

# NR500 Series Industrial Cellular VPN Router

## Application Note 030

### DMVPN with OSPF

**Version:** V1.0.0  
**Date:** Dec 2018  
**Status:** Confidential



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# 1. Introduction

## 1.1 Overview

This document contains information regarding the configuration and use of DMVPN with OSPF.

This guide has been written for use by technically competent personnel with a good understanding of the communications technologies used in the product, and of the requirements for their specific application.

## 1.2 Compatibility

This application note applies to:

**Models Shown:** NR500 series.

**Firmware Version:** devel(baba6c2) or newer

**Other Compatible Models:** None

## 1.3 Version

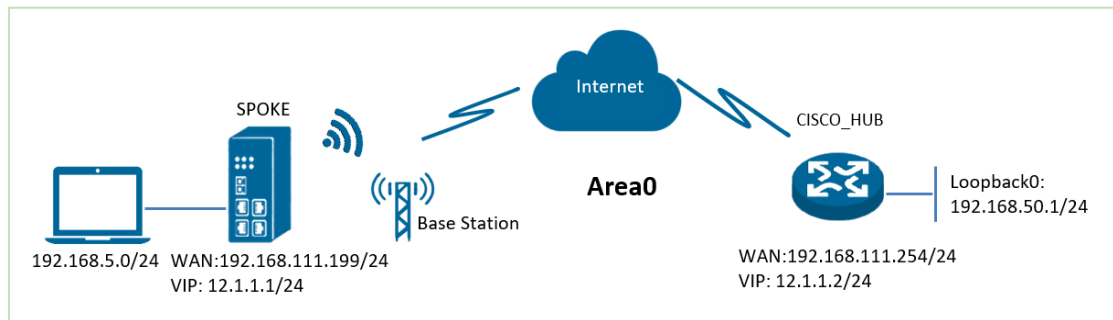
Updates between document versions are cumulative. Therefore, the latest document will include all the content of previous versions.

| Release Date | Doc. Version | Firmware Version | Change Description |
|--------------|--------------|------------------|--------------------|
| 2018/12/15   | V1.0.0       | devel(baba6c2)   | First released     |
|              |              |                  |                    |

## 1.4 Corrections

Appreciate for corrections or rectifications to this application note, and if any request for new application notes please email to: [support@navigateworx.com](mailto:support@navigateworx.com)

## 2. Topology



1. NR500 Pro runs as DMVPN spoke with any kind of IP, which can ping DMVPN hub successfully.
2. CISCO router runs as DMVPN hub with a static public IP.
3. The tunnel is established between spoke and hub, the subnet can PING each other successfully.
4. Both NR500 Pro and CISCO run OSPF within a same Area0.

## 3. Configuration

### 3.1 HUB Configuration

1. The configuration of **Hub on CISCO** like below:

=====

```
cisco2811#show running-config
Building configuration...
version 12.4
hostname cisco2811
ip address-pool local
no ipv6 cef
!
username cisco password 0 cisco
!
crypto isakmp policy 10
  encr 3des
  hash md5
  authentication pre-share
  group 2
crypto isakmp key 6 cisco address 0.0.0.0 0.0.0.0
!
crypto ipsec transform-set DMVPN esp-3des esp-sha-hmac
  mode transport
!
crypto ipsec profile DMVPN-PROFILE
  set transform-set DMVPN

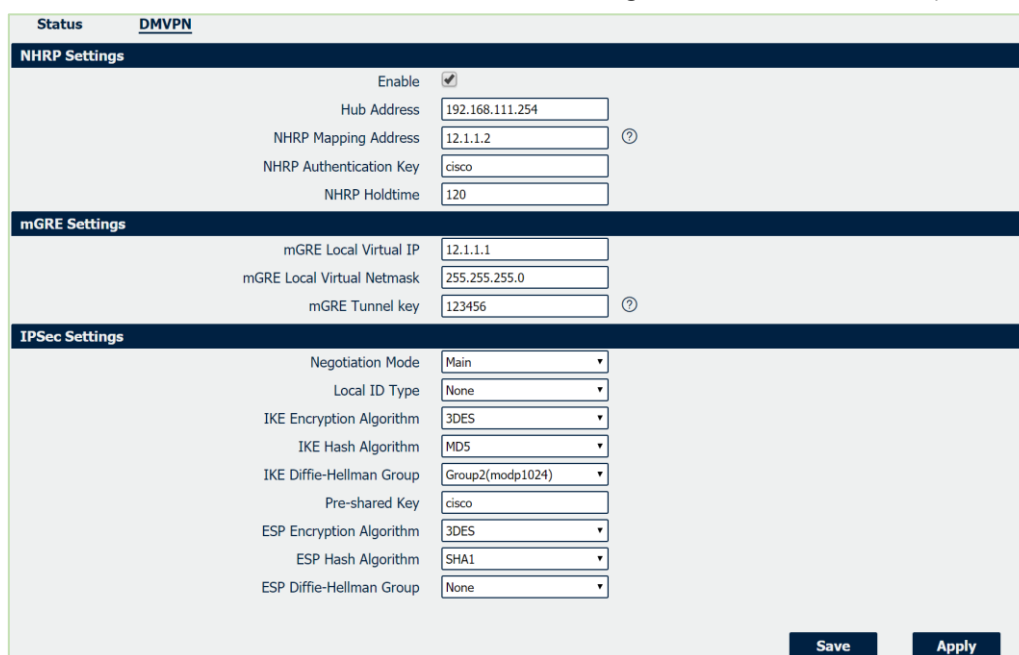
interface Loopback0
  ip address 192.168.50.1 255.255.255.0
!

interface Tunnel1
  ip address 12.1.1.2 255.255.255.0
  no ip redirects
  ip nhrp authentication cisco
  ip nhrp map multicast dynamic
  ip nhrp network-id 3
  ip nhrp holdtime 120
  ip nhrp redirect
  no ip split-horizon
```

```
ip ospf network non-broadcast  
//Only support "non-broadcast" due to the limitation of protocol  
tunnel source 192.168.111.254  
tunnel mode gre multipoint  
tunnel key 123456  
tunnel protection ipsec profile DMVPN-PROFILE  
!  
interface FastEthernet0/0  
ip address 192.168.111.254 255.255.255.0  
ip nat outside  
ip nat enable  
ip virtual-reassembly  
duplex full  
speed auto  
no mop enabled  
!  
interface FastEthernet0/1  
ip address 192.168.6.3 255.255.255.0  
ip nat inside  
ip nat enable  
ip virtual-reassembly  
duplex auto  
speed auto  
!  
router ospf 1  
router-id 9.9.9.9  
log-adjacency-changes  
network 12.1.1.0 0.0.0.255 area 0  
network 192.168.50.0 0.0.0.255 area 0  
neighbor 12.1.1.2  
  
ip forward-protocol nd  
no ip http server  
no ip http secure-server  
!  
  
ip nat inside source list 10 interface FastEthernet0/0 overload  
!  
access-list 10 permit 192.168.6.0 0.0.0.255  
snmp-server community public RO  
cisco2811#  
=====
```

## 3.2 Spoke Configuration

1. Go to **VPN>DMVPN**, enable DMVPN and configure DMVPN as below picture.



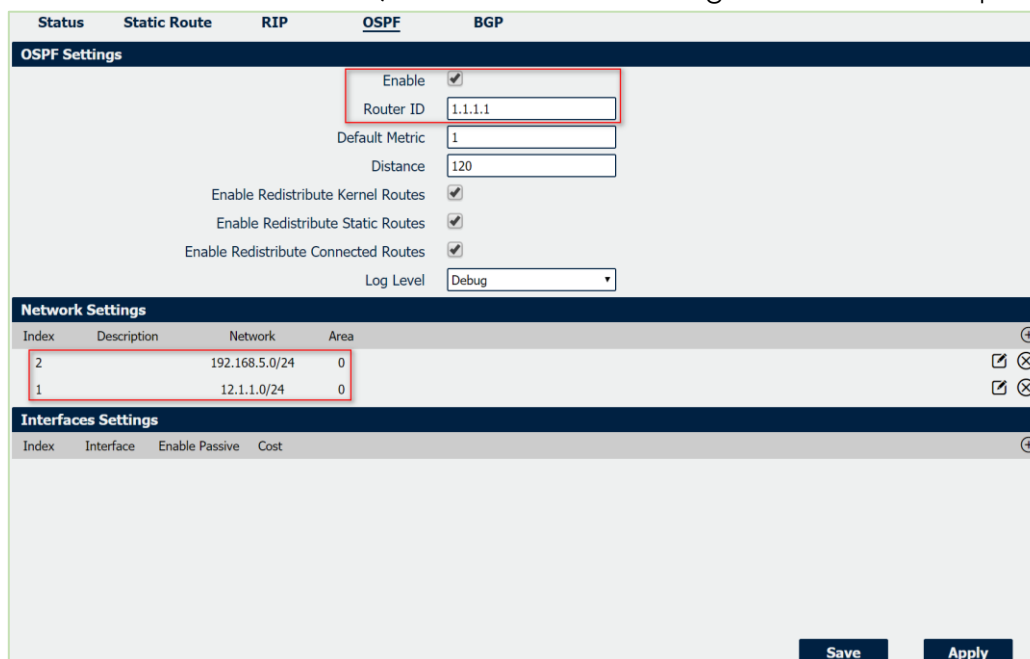
The screenshot shows the DMVPN configuration page with the following settings:

- Status:** DMVPN
- NHRP Settings:**
  - Enable:
  - Hub Address: 192.168.111.254
  - NHRP Mapping Address: 12.1.1.2
  - NHRP Authentication Key: cisco
  - NHRP Holdtime: 120
- mGRE Settings:**
  - mGRE Local Virtual IP: 12.1.1.1
  - mGRE Local Virtual Netmask: 255.255.255.0
  - mGRE Tunnel key: 123456
- IPSec Settings:**
  - Negotiation Mode: Main
  - Local ID Type: None
  - IKE Encryption Algorithm: 3DES
  - IKE Hash Algorithm: MD5
  - IKE Diffie-Hellman Group: Group2(modp1024)
  - Pre-shared Key: cisco
  - ESP Encryption Algorithm: 3DES
  - ESP Hash Algorithm: SHA1
  - ESP Diffie-Hellman Group: None

Buttons: Save, Apply

2. Click Save>Apply.

3. Go to **Network>Route>OSPF**, enable OSPF and configure OSPF as below picture.



The screenshot shows the OSPF configuration page with the following settings:

- Status:** Static Route, RIP, **OSPF**, BGP
- OSPF Settings:**
  - Enable:
  - Router ID: 1.1.1.1
  - Default Metric: 1
  - Distance: 120
  - Enable Redistribute Kernel Routes:
  - Enable Redistribute Static Routes:
  - Enable Redistribute Connected Routes:
  - Log Level: Debug
- Network Settings:**

| Index | Description | Network        | Area |
|-------|-------------|----------------|------|
| 2     |             | 192.168.5.0/24 | 0    |
| 1     |             | 12.1.1.0/24    | 0    |
- Interfaces Settings:**

| Index | Interface | Enable Passive | Cost |
|-------|-----------|----------------|------|
|-------|-----------|----------------|------|

Buttons: Save, Apply

4. Go to **Network>Route>OSPF>Interface Settings**, to specify the Interface Network Type as “**Non-Broadcast**” as below picture.



The screenshot shows the Interface Settings table with a red box highlighting the '+' icon in the right corner, indicating the need to add a new interface entry.

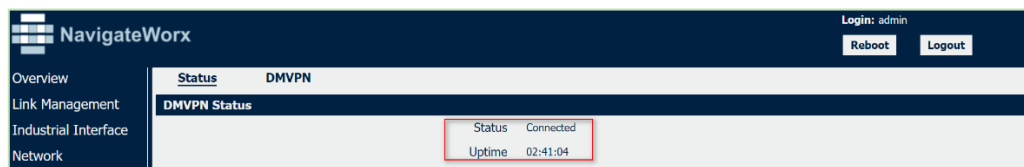
| Index | Interface | Enable Passive | Cost |
|-------|-----------|----------------|------|
|-------|-----------|----------------|------|

### Interface Settings

Interfaces Settings

|                     |  |
|---------------------|--|
| Index               | <input type="text" value="1"/>             |
| Interface           | <input type="text" value="dmvpntun"/>      |
| Enable Passive      | <input type="checkbox"/>                   |
| Authentication Mode | <input type="text" value="None"/>          |
| Network Type        | <input type="text" value="Non-Broadcast"/> |
| Cost                | <input type="text" value="1"/>             |
| Priority            | <input type="text" value="1"/>             |
| Hello Interval      | <input type="text" value="30"/>            |
| Retransmit Interval | <input type="text" value="5"/>             |
| Dead Interval       | <input type="text" value="120"/>           |

5.Route had connected to CISCO HUB. Go to **VPN>DMVPN>Status** to check the connection status.



## 4. Route Table

1. Route Table on CISCO HUB for reference.

```

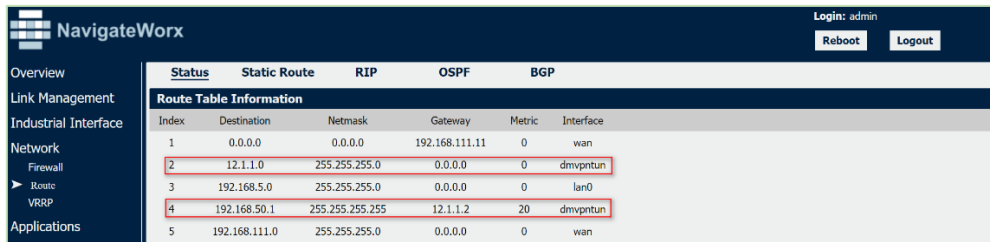
cisco2811#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.111.1 to network 0.0.0.0

C    192.168.88.0/24 is directly connected, Loopback3
C    192.168.111.0/24 is directly connected, FastEthernet0/0
    172.16.0.0/24 is subnetted, 2 subnets
C      172.16.1.0 is directly connected, Loopback1
C      172.16.2.0 is directly connected, Loopback2
O    192.168.5.0/24 [110/1010] via 12.1.1.3, 00:19:30, Tunnel1
    10.0.0.0/24 is subnetted, 1 subnets
C      10.1.1.0 is directly connected, Loopback100
C      12.0.0.0/24 is subnetted, 1 subnets
C      12.1.1.0 is directly connected, Tunnel1
C    192.168.50.0/24 is directly connected, Loopback0
S*   0.0.0.0/0 [1/0] via 192.168.111.1
cisco2811#
  
```

2. Route Table on SPOKE for reference.



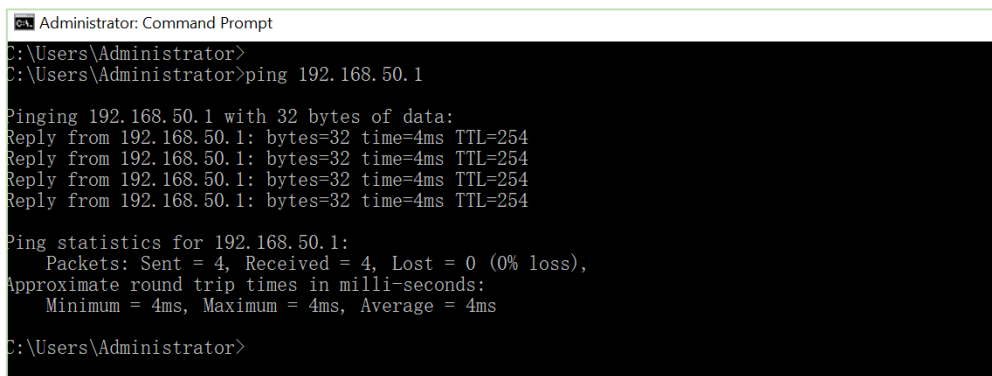


The screenshot shows the NavigateWorx web interface. On the left is a navigation menu with options like Overview, Link Management, Industrial Interface, Network, Firewall, Route, VRRP, and Applications. The main content area displays a table titled 'Route Table Information' with columns for Index, Destination, Netmask, Gateway, Metric, and Interface. The table contains five rows of route data. The second, third, and fourth rows are highlighted with red boxes.

| Index | Destination   | Netmask         | Gateway        | Metric | Interface |
|-------|---------------|-----------------|----------------|--------|-----------|
| 1     | 0.0.0.0       | 0.0.0.0         | 192.168.111.11 | 0      | wan       |
| 2     | 12.1.1.0      | 255.255.255.0   | 0.0.0.0        | 0      | dmvpntun  |
| 3     | 192.168.5.0   | 255.255.255.0   | 0.0.0.0        | 0      | lan0      |
| 4     | 192.168.50.1  | 255.255.255.255 | 12.1.1.2       | 20     | dmvpntun  |
| 5     | 192.168.111.0 | 255.255.255.0   | 0.0.0.0        | 0      | wan       |

## 5. Testing

1. Enable CMD and Ping from end device of SPOKE to subnet of CISCO HUB.



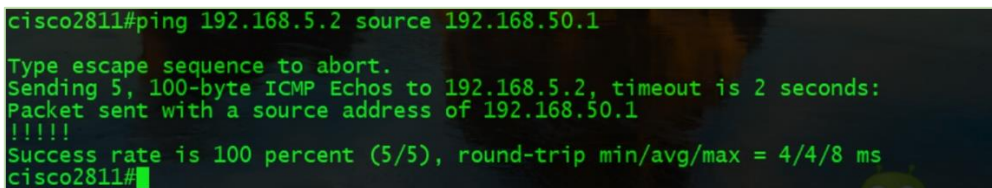
```
Administrator: Command Prompt
C:\Users\Administrator>
C:\Users\Administrator>ping 192.168.50.1

Pinging 192.168.50.1 with 32 bytes of data:
Reply from 192.168.50.1: bytes=32 time=4ms TTL=254
Reply from 192.168.50.1: bytes=32 time=4ms TTL=254
Reply from 192.168.50.1: bytes=32 time=4ms TTL=254
Reply from 192.168.50.1: bytes=32 time=4ms TTL=254

Ping statistics for 192.168.50.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 4ms, Average = 4ms

C:\Users\Administrator>
```

2. Ping from CISCO HUB to end device of SPOKE.



```
cisco2811#ping 192.168.5.2 source 192.168.50.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.5.2, timeout is 2 seconds:
Packet sent with a source address of 192.168.50.1
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms
cisco2811#
```

3. Test successfully.