FortiGate

High Availability on OCB Flex Engine Installation Deployment and configuration Guide

21st September 2021

Version 2.0

document control

date	version no.	author	change/addition
6th December 2019	1.0	Ahmad Samak	Creation
21st September 2021	2.0	Ahmad Samak	Adding the initial network interfaces configuration steps of fortigate ECS, static Mode configuration as a work around to fixe the DHCP issue on OCB FE

table of contents

1 References

Reference	Description	Link to document
[1]	FortiOS Handbook VM Installation for FortiOS	https://docs.fortinet.com/uploaded/files/1734/fortigate-vm-install50.pdf#M8.9.51917.Chapter.Title.FortiGate.VM.Deployment
[2]	Fortigate System administration Guide	https://docs.fortinet.com/uploaded/files/1052/fortigate-system-admin-40-mr3.pdf

2 Introduction

FortiGate virtual appliances allow you to mitigate blind spots by implementing critical security controls within your virtual infrastructure. They also allow you to rapidly provision security infrastructure whenever and wherever it is needed. FortiGate virtual appliances feature all of the security and networking services common to traditional hardware-based FortiGate appliances. With the addition of virtual appliances from Fortinet, you can deploy a mix of hardware and virtual appliances, operating together and managed from a common centralized management platform.

Guide Scope

This document describes how to deploy a FortiGate virtual appliance in several virtualization server environments. This includes how to configure the virtual hardware settings of the virtual appliance. This document assumes:

- you have already successfully installed the virtualization server on the physical machine,
- you have installed appropriate VM management software on either the physical server or a computer to be used for VM management.

This document does not cover configuration and operation of the virtual appliance after it has been successfully installed and started.

3 FortiGate VM Overview

Organizations generally move to the public cloud with the goals of increasing scale and reducing time to deployment. Achieving these goals requires application architectures built specifically for the public cloud. Before you can architect for the public cloud, you must understand how it is different from traditional on-premises environments.

3.1 ForiGate VM models and Licensing

Fortinet offers the FortiGate VM in five virtual appliance models determined by license. When configuring your FortiGate VM, be sure to configure hardware settings within the ranges outlined in Table 1. Contact your Fortinet Authorized Reseller for more information.

Table 1: FortiGate VM model information

Technical Specification	FG-VM00	FG-VM01	FG-VM02	FG-VM04	FG-VM08
Virtual CPUs (min/max)	1/1	1/1	1/2	1/4	1/8
Virtual Network Interfaces (min/max)	2 / 10				
Virtual Memory (min/max)	1 GB / 1 GB	1 GB / 2 GB	1 GB / 4 GB	1 GB / 6 GB	1 GB / 12 GB
Virtual Storage (min/max)	30 GB / 2 TB				
Managed Wireless Access Points (tunnel mode / global)	32 / 32	32 / 64	256 / 512	256 / 512	1024 / 4096
Virtual Domains (default / max)	1 / 1	10 / 10	10 / 25	10 / 50	10 / 250

After placing an order for FortiGate VM, a license registration code is sent to the email address used on the order form. Use the registration number provided to register the FortiGate VM with Customer Service & Support and then download the license file. Once the license file is uploaded to the FortiGate VM and validated, your FortiGate VM appliance is fully functional.

3.2 Register FortiGate VM with Customer Service and Support

To obtain the FortiGate VM license file you must first register your FortiGate VM with Customer Service & Support.To register your FortiGate VM:

1.Log in to the Customer Service & Support portal using an existing support account or select Sign Up to create a new account.

2.In the main page, under Asset, select Register/Renew.The Registration page opens.

3.Enter the registration code that was emailed to you and select Register. A registration form will display.

4.After completing the form, a registration acknowledgement page will appear.

5.Select the License File Download link.

6.You will be prompted to save the license file (.lic) to your local computer.

3.3 Deployment package contents

KVM

The FORTINET.out.kvm.zip contains only fortios.qcow2, the FortiGate VM system hard disk in qcow2 format. You will need to manually:

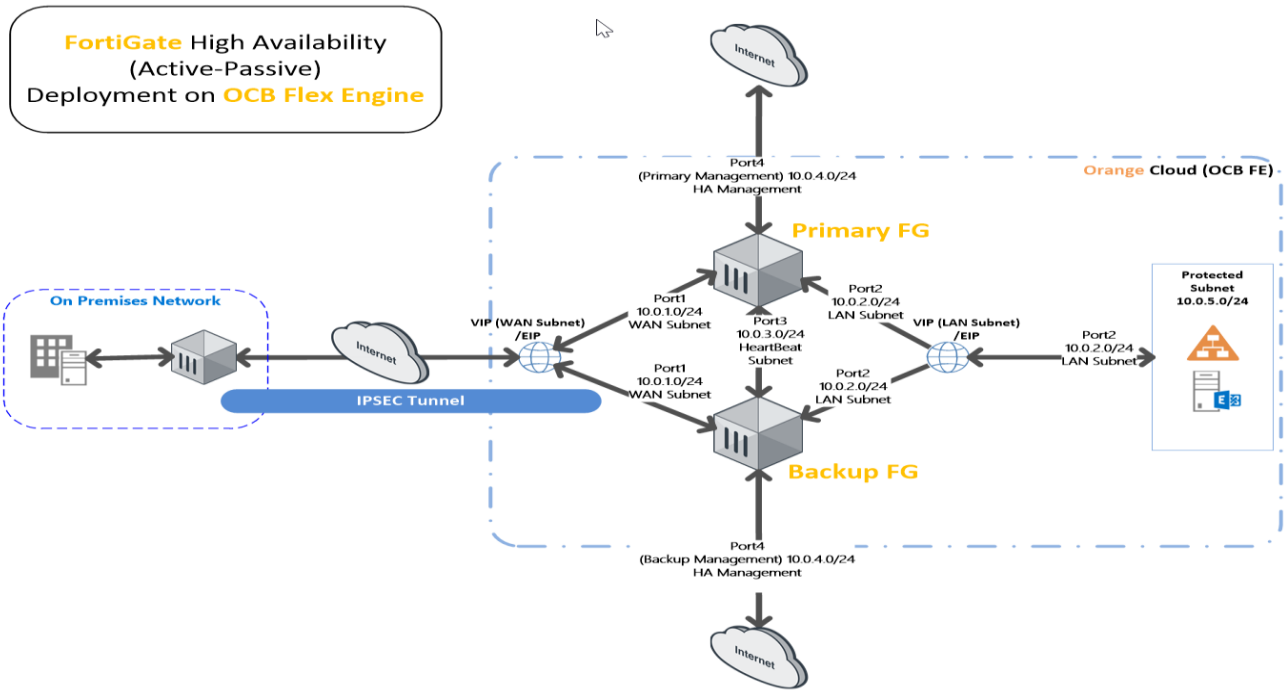
- create a 30GB log disk
- specify the virtual hardware settings

4 Deployment Method

Use the FortiGate VM on OCB FE to secure your network users in the following scenarios:

4.1 High Availability (Active – Passive) deployment

A recommended installation requires four network interfaces per FortiGate-VM node. In addition to inbound and outbound data interfaces, the FortiGate-VMs use two interfaces for internal operations. Choose OCB Flex Engine ECS sizes that can equip four network interfaces. The table below outlines how the FortiGate-VMs use each port:



Port	Description
Port1	External data interface on the public network-facing side, 10.0.1.0/24. A public IP address (1.1.1.1) is associated with the active node's private IP address. FortiGate performs NAT for inbound and outbound traffic.
Port2	Internal data traffic interface on the protected network-facing side, 10.0.2.0/24. UDRs for networks behind the firewalls point to the active node port2 IP address.
Port3	Used for heartbeat between two FortiGate nodes on 10.0.3.0/24. This is the unicast communication. This heartbeat interface has its dedicated hbdev VDOM. You cannot use this interface for another purpose.
Port4	Dedicated management interface, placed on the subnet 10.0.4.0/24, to each FortiGate (2.2.2.2 for FortiGate A and 3.3.3.3 for FortiGate B) so that you can access them over the Internet for management purposes, such as logging in

Port	Description
	the FortiGate via SSH or the GUI and making configuration changes. In case of heartbeat failure, a passive firewall needs a dedicated port to communicate with OCB Flex Engine to issue failover-related commands. This port should always be available, regardless of the node status (active or passive), except when the node is unexpectedly down.

4.2 Checking the prerequisites

The following is required for a successful deployment:

- Availability to accommodate required OCB Flex Engine resources
    - VPC with five subnets (new or existing)
    - Two Virtual IP's
        - One for traffic to/through the active (primary) FortiGate
        - The second for the internal (LAN) ports facing the protected subnet.
    - Three public IP addresses
        - One for traffic to/through the active (primary) FortiGate
        - Two for management access to each FortiGate
    - All IP addresses must be static, not DHCP.
    - Two FortiGate-VM ECS's
        - You must deploy the two nodes in the same region and under the same VNet.
        - Each FortiGate-VM must have at least four network interfaces.
        - Decide the FortiGate login username and password.
- IMPORTANT: In this deployment on OCB Flex Engine, the FortiGate-VM can make API calls to change the route tables and the elastic IP address during a failover.

  Once licensed and rebooted, you can proceed to configure the OCB Flex Engine settings to enable the cluster IP address and route table failover.

  The following provides example installtion for the primary and secondary FortiGates. Most of this configuration will be specific to your environment and so must be modified.

5 Deploy the FortiGate VM Firewalls on Orange Flex Engine

In our scenarios we have 1 VPC

- FGHA VPC that will host FortiGate VM Firewalls with 5 Subnets
- 2 FortiGate ECS's each ECS will have two disks one for the system and the other for the LOGS (SCSI)
- Protected Area Subnet.

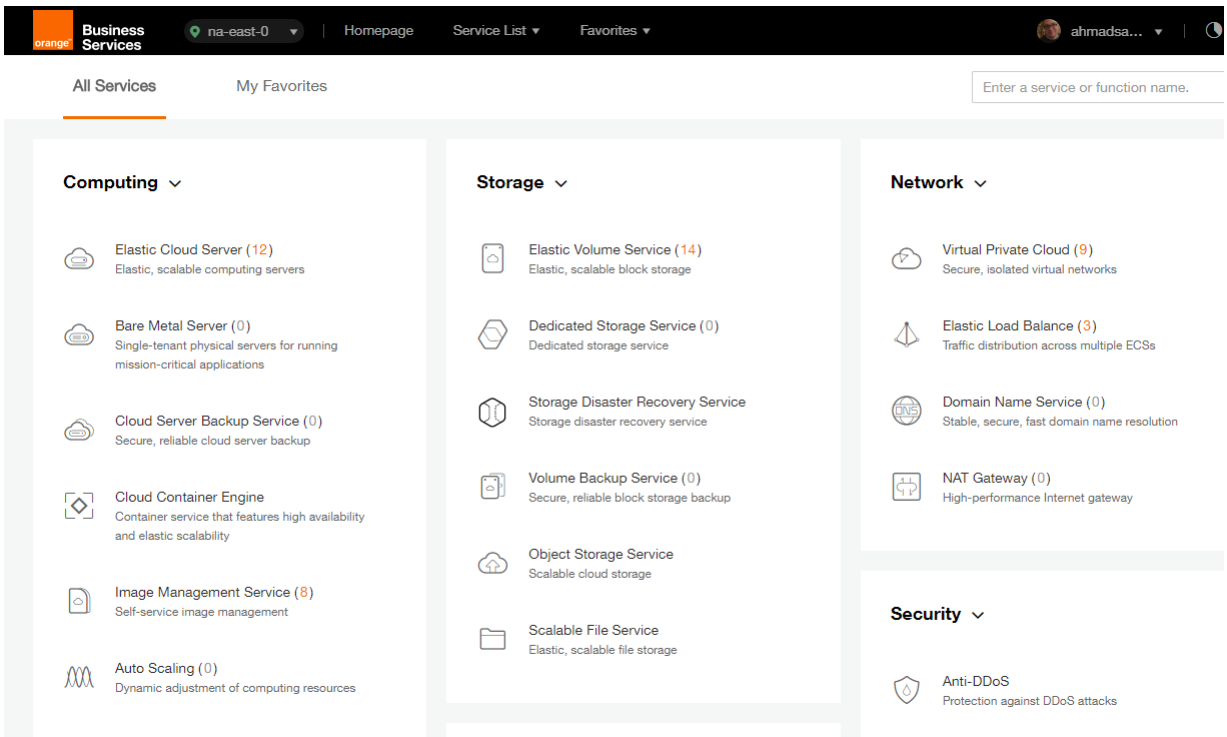
5.1 Create VPC

A VPC provides an isolated virtual network for ECSs. You can configure and manage the network as required.

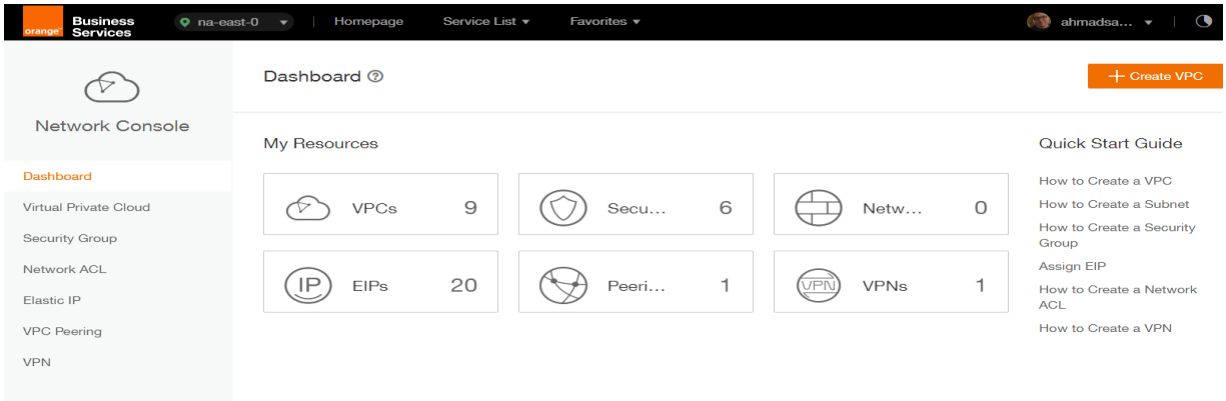
To use a VPC, first create it by following the procedure provided in this section. Then, create subnets, security groups, and VPNs, and assign EIPs by following the procedure provided in subsequent sections based on your actual network requirements.

Procedure

1. Log in to the management console.
2. On the console homepage, under **Network**, click **Virtual Private Cloud**.



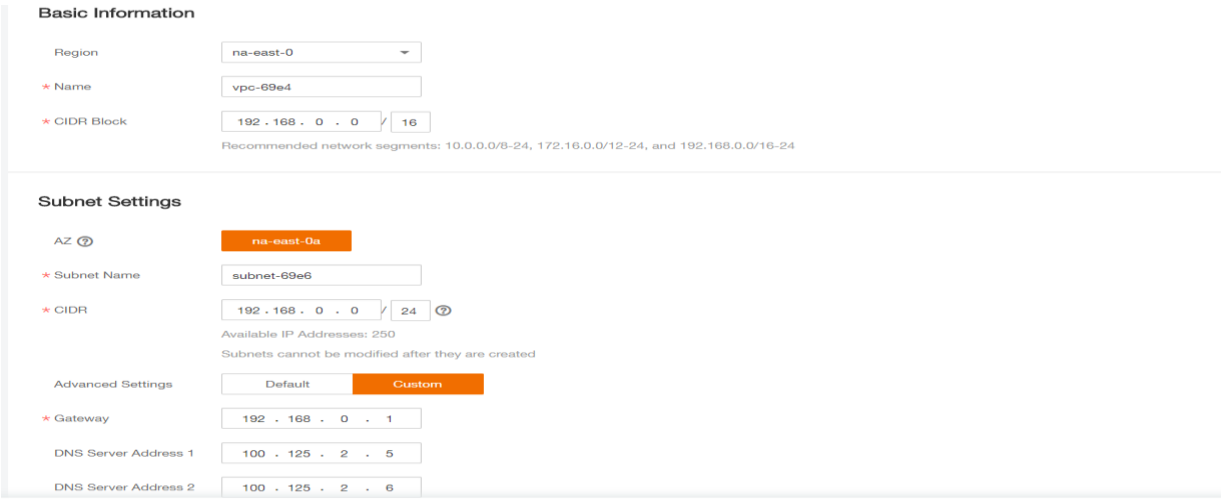
3. On the **Dashboard** page, click **Create VPC**.



On the displayed **Apply for VPC** page, set the parameters as prompted.

Table 1 Parameter description

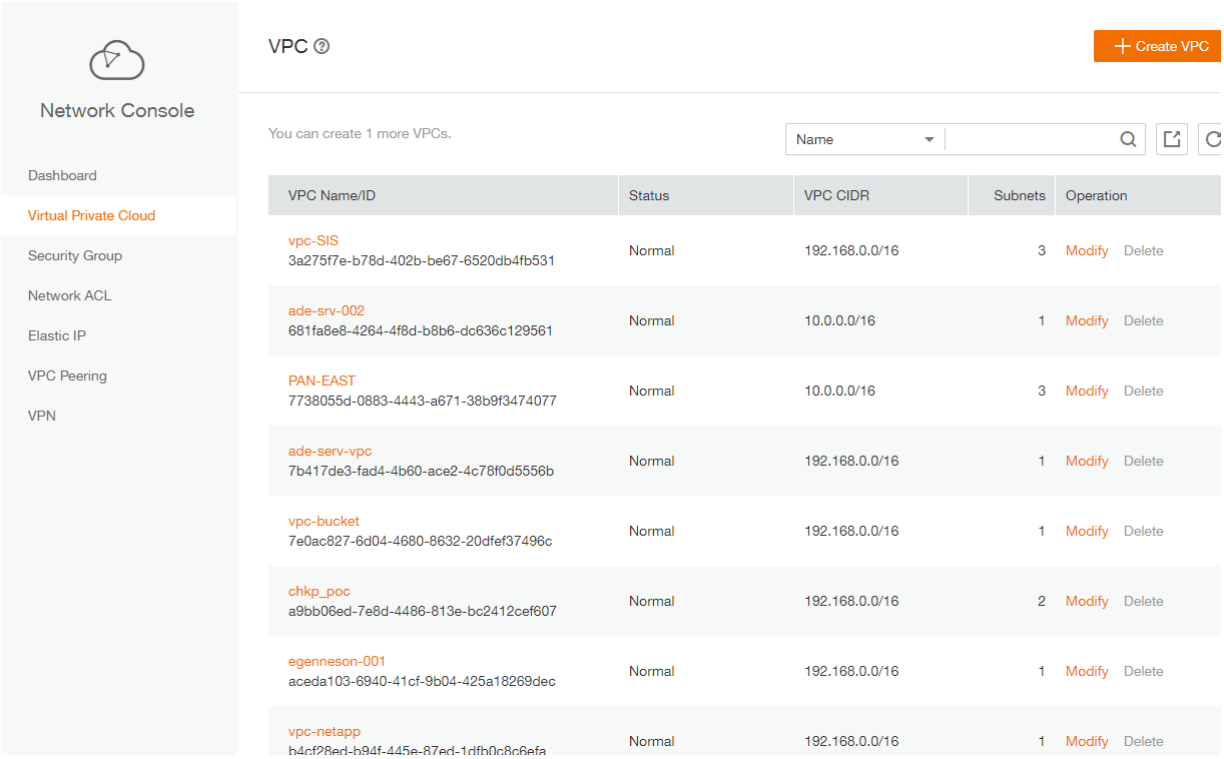
Parameter	Description	Example Value
Name	Specifies the VPC name.	VPC-001
VPC CIDR	Specifies the Classless Inter-Domain Routing (CIDR) block for the VPC. The CIDR block of a subnet can be the same as the CIDR block for the VPC (for a single subnet in the VPC) or a subset (for multiple subnets in the VPC). The following CIDR blocks are supported: 10.0.0.0/8–24 172.16.0.0/12–24 192.168.0.0/16–24	192.168.0.0/16
Name	Specifies the subnet name.	Subnet-001
CIDR	Specifies the CIDR block for the subnet. This value must be within the VPC CIDR range.	192.168.0.0/24
Gateway	Specifies the gateway address of the subnet.	192.168.0.1



4. The external DNS server address is used by default. If you need to change the DNS server address, click **Show Advanced Settings** and configure the DNS server addresses. You must ensure that the configured DNS server addresses are available.

5. Click **Create Now**.

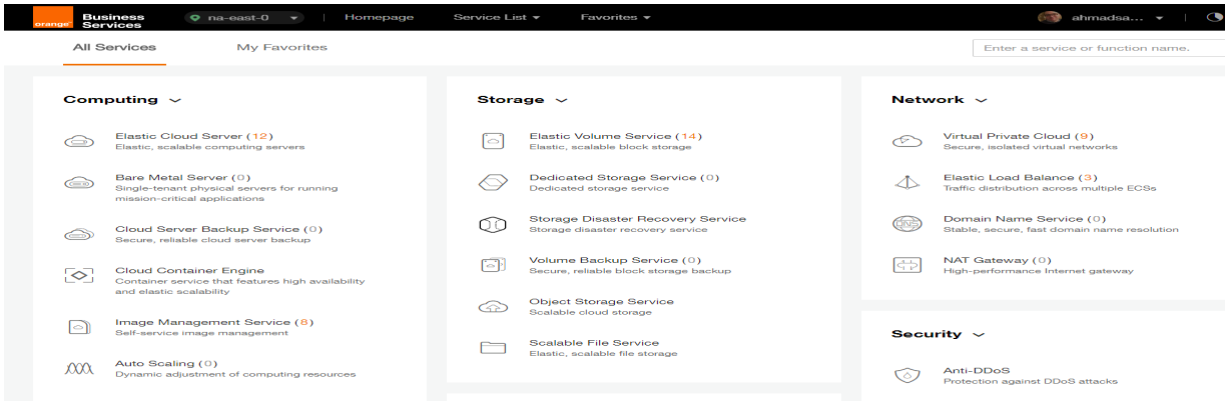
   The created VPC will be shown in the VPC List



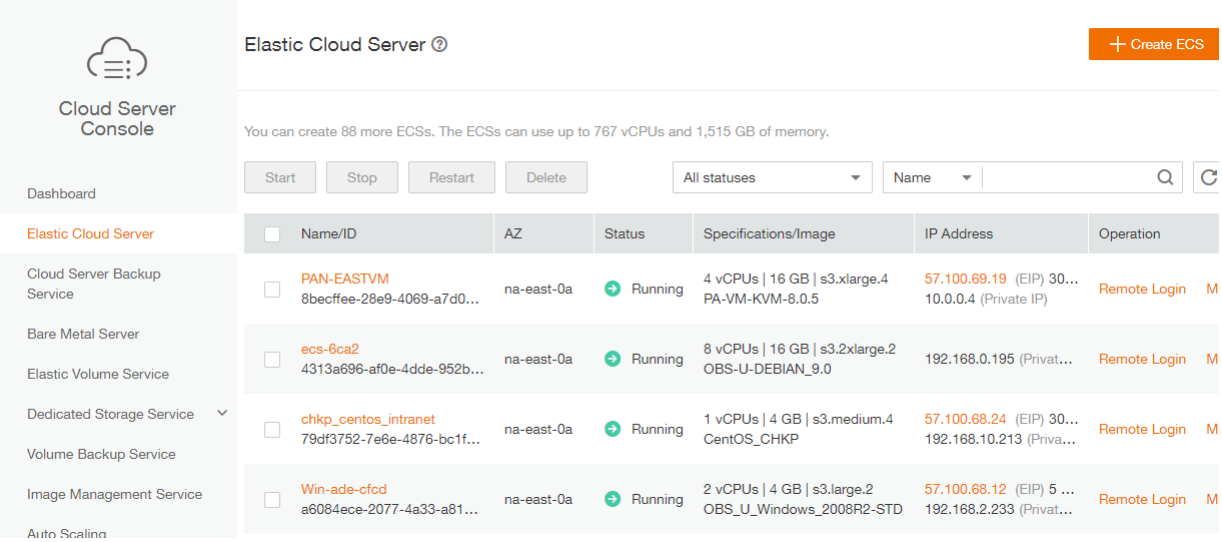
5.2 Install FortiGate VM on the VPC

ECSs are more cost-effective than physical servers. Within minutes, you can obtain ECS resources from the public cloud. ECS resources are flexible and on-demand. This section describes how to create an ECS.

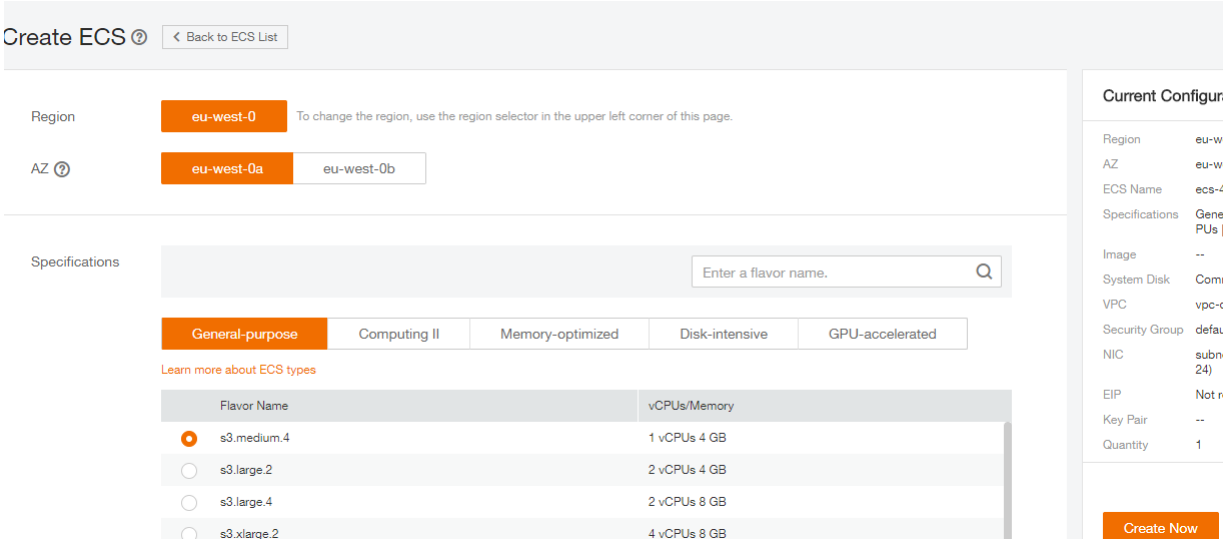
1. Log in to the management console.
2. Under **Computing**, click **Elastic Cloud Server**.



3. Click **Create ECS**.



The ECS creation page is displayed.



4. Confirm the region.

If the region is incorrect, click  in the upper left corner of the page for correction.

5. Select an AZ.

An AZ is a physical region where power and networks are physically isolated. AZs in the same region can communicate with each other over an intranet.

   1. To enhance application availability, create ECSs in different AZs.
   2. To shorten network latency, create ECSs in the same AZ.

6. Click  to open the **Select Specifications** page. On the page, select an ECS type.

7. Set **Local-Disk**.

   This parameter is optional and is automatically displayed when you use a local disk.

   A local disk specifies the local storage for the physical host where the ECS is deployed. Only hard disk drives (HDDs) are supported. If you select the disk-intensive ECS type, the system automatically attaches local disks to the ECS.

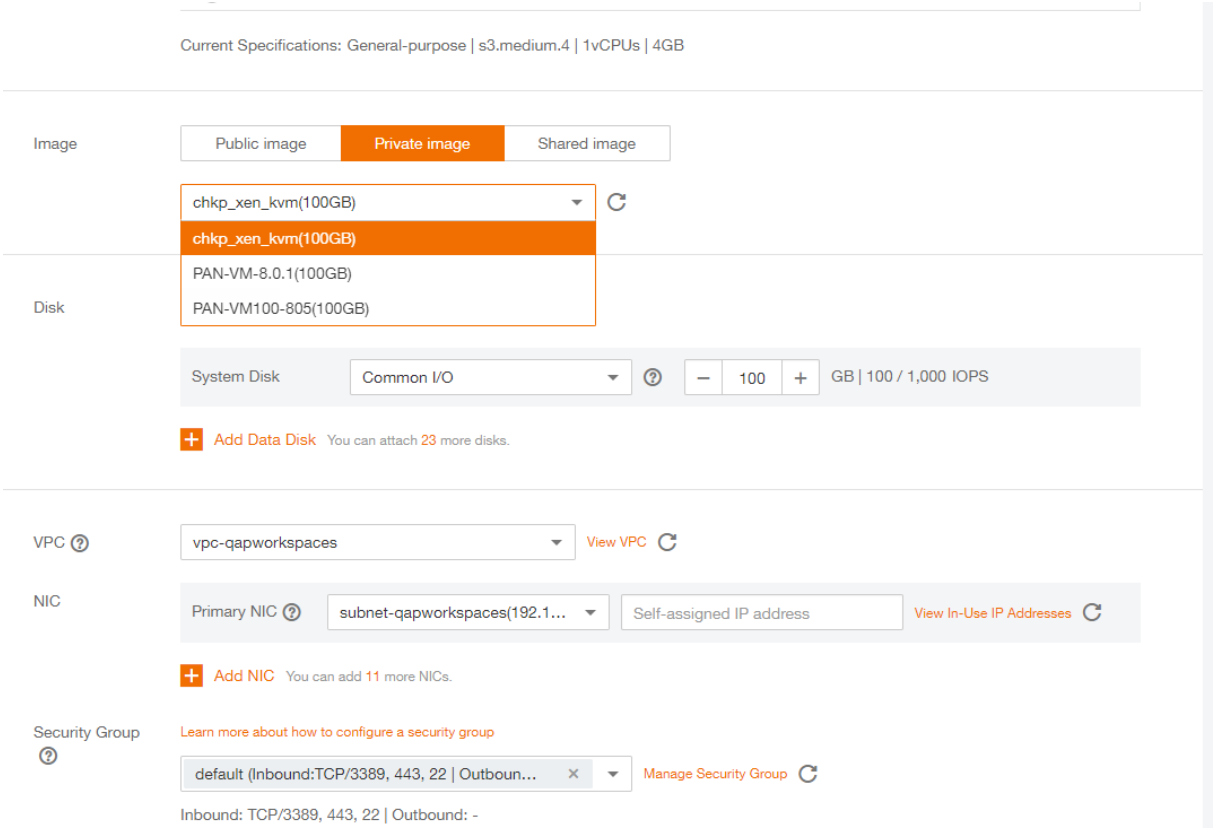
   For example, if the Local Disk value is 3 x 1800 GB, three HDDs are attached to the ECS and the capacity of each HDD is 1800 GB.

8. Click **Image**.

   Private Image

A private image is an image available only to the user who creates it. It contains an OS, preinstalled public applications, and the user's private applications. Using a private image to create ECSs removes the need to configure multiple ECSs repeatedly.

In our installation we previuosly uploaded a KVM image for Fortigate VM . to check how to upload a private image to certain region please check the URL: https://docs.prod-cloud-ocb.orange-business.com/en-us/usermanual/ims/en-us_topic_0030713190.html



9. Set **Disk**.

   A disk can be a system disk or a data disk. You can create multiple data disks for an ECS and customize their disk sizes.

10. Set network parameters, including **VPC**, **Security Group**, and **NIC**.

    When you use VPC for the first time, the system automatically creates a VPC for you, including the security group and NIC.

Table 2 Parameter descriptions

Parameter	Description
VPC	Provides a network, including subnet and security group, for an ECS. You can select an existing VPC, or click **View VPC** and create a desired one. For more information about VPC, see *Virtual Private Cloud User*

Table 2 Parameter descriptions

Parameter	Description
	Guide. **NOTE:** DHCP must be enabled in the VPC to which the ECS belongs.
Security Group	Controls instance access within or between security groups by defining access rules. This enhances instance security. When creating an ECS, you can select multiple (recommended not more than five) security groups. In such a case, the access rules of all the selected security groups apply on the ECS. **NOTE:** Before initializing an ECS, ensure that the security group rule in the outbound direction meets the following requirements: • **Protocol**: **TCP** • **Port Range**: **80** • **Remote End**: **169.254.0.0/16** If you use the default security group rule in the outbound direction, the preceding requirements are met, and the ECS can be initialized. The default security group rule in the outbound direction is as follows: • **Protocol**: **ANY** • **Port Range**: **ANY** • **Remote End**: **0.0.0.0/16**
NIC	Consists of a primary NIC and one or more extension NICs. **MTU Settings**: optional If your ECS is of M2, large-memory, H1, or D1 type, you can click **MTU Settings** to configure the maximum transmission unit (MTU) for a to-be-added extension NIC for improving network performance. An MTU can only be a number, ranging from 1280 to 8888. ** In our scenario: We created only two NIC cards one for the Management and the Other is for the Untrust Interfaces. The other two NIC cards will be created using API request on the Business and Web VPC's then will be assigned to the Fortigate VM **
EIP	A static public IP address bound to an ECS in a VPC. Using the EIP, the ECS provides services externally. The following options are provided: • **Do not use** Without an EIP, the ECS cannot access the Internet and is used only in the private network or cluster. • **Automatically assign** The system automatically assigns an EIP for the ECS. The EIP provides exclusive bandwidth that is configurable. • **Specify** An existing EIP is assigned for the ECS. When using an existing EIP, you cannot create ECSs in batches.

Table 2 Parameter descriptions

Parameter	Description
	** In our scenario: We assigned 2 EIP's one for the management NIC and the other for the Un trust NIC.

11. Set **ECS Name**.

    If you want to create multiple ECSs at a time, the system automatically sequences these ECSs.

12. Configure the number of ECSs to be created.

    After the configuration, click **Price Calculator** to view the ECS configuration fee.

13. Click **Create Now**.

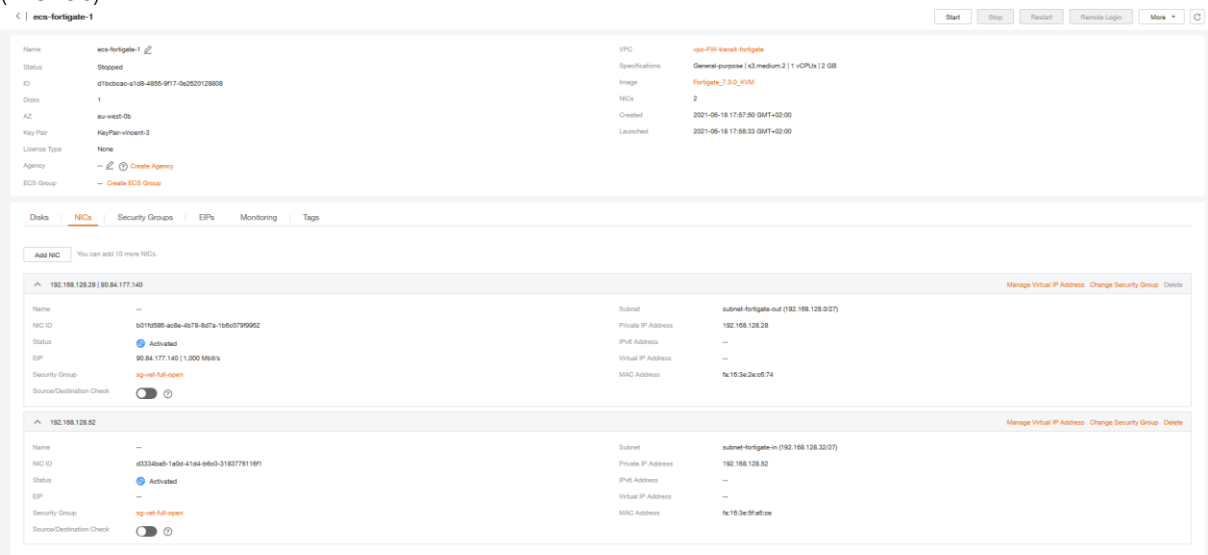
14. On the ECS specification confirmation page, confirm the ECS specifications and click **Submit**.

    After the ECS is created, you can view information about it on the **Elastic Cloud Server** page.

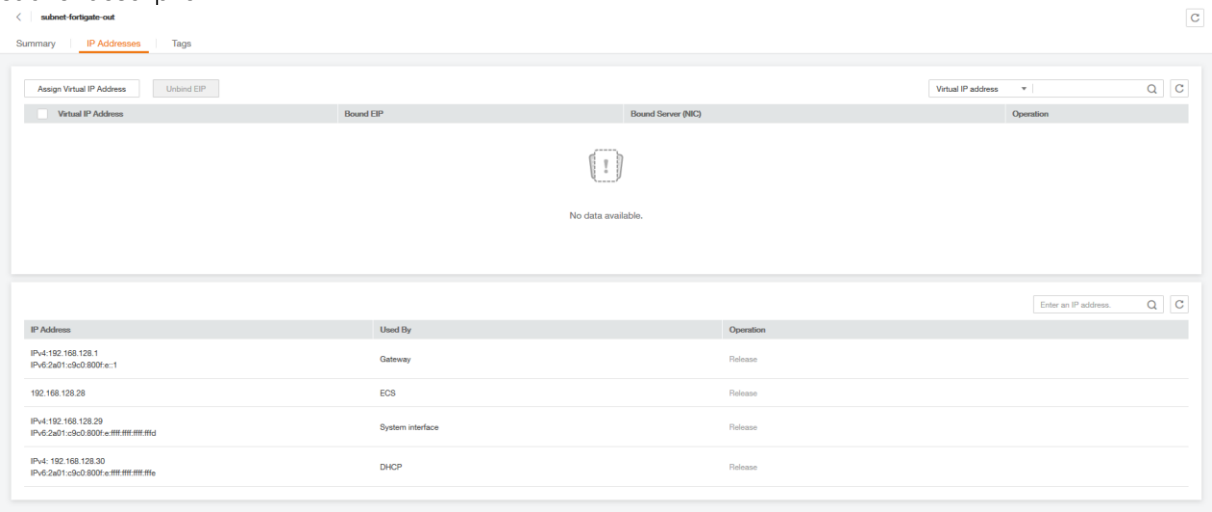
15. After creating the FortiGate ECS's you can access it through **Https** using the EIP of the WAN NIC. (username: admin / Password: no password)

5.3 Configure Network Interfaces manually

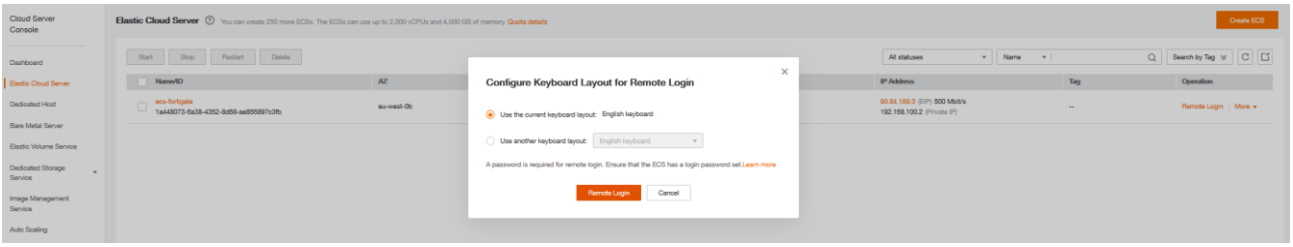
Fortigate DHCP client is currently not compatible with FE DHCP service.
To configure network interfaces (NIC) of a Fortigate ECS, static mode configuration is required.
IP addresses associated with Fortigate ECS NIC in FE console must be used for this manual configuration.
Those IP addresses can be retrieved on the Cloud Server Console page, in Fortigate ECS description (NIC tab) :



In this example, IP address of main NIC is 192.168.128.28 in subnet 192.168.128.0/27(255.255.255.224) and IP address of extension NIC is 192.168.128.52 in subnet 192.168.128.32/27(255.255.255.224).
Note that “Source/Destination Check” option must disactivated on all Fortigate ECS NIC.
The address of the main NIC subnet gateway can be retrieved on the Network Console, in the main NIC subnet description:



In this example, the subnet gateway address is 192.168.128.1.
To configure Fortigate ECS NIC in static mode, connect to ECS using “Remote Login” on Cloud Server Console:



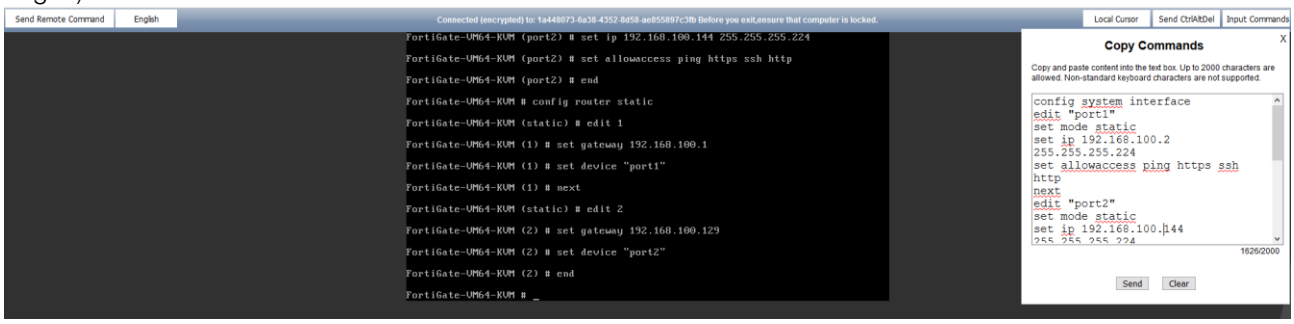
In “Remote Login” console, log in to Fortigate instance using login “admin” and empty password:

Once logged in, type in the following commands to configure Fortigate ECS NIC with addresses captured previously:

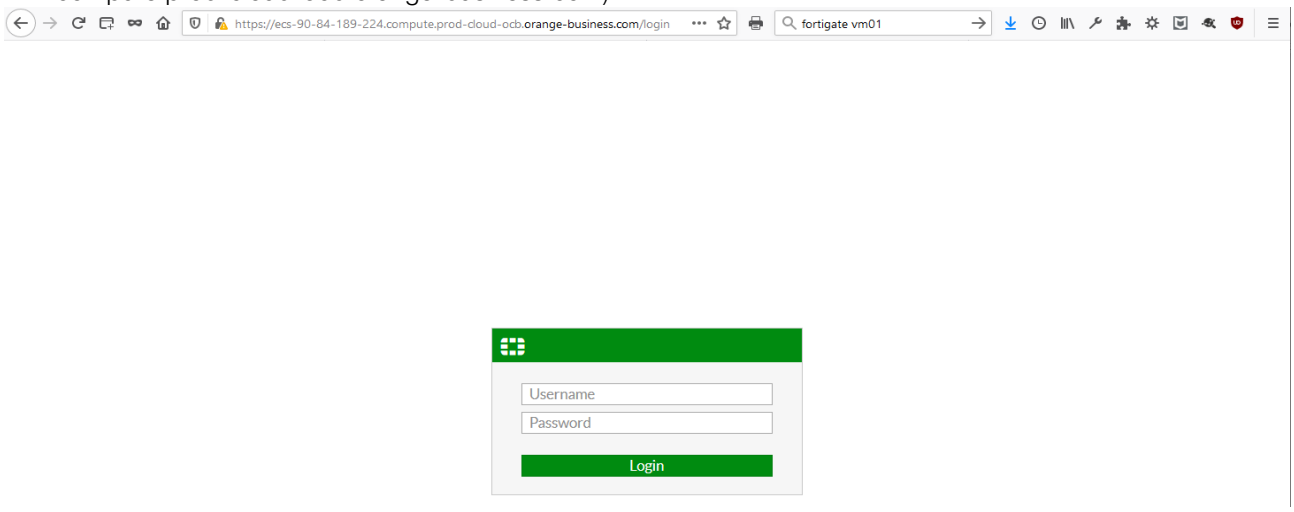
config system interface
edit "port1"
set mode static
set ip 192.168.128.28 255.255.255.224
set allowaccess ping https ssh http
next
edit "port2"
set mode static
set ip 192.168.128.52 255.255.255.224
set allowaccess ping https ssh http

end
config router static
edit 1
set gateway 192.168.128.1
set device "port1"
end

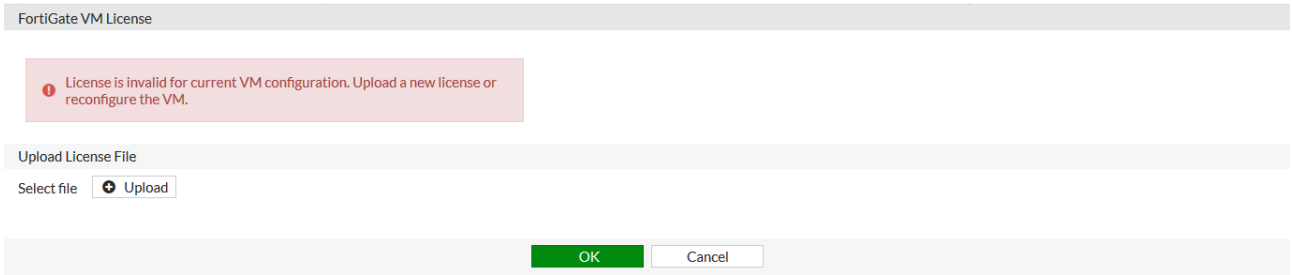
To ease this, use “Input Commands” button (available if you select “English keyboard” layout for “Remote Login”):



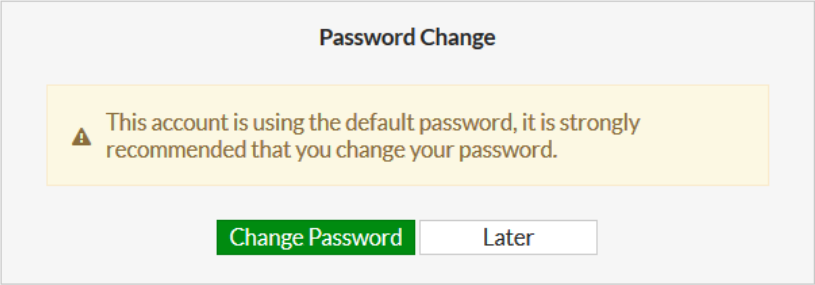
Once NIC configuration done, you can connect to Fortigate Web Console, using reverse DNS name of EIP associated with ECS main NIC (example: EIP=90.84.189.224 => reverse DNS=ecs-90-84-189-224.compute.prod-cloud-ocb.orange-business.com) :



In Fortigate Web console, log in using userame “admin” and empty password:
Then upload your Fortigate licence:



Once license is installed, the Fortigate instance reboots and after login, you will need to change admin password:


Password Change
This account is using the default password, it is strongly recommended that you change your password.
Change Password
Later

6 Solution Configuration

Immediately after initial deployment, your new FortiGate ECS's should have only one interface (port1) active with the IP address provided via DHCP. However, you should configure your new firewalls to use static IP addresses instead. FortiGate HA configuration relies on static settings, which DHCP invalidates. You must change your network configuration to use static IP addresses. You can accomplish this using the FortiGate CLI or GUI.

Connect via SSH to the IP address associated with FortiGate A's port1.

The below are configurations made in the CLI **before** changing port1 to a static IP address. The variables are based on the example diagram. Replace these with your own values.

6.1 Primary Fortigate ECS Configuration

```
config system interface
edit "port2"
set mode static
set ip 10.0.2.4 255.255.255.0
set allowaccess ping ssh
set alias "internal"
next
edit "port3"
set mode static
set ip 10.0.3.4 255.255.255.0
set allowaccess ping probe-response
set alias "hasyncport"
next
edit "port4"
set mode static
set ip 10.0.4.4 255.255.255.0
set allowaccess ping https ssh snmp fgfm radius-acct capwap ftm
```

```
set alias "management"
next
end
config router static
edit 1
set gateway 10.0.1.1
set device port1
next
edit 2
set dst 10.0.5.0 255.255.255.0
set gateway 10.0.2.1
set device "port2"
next
end
config system ha
set group-name "HAtest"
set mode a-p
set hbdev "port3" 100
set session-pickup enable
set session-pickup-connectionless enable
set ha-mgmt-status enable
config ha-mgmt-interfaces
edit 1
set interface "port4"
set gateway 10.0.4.1
next
```

end

set override disable

set priority 200

set unicast-hb enable

set unicast-hb-peerip 10.0.3.5

end

The italicized commands were introduced to unicast HA for public cloud FortiGate-VM. When these lines are present, the FGCP cluster does not use virtual IP and MAC addresses. Instead, both firewall nodes have distinguished IP addresses that point to the counterpart's heartbeat IP address.

After finishing the configuration on FortiGate A, connect via SSH to FortiGate B:

exec ssh 10.0.1.5

6.2 Secondary FortiGate ECS Configuration

config system interface

edit "port2"

set mode static

set ip 10.0.2.5 255.255.255.0

set allowaccess ping ssh

set alias "internal"

next

edit "port3"

set mode static

set ip 10.0.3.5 255.255.255.0

set allowaccess ping probe-response

set alias "hasyncport"

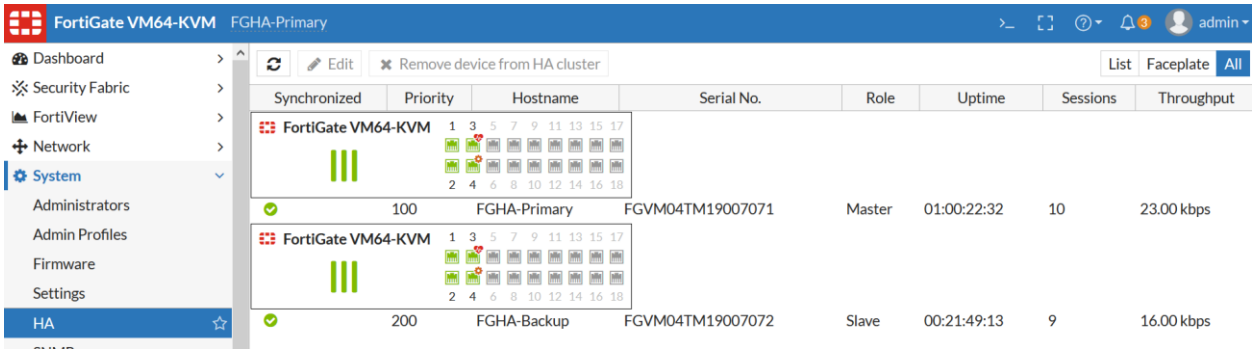
next

```
edit "port4"
set mode static
set ip 10.0.4.5 255.255.255.0
set allowaccess ping https ssh snmp fgfm radius-acct capwap ftm
set alias "management"
next
end
config router static
edit 1
set gateway 10.0.1.1
set device port1
next
edit 2
set dst 10.0.5.0 255.255.255.0
set gateway 10.0.2.1
set device "port2"
next
end
config system ha
set group-name "HAtest"
set mode a-p
set hbdev "port3" 100
set session-pickup enable
set session-pickup-connectionless enable
set ha-mgmt-status enable
config ha-mgmt-interfaces
```

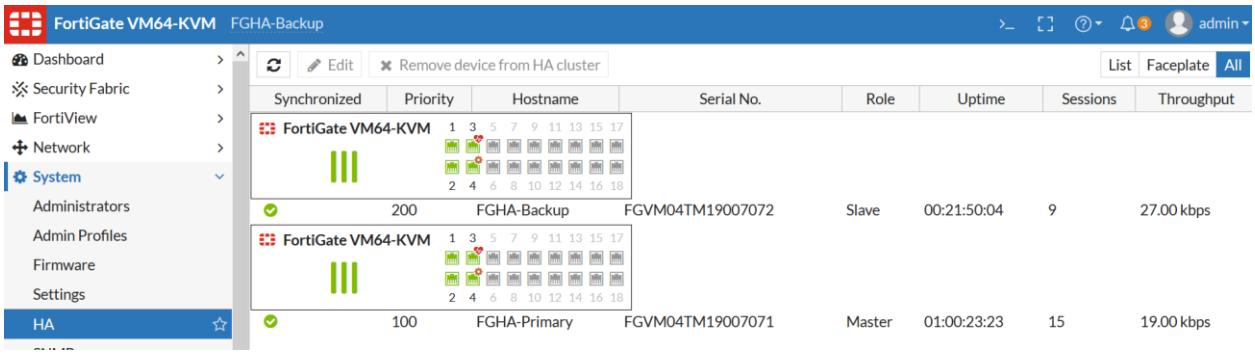
```
edit 1
set interface "port4"
set gateway 10.0.4.1
next
end
set override disable
set priority 200
set unicast-hb enable
set unicast-hb-peerip 10.0.3.4
end
```

The FortiGate with the lower set priority value is determined as the secondary node, as FortiGate B is in the example.

Since your HA configuration has now specified your port4 as the dedicated management interface, you can exist the current SSH session and start a new one to your dedicated management IP address, FGTAMgmtPublicIp. You can also now change the port1 IP address to a static IP address.

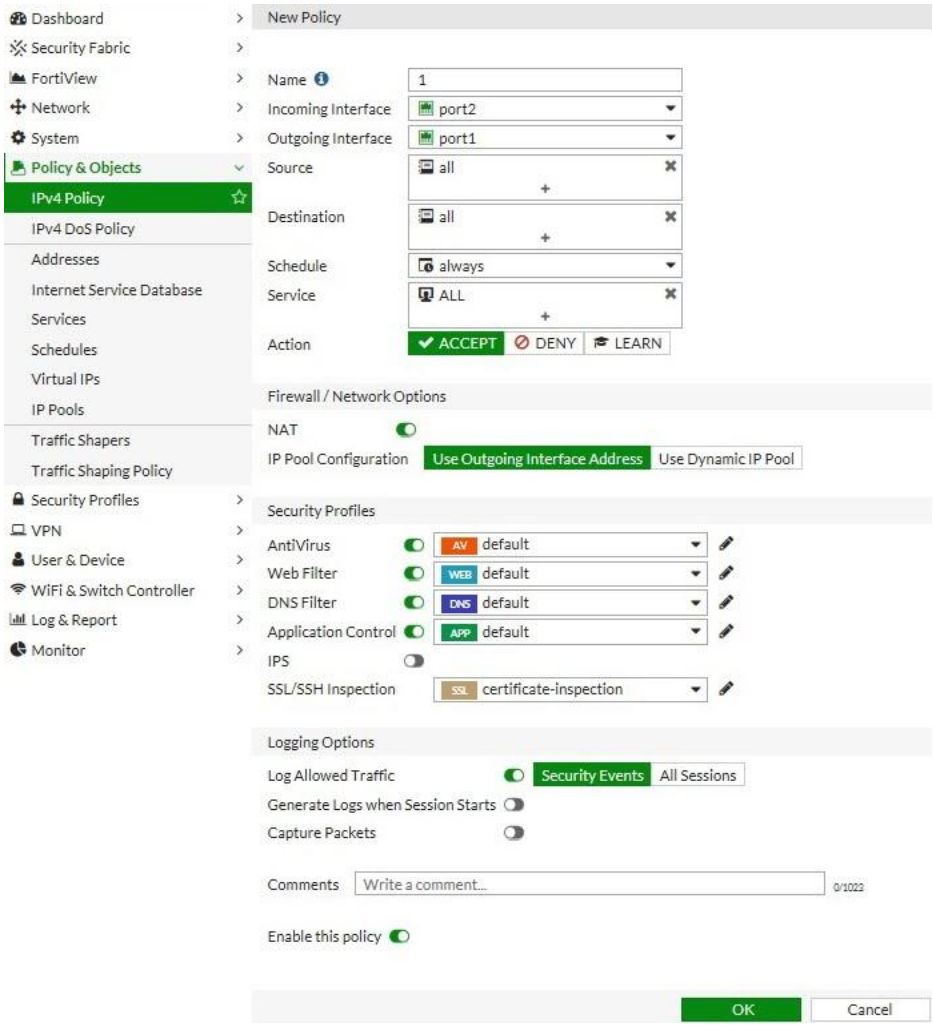


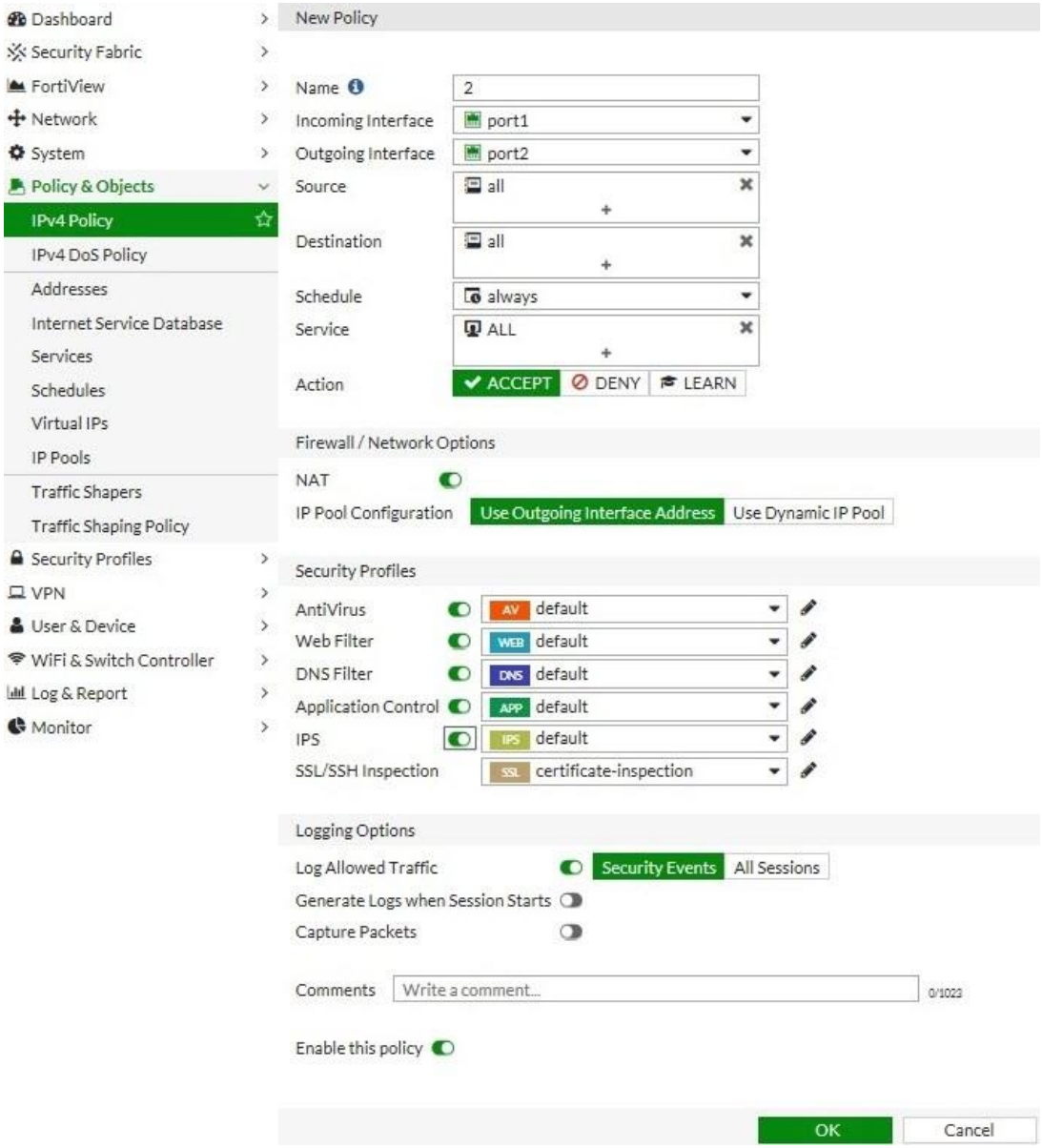
Primary Fortigate (Master) & Secondary FortiGate (Slave)



6.3 Configuring FortiGate firewall policies

First, configure Primary Fortigate. In the FortiGate ECS console, select *Policy & Objects > IPv4 Policy* and create two new policies, as shown in this example. Create one policy for outgoing traffic from the private subnet, through the public subnet, to the Internet. Create another policy for incoming traffic from the Internet, through the public subnet, to the private subnet




Dashboard
Security Fabric
FortiView
Network
System
Policy & Objects
IPv4 Policy
IPv4 DoS Policy
Addresses
Internet Service Database
Services
Schedules
Virtual IPs
IP Pools
Traffic Shapers
Traffic Shaping Policy
Security Profiles
VPN
User & Device
WiFi & Switch Controller
Log & Report
Monitor
New Policy
Name
2
Incoming Interface
port1
Outgoing Interface
port2
Source
all
Destination
all
Schedule
always
Service
ALL
Action
ACCEPT
DENY
LEARN
Firewall / Network Options
NAT
IP Pool Configuration
Use Outgoing Interface Address
Use Dynamic IP Pool
Security Profiles
AntiVirus
default
Web Filter
default
DNS Filter
default
Application Control
default
IPS
default
SSL/SSH Inspection
certificate-inspection
Logging Options
Log Allowed Traffic
Security Events
All Sessions
Generate Logs when Session Starts
Capture Packets
Comments
Write a comment...
0/1023
Enable this policy
OK
Cancel

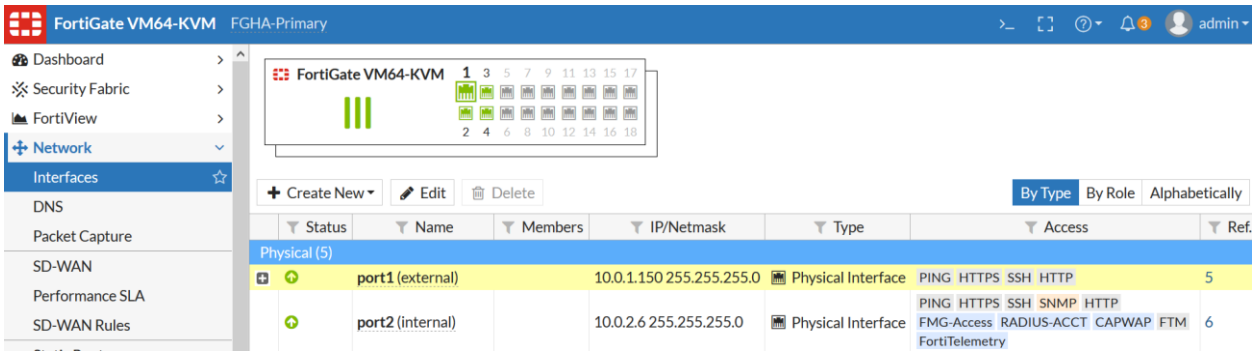
6.4 Creating virtual IPS for Fortigates on OCB Flex Engine

You have to create 2 virtual IPS on OCB Flex Engine for the Fortigate HA configuration. The purpose behind these virtual IPS is to assign 1 virtual IP to the WAN Port (Port1) and the Inside Port (Port2) then assigning Elastic IP's two these virtual IPS.

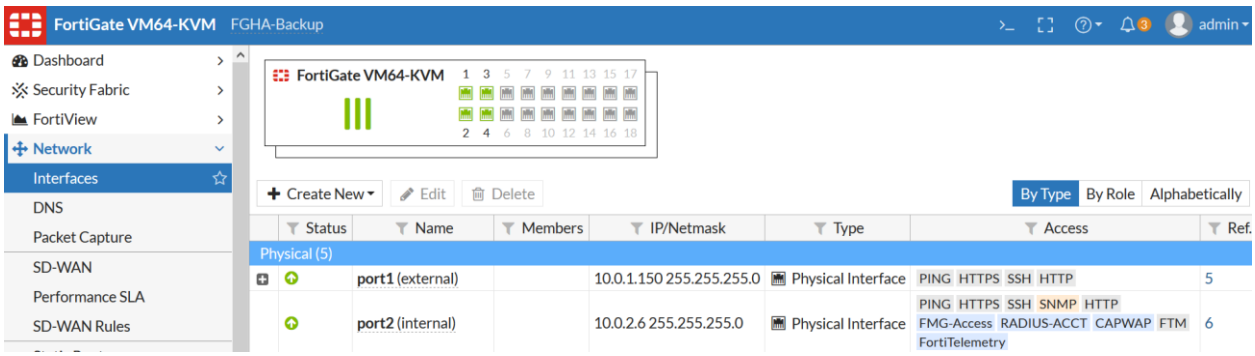
Important:

When you assign the vitual IP's with their elasing IP's to Port1 and Port2 in the Primary Fortigate ECS. It will synchronize the same configuration to the Secondary Fortigate.

The images below shows the primary and backup fortigates after configuring the virtual IP and assigning to the Primary fortigate.



Primary Fortigate



Backup Fortigate

6.4.1 Managing virtual IP

A virtual IP address provides the second IP address for one or more ECS NICs, improving high availability between the ECSs.

Procedure

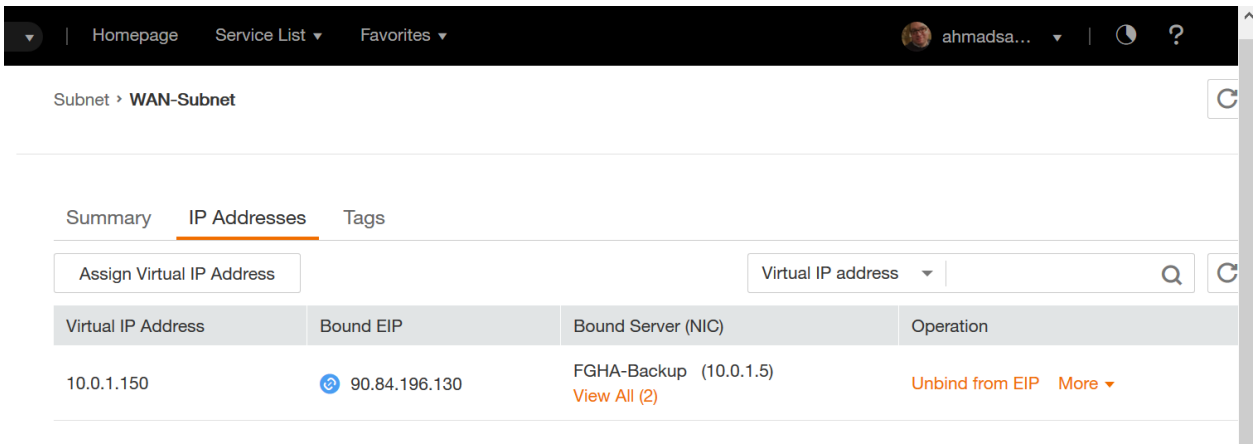
1. Log in to the management console.
2. Under **Computing**, click **Elastic Cloud Server**.
3. On the **Elastic Cloud Server** page, click the name of the target ECS.

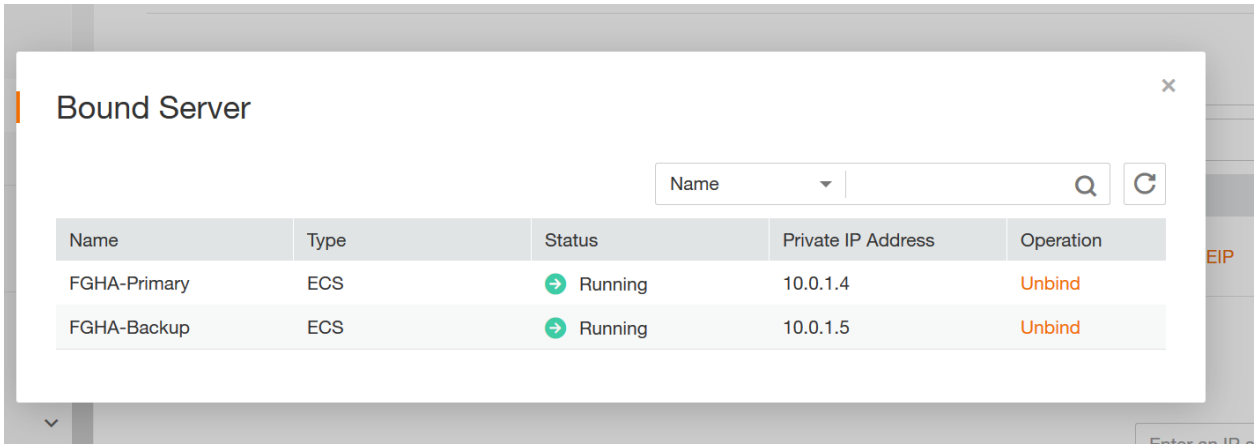
The page providing details about the ECS is displayed.

4. Click the **NICs** tab. Then, click **Manage Virtual IP Address**. (In our case we will bind virtual IPS for both Port1 and Port 2)
5. In the **Manage Virtual IP Address** dialog box, select **Bind virtual IP address**.
6. Set the IP address.

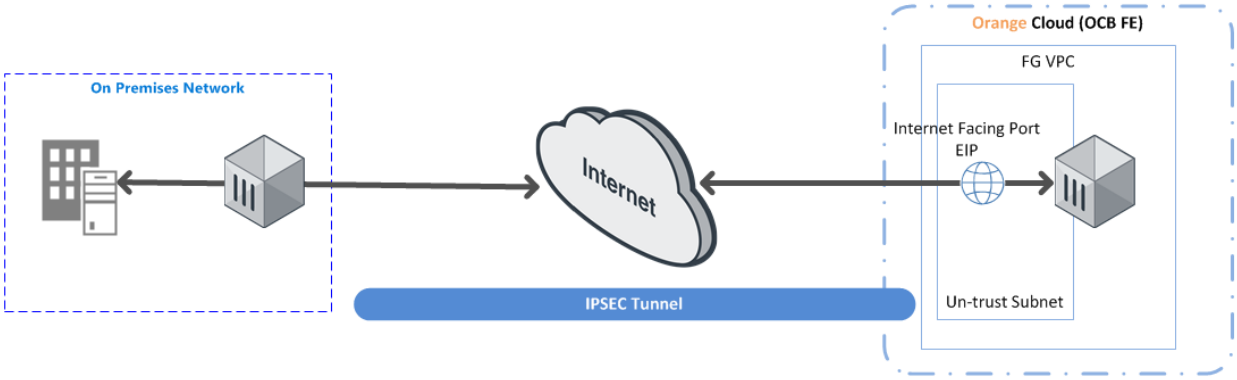
   This IP address is a virtual one. Multiple ECSs deployed to work in active/standby mode can be bound with the same virtual IP address for disaster recovery.

7. Click **OK**.





6.5 IPSEC Tunnel Configuration

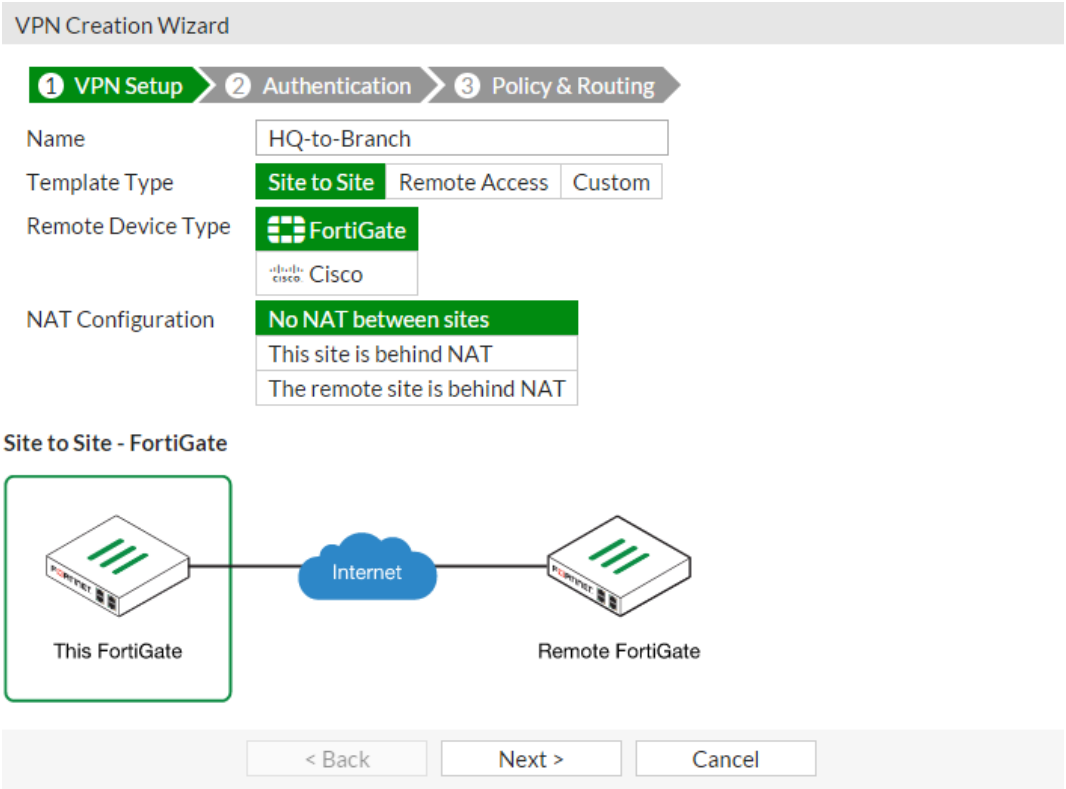


IPSec Tunnel configuration will be performed on Both the firewalls as per the diagram above

6.5.1 Configuring the onpremises IPsec VPN

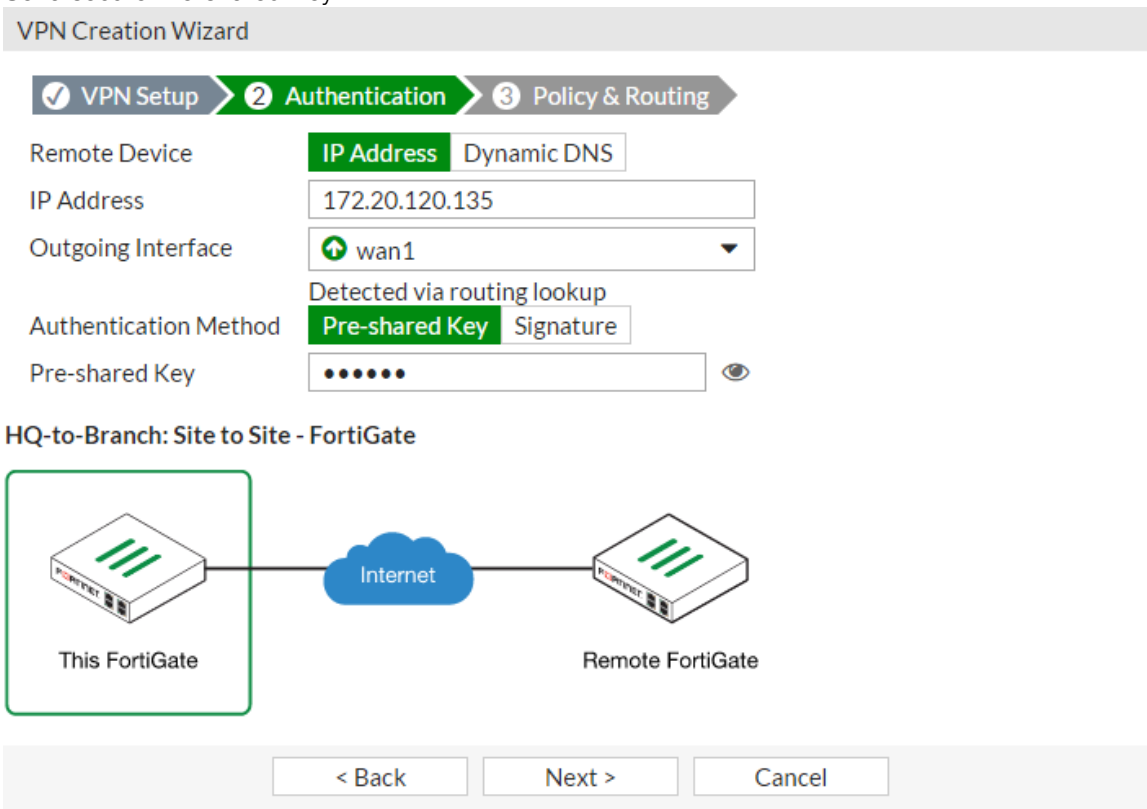
1. From the On premises FortiGate

Go to **VPN > IPSEC Wizard**

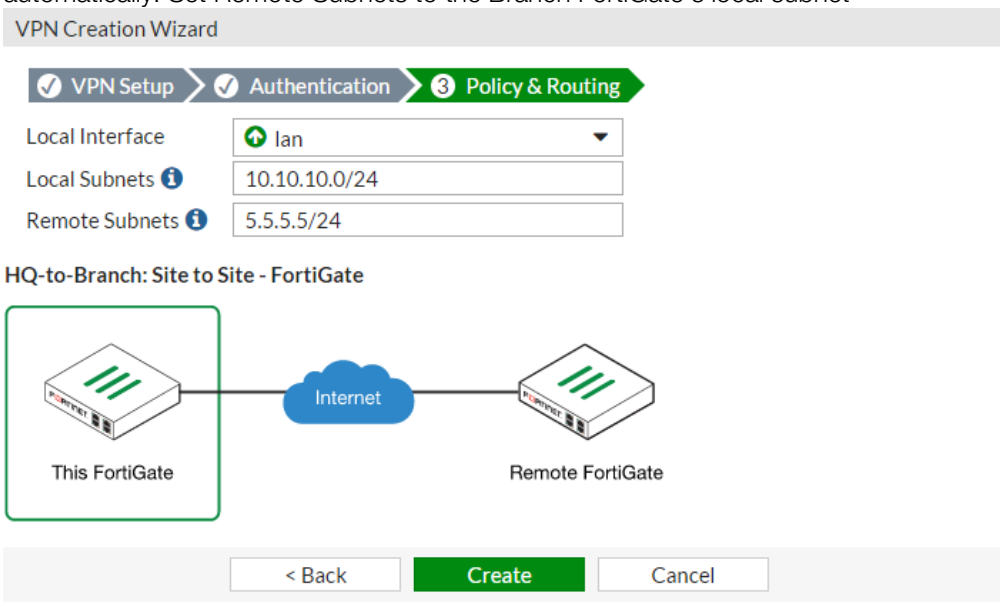


Select the **Site to Site** template, and select **FortiGate**

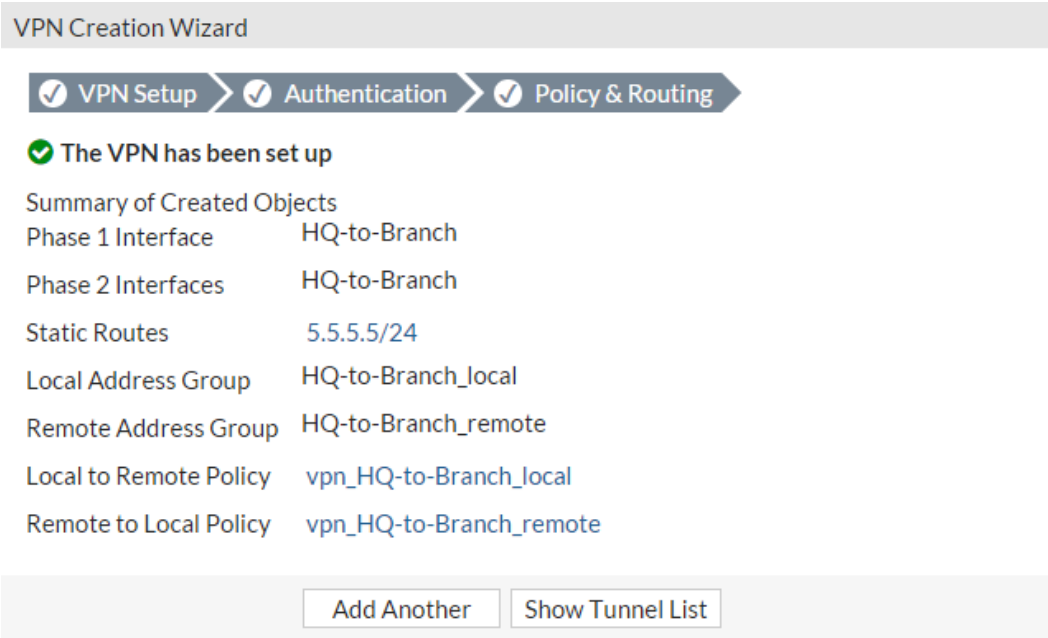
2. In the **Authentication** step, set **IP Address** to the IP of the Branch FortiGate After you enter the gateway, an available interface will be assigned as the Outgoing Interface. If you wish to use a different interface, select it from the drop-down menu.
   Set a secure Pre-shared Key.



3. n the Policy & Routing step, set the Local Interface. The Local Subnets will be added automatically. Set Remote Subnets to the Branch FortiGate's local subnet

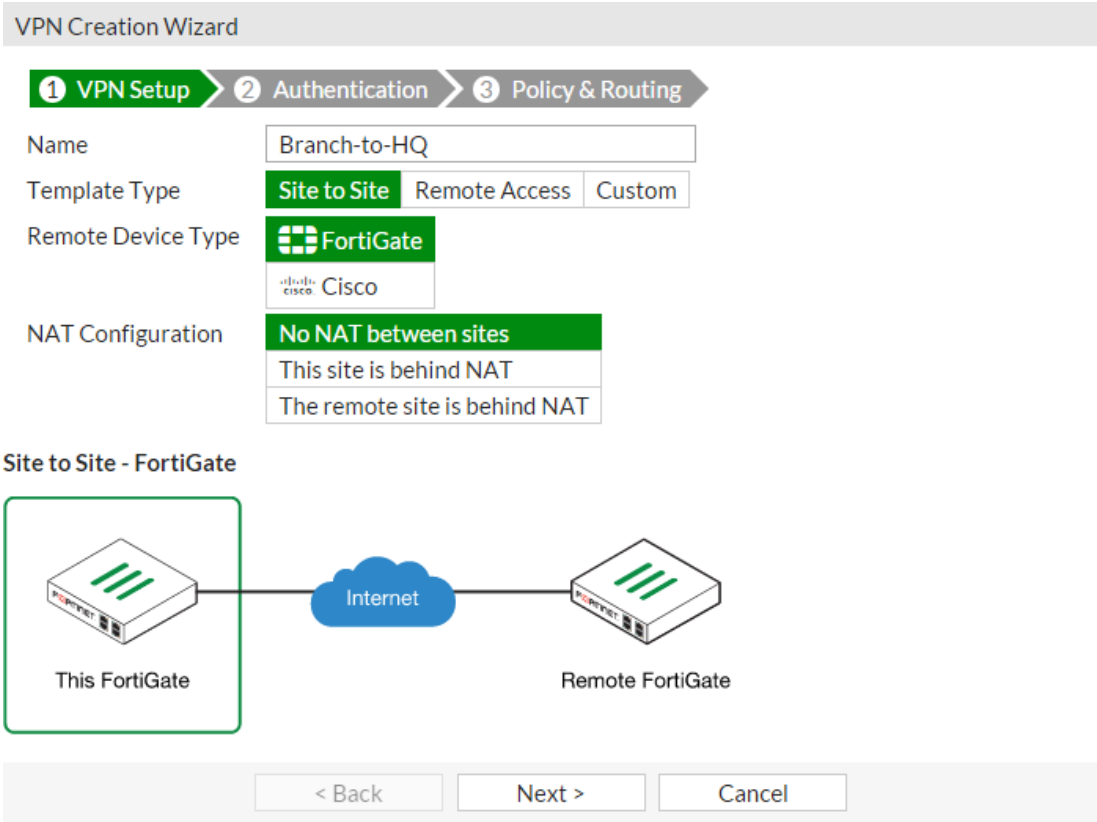


4. A summary page shows the configuration created by the wizard, including firewall addresses, firewall address groups, a static route, and security policies.



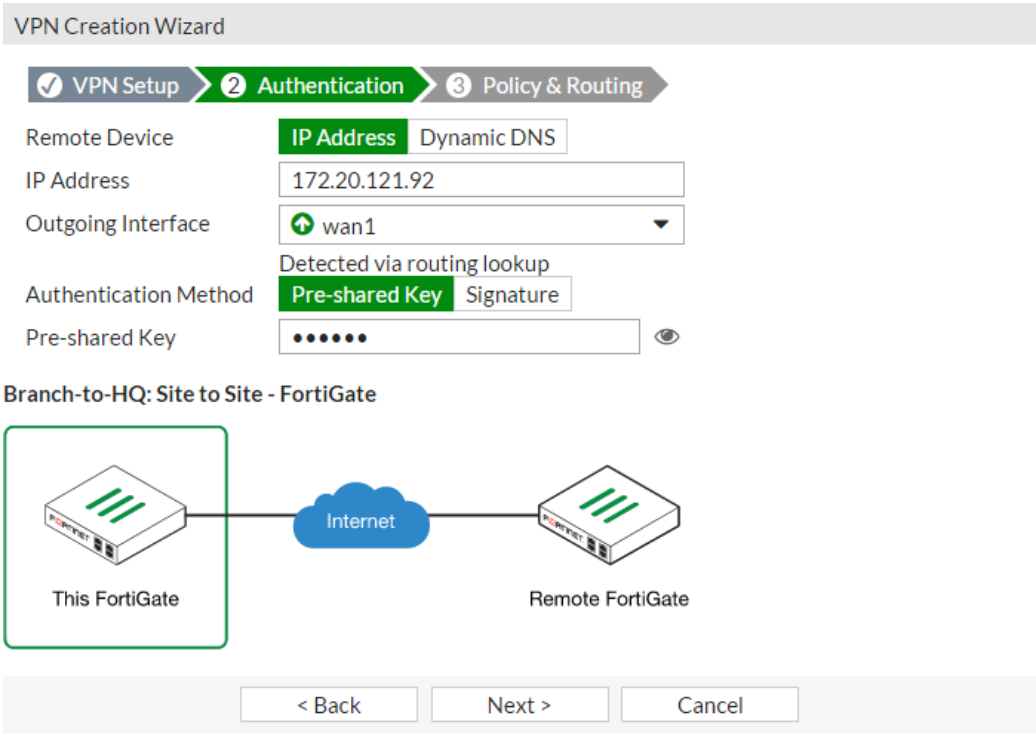
6.5.2 Configuring OCB FE IPSEC VPN

1. On the Branch FortiGate, go to **VPN > IPsec Wizard**. Select the **Site to Site** template, and select **FortiGate**

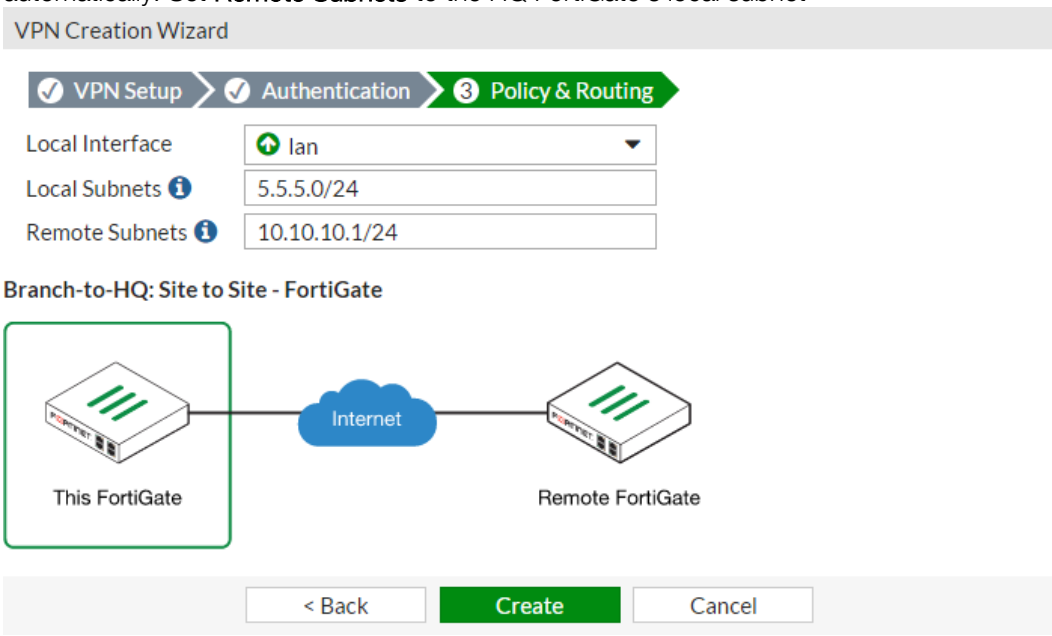


2. In the **Authentication** step, set **IP Address** to the IP of the on prem. FortiGate. After you enter the gateway, an available interface will be assigned as the Outgoing Interface. If you wish to use a different interface, select Change. Set the same Pre-shared Key that was

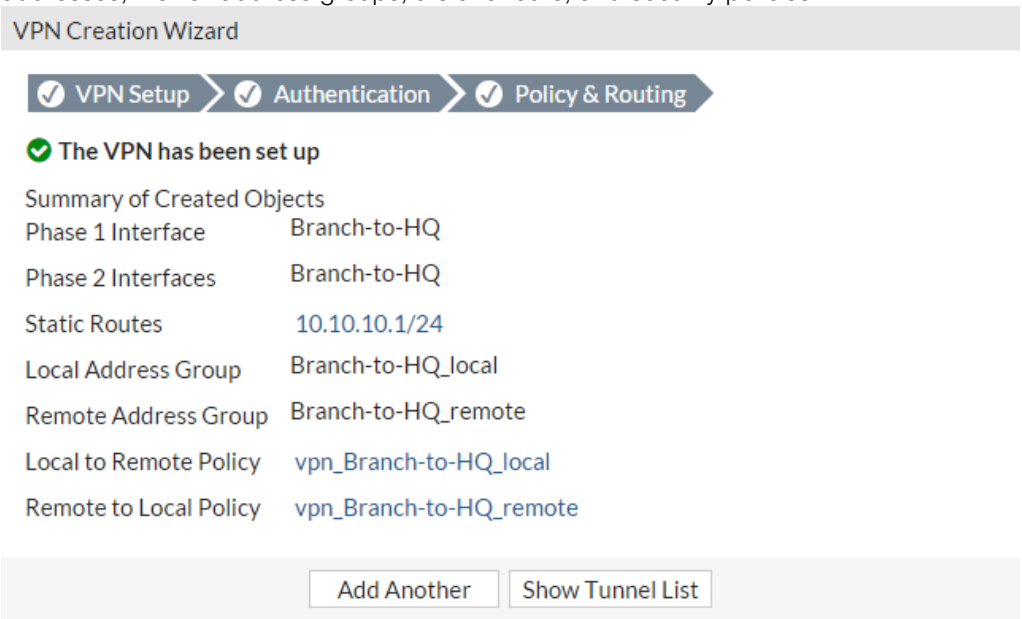
used for HQ's VPN.



3. In the **Policy & Routing** step, set the **Local Interface**. The **Local Subnets** will be added automatically. Set **Remote Subnets** to the HQ FortiGate's local subnet



4. A summary page shows the configuration created by the wizard, including firewall addresses, firewall address groups, a static route, and security policies.



6.5.3 Adding user defined route on OCB FE to allow traffic between on premisis and OCB Flex engine