products are set to factory default. Most of configuration steps are only shown if they are different from the factory default settings.

^ System Information	
Device Model	R2000
System Uptime	0 days, 03:13:07
System Time	Thu Feb 9 14:26:14 2017
Firmware Version	2.0.6 (Rev 466)
Hardware Version	1.0
Kernel Version	3.10.49
Serial Number	11111111091111

1.3 Rectifications

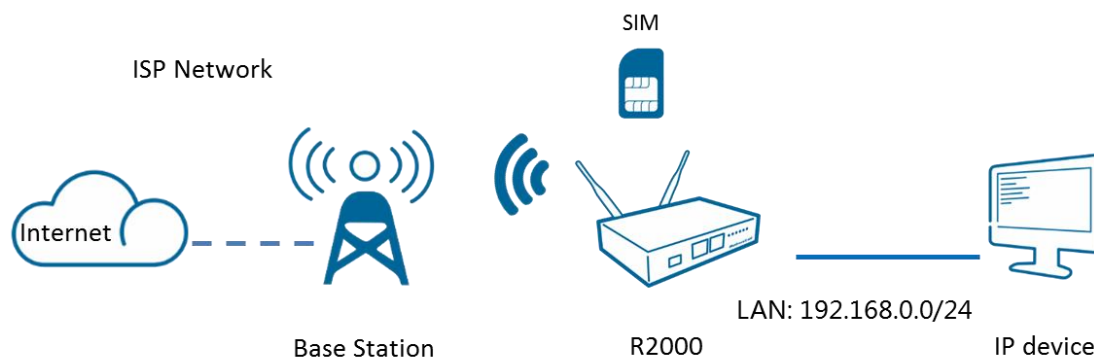
Requests for corrections or rectifications to this application note will be appreciated, and if there are any request for new application notes please email to: support@robustel.com.

1.4 Version

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Release Date	Firmware Version	Change Description
2017-02-09	v.1.0.0	Initial Release

Chapter 2 Topology

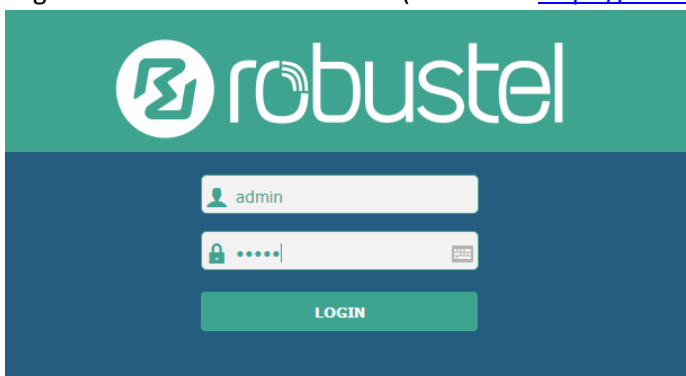


1. R2000 works as a LAN gateway and uses cellular as primary link to access remote Internet or services.
2. Eth0/Eth1 works as a LAN interface and a DHCP server, automatically allocates IP to IP devices.
3. R2000 can be configured to access a specific cellular band and network (*Note: This is related to the cellular module type and the SIM card type you are using*). In this application, we take 3G WCDMA 2100 network as an example providing configuration guidance for some scenarios.

Chapter 3 Configuration

3.1 Configure Cellular Settings

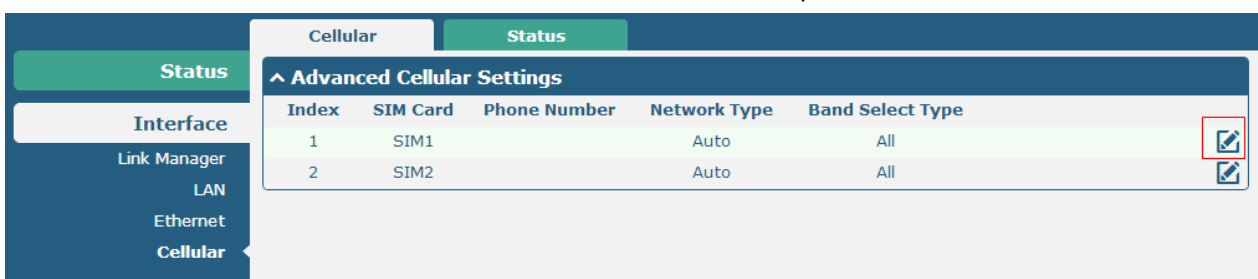
- Follow these steps before configuring the router:
 - Attach the external antenna to the router's connector and twist tightly
 - Insert the SIM card into the router
 - Connect the power supply correctly
 - Connect the router to a PC via a cross-over cable
 - Log in the Web GUI of the router (default IP: <https://192.168.0.1/>)



You need to know the following factory settings before you have logged in the Web GUI.

Item	Description
Username	admin
Password	admin
Eth0	192.168.0.1/255.255.255.0, LAN mode
Eth1	192.168.0.1/255.255.255.0, LAN mode
DHCP Server	Enabled.

- Browse to **Interface > Cellular**.
 - Click edit button of the used SIM card. Here takes SIM1 as an example.



- Enter the SIM1's related information in "General Setting" field if required in scenario.

Cellular

^ General Settings

Index

SIM Card

Phone Number

PIN Code

Extra AT Cmd

Telnet Port

Item	Description	Setting
Phone Number	Enter the phone number of the SIM card.	Null
PIN Code	Enter the PIN Code to unlock the SIM card, and digits from 4 to 8.	Null
Extra AT Cmd	Enter the Extra AT commands used for cellular initialization. It is for expert use only.	Null
Telnet Port	Set the Port listening for telnet service, used for AT over Telnet.	Null

- If need to access the specific cellular network, follow the below settings. Otherwise, skip this part.
 - At the “Cellular Network Settings” window, click the drop-down button of “Network Type” and select “3G only”, then click the drop-down button of “Band Select type” and select “Specify”.

^ Cellular Network Settings

Network Type

Band Select Type

- At the “Band Settings” field, enable the “WCDMA 2100” band.

^ Band Settings

WCDMA 850 ☐ ON ☐ OFF

WCDMA 900 ☐ ON ☐ OFF

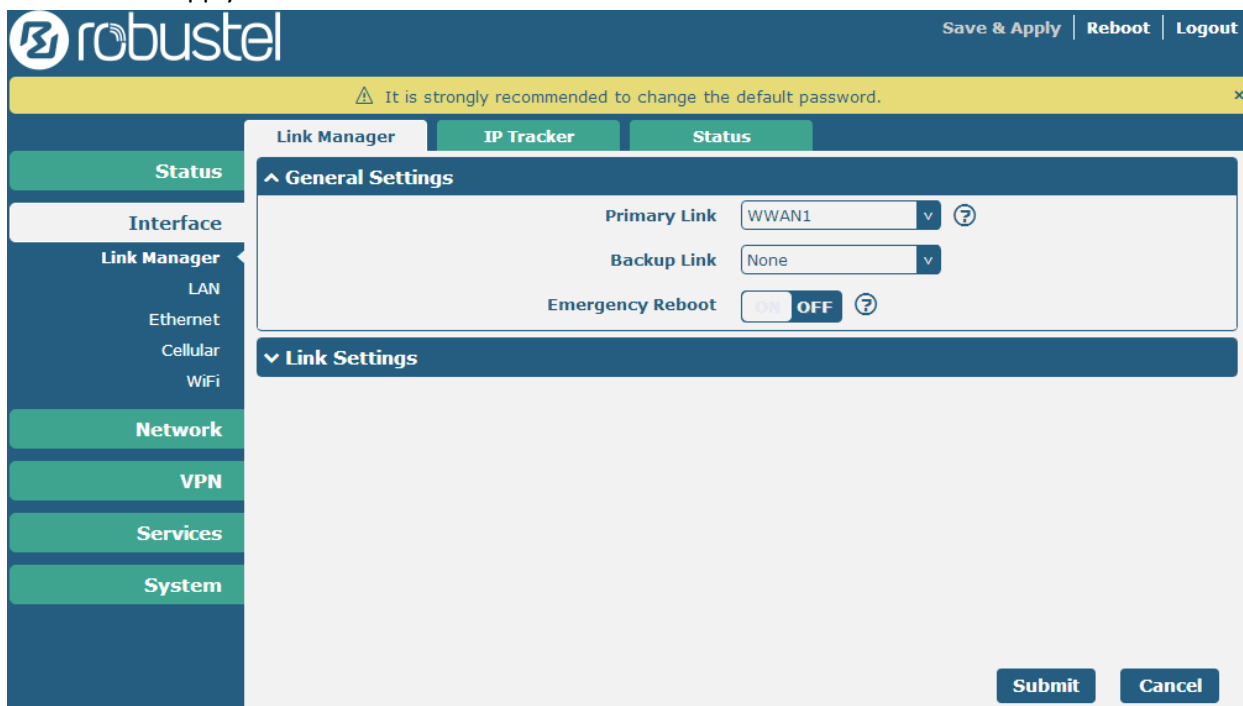
WCDMA 1900 ☐ ON ☐ OFF

WCDMA 2100 ☒ ON ☐ OFF

- Click “Submit > Save & Apply”.

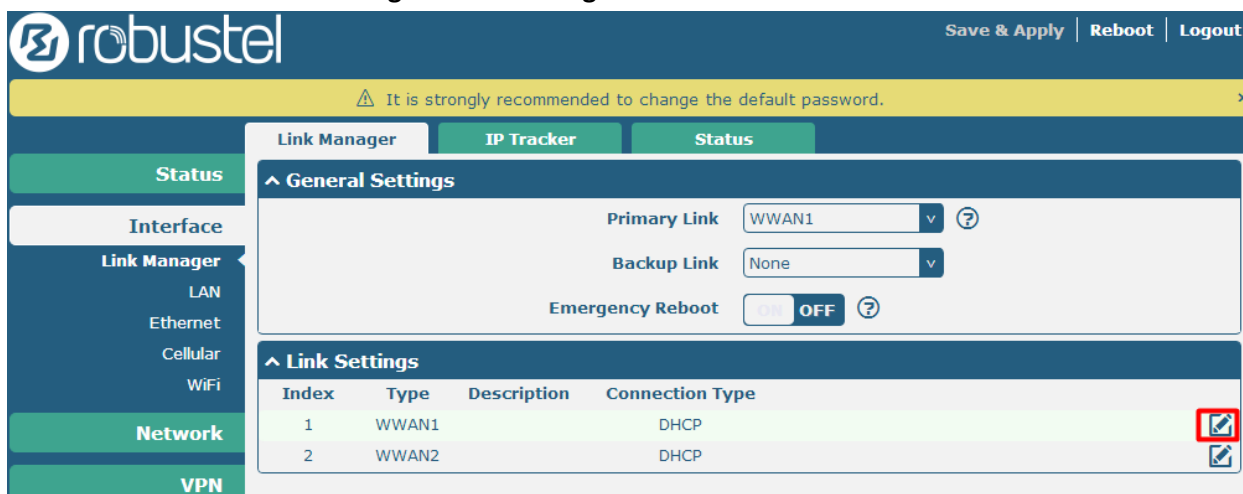
3.2 Configure WWAN Link as Primary Link

1. Browse to **Interface > Link Manager > General Settings**.
 - Click the drop-down box of “Primary Link” and select “WWAN1”.
 - Click “Submit”.
 - Click “Save & Apply”



The screenshot shows the RobustOS web interface. The top navigation bar includes the RobustOS logo, a notification banner stating "It is strongly recommended to change the default password.", and links for "Save & Apply", "Reboot", and "Logout". The left sidebar contains a menu with "Status", "Interface", "Link Manager", "Network", "VPN", "Services", and "System". The "Interface" section is expanded, showing "Link Manager", "LAN", "Ethernet", "Cellular", and "WiFi". The "Link Manager" section is further expanded, showing "General Settings" and "Link Settings". The "General Settings" section contains three fields: "Primary Link" (set to WWAN1), "Backup Link" (set to None), and "Emergency Reboot" (set to OFF). The "Link Settings" section is currently collapsed. At the bottom right, there are "Submit" and "Cancel" buttons.

2. Browse to **Interface > Link Manager > Link Settings** and click the edit button of “WWAN1”.



The screenshot shows the RobustOS web interface with the "Link Settings" section expanded. It displays a table with two rows of link settings. The first row is for WWAN1 and the second row is for WWAN2. Both links have a DHCP connection type. The edit button for WWAN1 is highlighted with a red box.

Index	Type	Description	Connection Type
1	WWAN1		DHCP
2	WWAN2		DHCP

3. Fill in the related parameters in “WWAN Settings” section.
 - The window will display as below when enabling the “Automatic APN Selection” option. Fill in corresponding parameters.

Link Manager

^ General Settings

Index

1

Type

WWAN1

v

Description

^ WWAN Settings

Automatic APN Selection

ON OFF

Dialup Number

*99***1#

Authentication Type

Auto

v

Aggressive Reset

ON OFF

?

Switch SIM By Data Allowance

ON OFF

?

Data Allowance

0

?

Billing Day

1

?

^ Ping Detection Settings

Enable

ON OFF

Submit

Close

Item	Description	Setting
Dialup Number	Set the dialup number for cellular dial-up connection, provided by local ISP.	*99***1#
Data Allowance	Set the monthly data traffic limitation.	0
Billing Day	Specify the monthly billing day, and the data traffic statistics will be recalculated from this day.	1

- The window will display as below when disabling the “Automatic APN Selection” option. Fill in corresponding parameters.

Link Manager

^ General Settings

Index

Type

Description

^ WWAN Settings

Automatic APN Selection ☐ ON ☒ OFF

APN

Username

Password

Dialup Number

Authentication Type

Aggressive Reset ☐ ON ☒ OFF ?

Switch SIM By Data Allowance ☐ ON ☒ OFF ?

Data Allowance ?

Submit Close

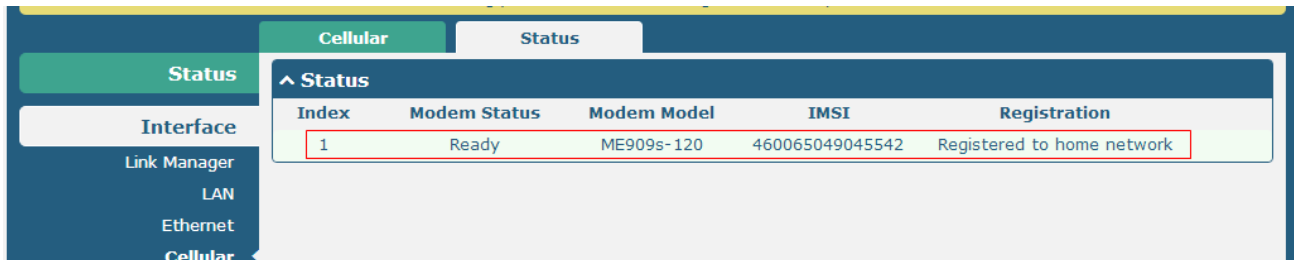
Item	Description	Setting
APN	Enter the Access Point Name for cellular dial-up connection, provided by local ISP.	Internet
Username	Enter the username for cellular dial-up connection, provided by local ISP	Null
Password	Enter the password for cellular dial-up connection, provided by local ISP	Null

- After fill in the related parameters, click “Submit”.
- Click “Save & Apply”.

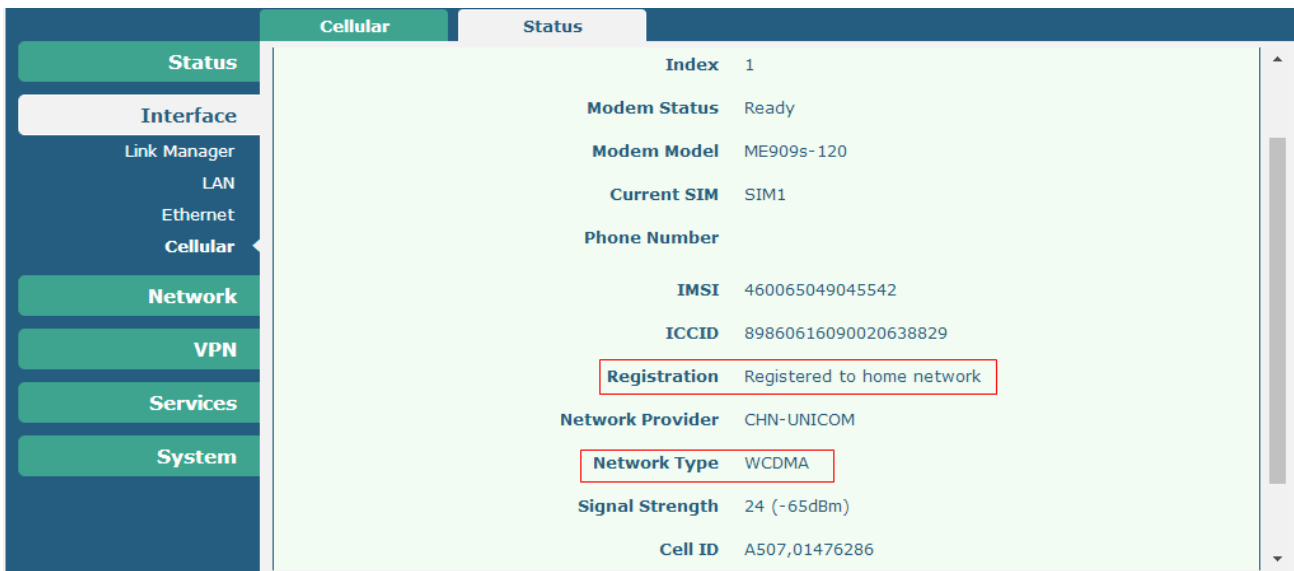
Chapter 4 Testing

4.1 Check Cellular Status

1. Browse to **Interface > Cellular > Status** and click on Modem to display its status details.



2. Check the device has registered to the network and its network type is “WCDMA”.



4.2 Event/Logs

Modem initialized to register to ISP network.

```
Feb  9 14:12:25 router user.debug init[1]: services to restart: modem modem2
Feb  9 14:12:25 router user.notice modemd[11919]: rcv signal to reset modem
Feb  9 14:12:25 router user.debug link_manager[724]: rcv action disconnected from modemd
Feb  9 14:12:25 router user.debug link_manager[724]: target link WWAN1, state Connected
Feb  9 14:12:25 router user.info link_manager[724]: WWAN1 disconnected
Feb  9 14:12:25 router user.warn modemd[12079]: modemd already running!
Feb  9 14:12:26 router user.debug modemd[11919]: try modem reset
Feb  9 14:12:27 router daemon.info udhcpc[11960]: Received SIGTERM
Feb  9 14:12:27 router daemon.info udhcpc[11960]: Unicasting a release of 10.104.135.28 to 10.104.135.25
```

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```
Feb  9 14:12:27 router daemon.info udhcpd[11960]: Sending release...
Feb  9 14:12:27 router daemon.err udhcpd[11960]: bind(UDP): Cannot assign requested address
Feb  9 14:12:27 router user.info modemd[11919]: SIGTERM received
Feb  9 14:12:27 router user.debug modemd[11919]: modemd exit
Feb  9 14:12:27 router user.info dhcpcd_event[12163]: dhcpcd event deconfig, interface=wwan
Feb  9 14:12:27 router daemon.info udhcpd[11960]: Entering released state
Feb  9 14:12:27 router user.notice modemd[12169]: modem service started
Feb  9 14:12:27 router user.warn modemd[12173]: modemd already running!
Feb  9 14:12:27 router user.info modemd[12169]: modem initialization start, using SIM1
Feb  9 14:12:28 router user.notice link_manager[724]: udhcpd for wwan stopped
Feb  9 14:12:28 router user.notice link_manager[724]: active link (WWAN1) down
Feb  9 14:12:28 router user.debug init[1]: handle services on link down
Feb  9 14:12:28 router user.info link_manager[724]: WWAN1 wait for reconnect, 10 seconds. (0/2)
Feb  9 14:12:28 router user.debug link_manager[724]: rcv action disconnected from udhcpd
Feb  9 14:12:28 router user.debug link_manager[724]: target link WWAN1, state Disconnected
Feb  9 14:12:34 router user.debug modemd[12169]: ATZ
Feb  9 14:12:36 router user.debug link_manager[724]: WWAN1 (wwan) start reconnect
Feb  9 14:12:36 router user.debug link_manager[724]: rcv action connect from link_manager
Feb  9 14:12:36 router user.debug link_manager[724]: target link WWAN1, state Disconnected
Feb  9 14:12:36 router user.info link_manager[724]: WWAN1 start connect
Feb  9 14:12:36 router user.notice link_manager[724]: modem is not ready now, wait...
Feb  9 14:12:36 router user.info link_manager[724]: WWAN1 is not ready, waiting for initialization
Feb  9 14:12:37 router user.debug modemd[12169]: ^SYSSTART
Feb  9 14:12:37 router user.debug modemd[12169]: ^RSSI: 27
Feb  9 14:12:37 router user.debug modemd[12169]: ^HCSQ: "LTE",63,57,141,28
Feb  9 14:12:38 router user.debug modemd[12169]: ^ECCLIST: 112,911,110,119,120,122,999
Feb  9 14:12:38 router user.debug modemd[12169]: ^SRVST: 2
Feb  9 14:12:38 router user.debug modemd[12169]: ^RSSI: 27
Feb  9 14:12:38 router user.debug modemd[12169]: ^HCSQ: "LTE",63,57,141,28
Feb  9 14:12:43 router user.notice modemd[12318]: modem service started
Feb  9 14:12:44 router user.info modemd[12318]: modem initialization start, using SIM1
Feb  9 14:12:44 router user.warn modemd[12323]: modemd already running!
Feb  9 14:12:50 router user.debug modemd[12318]: ATZ
Feb  9 14:12:50 router user.debug modemd[12318]: ATZ^M
Feb  9 14:12:50 router user.debug modemd[12318]: OK
Feb  9 14:12:50 router user.debug modemd[12318]: ATE0
Feb  9 14:12:50 router user.debug modemd[12318]: ATE0^M
Feb  9 14:12:50 router user.debug modemd[12318]: OK
Feb  9 14:12:50 router user.debug modemd[12318]: AT+GMM
Feb  9 14:12:50 router user.debug modemd[12318]: ME909s-120
Feb  9 14:12:50 router user.debug modemd[12318]: OK
Feb  9 14:12:50 router user.debug modemd[12318]: AT+GSN
Feb  9 14:12:51 router user.debug modemd[12318]: 867377020026302
Feb  9 14:12:51 router user.debug modemd[12318]: OK
Feb  9 14:12:51 router user.debug modemd[12318]: AT+CGMR
Feb  9 14:12:51 router user.debug modemd[12318]: 11.617.01.00.00
```

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```
Feb  9 14:12:51 router user.debug modemd[12318]: OK
Feb  9 14:12:51 router user.debug modemd[12318]: AT+CPIN?
Feb  9 14:12:51 router user.debug modemd[12318]: +CPIN: READY
Feb  9 14:12:51 router user.debug modemd[12318]: OK
Feb  9 14:12:51 router user.debug modemd[12318]: AT+CGREG=2;^CURC=0
Feb  9 14:12:51 router user.debug modemd[12318]: OK
Feb  9 14:12:51 router user.debug modemd[12318]: AT
Feb  9 14:12:51 router user.debug modemd[12318]: OK
Feb  9 14:12:51 router user.debug modemd[12318]: AT^SYSCFGEX="02",400000,2,4,40000000,,
Feb  9 14:12:52 router user.debug modemd[12318]: +CGREG: 0
Feb  9 14:12:52 router user.debug modemd[12318]: ^SRVST: 0
Feb  9 14:12:52 router user.debug modemd[12318]: OK
Feb  9 14:12:52 router user.debug modemd[12318]: AT+CIMI
Feb  9 14:12:52 router user.debug modemd[12318]: 460065049045542
Feb  9 14:12:52 router user.debug modemd[12318]: OK
Feb  9 14:12:52 router user.debug modemd[12318]: AT^ICCID?
Feb  9 14:12:52 router user.debug modemd[12318]: ^ICCID: 89860616090020638829
Feb  9 14:12:52 router user.debug modemd[12318]: OK
Feb  9 14:12:52 router user.debug modemd[12318]: AT+CNUM
Feb  9 14:12:52 router user.debug modemd[12318]: OK
Feb  9 14:12:52 router user.debug modemd[12318]: AT+CLIP=1
Feb  9 14:12:53 router user.debug modemd[12318]: OK
Feb  9 14:12:53 router user.debug modemd[12318]: AT+CMGF=0
Feb  9 14:12:53 router user.debug modemd[12318]: OK
Feb  9 14:12:53 router user.debug modemd[12318]: AT+CNMI=2,1
Feb  9 14:12:53 router user.debug modemd[12318]: OK
Feb  9 14:12:53 router user.debug modemd[12318]: AT+CGREG?
Feb  9 14:12:53 router user.debug modemd[12318]: +CGREG: 2,0
Feb  9 14:12:53 router user.debug modemd[12318]: OK
Feb  9 14:12:56 router user.debug modemd[12318]: AT+CGREG?
Feb  9 14:12:56 router user.debug modemd[12318]: +CGREG: 2,1,"A507","01476286",6
Feb  9 14:12:56 router user.debug modemd[12318]: OK
Feb  9 14:12:57 router user.debug modemd[12318]: AT+COPS=3,2
Feb  9 14:12:57 router user.debug modemd[12318]: OK
Feb  9 14:12:57 router user.debug modemd[12318]: AT+COPS?
Feb  9 14:12:57 router user.debug modemd[12318]: +COPS: 0,2,"46001",2
Feb  9 14:12:57 router user.debug modemd[12318]: OK
Feb  9 14:12:57 router user.debug modemd[12318]: AT+COPS=3,0
Feb  9 14:12:57 router user.debug modemd[12318]: OK
Feb  9 14:12:57 router user.debug modemd[12318]: AT+COPS?
Feb  9 14:12:57 router user.debug modemd[12318]: +COPS: 0,0,"CHN-UNICOM",2
Feb  9 14:12:57 router user.debug modemd[12318]: OK
Feb  9 14:12:57 router user.debug modemd[12318]: AT+CSQ
Feb  9 14:12:57 router user.debug modemd[12318]: +CSQ: 24,99
Feb  9 14:12:57 router user.debug modemd[12318]: OK
Feb  9 14:12:58 router user.notice modemd[12318]: modem initialization finish
```

Dialup and obtain IP from ISP network

```
Feb  9 14:12:58 router user.debug link_manager[724]: rcv action ready from modemd
Feb  9 14:12:58 router user.debug link_manager[724]: target link WWAN1, state Disconnected
Feb  9 14:12:58 router user.debug link_manager[724]: rcv action connect from link_manager
Feb  9 14:12:58 router user.debug link_manager[724]: target link WWAN1, state Disconnected
Feb  9 14:12:58 router user.info link_manager[724]: WWAN1 start connect
Feb  9 14:12:58 router user.debug modemd[12318]: auto apn matched, carrier=China Unicom, mcnc=46001,
apn=3gnet, username=, password=
Feb  9 14:12:58 router user.debug modemd[12318]: AT^NDISDUP=1,1,"3gnet","", "",2
Feb  9 14:12:58 router user.debug modemd[12318]: OK
Feb  9 14:13:00 router user.debug modemd[12318]: ^NDISSTAT: 1,,,"IPV4"
Feb  9 14:13:00 router user.debug modemd[12318]: ^NDISSTAT: 0,50,,,"IPV6"
Feb  9 14:13:01 router user.debug link_manager[724]: rcv action associated from ifplugd
Feb  9 14:13:01 router user.debug link_manager[724]: target link WWAN1, state Connecting
Feb  9 14:13:01 router user.info link_manager[724]: WWAN1 associated
Feb  9 14:13:01 router user.notice link_manager[724]: start udhcpc for wwan
Feb  9 14:13:01 router daemon.info udhcpc[12356]: udhcpc (v1.22.1) started
Feb  9 14:13:01 router user.info dhcpc_event[12357]: dhcpc event deconfig, interface=wwan
Feb  9 14:13:01 router daemon.info udhcpc[12356]: Sending discover...
Feb  9 14:13:01 router daemon.info udhcpc[12356]: Sending select for 10.126.185.144...
Feb  9 14:13:01 router daemon.info udhcpc[12356]: Lease of 10.126.185.144 obtained, lease time 518400
Feb  9 14:13:01 router user.info dhcpc_event[12358]: dhcpc event bound, interface=wwan
Feb  9 14:13:01 router user.notice dhcpc_event[12358]: dhcp client bound to 10.126.185.144/255.255.255.224 on
wwan
Feb  9 14:13:01 router user.notice dhcpc_event[12358]: dhcp got router 10.126.185.129, dns 210.21.4.130
221.5.88.88
Feb  9 14:13:01 router user.debug link_manager[724]: rcv action connected from udhcpc
Feb  9 14:13:01 router user.debug link_manager[724]: target link WWAN1, state Connecting
Feb  9 14:13:01 router user.info link_manager[724]: WWAN1 connected
Feb  9 14:13:01 router user.notice link_manager[724]: active link (WWAN1) up
Feb  9 14:13:01 router user.debug init[1]: handle services on link up
Feb  9 14:13:01 router user.notice init[1]: dnsmasq stopped
Feb  9 14:13:01 router user.notice init[1]: dnsmasq started for interface lan0
Feb  9 14:13:01 router user.notice init[1]: firewall stopped
Feb  9 14:13:01 router user.notice init[1]: firewall started
```