

Static Routing for ROS

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Chapter 1 Introduction

1.1 Overview

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

Static routing is a form of routing that occurs when a router uses a manually-configured routing entry, rather than information from a dynamic routing traffic. In many cases, static routes are manually configured by a network administrator by adding entries into a routing table, though this may not always be the case. Unlike dynamic routing, static routes are fixed and do not change if the network is changed or reconfigured. Static routing and dynamic routing are not mutually exclusive. Both dynamic routing and static routing are usually used on a router to maximize routing efficiency and to provide backups in the event that dynamic routing information fails to be exchanged. Static routing can also be used in stub networks, or to provide a gateway of last resort.

This application note has been written for customer with a good understanding of Robustel products and a basic experience of Static routing. It shows customer how to configure and test the Static routing between the ROS and Cisco router through the cellular network.

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

1.2 Assumptions

The features of Static Routing have been fully tested and this application note has been written by technically competent engineer who is familiar with the Robustel products and the application requirements.

This application note is based on:

- Product model: Robustel GoRugged R2000, an industrial cellular VPN router
- Firmware version: R2000_ROS_V2.0.6
- Configuration: This application note assumes the Robustel products are set to factory default. Most of configuration steps are only shown if they are different from the factory default settings.

^ System Information	
Device Model	R2000-4L
System Uptime	0 days, 00:28:31
System Time	Fri Jan 1 00:28:16 2016 (NTP not updated)
Firmware Version	2.0.6 (Rev 466)
Hardware Version	1.1
Kernel Version	3.10.49
Serial Number	01470616070025

The central Cisco router must be assigned a public IP address to its WAN port. The IP address can be dynamic or static. If the central Cisco router working with dynamic public IP address, a DNS service must be used to park dynamic public IP address to a static domain.

1.3 Rectifications

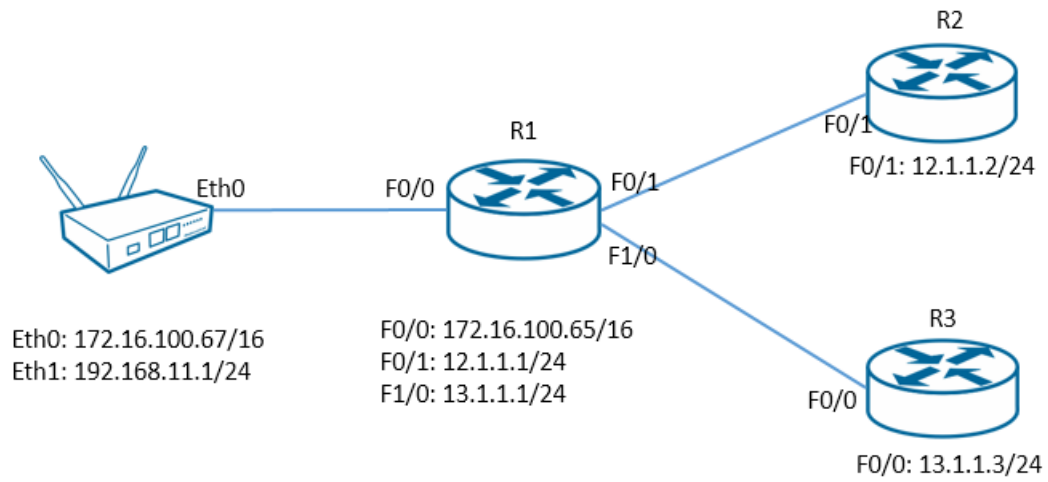
Requests for corrections or rectifications to this application note will be appreciated, and if there are any request for new application notes please email to: support@robustel.com.

1.4 Version

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

Release Date	Firmware Version	Change Description
2017-02-17	v.1.0.0	Initial Release

Chapter 2 Topology



1. Cisco 2811 Routers run with Static routing protocol.
2. The R2000 works with Static routing protocol.
3. The R2000 updates its own route table and transmit data to remote side successfully.

Chapter 3 Configuration

3.1 Cisco Configuration

Enter the configuration mode and check the IOS version of Cisco router, but you need to be in Enable mode in advance (e.g. typing “configure terminal”).

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
```

The entries below is the settings of Static routing on Cisco router R1.

```
hostname R1
!
boot-start-marker
boot-end-marker
!
interface FastEthernet0/0
 ip address 172.16.100.65 255.255.0.0
 duplex auto
 speed auto
!
interface FastEthernet0/1
 ip address 12.1.1.1 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet1/0
 ip address 13.1.1.1 255.255.255.0
 duplex auto
 speed auto
!
```

The entries below is the settings of Static routing on Cisco router R2.

```
hostname R2
!
boot-start-marker
boot-end-marker
!
interface FastEthernet0/1
 ip address 12.1.1.2 255.255.255.0
 duplex auto
```

```
speed auto
!  
ip classless  
ip route 172.16.0.0 255.255.0.0 12.1.1.1
```

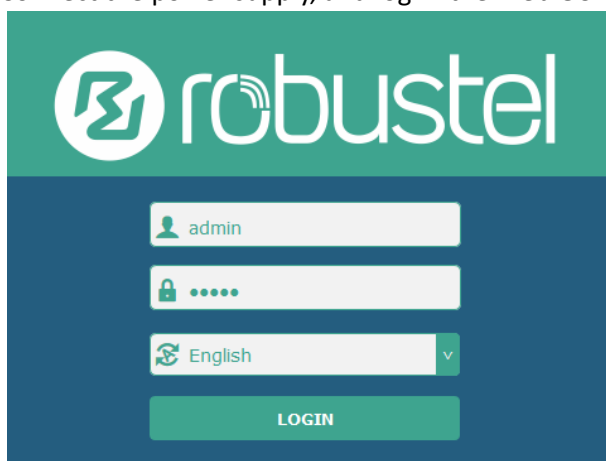
The entries below is the settings of Static routing on Cisco router R3.

```
hostname R3  
!  
boot-start-marker  
boot-end-marker  
!  
interface FastEthernet0/0  
 ip address 13.1.1.3 255.255.255.0  
 duplex auto  
 speed auto  
!  
ip classless  
ip route 172.16.0.0 255.255.0.0 13.1.1.1
```

3.2 R2000_ROS Configuration

3.2.1 Configure IP Address of LAN

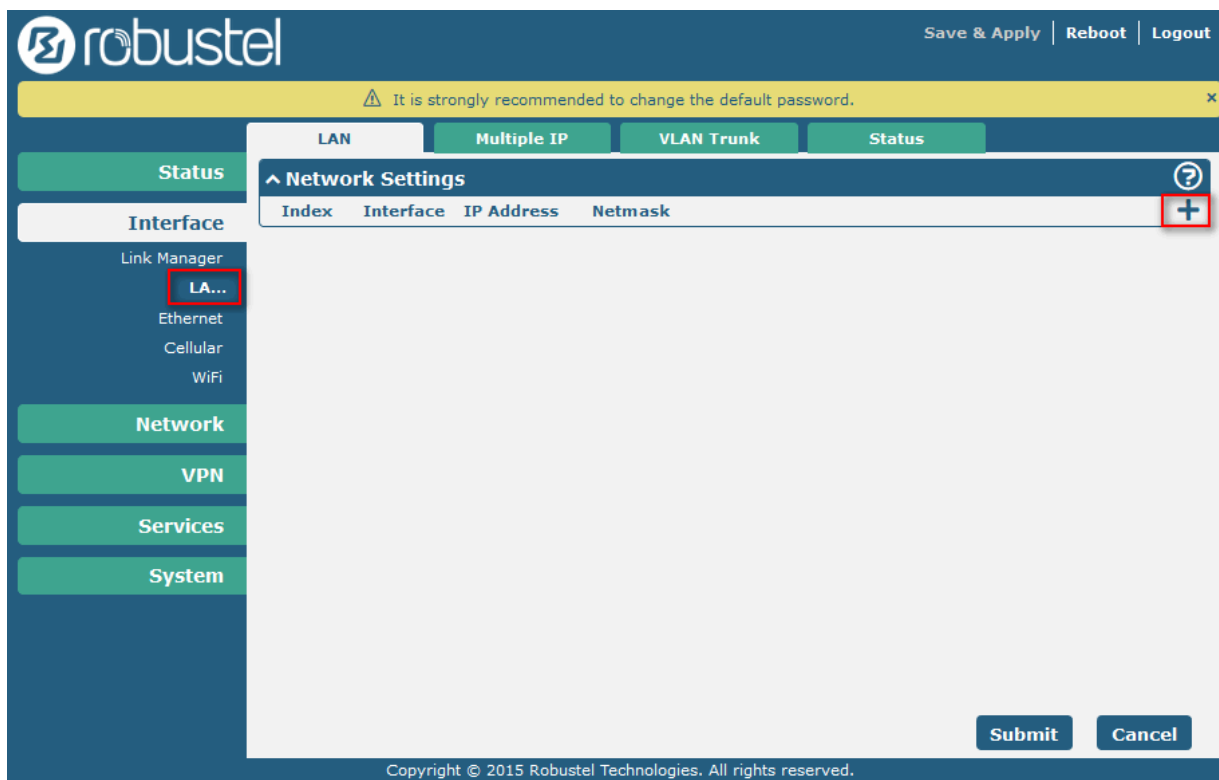
1. Connect the power supply, and log-in the Web GUI of R2000.



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

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

2. Browse to **Interface > LAN > LAN**.
- Click the edit button of “lan0”.



- Set its IP address and Netmask, and the parameters of “DHCP Settings” are set accordingly.
- Click “Submit”.

LAN

^ General Settings

Index

1

Interface

lan0

IP Address

192.168.11.1

Netmask

255.255.255.0

MTU

1500

^ DHCP Settings

Enable

ON

OFF

Mode

Server

IP Pool Start

192.168.11.2

IP Pool End

192.168.11.100

Subnet Mask

255.255.255.0

^ DHCP Advanced Settings

Submit

Close

- Click “Save & Apply”.

The screenshot shows the Robustel web interface. At the top right, there are buttons for 'Save & Apply' (highlighted with a red box), 'Reboot', and 'Logout'. A yellow banner at the top states: 'It is strongly recommended to change the default password.' The left sidebar contains a menu with 'Status', 'Interface' (selected), 'Link Manager', 'LAN' (sub-selected), 'Ethernet', 'Cellular', 'WiFi', 'Network', 'VPN', 'Services', and 'System'. The main content area is titled 'Network Settings' and contains a table with the following data:

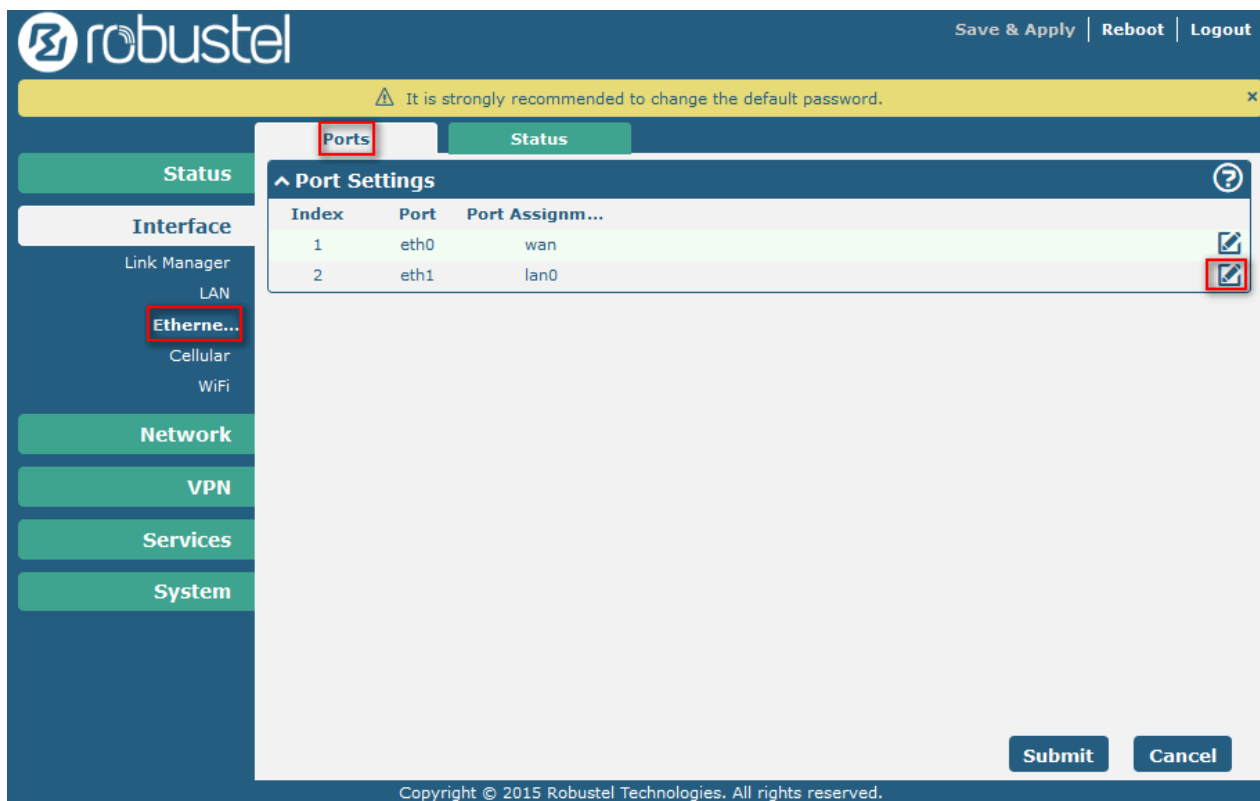
Index	Interface	IP Address	Netmask
1	lan0	192.168.11.1	255.255.255.0

At the bottom right of the main content area, there are 'Submit' and 'Cancel' buttons. The footer of the interface reads: 'Copyright © 2015 Robustel Technologies. All rights reserved.'

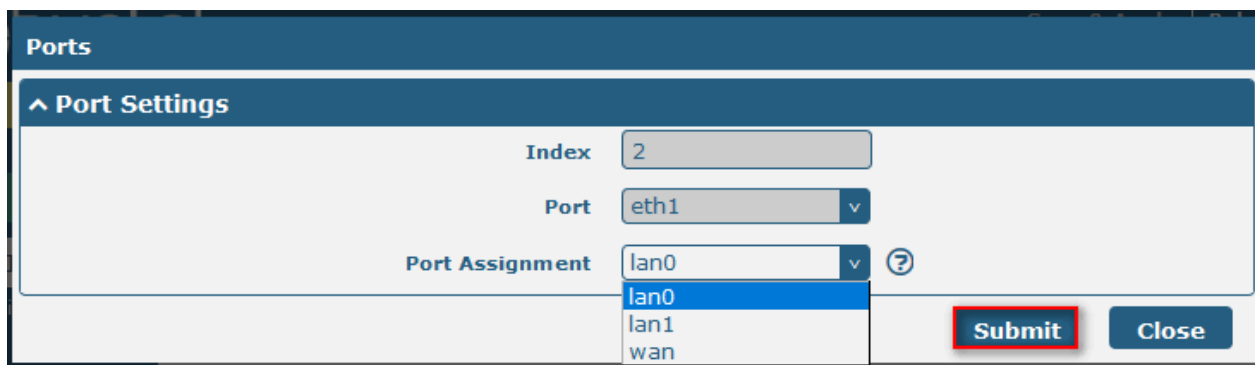
Item	Description	Setting
IP Address	Set the IP address of lan0.	Enter accordingly
Netmask	Set the Netmask of lan0.	Enter accordingly
MTU	Set the MTU of lan0.	1500

- Browse to **Interface > Ethernet > Ports**.

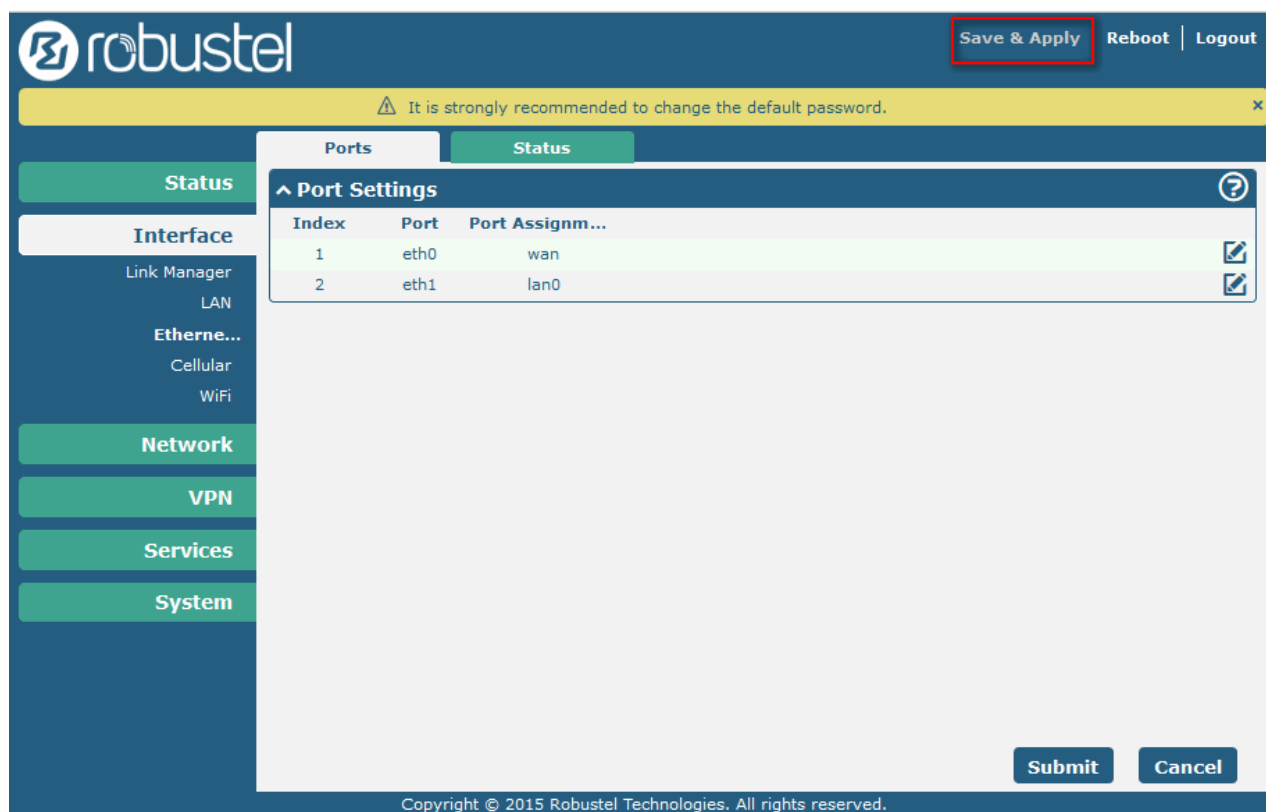
- Click the edit button of “eth1”.



- Assign lan0 to the eth1 port.
- Click "Submit".



- Click "Save & Apply".



3.2.2 Configure Link Manager

1. Browse to **Ethernet > Ports**
 - Click the edit button of "eth0".

The screenshot shows the Robustel router configuration interface. The top navigation bar includes the Robustel logo, a yellow warning banner stating "It is strongly recommended to change the default password.", and links for "Save & Apply", "Reboot", and "Logout". The left sidebar contains a menu with "Status", "Interface", "Network", "VPN", "Services", and "System". Under "Interface", "Ethernet" is selected and highlighted with a red box. The main content area shows the "Ports" tab with a "Port Settings" table. The table has columns for "Index", "Port", and "Port Assignment". It lists two ports: Index 1 (eth0) assigned to lan0, and Index 2 (eth1) assigned to lan0. Red boxes highlight the edit icons (pencil) for each row. At the bottom right of the table are "Submit" and "Cancel" buttons. The footer contains the copyright notice: "Copyright © 2015 Robustel Technologies. All rights reserved."

Index	Port	Port Assignment
1	eth0	lan0
2	eth1	lan0

- Assign "wan" to the eth0 port and click "Submit".

This is a close-up of the "Port Settings" form for Index 1. It contains three fields: "Index" with the value "1", "Port" with a dropdown menu showing "eth0", and "Port Assignment" with a dropdown menu showing "wan". The "wan" option in the "Port Assignment" dropdown is highlighted with a red box. At the bottom right of the form are "Submit" and "Close" buttons, with the "Submit" button also highlighted with a red box.

- Click "Save & Apply".

The screenshot shows the Robustel web interface. At the top, there is a header with the Robustel logo, a "Save & Apply" button (highlighted with a red box), and links for "Reboot" and "Logout". Below the header, a yellow banner displays a warning: "It is strongly recommended to change the default password." The left sidebar contains a navigation menu with sections: "Status", "Interface" (with sub-items "Link Manager", "LAN", "Ethernet", "Cellular", "WIFI"), "Network", "VPN", "Services", and "System". The main content area is titled "Port Settings" and features a table with the following data:

Index	Port	Port Assignment
1	eth0	wan
2	eth1	lan0

Each row in the table has an edit icon (pencil) to its right. At the bottom right of the main content area, there are "Submit" and "Cancel" buttons. A green banner at the very bottom of the interface states: "Configuration successfully submitted. Changes will be saved and effective after clicking the 'Save&Apply' button."

2. Browse to **Interface > Link Manager**.
- Click the edit button of "wan".

robustel Save & Apply | Reboot | Logout

⚠ It is strongly recommended to change the default password.

Link Manager **Status**

Status

Interface

Link Manager

LAN

Ethernet

Cellular

WiFi

Network

VPN

Services

System

General Settings

Primary Link: WWAN1

Backup Link: None

Emergency Reboot: ☐ ON ☒ OFF

Link Settings

Index	Type	Description	Connection Type
1	WWAN1		DHCP
2	WWAN2		DHCP
3	WAN		DHCP

Submit **Cancel**

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- Enter the configuration correctly as below and click “Submit”.

Link Manager

General Settings

Index: 3

Type: WAN

Description:

Connection Type: Static

Static Address Settings

IP Address: 172.16.100.67/16

Gateway: 172.16.0.1

Primary DNS: 172.16.0.1

Secondary DNS:

Ping Detection Settings

Enable: ☐ ON ☒ OFF

Primary Server: 8.8.8.8

Secondary Server:

Submit **Close**

- Assign “WAN” to the “Primary Link” and click “Save & Apply”.

The screenshot shows the Robustel ROS web interface. The top navigation bar includes the Robustel logo, a 'Save & Apply' button, and links for 'Reboot' and 'Logout'. A yellow banner at the top states: 'It is strongly recommended to change the default password.' The left sidebar contains a menu with 'Status', 'Interface', 'Link Manager', 'Network', 'VPN', 'Services', and 'System'. The 'Link Manager' section is active, showing 'General Settings' and 'Link Settings'.

General Settings

- Primary Link: WAN
- Backup Link: None
- Emergency Reboot: OFF

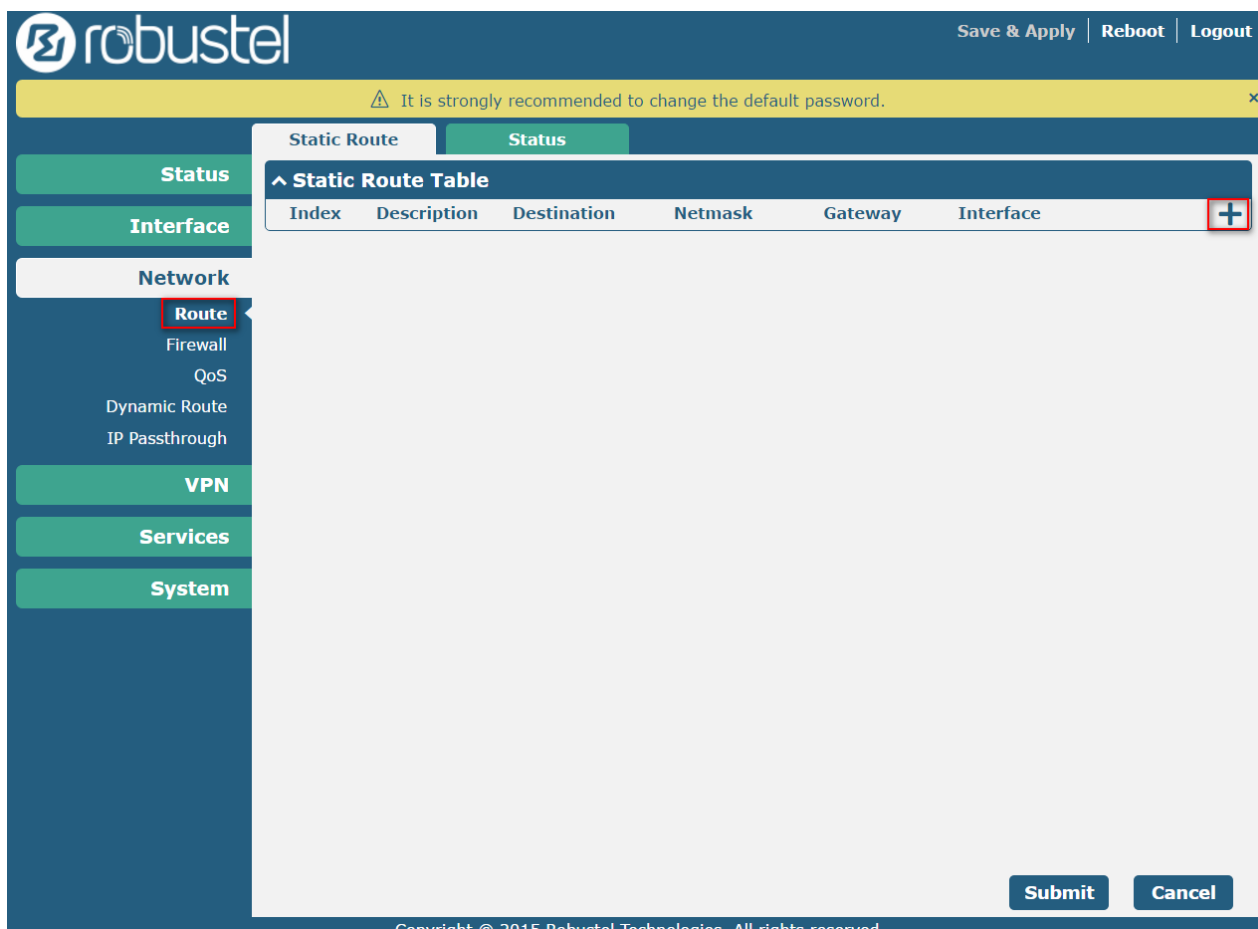
Link Settings

Index	Type	Description	Connection Type
1	WWAN1		DHCP
2	WWAN2		DHCP
3	WAN		Static

At the bottom right, there are 'Submit' and 'Cancel' buttons. The footer text reads: 'Copyright © 2015 Robustel Technologies. All rights reserved.'

3.2.3 Configure Static Routing

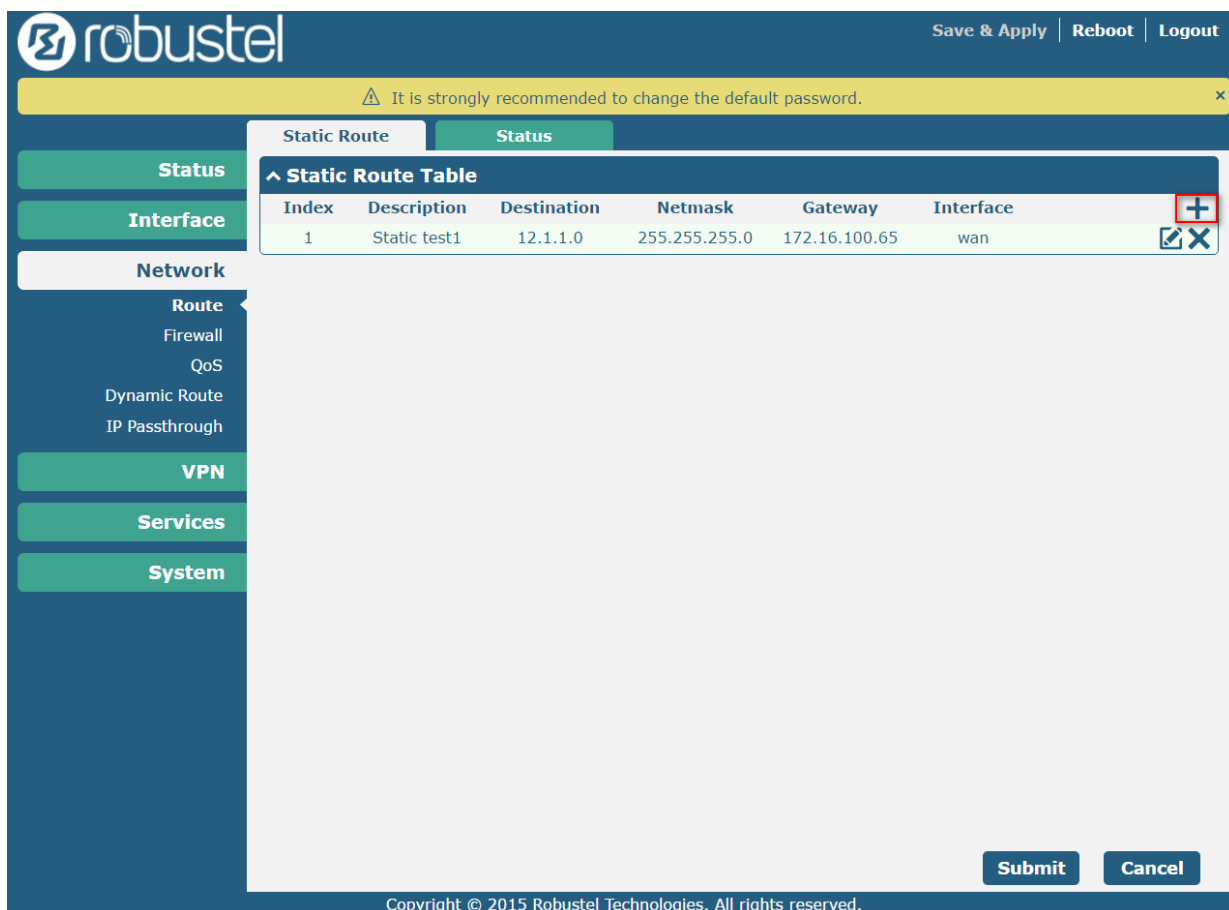
- Browse to **Network > Static Route**
- Click the edit button of Static Route Table.



- Set its Destination and Netmask, and set Gateway accordingly, and then set “wan” as the outbound interface.
- Click “Submit”.


The screenshot shows the 'Static Route' configuration form. The form fields are: Index (1), Description (Static test1), Destination (12.1.1.0), Netmask (255.255.255.0), Gateway (172.16.100.65), and Interface (wan). A red box highlights the Destination, Netmask, Gateway, and Interface fields. At the bottom right are 'Submit' and 'Close' buttons.

- Click the edit button of Static Route Table again.



- Set its Destination and Netmask, and set Gateway accordingly, and then set “wan” as the outbound interface.
- Click “Submit”.

- Click “Save & Apply”.



Save & Apply | Reboot | Logout

⚠ It is strongly recommended to change the default password. x

Status

Interface

Network

Route

VPN





Services

System

Static Route

Status

Static Route Table

Index	Description	Destination	Netmask	Gateway	Interface	
1	Static test1	12.1.1.0	255.255.255.0	172.16.100.65	wan	 
2	Static test2	13.1.1.0	255.255.255.0	172.16.100.65	wan	 

Submit

Cancel

Configuration successfully submitted. Changes will be saved and effective after clicking the 'Save&Apply' button.

Chapter 4 Testing

4.1 Check in R2000

1. Check the Route Table of R2000.

Path: Network > Route > Status.

The screenshot shows the Robustel R2000 web interface. The top navigation bar includes the Robustel logo, a notification banner stating "It is strongly recommended to change the default password.", and links for "Save & Apply", "Reboot", and "Logout". The left sidebar contains a menu with "Status", "Interface", "Network", "VPN", "Services", and "System". Under "Network", there are sub-items: "Route", "Firewall", "QoS", "Dynamic Route", and "IP Passthrough". The "Route" sub-item is selected, and the "Status" tab is active. The main content area displays the "Route Table" with the following data:

Index	Destination	Netmask	Gateway	Interface	Metric
1	0.0.0.0	0.0.0.0	172.16.0.1	wan	0
2	12.1.1.0	255.255.255.0	172.16.100.65	wan	0
3	13.1.1.0	255.255.255.0	172.16.100.65	wan	0
4	172.16.0.0	255.255.0.0	0.0.0.0	wan	0
5	192.168.11.0	255.255.255.0	0.0.0.0	lan0	0

The rows for destinations 12.1.1.0 and 13.1.1.0 are highlighted with a red border in the original image. The footer of the interface reads: "Copyright © 2015 Robustel Technologies. All rights reserved."

2. Ping 12.1.1.2 and 13.1.1.3 in R2000.

Path: System > Tools > Ping.

[Save & Apply](#)
[Reboot](#)
[Logout](#)

⚠ It is strongly recommended to change the default password.

Status

Interface

Network

VPN

Services

System

Debug

Update

App Center

Tools

Profile

User Management

Ping

At Debug

Traceroute

Sniffer

^ Ping

IP Address

12.1.1.2

Number of Request

5

Timeout

1

Local IP

```

PING 12.1.1.2 (12.1.1.2): 56 data bytes
64 bytes from 12.1.1.2: seq=0 ttl=254 time=23.816 ms
64 bytes from 12.1.1.2: seq=1 ttl=254 time=24.241 ms
64 bytes from 12.1.1.2: seq=2 ttl=254 time=51.754 ms
64 bytes from 12.1.1.2: seq=3 ttl=254 time=25.028 ms
64 bytes from 12.1.1.2: seq=4 ttl=254 time=21.985 ms

--- 12.1.1.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 21.985/29.364/51.754 ms

```

Start

Stop

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[Save & Apply](#)
[Reboot](#)
[Logout](#)

⚠ It is strongly recommended to change the default password.

Status

Interface

Network

VPN

Services

System

Debug

Update

App Center

Tools

Profile

User Management

Ping

At Debug

Traceroute

Sniffer

^ Ping

IP Address

13.1.1.3

Number of Request

5

Timeout

1

Local IP

```

PING 13.1.1.3 (13.1.1.3): 56 data bytes
64 bytes from 13.1.1.3: seq=0 ttl=254 time=27.556 ms
64 bytes from 13.1.1.3: seq=1 ttl=254 time=21.492 ms
64 bytes from 13.1.1.3: seq=2 ttl=254 time=23.976 ms
64 bytes from 13.1.1.3: seq=3 ttl=254 time=15.427 ms
64 bytes from 13.1.1.3: seq=4 ttl=254 time=19.084 ms

--- 13.1.1.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 15.427/21.507/27.556 ms

```

Start

Stop

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4.2 Check in Router

1. Enter command as below in R2.

```
R2# ping 172.16.100.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.100.67, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/88/104 ms
R2#
```

```
R2#sh ip route static
S    172.16.0.0/16 [1/0] via 12.1.1.1
R2#
```

2. Enter command as below in R3.

```
R3#ping 172.16.100.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.100.67, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/80/92 ms
R3#
```

```
R3#sh ip route static
S    172.16.0.0/16 [1/0] via 13.1.1.1
R3#
```