ER-800 3G Router
User Manual

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1. Product Introduction

This chapter mainly introduces the outlook, accessories, specifications and mechanism of ER-800.

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1.1 Brief Introduction

ER-800 is a high speed WCDMA 3G router. It works in China Unicom's WCDMA network, can access internet and transfer video and data with high speed.

Comparing with eTung's MR-900W 3G routers, ER-800 has extended 4 Ethernet interfaces, and can connect 4 PCs via Ethernet cable at the same time. Thus when customers have multiple PCs at the spot that need to access the internet, they do not have to deploy additional hub or wireless communication devices. This can reduce device procurement cost and maintenance cost as well.

ER-800 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 has WIFI functionality, can bind ER-800's WIFI access point and share Internet access via ER-800. This greatly extends the number of devices that can connect with ER-800 at the same time. Meanwhile, with ER-800's WIFI and extended Ethernet interfaces, customers can build a small local area network, and all devices that connect to ER-800 via WIFI or physical Ethernet cable are in the same local area network, and can communicate each other freely.

ER-800 has built-in WEB configuration interface, and is easy to use.

ER-800 supports static routing, DMZ host, port forwarding and VPN, and has performance tuning function for high speed wireless applications as well. It can work stably and reliably in unattended environment.

In theory the uplink speed of data transfer is 5.76Mbps, and downlink speed is 21Mbps. ER-800 can connect quickly with web camera, video server, PLC and IPC, and transfer data from the customer device that connects with ER-800 to a host in the internet, so as to transfer data remotely and transparently. ER-800 can be widely used in industries such as banking, road transportation, power system, environment protection and industrial controlling.

1.2 Product Outlook

Power light

Network status light

Model status light

Signal light

WIFI light

LAN port lights
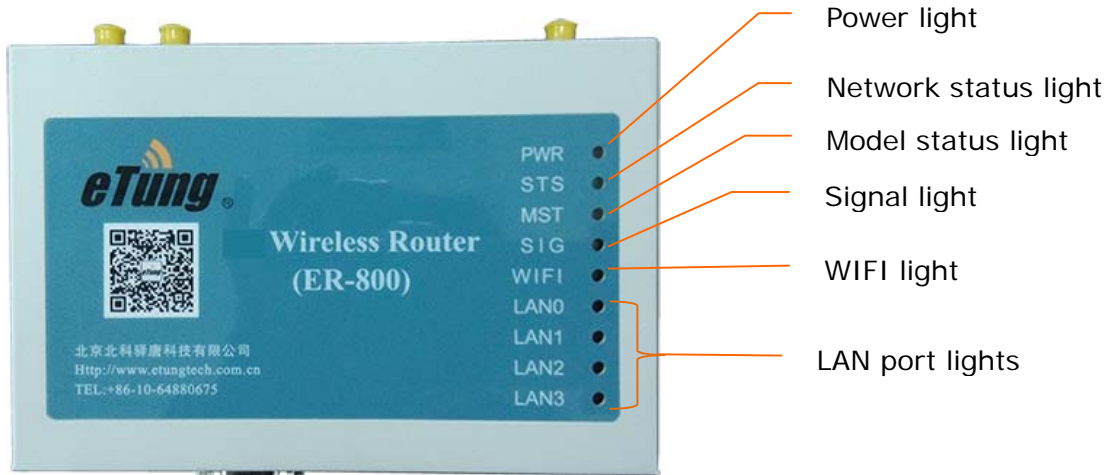
Figure 1-1: ER-800 front view

3G slave antenna

Power supply

LAN0~LAN3

WIFI antenna

Reset to default button

3G master antenna

Figure 1-2: ER-800 side view 1

Console Serial Port

SIM Card Slot
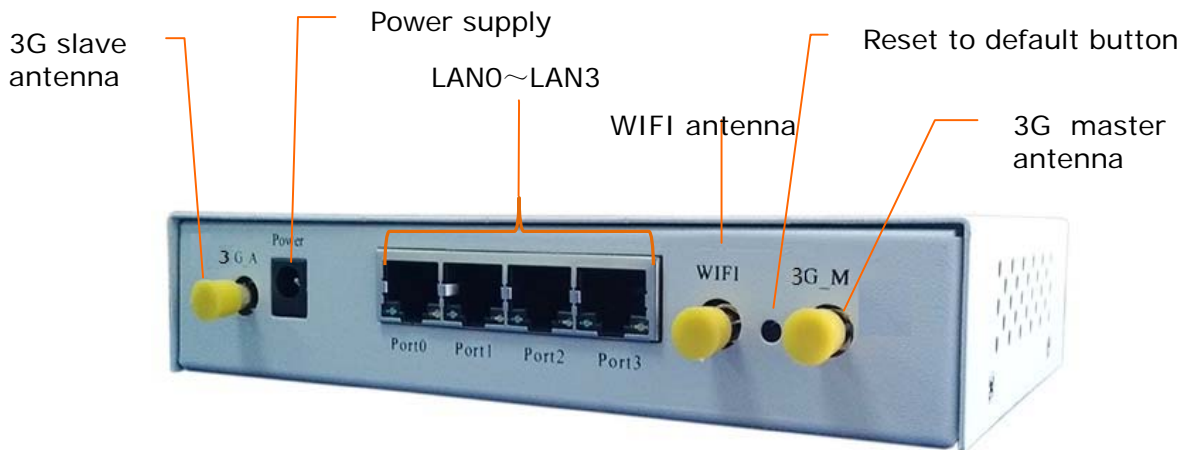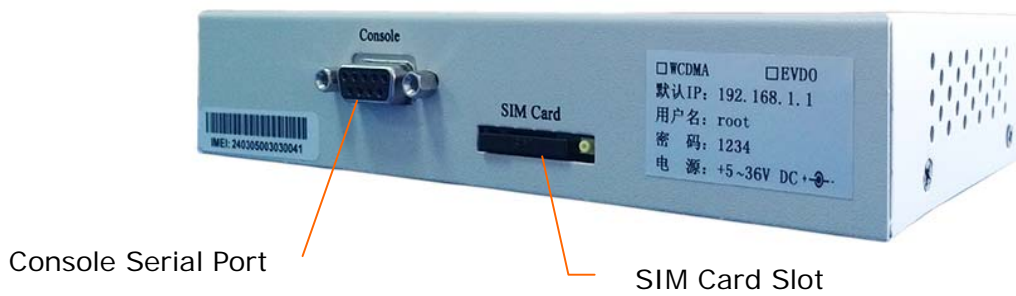
Figure 1-3: ER-800 side view 2

1.3 Standard Accessories

Figure 1-4: 3G all frequency sucking antenna

Figure 1-5: WIFI antenna

Figure 1-6: Cross cable

Figure 1-7: Power supply

1.4 Dimension

Bottom View

3mm hole has screw thread

Optional track installation accessories

Figure 1-8: ER-800 dimension with shell

Currently, ER-800 has two optional installation accessories: orbit type and flat type, as shown below.
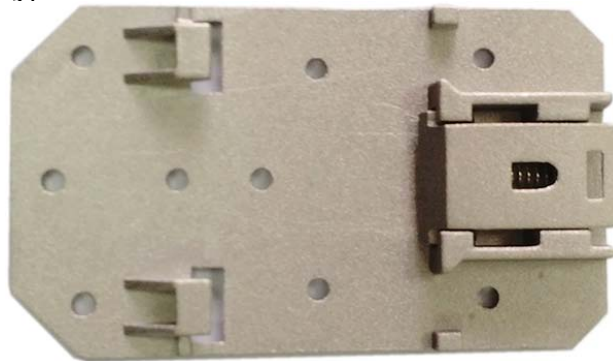
Figure 1-9: Orbit type installation accessory

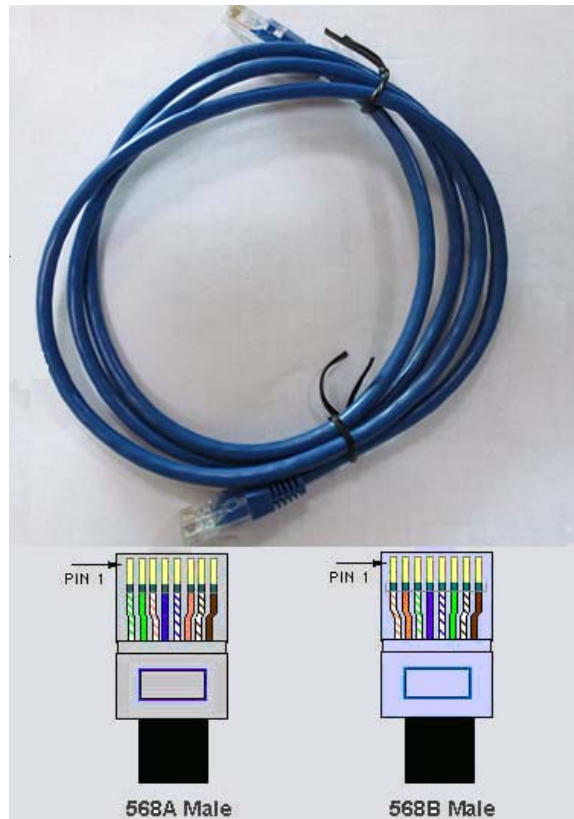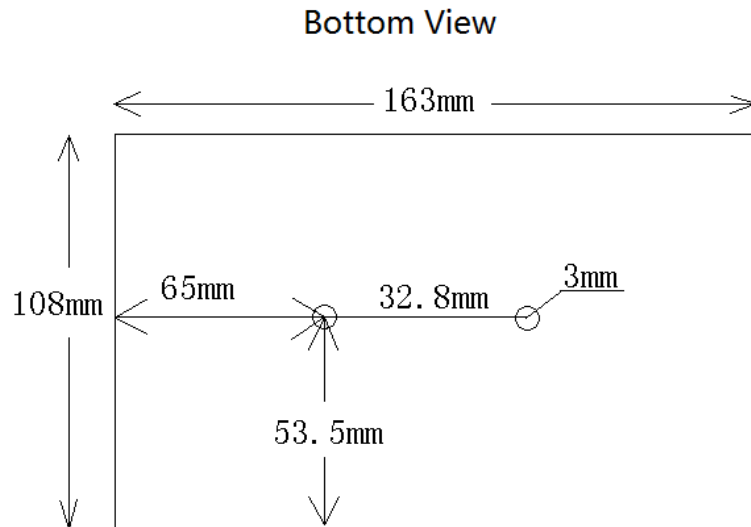Figure 1-10: Flat type installation accessory

Using orbit type installation accessory: fix the orbit type installation accessory on ER-800's two installation holes with screws, and then install ER-800 on the orbit of machine room with orbit type accessory.

Figure 1-11: Effect diagram of orbit type installation

Using flat type installation accessory: fix the flat type installation accessory on ER-800's two installation holes with screws, and then install ER-800 with the four installation holes on the installation accessory.
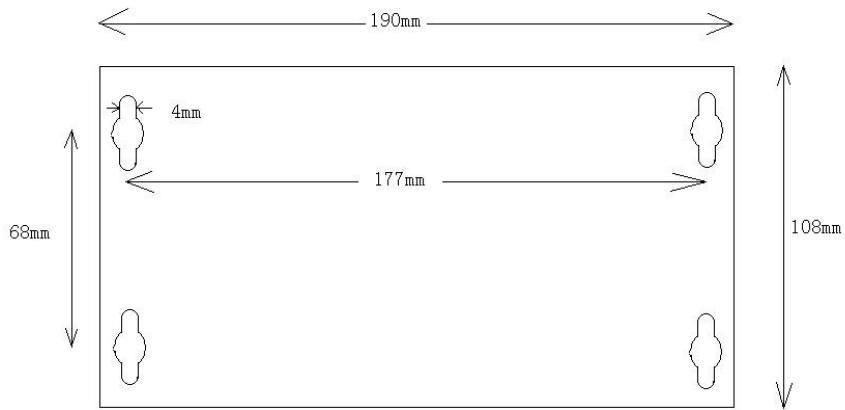
Figure 1-12: Dimension of flat type installation accessory

Figure 1-13: Effect diagram of flat type installation
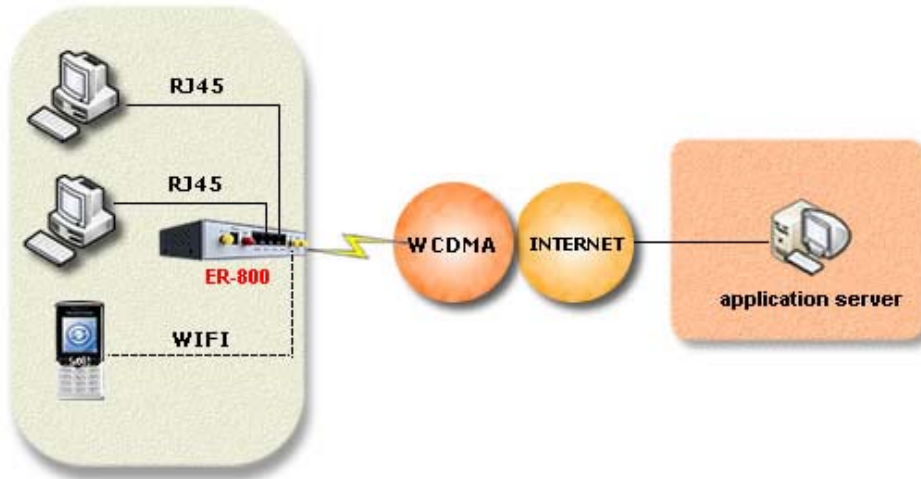
1.5 Working Mechanism

Figure 1-14: ER-800 working mechanism

PC connects to one of ER-800's Ethernet interfaces with a cross cable. After power on it dials via 3G wireless network and connects to the internet, then PCs can share the internet via ER-800, and access the application server. At the same time, using ER-800's WIFI functionality, PCs (or other devices that support WIFI) can connect to ER-800's WIFI access point, instead of connecting with Ethernet cable, to share the Internet access. Meanwhile, ER-800 can be used to build remote virtual LAN with Virhub or VPN, monitor video remotely, and publish programs remotely on LED color screens, etc.

1.6 Specifications

1.6.1 Technical Parameters

◆ Basic Parameters
  ✧ Power Supply: +9 ~ +36V wide range of voltage input
  ✧ Power Connector: inner(+) outer(-)
  ✧ Data Interface: 4 RJ45 Ethernet interfaces
  ✧ Network: GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA/WIFI
  ✧ Memory: RAM 64M FLASH 4M
  ✧ Frequency: UMTS/HSDPA/HSDPA850/900/1900/2100MHz
              Quad-BandGSM850/900/1800/1900MHz
              WIFI 802.11 b/g/n 2.4GHz

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✧ Max Current: 700mA@+5V DC, 300mA@+12V DC
✧ Standby Current: 560mA@+5V DC, 180mA@+12V DC
✧ Temperature: -30°C ~ +70°C
✧ Humidity: 95%@+40°C
✧ Dimension: 165*108*33mm

◆ 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 telnet and web interface
✧ Support flow wakeup, phone wakeup and SMS wakeup

1.6.2 Indicator Light Description

LED Indicator Light	Color	Status	Description
Power light (PWR)	Red	Always light	Device is working
		Extinguished	Device is not working
Online light (STS)	Green	Always light	Connected to 3G network
		Extinguished	No connection to 3G network
Module light (MST)	Red	Flashing	Module is working
		Extinguished	Module is not working
Signal light (SIG)	Green	Always light	Signal is excellent
	Yellow		Signal is good
	Red		Signal is bad
	N/A	Extinguished	No signal
WIFI	Green	Always light	WIFI enabled
		Extinguished	WIFI disabled
Ethernet light (LAN0-LAN3)	Red	Always light	Ethernet connection OK
		Flashing	Data transferring
		Extinguished	Ethernet connection not OK

Table 1-1 ER-800 indicator light description

1.7 Technical Advantages

eTung 3G router takes the leading role in the industry not only from hardware industrialization, design rationality, software convenience and usage flexibility, but also from its reliability. Its technical advantages are easy to see:

✧ Support dynamic domain auto-registration, domain resolving software is not needed;
✧ Support Telnet and web configuration;
✧ Support 4 RJ45 Ethernet interfaces, at most 4 PCs(devices) can connect with it via Ethernet cable;
✧ Support WIFI access point, devices supporting WIFI can connect with it quickly to build a small LAN;
✧ Support VPN to build virtual LAN, and simply change fixed line to wireless line;
✧ Support configuring 3G router remotely via SMS and from server side;
✧ Support soft and hard watch dog, keep alive all the time;
✧ Support APN name auto adaption, adaptive universally with default configuration;
✧ Support LBS location function to check device location at any time;
✧ Support "eYun" platform, server building not needed and plug-and-play.
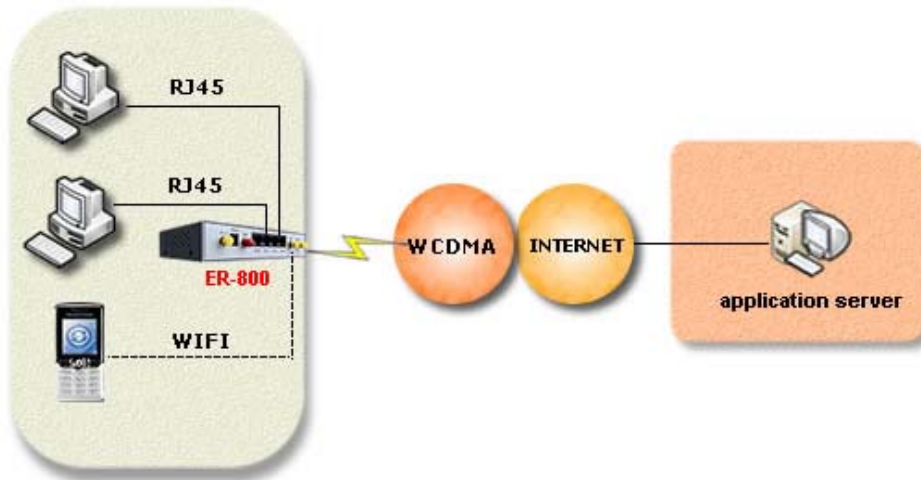
1.8 Typical Usecases

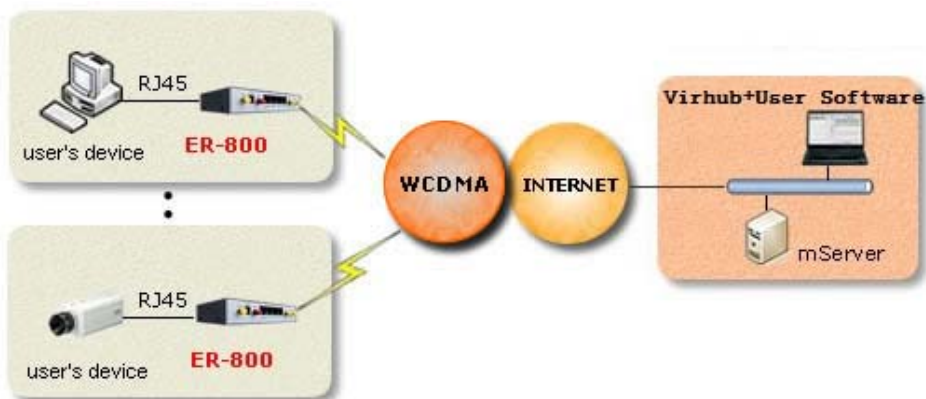Figure 1-15: Access Internet via 3G router

Figure 1-16: Implement virtual LAN via ER-800's Virhub functionality
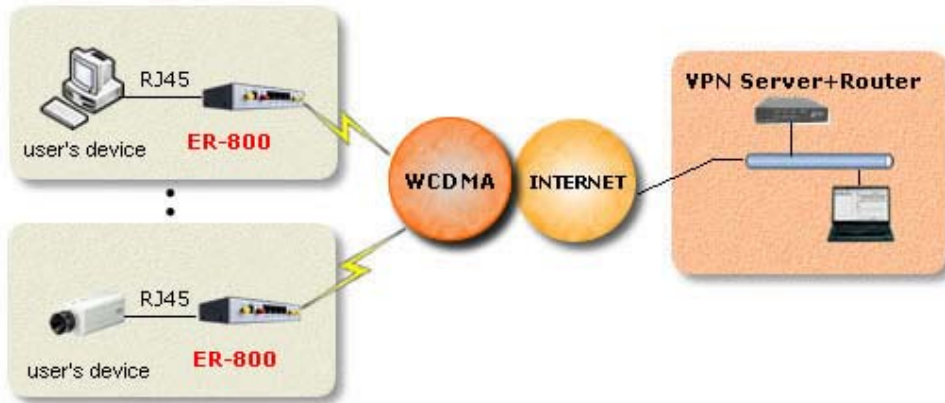
Figure 1-17: Use ER-800 to access LAN remotely via VPN

2. Device Configurations

This chapter introduces how to use ER-800 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 ER-800 with PC or customer device;
- ✧ One 3G all frequency sucking antenna;
- ✧ One power supply;
- ✧ One USIM card (for example China Unicom wo), that can access internet.

2.1.2 Configuring ER-800

- ✧ Connect PC with one of ER-800's Ethernet interfaces via a cross Ethernet cable;
- ✧ Boot PC, and set IP address as "Automatically obtain IP address";
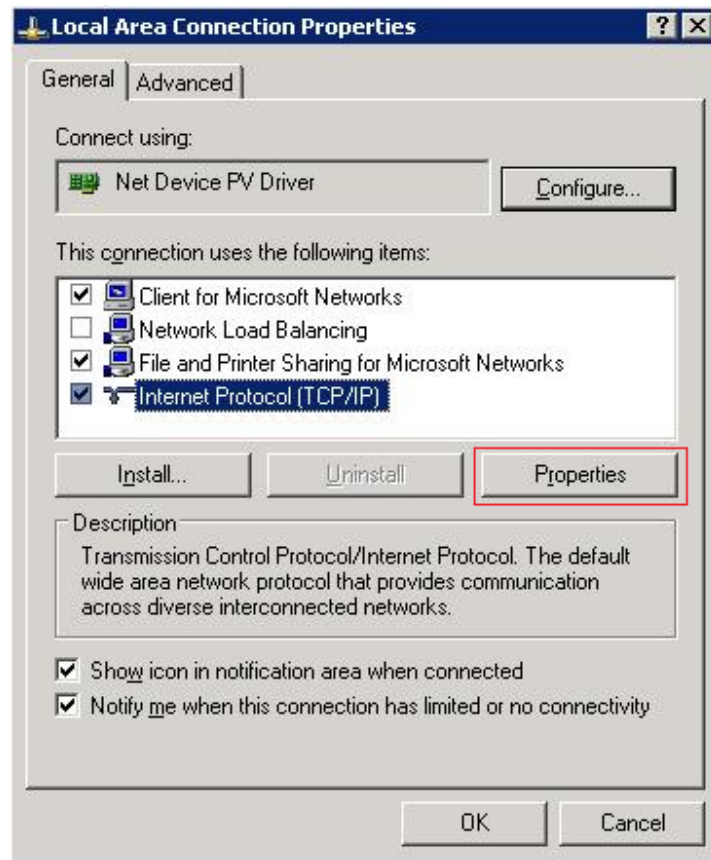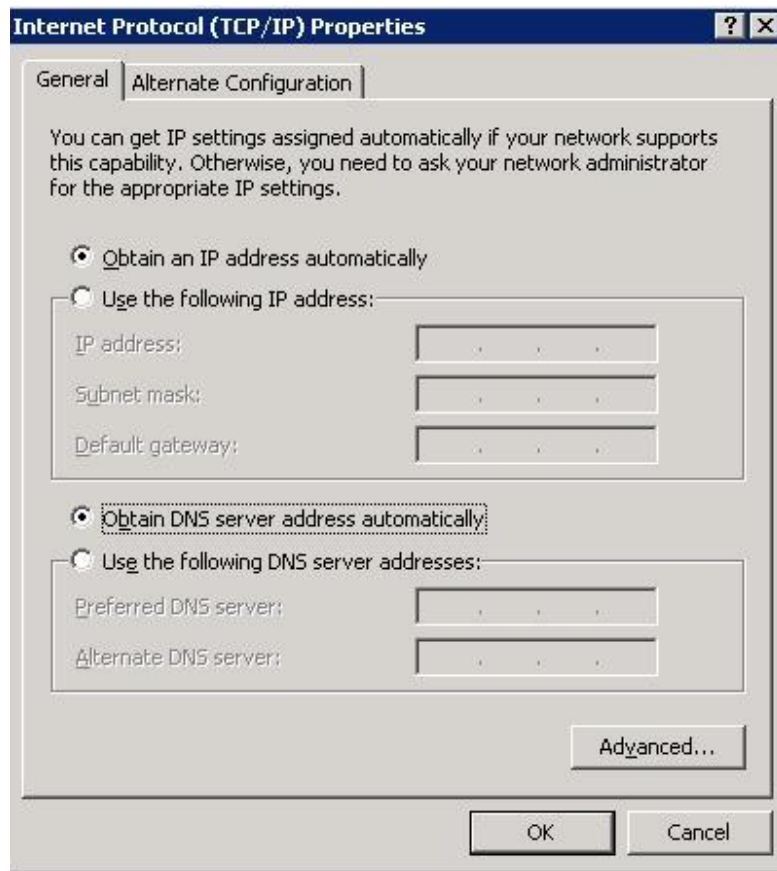
Figure 2-1: Set IP address as "Automatically obtain IP address"

✧ Open IE browser, input address "http://192.168.1.1" and press Enter;

✧ Input "root" as username and "1234" as password, select language as "ENGLISH", 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. Keep the default configurations if the router is used only to access internet.

Figure 2-3: Router's current status

2.2 Configuration Parameters

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

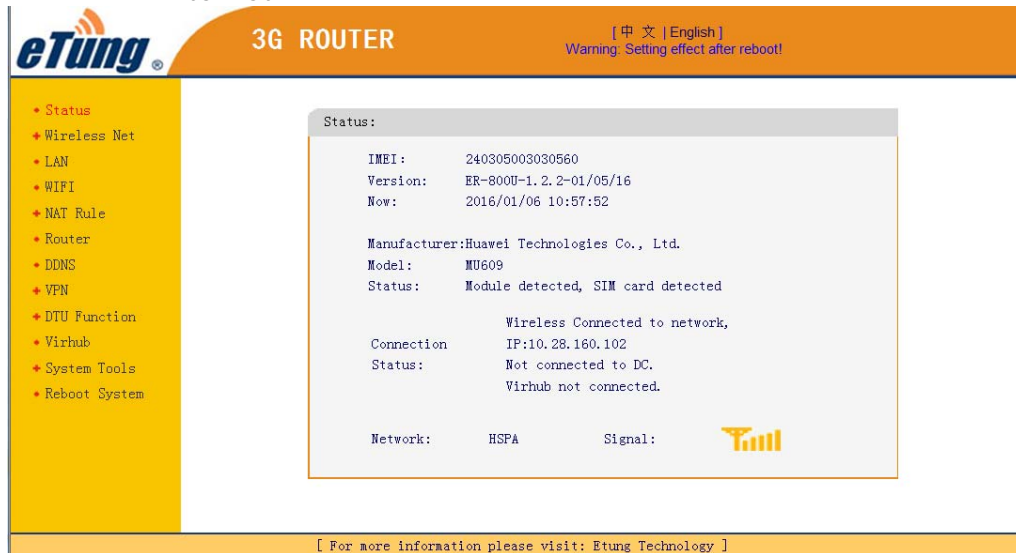| Configuration Menu Item		Description
Current status		Show device information, connection and data transfer status.
Wireless Net	Simple Cfg	Set user information about dialing into internet and SMS function, normally with default value
	Advanced Cfg	Check network debugging information
LAN		Set the router IP of LAN and set the DHCP function
WIFI		Configure WIFI parameters, normally with default values (Enable WIFI, SSID is "ER-800", enable security and with PSK PIN "12345678").
NAT Rule	NAT	Whether the device connected with router can access internet via NAT.
	Port Mapping	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.
Router		Set up static router table, a maximum of 10.
DDNS		Domain resolving function, configure the router to have a static domain to be easily accessed.
VPN	PPTP&L2TP	Login with username and password to connect VPN
	GRE Set	Set routing data encapsulation mode, normally with default value.
DTU Function	Simple Cfg	Set master data center address and serial port parameters
	Advanced Cfg	Set standby data center address and data format
	Link Management	Set heart beat parameters, normally with default values
	Embedded DC	Set embedded data center function
	Proxy Client	Set proxy client address
Virhub		Set server address for Virhub function, with eYun platform as default

System Tools	System Set	Set router's communication parameters, normally with default values
	SNMP Set	Set SNMP parameters, normally with default values
	System Log	Show router's connection and communication logs
	DTU Log	Show router's data transfer logs with DTU function
	Restore Set	Restore to initial default settings with one key
	Upgrade Firmware	Update router's firmware
	Change Password	Change password logging router(1234 by default)
	Import/Export config	Import parameter file saved before/Export current configurations to file
Reboot System		Reboot router

Table 2-1: Details of configuration parameters

2.3 Restore to Default

According to the description of "Configuring ER-800", after entering ER-800 configuration interface, select "System Tools" and then "Restore Set".
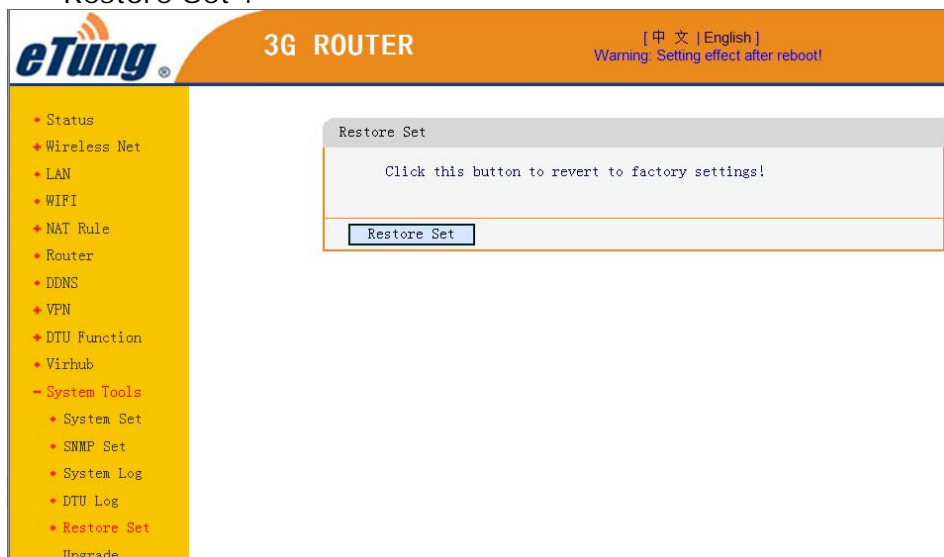

Figure 2-4: Restore to default

This can also be done by using the button "Reset to default" on ER-800. After ER-800 is started, hold the button "Reset to default" with a sharp object, do not release the button until "Online light" flashes two or three times and then always lights, that means the router has been reset to default and is rebooting automatically.

2.4 Firmware Update

✧ Ask eTung for firmware software

✧ According to the description of "Configuring ER-800", connect
   ER-800 with PC via a cross Ethernet cable, input username and
   password (by default username is root and password is 1234), and
   login router configuration interface.

✧ Select "System Tools" and then "Upgrade Firmware", click "Browse",
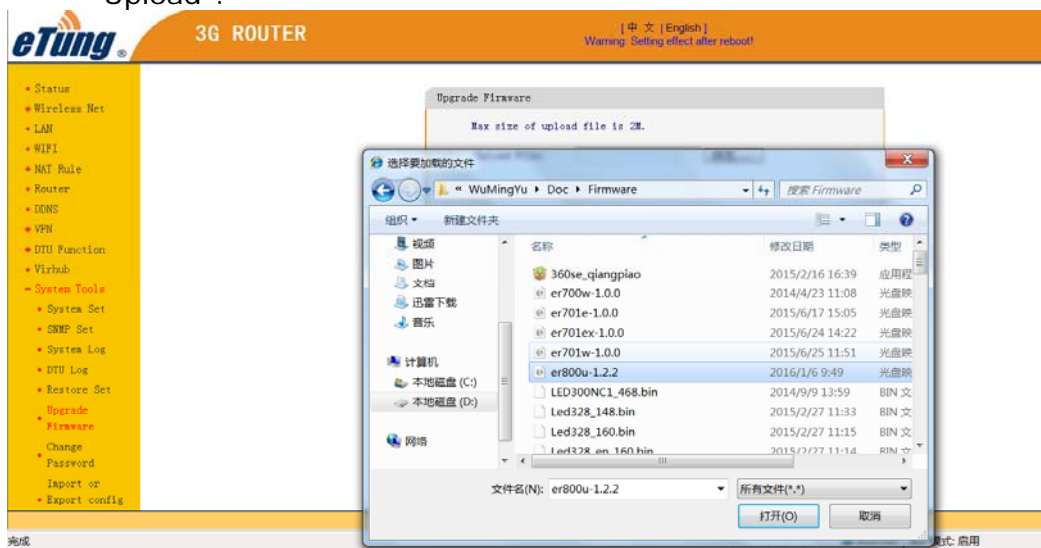   select the file (.img) to update, and click "Open", then click
   "Upload".

Figure 2-5: Select file to update

✧ Click "Update" after upload is complete.(It's better to select "Delete
   the Former File")

Figure 2-6: Firmware Update

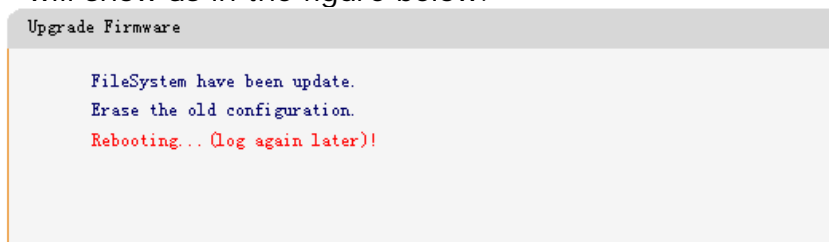✧ After update is complete the device will reboot automatically, and it will show as in the figure below.

Figure 2-7: Update complete

2.5 Remote Configurations

SMS commands and remote AT commands can be used on ER-800 to modify configuration parameters remotely. Details are described below:

1. Modify configuration parameters remotely via SMS
   The SMS to configure ER-800 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)

For remote SMS configuration, the contents of SMS must be English charactes or digits in single byte, and can not be in double byte.

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.
   net_mode: network mode: 1(GSM only), 2(WCDMA only), 3(GSM/WCDMA auto selection, WCDMA preferred)

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:GPRS/EDGE/WCDMA/HSDPA/HSUPA/HSPA/HSPA+

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 ER-800 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 ER-800 will be offline from the original mServer, and connect to the new data center and port.
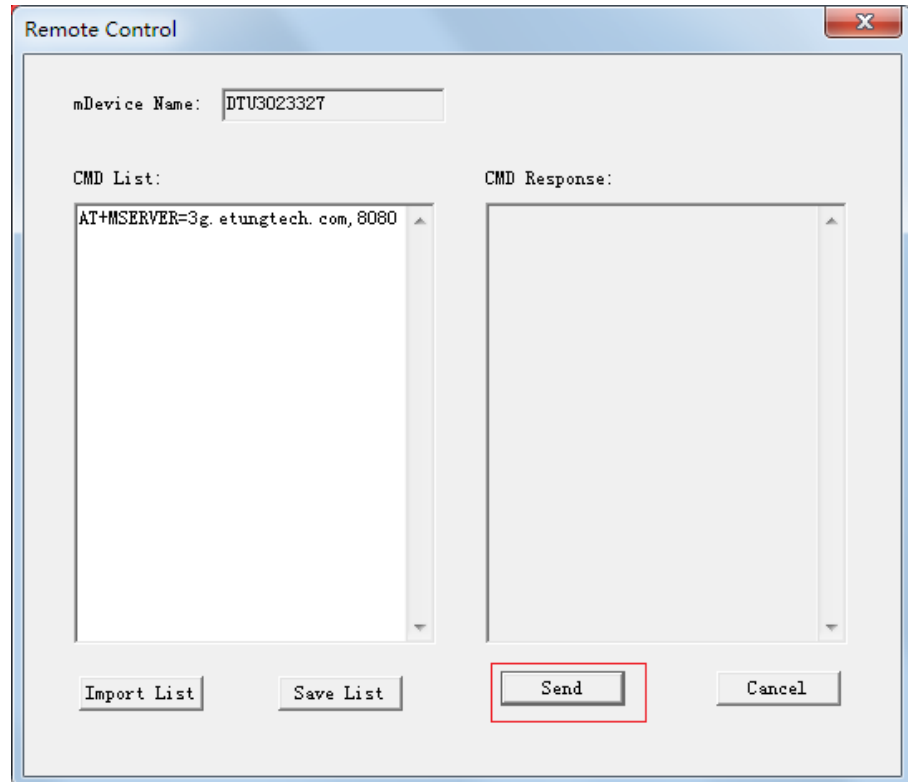
Remote AT commands are listed below:

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:
GPRS/EDGE/WCDMA/HSDPA/HSUPA/HSPA/HSPA+

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.

Appendix 1: Configure ER-800 for

High-Speed Internet Connection

PC can be directly connected to one of ER-800's Ethernet interfaces to access internet wirelessly, and mobile phones or other devices that has enabled WIFI can connect to ER-800 via WIFI, and share the Internet access.
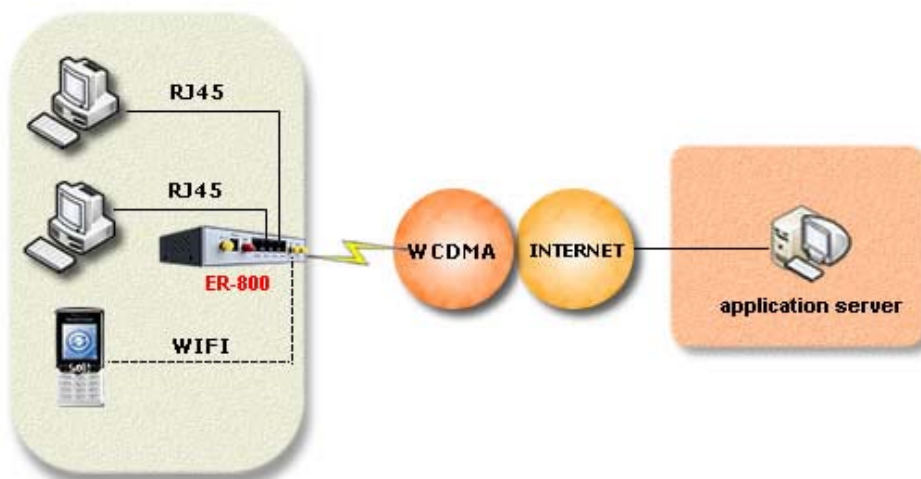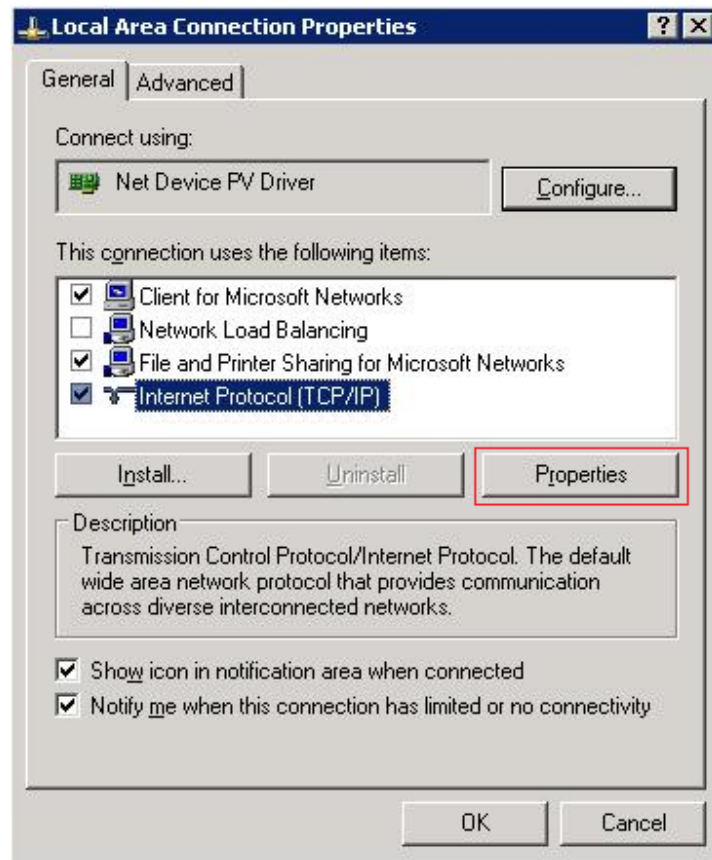
Figure Appendix 1-1: PC accesses internet via ER-800

Steps:
（1） Connect PC with one of ER-800's Ethernet interfaces via a cross Ethernet cable;
（2） Configure IP on PC as "Automatically obtain IP address":
Click "Control Panel"->"Network Connection"->"Local Connection", then right-click "Local Connection" and select "Properties"
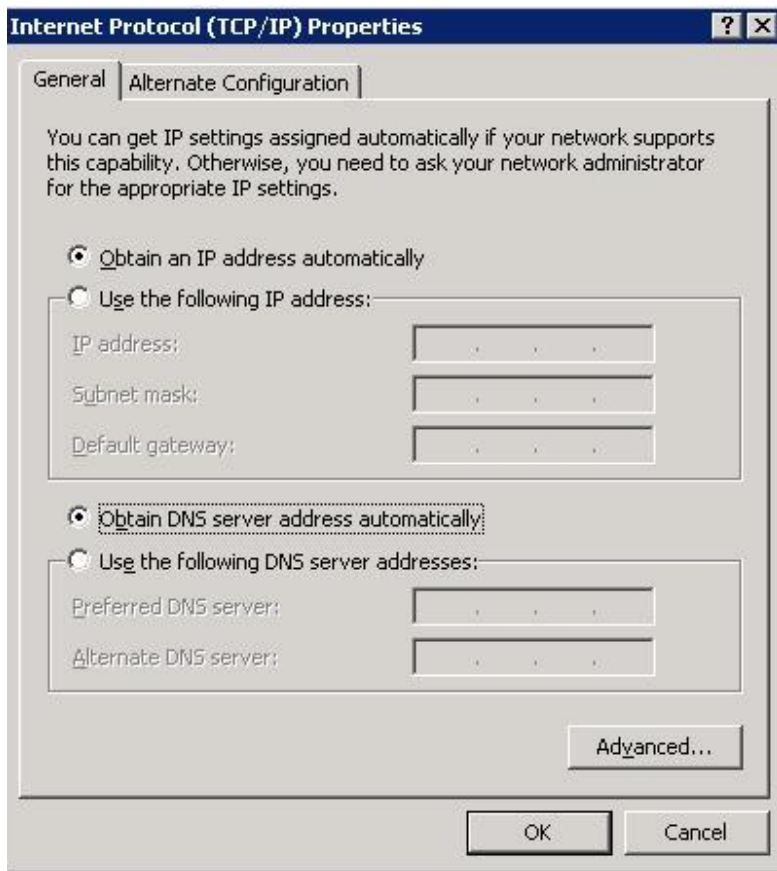
Figure Appendix 1-2: Configure to obtain IP address automatically

Or: you can configure a static IP address. Pay attention, the default gateway of ER-800 is 192.168.1.1, the IP address set manually should be in the same range (192.168.1.2~192.168.1.254), for example, 192.168.1.20 as shown below:
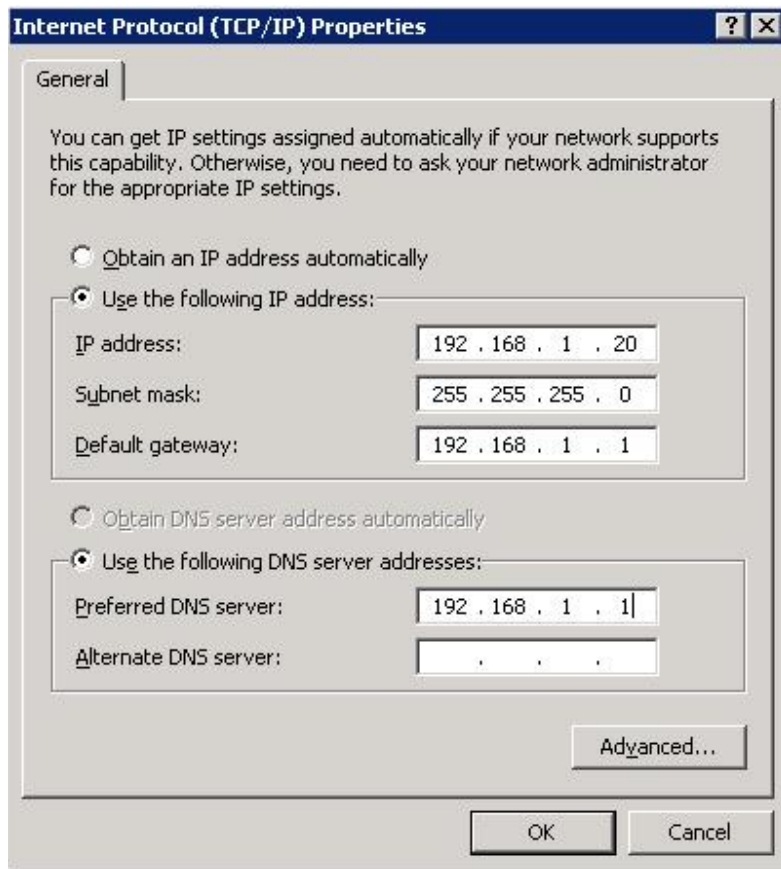
Figure Appendix 1-3: Configure a static IP address manually

（3） Plug a WCDMA card into ER-800, then after power on, ER-800 will dial automatically; and after dialing is successful, you can browse webpage, and send/receive emails via PC. The dialing status of ER-800 can be checked in the web interface. Just input http://192.168.1.1(ER-800's default gateway is 192.168.1.1) in IE, then input default username root, and password 1234, you can then check the working status, as well as current connection speed and flow of ER-800.
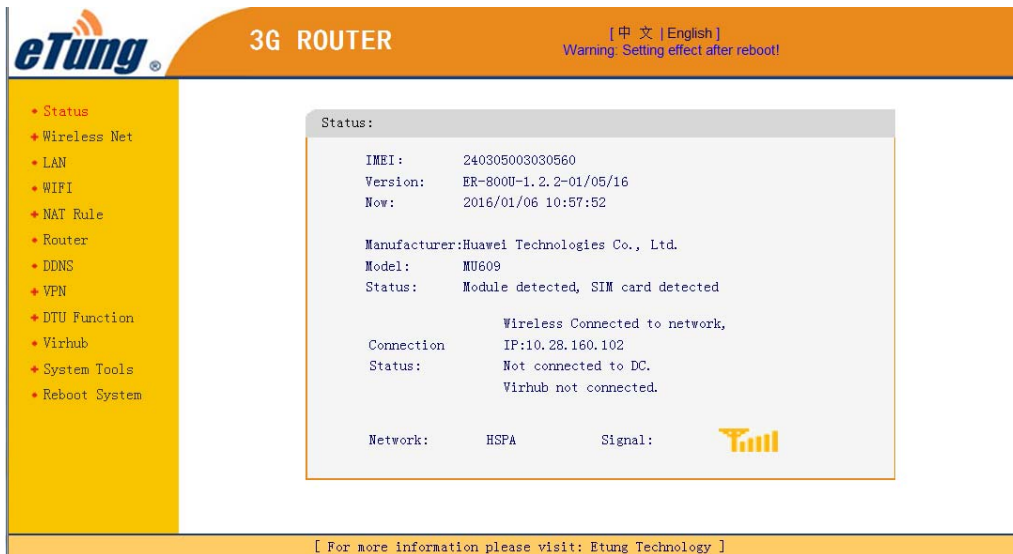
Figure Appendix 1-4: 3G router's network connection status

ER-800 wireless router has functions such as port forwarding, DMZ host, and DHCP service, so customers can define data forwarding rules on ER-800 as on a generic router.

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Appendix 2: eYun Virhub Testing

Case

1. **Apply eYun account**
   Access website http://3g.etungtech.com, apply a Virhub eYun account, and then contact technical support to open this account.
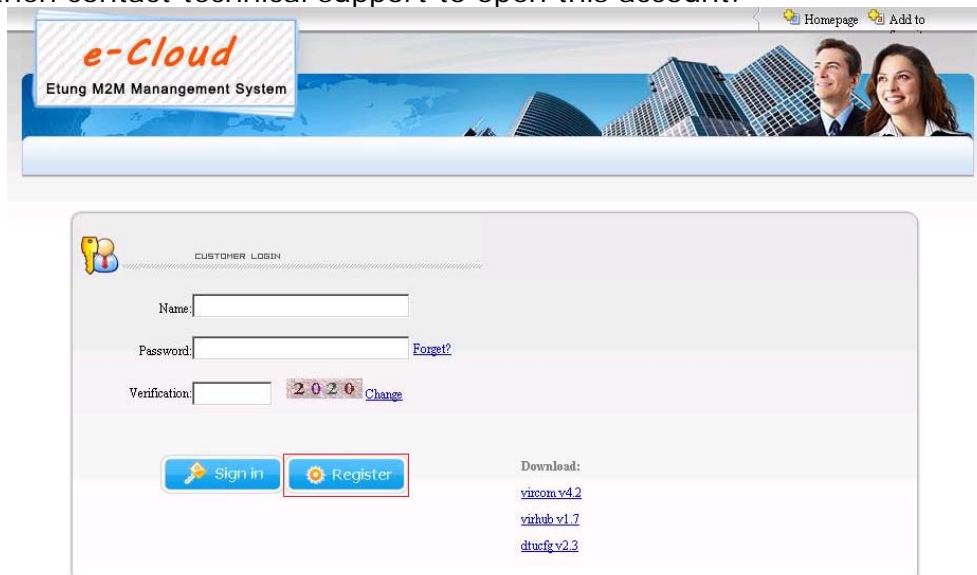

Figure Appendix 2-1: Apply eYun account

2. **Configure Virhub parameters**
   Refer chapter 2 Configuration, enter Virhub configuration menu, and select Virhub; input the username applied above, and click "Save", then reboot the router.

Figure Appendix 2-2: Enable Virhub function

3. Install Virhub software
Ask wireless Virhub v5.x installation package from eTung, install it according to Virhub's installation guide.

4. Login in Virhub and start data transfer
1) Run Virhub and click "Settings", input the username and password applied before.

Figure Appendix 2-3: Login Virhub

2) 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, 192.168.1.*.
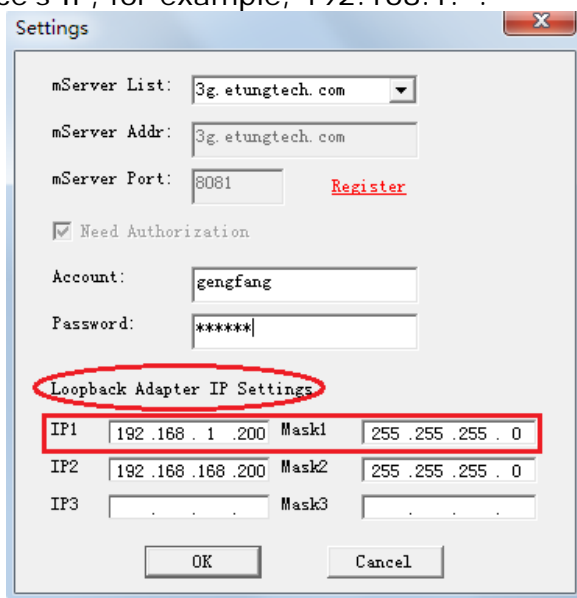

Figure Appendix 2-4: Configure Loopback adapter's IP address

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

3) Find the device to be tested based on IMEI, click "Add" to add user PC to the virtual LAN of "Customer Device - ER-800 - User PC", then the user PC can communicate directly with the customer device.
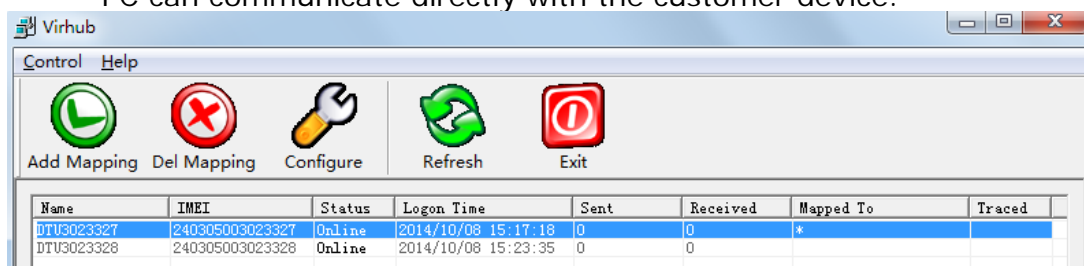
Figure Appendix 2-5: Add Virhub PC to virtual LAN

5. **Access the wireless router remotely via Virhub**
ER-800 V1.0.6 or higher version has functionality of accessing the wireless router remotely via Virhub. Normally, the router dials up into the wireless network and gets an inner IP address, and it cannot be accessed from the internet via this inner IP. eTung's Virhub solution can solve the problem. First, enable Virhub function on the router, and set a remote access IP; the

remote access IP is dedicated to access the router remotely when Virhub is enabled on the router. Then run Virhub software on the far-end PC, and configure an IP address on the Loopback adapter; this IP must be in the same range as the remote access IP on the router. This way, we can access the router remotely on the far-end PC via the remote access IP, to perform configuration, system monitoring, etc. Below are the details about the configuration procedure.

1) Configure the router's remote access IP

According to "2. Configure Virhub Parameters", go to the router's Virhub configuration, enable Virhub and configure username, then there are two parameters: "Remote Access IP" and "Remote Access Mask", with default values: 192.168.168.1 and 255.255.255.0.

Figure Appendix 2-6: Configure the router's remote access IP

Normally set the two parameters with default values, and they can also be changed on demand. Press "Save" after configuration, then reboot the router. These two parameters can also be changed/checked via remote AT commands, please refer "2.5 Remote Configurations".

2) Configure the Loopback adapter's IP address to access the router remotely

Run Virhub software, click button "Configure", and on the popped up "Settings" dialog, set the Loopback adapter's IP address in "Loopback Adapter IP Settings" part. IP2 is the IP address set on the Loopback adapter to access the router remotely via Virhub, and this IP must be in the same range as the "Remote Access IP" (192.168.168.1 by default) set on the router in step 1), for example, 192.168.168.*.
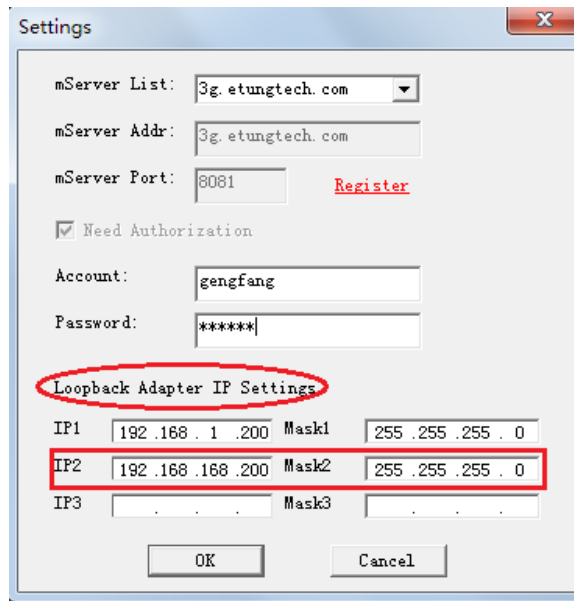
Figure Appendix 2-7: Configure the Loopback adapter's IP address to access the router remotely

Click "OK" after configuration is complete, the software will then set the IP address on the Loopback adapter.

3) Access the router remotely
Open browser, and input the router's remote access IP (192.168.168.1 by default), and then the router's web configuration page shows.

Figure Appendix 2-8: Access the router's Web configuration page remotely

Then we can login the web page to change the router's parameters remotely, just as the router is directly connected locally.

Appendix 3: APN Network Testing

Case

APN is the abbreviation of Access Point Name. It is used in operators' core network to identify the external data network, for example, enterprise intranet, Internet, WAP website and enterprise' internal networks. Using the APN SIM card, the terminal dials up into a dedicated network predefined from the operator side, and normally gets an internal IP address to access the network, this IP address cannot be accessed from the internet. But the terminals that dial into the same dedicated network can access each other. So we can easily implement the interconnection between wireless terminals with operator's APN networks, it's very convenient and can greatly reduce network access cost. There are two kinds of solutions to use APN networks, and below are details for each of them.

Solution 1: Embedded Data Center with APN Network

eTung's wireless routers support APN SIM card, and has embedded data center function. For those small-scale projects with few terminals, use one router as the data center, and dial into APN network; at the same time, all other terminals that connect to devices at the far end dial into the same APN network, then from the router's data center we can access the terminals at the far end, thus implement remote control of devices at the far end. This solution is cost-efficient, and can be easily deployed; it's flexible and convenient, and can be used especially in small-scale (No. of terminals <=100) device control projects.

Figure Appendix 3-1: Embedded data center and APN network solution

Below we will illustrate how to deploy this solution, and use MD-609G as an

example for terminals at the far end.

First of all, please order APN SIM cards from operator, and parameters include APN name, PPP username and password, and for the SIM card used by the router there should be a static IP address assigned as well.

1. Configure APN parameters in the router
    According to the description of "2.1 Configurations", login in the configuration web page, Choose "Wireless Net"->"Simple Cfg", and then select "Manual Set" for APN Mode, configure APN name, and PPP username and password if required. click "Save" and then reboot the router to apply the change.

Figure Appendix 3-2: Configure APN parameters in the router

2. Configure Embedded Data Center in the router
    Login the router's configuration web page, choose "DTU Function"->"Embedded DC", enable embedded DC, set transport protocol as TCP, center port as 9000, and set the maximum number of terminals as required, at most 100, and then click "Save" and reboot the router.

Figure Appendix 3-3: Configure embedded DC in the router

After the router reboots and dials up into the APN network, in configuration web page "Status", we can check the IP address assigned by APN network.

Figure Appendix 3-4: Check the IP address acquired from APN network

3. Configure data center address and APN parameters in DTU
Run wireless configuration software dtucfg.exe, power on DTU according to the prompt and then enter the configuration menu. For the 1st item: mServer DN/IP Addr, set as the static IP address acquired by the router from APN network, for example, 10.8.224.81; for the 2nd item: mServer Port, set as 9000; for the 4th item: APN, set as the APN name; for the 5th item: Protocol, set as TCP that is the same as the transport protocol configured in the embedded data center; then press Enter until Dial Account and Password, set as PPP username and password of the APN SIM card as required.

```
mDevice Configuration Software

Start Config  Start Update   Stop   Select File   Configure   Clear   About

CONFIG MENU
1)MSERVER DN/IP ADDR(eyun.etungtech.com):10.8.224.81
2)MSERVER PORT(8080):9000
3)ACCOUNT():
4)APN():gprs.net
5)PROTOCOL[UDP/TCP](TCP):
6)CONNECT MSERVER[Y/N](Y):
7)REGISTER WHEN NOT MSERVER(ETUNG:240305003024230
\x00):
8)HEARTBEAT WHEN NOT MSERVER(ETUNG\x00):
9)OUTPUT STR WHEN CONN():
10)OUTPUT STR WHEN DISC():
11)DIAL ACCOUNT(gprs):
12)DIAL PASSWORD(****):
13)NUMBER(13901234567):
14)CONNECTION MODE[1:FOREVER/2:WAKEUP/3:DEMAND](1):
15)RING WAKEUP NUMBER():
16)SMS WAKEUP PASSWORD(1234):
```
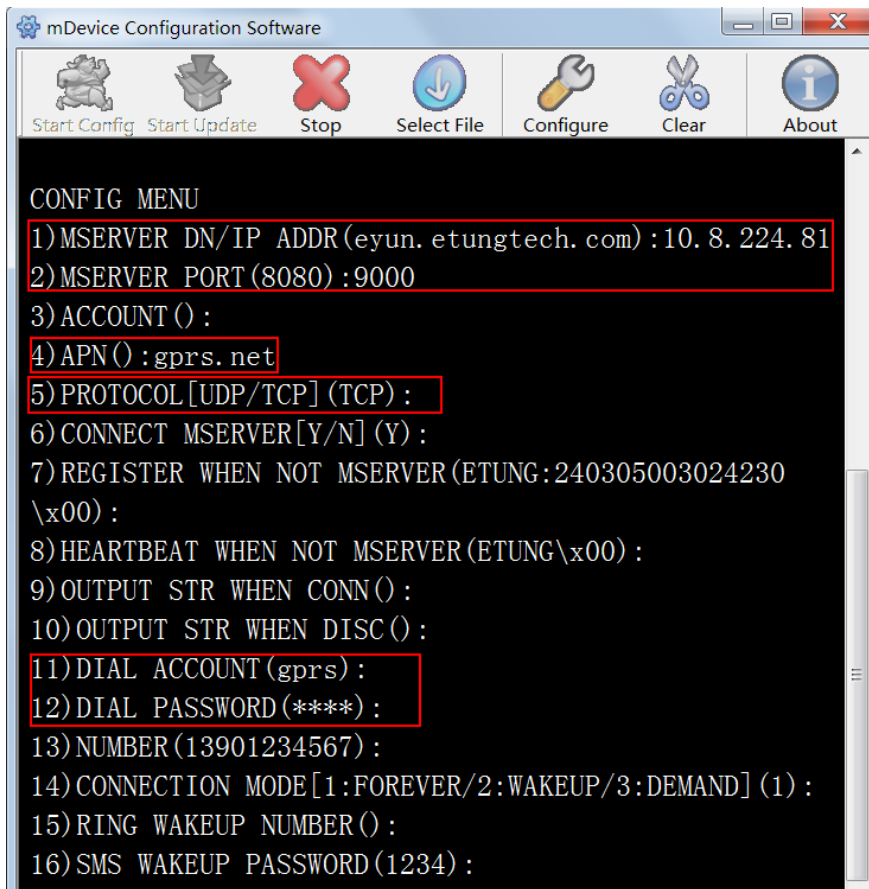
Figure Appendix 3-5: Configure DC address and APN parameters in DTU

After that press Enter until the serial port parameters: baud rate, data bits, parity, stop bits and flow control, the values for these parameters must be the same as those set in the serial device that DTU connects to; and if they are not the same, we can modify the values here in DTU to make sure they are the same.

Figure Appendix 3-6: Configure DTU serial port parameters
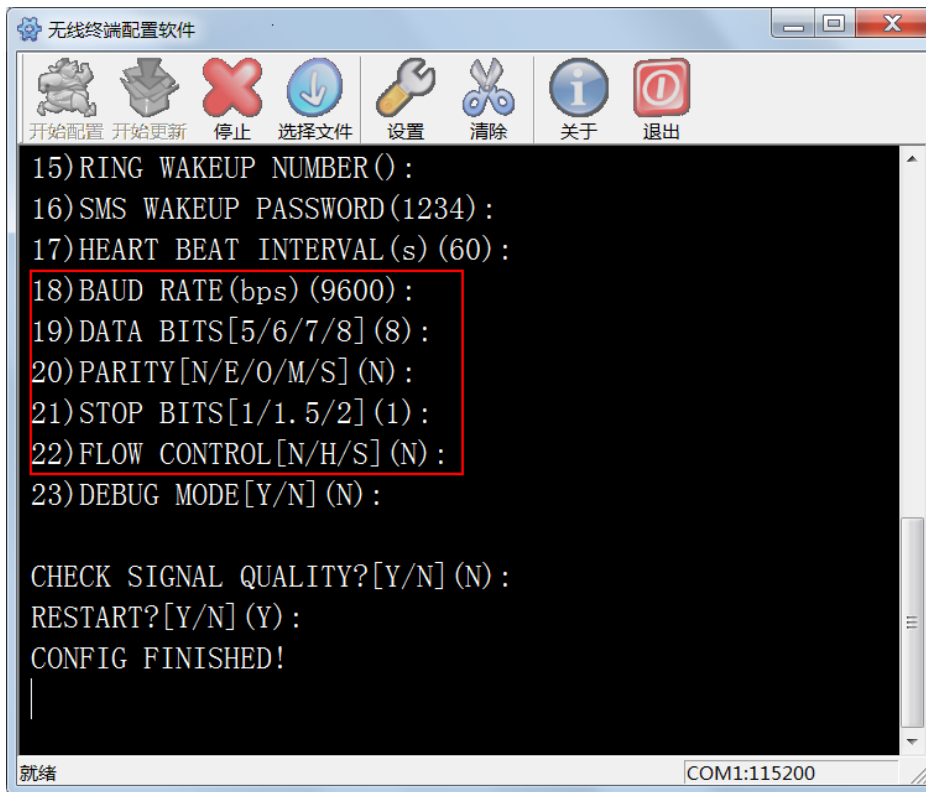
After configuration is finished, reboot DTU to dial up into APN network, it will then automatically connect to the router's embedded data center; in the router's status page, we can see that one device has connected the embedded data center.

Figure Appendix 3-7: Status shows DTU has connected to embedded DC

4. Device at the front end receives/sends data via serial port

After configuring router and DTU at the far end, both dial up into the APN network, and DTU connects to the embedded data center running in the router; then we can receive data from the serial device at the far end via the router's user serial port, and at the same time device at the front end can send data to the device at the far end via the router's user serial port. Pay attention, the front-end device broadcast data to all the far-end devices, so there should be identity in the data packets sent/received between front-end and far-end devices to distinguish from/to whom the packets are received/sent.

Solution 2: mServer Connects the Router and with APN Network

For large-scale projects with lots of terminals, this solution: mServer connects the router and with APN network can be used. As shown in the figure below, eTung's wireless router dials into operator's APN network, and the data center at the back end connects to the router with Ethernet cable; at the same time configure DMZ host on the router, then terminals at the far end dial into the same APN network and can connect to the data center at the back end. Compared to solution 1, this solution can also be easily deployed and cost-efficient; at the same time since the data center is running in a dedicated server, compared to embedded data center solution, it allows more terminals to connect to the data center, and there can be more flexible configurations, for example, map a virtual serial port for each terminal, make point-to-point mapping between two terminals, etc.
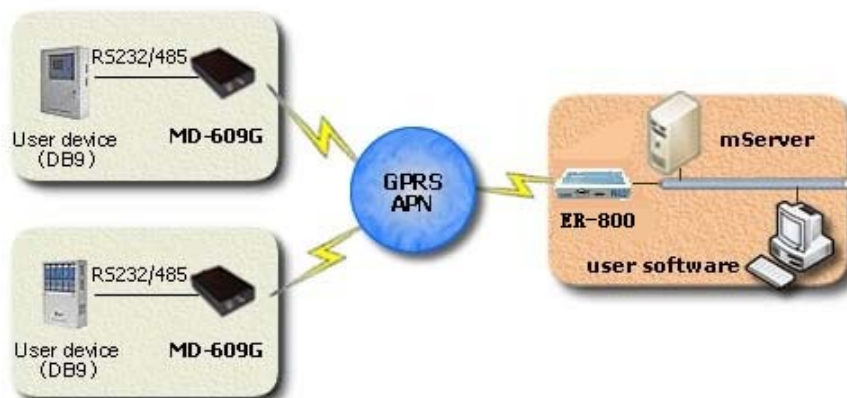

Figure Appendix 3-8: mServer connects to the router and with APN network

Below we will illustrate how to deploy this solution, and use MD-609G as an example for terminals at the far end.

First of all, please order APN SIM cards from operator, and parameters include APN name, PPP username and password, and for the SIM card used by the router there should be a static IP address assigned as well.

1. Install and run mServer in the data center server
    Ask eTung for mServer installer, and install mServer according the user manual. Make sure the firewall software allows accessing mServer from outside.

After mServer is installed, double-click mServer's icon on the desktop to run mServer console, choose "System Settings", in tab "Service Settings", choose TCP for link mode, and set listen port as 9000.
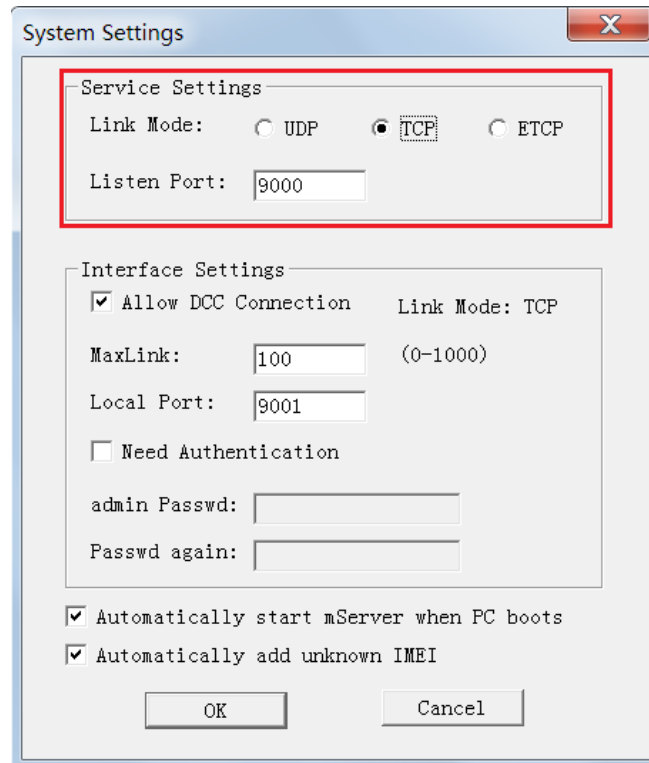

Figure Appendix 3-9: Configure mServer

2. Configure APN parameters in the router
    As step 1 in solution one shows, configure APN parameters in the router's configuration web page.

3. Configure DMZ host in the router
    First, connect data center server to the router with Ethernet cable.
    Then, set static IP address in the data center server, and the IP address must be in the same IP range as the IP address of the router's Ethernet interface, for example, 192.168.1.*. The figure below shows the server's static IP address is set to 192,168.1.100, and gateway and DNS are set to 192.168.1.1.
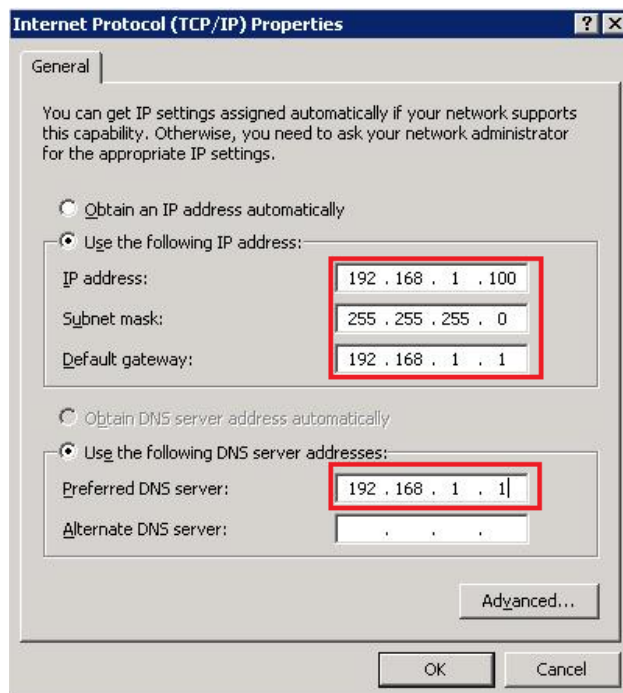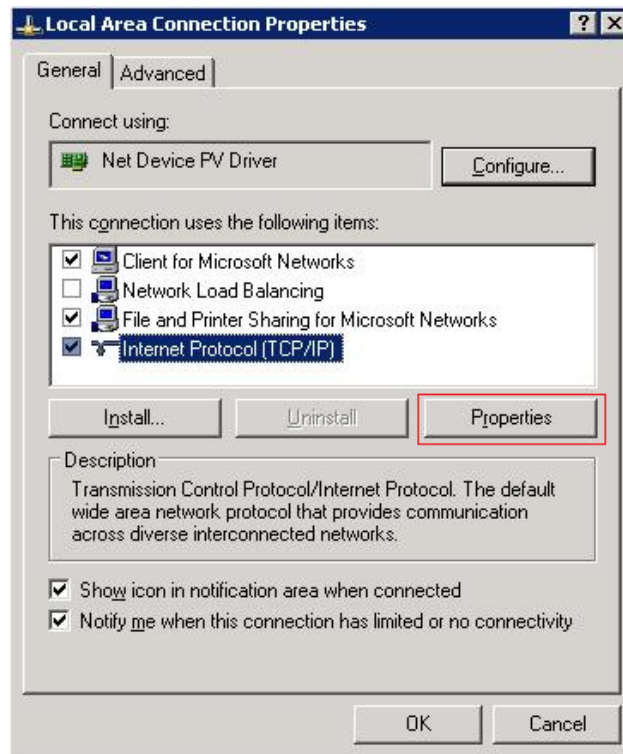
Figure Appendix 3-10: Set static IP address

Login the router's web configuration page, choose "NAT Rule"->"DMZ Host", then configure DMZ Host IP as the static IP address of the data center server, for example, 192.168.1.100 as configured above.
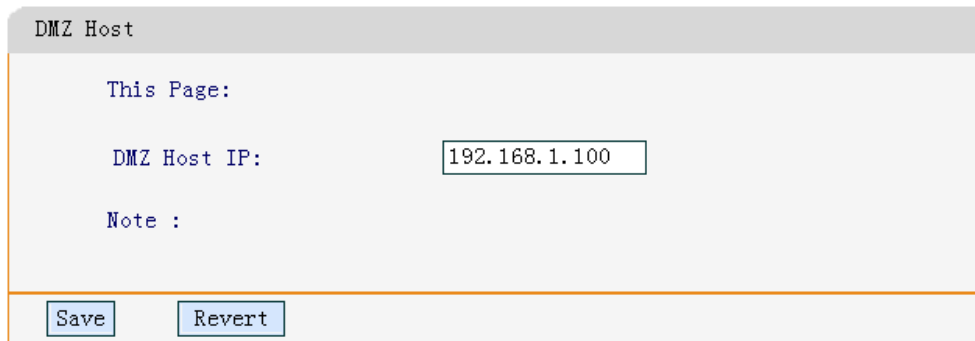
Figure Appendix 3-11: Configure DMZ host

Click "Save", and then reboot the router. Then data packets received by the router from the outside network will be forwarded to the data center server.

4. Configure data center address and APN parameters in DTU
Configure data center address and APN parameters as shown in step 3 of solution one. Set data center IP address to the IP address acquired by the router after dialing into the network, and data center port as mServer's listening port, i.e. 9000 as shown in figure appendix 5-9.

After configuration is complete, reboot DTU, it will dial into APN network, and then connect to mServer; in mServer's console we can see that this terminal is already online.
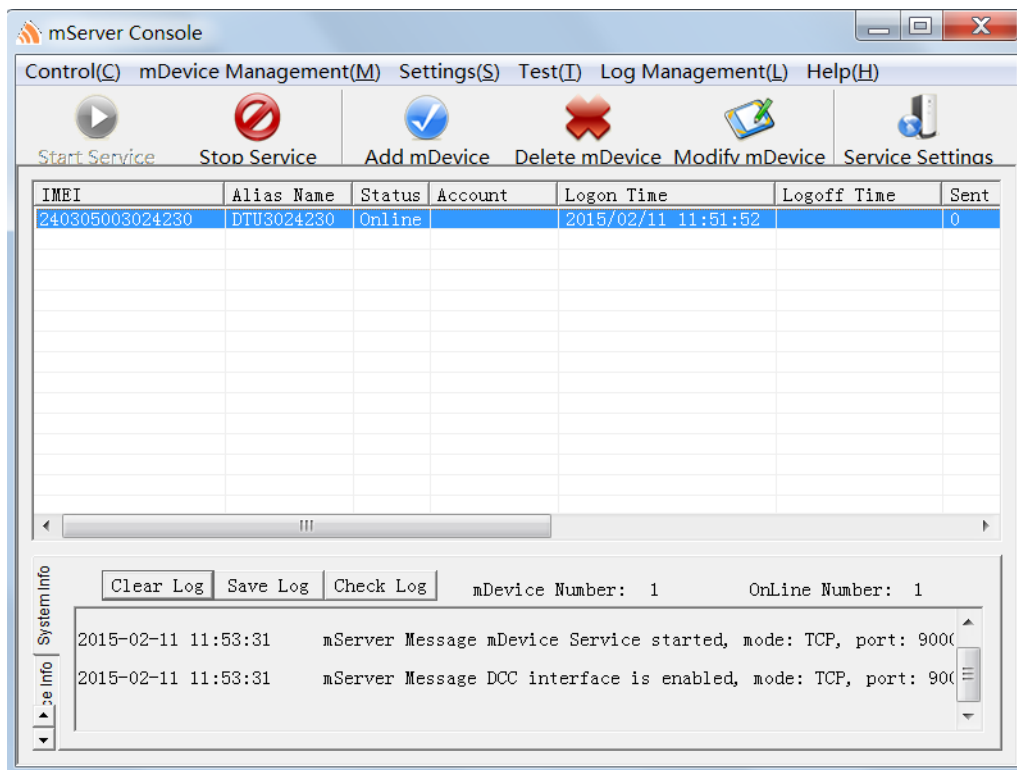

Figure Appendix 3-12: DTU is online in mServer's console

After DTU connects to the data center, the application software at the front end will then be able to communicate with the devices at the far end via virtual serial port (or other ways).

Appendix 4: Use ER-800 to Access LAN Remotely via VPN

ER-800 can be used to extend and access the corporate virtual LAN remotely with VPN function, for example, the user can use ER-800 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
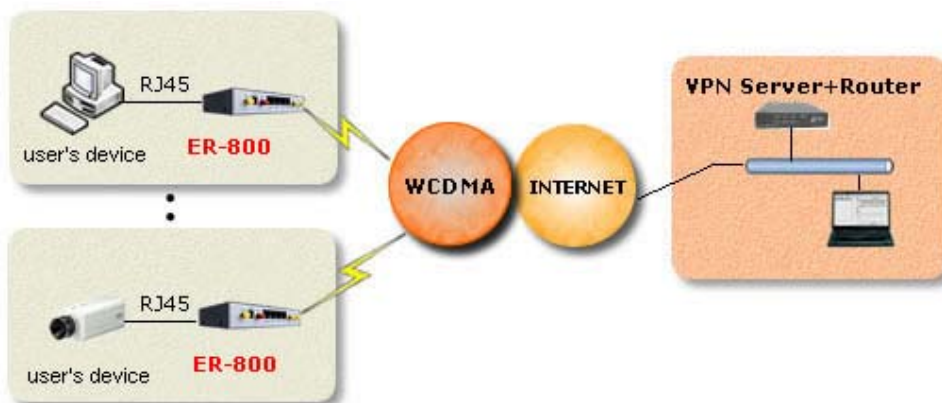
Figure Appendix 4-1: Use ER-800 to access LAN remotely via VPN

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 ER-800(including accessories)
3) One USIM card with internet service(for example China Unicom wo)
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 4-2: Configure router's VPN function

Actually different routers have different configuration interface and options, we can configure it accordingly.
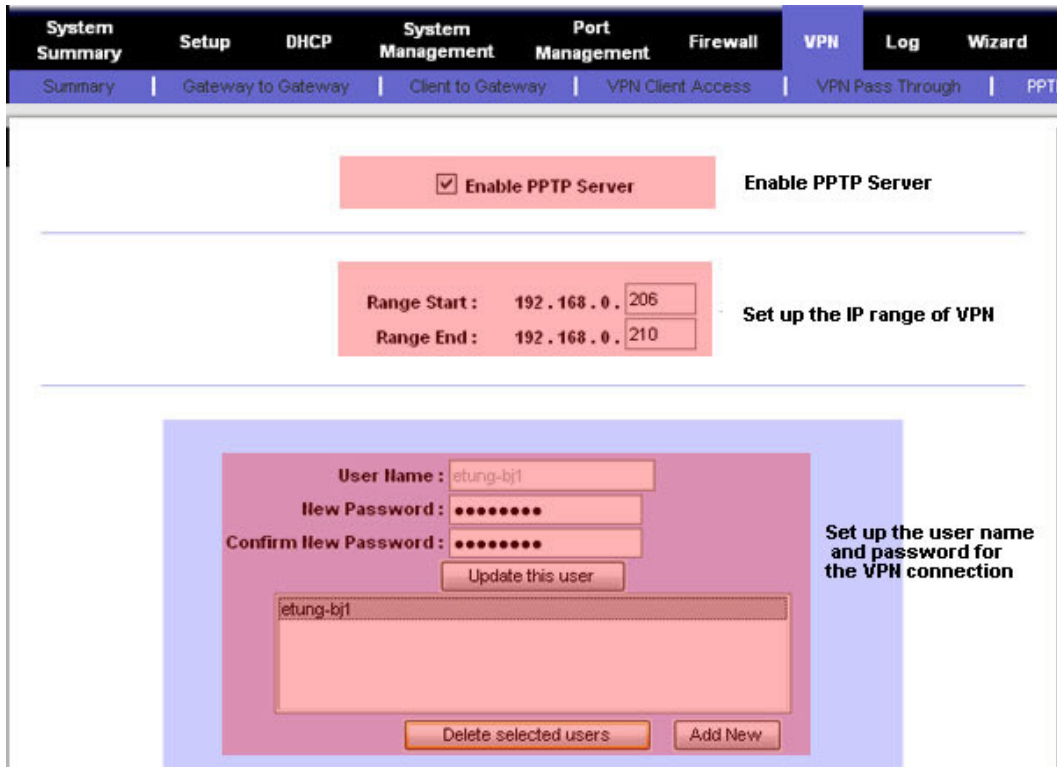
2) Configure ER-800
Login ER-800's configuration interface, click "VPN function" and configure it as shown in the figure below:

Figure Appendix 4-3: 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, ER-800 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 ER-800.

3) Check dialing status
   Login ER-800 to check dialing status, as shown in the figure below:
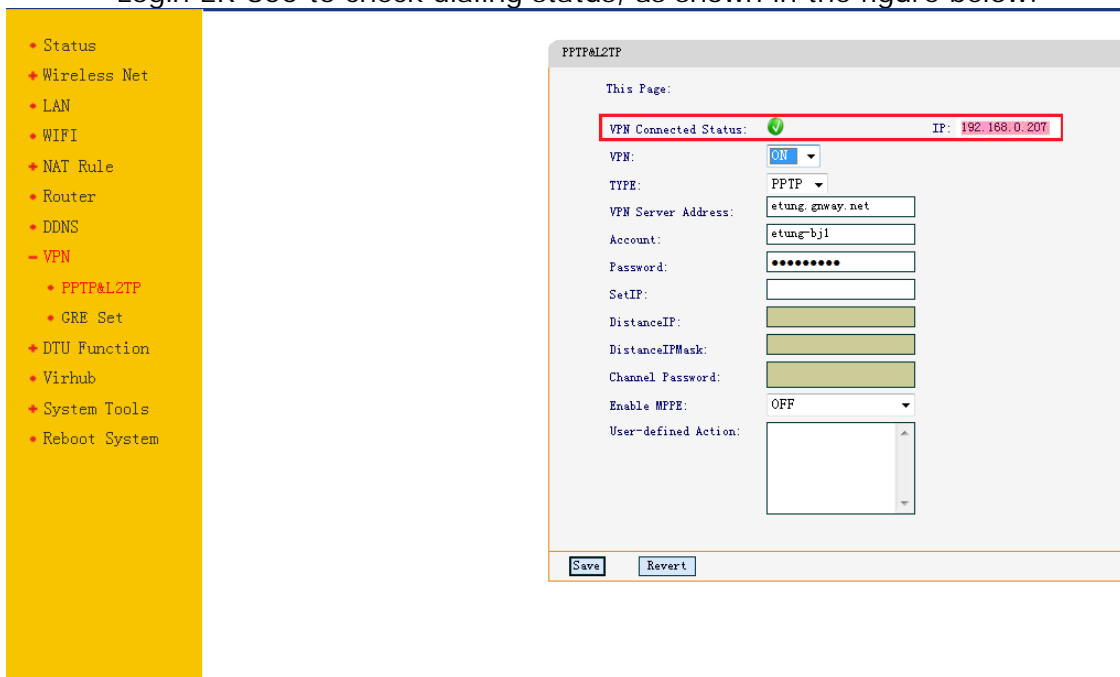
Figure Appendix 4-4: ER-800 status of accessing LAN

At this time, ER-800 is connected to the corporate LAN, and visiting http://192.168.0.207 inside the corporate LAN can see ER-800's web login interface, and at the same time ER-800 can access resources inside the corporate LAN.

If we connect a video server to ER-800, and configure port forwarding or DMZ host on ER-800, 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 ER-800 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 ER-800 should be in other IP range, for example 192.168.1.*.

2） ER-800 and the PC or video server that connects to it should be in the same IP range. ER-800's default gateway is 192.168.1.1, and if the IP range of the PC or video server that connects to ER-800 need to be 192.168.0.*, then change ER-800's gateway to the same range, for example 192.168.0.1.

Appendix 5: Send/Receive SMS with the Router and SMS Format

ER-800 supports sending/receiving SMSs via Ethernet interface. The method is described below:

First, establish a TCP connection with the router'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:
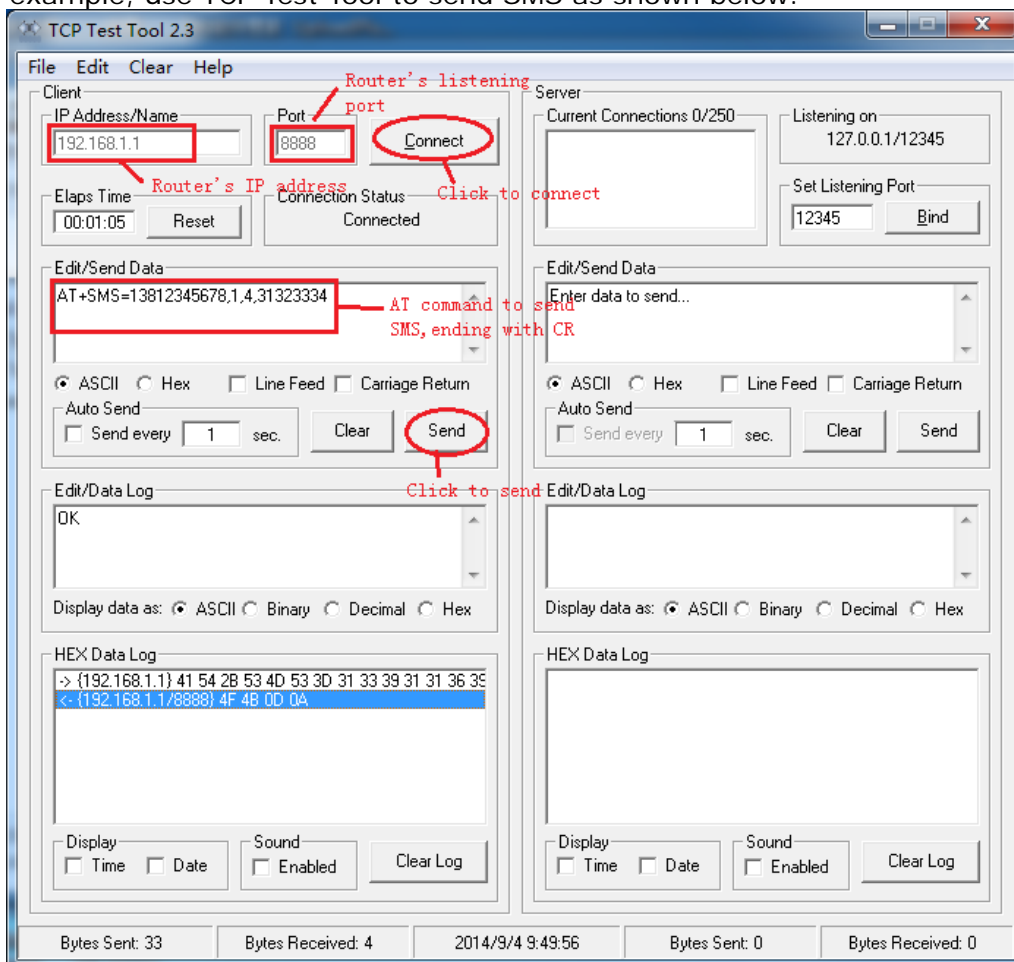

Figure Appendix 5-1: Send SMS via router's Ethernet interface

1) In the left part "Client", input router's Ethernet IP address "192.168.1.1" in "IP Address/Name", and router's listening port "8888" in "Port", then click

"Connect" to establish TCP connection with the router; if "Connected" is shown Connection Status, that means TCP Test Tool has connected to the router'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 only ER-800 v1.0.3 or higher version supports sending/receiving SMSs via Ethernet interface.
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".

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

   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

Use 8bit encoding to send "1234"to 13812345678:
AT+SMS=13812345678,2,4,31323334\r
Use Unicode encoding to send "你好" to 13812345678:
AT+SMS=13812345678,3,4,4F60597D\r

2. The received SMS messages will be output via the serial port in the format below:
\r\n+SMS:<phone   number>,<encoding   format>,<data length>,<data>\r\n

Examples:
"1234" received from 13812345678 in ASCII format:
\r\n+SMS:13812345678,1,4,31323334\r\n
"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 6: AT Commands on the

Router's Ethernet Interface

eTung's wireless routers support AT commands directly coming from Ethernet interface, to query status, modify parameters, send/receive SMS, etc. The AT commands that a router supports can be different based on different models and different firmware versions. Below are the AT commands on the Ethernet interface that ER-800 V1.0.4 or higher versions support.

Attention: the AT commands MUST be in uppercase, and MUST end with CR(0x0d), as shown in "\r" below.

For the following commands, please refer the descriptions of AT commands via SMS in "2.5 Remote Configurations"

1. AT+WN=apn,user,passwd,net_mode\r
2. AT+DC=addr,port,user,mode\r
3. AT+PWD=passwd\r
4. AT+VIRHUB=0/1\r
5. AT+RESTORE\r
6. AT+REBOOT\r
7. AT+STATUS? \r
8. AT+WN? \r
9. AT+DC? \r
10. AT+INFO? \r
11. AT+VIRHUB? \r
12. AT+UPDATE=url\r
13. AT+UPDATEALL=url\r

Following are the AT commands used to send SMS, for details please refer "Appendix 5: Send/Receive SMS with the Router and SMS Format".

14. AT+SMS=<target number>,<encoding format>,<data length>,<data>\r
15. AT+SMSA=<target number>,<data length>,<data>\r

Following are the AT commands that can be used only on Ethernet interface, and currently cannot be used via SMS.

16. AT+UPTIME\r
    Get the system's running time, and the return value is in seconds.
17. AT+DISCCOUNT=YYYYMMDD\r

Get the disconnection times in the specified date, the date format is YYYYMMDD, and the reply is the times of disconnection during that day.

FCC Warning

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, 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.

The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter. This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.