Name : Sherif Saad Abd El-Hafez

Email : -321220233@sha.edu.eg

NTI : – (National Telecommunication Institute)

Code Group :- DEPI_1_CAI1_ISS8_S1e

Code Coaching :- DEPI_1_CAI1_ISS8_S1e

Phone :- 01208825165

Project Fortinet Cybersecurity Engineer

IPSEC VPN CONFIGURATION

Introduction:

A **VPN (Virtual Private Network)** within a firewall acts as a secure tunnel designed to encrypt and protect data transmission between devices or networks, especially over the internet or other public networks. By integrating VPN capabilities, firewalls enhance security by not only monitoring and controlling traffic but also ensuring that connections remain encrypted and safeguarded against unauthorized access or potential threats. This combination of functionality strengthens the overall security posture of the network.

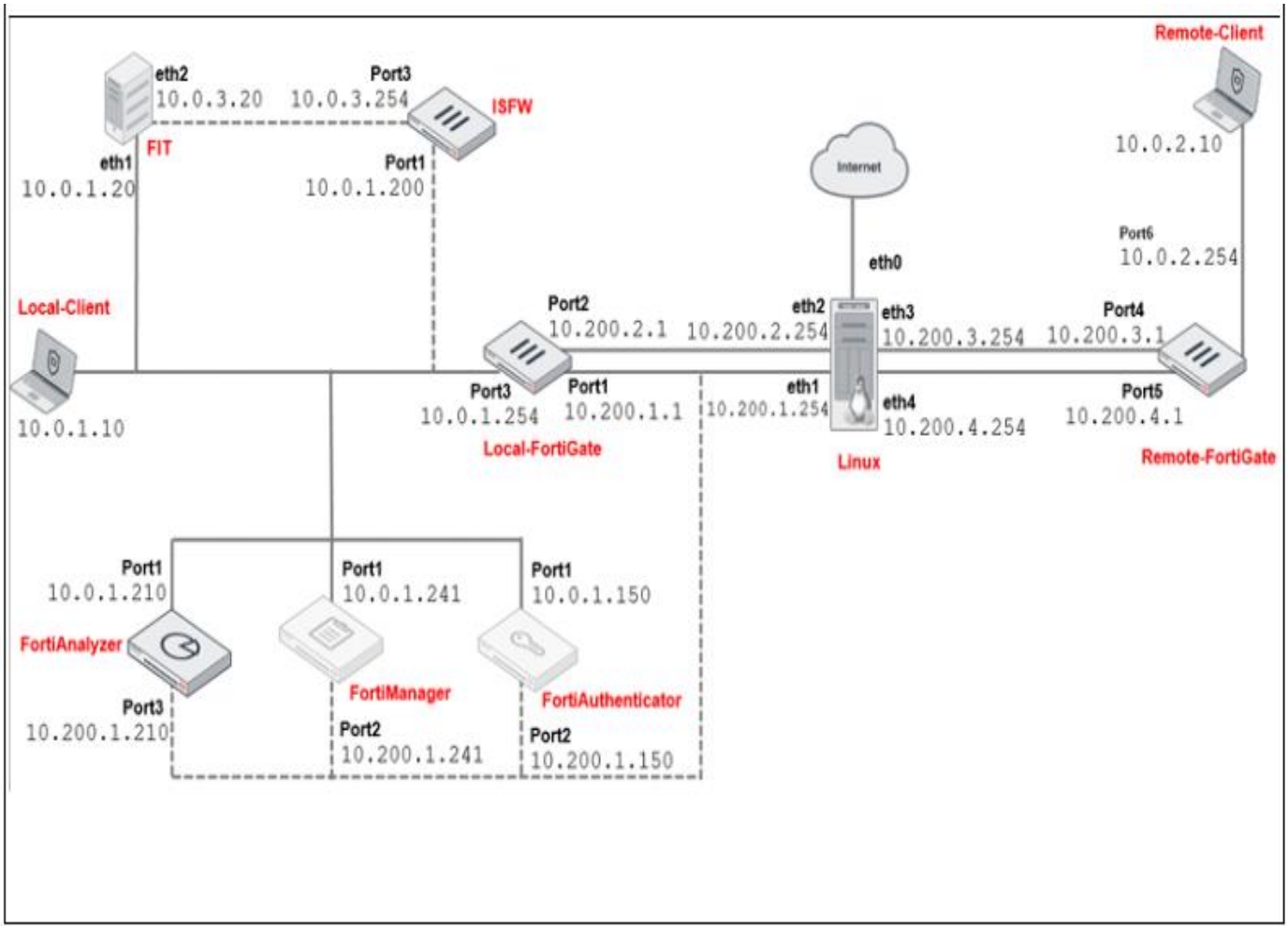
Types of VPN :

1. **Remote Access VPN**:
   - Allows users to connect securely to a private network from any location.
   - Ideal for remote employees accessing company resources.
2. **Site-to-Site VPN**:
   - Connects entire networks (e.g., branch offices and headquarters).
   - Two types: Intranet VPN (within the same organization) and Extranet VPN (with external partners).
3. **SSL VPN**:
   - Provides secure access via a web browser without the need for special software.
   - Suitable for accessing applications securely online.
4. **IPSec VPN**:
   - Secures data through encryption and authentication.
   - Used for safely transmitting data over public networks.
5. **Hybrid VPN**:
   - Combines MPLS performance with VPN encryption.
   - Best for large enterprises needing high speed and security.
6. **Cloud VPN**:
   - Connects users securely to cloud-based applications or services.
   - Perfect for businesses relying on cloud infrastructure.

Objective of the lab

1. Deploy a site-to-site VPN between two FortiGate devices
2. Set up dial-up and static remote gateways
3. Configure redundant VPNs between two FortiGate devices

Topology : -



Components:

- Local FortiGate
- Remote FortiGate
- Local Client
- Remote Client

Steps :

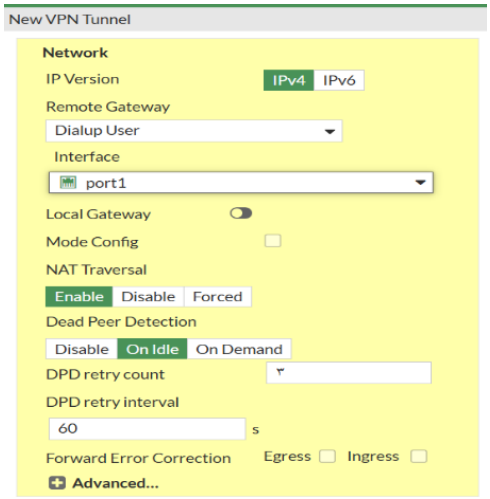
1) Configuring a Dial-Up IPsec VPN Between Two FortiGate Devices

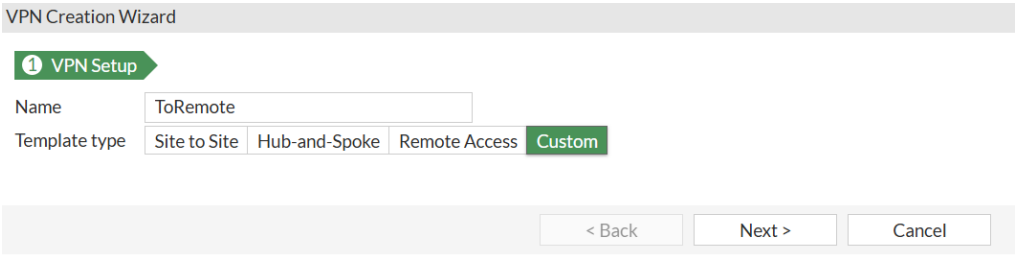
Create Phase 1 and Phase 2 on Local-FortiGate (Dial-Up Server)

You will configure the IPsec VPN by creating phase 1 and phase 2.

To create phase 1 and phase 2

1. Connect to the Local-FortiGate GUI, and then log in with the username `admin` and password `admin`.
2. Click **VPN** > **IPsec Tunnels**, and then click **Create New** > **IPsec Tunnel**.
3. Configure the following settings:

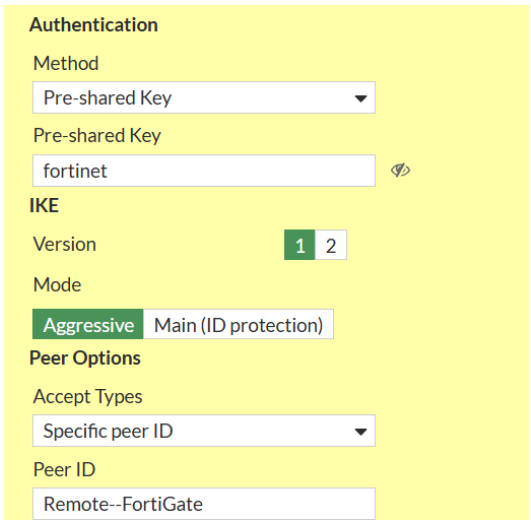




4. Click **Next**.
5. In the **Network** section, configure the following settings:

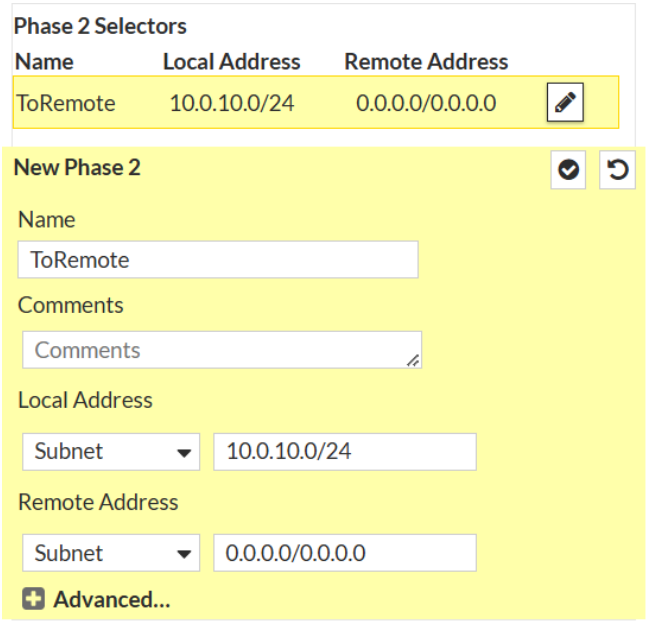
6. In the **Authentication** section, configure the following settings:

Field	Value
Method	Pre-shared Key
Pre-shared Key	fortinet
Mode	Aggressive
Accept Types	Specific peer ID
Peer ID	Remote-FortiGate



7. In the **Phase 2 Selectors** section, configure the following setting:

Field	Value
Local Address	10.0.1.0/24



8. Keep the default values for the remaining settings.
9. Click **OK**.

Create Firewall Policies for VPN Traffic on Local-FortiGate (Dial-Up Server)

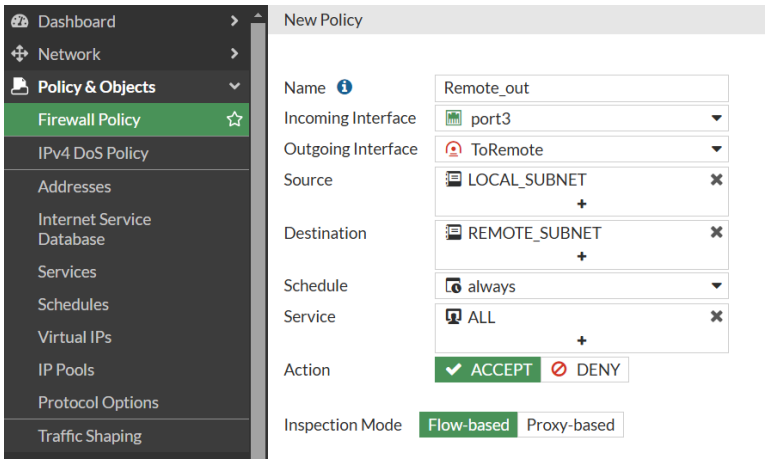
You will create two firewall policies between **port3** and **To Remote**—one for each traffic direction.

To create firewall policies for VPN traffic

1. On the Local-FortiGate GUI, click **Policy & Objects** > **Firewall Policy**.
2. Click **Create New**.

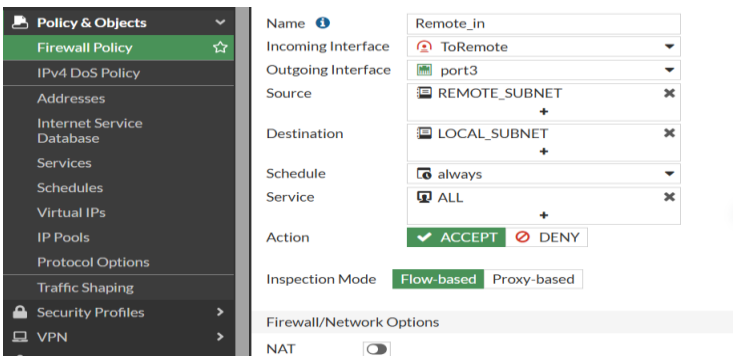
3. Configure the following settings:

Field	Value
Name	Remote_out
Incoming Interface	port3
Outgoing Interface	ToRemote
Source	LOCAL_SUBNET
Destination	REMOTE_SUBNET
Schedule	always
Service	ALL
Action	ACCEPT

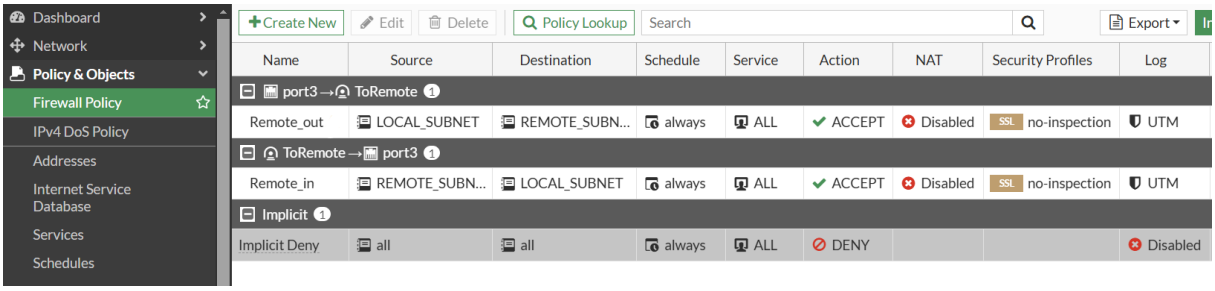


4. In the **Firewall/Network Options** section, disable **NAT**.
5. Click **OK**.
6. Click **Create New** again.
7. Configure the following settings:

Field	Value
Name	Remote_in
Incoming Interface	ToRemote
Outgoing Interface	port3
Source	REMOTE_SUBNET
Destination	LOCAL_SUBNET
Schedule	always
Service	ALL
Action	ACCEPT



8. In the **Firewall/Network Options** section, disable **NAT**.
9. Click **OK**



Create Phase 1 and Phase 2 on Remote-FortiGate (Dial-Up Client)

You will create phase 1 and phase 2 on Remote-FortiGate.

To create phase 1 and phase 2

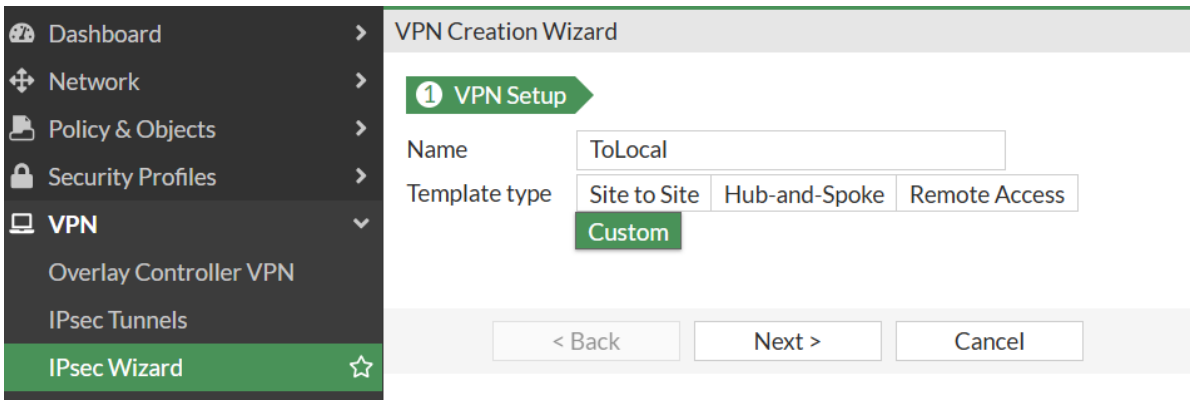
1. Connect to the Remote-FortiGate GUI, and then log in with the username `admin` and password `admin`.

2. Click **VPN** > **IPsec Tunnels**, and then click **Create New** > **IPsec Tunnel**.

3. Configure the following settings

Field	Value
Name	ToLocal
Template type	Custom

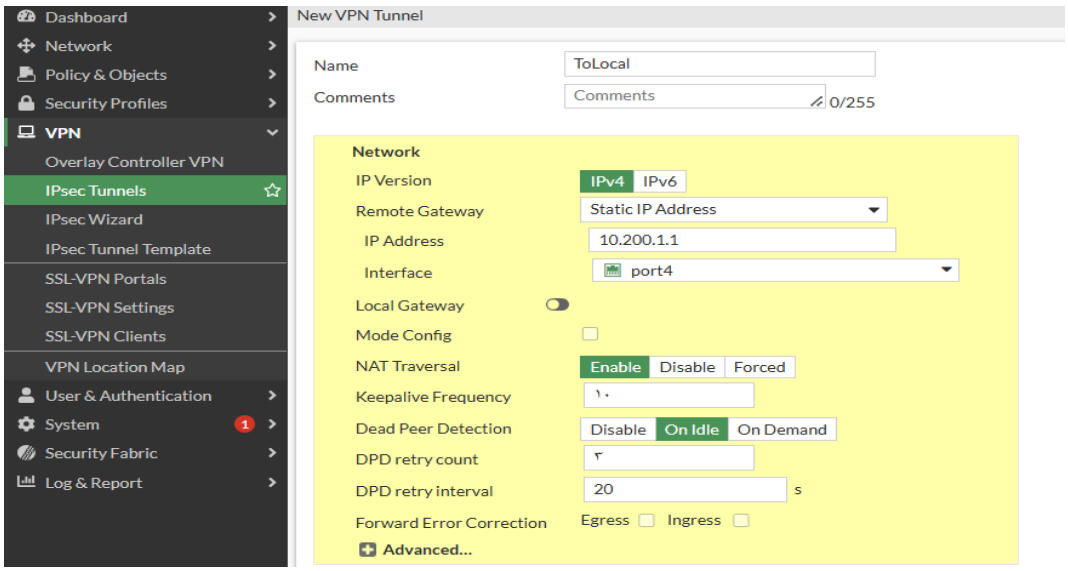
:



4. Click **Next**.

5. In the **Network** section, configure the following settings:

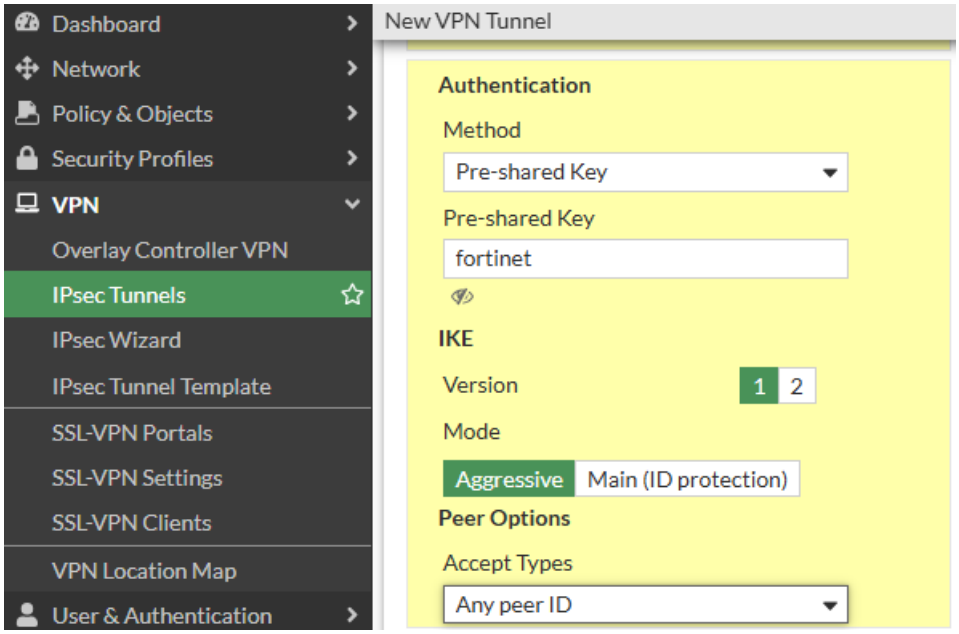
Field	Value
Name	ToLocal
Template type	Custom



6. In the **Authentication** section, configure the following settings:

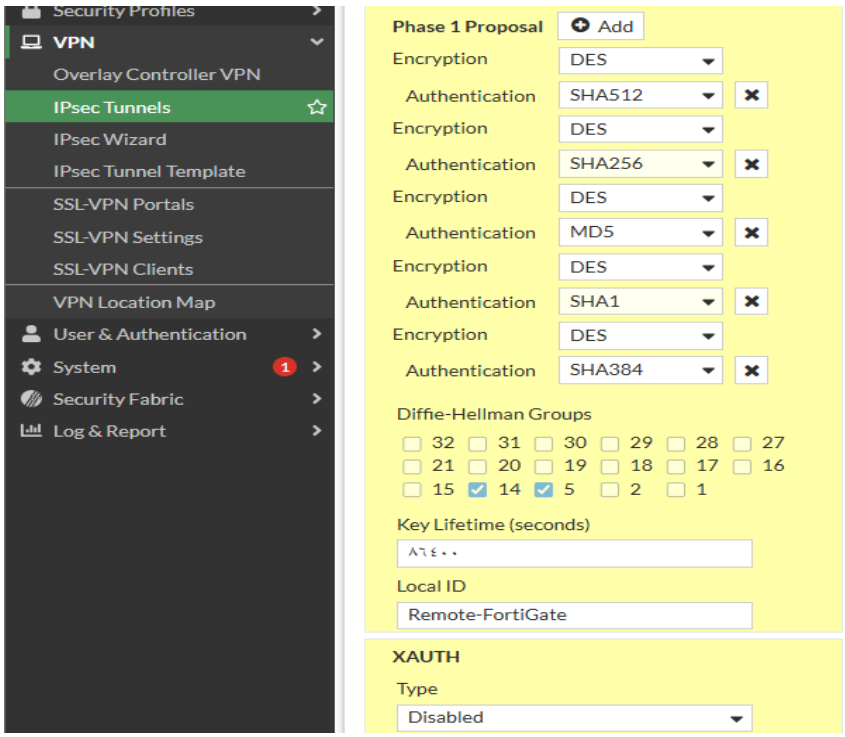
Field	Value
Method	Pre-shared Key
Pre-shared Key	fortinet

Field	Value
Mode	Aggressive
Accept Types	Any peer ID



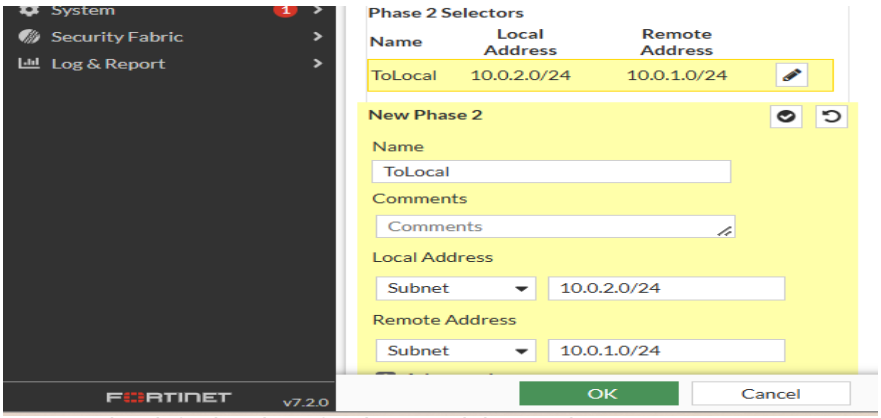
7. In the **Phase 1 Proposal** section, configure the following settings:

Field	Value
Local ID	Remote-FortiGate



8. In the **Phase 2 Selectors** section, configure the following settings:

Field	Value
Local Address	10.0.2.0/24
Remote Address	10.0.1.0/24



9. Keep the default values for the remaining settings.
10. Click **OK**.

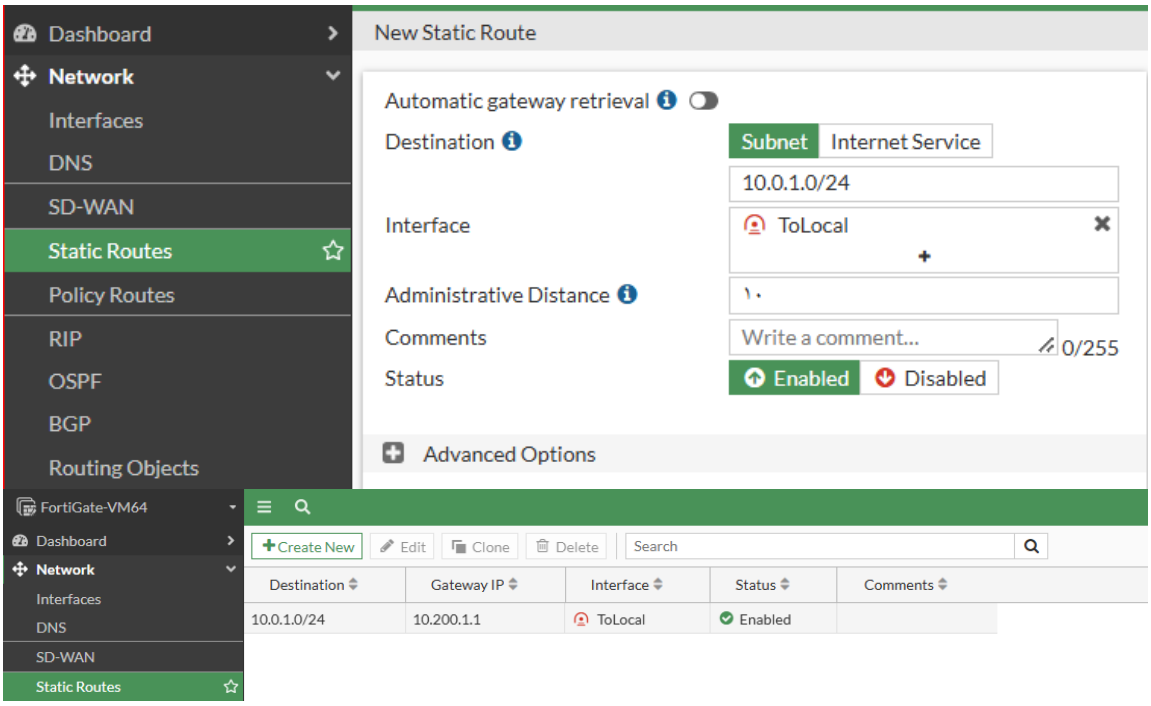
Create a Static Route for VPN Traffic on Remote-FortiGate (Dial-Up Client)

You will create one static route on Remote-FortiGate. This step was not necessary on Local-FortiGate because, as the dial-up server, it automatically adds the route for the remote network after the tunnel comes up.

To create a static route for VPN traffic on Remote-FortiGate

1. On the Remote-FortiGate GUI, click **Network** > **Static Routes**.
2. Click **Create New**.
3. Configure the following settings:

Field	Value
Destination	Subnet 10.0.1.0/24
Interface	ToLocal



4. Click **OK**.

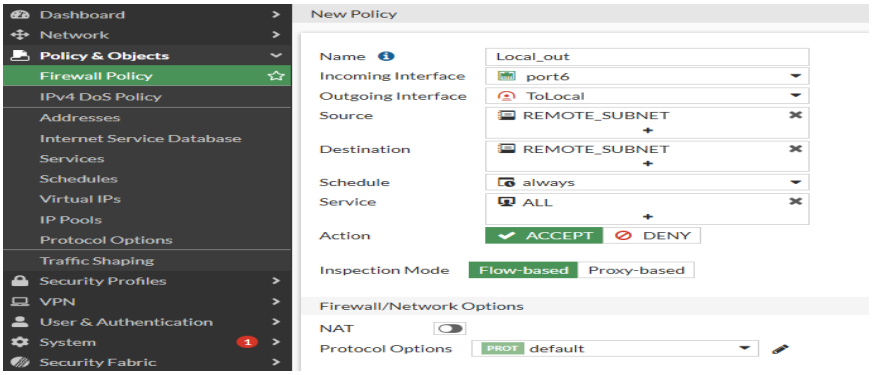
Create the Firewall Policies for VPN Traffic on Remote-FortiGate (Dial-Up Client)

You will create two firewall policies between **port6** and **To Local**—one for each traffic direction.

To create firewall policies for VPN traffic

1. On the Remote-FortiGate GUI, click **Policy & Objects** > **Firewall Policy**.
2. Click **Create New**.
3. Configure the following settings:

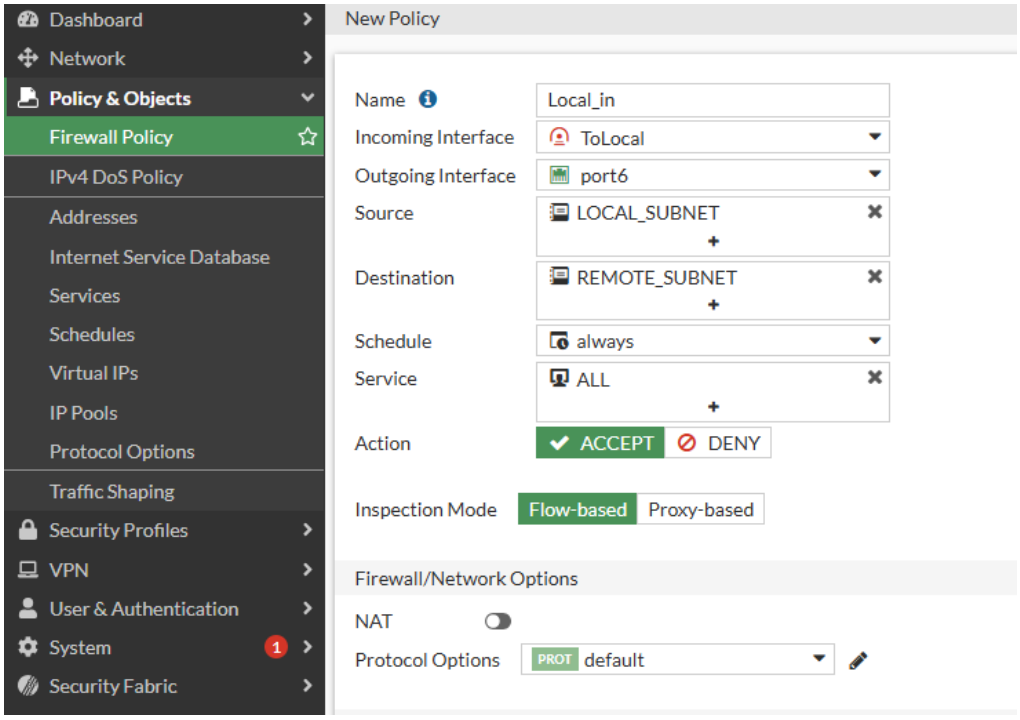
Field	Value
Name	Local_out
Incoming Interface	port6
Outgoing Interface	ToLocal
Source	REMOTE_SUBNET
Destination	LOCAL_SUBNET
Schedule	always
Service	ALL
Action	ACCEPT



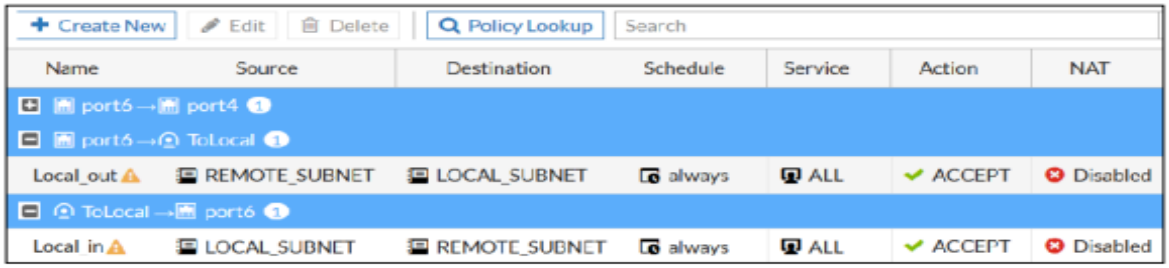
4. In the **Firewall/Network Options** section, disable **NAT**.
5. Click **OK**.

6. Click **Create New** again.
7. Configure the following settings:

Field	Value
Name	Local_in
Incoming Interface	ToLocal
Outgoing Interface	port6
Source	LOCAL_SUBNET
Destination	REMOTE_SUBNET
Schedule	always
Service	ALL
Action	ACCEPT



8. In the **Firewall/Network Options** section, disable **NAT**.
9. Click **OK**.

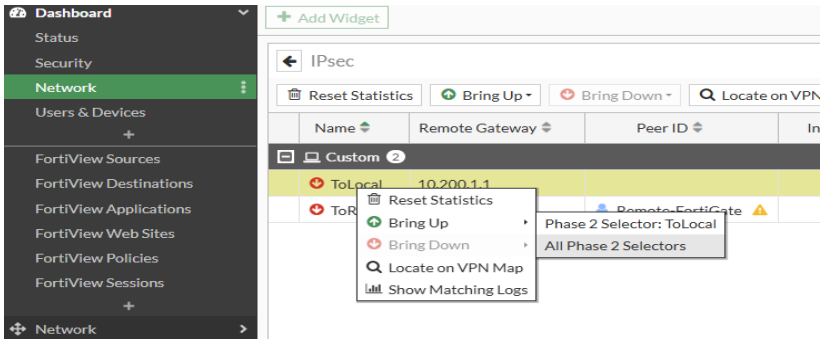


Test and Monitor the VPN

Now that you configured the VPN on both FortiGate devices, you will test the VPN.

To test the VPN

1. On the Remote-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
2. Click the **+** sign beside **Custom** to expand the custom VPN tunnel section.
Notice that the **ToLocal** VPN is currently down.
3. Right-click the VPN, and then click **Bring Up** > **All Phase 2 Selectors** to bring up the tunnel.

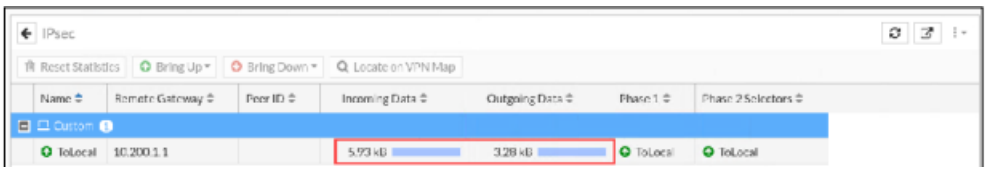


4. On the Remote-Client VM, open a terminal window, and then enter the following command to ping the Local-Client
VM:

```
ping 10.0.1.10
```

The ping should work.
5. On the Remote-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
6. Click the refresh button in the upper-right corner multiple times to refresh the widget information.

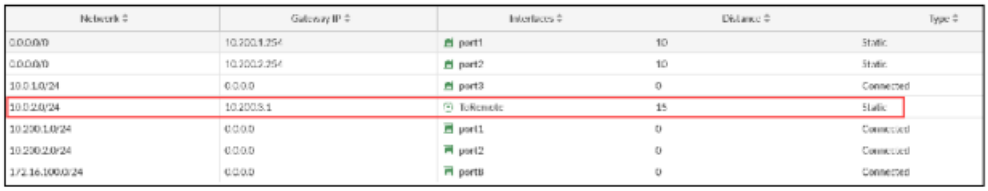
You will notice that the counters for **Incoming Data** and **Outgoing Data** increase over time. This indicates that the traffic between `10.0.1.10` and `10.0.2.10` is being encrypted successfully and routed through the tunnel.



Testing the lab

7. On the Local-FortiGate GUI, click **Dashboard** > **Network** > **Routing**.
Find the static route that was dynamically added to the FortiGate device.
8. View the route details.

Notice the address listed in the **Gateway IP** column for that route.



9. On the Remote-Client VM, press `Ctrl+C` to stop the ping

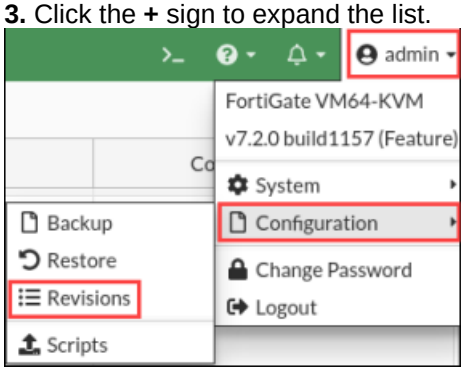
2) Configuring a Static IPsec VPN Between Two FortiGate Devices

you will configure a static VPN between Local-FortiGate and Remote-FortiGate. You will also configure a static route on Local-FortiGate for VPN traffic.
Before beginning this lab, you must restore a configuration file to Local-FortiGate.

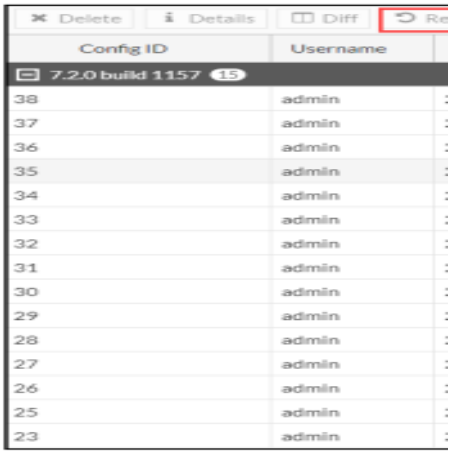
To restore the Local-FortiGate configuration file

1. Connect to the Local-FortiGate GUI, and then log in with the username `admin` and password `admin`.

2. In the upper-right corner of the screen, click **admin**, and then click **Configuration** > **Revisions**.
3. Click the **+** sign to expand the list.



4. Select the configuration with the comment **local-ipsec-vpn**, and then click **Revert**.



Create Phase 1 and Phase 2 on Local-FortiGate

You will configure the IPsec VPN by creating phase 1 and phase 2.

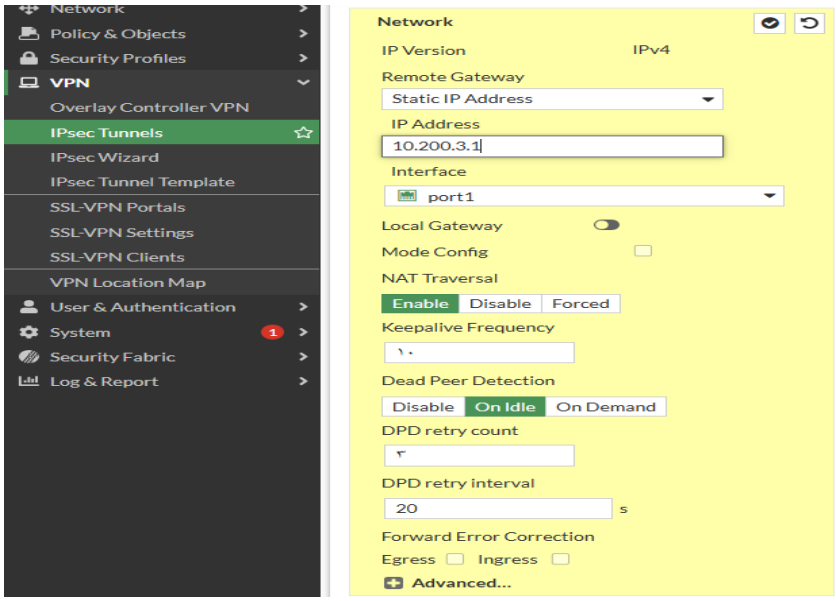
To create phase 1 and phase 2

1. Connect to the Local-FortiGate GUI, and then log in with the username `admin` and password `password`.
2. Click **VPN** > **IPsec Tunnels**, and then click **Create New** > **IPsec Tunnel**.
3. Configure the following settings:

Field	Value
Name	ToRemote
Template type	Custom

4. Click **Next**.
5. In the **Network** section, configure the following settings:

Field	Value
Remote Gateway	Static IP Address
IP Address	10.200.3.1
Interface	port1
Dead Peer Detection	On Idle

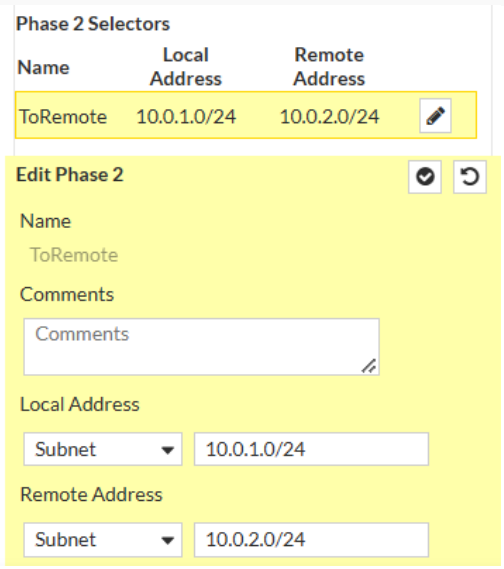


6. In the **Authentication** section, configure the following settings:

Field	Value
Method	Pre-shared Key
Pre-shared Key	fortinet
Mode	Aggressive
Accept Types	Any peer ID

7. In the **Phase 2 Selectors** section, configure the following settings:

Field	Value
Local Address	10.0.1.0/24
Remote Address	10.0.2.0/24



8. Keep the default values for the remaining settings.
9. Click **OK**.

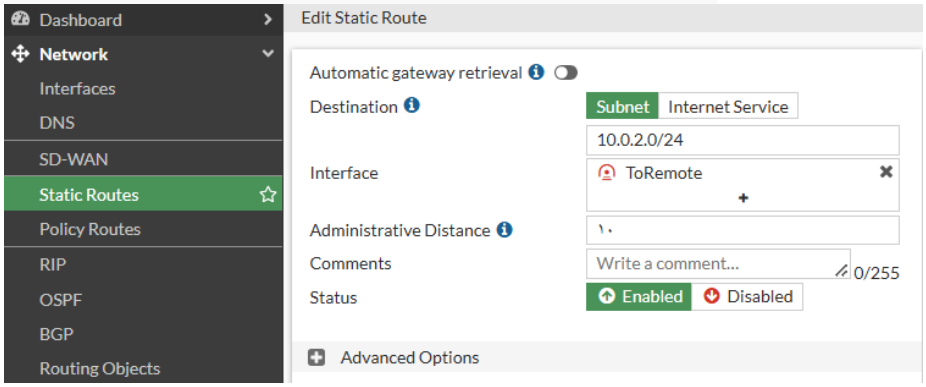
✓ Create a Static Route for VPN Traffic on Local-FortiGate

You will create one static route on Local-FortiGate.

To create a static route for VPN traffic on Local-FortiGate

1. On the Local-FortiGate GUI, click **Network** > **Static Routes**.
2. Click **Create New**.
3. Configure the following settings:

Field	Value
Destination	Subnet 10.0.2.0/24
Interface	ToRemote



4. Click **OK**.

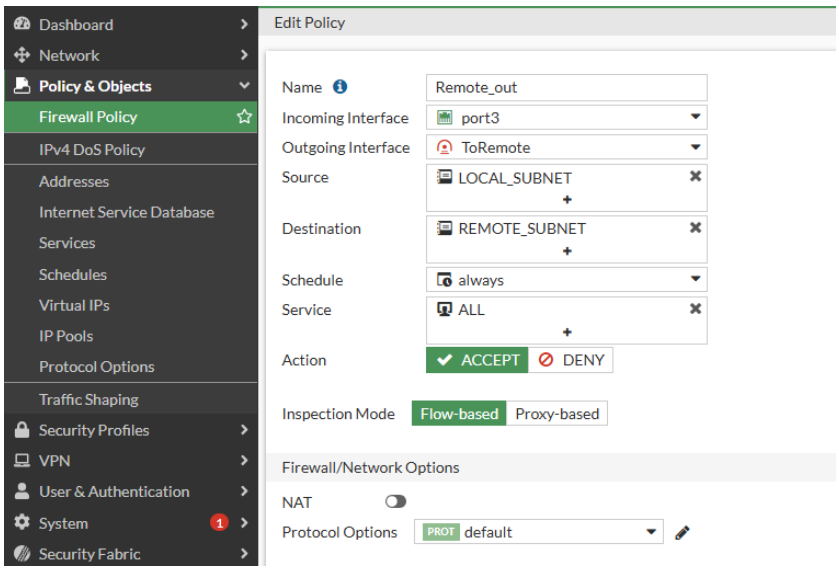
✓ Create Firewall Policies for VPN Traffic on Local-FortiGate

You will create two firewall policies between **port3** and **ToRemote**—one for each traffic direction.

To create firewall policies for VPN traffic

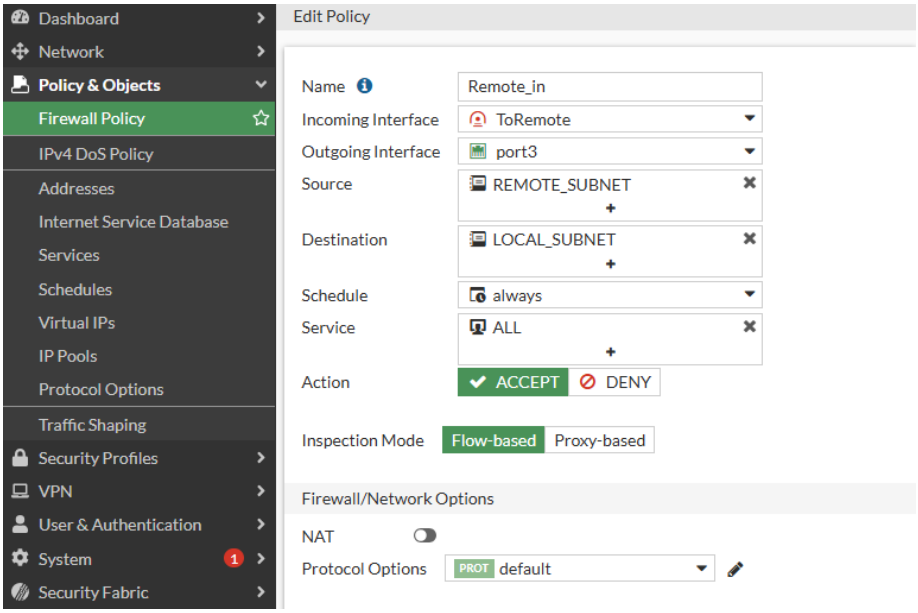
1. On the Local-FortiGate GUI, click **Policy & Objects** > **Firewall Policy**.
2. Click **Create New**.
3. Configure the following settings:

Field	Value
Destination	Subnet 10.0.2.0/24
Interface	ToRemote

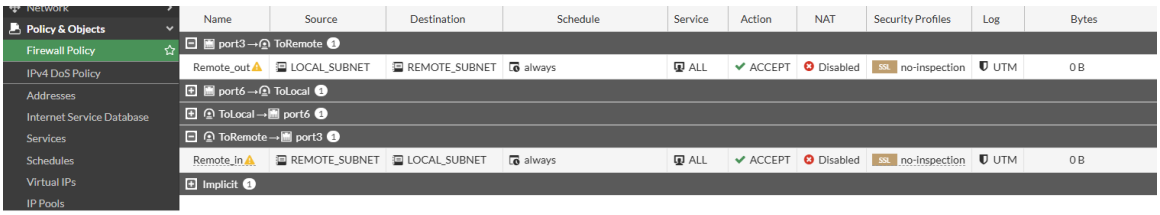


4. In the **Firewall/Network Options** section, disable **NAT**.
5. Click **OK**.
6. Click **Create New** again.
7. Configure the following settings:

Field	Value
Name	Remote_out
Incoming Interface	port3
Outgoing Interface	ToRemote
Source	LOCAL_SUBNET
Destination	REMOTE_SUBNET
Schedule	always
Service	ALL
Action	ACCEPT



8. In the **Firewall/Network Options** section, disable **NAT**.
9. Click **OK**.

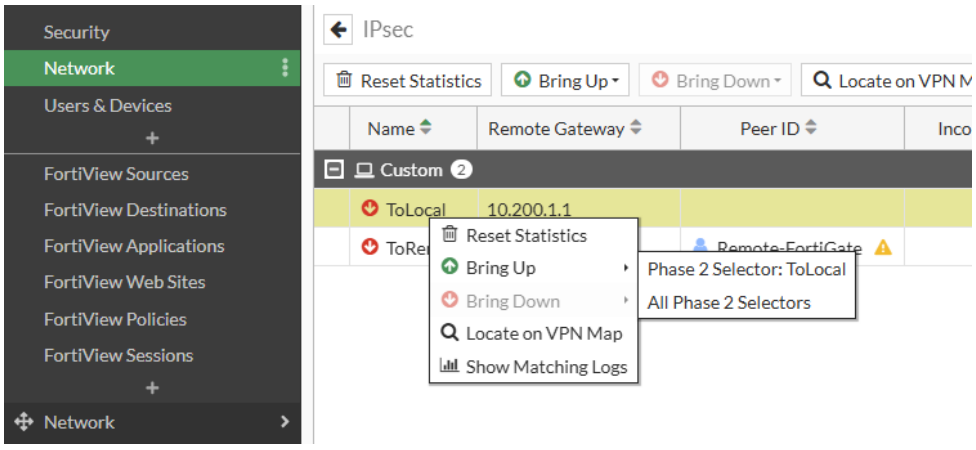


Test and Monitor the VPN

You will test the VPN and monitor its status.

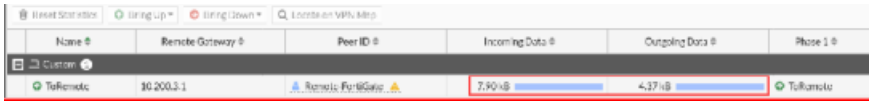
To test the VPN

1. On the Local-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
2. Click the **+** sign beside **Custom** to expand the custom VPN tunnel section.
Notice that the **ToRemote** VPN is currently down.
3. Right-click the VPN, and then click **Bring Up** > **All Phase 2 Selectors**.



4. In the top-right corner, click the refresh button to refresh the widget information.
The **Name** column of the VPN now contains a green up arrow, which indicates that the tunnel is up.

5. On the Remote-Client VM, open a terminal window, and then enter the following command to ping the Local-Client
VM:
`ping 10.0.1.10`
The ping should work.
6. On the Local-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
7. In the upper-right corner, click the refresh button multiple times to refresh the widget information. You will notice that the counters for **Incoming Data** and **Outgoing Data** increase over time. This indicates that the traffic between `10.0.1.10` and `10.0.2.10` is being encrypted successfully and routed through the tunnel.



8. On the Remote-Client VM, press `Ctrl+C` to stop the ping.

3) Configuring Redundant Static IPsec VPN Tunnels Between Two FortiGate Devices

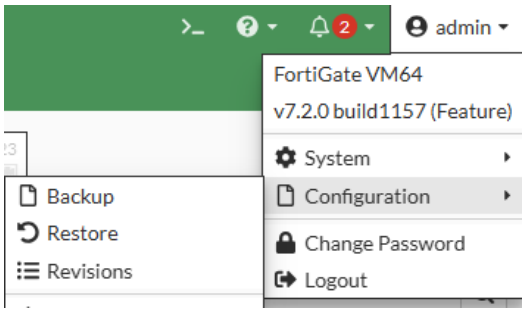
In this exercise, you will configure one more VPN tunnel between Local-FortiGate and Remote-FortiGate for redundancy purposes. You must first restore a configuration file on Remote-FortiGate.

Prerequisites

Before beginning this exercise, you must restore a configuration file on Remote-FortiGate.

To restore the Remote-FortiGate configuration file

1. Connect to the Remote-FortiGate GUI, and then log in with the username `admin` and password `admin`.
2. In the upper-right corner of the screen, click **admin**, and then click **Configuration** > **Revisions**.



3. Click the **+** sign to expand the list.
4. Select the configuration with the comment **remote-redundant-ipsec-vpn**, and then click **Revert**.

5. Click **OK** to reboot.

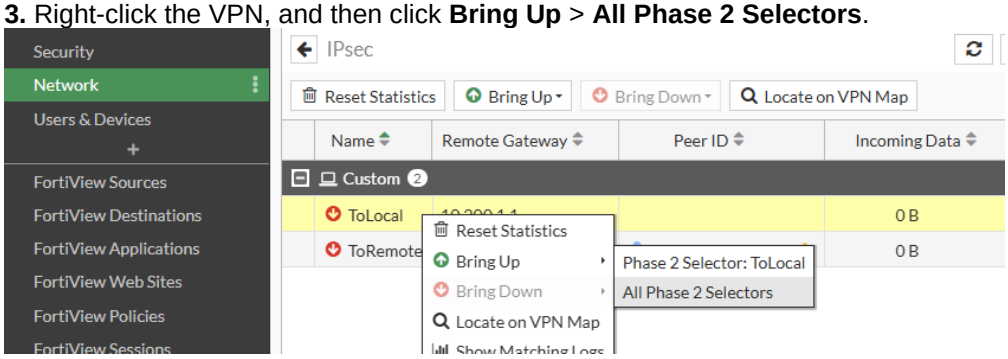
Check the IPsec VPN Tunnel on Local-FortiGate

You just restored a configuration file to Remote-FortiGate. You will now check the status of the **ToRemote** VPN
on Local-FortiGate.

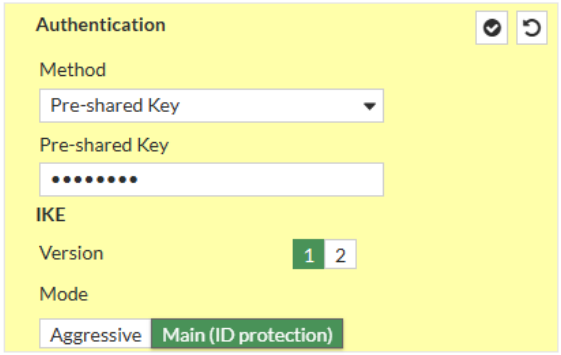
To check the VPN on Local-FortiGate

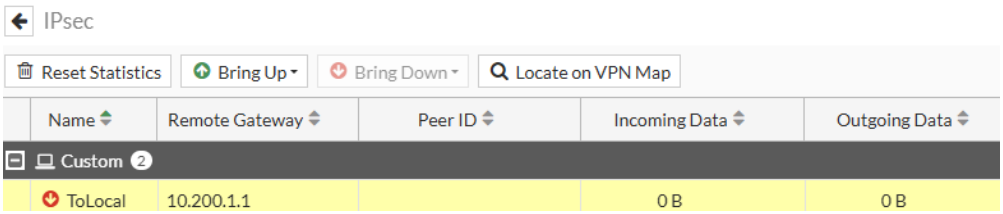
1. On the Local-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
2. Click the **+** sign beside **Custom** to expand the custom VPN tunnel section.
Notice that the **ToRemote** VPN is currently down.

3. Right-click the VPN, and then click **Bring Up** > **All Phase 2 Selectors**.



4. In the upper-right corner, click the refresh button to refresh the widget information.
The **Name** column of the VPN shows a red down arrow, indicating that the tunnel is still down.



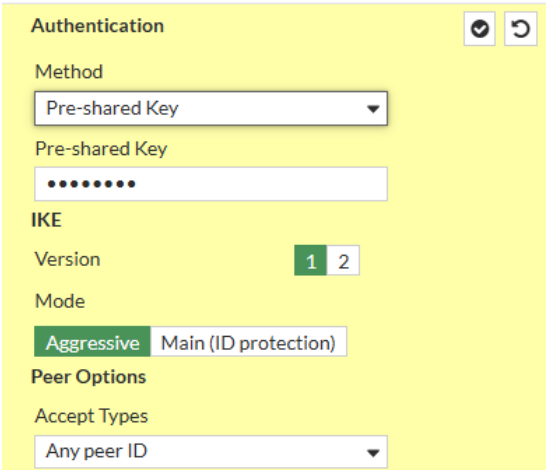


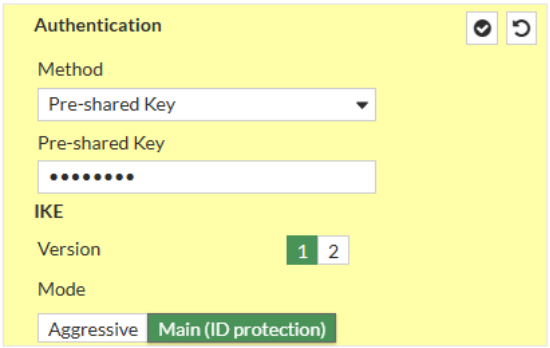
Review the VPN Configuration on Both FortiGate Devices

Phase 1 and phase 2 settings on both peers are no longer a mirror of each other. You will review the VPN configuration on each FortiGate and identify the differences. After that, you will apply the changes to the LocalFortiGate configuration so it mirrors the configuration on Remote-FortiGate.

To review the VPN configuration on both FortiGate devices

1. On the Local-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then double-click **ToRemote** to review the tunnel
settings.
2. On the Remote-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then double-click **ToLocal** to review the tunnel
settings.
3. Compare the settings in the **Authentication** section on each FortiGate.

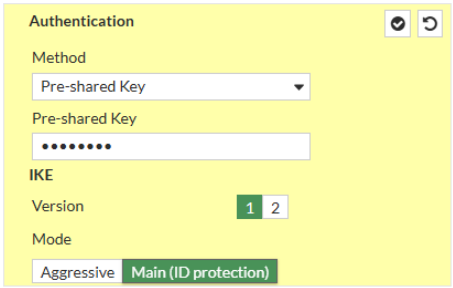




To change the VPN configuration on Local-FortiGate

1. On the Local-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then double-click **ToRemote** to edit the tunnel
settings.
2. Click the **Authentication** section, and then configure the following setting:

Field	Value
Mode	Main (ID protection)



3. Click **OK**.

Test and Monitor the VPN

Now that you fixed the VPN configuration on Local-FortiGate, you will test the VPN. Instead of bringing up the tunnel manually, you will generate traffic to bring the tunnel up.

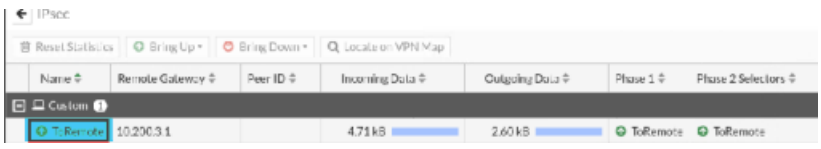
To test the VPN

1. On the Remote-Client VM, open a terminal window, and then enter the following command to ping the Local-Client
VM:

```
ping 10.0.1.10
```

The ping should work.

2. On the Local-FortiGate GUI, click **Dashboard** > **Network** > **IPsec**.
3. Click the **+** sign beside **Custom** to expand the custom VPN tunnel section.
Notice that the **ToRemote** VPN is currently up.



4. On the Remote-Client VM, press `Ctrl+C` to stop the ping.

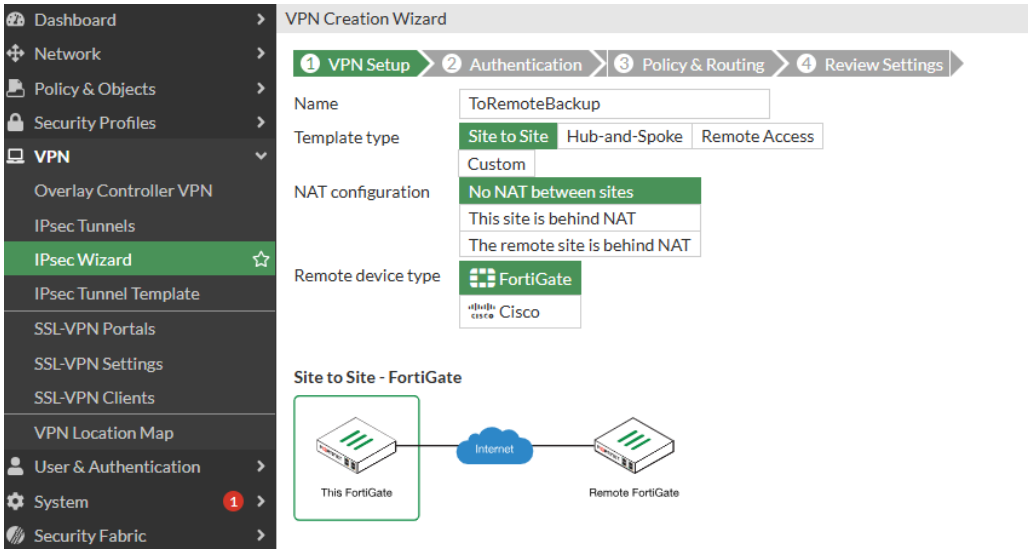
Create a Backup VPN Tunnel Using the IPsec Wizard

You will configure a backup VPN tunnel on Local-FortiGate, named **ToRemoteBackup**, for redundancy
purposes. To configure the new tunnel, you will use the IPsec wizard. On the Remote-FortiGate, the backup VPN
tunnel was preconfigured and named **ToLocalBackup**.

To create a VPN using the IPsec wizard

1. On the Local-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then click **Create New** > **IPsec Tunnel**.
2. Configure the following settings:

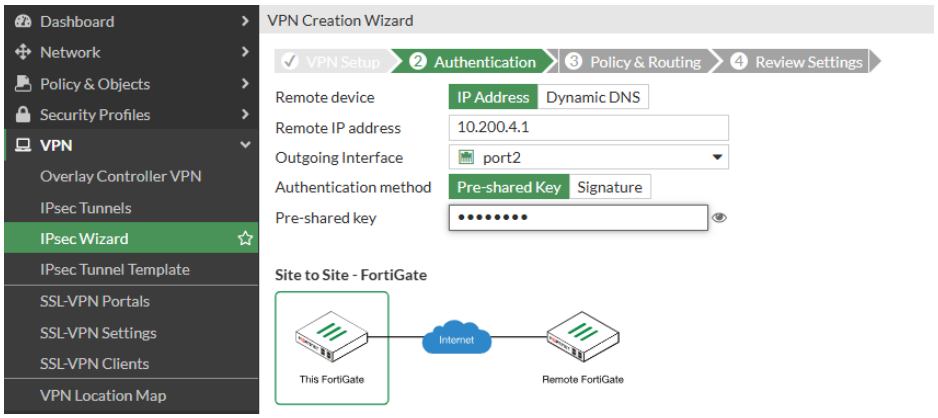
Field	Value
Name	ToRemoteBackup
Template type	Site to Site
NAT configuration	No NAT between sites
Remote device type	FortiGate



3. Click **Next**.
4. Configure the following settings:

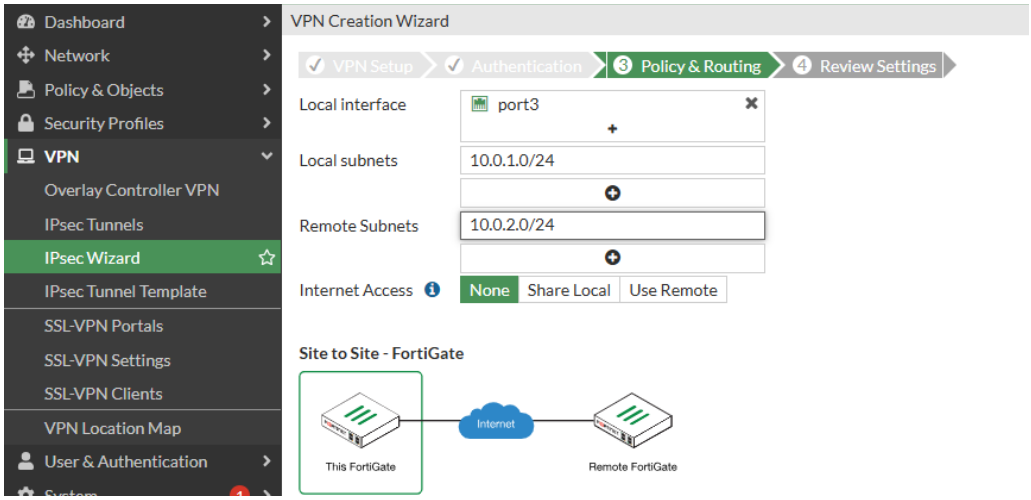
Field	Value
Remote device	IP Address
Remote IP address	10.200.4.1
Outgoing Interface	port2
Authentication method	Pre-shared Key
Pre-shared key	fortinet

. Click Next.

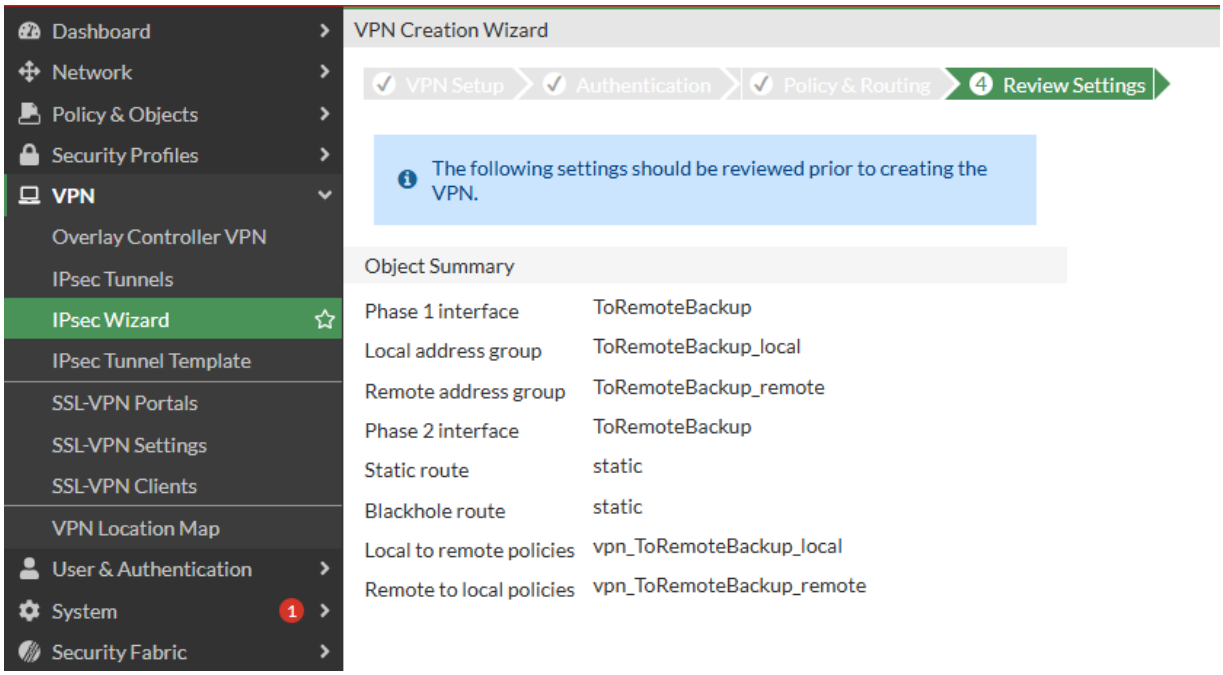


5. Click **Next**.
6. Configure the following settings:

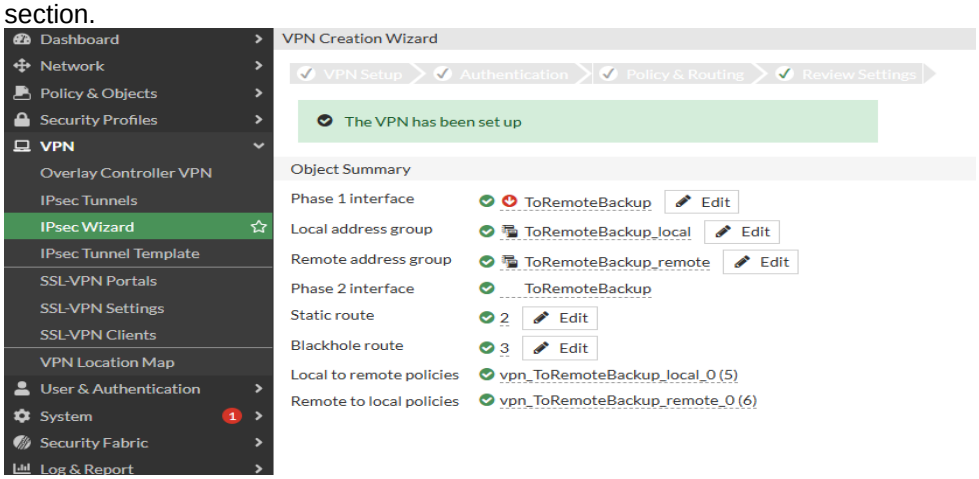
Field	Value
Local interface	port3
Local subnets	10.0.1.0/24
Remote Subnets	10.0.2.0/24
Internet Access	None



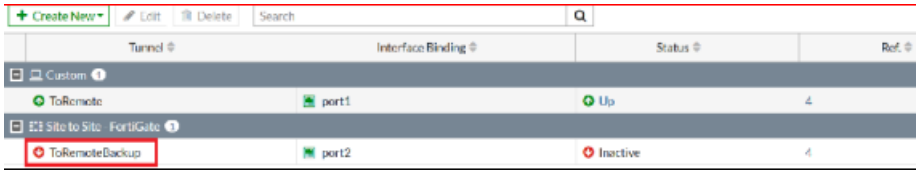
7. Click **Next**.
8. Click **Create**.
You should see the following screen:



9. Click **Create** to create the new VPN tunnel.
10. Click **Show Tunnel List**, and then click the **+** sign beside **Site to Site - FortiGate** to expand the VPN tunnel
section.



You will see the VPN you just created.

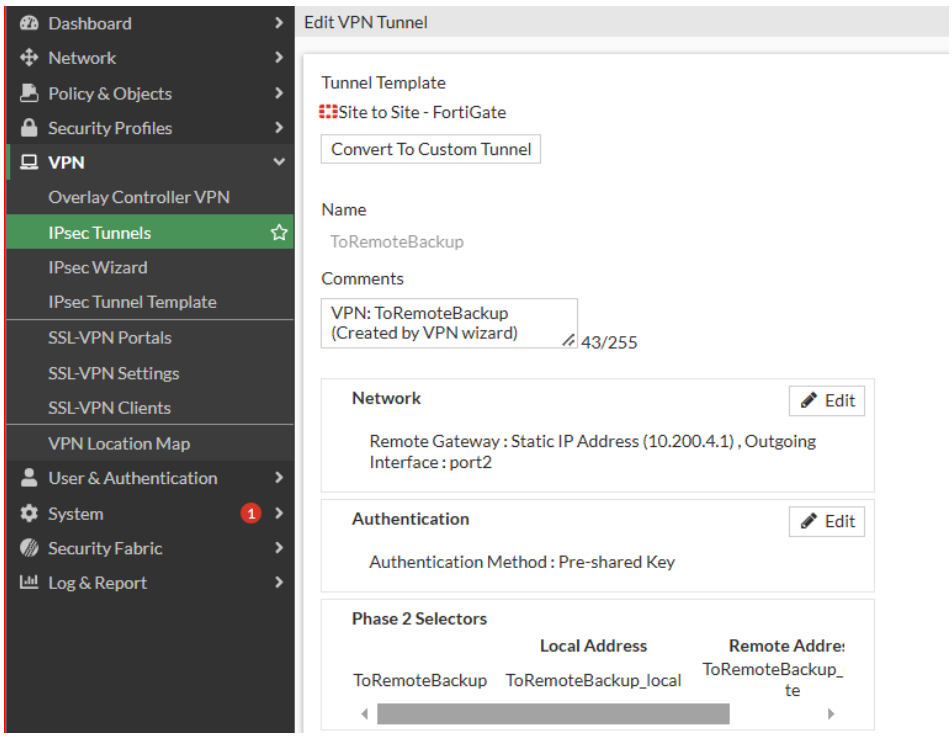


Review the Objects the IPsec Wizard Created

You will review the objects that the IPsec wizard created.

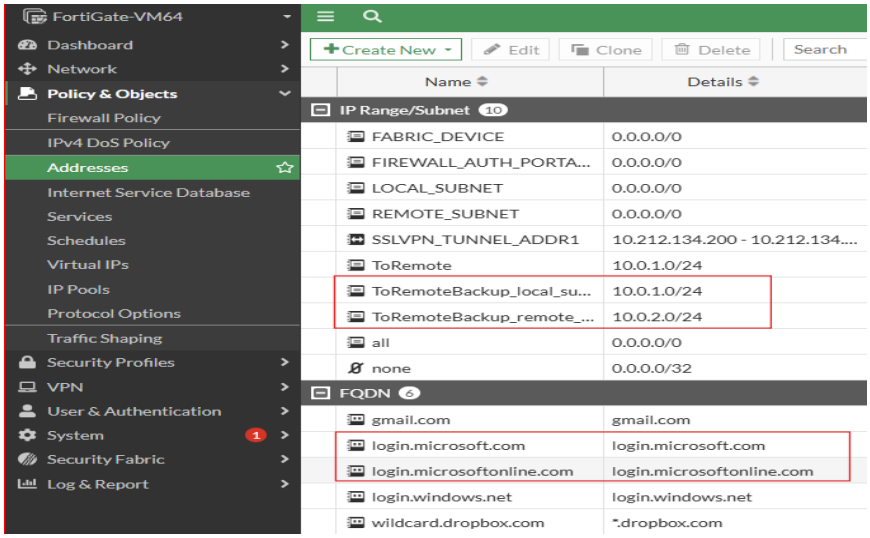
To review the objects the IPsec wizard created

1. On the Local-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then double-click **ToRemoteBackup** to review the
tunnel settings.
Notice the quick mode selectors that the wizard configured for you.

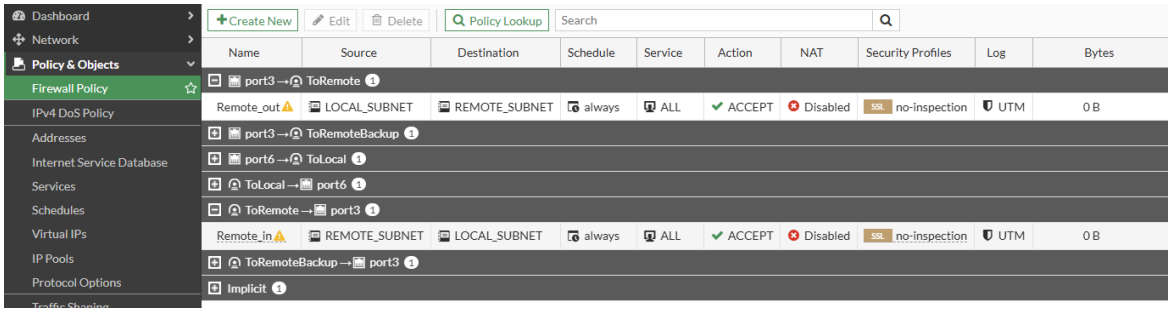


2. Click **Cancel**.
3. Click **Policy & Objects** > **Addresses**, and then click the **+** icon to expand **Address Group**.
Observe the following new firewall address objects:

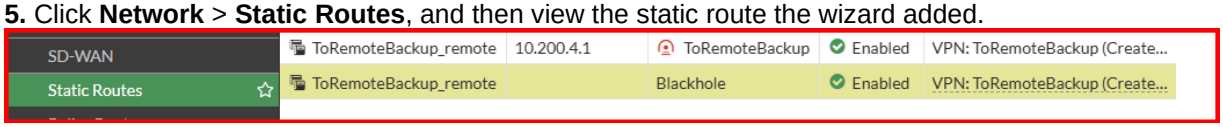
- **ToRemoteBackup_local_subnet_1**, a member of the **ToRemoteBackup_local** address group
- **ToRemoteBackup_remote_subnet_1**, a member of the **ToRemoteBackup_remote** address group



4. Click **Policy & Objects** > **Firewall Policy**.
Observe the two new firewall policies: one from **port3** to **ToRemoteBackup** and another from **ToRemoteBackup** to **port3**. You will see that the **Action** in both cases is **ACCEPT**.



5. Click **Network** > **Static Routes**, and then view the static route the wizard added.

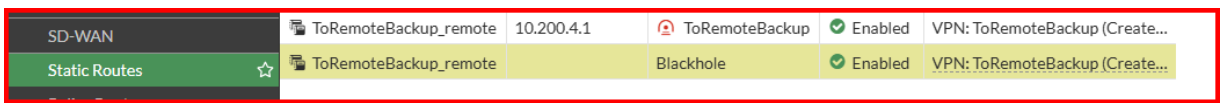


Adjust Routing for the Backup VPN Tunnel on Local-FortiGate

You will increase the administrative distance of the static route the IPsec wizard created for the **ToRemoteBackup** VPN, so the tunnel is only used when the **ToRemote** VPN is down.

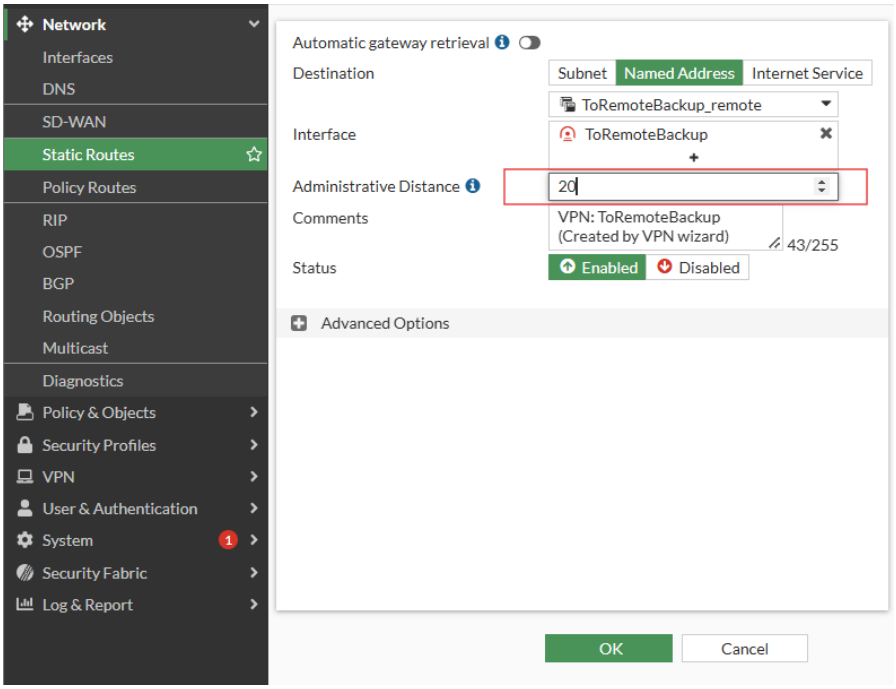
To configure a backup VPN on Local-FortiGate

1. On the Local-FortiGate GUI, click **Network** > **Static Routes**.
2. Double-click the static route created for **ToRemoteBackup** to edit the settings.



4. Configure the following setting:

Field	Value
Administrative Distance	20



4. Click **OK**.

Review the Backup VPN Configuration on Remote-FortiGate

For the purpose of this lab, the backup VPN configuration on Remote-FortiGate was preconfigured for you. The configuration also includes a zone to reduce the number of firewall policies needed for the redundant VPNs. You will review this configuration.

To review the Remote-FortiGate configuration

1. On the Remote-FortiGate GUI, click **VPN** > **IPsec Tunnels**, and then double-click **ToLocalBackup** to review the
tunnel settings.
2. Click **Network** > **Static Routes**, and then view **ToLocalBackup** to review the static route for the backup VPN.
3. Click **Network** > **Interfaces**, and then expand the **Zone** section to view the **VPN** zone details to review the
interface zone.
4. Click **Policy & Objects** > **Firewall Policy**, and then view the **Local_out** and **Local_in** policies to review the
firewall policies for VPN traffic on Remote-FortiGate.

Test VPN Redundancy

You will test the VPN failover. You will use the sniffer tool to monitor which VPN tunnel the traffic is using.

To test VPN redundancy

1. On the Local-FortiGate CLI, log in with the username `admin` and password `password`.
2. Enter the following command to sniff all ICMP traffic to `10.0.2.10` with verbosity `4`:

```
diagnose sniffer packet any 'icmp and host 10.0.2.10' 4
```

3. On the Local-Client VM, open a terminal window, and then run a continuous ping to Remote-Client, using the
following command:

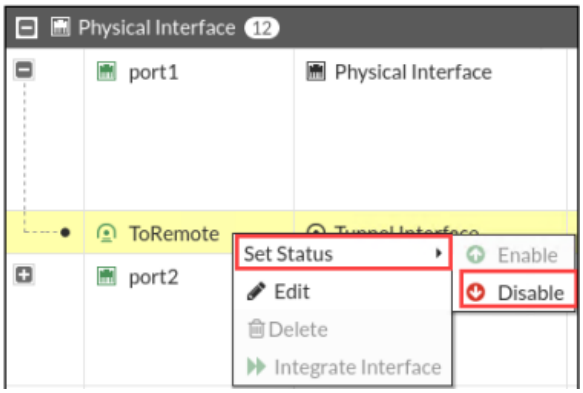
```
ping 10.0.2.10
```

4. Return to the Local-FortiGate CLI session, and then view the sniffer output.
It shows that Local-FortiGate is routing the packets through the `ToRemote` VPN.

```
28.040086 port3 in 10.0.1.10 -> 10.0.2.10: icmp: echo request
28.040107 ToRemote out 10.0.1.10 -> 10.0.2.10: icmp: echo request
28.041188 ToRemote in 10.0.2.10 -> 10.0.1.10: icmp: echo reply
28.041196 port3 out 10.0.2.10 -> 10.0.1.10: icmp: echo reply
```

Now, you will simulate a failure in the **ToRemote** VPN, and observe how FortiGate starts using the secondary
ToRemoteBackup VPN.

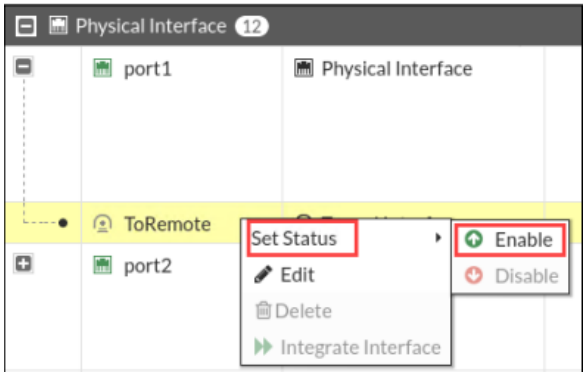
5. On the Local-FortiGate GUI, click **Network** > **Interfaces**.
6. Click the **+** sign beside **port1** to view the subinterfaces using port1.
7. Right-click **ToRemote**, and then click **Set Status** > **Disable** to disable the VPN interface.



ToRemote is now grayed out.
8. Wait about a minute for DPD to detect the failure in **ToRemote**, and as a result, for FortiGate to reroute the traffic
through **ToRemoteBackup**.
9. Return to the Local-FortiGate CLI session, and then view the sniffer output again.
Notice that the `ToRemoteBackup` VPN is being used now.

```
546.352063 port3 in 10.0.1.10 -> 10.0.2.10: icmp: echo request
546.352090 ToRemoteBackup out 10.0.1.10 -> 10.0.2.10: icmp: echo request
546.353546 ToRemoteBackup in 10.0.2.10 -> 10.0.1.10: icmp: echo reply
546.353560 port3 out 10.0.2.10 -> 10.0.1.10: icmp: echo reply
```

10. On the Local-FortiGate GUI, click **Network** > **Interfaces**.
11. Click the **+** sign beside **port1** to view the subinterfaces using port1.
12. Right-click **ToRemote**, and then click **Set Status** > **Enable** to re-enable the VPN interface.



ToRemote is no longer grayed out.

13. Return to the Local-FortiGate CLI session, and then view the sniffer output again.
Notice that the `ToRemote` VPN is being used again.

```
589.622935 port3 in 10.0.1.10 -> 10.0.2.10: icmp: echo request
589.622948 ToRemote out 10.0.1.10 -> 10.0.2.10: icmp: echo request
589.624057 ToRemote in 10.0.2.10 -> 10.0.1.10: icmp: echo reply
589.624072 port3 out 10.0.2.10 -> 10.0.1.10: icmp: echo reply
```

14. Press `Ctrl+C` to stop the ping.
15. Close the Local-FortiGate CLI window.