Tersus

TR600 Wireless Router
User Manual

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Table of Contents

1. Product Introduction

This chapter mainly introduces the outlook, accessories, specifications and mechanism of TR600.

1. Brief Introduction
2. Product Outlook
3. Accessories
4. Dimension
5. Working Mechanism
6. Specifications
7. Typical Usecases

1.1 Brief Introduction

TR600 is an industrially designed product that embeds industrial 4G wireless communication module. It has capability of high-speed Internet access, high-speed video and data transmission. Compared with ER-800 and MR-900 industrial routers, ER-600 has more data interfaces and more flexible network access modes. It is a high cost-effective and industrial wireless router.

TR600 not only supports all network modes from China's three mobile operators, but also has two RJ-45 Ethernet interfaces, one of which (LAN1) can be used as WAN as well, one RS232 and one RS485 serial interfaces. Ethernet interfaces and serial interfaces can be used at the same time. It breaks through network limits.

TR600 has WIFI functionality as well, and supports 802.11b/g/n protocol. In theory the highest speed can be 150Mbps. Either mobile phones, PCs or other devices that have WIFI functionality, can bind TR600's WIFI access point and share Internet access via TR600. This greatly extends the number of devices that can connect with TR600

at the same time.

TR600 can use WAN or WIFI network: in case cable network is available, WAN (LAN1) port can be used to access cable network; and in case WIFI is available, TR600 can be configured to access internet via WIFI. 4G, WAN and WIFI are all supported by TR600, this greatly facilitates customer's project deployment that customers do not have to choose different devices from different suppliers because of different network access at the spot. This can not only save procurement cost, but also reduce maintenance effort for the projects.

GPS model can be embedded into TR600, to implement device location. Set time interval of transmitting GPS location data, then after TR600 connects to data center, it will transmit location data to data center with the predefined time interval. Data center can also ask for GPS location data at any time by sending commands. Besides, the device connecting TR600 can also send AT command via RS232/RS485 serial port to ask for location information.

TR600 is easy to use, and is plug-n-play without any configuration. Together with eTung's eYun platform and Virhub/Vircom software, it can be easy to integrate with PLC programming software, and there is no extra integration effort. TR600 is stable and easy-to-use, thus greatly facilitates project deployment.

1.2 Product Outlook

Figure 1-1: TR600 side view 1

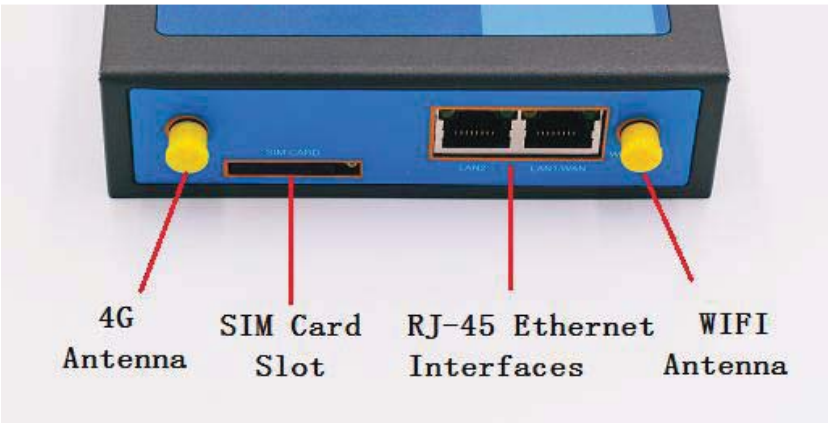


Figure 1-2: TR600 side view 2

1.3 Standard Accessories

Figure 1-3: 4G all frequency sucking antenna

Figure 1-4: WIFI antenna

Figure 1-5: GPS antenna

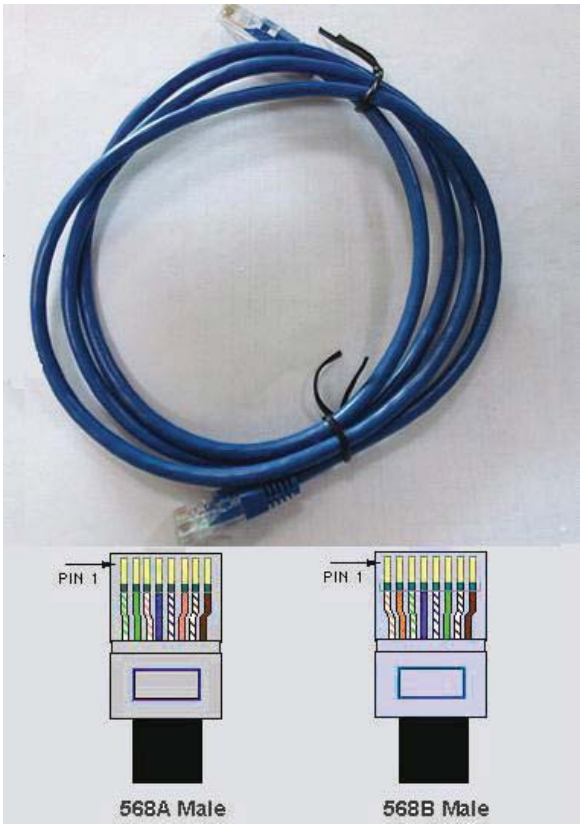


Figure 1-6: Cross cable

NOTE: The accessories may be different because of different models and customer requirements, the figures above are just for reference.

1.4 Dimension

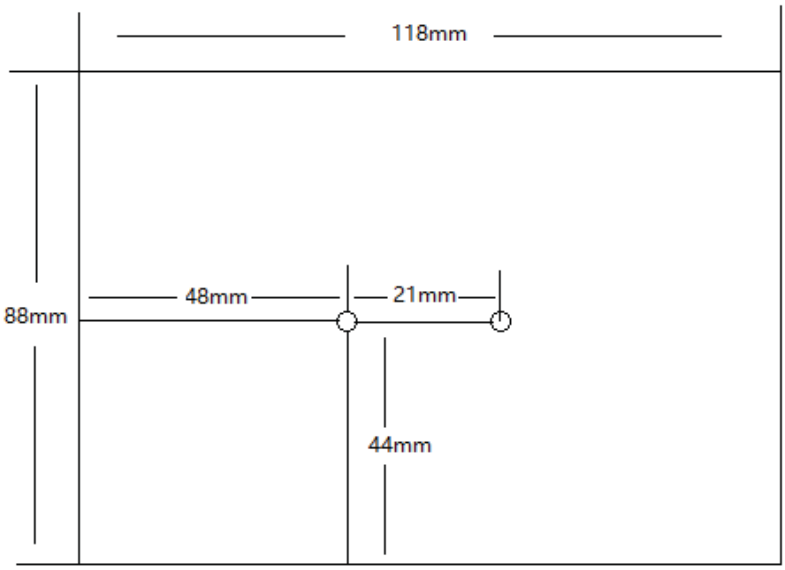


Figure 1-7: TR600 dimension

Figure 1-8: Installation effect

1.5 Working Mechanism

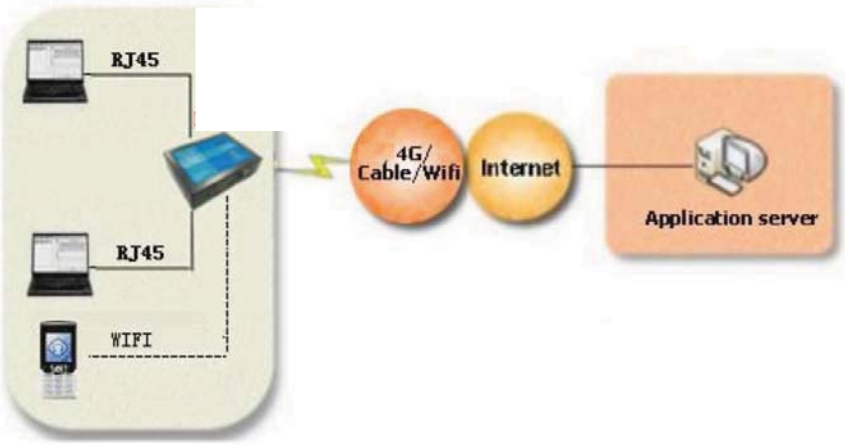


Figure 1-9:TR600 working mechanism

TR600 connects with PC via Ethernet cross cable, and set PC's IP address as automatically obtained IP. After power on, it dials up into 4G network (or, via cable/WIFI network) and access Internet, then PC can access Internet via TR600, and then access the application server.
At the same time,TR600 can be a WIFI AP, and PC (or other devices that support WIFI) can connect to TR600's AP with its own WIFI network adapter, instead of using network cable, and then access Internet via TR600.
Meanwhile,TR600 can be used to build remote virtual LAN with Virhub or VPN, to monitor video remotely, and publish programs remotely on LED color screens, acquire data and control PLC remotely, etc.

1.6 Specifications

1.6.1 Technical Parameters

- Basic Parameters
  - Power Supply: +12 ~ +48V wide range of voltage input
  - Power Connector: inner(+) outer(-)
  - Max Current: 350mA@+12V DC
  - Standby Current: 250mA@+12V DC
  - Network:

TR600-N4:
FDD-LTE
WAN

TR600-W0：WIFI/WAN

TR600-W4:
FDD-LTE
WIFI/WAN

TR600-N4G:
FDD-LTE
WAN
GPS

- ✧ Frequency:
  Band FDD-LTE B7
  WIFI IEEE 802.11n/g/b: 2.4GHz
  GPS L1, 1575.42MHz

- ✧ Data Interface: RS232/RS485, two RJ45 Ethernet interfaces
- ✧ Temperature: -30ºC ~ +80ºC
- ✧ Humidity: 95%@+40ºC
- ✧ Dimension: 88x118x34mm (excluding antenna and handle)

◆ Basic Functions
- ✧ Support NAT
- ✧ Support DHCP server
- ✧ Support DNS Proxy
- ✧ Support port forwarding
- ✧ Support DMZ host(IP address mapping)
- ✧ Support VPN
- ✧ Support dynamic domain auto-registration
- ✧ Support configuring static route table
- ✧ Support real-time speed display of wireless network
- ✧ Support configuring with serial port, telnet and web interface
- ✧ Support serial port DTU function, Ethernet and serial interfaces can be used at the same time

- ✧ Support flow control per month, and hours per month for internet access
- ✧ Support flow wakeup, phone wakeup and SMS wakeup

1.6.2 Indicator Light Description

LED Indicator Light	Color	Status	Description
Signal lights	Orange	Always light	There are three signal lights. All lights one means the signal is strongest.
PWR	Red	Always light	Device is working
		Extinguished	Device is not working
NET	Green	Always light	Connected to Internet
		Extinguished	No connection to Internet
ERR	Red	Always light	4G model is not working or SIM card error
		Extinguished	4G model is working
SVR1	Green	Always light	DTU has connected to data center
		Extinguished	DTU does not connect to data center
SVR2	Green	Always light	Virhub is working
		Extinguished	Virhub is not working
WIFI	Green	Always light	WIFI is enabled
		Extinguished	WIFI is not enabled
LAN1 (WAN)	Green	Always light	Ethernet connection OK
		Extinguished	Ethernet connection not OK
LAN2	Green	Always light	Ethernet connection OK
		Extinguished	Ethernet connection not OK
GPS	Green	Always light	Has latitude and longitude data
		Flashing quickly	Found satellite signal, but has no latitude and longitude data
		Flashing slowly	No satellite signal

Table 1-1 TR600 indicator light description

1.6.3 Serial Port Definition

Type	RS-232		
Pin	2	3	5
Definition	**RXD**	**TXD**	**GND**

Table 1-2: TR600 RS232 serial port
(Standard RS-232 DB9 male port) pin definition

Type	RS-485	
Pin	485A	485B
Definition	**A**	**B**

Table 1-3: TR600 RS485 serial port pin definition

1.6.4 RESET Button

To reset TR600 to default, login its configuration web page, and choose "System tools" -> "Restore set"; Or: press the RESET button continuously, the signal lights will flash one by one, until all lights are on, that means the reset is finished.

1.7 Typical Usecases

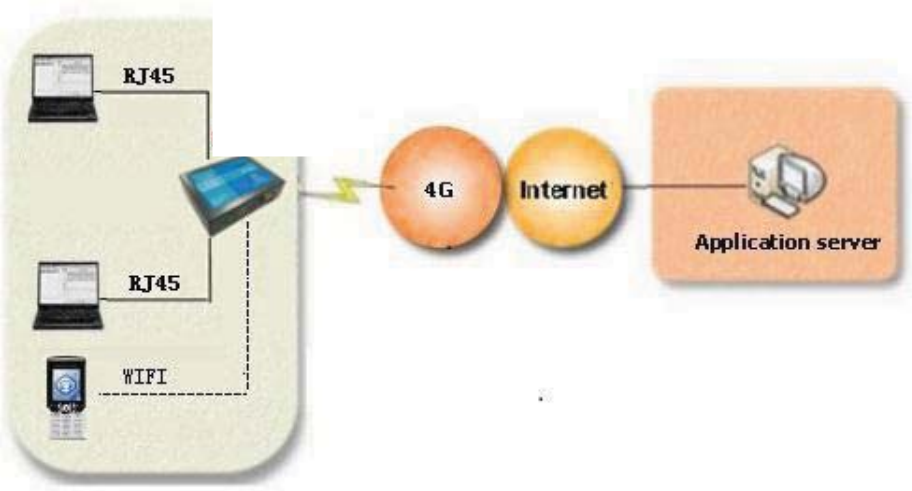


Figure 1-10: Access Internet via 4G network

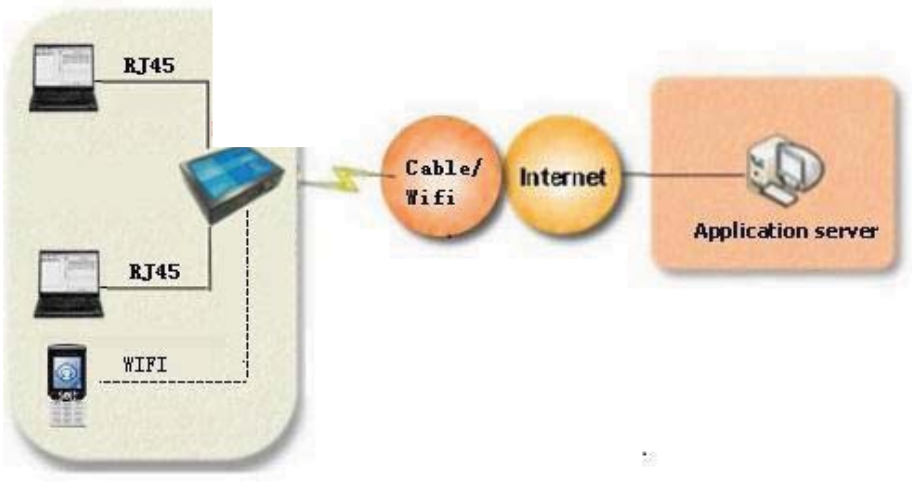


Figure 1-11: Access Internet via cable/WIFI network

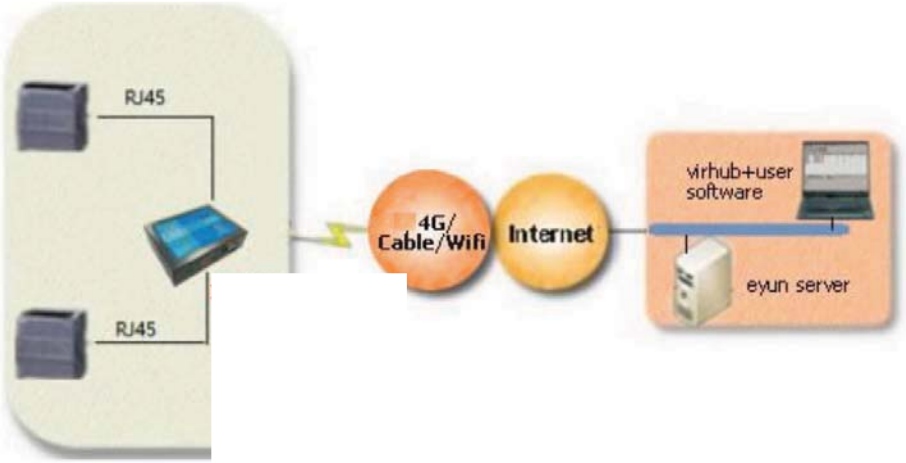


Figure 1-12: Implement virtual LAN via TR600's Virhub functionality

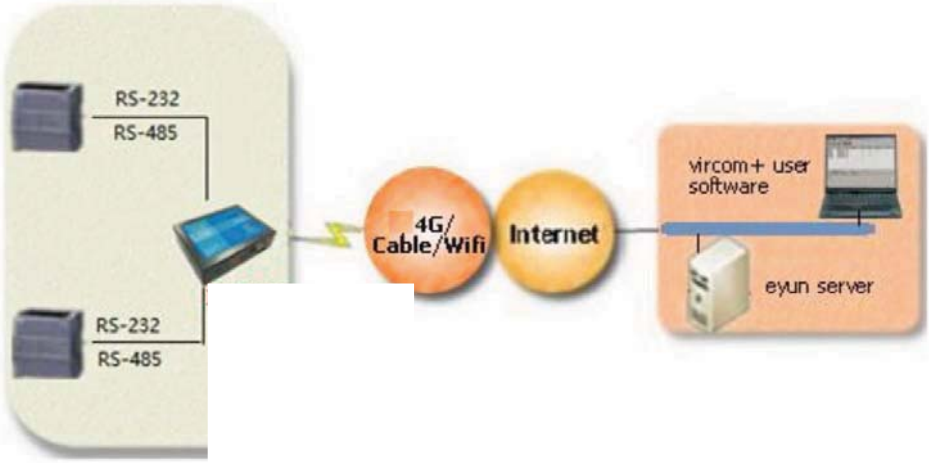


Figure 1-13: Implement device remote control via TR600 and Vircom functionality

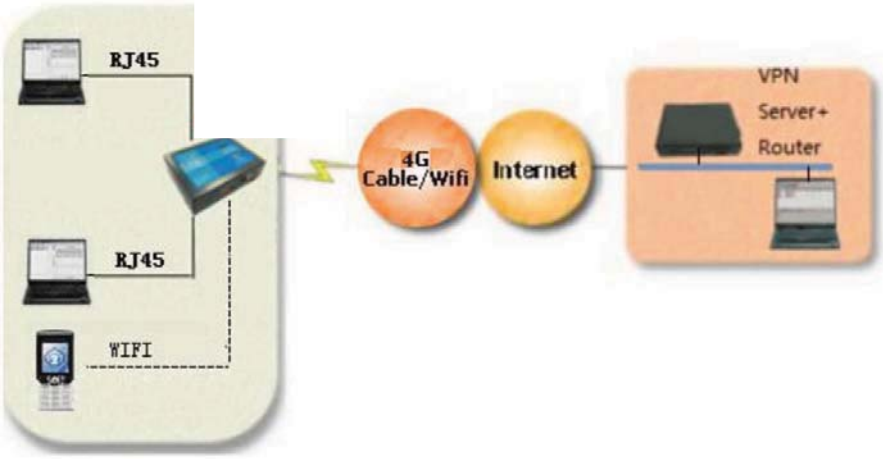


Figure 1-14: Use TR600 to access LAN remotely via VPN

2. Device Configurations

This chapter introduces how to use TR600 and related parameters.

1. Configurations
2. Parameters
3. Restore to default
4. Firmware Update
5. Remote Configurations

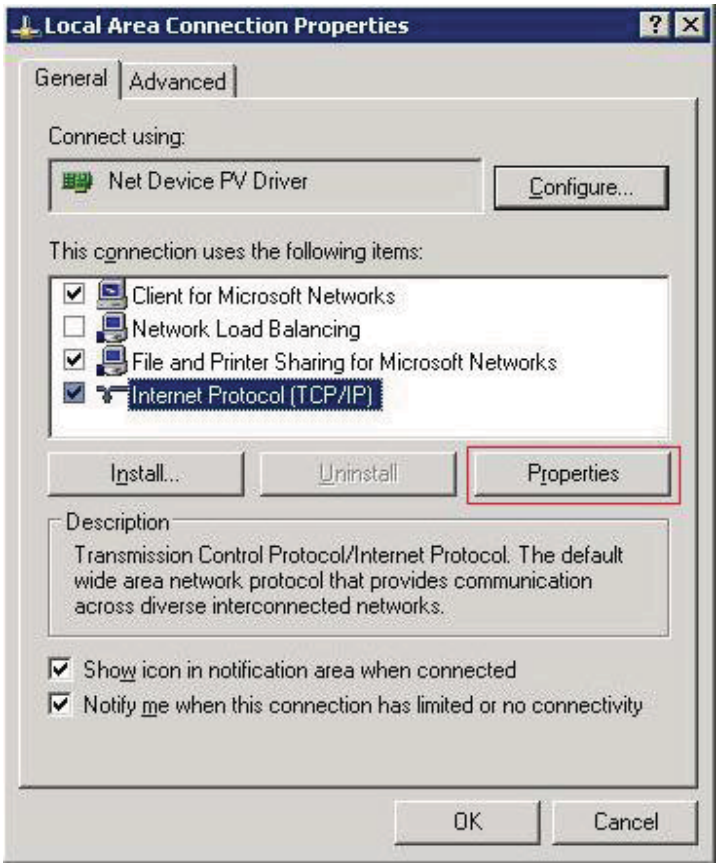
2.1 Configurations

2.1.1 Preparation

- ✧ One cross Ethernet cable used to connect TR600 with PC or customer device;
- ✧ One 4G all frequency sucking antenna;
- ✧ One power supply;
- ✧ One USIM card that can access internet.

2.1.2 Configuring TR600

- ✧ Connect TR600 with PC via a cross Ethernet cable;
- ✧ Boot PC, and set IP address as "Automatically obtain IP address";


Local Area Connection Properties
General
Advanced
Connect using:
Net Device PV Driver
Configure...
This connection uses the following items:
Client for Microsoft Networks
Network Load Balancing
File and Printer Sharing for Microsoft Networks
Internet Protocol (TCP/IP)
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
Show icon in notification area when connected
Notify me when this connection has limited or no connectivity
OK
Cancel

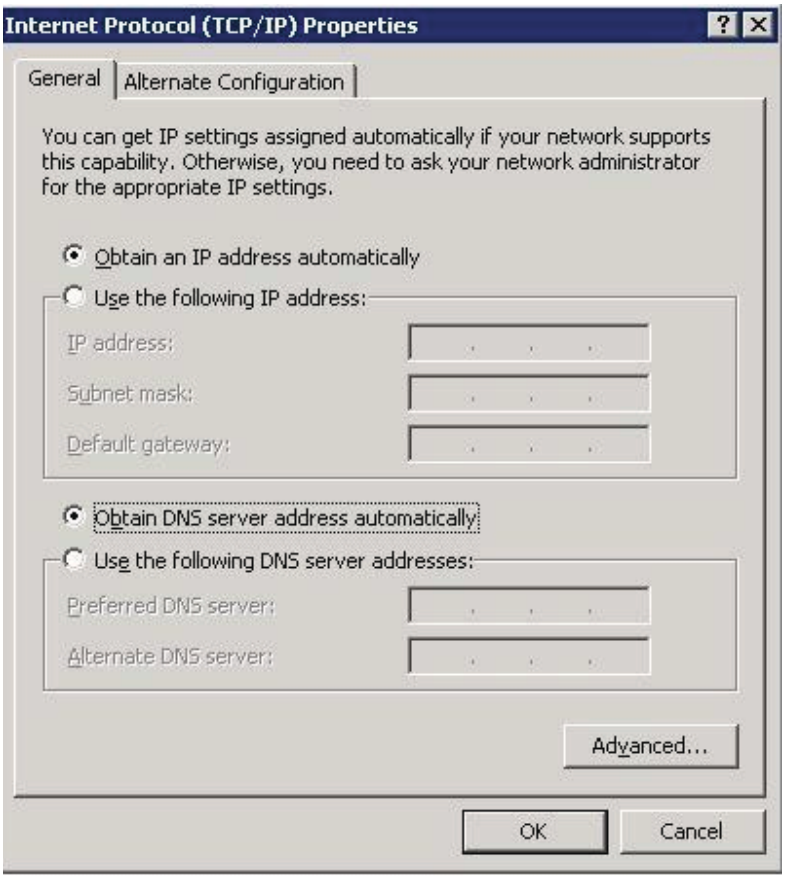


Figure 2-1: Set IP address as "Automatically obtain IP address"

- ✧ Open IE browser, input address "http://192.168.1.1" and press Enter;
- ✧ Input "root" as username and "1234" as password, then press Enter to login web configuration interface and configure the device.

Figure 2-2: Login router configuration interface

- It is clear to see each configuration item in the router configuration interface. To change some parameter, click it, modify and then save it, then reboot the router. Configure DTU functionality if serial port is used, with data center IP:Port as eyun.etungtech.com:8080

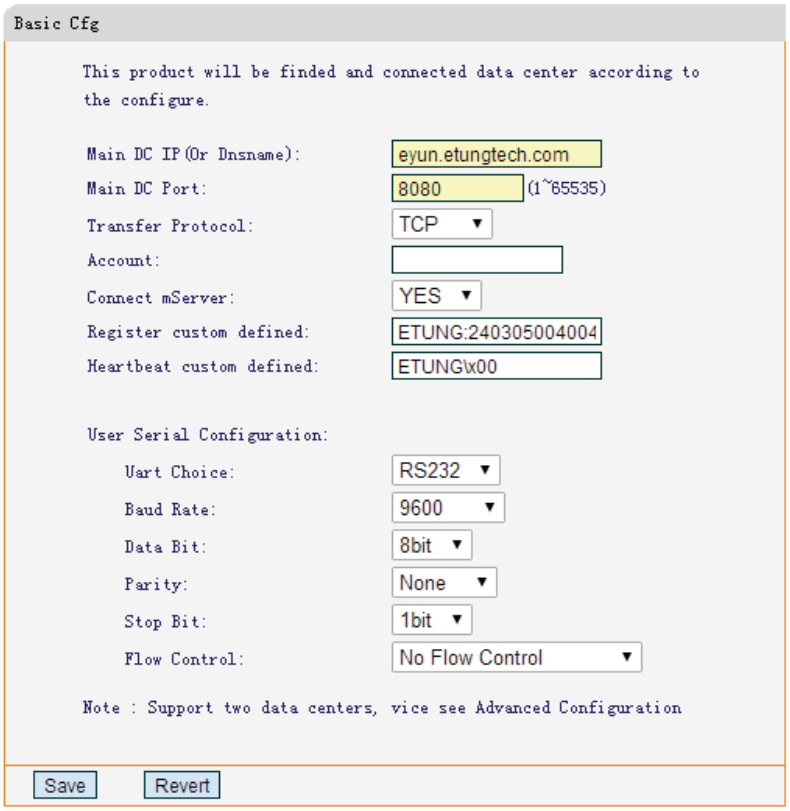


Figure 2-3: Configure DTU functionality

- Enable Virhub functionality to use this function, the configuration interface is shown as below:

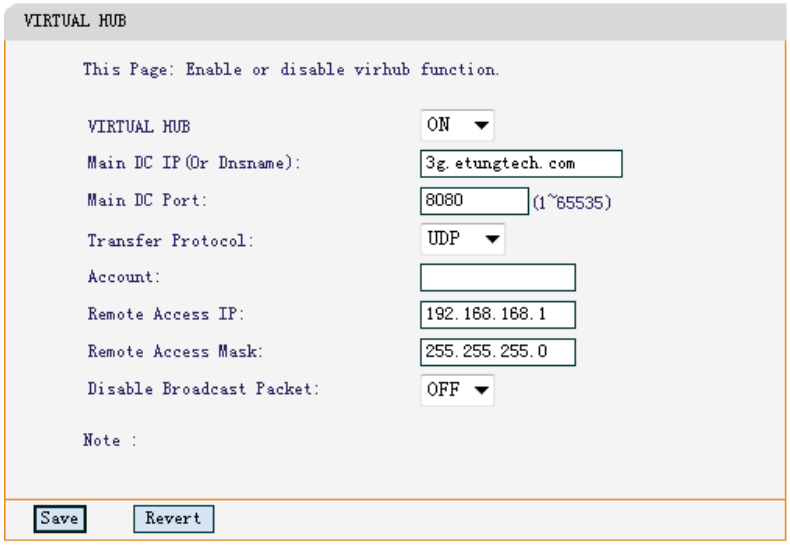


Figure 2-4: Configure Virhub functionality

2.2 Configuration Parameters

Each configuration menu has multiple parameters, and some of them have sub-menus. Details are described below.

Configuration Menu Item		Description
Current status		Show device information, connection and data transfer status.
Network Settings	Network Select	Configure to use wireless (4G), cable network (WAN) or WIFI, set ICMP host, and whether to allow external access.
	Wireless Basic	Set user information about dialing into internet and SMS function, normally with default value. "Network mode" area is "Auto Switch" be default. If SIM card does not support 4G or there is no 4G signal.
	Wireless Advanced	Check network debugging information
	WAN	Configure WAN interface, for TR600-W0, WAN is enabled by default; For TR600-N4, WAN is disabled by default.
	WIFI client	Configure WIFI parameters. Once WIFI is enabled, WAN will be disabled.
LAN		Set inner IP and DHCP
WIFI Hotspot		Configure WIFI hotspot parameters. WIFI hotspot and WIFI client cannot be used at the same time, to enable WIFI hotspot function, please disable WIFI client if it is enabled: set network to 4G or WAN other than WIFI in network settings.
Forwarding rules	NAT	Whether the device connected with router can access internet via NAT.
	Port forwarding	Use pre-defined port to forward data from internet to some inner IP's dedicated port.
	DMZ host	Forward data from internet directly to some inner IP.
Routing		Forward data to a pre-defined inner IP
VPN	PPTP&L2TP	Login with username and password to connect VPN
	GRE settings	Set routing data encapsulation mode, normally with default value.
DTU	Simple settings	Set master data center address and serial

		port parameters, choose serial port type. For TR600-N4G that embeds GPS model, configure GPS report time interval here.
	Advanced settings	Set standby data center address and data format
	Link management	Set heart beat parameters, normally with default values
	Embedded data center	Set embedded data center function
	Proxy client	Set proxy client address
Wireless Virhub		Set server address for Virhub function, with 3g eYun platform as default
System tools	System settings	Set router's communication parameters, normally with default values
	Show system log	Show router's connection and communication logs
	Show DTU log	Show router's data transfer logs with DTU function
	Restore to default	Restore to initial default settings with one key
	Update firmware	Update router's firmware
	Change password	Change password logging router(1234 by default)
Reboot		Reboot router

Table 2-1: Details of configuration parameters

2.3 Restore to Default

According to the description of "Configuring TR600", after entering TR600 configuration interface, select "System Tools" and then "Restore Set".

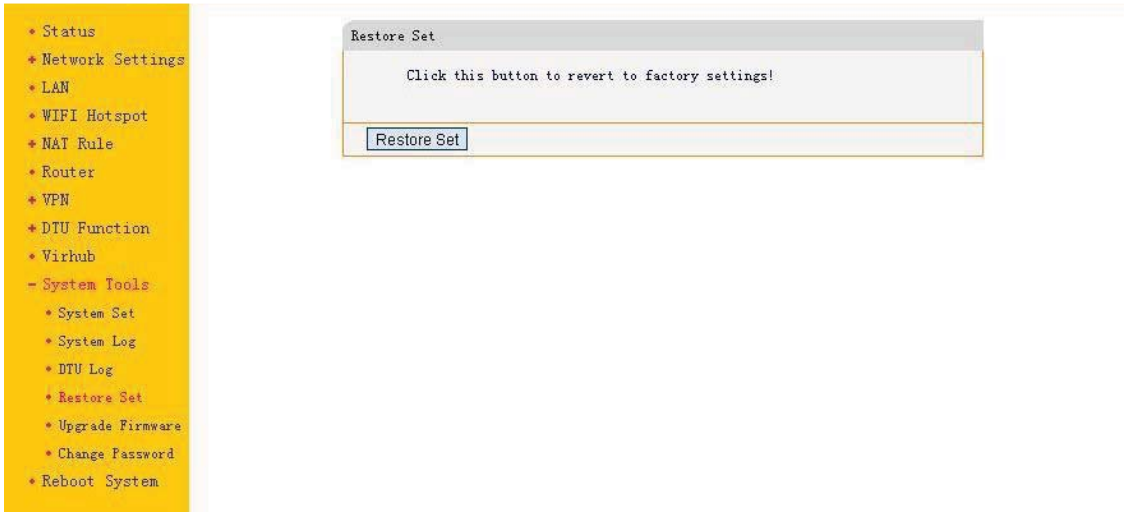


Figure 2-5: Restore to default

Or: press the RESET button continuously to reset it to default.

2.4 Firmware Update

- ✧ Ask eTung for firmware to update. The firmware (*.img) can be uploaded from local disk, or downloaded from a server from Internet.
- ✧ According to the description of "Configuring TR600", connect ER with TR600 via a cross Ethernet cable, open browser, inputhttp://192.168.1.1 as URL, input username and password (by default username is root and password is 1234), and login router configuration webpage.
- ✧ Select "System tools" and then "Upgrade Firmware";
- ✧ If the firmware is on the local disk, click "Browse", select the file (.img) to update, and click "Open", then click "Upload/Download":

Figure 2-6: Upload firmware

✧ If the firmware can be downloaded from a server, input download URL (please ask eTung technical support for the URL), and click "Upload/Download":

Figure 2-7: Download firmware from server

✧ Wait for a moment, until "Update" is shown, choose "Delete the Former File", then click "Update". It will prompt the file system has been updated, the original settings is clear, and the system is rebooting. Wait a moment and then refresh the webpage to see the

2.5 Remote Configurations

SMS commands and remote AT commands can be used on TR600 to modify configuration parameters remotely. Details are described below:

1. Modify configuration parameters remotely via SMS
   The SMS to configure TR600 parameters should follow the format below: SMS password;AT commands

   1) SMS password is the "SMS wakeup password" as shown in wireless network settings of the web configuration interface, with "1234" by default. This password is used to filter rubbish SMS. Long SMS is not supported.
   2) There can be multiple AT commands, and ";" is used between SMS and AT command, and between AT commands. If there are more than one AT command and some command fails, the following commands will not be executed. If a command is unknown, an ERROR will return. The commands will take effect after system reboot. This can be done by putting a command "AT+REBOOT" in the end of SMS commands, or sending a separate SMS with command "AT+REBOOT".
   3) AT command must be capitalized, but the parameters in the command do not have this limit.
   4) If there are multiple parameters in the command, just write those that need to change and you do not have to write all of them. If some item does not need to change, write two continuous colons, and if some item needs to clean, write a space. For example:
      AT+WN=3gnet (configure onely APN, and other parameters keep unchanged)
      AT+DC=,,user (the first two items keep unchanged, and change username only)

AT commands that can be used via SMS are listed and described below:

1) AT+WN=apn,user,passwd,net_mode
   Configure parameters related to dialling, with reply OK or ERROR.
   apn: Access point name, this parameter is unused for EVDO device and can be null. write "auto" to ask to select APN automatically.
   user: dialling account, the dialing password must be changed together with dialling account.
   passwd: dialling password, the dialing account must be changed together with dialling password.

2) AT+DC=addr,port,user,mode
Configure data center parameters, with reply OK or ERROR.
addr: data center address, either IP or domain
port: data center port
user: username
mode: TCP or UDP

3) AT+PWD=passwd
Set new SMS password, with at most 8 characters, exluding ",",":", "=", etc. It is adviced to use digits and English characters only. The reply is OK or ERROR.

4) AT+VIRHUB=0/1
Set whether to enabe Virhub or not, with reply OK or ERROR.
0: disable Virhub, 1: enable Virhub

5) AT+RESTORE
Restore to default settings, with reply OK.

6) AT+REBOOT
Reboot the device, with reply OK.

7) AT+STATUS?
Check current status, with reply below:
OK:connection status,signal quality,IP address,net_mode
connection status: 0: dialling not successful, 1: dialling successful
signal quality: 0-31, bigger value means better quality
IP address: IP address obtained after dialling is successful, invalid if dialling is not successful.
net_mode:FDD LTE

8) AT+WN?
Check wireless network settings, with reply below:
OK:addr,port,user,mode
Refer the first command for parameters description

9) AT+DC?
Check data center parameters, with reply below:
OK:addr,port,user,mode
Refer the second command for parameters description

10) AT+PWD?
Check SMS password, with reply below:
OK:passwd

11) AT+INFO?
Check device information. with reply below:
OK:IMEI,version,IP address at Ethernet interface

12) AT+VIRHUB?
Check status of Virhub, with reply below:
OK:0/1
0: Virhub is disabled, 1: Virhub is enabled.

13) AT+UPDATE=url
Update firmware, with reply OK or ERROR. The reply OK does not mean update is complete, but the command has been received and the update will start. To check whether update is successful, send AT+INFO? after 5 minutes and check whether the firmware version is changed.
url: download URL of the new firmware, beginning with "http://". Make sure the device can access this url, for example it should not be a public URL if the device has a private net card.

14) AT+UPDATEALL=url
Update firmware and restore to default settings, with reply OK or ERROR.
url: download URL of the new firmware, beginning with "http://". Make sure the device can access this url.

15) AT+SMSZHUANFA=txt,info_src,dest
Ask the router to send an SMS to info_src first with content "txt" (only in English characters and digits), and then forward the reply to dest. dest can be omitted, and if then the reply will be forwarded the the mobile that sends this AT command. If the reply SMS has more than one message, the router will forward the messages one by one.
For example: AT+SMSZHUANFA=CXLL,10086,13801234567, means to send an SMS to 10086 to query traffic and then forward the reply to 13801234567.

2. Change configuration parameters via remote AT commands

1) This method can be used only when enabliing DTU function or virhub function, and TR-600 is shown online in mServer.
2) Method: choose the router in mServer's console, right-click it and choose "Remote Control", in the popped-up dialog, input AT commands in "CMD List" on the left side.
For example, input the following command to change the data center's address and port:
AT+MSERVER=3g.etungtech.com,8080
Click "Send" afterwards, and if successful, a "OK" will show in "CMD Response" on the right side. Then TR600 will be offline from the original mServer, and connect to the new data center and port.

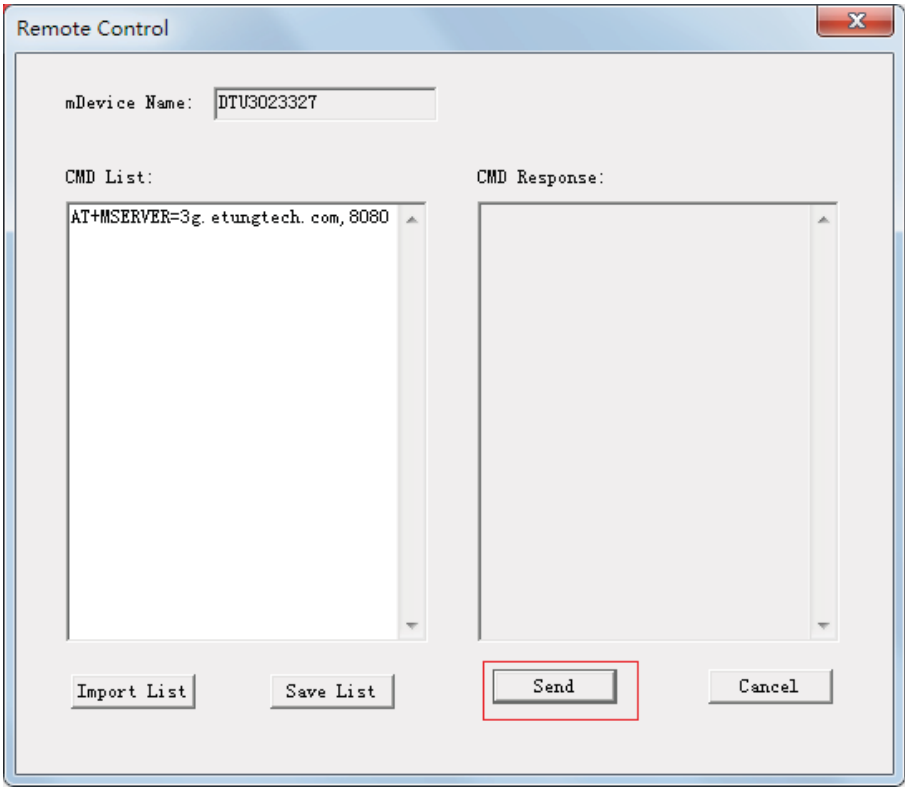


Figure 2-8: Transfer Terminal remotely

Remote AT commands are listed below:

1) AT

2) AT+MSERVER=addr, port
Change data center address and port, with reply OK or ERROR.
addr: data center address, either IP address or domain
port: data center port

3) AT+USER=user
Change DTU username, with reply OK or ERROR.
user：username

4) AT+CSQ
Query signal strength and network mode, with the following reply:
OK:sig_quality,net_mode
sig_quality: 0-31, bigger value means better signal quality
net_mode:
FDD LTE

5) AT+REBOOT
Reboot the router, with reply OK.

6) AT+UPDATE=url,md5
Update firmware, with reply OK or ERROR. The reply OK does not mean update is complete, but the command has been received and the update will start. To check whether update is successful, send AT+INFO? after 5 minutes and check whether the firmware version is changed.
url: download URL of the new firmware, beginning with "http://". Make sure the device can access this url, for example it should not be a public URL if the device has a private net card.

7) AT+UPDATEALL=url,md5
Update firmware and restore to default settings, with reply OK or ERROR.
url: download URL of the new firmware, beginning with "http://". Make sure the device can access this url.

8) AT+DTU&IMEI?
Query the router's IMEI number, with the following reply:
OK:IMEI

9) AT+DTU&VER?
Query the router's version, with the following reply:
OK:ver

10) AT+CM&TYPE?
Query protocol type, with the following reply:
OK:prot
Prot: TCP, UDP or ETCP

11) AT+CM&HBI?
Query heartbeat interval, with the following reply:
OK:interval
Heartbeat interval is in seconds.

12) AT+CM&HBT?
Query heartbeat timeout, with the following reply:
OK:timeout
Heartbeat timeout is in seconds.

13) AT+SER&BAUD?
Query user serial port baud rate, with the following reply:
OK:baud
Baud: 2400/4800/9600/19200/38400/57600/115200

14) AT+SER&SIZE?
Query user serial port data bits, with the following reply:
OK:size
size: 8/7/6/5

15) AT+SER&PAR?
Query user serial port parity, with the following reply:
OK:par
Par: N: no parity, O: odd parity, E: even parity

16) AT+VIRHUB&ENABLED?
Query whether virhub function is enabled, with the following reply:
OK:0/1
0: disable virhub function, 1: enable virhub function

17) AT+CM&TYPE=prot
Set protocol type, with reply OK.
prot：TCP、UDP、ETCP

18) AT+CM&HBI=interval
Set heartbeat interval in seconds, with reply OK.

19) AT+CM&HBT=timeout
Set heartbeat timeout in seconds, with reply OK.

20) AT+SER&BAUD=baud
Set user serial port baud rate, with reply OK.
Baud: 2400/4800/9600/19200/38400/57600/115200

21) AT+SER&SIZE=size
Set user serial port data bit, with reply OK.
Size: 8/7/6/5

22) AT+SER&PAR=par
Set user serial port parity, with reply OK.
par: N: no parity, O: odd parity, E: even parity

23) AT+VIRHUB&ENABLED=0/1
Enable/disable virhub function, with reply OK.

24) AT+SMSPING=PHONE_NUM
Ask the router to send an SMS to PHONE_NUM, and the content is the router's IMEI number, with reply OK.

25) AT+SMSZHUANFA=txt,info_src,dest
Ask the router to send an SMS to info_src first with content "txt" (only in English characters and digits), and then forward the reply to dest. dest can be omitted, and if then the reply will be forwarded to the mobile that sends this AT command. If the reply SMS has more than one message, the router will forward the messages one by one.
For example: AT+SMSZHUANFA=CXLL,10086,13801234567, means to send an SMS to 10086 to query traffic and then

forward the reply to 13801234567.

26) AT+VIRHUB&TAP_IP?
Check the remote access IP address via Virhub, with reply: OK:x.x.x.x

27) AT+VIRHUB&TAP_MASK?
Check the remote access netmask via Virhub, with reply: OK:x.x.x.x

28) AT+VIRHUB&TAP_IP=x.x.x.x
Set the remote access IP address via Virhub, with reply OK.

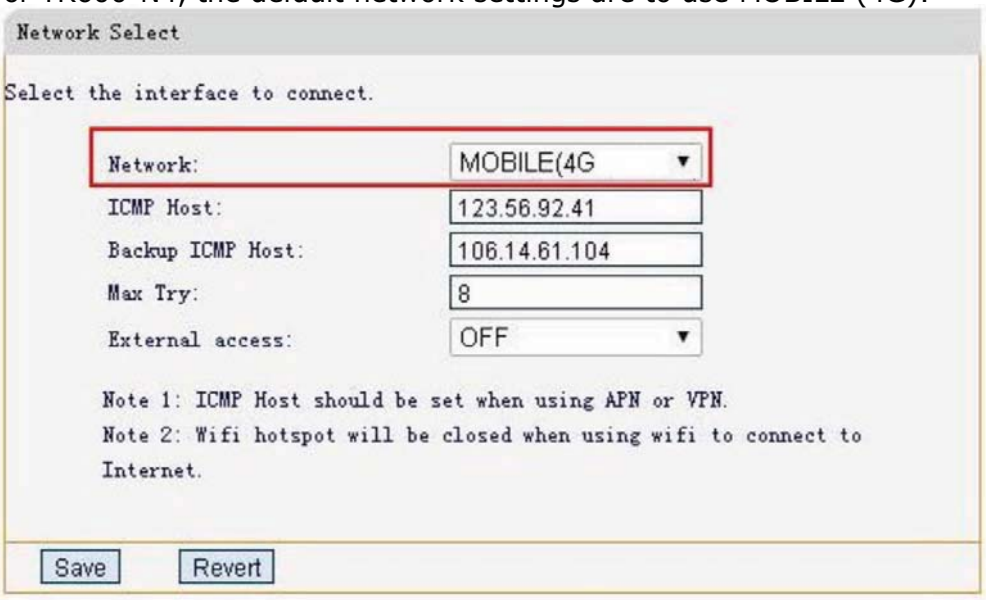
29) AT+VIRHUB&TAP_MASK=x.x.x.x
Set the remote access netmask via Virhub, with reply OK.

30) AT+GPS?
Ask for GPS location data, the reply data format is shown below:
$GPRMC,090758.182,A,3958.2382,N,11621.4878,E,1.06,201.56,120211,,,A*6A

Appendix 1: Configure TR600 to Access Internet via 4G Network

According to the description of Ch. 2.1 Configurations, login TR600's webpage, choose "Network Settings" -> "Network Select", configure to use 4G to access Internet.

For TR600-N4, the default network settings are to use MOBILE (4G):



Set Network to "MOBILE 4G", press "Save" and then reboot TR600.

NOTE: Some TR600 types does not have 4G module, and then cannot access Internet via 4G network.

Appendix 2: Configure TR600 to Access Internet via Cable/WIFI

1. Configure ER-600 to access Internet via cable network

According to the description of Ch. 2.1 Configurations, login TR600's webpage, choose "Network Settings" -> "Network Select", configure to use WAN to access Internet.

For ER-600-W0, the default network settings are to use WAN:

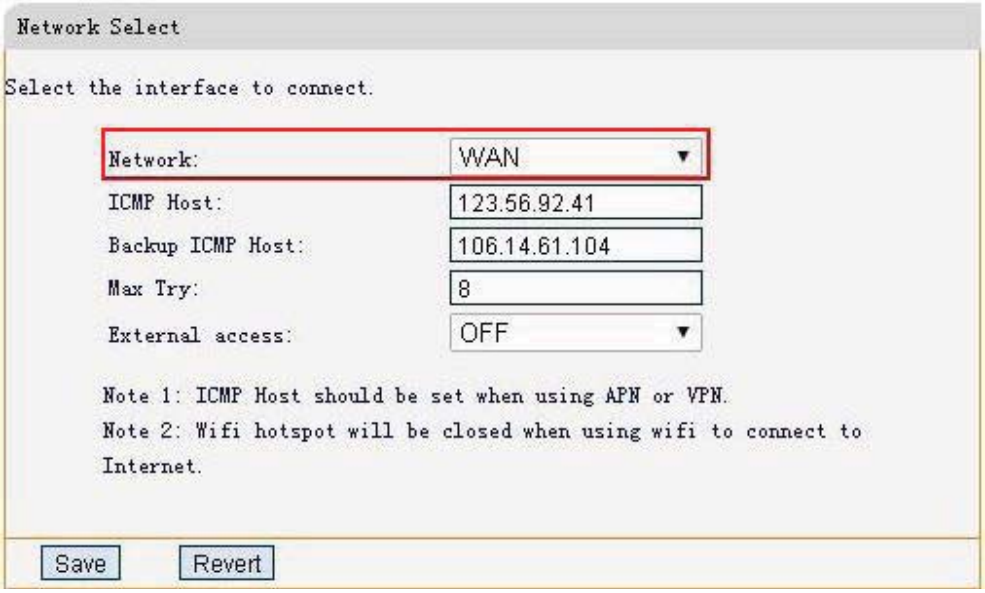


Figure Appendix 2-1: Use WAN to access Internet by default

For TR600-N4, the default network settings are to use MOBILE (4G):

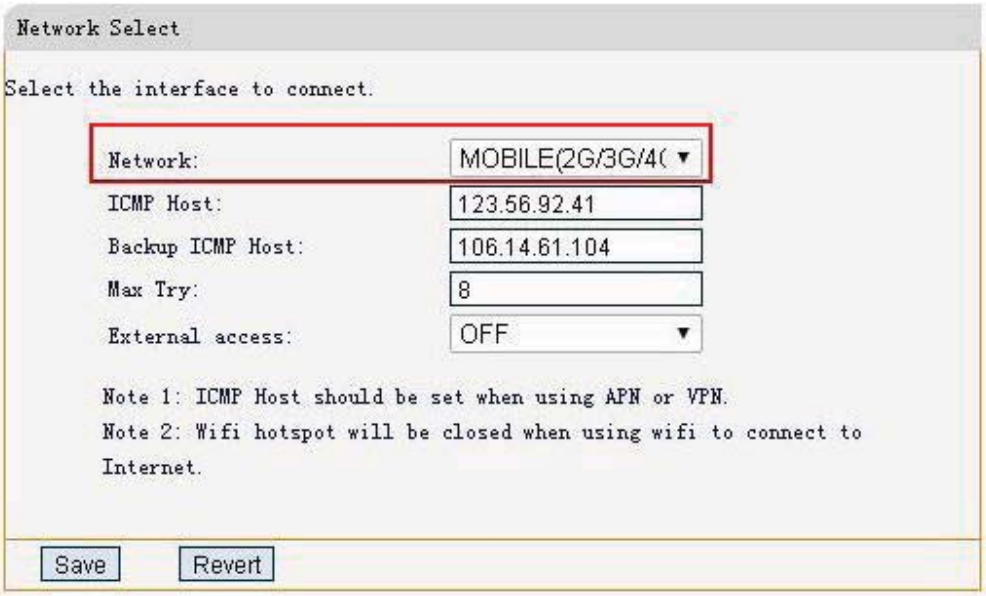


Figure Appendix 2-2: Use 4G to access Internet by default

Set "Network Select" as WAN, and then click "Save";

Choose "Network Settings" -> "WAN" to configure WAN parameters;

There are three kinds of types: DHCP, PPPoE and STATIC. Choose PPPoE if cable MODEM is used to access internet, and choose DHCP or STATIC if a dedicated line or LAN is used to access internet. Use STATIC if the IP address is static or assigned manually, otherwise use DHCP.

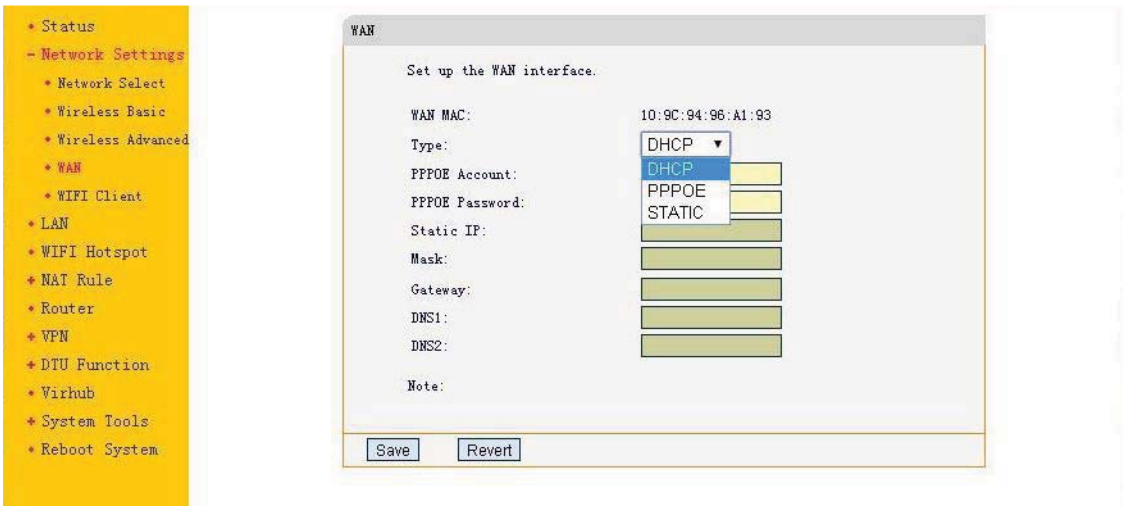


Figure Appendix 2-3: Set type

When choosing PPPoE, PPPoE username and password should be set additionally:

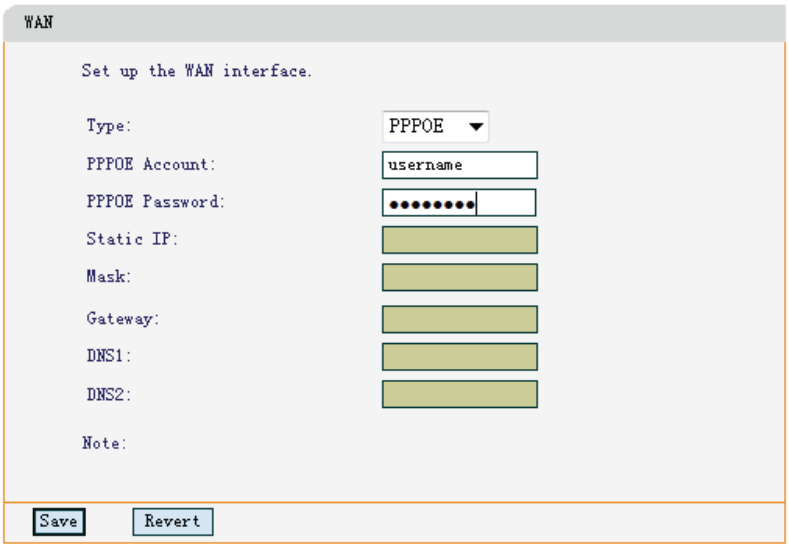


Figure Appendix 2-4: Configure PPPoE username and password

When choosing STATIC, configure static IP, net mask, gateway and DNS accordingly:

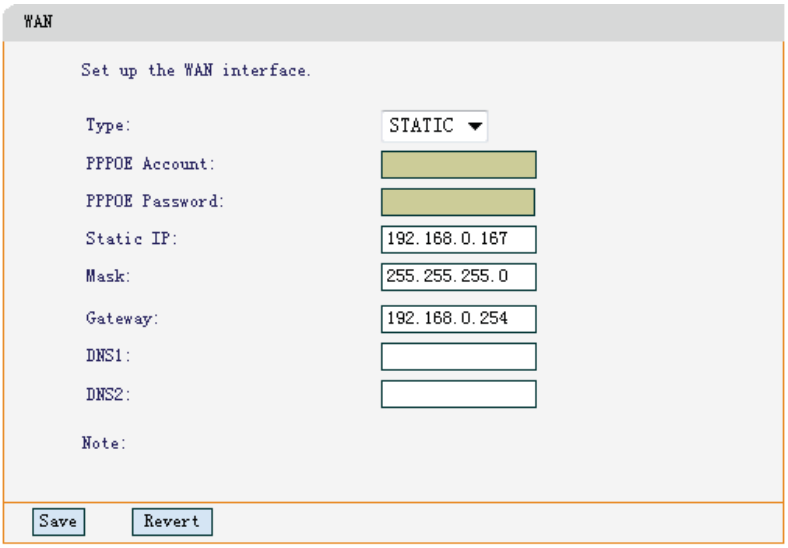


Figure Appendix 2-5: Configure static IP

When choosing DHCP, no additional parameters need to configure:

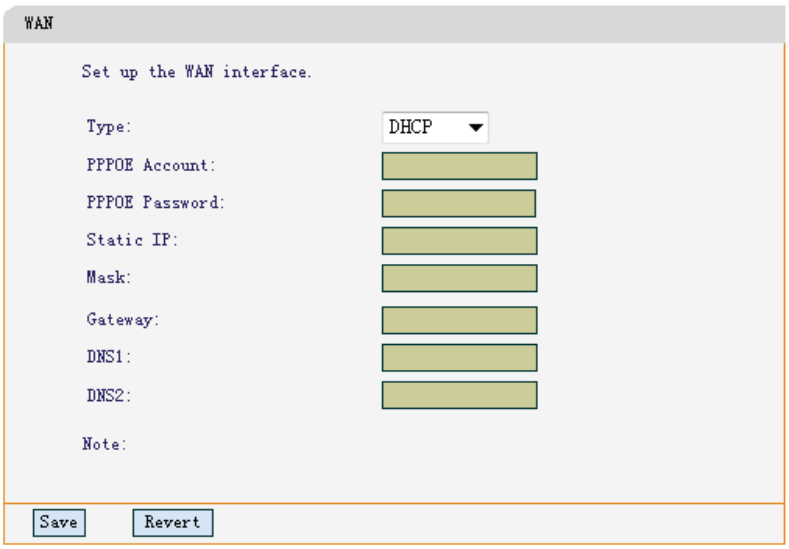


Figure Appendix 2-6: Configure DHCP

Click "Save", and plug in Ethernet cable on LAN1 (WAN) of TR600 and connect to the cable network, then reboot TR600. After reboot, login TR600's web configuration page, it can be seen that TR600 has connected to the internet with WAN.

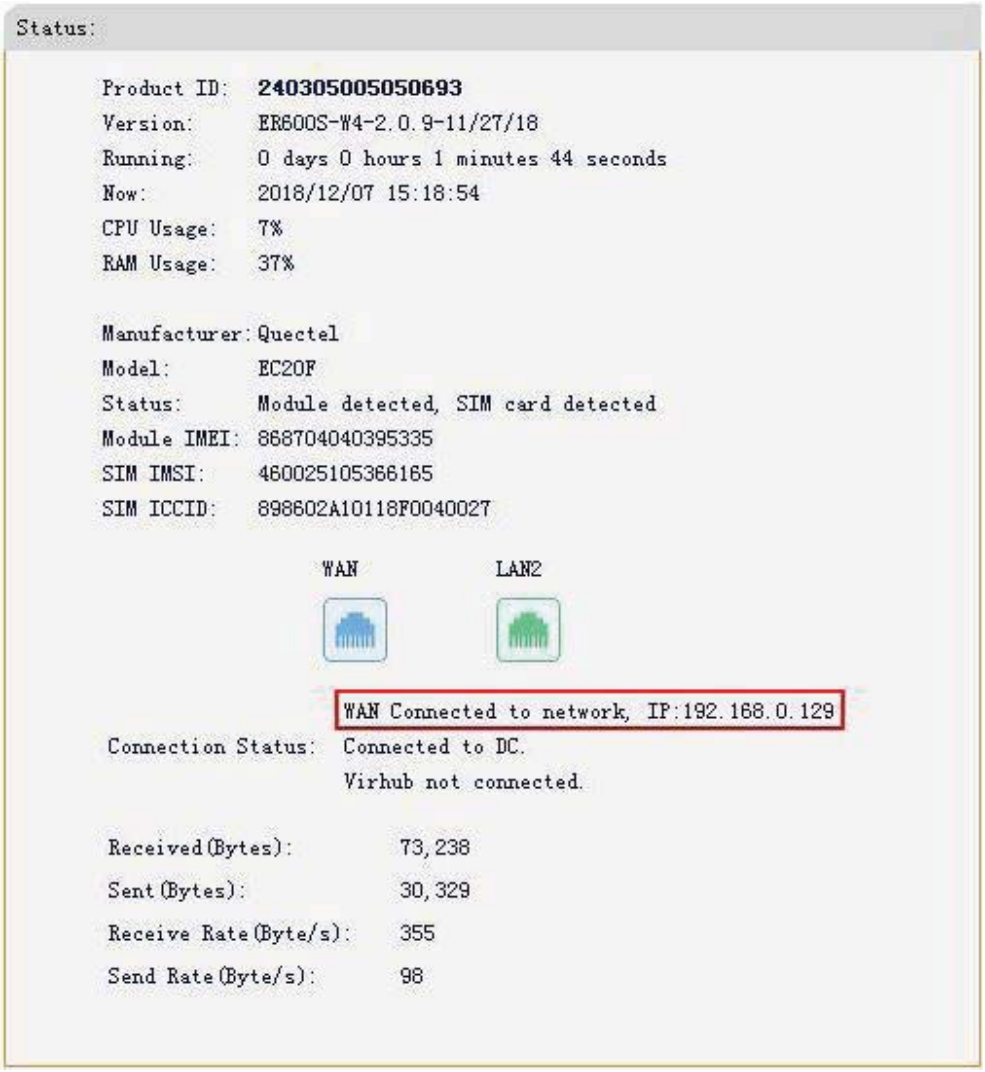


Figure Appendix 2-7: TR600 accesses Internet via WAN

2. Configure TR600 to access Internet via WIFI

TR600-W0 and TR600-W4 can access Internet via WIFI. According to the description of Ch. 2.1 Configurations, login TR600's webpage, choose "Network Settings" -> "Network Select", set network as WIFI, then click "Save".

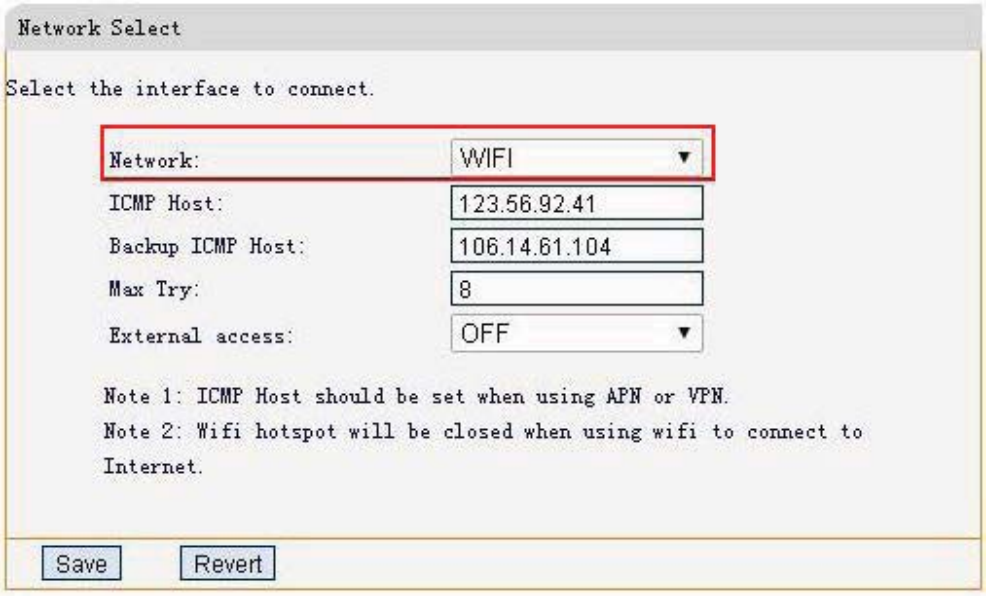


Figure Appendix 2-8: Set network as WIFI

Choose "Network Settings" -> "WIFI Client", to configure WIFI parameters.

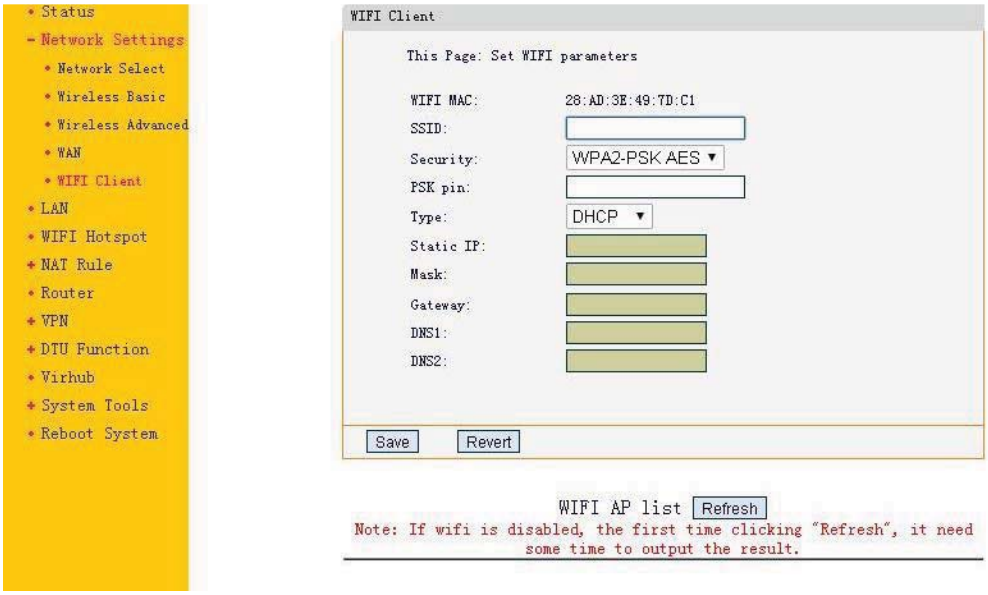


Figure Appendix 2-9: Configure WIFI parameters – 1

Click "Refresh" to search the WIFI APs around:

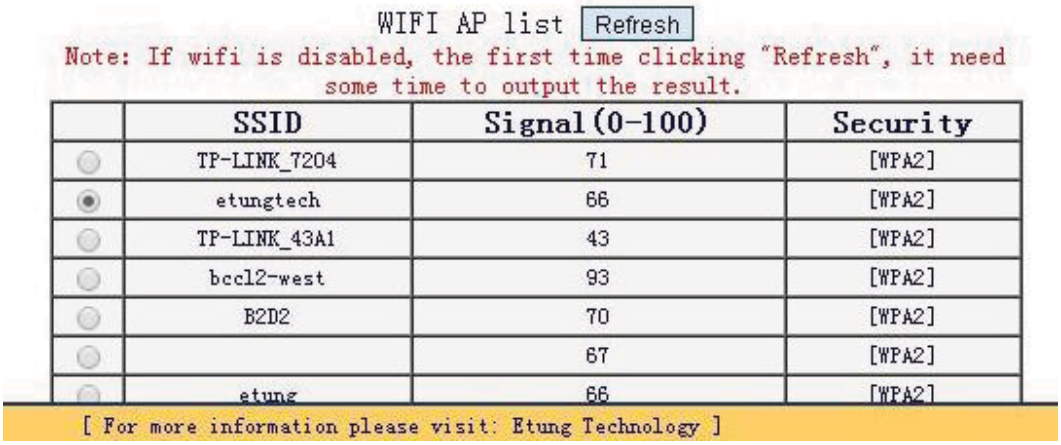


Figure Appendix 2-10: Search WIFI APs

Choose WIFI AP in the list, select security type, and input pin, then click "Save", and reboot TR600.

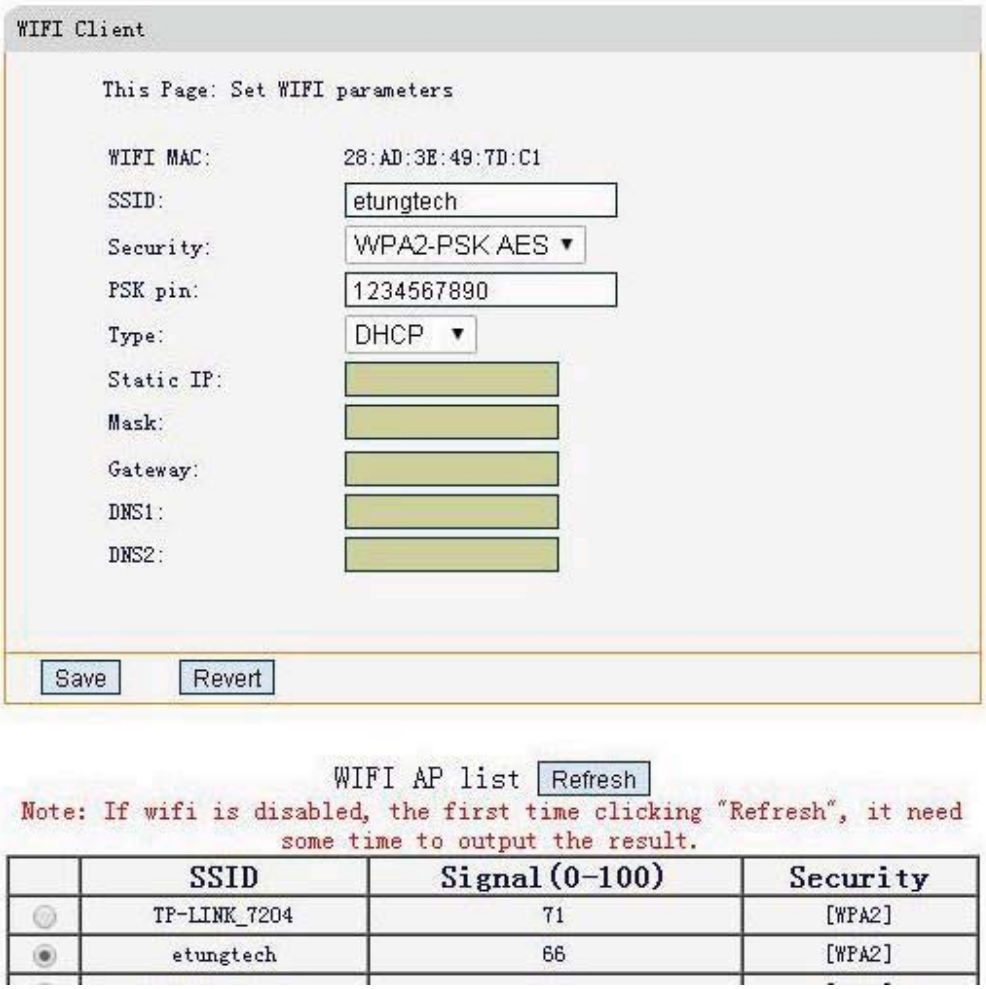


Figure Appendix 2-11: Configure WIFI parameters – 2

WAN will be disabled automatically once WIFI is enabled. After reboot, login TR600's web configuration page, it can be seen that TR600 has connected to the internet with WIFI.

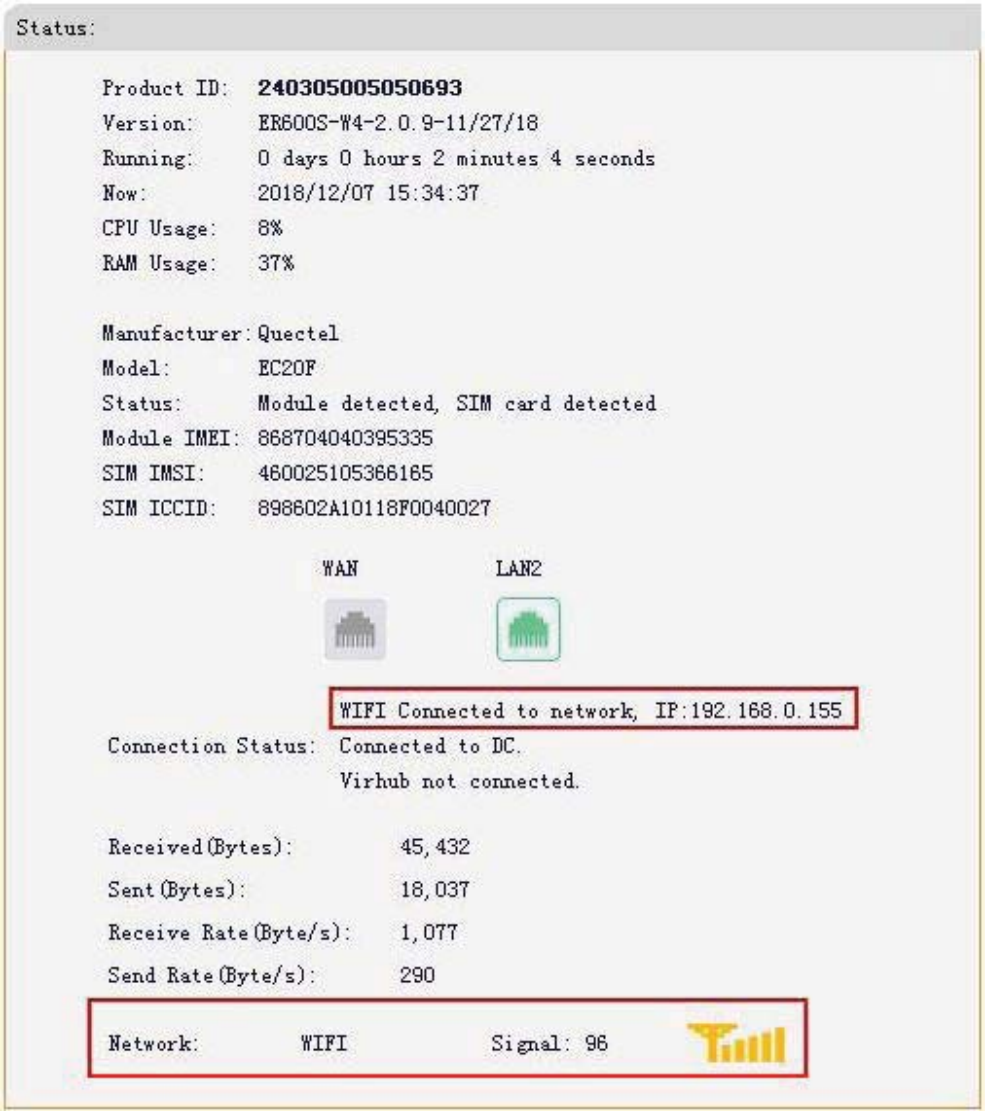


Figure Appendix 2-12: TR600 accesses Internet via WIFI

NOTE: Some TR600 types do not have WIFI module, and then cannot access Internet via WIFI.

Appendix 3: eYun Virhub Testing Case

1. **Apply eYun account**
   Access website http://3g.etungtech.com, press "Register", and input registration information. Pay attention that the password should not be too simple. Input a correct email address, then after submit the system will automatically send a web link to the mailbox, just click the link to enable the account.

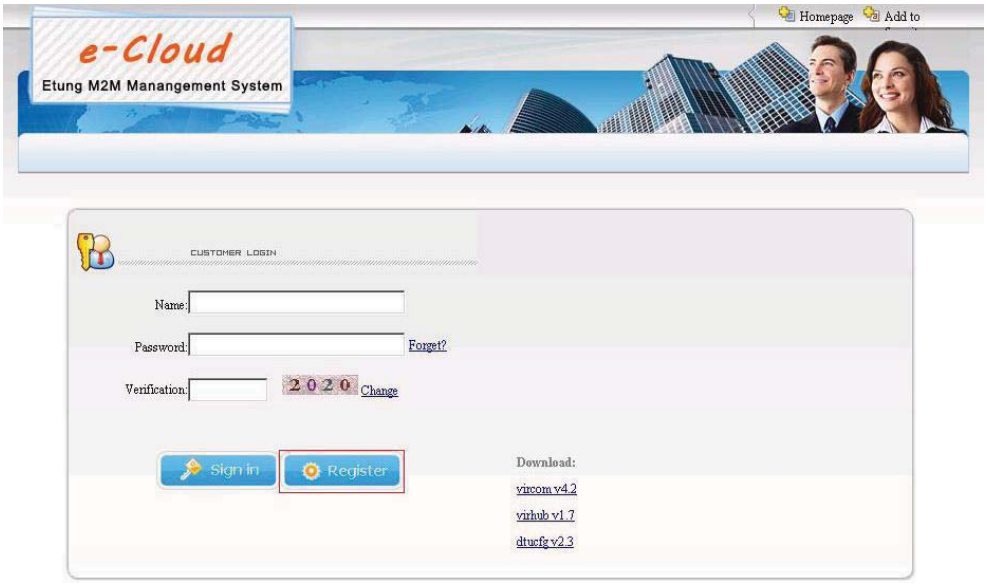


Figure Appendix 3-1: Apply eYun account

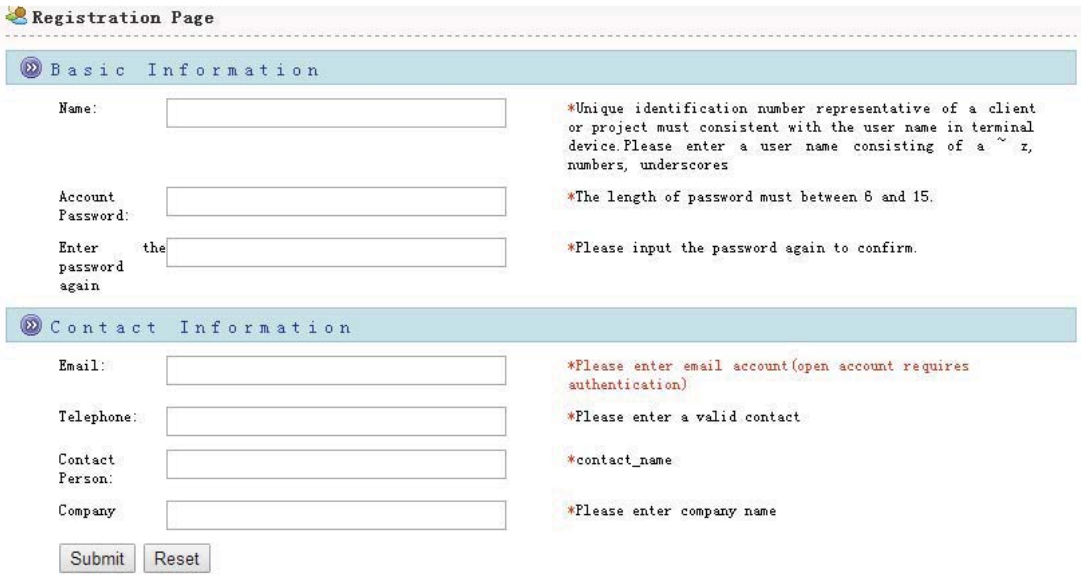


Figure Appendix 3-2: Input registration information

2. Configure TR600

- ✧ Connect TR600 with PC via Ethernet cross cable, and the IP address in PC is set to obtain automatically;
- ✧ Open browser and input URL: 192.168.1.1;
- ✧ Input username: root, and password: 1234 to login;
- ✧ Choose Virhub in the menu list;
- ✧ Input account, and then press "Save";
- ✧ Choose "Reboot System" in the menu list, and reboot TR600.

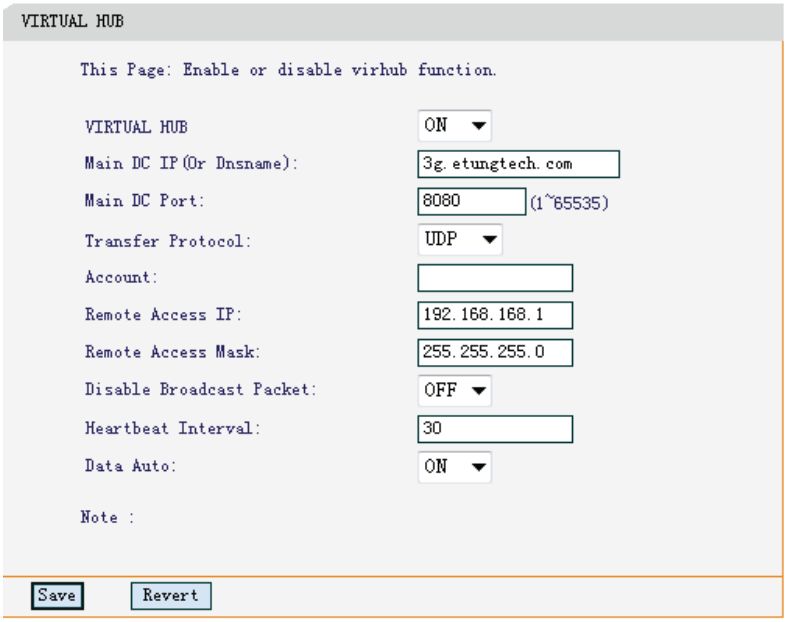


Figure Appendix 3-3: Configure Virhub function

3. Install Virhub software

Ask Virhub v5.x installation package from eTung (either from CD or eTung's website), install it on the host pc according to Virhub's installation guide.

4. Login in Virhub and start data transfer

Run Virhub and click "Settings", input the username and password applied before.

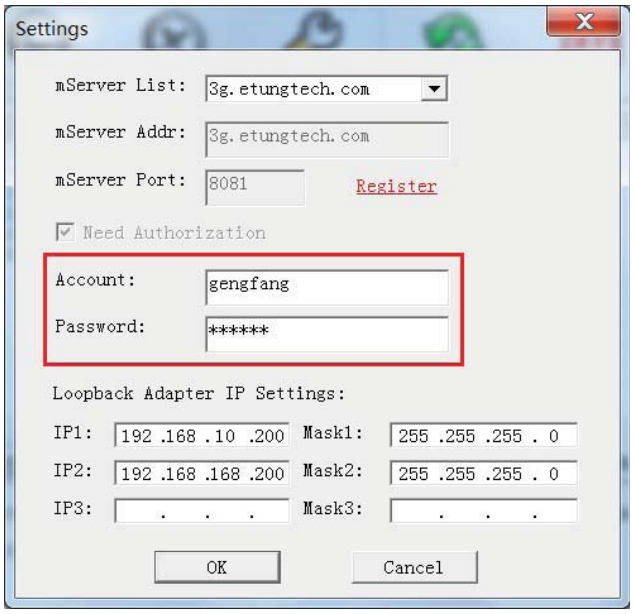


Figure Appendix 3-4: Login Virhub

1) Configure Microsoft Loopback adapter's IP address: in the "Settings" dialog, we can set Loopback adapter's IP address in "Loopback Adapter IP Settings". IP1 is used to build a virtual LAN with the front-end device (i.e. the Webcam), and it has to be in the same IP range as the front-end device's IP, for example, 192.168.3.*.

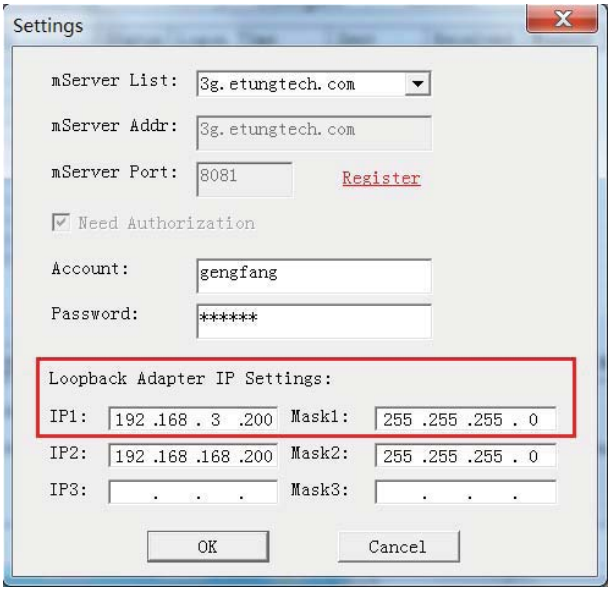


Figure Appendix 3-5: Configure Loopback adapter's IP address

Press "OK" after configuration, the software will set the IP address to the Loopback adapter.

2) Add device: if account name is not input when configuring Virhub function in TR600, then use "Add Device" in Virhub software to add TR-600 to the account: press "Add Device", and input the IMEI number

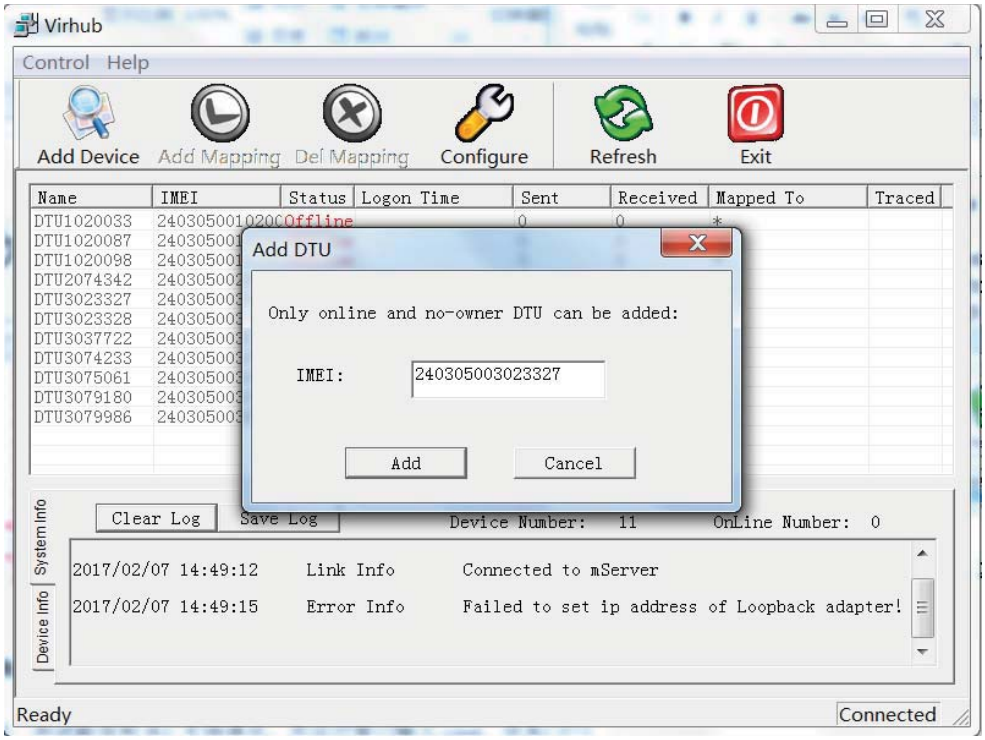


Figure Appendix 3-6: Add device

If add device fails, please first make sure if the SVR2 led light is on, that means TR600 has connected to eYun platform. If TR600 does not connect to eYun platform, add device will fail.

3) Then Virhub configuration is complete, check if the communication between host pc and PLC is OK. Open a cmd window, input command: ping 192.168.3.* (device's IP address), If there are responses, that means the communication is OK, and if there is no response for a long time, please contact eTung technical support.

4) Detect IP address of devices via Virhub
In order that PC running Virhub can communicate with devices at the far end that connect to TR600, the devices' IP must be known beforehand. Virhub's "Detect IP" functionality can automatically detect the devices' IP .
In Virhub's interface, right-click the terminal and choose "Detect IP", offer the device IP's subnet area, and then click "Detect IP"; and after a while, the IPs detected will be shown in the list, as shown in the figure below:

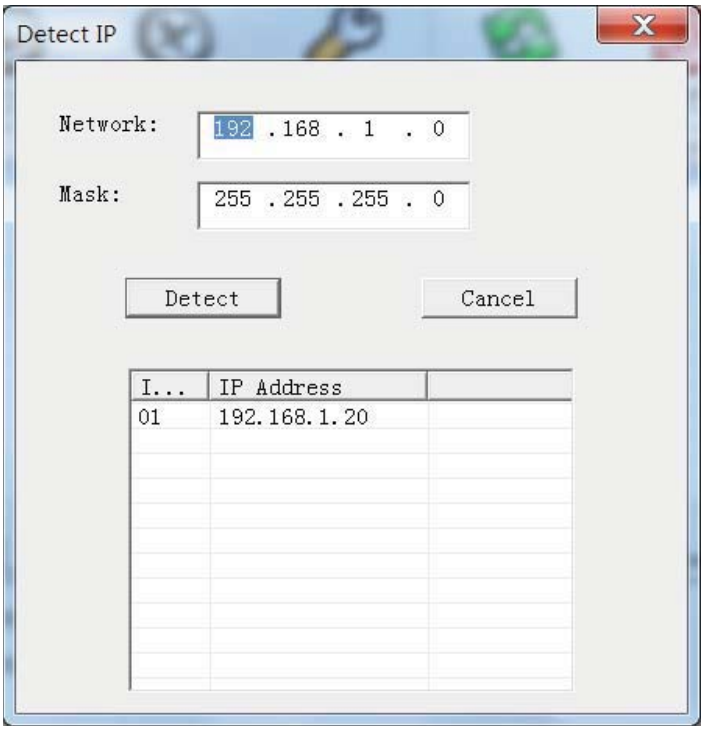


Figure Appendix 3-7: Detect device's IP address

Attention:
1) The terminal must be online to use this functinality;
2) Virhub version must be V5.9 or higher.

Appendix 4: eYun Vircom Testing Case

TR600 has two user serial ports, so it can be used as a DTU to connect with PLCs that have serial ports, and perform remote program download and transparent data transmission. eYun platform and Vircom functionality make it easier to implement remote access of PLCs that have serial port. Below we will illustrate the implementation in detail.

1. **Apply eYun account**
   Access website http://eyun.etungtech.com, press "Register", and input registration information. Pay attention that the password should not be too simple. Input a correct email address, then after submit the system will automatically send a web link to the mailbox, just click the link to enable the account.

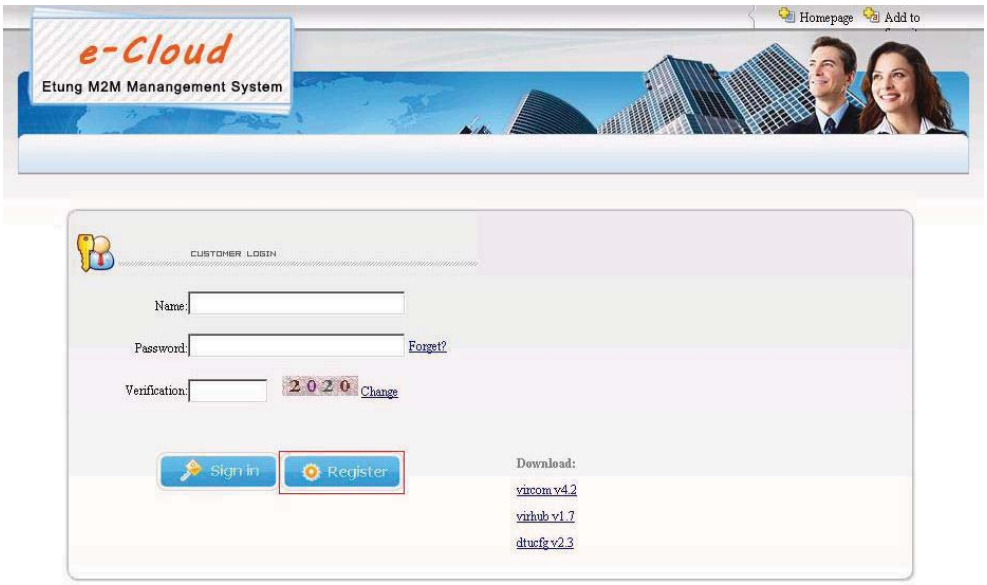


Figure Appendix 4-1: Apply eYun account

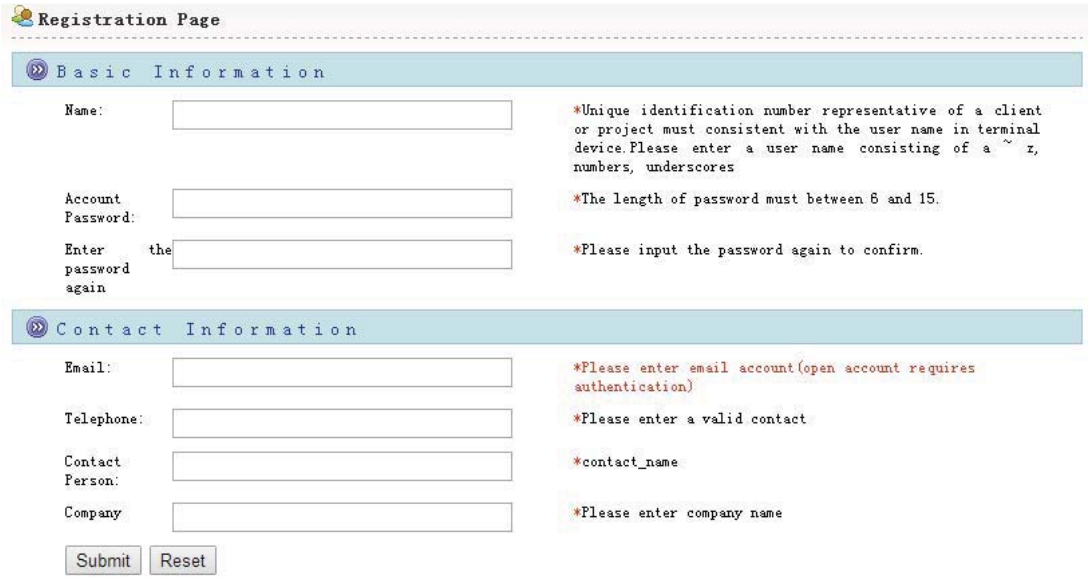


Figure Appendix 4-2: Input registration information

2. Configure TR600

- ✧ Connect TR600 with PC via Ethernet cross cable,
- ✧ the IP address in PC is set to obtain automatically;
- ✧ Open browser and input URL: 192.168.1.1;
- ✧ Input username: root, and password: 1234 to login;
- ✧ Choose DTU function in the menu list;
- ✧ Input main DC IP: eyun.etungtech.com
- ✧ Input main DC port: 8080
- ✧ Input account registered above;
- ✧ Select UART type: 232 or 485;
- ✧ Set serial port parameters: baud rate, data bits, stop bits, and parity;
- ✧ Click "Save";
- ✧ Choose "Reboot System" in the menu list, and reboot TR600.

NOTE: RS232 and RS485 serial ports cannot be used at the same time, choose one of them to use in DTU function->Basic Cfg.

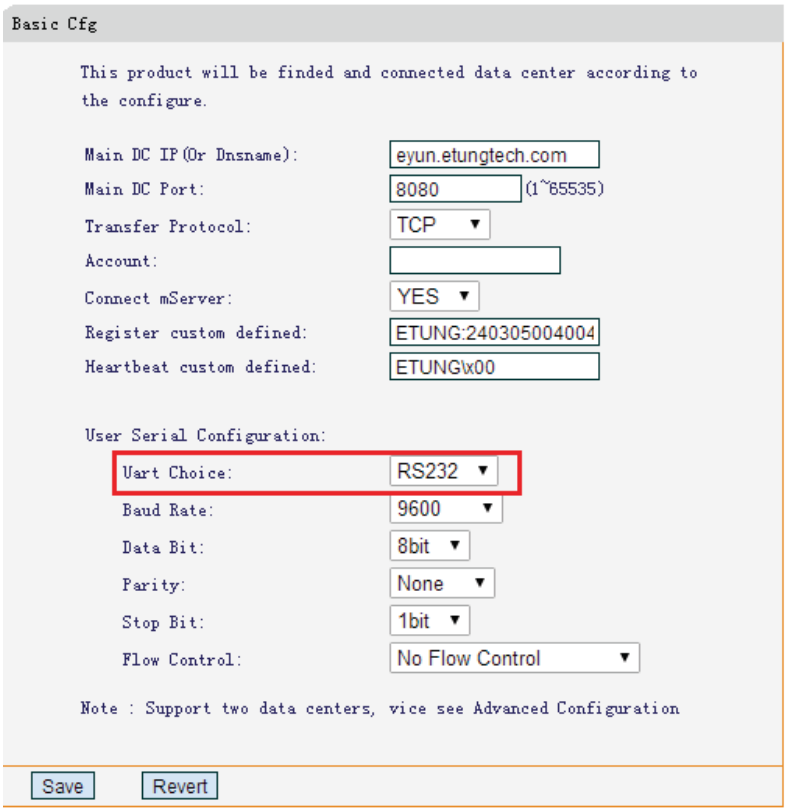


Figure Appendix 4-3: Configure DTU parameters

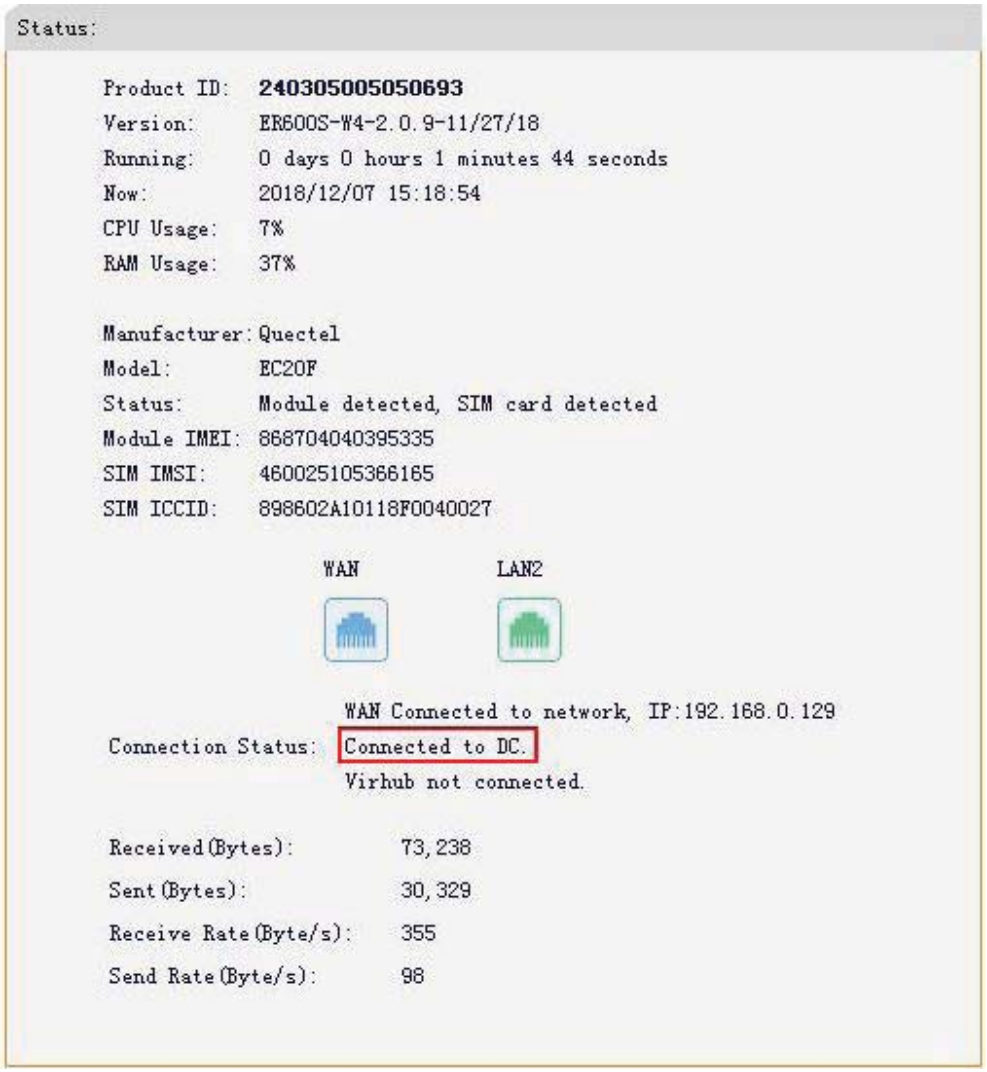


Figure Appendix 4-4: DTU connected to DC

3. Login Vircom and test communication

Find Vircom installation package from eTung website: www.etungtech.com, and Download Center->DTU related, then download and install Vircom.

- ✧ Run Vircom software, and click "Configure", then input the username and password applied before;
- ✧ If user account is not configured in TR600's DTU function, please add the device in Vircom by clicking "Add DTU", then input TR600's IMEI number to add the device;
- ✧ Choose the device, and then click "Add Mapping" to map a virtual COM for TR600;
- ✧ Run PLC program software to open the virtual COM and send/receive data.

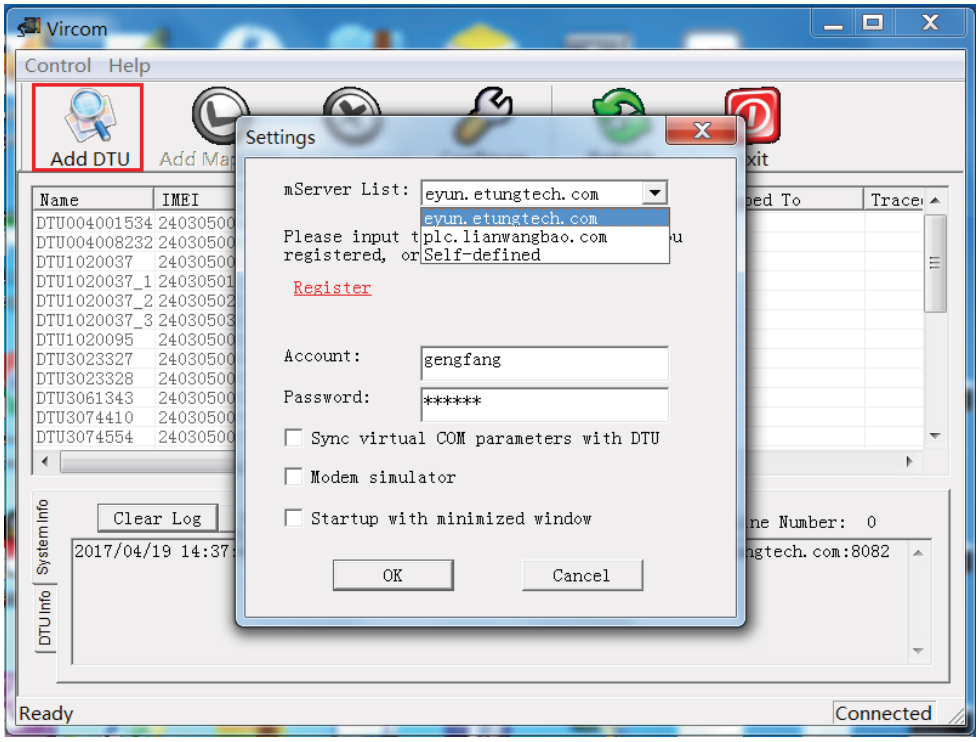


Figure Appendix 4-5: Configure Vircom and choose mServer

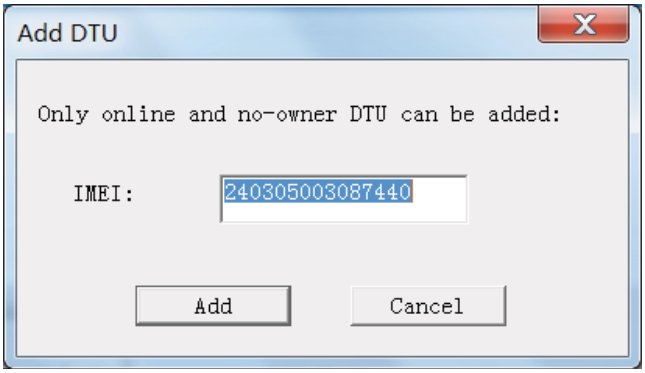


Figure Appendix 4-6: Add device

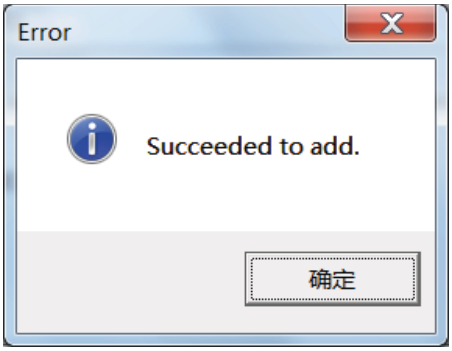


Figure Appendix 4-7: Succeed to add device

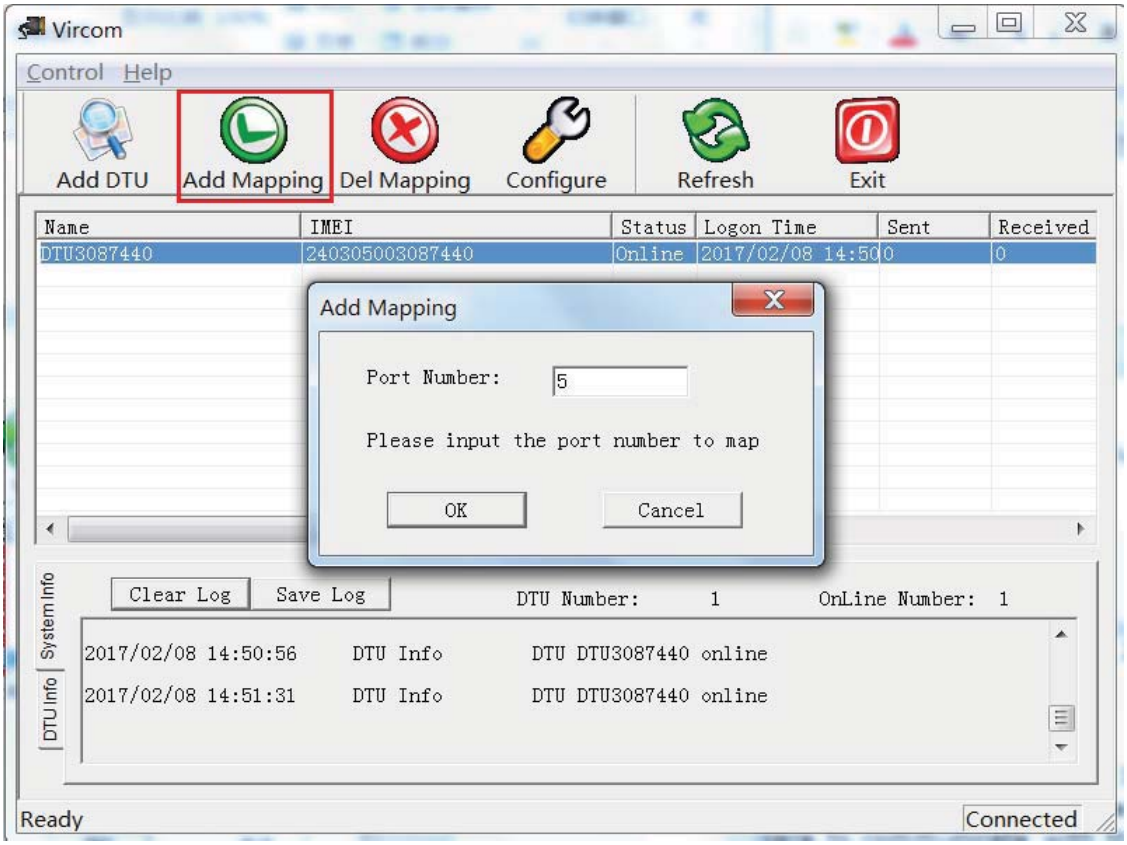


Figure Appendix 4-8: Map a virtual COM

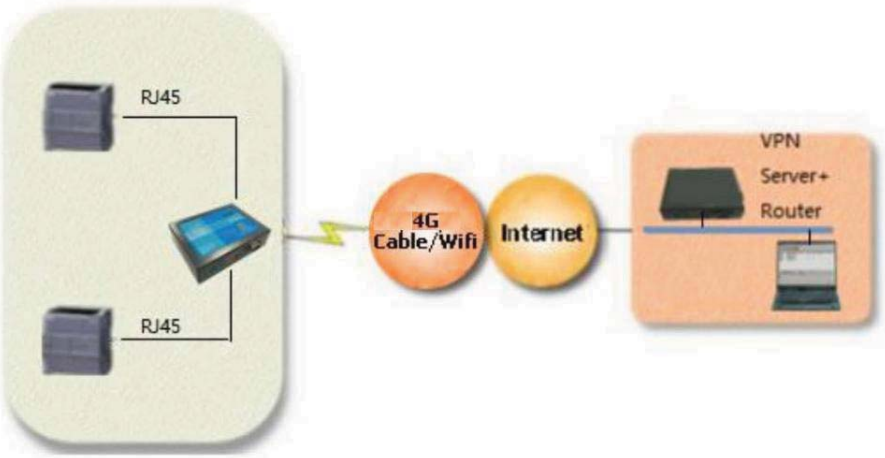
Name	IMEI	Status	Logon Time	Sent	Received	Mapped To	Tra
DTU3087440	240305003087440	Online	2017/02/08 14:50	0	0	COM5	

Figure Appendix 4-9: Succeed to map virtual COM

Appendix 5: Use TR600 to Access LAN Remotely via VPN

TR600 can be used to extend and access the corporate virtual LAN remotely with VPN function, for example, the user can use TR600 to dial into corporate LAN. But the router in user's corporate LAN should support VPN in this way. We will illustrate below how to implement this kind of network connection with VPN.

1. System Architecture



2. Preparations

1) One router with VPN function(use PPTP protocol as an example), a LAN is attached to this router and can access internet;
2) One TR600(including accessories) 3)

One USIM card with internet service

4) One PC

3. Steps

1) Configure to use PPTP when accessing the router

Here we use router RV042 from linksys as an example. First, this router supports VPN and PPTP protocol. Login this linksys router. and click "VPN"->"PPTP", enable PPTP server and set the IP range for VPN connection, then create username and password used for VPN connection,

as shown in the figure below:

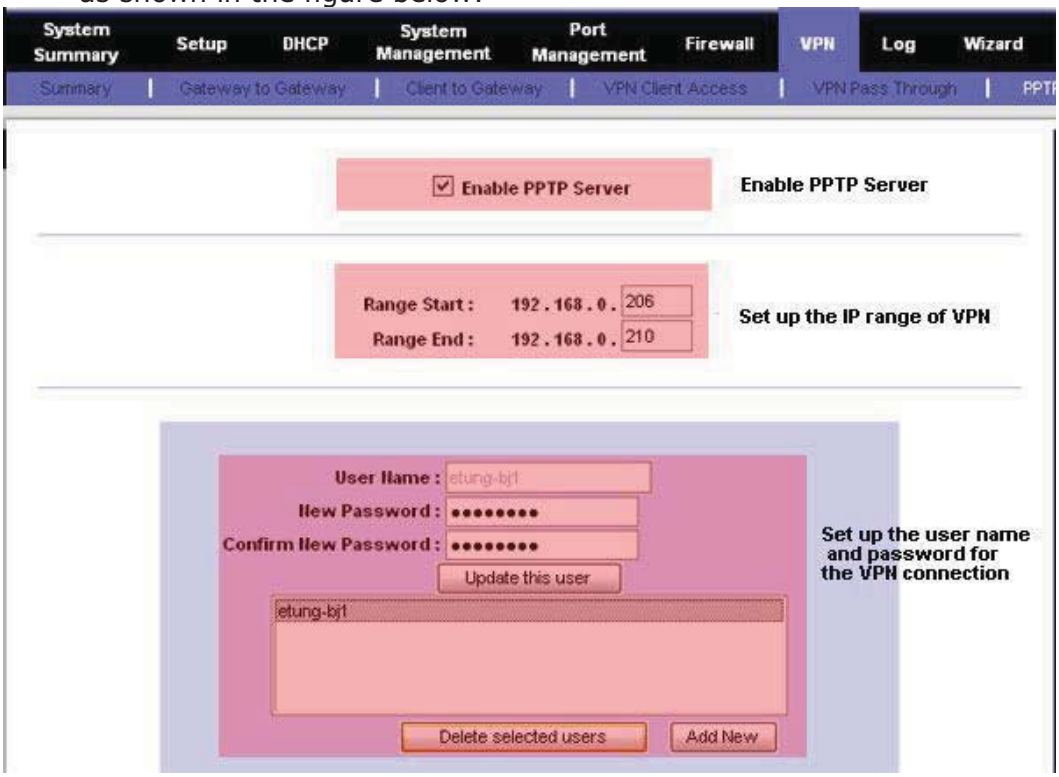


Figure Appendix 5-2: Configure router's VPN function

Actually different routers have different configuration interface and options, we can configure it accordingly.

2) Configure TR600

Login TR600's configuration interface, click "VPN function" and configure it as shown in the figure below:

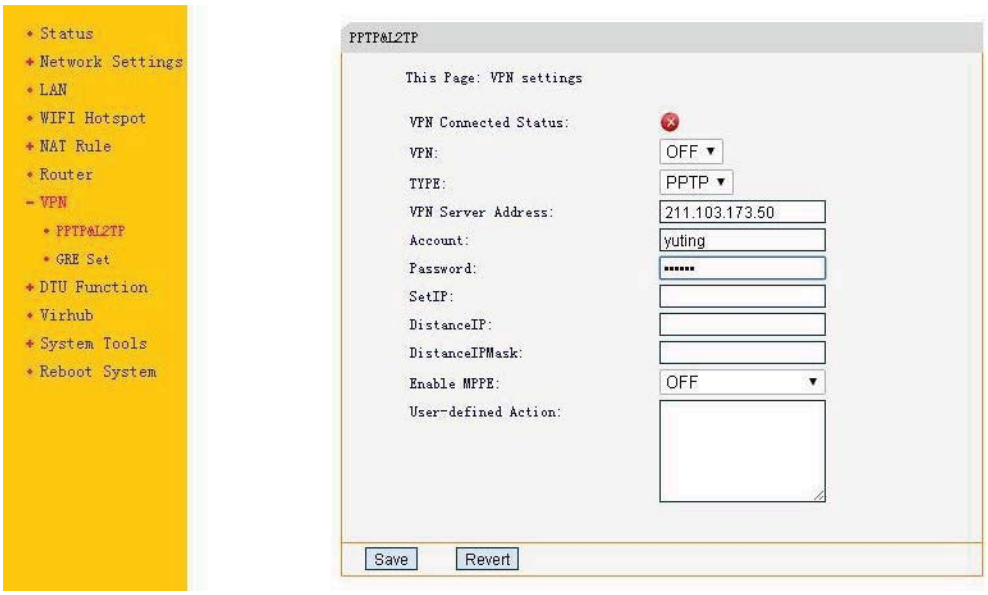


Figure Appendix 5-3: Configure account for VPN function

Type -- PPTP or L2TP

VPN server IP or domain -- the IP address on corporate LAN side, if the IP address is not static, we recommend to apply a domain free of charge from Oray or Gnway, then input the domain here, TR600 supports domain resolving.

Username -- the username configured in the router at corporate LAN side, i.e. the username configured in linksys router before;

Password -- the password configured in the router at corporate LAN side, i.e. the password configured in linksys router before;

VPN function -- ON, to enable VPN connection.

After all settings are complete, reboot TR600.

3) Check dialing status

Login TR600 to check dialing status, as shown in the figure below:

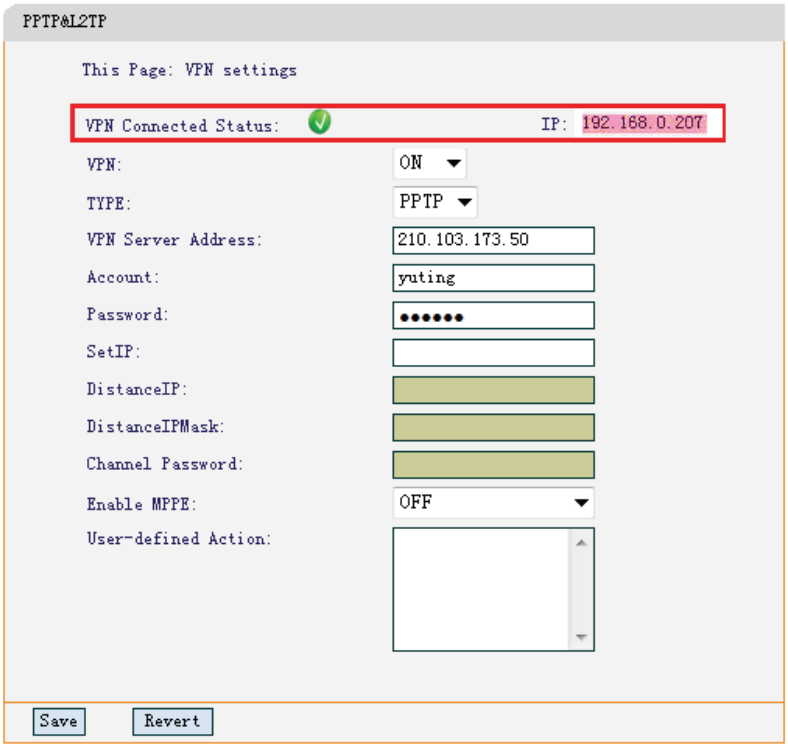


Figure Appendix 5-4: TR600 status of accessing LAN

At this time, TR600 is connected to the corporate LAN, and visiting http://192.168.0.207 inside the corporate LAN can see ER-600's web login interface, and at the same time TR600 can access resources inside the corporate LAN.

If we connect a video server to TR600, and configure port forwarding or DMZ host on ER-600, we can then access http://192.168.0.207 inside the corporate LAN and then access the video monitoring interface.

Notes:

1） The IP address used by PC or video server that is connected to TR600 must not be in the same range as those IP addresses at the corporate LAN side. For example, if the IP range at the corporate LAN side is 192.168.0.*, then TR600 should be in other IP range, for example 192.168.1.*.

2） TR600 and the PC or video server that connects to it should be in the same IP range. TR600's default gateway is 192.168.1.1, and if the IP range of the PC or video server that connects to TR600 need to be 192.168.0.*, then change TR600's gateway to the same range, for example 192.168.0.1.

Appendix 6: Configure GPS Query Settings and GPS data format

TR600-N4G embeds GPS model and supports device location. GPS location information can be actively transferred by TR600 to the host PC, or: the host PC sends AT+GPS? command to query GPS location information, or: the device connecting TR600 sends AT+GPS? command via serial port to query GPS location information.

As shown in the figure below, in TR600's configuration webpage, choose "DTU function" -> "Simple Cfg", set GPS report interval in seconds. Setting it to 0 means TR600 will not actively transfer location information to the host PC.

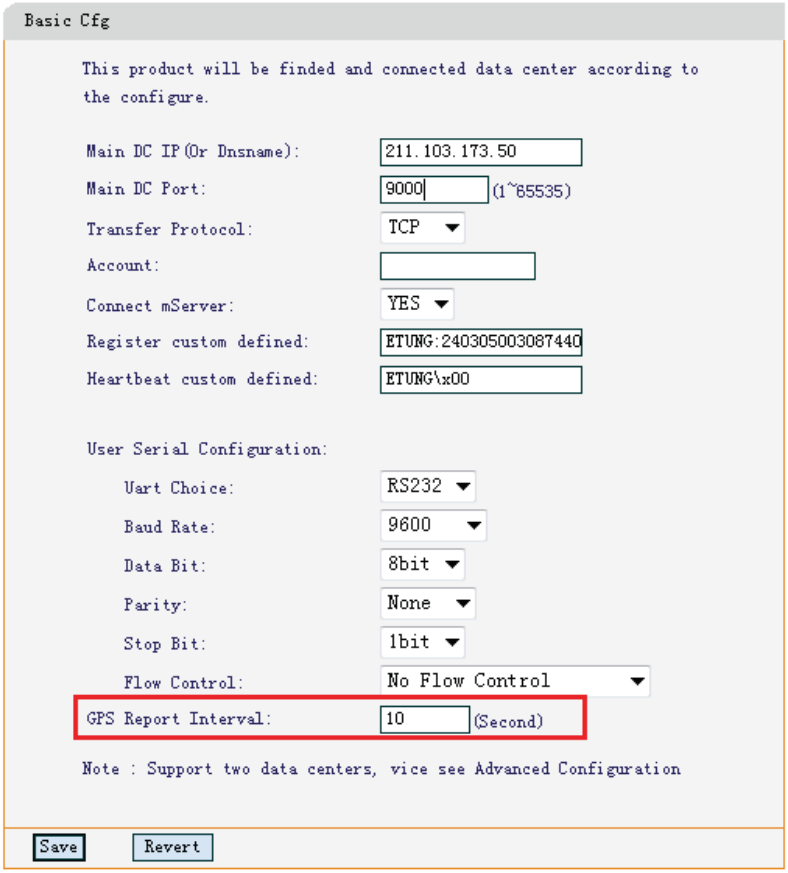


Figure Appendix 6-1: Set GPS report interval

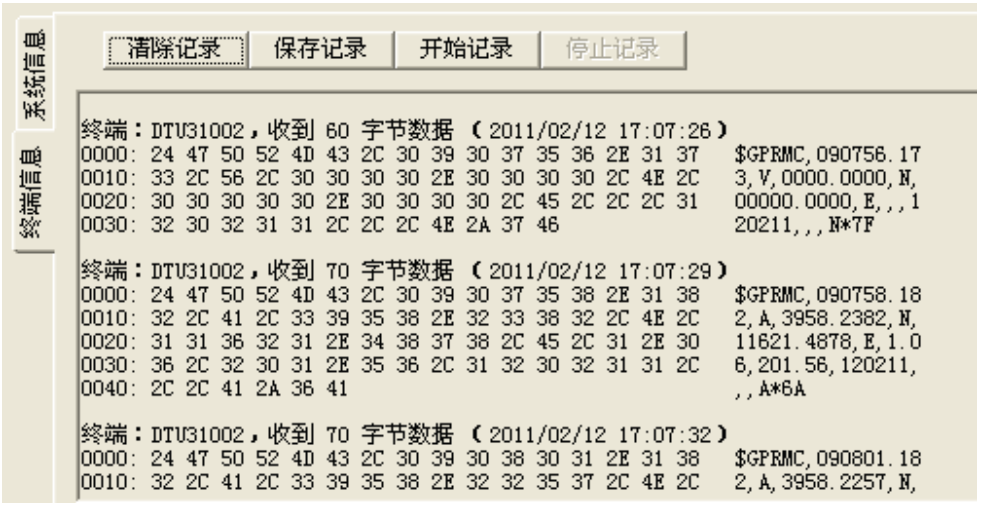


Figure Appendix 6-2: GPS data

①$GPRMC,090756.173,V,0000.0000,N,00000.0000,E,,,120211,,,N*7F

②$GPRMC,090758.182,A,3958.2382,N,11621.4878,E,1.06,201.56,120211,,,A*6A

The figure above is the GPS data transferred to mServer, the data format is described below, with ② as an example.

Name	Example	Unit	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	090758.182		hhmmss.sss, in the example it is 09:07 and 58.182 seconds UTC time
Status	A		A means valid location information; V means invalid location information
Latitude	3958.2382		ddmm.mmmm, in the example it is 39 degrees 58.2382 minutes
South/North Latitude	N		N means North latitude, S means South latitude
Longitude	11621.4878		ddmm.mmmm, in the example it is 116 degrees 21.4878 minutes
East/West Longitude	E		E means East longitude, W means West longitude
Ground Speed	1.06	Mile/Hour	In the example, it means 1.06 miles/hour
Ground Course	201.56	Degree	Use north as the benchmark
Date	120211		ddmmyy, in the example it means Feb. 12th, 2011
Magnetic Variation		Degree	E means East, W means West
Check	*6A		
<CR><LF>			Mark of message end

Table Appendix 5-1: GPS data format

According to the description above, it can be seen that ① is invalid GPS location information, and ② is valid GPS location information.

Appendix 7: Send/Receive SMS with TR600's Ethernet Interface and SMS Format

TR600 supports sending/receiving SMSs via Ethernet interface. The method is described below:
First, establish a TCP connection with the TR600's Ethernet IP (192.168.1.1 by default) and port: 8888; then use command AT+SMS or AT+SMSA to send SMSs. For example, use TCP Test Tool to send SMS as shown below:

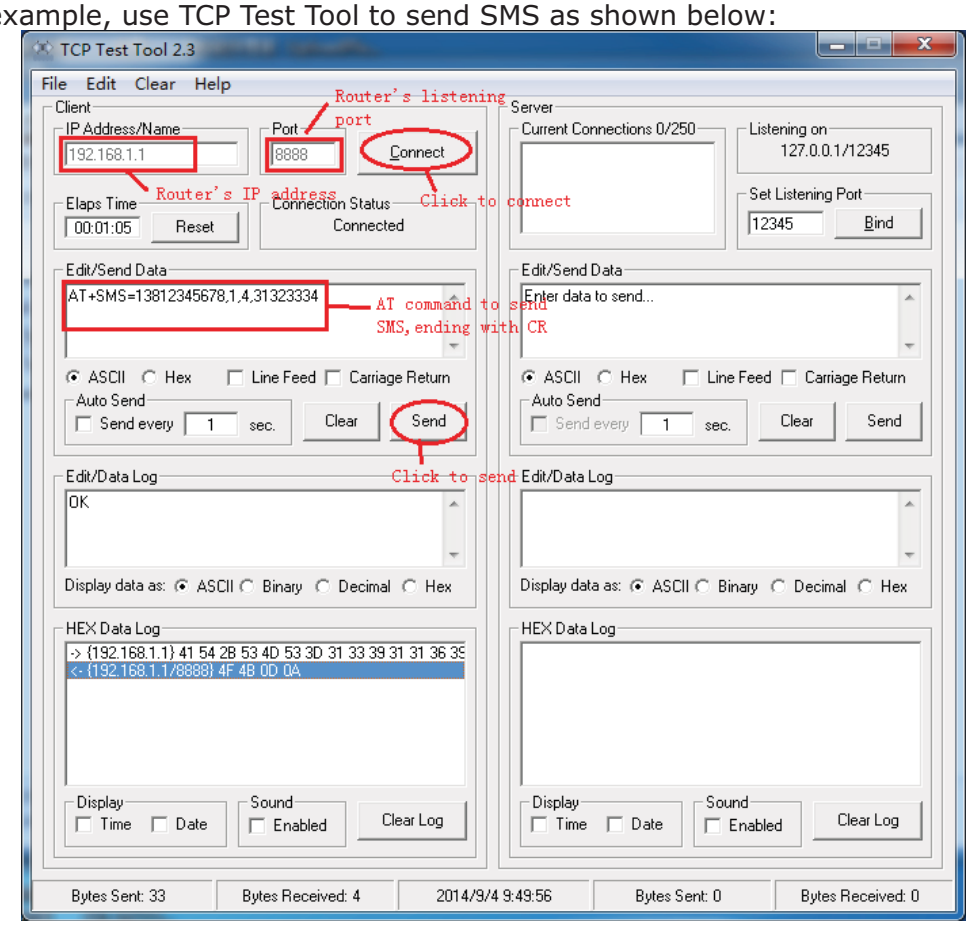


Figure Appendix 7-1: Send SMS via TR600's Ethernet interface

1) In the left part "Client", input TR600's Ethernet IP address "192.168.1.1" in "IP Address/Name", and TR600's listening port "8888" in "Port", then click "Connect" to establish TCP connection with TR600; if "Connected" is shown Connection Status, that means TCP Test Tool has connected to ER-600's listening port.
2) Input AT+SMS or AT+SMSA command in box "Edit/Send Data", and pay attention to end with CR, then click "send"; if "OK" is shown in box "Edit/Data Log", that means the command has been sent successfully.

NOTE:

1) Currently receiving long SMSs is supported, but sending long SMSs is not supported, i.e. the length of messages in English cannot exceed 160 characters, and the length of messages in Chinese cannot exceed 70 words.
2) AT commands must end with CR (0x0d), expressed below as "\r".

1. Using AT command to send short messages
   1) Special AT command for sending short messages with ASCII encoding via serial port:
      AT+SMSA=<target number>,<data length>,<data>\r

      DTU will send the following reply:
      \r\nOK\r\n
      Or:
      \r\nERROR\r\n
      Target Number: Phone number to receive the short message
      Data Length: The actual data length behind
      Data: The data to be sent, MUST with ASCII encoding.

      Examples:
      Send "1234" with ASCII encoding to 13812345678:
      AT+SMSA=13812345678,4,1234\r
      Below is the command shown in hexadecimal:
      41 54 2B 53 4D 53 41 3D 31 33 38 31 32 33 34 35 36 37 38 2C 34 2C 31 32 33 34 0D

   2) General AT command for sending short messages via serial port:
      AT+SMS=<target number>,<encoding format>,<data length>,<data>\r
      DTU will send the following reply:
      \r\nOK\r\n
      Or:
      \r\nERROR\r\n
      Target Number:Phone number to receive the short message
      Encoding Format: 1:ASCII encoding, 2:8bit encoding, 3:Unicode encoding
      Data Length: The actual data length behind
      Data: The data to be sent, each byte should be formatted to a 2-byte hexadecimal number, for instance "1234" should be written as"31323334".

Examples:
Send "1234" with ASCII encoding to 13812345678:
AT+SMS=13812345678,1,4,31323334\r
Below is the command shown in hexadecimal:
41 54 2B 53 4D 53 3D 31 33 38 31 32 33 34 35 36 37 38 2C 31 2C 34 2C 33 31 33 32 33 33 33 34 0D

Use 8bit encoding to send "1234"to 13812345678:
AT+SMS=13812345678,2,4,31323334\r
Below is the command shown in hexadecimal:
41 54 2B 53 4D 53 3D 31 33 38 31 32 33 34 35 36 37 38 2C 32 2C 34 2C 33 31 33 32 33 33 33 34 0D

Use Unicode encoding to send "你好" to 13812345678:
AT+SMS=13812345678,3,4,4F60597D\r
Below is the command shown in hexadecimal:
41 54 2B 53 4D 53 3D 31 33 38 31 32 33 34 35 36 37 38 2C 33 2C 34 2C 34 46 36 30 35 39 37 44 0D

2. The received SMS messages will be output via the serial port in the format below:
   1) Format for SMS messages received with ASCII encoding
      If the content of received SMSs is in ASCII format, the output is in the following format:

      \r\n+SMSA:<phone number>,<data length>,<data>\r\n

      Examples:
      "1234" received from 13812345678 in ASCII format:
      \r\n+SMSA:13812345678,4,31323334\r\n

      If the received SMS has more than one message, the format is as below:
      \r\n+SMSAL:<identifier>,<total>,<sequence number>,<phone number>,<data length>,<data>\r\n
      The messages with the same identifier can be assembled into one long SMS.
      For example, a long SMS is received from 10001, with identifier 05000376, total 4 messages, and below is the fourth message:
      \r\n+SMSAL:05000376,4,4,10001,6,123456

   2) Format for SMS messages received with encodings other than ASCII
      If the content of received SMSs is not in ASCII encoding, for example with Chinese characters, the output is in the following format:

      \r\n+SMS:<phone number>,<encoding format>,<data length>,<data>\r\n

      Examples:

“1234” received from 13812345678 in 8bit encoding:
\r\n+SMS:13812345678,2,4,31323334\r\n
“你好” received from 13812345678 in Unicode encoding:
\r\n+SMS:13812345678,3,4,4F60597D\r\n

If the received SMS has more than one message, the format is as below:
\r\n+SMSL:<identifier>,<total>,<sequence number>,<phone number>,<encoding format>,<data length>,<data>\r\n
The messages with the same identifier can be assembled into one long SMS.
For example, a long SMS is received from 10001, with identifier 05000376, total 4 messages, and below is the fourth message:
\r\n+SMSL:05000376,4,4,10001,3,6,007600793002

Appendix 8: Send/Receive SMS with TR600's Serial Port

TR600 supports sending/receiving SMSs via user serial port. The method is described below:

1) Connect PC (or user device) with TR600's RS232 serial port via female-female RS232 cross cable; (Use RS485-to-RS232 converter if RS485 serial port is used on TR600)
2) Go to TR600's configuration web page, according to Ch. 2.1 Configurations, and choose "DTU function" ->"Simple Cfg" to set parameters for user serial port, including serial type(Uart Choice), baud rate, data bits, parity, stop bits and flow control; by default they are RS232, 9600, 8, No parity, 1, and No flow control. Make sure that the values of these parameters are set the same both on the user device and on TR600. Click "Save" after change and reboot TR600.

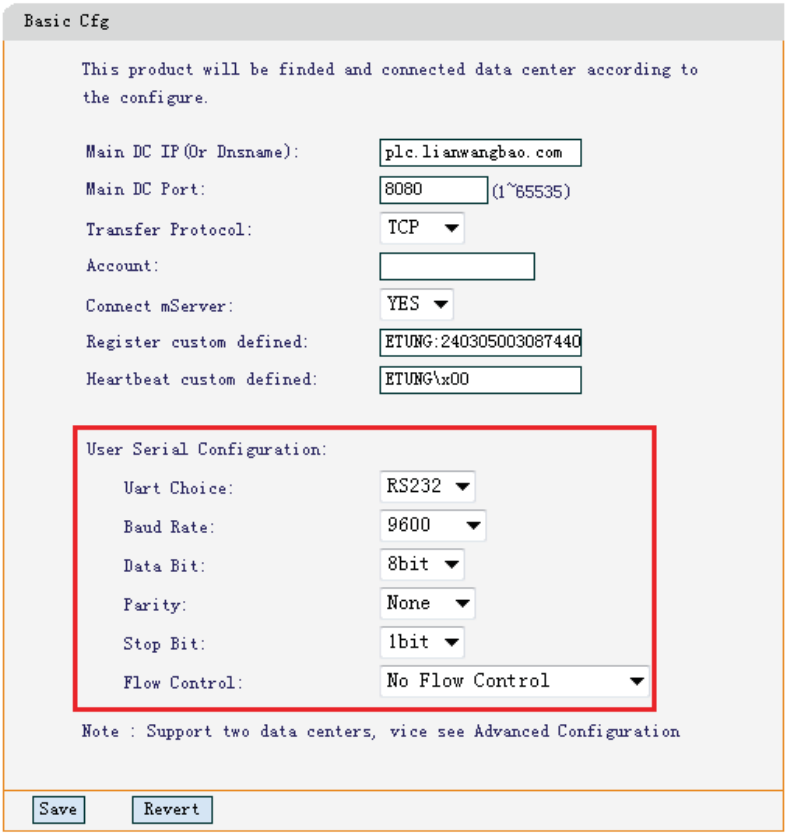


Figure Appendix 8-1: Configure TR600's serial port

3) Use command AT+SMS or AT+SMSA on PC (or user device) to send SMSs. For example, use tool Serial Interface on PC to send SMS, choose COM1 and set baud rate to 9600, then click "Connect", then input AT command in the serial input box at the bottom and click "Send"; "OK" appears in the output box means that the SMS has been sent successfully.

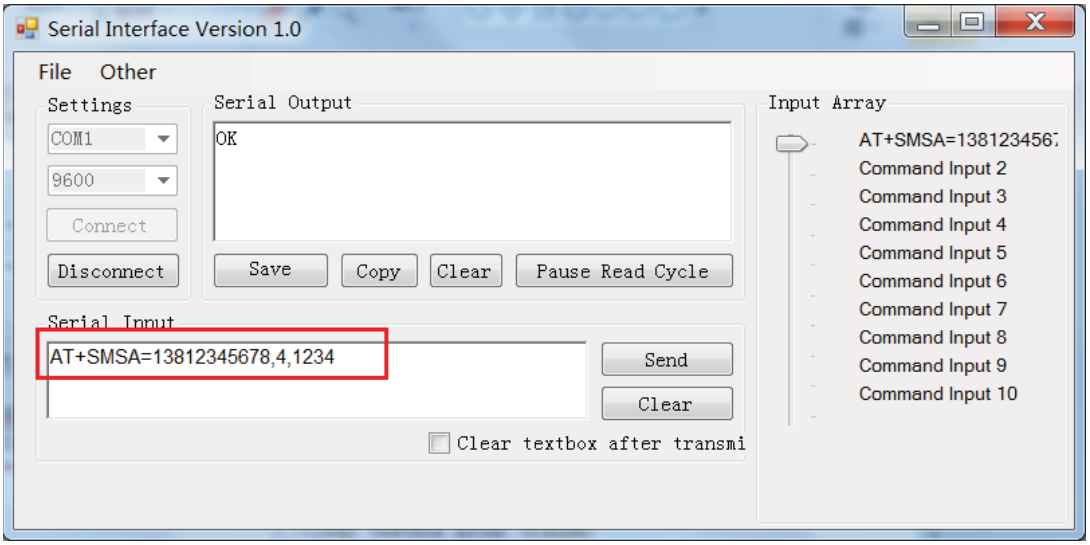


Figure Appendix 8-2: Send SMS via TR600's serial port

4) Meanwhile, TR600 can receive and output SMSs from the user serial port, as shown below:

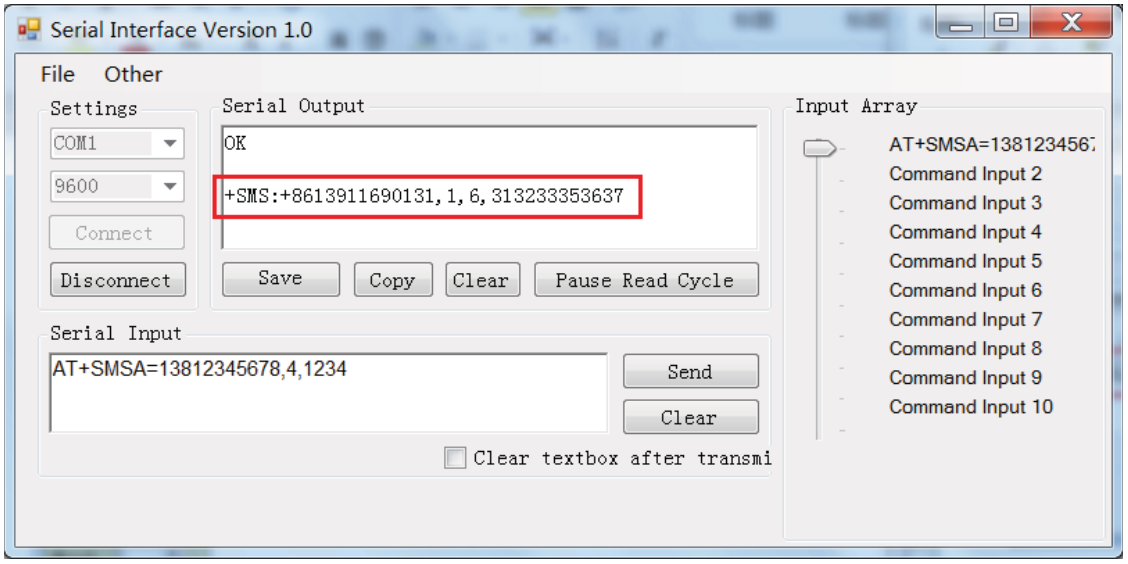


Figure Appendix 8-3: Receive and output SMS via TR600's serial port

NOTE:

1) TR600's RS232 serial port is standard RS232 DB9 male interface, and if the user device's serial port is also DB9 female interface, use a standard RS232 female-male cable to connect TR600 and user device, otherwise us female-to-female cross cable to connect user device and TR600.
2) Currently receiving long SMSs is supported, but sending long SMSs is not supported, i.e. the length of messages in English cannot exceed 160 characters, and the length of messages in Chinese cannot exceed 70 words.
3) AT commands must end with CR (0x0d), expressed below as "\r".

The AT commands to send/receive SMSs are described in "Appendix 7: Send/Receive SMS with TR600's Ethernet Interface and SMS F

FCC Statement

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, 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.

To assure continued compliance, any changes or modifications not expressly approved by the party.

Responsible for compliance could void the user's authority to operate this equipment. (Example- use only shielded interface cables when connecting to computer or peripheral devices).

This equipment 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.

FCC Radiation Exposure Statement:

The equipment complies with FCC Radiation exposure limits set forth for uncontrolled enviroment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.