



DT01 WiFi/3G VoIP PBX / ATA User Manual

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Index:

1	Introduction	3
1.1	What is DT01	3
1.2	Specifications	3
1.3	Features	3
1.4	Operation Temperature	4
2	Access DT01.....	5
2.1	Overview	5
2.2	Find the ip addresses	5
2.3	Configure Method	6
2.3.1	Access via browser	6
2.3.2	Access via SSH	6
3	Typical Network Setup	7
3.1	Connect Internet via WAN port.....	7
3.2	Connect Internet via WiFi Client mode	8
3.3	Connect Internet via USB dongle, 3G/4G/GPRS.....	9
3.4	Set up WiFi mesh network	11
3.4.1	Mesh Gateway Set Up via Web UI.....	11
3.4.2	Mesh Client Set Up via Web UI	12
4	VoIP Settings.....	13
4.1	Overview	13
4.2	General Settings	13
4.3	VoIP Server Settings.....	14
4.4	VoIP Clients	15
4.5	Dial Plan	16
5	VoIP Set up example:	18
5.1	Configure as SIP ATA	18
5.2	Configure as SIP server	19
5.3	Link two DT01s via IAX2 protocol.	20
6	Upgrade Firmware	21
7	FAQ.....	22
7.1	How to get long distance WiFi range?	22
7.2	How to reset DT01 to factory default?	22
7.3	How to recover DT01 if firmware crash?	22
8	Reference	23

1 Introduction

1.1 What is DT01

The DT01 is an Open Source appliance designed for VoIP application. DT01 has built-in Asterisk software and have a FXS port to connect normal phone. DT01 has a friendly Web UI, user can configure the DT01 to work as a VoIP ATA or PBX through the web browser easily.

DT01 has two RJ45 port, a WiFi 802.11 b/g/n interface and a USB port host port to provide flexible network connection via LAN cable/ wifi or 3G/4G network.

DT01 is fully open source, user can modify the inside Linux system or compile a firmware for their customized applications.

The goal for DT01 is to fulfill VoIP requirement on dedicate application or installations.

1.2 Specifications

Hardware System:

- Processor: 400MHz, 24K MIPS
- 64MB RAM
- 16MB Flash
- DC Input: 9 ~ 12v or 5V

Interface:

- 1 x FXS port
- 2 x RJ45 ports
- USB 2.0 Host port to connect 3G dongle or USB flash

WiFi Spec:

- IEEE 802.11b/g/n
- Frequency Band: 2.4 ~ 2.462GHz
- Chip Antenna or External antenna

1.3 Features

- ✓ Open Source OpenWrt system
- ✓ Asterisk 1.8.10
- ✓ Support SIP / IAX2 server/client.
- ✓ Support multiply SIP / IAX2 entries
- ✓ Easy configure SIP/IAX2/dial-plan in Web UI
- ✓ Managed by Web GUI or SSH
- ✓ Firmware upgrade via Web

- ✓ Support WiFi AP, Client or Ad-Hoc(Mesh) mode
- ✓ Optional external antenna for long distance connection
- ✓ Support USB dongle for 3G/4G dial up
- ✓ Support USB flash for extend storage

1.4 Operation Temperature

- ✓ Operation Temperature: -25°C ~ 65°C
- ✓ Storage Temperature: -40°C ~ 85°C

2 Access DT01

2.1 Overview

DT01 has two separate RJ45 ports and a WiFi Interface. They have different IP addresses, user can use either of them to access the DT01 and configure it via Web or SSH.

2.2 Find the ip addresses

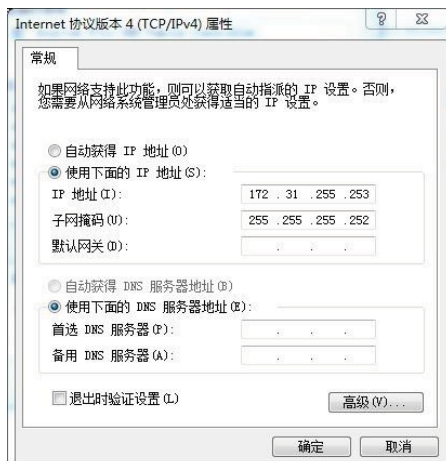
Factory IP of WiFi port



At the first boot of Yun Shield, it will auto generate an secure WiFi network call *Dragino2-xxxxxx*. The WiFi password is *dragino-dragino* by default

User can use their laptop to join this WiFi network. The laptop will get an IP 10.130.1.xxx and the DT01 has the default IP *10.130.1.1*

Fall Back IP



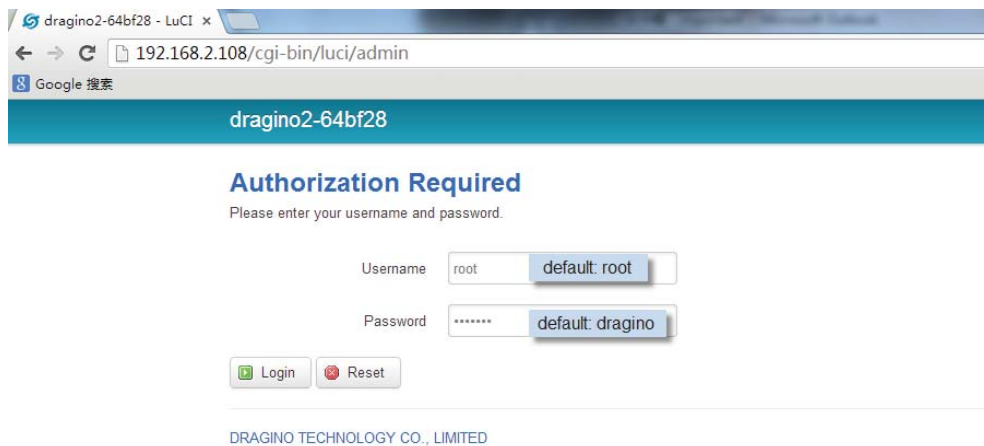
A fall back IP *172.31.255.254/255.255.255.252* is assigned to DT01's LAN port so user can always access DT01 with this ip if their laptop has the IP *172.31.255.253/255.255.255.252*.

2.3 Configure Method

The DT01 runs Open Source Linux system. If user has a PC at the same network as DT01, user can access its system via either [Web Interface](#) or [Secure Shell \(SSH\)](#).

2.3.1 Access via browser

The recommended browsers to configure DT01 are [Firefox](#) and [Chrome](#). Simply type the IP address into your browser and you will see the log in page of DT01.



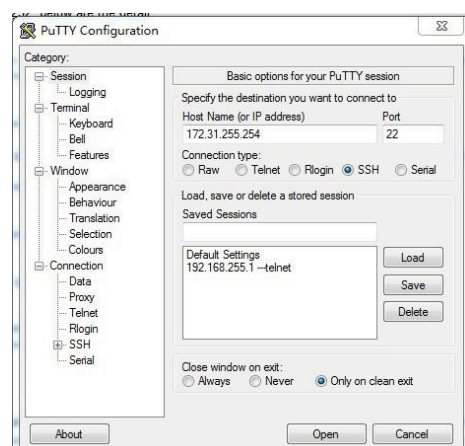
Default Web Login:

User name: root

Password: dragino

2.3.2 Access via SSH

Via SSH access, user can access to the Linux system directly and customized the system to support more features and applications.



SSH Access:

IP address: **IP Address of DT01**

Port: **22**

User Name: **root**

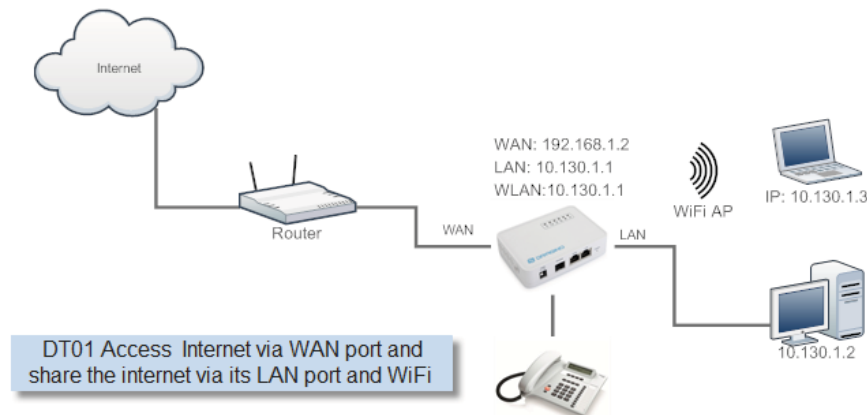
Password: **dragino (default)**

3 Typical Network Setup

User can configure DT01 to meet different network requirement. This chapter lists some typical network setup. Device are not limited to the network set up shows below, user can configure more advance network modes via the OpenWrt Linux system.

3.1 Connect Internet via WAN port

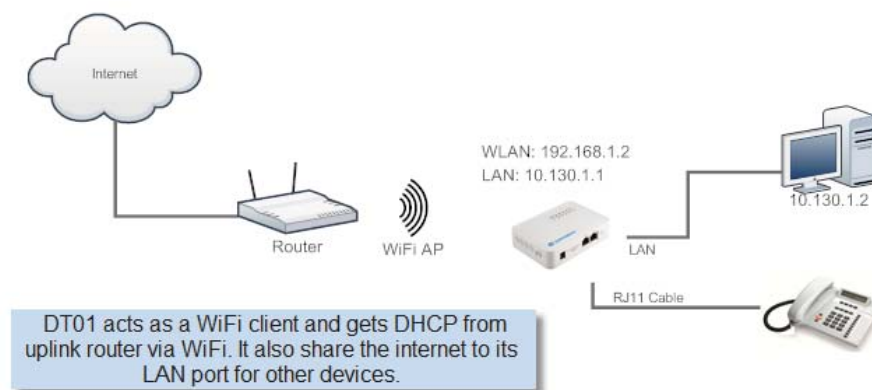
This is the default connection mode. System works like below:



Set Up in Web UI:

- ✓ **Internet Access**
Access Internet via WAN port
- ✓ **LAN and DHCP:**
Enable DHCP server in its LAN port
- ✓ **Access Point(optional)**
Enable WiFi AP
Input SSID/ Encryption/ Passphrase
- ✓ **Mesh Network**
Disable WiFi Mesh Network

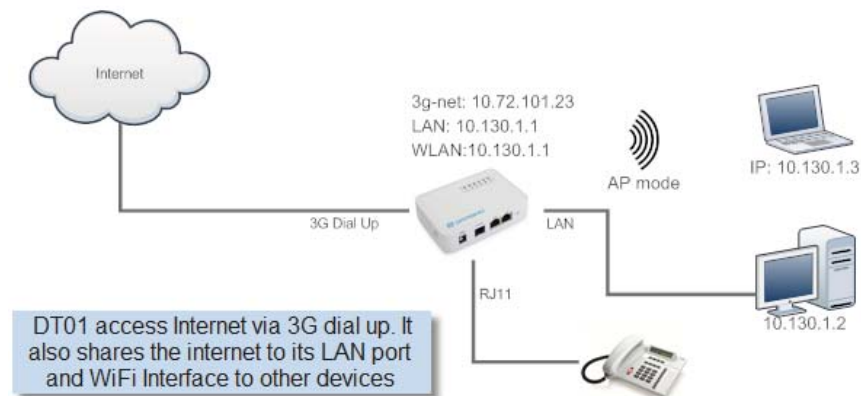
3.2 Connect Internet via WiFi Client mode



Set Up in Web UI:

- ✓ **Internet Access**
Access Internet via WiFi Client
Way to Get IP: DHCP
Input correct SSID, Password and Encryption.
- ✓ **LAN and DHCP**
Enable DHCP server in its LAN port
- ✓ **Access Point**
Disable WiFi AP
- ✓ **Mesh Network**
Disable WiFi Mesh Network

3.3 Connect Internet via USB dongle, 3G/4G/GPRS



Set Up in Web UI:

- ✓ **Internet Access**
Access Internet via USB Modem
- ✓ **LAN and DHCP:**
Enable DHCP server in its LAN port
- ✓ **Access Point(optional)**
Enable WiFi AP
Input SSID/ Encryption/ Passphrase
- ✓ **Mesh Network**
Disable WiFi Mesh Network

Below are USB 3G modem set up example:

Service 3G WCDMA

Provider: China Unicom

dragino2-3ccaef
Network

USB Modem Setting

USB Modem
Manufacturer:HUAWEI Technology, Vendor ID:12d1, Product ID:1436
Auto Detect USB Devices

Modem Status
inet addr:10.72.101.23 P-t-P:10.64.64.64 Mask:255.255.255.255
Connection Status

Available USB Port
/dev/ttyUSB1 /dev/ttyUSB2 /dev/ttyUSB3 /dev/ttyUSB4
A modem is always detected to have several USB port for different features

USB Modem Service
UMTS
3G WCDMA

VID
12d1
Vendor ID as shown in USB info section

PID
1436
Product ID as shown in USB info section

Service APN
3gnet
Service APN. 3gnet is for China Unicom

Dial String
*99#
Dial String, Default *99#

Username
Leave blank if no provided by your provider

Password
Leave blank if no provided by your provider

PIN
Leave blank if no provided by your provider

USB Serial Port
ttyUSB1
The USB port of your dongle used for Dial Up.

Service: 3G EV-DO

Provider: China Telecom

dragino2-3ccaef
Status
System
Sensor
Network
Logout

USB Modem Setting
3G EV-DO dial up example:
Provider: China Telecom 3G
USB Dongle: ZTE AC582

USB Modem
Manufacturer:ZTE, Vendor ID:19d2, Product ID:0152

Modem Status

Available USB Port
/dev/ttyUSB0 /dev/ttyUSB1 /dev/ttyUSB2 /dev/ttyUSB3 /dev/ttyUSB4

USB Modem Service
EV-DO
Choose EV-DO

VID
19d2
Input USB dongle VID

PID
0152
Input USB dongle PID

Service APN

Dial String
#777
Dial String for Chinatelecom

Username
ctnet@mycdma.cn
User Name

Password
Password

PIN

USB Serial Port
ttyUSB0
Choose USB Serial Port for 3G

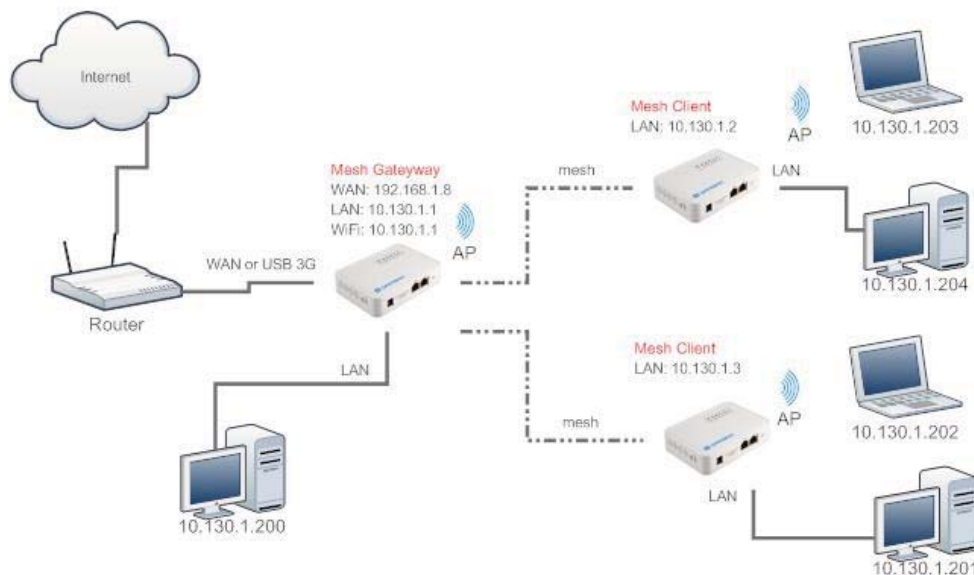
Save & Apply

3.4 Set up WiFi mesh network

Brief: in this network topology, user should choose the device to be a mesh gateway node or mesh client node

- ✓ **Mesh Gateway:** use WAN port or USB 3G to get internet access from uplink router. It also shares the internet to its Mesh Network for other Mesh Clients. The Mesh Gateway also acts as a DHCP router for its mesh network.
- ✓ **Mesh Client:** Connects to the Mesh Gateway via mesh WiFi, it also bridge internet via the LAN and WiFi AP interface.

A mesh network with DT01.



3.4.1 Mesh Gateway Set Up via Web UI

- ✓ **Internet Access**
Access Internet via WAN port or USB Modem
- ✓ **LAN and DHCP**
Enable DHCP server in its LAN port
- ✓ **Access Point**
Enable WiFi AP
- ✓ **Mesh Network**
Enable WiFi Mesh Network
Mesh Mode: SERVER

BSSID: 02:CA:FF:EE:BA:BB //Note: (1) BSSID should start with 02: ; (2) Mesh Device with different BSSID can't communicate with each other.

3.4.2 Mesh Client Set Up via Web UI

✓ **Internet Access**

Access Internet via Mesh WiFi

✓ **LAN and DHCP**

Disable DHCP server in its LAN port

✓ **Access Point**

Enable WiFi AP (can use same SSID or difference SSID with other mesh node)

✓ **Mesh Network**

Enable WiFi Mesh Network

Mesh Mode: CLIENT

BSSID: 02:CA:FF:EE:BA:BB //Note: (1) BSSID should start with 02;; (2) Mesh Device with different BSSID can't communicate with each other.

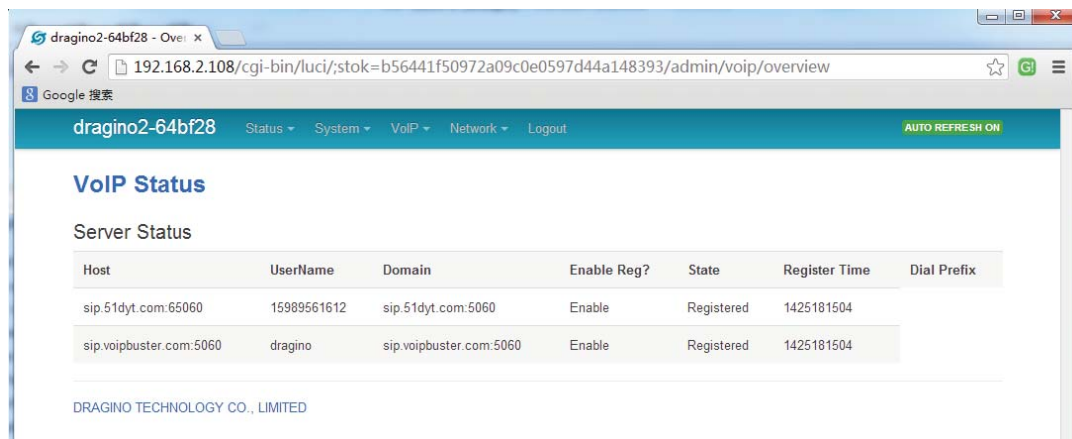
Note: Mesh set up need to reboot to take effect.

4 VoIP Settings

User can configure the VoIP settings in the Web UI or configure Asterisk advance settings via SSH access to the DT01.

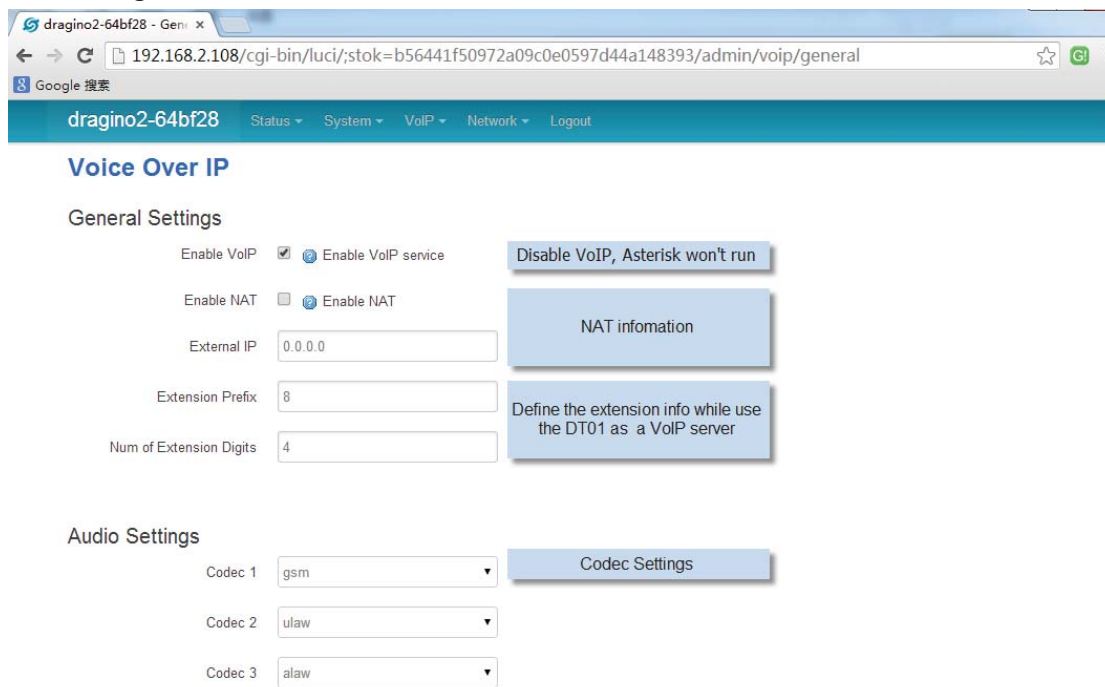
4.1 Overview

This page shows the servers register status.



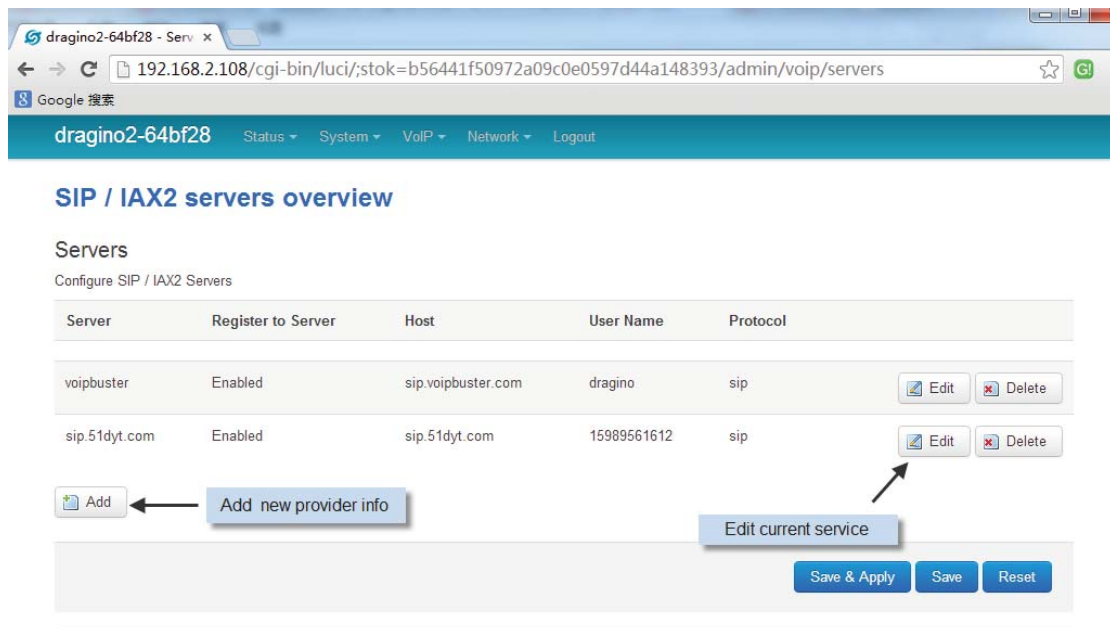
4.2 General Settings

Define the general info for Asterisk



4.3 VoIP Server Settings

This page defines how DT01 connect to VoIP services.



SIP / IAX2 servers overview

Servers

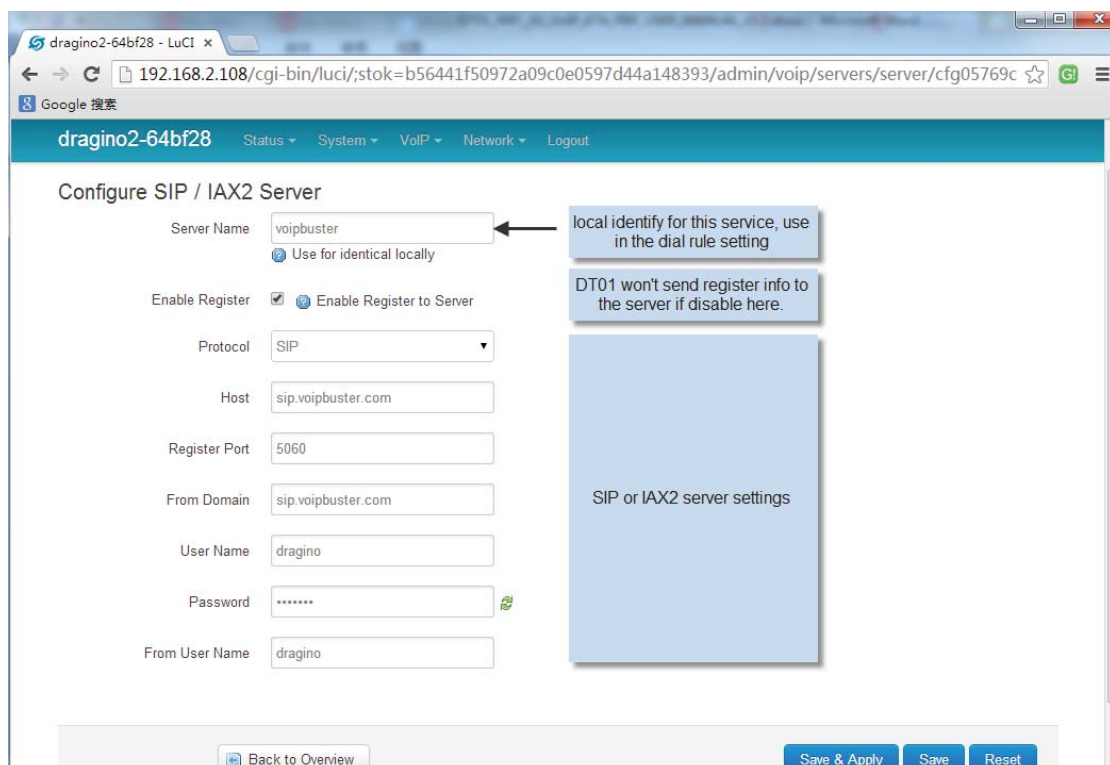
Configure SIP / IAX2 Servers

Server	Register to Server	Host	User Name	Protocol	
voipbuster	Enabled	sip.voipbuster.com	dragino	sip	Edit Delete
sip.51dyt.com	Enabled	sip.51dyt.com	15989561612	sip	Edit Delete

[Add](#) [Add new provider info](#) [Edit current service](#)

[Save & Apply](#) [Save](#) [Reset](#)

Configure each SIP/IAX2 service entry.



Configure SIP / IAX2 Server

Server Name: [Use for identical locally](#)

Enable Register: ☒ [Enable Register to Server](#)

Protocol:

Host:

Register Port:

From Domain:

User Name:

Password:

From User Name:

[Back to Overview](#) [Save & Apply](#) [Save](#) [Reset](#)

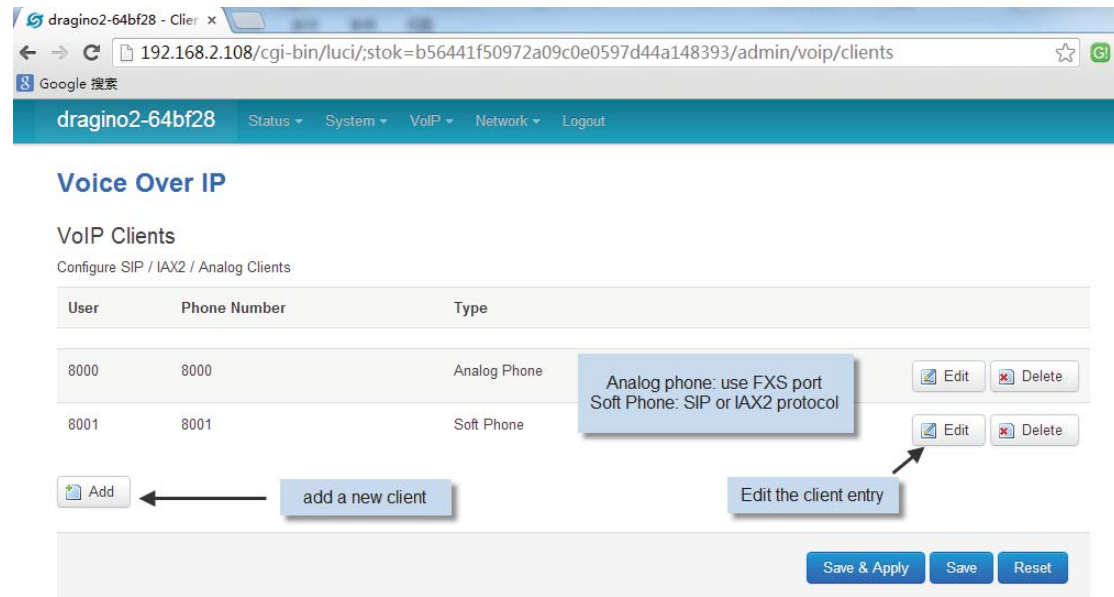
local identify for this service, use in the dial rule setting

DT01 won't send register info to the server if disable here.

SIP or IAX2 server settings

4.4 VoIP Clients

DT01 can act as a SIP/IAX2 server. This page defines the clients' info.



dragino2-64bf28 Status System VoIP Network Logout

Voice Over IP

VoIP Clients

Configure SIP / IAX2 / Analog Clients

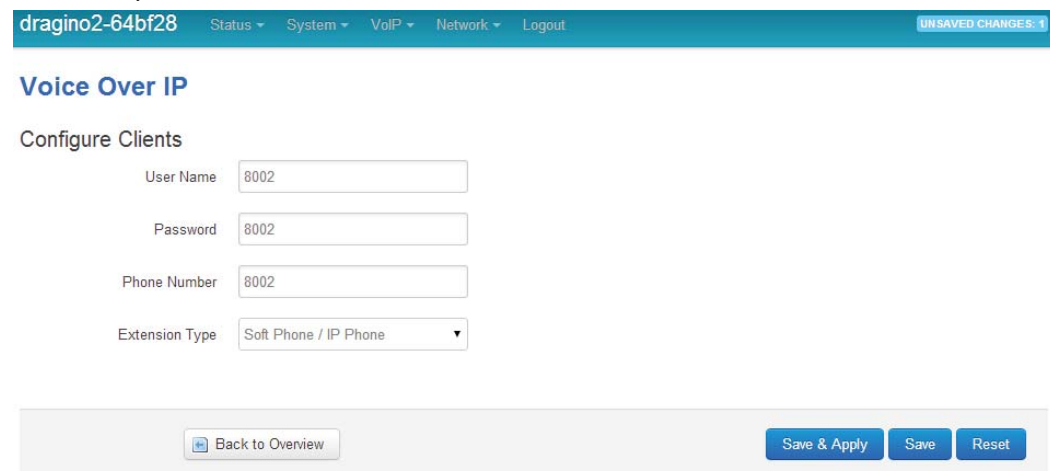
User	Phone Number	Type	
8000	8000	Analog Phone	Edit Delete
8001	8001	Soft Phone	Edit Delete

Add add a new client Edit the client entry

Save & Apply Save Reset

Analog phone: use FXS port
Soft Phone: SIP or IAX2 protocol

Client Entry:



dragino2-64bf28 Status System VoIP Network Logout UNSAVED CHANGES

Voice Over IP

Configure Clients

User Name: 8002

Password: 8002

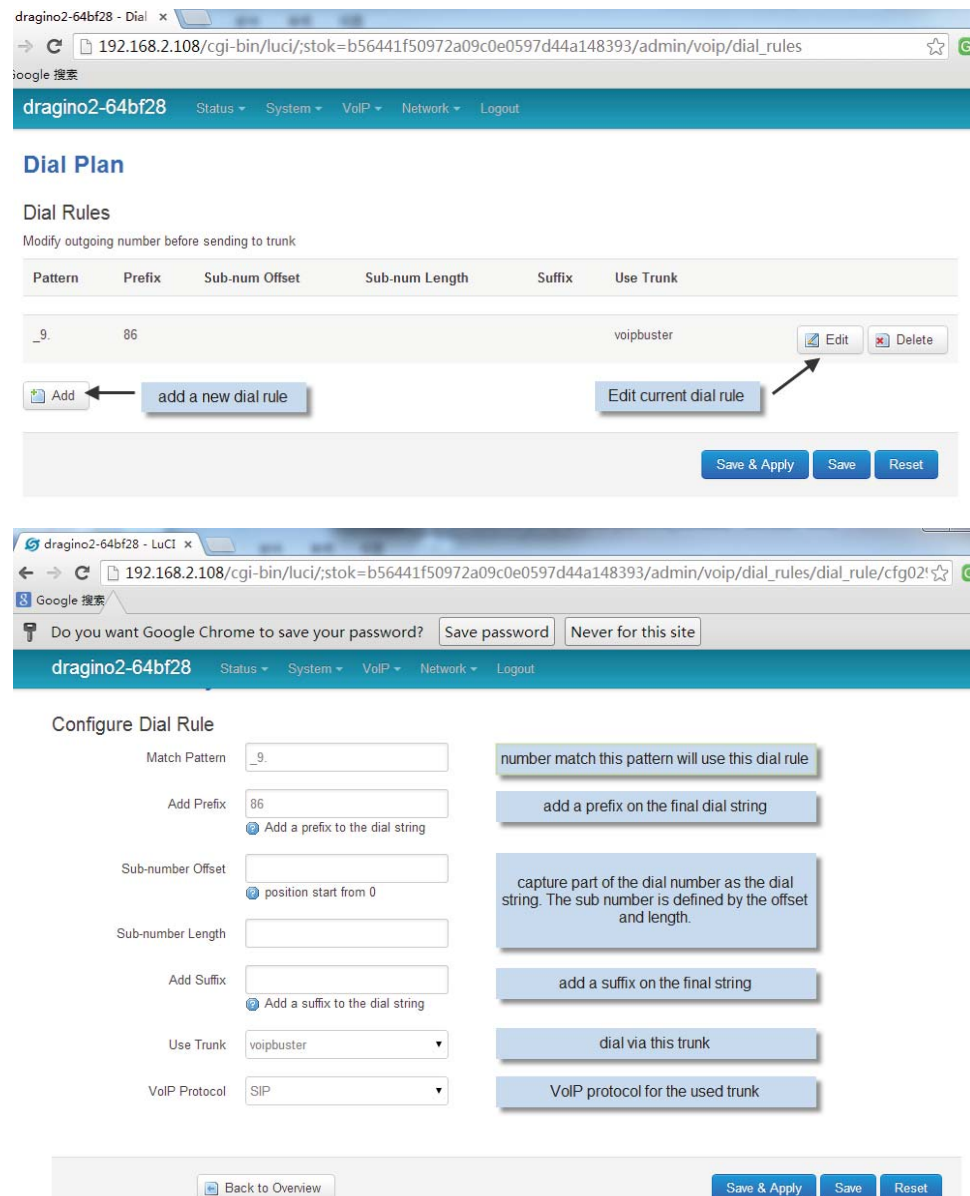
Phone Number: 8002

Extension Type: Soft Phone / IP Phone

Back to Overview Save & Apply Save Reset

4.5 Dial Plan

Here configure how to make calls via the service provide.



Dial Plan

Dial Rules
Modify outgoing number before sending to trunk

Pattern	Prefix	Sub-num Offset	Sub-num Length	Suffix	Use Trunk
_9.	86			voipbuster	

Buttons: Add, Edit, Delete, Save & Apply, Save, Reset

Configure Dial Rule

Match Pattern: number match this pattern will use this dial rule

Add Prefix: add a prefix on the final dial string
☒ Add a prefix to the dial string

Sub-number Offset: capture part of the dial number as the dial string. The sub number is defined by the offset and length.
☒ position start from 0

Sub-number Length:

Add Suffix: add a suffix on the final string
☒ Add a suffix to the dial string

Use Trunk: dial via this trunk

VoIP Protocol: VoIP protocol for the used trunk

Buttons: Back to Overview, Save & Apply, Save, Reset

Definition of dial rule entry:

- **Match Pattern:** Define what number will use this dial rule. Same the extension pattern defined in Asterisk, it can be a complete number or a pattern.
 If extension name starts with '_', it is consider as pattern.
 When use the pattern, some characters have special meaning:
 - **X** - any digit from 0-9
 - **Z** - any digit from 1-9
 - **N** - any digit from 2-9
 - **[12679]** - any digit in the brakets (in the example: 1,2,6,7,9)
 - **.** (dot) wildcard, matches everything remaining

(_1234. - matches anything starting with 1234 excluding 1234 itself).

Note: Do not use '_.', because it will match everything even the predefined extensions!!!

Example:

_359ZXXXXXX - This will match all dialed numbers that start with 359, and are 10 digits long(including 359)

_0XXX. - This will match all dialed numbers that begin with 0 and are minimum 5 digits long (including 0)

➤ **Sub Number Offset, Sub Number Length**

These two setting is used to get a sub-number from the dialed number and use this sub-number as the number dial to the VoIP provider.

The **offset** tells the position to get the sub-number and the **length** tells the length of this sub-number. If **Length** is blank, the sub-number will be the number from the offset to the end of dialed number.

Example:

If the dialed number is 9123456, while:

Offset is 0, length is 4. → the real outgoing number 9123

Offset is 1, length is blank → the real outgoing number is 123456

➤ **Add Prefix, Suffix**

Add prefix or suffix to the real outgoing number.

➤ **Use trunk**

Select the VoIP service provider to send the outgoing call.

➤ **VoIP Protocol**

The dial out voip protocol , SIP or IAX2.

5 VoIP Set up example:

5.1 Configure as SIP ATA

This is the most normal configuration for DT01, the structure is as below:



Below is the configure example for Voipbuster service:

Step 1: Input Service Provider info

dragino2-64bf28 Status System VoIP Network Logout [UNSAVED CHANGES](#)

Configure Server

Configure SIP / IAX2 Server

Server Name
☒ Use for identical locally

Enable Register ☒ ☒ Enable Register to Server

Protocol

Host

Register Port

From Domain

User Name

Password

From User Name

[Back to Overview](#) [Save & Apply](#) [Save](#) [Reset](#)

Step 2: Configure Dial Plan

dragino2-64bf28 Status System VoIP Network Logout

Dial Rule Entry

Configure Dial Rule

Match Pattern All number start with 9 will use this rule

Add Prefix
☒ Add a prefix to the dial string

Sub-number Offset The first digit (9) will be cut off, rest digits will be sent out as the dial
☒ position start from 0

Sub-number Length

Add Suffix
☒ Add a suffix to the dial string

Use Trunk Dial via voipbuster and use SIP protocol.

VoIP Protocol

[Back to Overview](#) [Save & Apply](#) [Save](#) [Reset](#)

After above configure, user will be able to use the normal phone to dial out via VoIP Buster.

5.2 Configure as SIP server

In this application, DT01 connect to SIP provider like section 5.1. Besides that, DT01 also acts as a SIP server. So softphones or IP phones can register to DT01 and make outbound calls via DT01's trunks.

Structure is as below:



User can add clients via the VoIP → Clients page. VoIP client uses the type [soft phone](#) while create.

dragino2-64bf28
Status
System
VoIP
Network
Logout

Voice Over IP

VoIP Clients

Configure SIP / IAX2 / Analog Clients

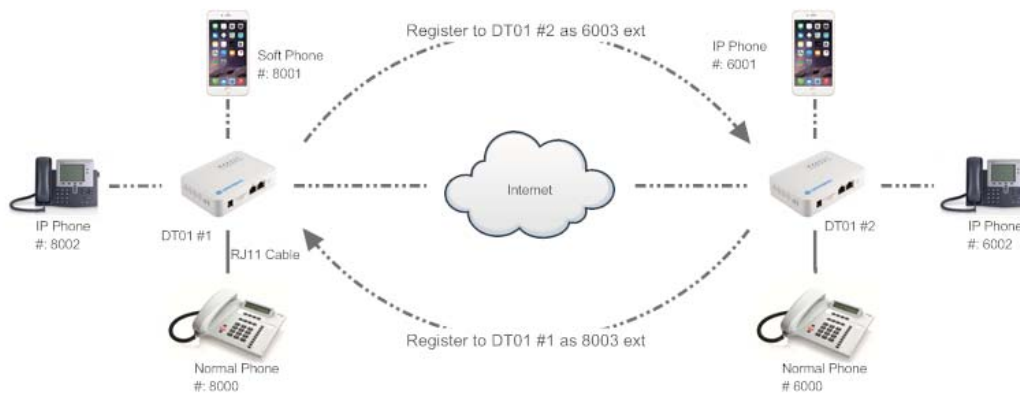
User	Phone Number	Type	
6000	6000	Analog Phone	Edit Delete
6001	6001	Soft Phone	Edit Delete
6002	6002	Soft Phone	Edit Delete

[Add](#)

[Save & Apply](#)
[Save](#)
[Reset](#)

5.3 Link two DT01s via IAX2 protocol.

Two DT01 can link to each other so extension behind them looks like in the same office and calls between all extensions are free.



Two DT01 are in different locations. They register to each other as an extension and able to call to extension in the other DT01.

Set up example:

Step 1:

- Create a softphone client 8003 in DT01 #1,
- create a softphone client 6003 in DT01 #2

Step 2: In DT01 #1:

- In VoIP → Servers, set up an IAX2 account to register to **DT01 #2's** account 6003.
- In VoIP → Dial Plan, create a dial rule with below info:
 - ✧ **Match Pattern:** _6.
 - ✧ **Use Trunk:** Select DT01 #2 trunk
 - ✧ **Protocol:** IAX2

Step 3: In DT01 #2:

- In VoIP → Servers, set up an IAX2 account to register to **DT01 #1's** account 8003.
- In VoIP → Dial Plan, create a dial rule with below info:
 - ✧ **Match Pattern:** _8.
 - ✧ **Use Trunk:** Select DT01 #1 trunk
 - ✧ **Protocol:** IAX2


After above configure, all the extensions in DT01 #1 (8xxx) is able to reach the DT01 #2 extensions (6xxx) by simple dial the number 6xxx. Inverse for 6xxx to call to 8xxx.

6 Upgrade Firmware

User can upgrade the firmware of DT01 for new features or bugs fix. Below are the method to upgrade via Web UI, there are more other upgrade methods can refer: [Upgrade DT01 firmware](#)

[Upgrade via Web UI:](#)

Goto [Web UI](#) → [System](#) → [Flash Firmware](#): Choose the `xxx--squashfs-sysupgrade.bin` image and process update:



The screenshot shows the Dragino Web UI interface. The top navigation bar includes 'Status', 'System', 'Network', and 'Logout'. The main content area is divided into two sections:

- Backup / Restore**: This section contains instructions for downloading a backup archive and performing a reset. It includes buttons for 'Generate archive' and 'Perform reset'. Below this, there is a section for restoring configuration files, with a text input field and an 'Upload archive...' button.
- Flash new firmware image**: This section contains instructions for uploading a sysupgrade-compatible image. It includes a checkbox for 'Keep settings' (which is checked) and a text input field for the image path, followed by a 'Flash image...' button.

7 FAQ

7.1 How to get long distance WiFi range?

The DT01 are equipped with chip antenna by default this antenna is mainly for indoor use and have a range 20~50 meters depends on the real environment. It is possible to change the DT01 to use a high gain (15dB etc) external antenna to reach a long distance range in WiFi.

The change can be done via the instruction from this link:

[Change the resistor to use external antenna.](#)

7.2 How to reset DT01 to factory default?

User can go to the configure page: system → flash firmware to reset the device to factory default.

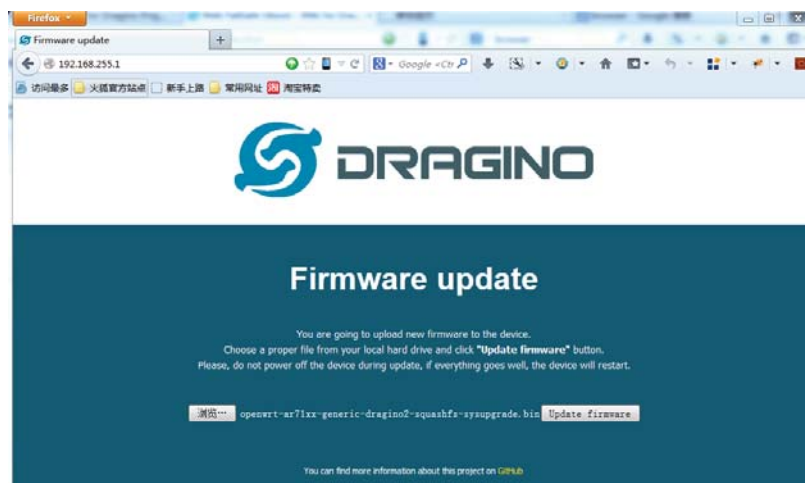
7.3 How to recover DT01 if firmware crash?

In case the device is power off during a firmware upgrade which causes it can't boot or access.

User is still able to recover the device by the web failsafe mode, by below procedures:

Recover Procedure:

- Use a RJ45 cable to connect the PC to DT01's Ethernet port directly.
- Set the PC to ip 192.168.255.x, netmask 255.255.255.0
- Pressing the toggle button and power on the DT01
- All LEDs of the DT01 will start blink, release the toggle button after four blinking.
- Then all LEDs will blink very fast, this means device detect a network connection and DT01 is in the web-failsafe mode. Your PC should be able to ping 192.168.255.1 after device enter this mode.
- Open 192.168.255.1 in web browser.
- Select a [squashfs-sysupgrade](#) type firmware and update firmware.



8 Reference

- ✧ DT01 firmware link:
<http://www.dragino.com/downloads/downloads/DT01/Firmware/>
- ✧ MS14 (mother board for DT01) Official wiki
http://wiki.dragino.com/index.php?title=IoT_Mesh_Firmware_User_Manual
- ✧ OpenWrt official website:
<http://www.openwrt.org/>
- ✧ Asterisk official site
<http://www.asterisk.org/>
- ✧ Things about Asterisk.
<http://www.voip-info.org/wiki/view/Asterisk>

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.

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.

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

Remark : 3G or 4G dongle is not in the device package, only the USB port of the device can connect this kind dongle
The distance between user and products should be no less than 20cm