

## **Brief Note**

# OSPF of IP Routing for R3000

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# Chapter 1. Introduction

## 1.1 Overview

OSPF (Open Shortest Path First) version 2 is a routing protocol which is described in *RFC2328, OSPF Version 2*. OSPF is an IGP (Interior Gateway Protocol). Compared with RIP, OSPF can provide scalable network support and faster convergence times. OSPF is widely used in large networks such as ISP (Internet Service Provider) backbone and enterprise networks.

## 1.2 Assumptions

This Brief Note is written by technically competent engineer who is familiar with Robustel products and the application requirement.

This Brief Note is basing on:

- Product Model: Robustel GoRugged R3000 industrial router.
- Firmware Version: R3000\_S\_V1.01.01.fs
- Configuration: This Brief Note assumes that R3000 is working under its factory default settings. We mainly focus on the settings that need to configure in this Brief Note.

## 1.3 Rectifications

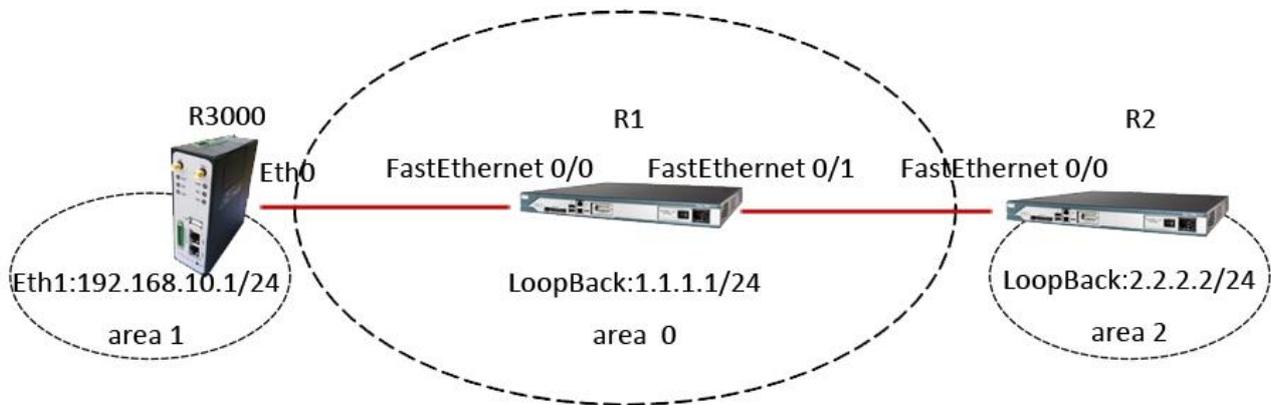
Appreciate for the corrections and Rectifications to this Brief Note, and if there are requests for new Brief Notes please also send to email address: [support@robustel.com](mailto:support@robustel.com) .

## 1.4 File Version

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

Release Date	Firmware Version	Details
2014-07-15	V1.01.01	First Release

## Chapter 2. Application Topology



1. Cisco 2811 Routers run with OSPF protocol.
2. R3000 works with OSPF protocol.
3. R3000 update its own route table and transmit data to remote side successfully.

**Note:** IP address Table as below

IP address table

Device	Interface	IP address
R3000	Eth0	13.1.1.3/24
R3000	Eth1	192.168.10.1/24
R1	Fa0/0	13.1.1.1/24
R1	Fa0/1	12.1.1.1/24
R1	Loop0	1.1.1.3/24
R2	Fa0/0	12.1.1.2/24
R2	Loop0	2.2.2.2/24

## 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 and entered configuration mode firstly(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 sets the host name of the Cisco router.

```
hostname cisco2811
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$ROMx$RGJMeV3dfHuOQu0z7Ffjh.
```

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

```
R1:
Interface Loopback0
 ip address 1.1.1.1 255.255.255.0
!
interface FastEthernet0/0
 ip address 13.1.1.1 255.255.255.0
!
interface FastEthernet0/1
 ip address 12.1.1.1 255.255.255.0
!
router ospf 110
 route-id 1.1.1.1
 network 1.1.1.0 0.0.0.255 area 0
 network 12.1.1.0 0.0.0.255 area 0
 network 13.1.1.0 0.0.0.255 area 0
```

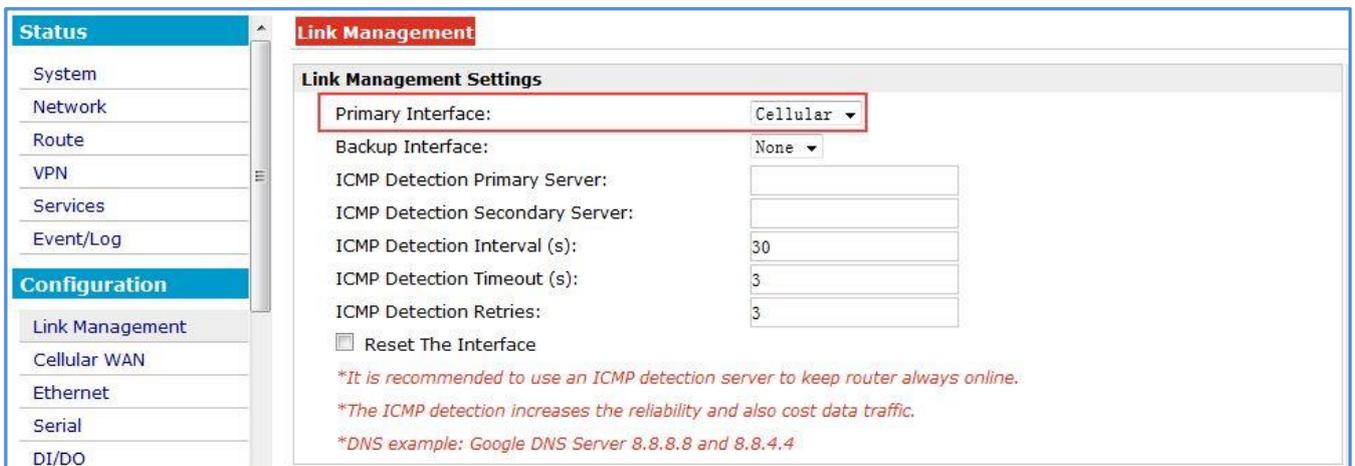
The entries below is the settings of OSPF on Cisco router R2.

```
R2:
Interface Loopback0
 ip address 2.2.2.2 255.255.255.0
!
```

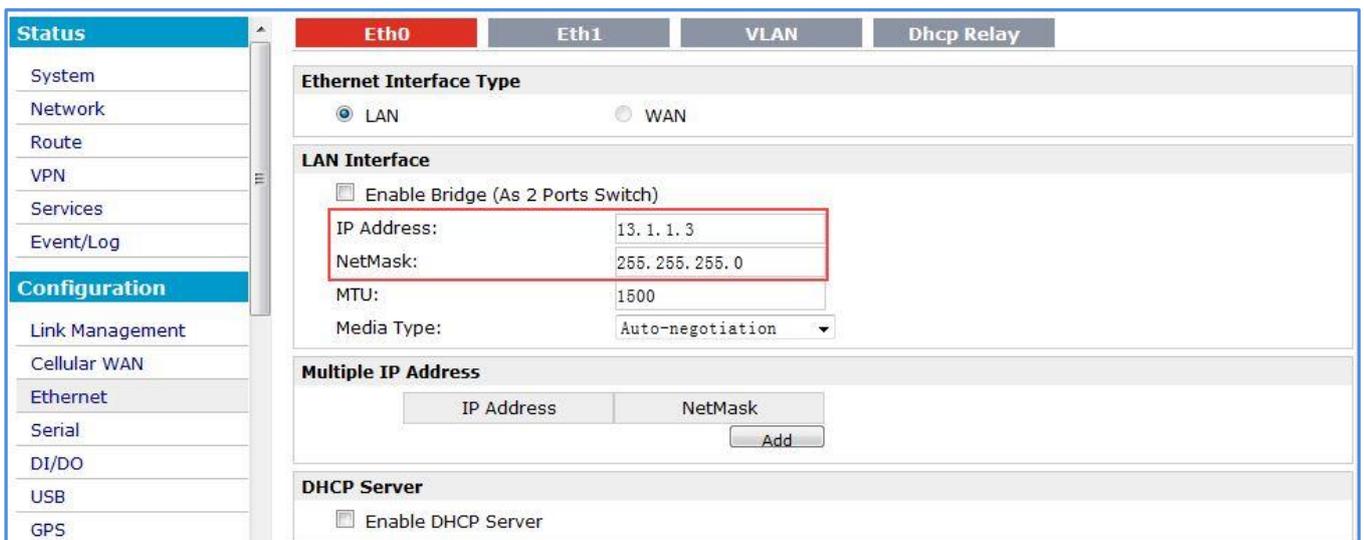
```
interface FastEthernet0/0
 ip address 12.1.1.2 255.255.255.0
!
router ospf 110
 route-id 2.2.2.2
 network 2.2.2.0 0.0.0.255 area 2
 network 12.1.1.0 0.0.0.255 area 0
```

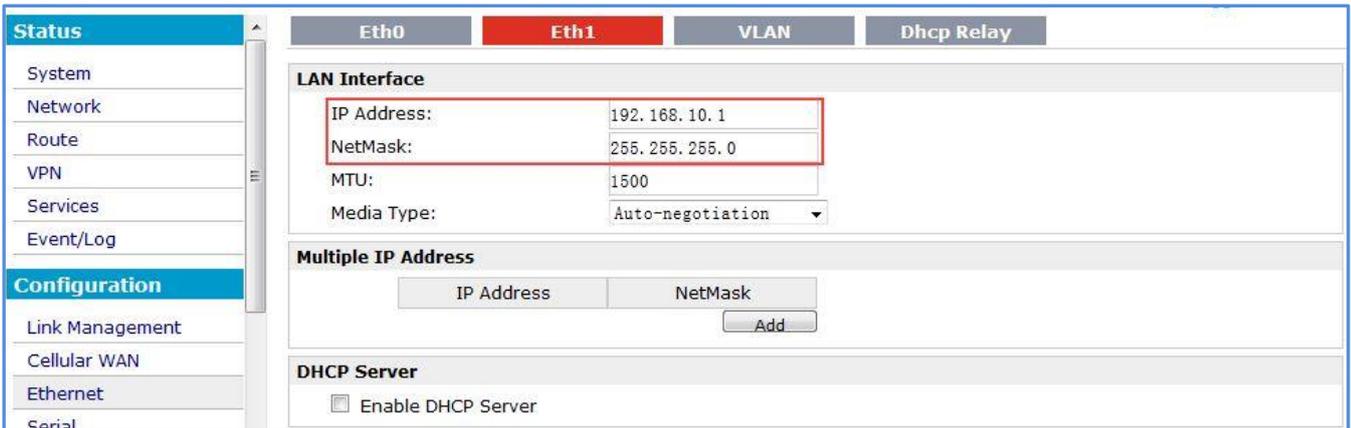
### 3.2 Configure OSPF in R3000

1. Browse to "Configuration" -> "Link Management".
  - Set Eth0 and Eth1 as LAN port, we set the cellular as the Primary Interface.

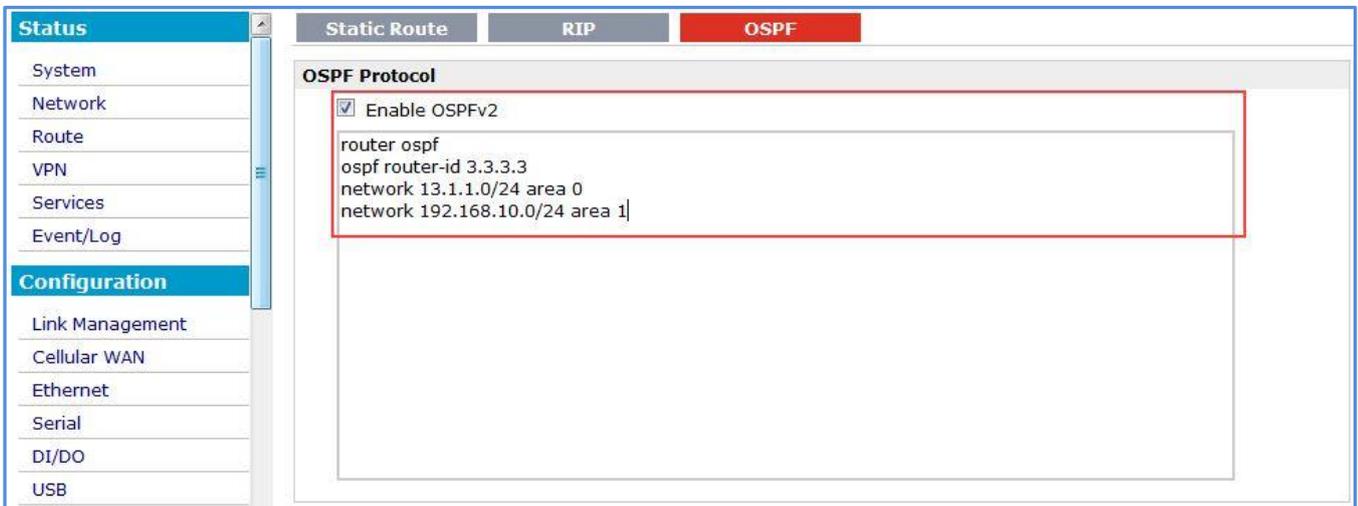


2. Configure the IP address of Eth0 and Eth1.
  - Click "Apply" -> "Save".





- Browse to “Configuration”-> “IP Routing-> OSPF”.  
Configure OSPF in R3000, then click “Apply”-> “Save”->”Reboot”



*Note: If R3000 enable OSPF and RIP protocol at the same time, the OSPF protocol would take effect because OSPF has a lower AD (Administrative Distance).*

# Chapter 4. Testing

1. Check the Route Table of R3000.

Path: Status->Route.

Destination	NetMask	Gateway	Interface	Metric
0.0.0.0	0.0.0.0	192.168.254.254	ppp0	0
1.1.1.1	255.255.255.255	13.1.1.1	eth0	11
2.2.2.2	255.255.255.255	13.1.1.1	eth0	21
12.1.1.0	255.255.255.0	13.1.1.1	eth0	20
13.1.1.0	255.255.255.0	0.0.0.0	eth0	0
192.168.10.0	255.255.255.0	0.0.0.0	eth1	0
192.168.254.254	255.255.255.255	0.0.0.0	ppp0	0

2. Ping 1.1.1.1 and 2.2.2.2 in R3000.

Path: Administration->Tools->Ping

**Ping**

Ping IP address: 1.1.1.1

Number of requests: 5

Timeout (s): 1

Local IP:

```

PING 1.1.1.1 (1.1.1.1): 56 data bytes
64 bytes from 1.1.1.1: seq=0 ttl=255 time=42.427 ms
64 bytes from 1.1.1.1: seq=1 ttl=255 time=24.518 ms
64 bytes from 1.1.1.1: seq=2 ttl=255 time=52.986 ms
64 bytes from 1.1.1.1: seq=3 ttl=255 time=35.358 ms
64 bytes from 1.1.1.1: seq=4 ttl=255 time=20.962 ms

--- 1.1.1.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 20.962/35.250/52.986 ms
    
```

The screenshot shows a network management interface with a sidebar on the left and a main content area on the right. The sidebar has three main sections: 'Status' (with sub-items: System, Network, Route, VPN, Services, Event/Log), 'Configuration', and 'Administration' (with sub-items: Profile, Tools, Clock, Web Server, User Management, SDK Management, Update Firmware). The 'Tools' item is highlighted. The main content area has a top navigation bar with tabs: 'Ping' (active), 'AT Debug', 'Traceroute', 'Sniffer', and 'Test'. Below the tabs, the 'Ping' tool is active, showing a configuration form with the following fields: 'Ping IP address:' (2.2.2.2), 'Number of requests:' (5), 'Timeout (s):' (1), and 'Local IP:'. There are 'Start' and 'Stop' buttons below the form. The results area shows the following output:

```
PING 2.2.2.2 (2.2.2.2): 56 data bytes
64 bytes from 2.2.2.2: seq=0 ttl=254 time=41.372 ms
64 bytes from 2.2.2.2: seq=1 ttl=254 time=41.539 ms
64 bytes from 2.2.2.2: seq=2 ttl=254 time=83.001 ms
64 bytes from 2.2.2.2: seq=3 ttl=254 time=46.701 ms
64 bytes from 2.2.2.2: seq=4 ttl=254 time=57.107 ms

--- 2.2.2.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 41.372/53.944/83.001 ms
```

## Chapter 5. Common Commands

To start OSPF process you have to specify the OSPF router. As of this writing, ospfd does not support multiple OSPF processes.

### **[Command] router ospf**

Enable or disable the OSPF process. ospfd does not yet support multiple OSPF processes. So you can not specify an OSPF process number.

### **[OSPF Command] ospf router-id a.b.c.d**

This sets the router-ID of the OSPF process. The router-ID may be an IP address of the router, but need not be - it can be any arbitrary 32bit number. However it **MUST** be unique within the entire OSPF domain to the OSPF speaker - bad things will happen if multiple OSPF speakers are configured with the same router-ID! If one is not specified then ospfd will obtain a router-ID automatically from zebra.

### **[OSPF Command] ospf abr-type type**

Type can be cisco|ibm|shortcut|standard. The "Cisco" and "IBM" types are equivalent. The OSPF standard for ABR behaviour does not allow an ABR to consider routes through non-backbone areas when its links to the backbone are down, even when there are other ABRs in attached non-backbone areas which still can reach the backbone -this restriction exists primarily to ensure routing-loops are avoided. With the "Cisco" or "IBM" ABR type, the default in this release of Quagga, this restriction is lifted, allowing an ABR to consider summaries learnt from other ABRs through non-backbone areas, and hence route via non-backbone areas as a last resort when, and only when, backbone links are down.

### **[OSPF Command] passive-interface interface**

Do not speak OSPF interface on the given interface, but do advertise the interface as a stub link in the router-LSA (Link State Advertisement) for this router. This allows one to advertise addresses on such connected interfaces without having to originate AS-External/Type-5 LSAs (which have global flooding scope) - as would occur if connected addresses were redistributed into OSPF, This is the only way to advertise non-OSPF links into stub areas.

### **[OSPF Command] auto-cost reference-bandwidth <1-4294967>**

This sets the reference bandwidth for cost calculations, where this bandwidth is considered equivalent to an OSPF cost of 1, specified in Mbits/s. The default is 100Mbit/s(i.e. a link of bandwidth 100Mbit/s or higher will have a cost of 1. Cost of lower bandwidth links will be scaled with reference to this cost). This configuration setting **MUST** be consistent across all routers within the OSPF domain.

### **[OSPF Command] network a.b.c.d/m area a.b.c.d**

### **[OSPF Command] network a.b.c.d/m area <0-4294967295>**

This command specifies the OSPF enabled interface(s). If the interface has an address from range 192.168.1.0/24 then the command below enables ospf on this interface so router can provide network information to the other ospf routers via this interface.

```
router ospf
```

```
network 192.168.1.0/24 area 0.0.0.0
```

Prefix length in interface must be equal or bigger (ie. smaller network) than prefix length in network statement. For example statement above doesn't enable ospf on interface with address 192.168.1.1/23, but it does on interface with address 192.168.1.129/25.

Note that the behavior when there is a peer address defined on an interface changed after release 0.99.7. Currently, if a peer prefix has been configured, then we test whether the prefix in the network command contains the destination prefix. Otherwise, we test whether the network command prefix contains the local address prefix of the interface.

**[OSPF Command] area a.b.c.d range a.b.c.d/m**

**[OSPF Command] area <0-4294967295> range a.b.c.d/m**

Summarize intra area paths from specified area into one Type-3 summary-LSA announced to other areas. This command can be used only in ABR and ONLY router LSAs (Type-1) and network-LSAs (Type-2) (ie. LSAs with scope area) can be summarized. Type-5 AS-external-LSAs can't be summarized - their scope is AS. Summarizing Type-7 AS-external-LSAs isn't supported yet by Quagga.

```
router ospf
  network 192.168.1.0/24 area 0.0.0.0
  network 10.0.0.0/8 area 0.0.0.10
  area 0.0.0.10 range 10.0.0.0/8
```

With configuration above one Type-3 Summary-LSA with routing info 10.0.0.0/8 is announced into backbone area if area 0.0.0.10 contains at least one intra-area network (ie. described with router or network LSA) from this range.