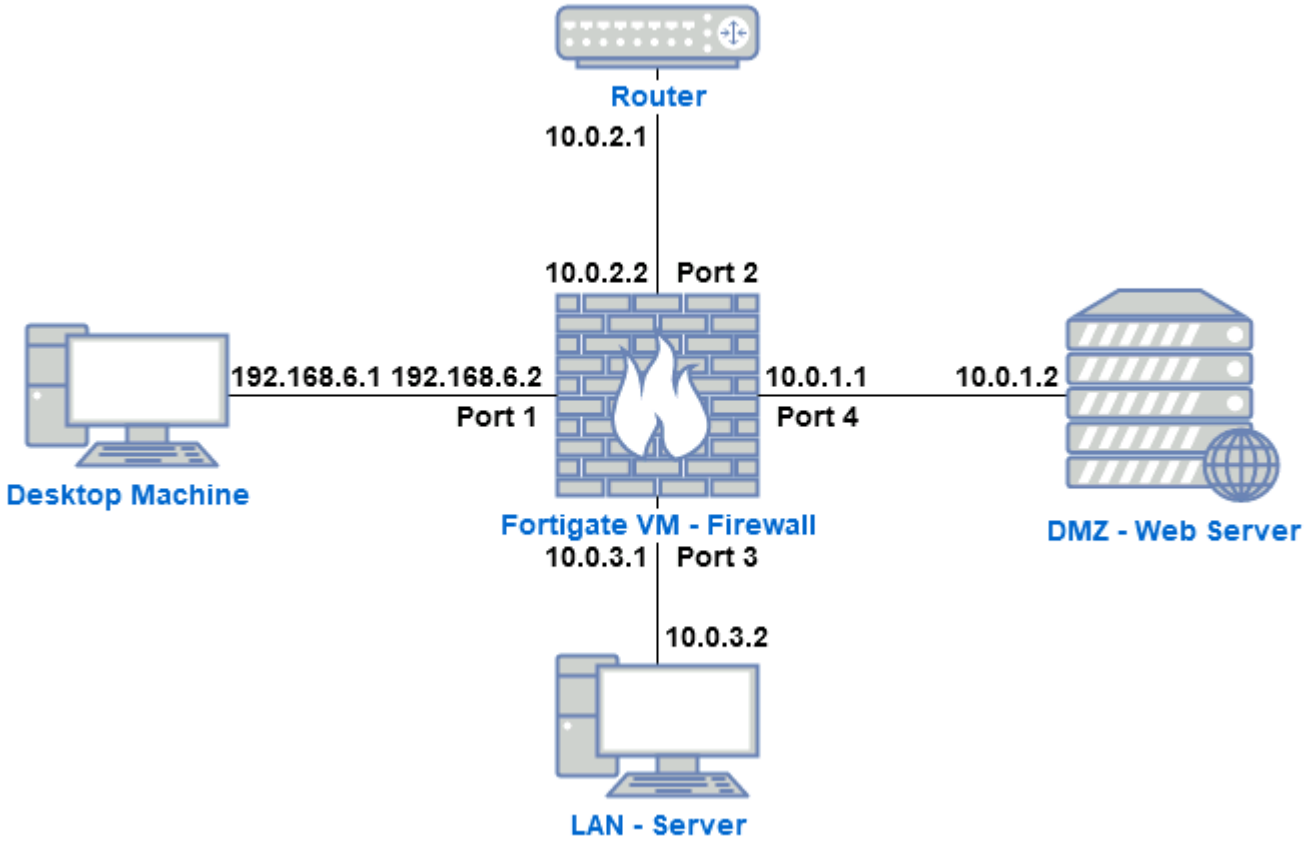
Topology



Module Description

- **Fortinet** provides intelligent and seamless protection technologies to more than 450k customers, including Fortune 500 companies, all around the world (including UofC).
- Fortinet provides their flagship **Fortigate** enterprise firewall platform in variety of sizes and form factors to accomodate their customers needs and to fit in their environments seamlessly.
- Customers have liberty of acquiring their Next-Generation Firewall solution as a **physical appliance or virtual machine** that supports various virtualization technologies.
- **FortiOS** is the OS that lies in heart of both their physical security devices and virtual machines.

→ In this module, you will be introduced to firewall policies with FortiGate VM.

Interface Configuration

- FortiGate VM offer users CLI and WEB GUI environments.
- This module will focus on WEB GUI interface, but you have the liberty of performing all tasks with command line interface via SSH if you wish so.
- Investigate the **network topology** from the menu above.
- LAN, DMZ and WAN interfaces are connected to respective ports of the FortiGate VM firewall. However, correct access permissions, interface roles, and aliases are NOT assigned to those ports yet.
- Populated ports can be viewed, edited or configured from **Network → Interfaces** of the Web GUI.
- To configure the interface, Right-click on the interface and select **Edit**.
    - **Alias** - Naming ports descriptively will allow you to navigate and make further changes easily.
    - **Interface roles** - Once the correct role is assigned, Fortigate will hide unrelated settings for that role.
    - **Administrative Access** - Allows you to grant/remove admin permissions to interfaces.
- The management interface is the backbone of this module and is used by the desktop machine to access the firewall and by the router to communicate with devices for grading purposes.

Note: Do NOT edit the management interface!

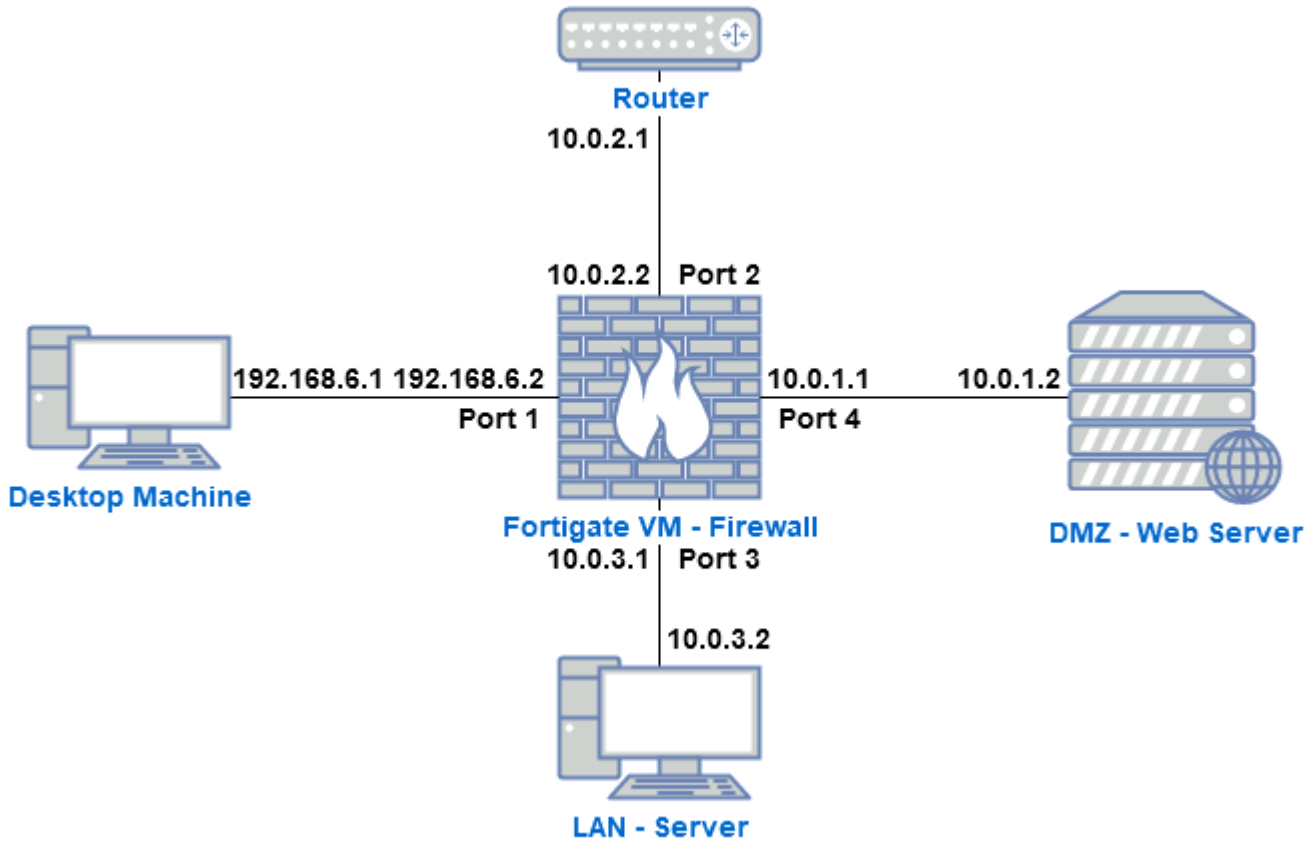
→ In this module, you will:

1. Assign correct roles and aliases to ports
2. Restrict management access from DMZ.

Objectives:

- Access to FortiGate VM.
  - Address: **https://fortigate.lab**
  - Username: **student**
  - Password: **student**
- Edit **Port 2**:
  - Set Alias to: **WAN**
  - Set Role to: **WAN**
  - Granted Administrative Access: **PING**
- Edit **Port 3**:
  - Set Alias to: **LAN**
  - Set Role to: **LAN**
  - Granted Administrative Access: **HTTPS, HTTP, SSH, PING**
- Edit **Port 4**:
  - Set Alias to: **DMZ**
  - Set Role to: **DMZ**
  - Granted Administrative Access: **None**

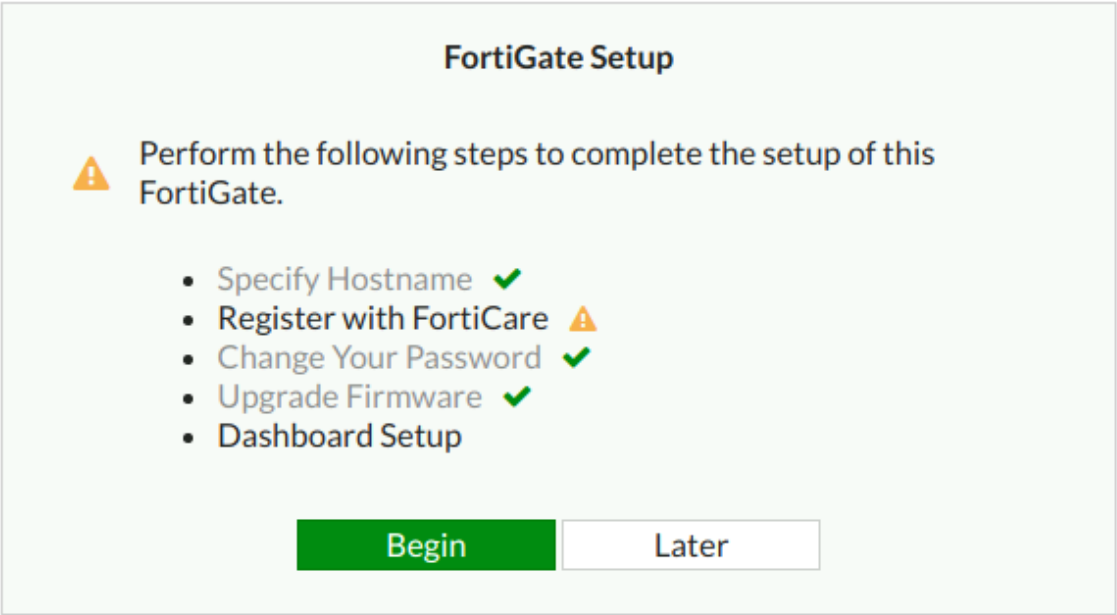
Recap of the Topology:



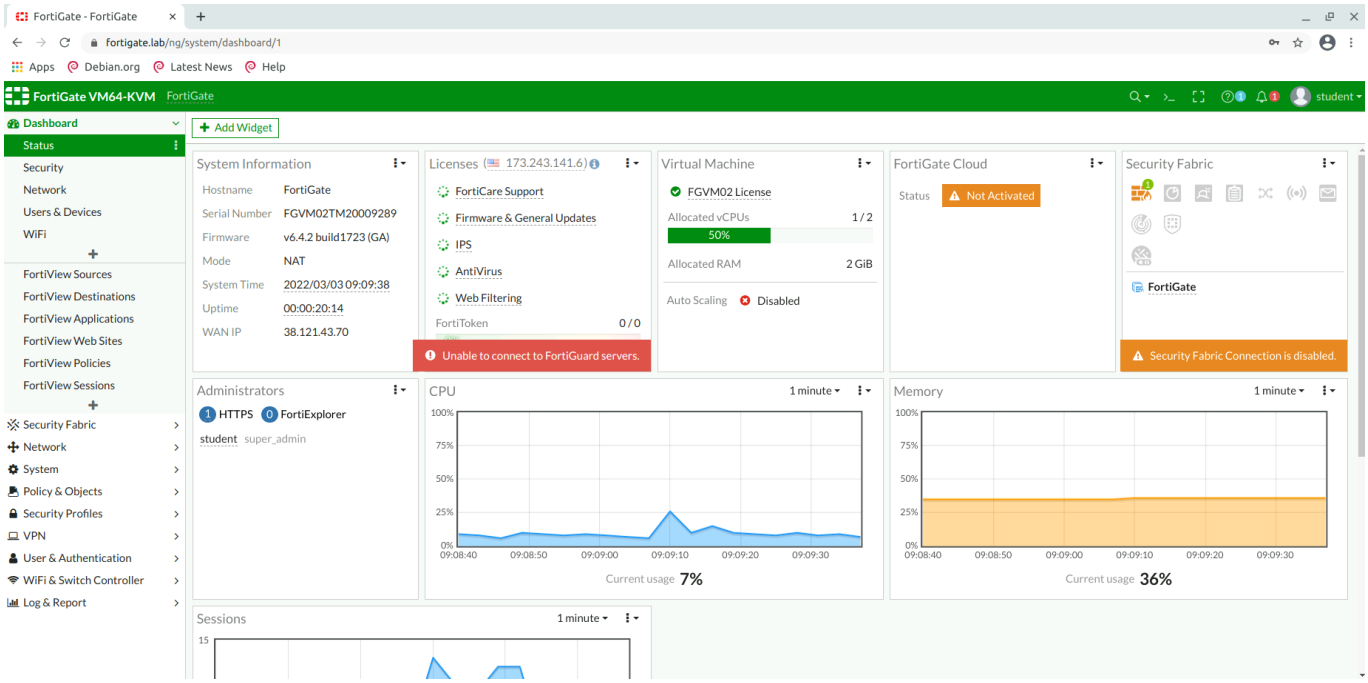
Documentation:

1. Login to the fortigate.lab link and use the given credentials.

2. Do the Fortigate Setup later.

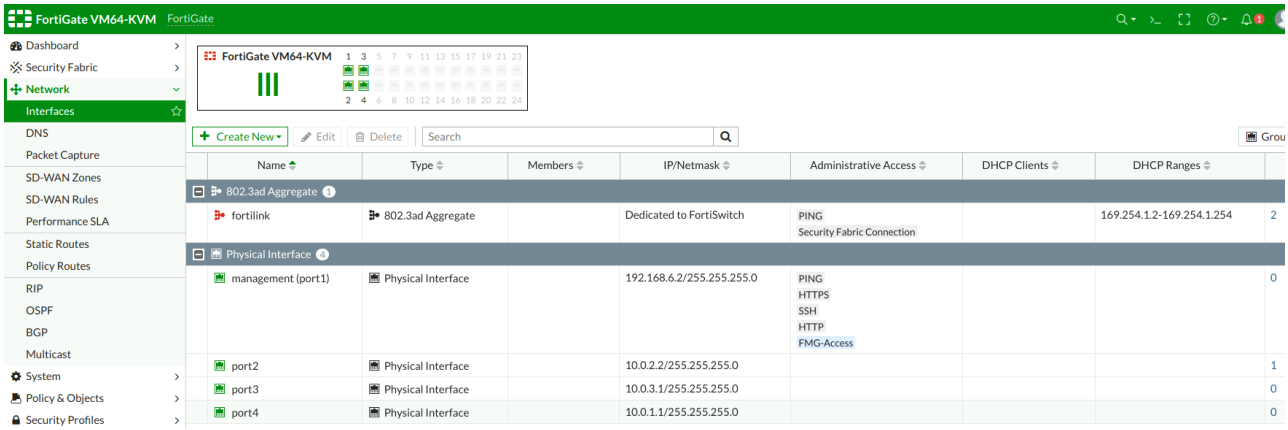


3. As you can see, this is the general overview of the Web GUI interface of the FortiGate VM.

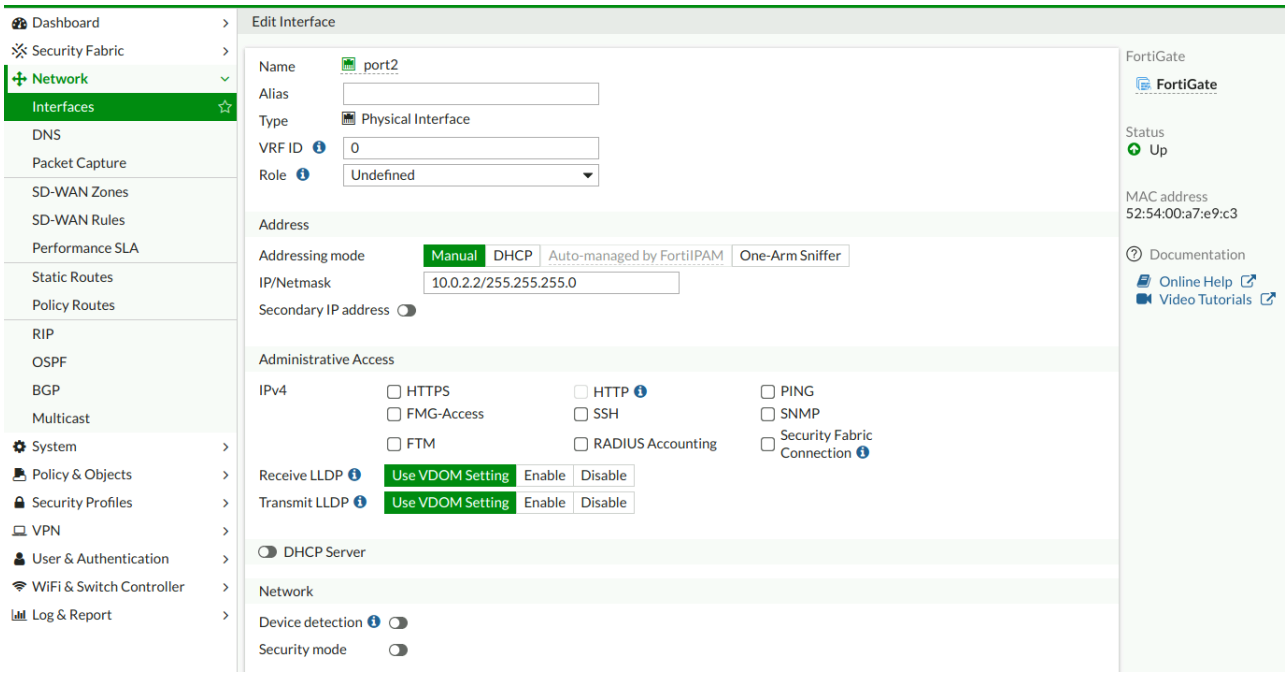


4. How to get to modify "Port 2"?

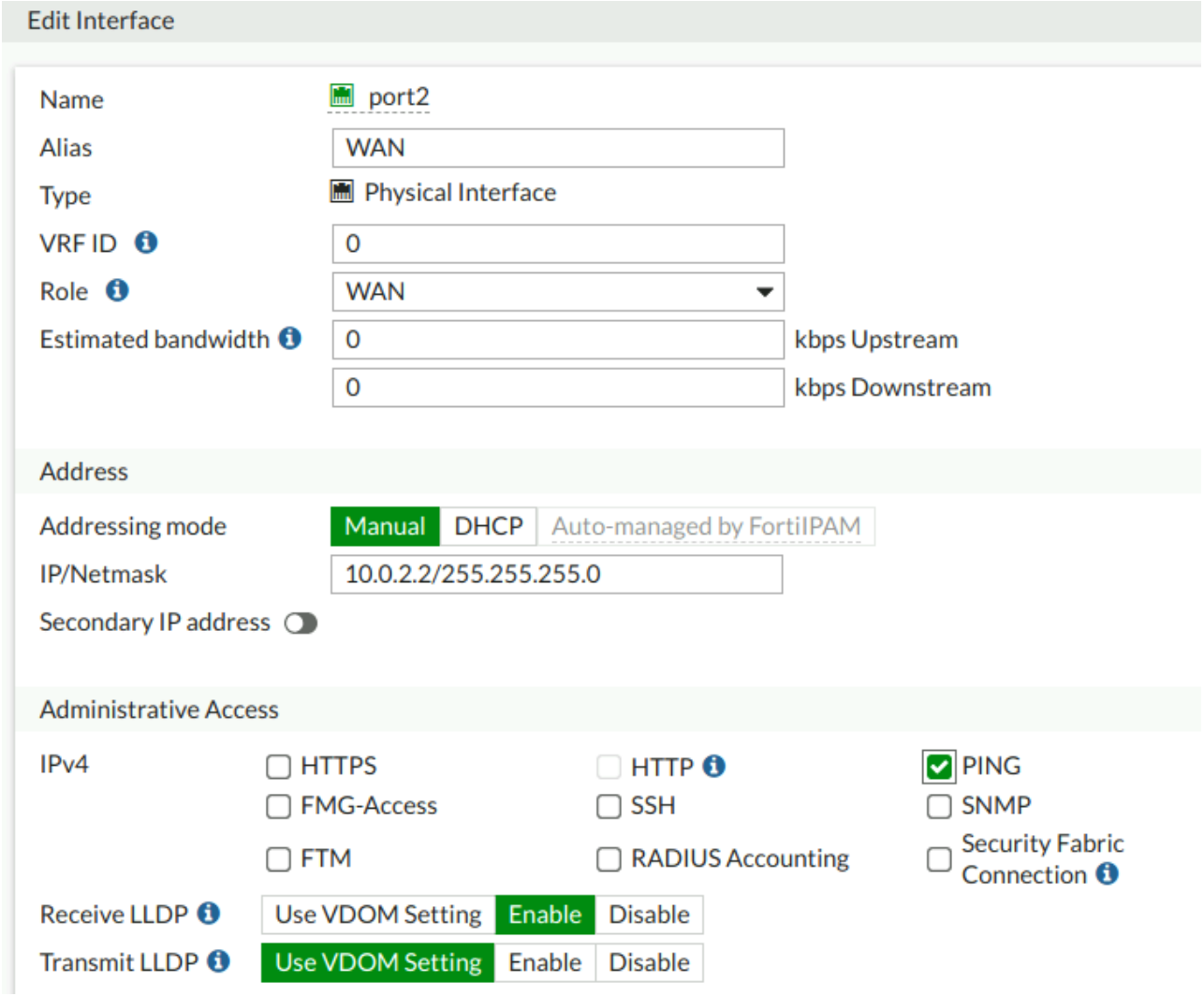
```
- On the left bar, go to "Network" and click it.
- Then, click on **Interfaces**. You can see this:
```



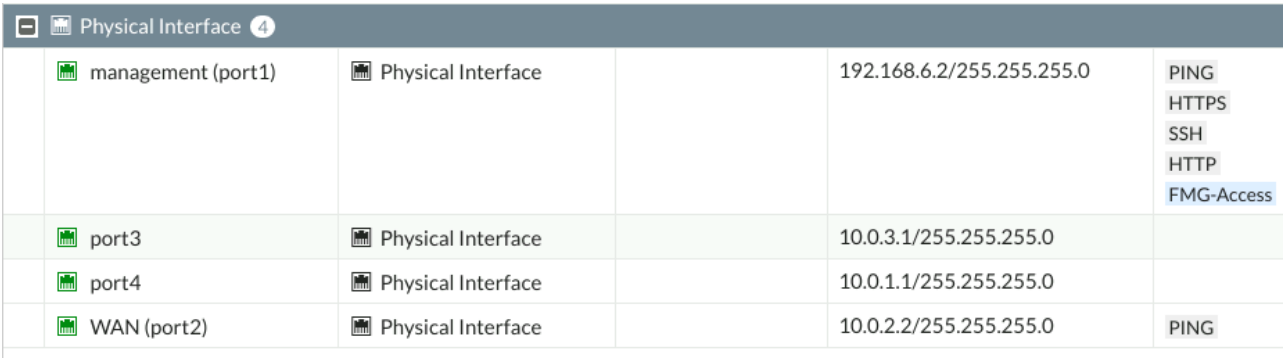
- Double-click on "port2" to be able to modify it. You'll see this:



- And then, now you can set the **Alias=WAN**, **Role=WAN** and **Permissions=+PING**. Then press **OK** at the button below.



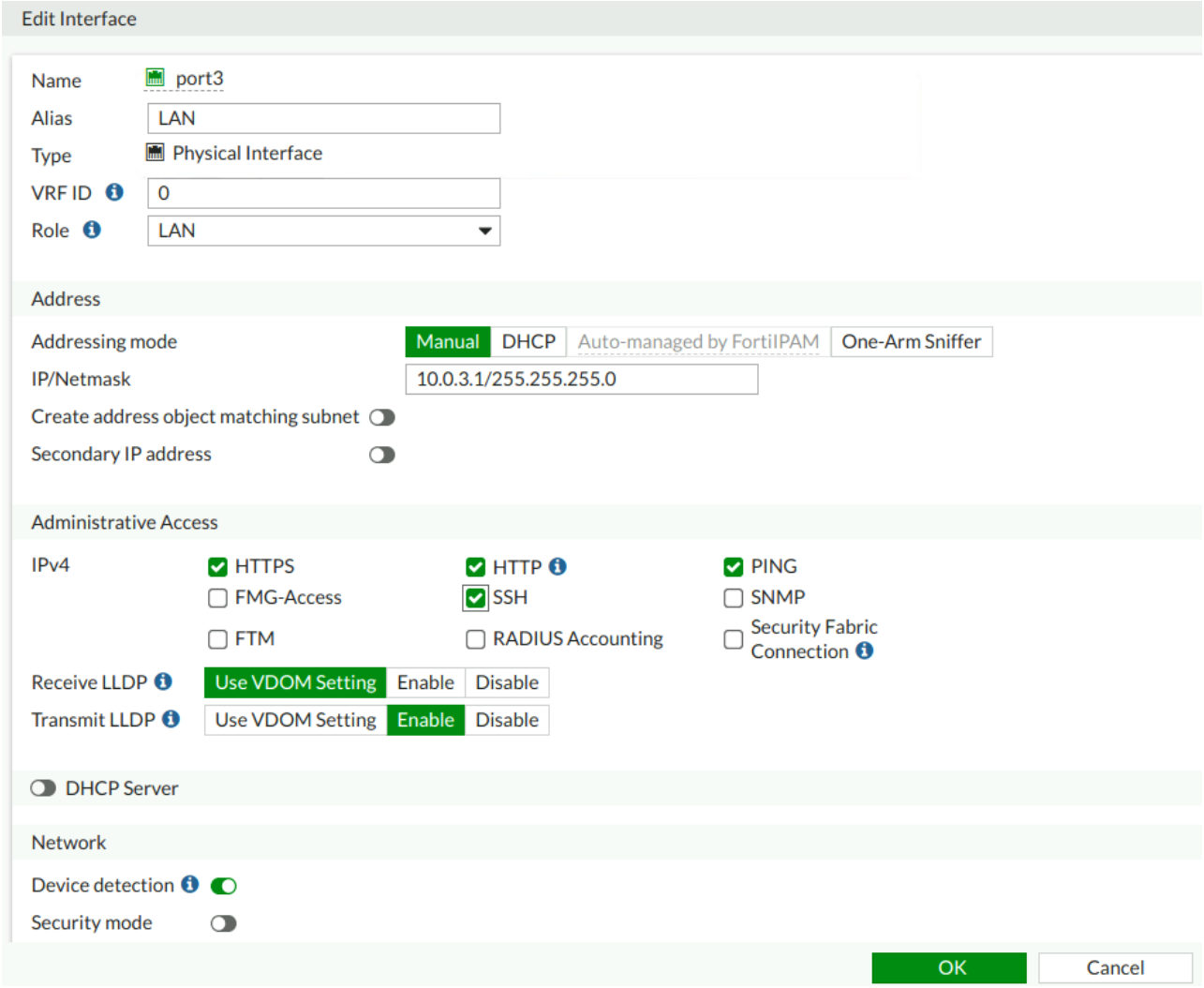
- Now, you'll see that the **port2** was definitely **modified**.



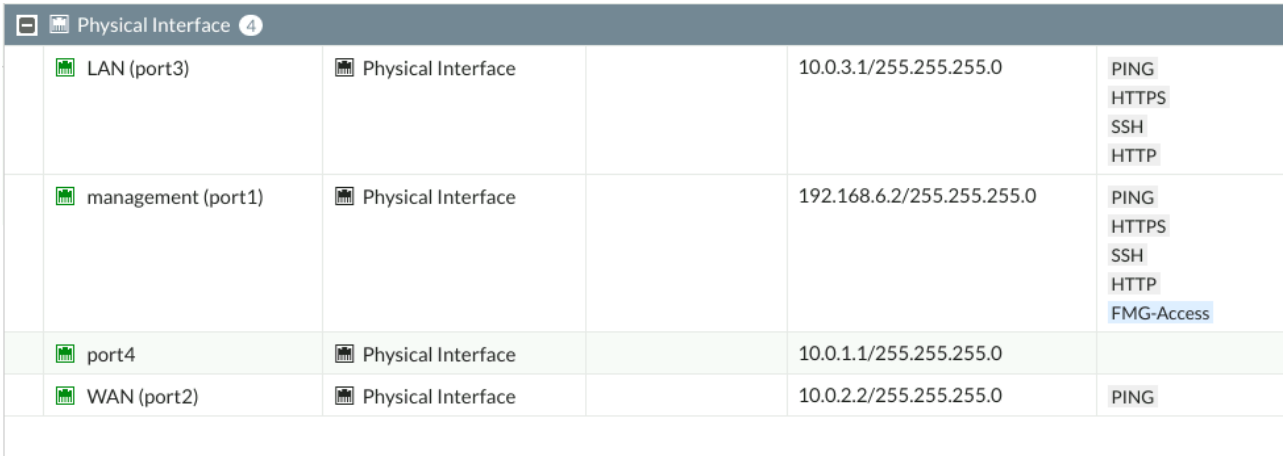
Physical Interface 4				
management (port1)	Physical Interface		192.168.6.2/255.255.255.0	PING HTTPS SSH HTTP FMG-Access
port3	Physical Interface		10.0.3.1/255.255.255.0	
port4	Physical Interface		10.0.1.1/255.255.255.0	
WAN (port2)	Physical Interface		10.0.2.2/255.255.255.0	PING

5. Modify "Port 3".

```
- Same as port2, double-click on **Port 3**.
- This time, change **Alias=LAN**, **Role=LAN** and **Admin
access=+HTTPS,HTTP,SSH,PING**. Then press **OK** below to save changes.
```

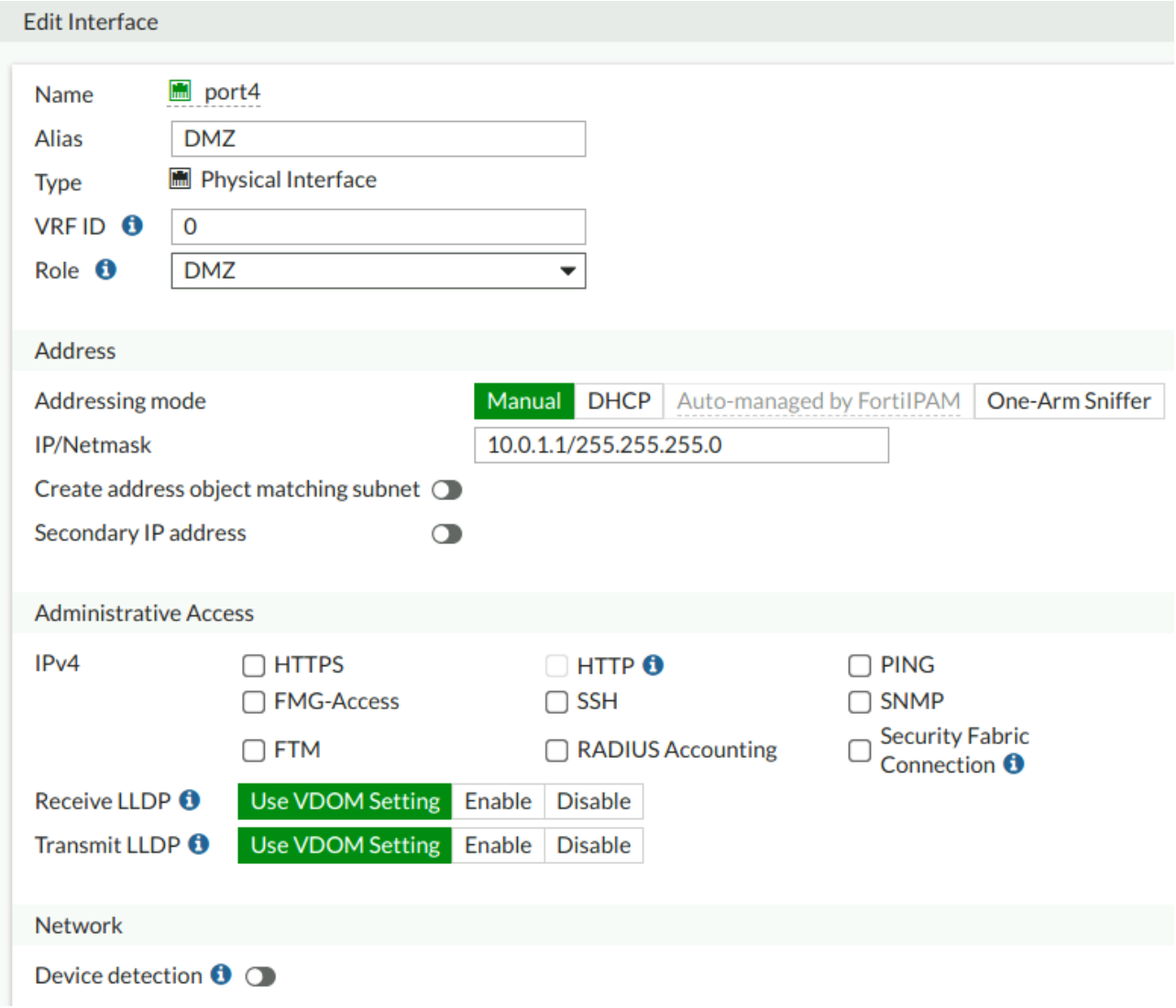


- Result of modifying **Port 3**:



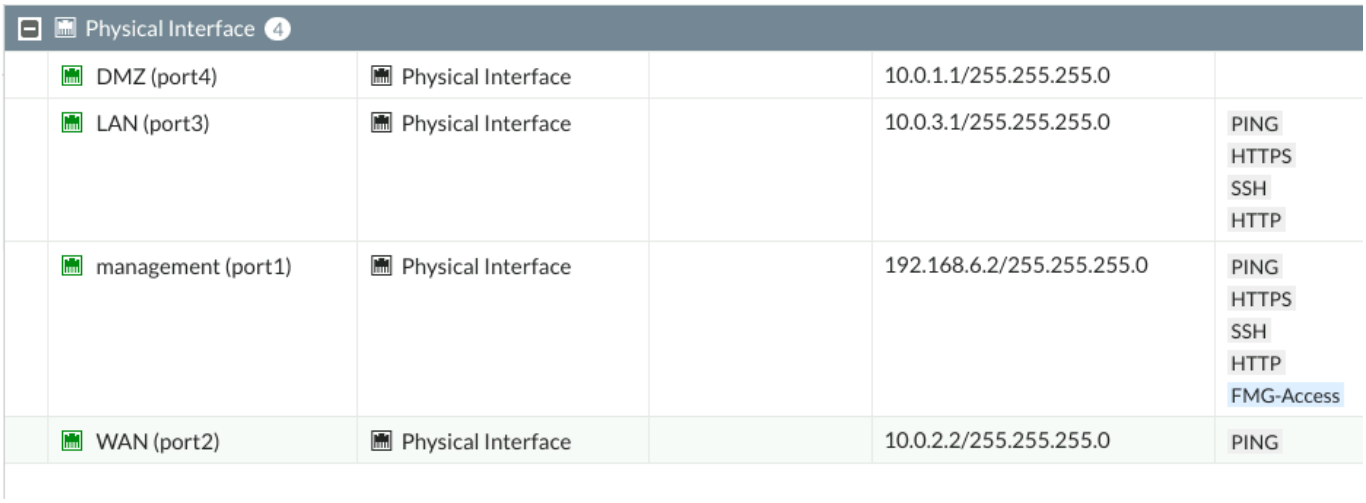
6. Modify **Port 4**:

```
- Double-click on Port 4 and modify it as such: **Alias=DMZ**,**Role=DMZ**,
**Admin access=NONE**.
```



→ Notice that for have NONE on the **Admin Access**, you just don't have to check on anything at all. Then, press **OK**.

Result:



Virtual IPs

- Currently, the web server in the DMZ is NOT accessible from the outside network which prevents users outside the network from accessing the web application hosted there.
- In order to allow their communications with the web server you need to **map** from the firewall WAN interface to the DMZ.
- Virtual IPs can help you redirect http and https requests addressed to the WAN interface of your firewall machine to the web server in DMZ.
  → So technically, it goes to the router first BEFORE it goes to the DMZ but has to be redirected before the DMZ can be reachable from the outside world.
  → Also notice that the WAN/router and the DMZ are on two different VLANs. I guess in this case, the firewall acts like a "switch" as well? (not sure)
- **FortiGate Virtual IPs are similar in purpose to iptables destination NAT**.
- Virtual IPs can be created from firewall web interface by navigating to **Policy & Objects → Virtual IPs**.
- The FortiGate web GUI allows you to name the Virtual IP, choose which IP address or addresses to link, protocol, source and/or destination port or port ranges.

→ In this step, you will be creating 2 virtual IPs. One for:

1. HTTP requests and,
2. HTTPS requests

Objectives:

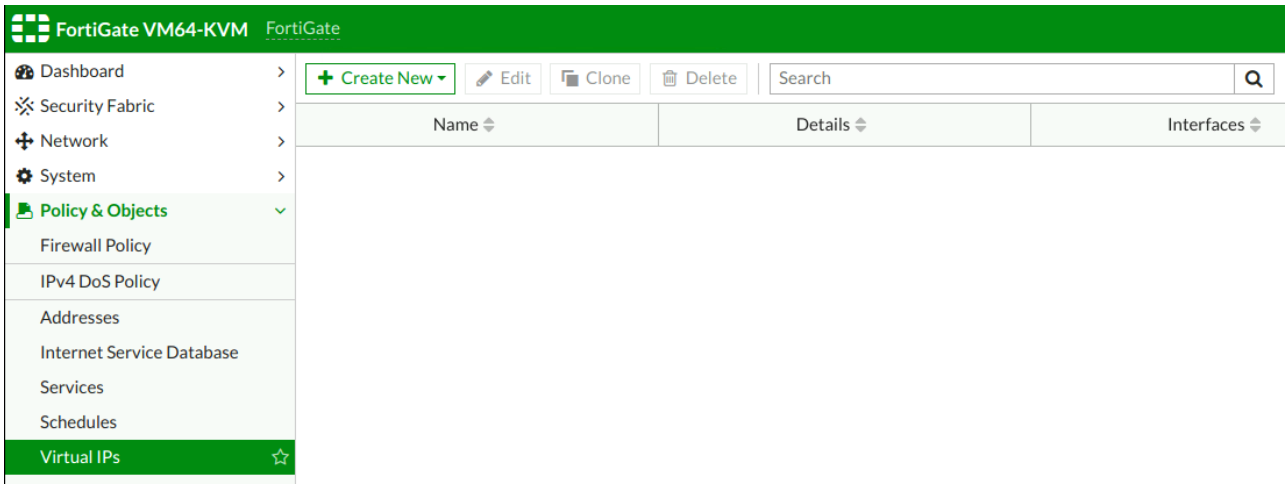
- Create first virtual IP:
  - Name: **web server - HTTP**
  - Interface: **WAN (port2)**
  - External IP Address: ***FortiGate's WAN IP address***
  - Mapped IP Address: ***Web Server's IP address***
  - Port forwarding:
    - Protocol: **TCP**
    - External service port: **80**
    - Map to port: **80**

- Create second virtual IP:
  - Name: **web server - HTTPS**
  - Interface: **WAN (port2)**
  - External IP Address: ***FortiGate's WAN IP address***
  - Mapped IP Address: ***Web Server's IP address***
  - Port forwarding:
    - Protocol: **TCP**
    - External service port: **443**
    - Map to port: **443**

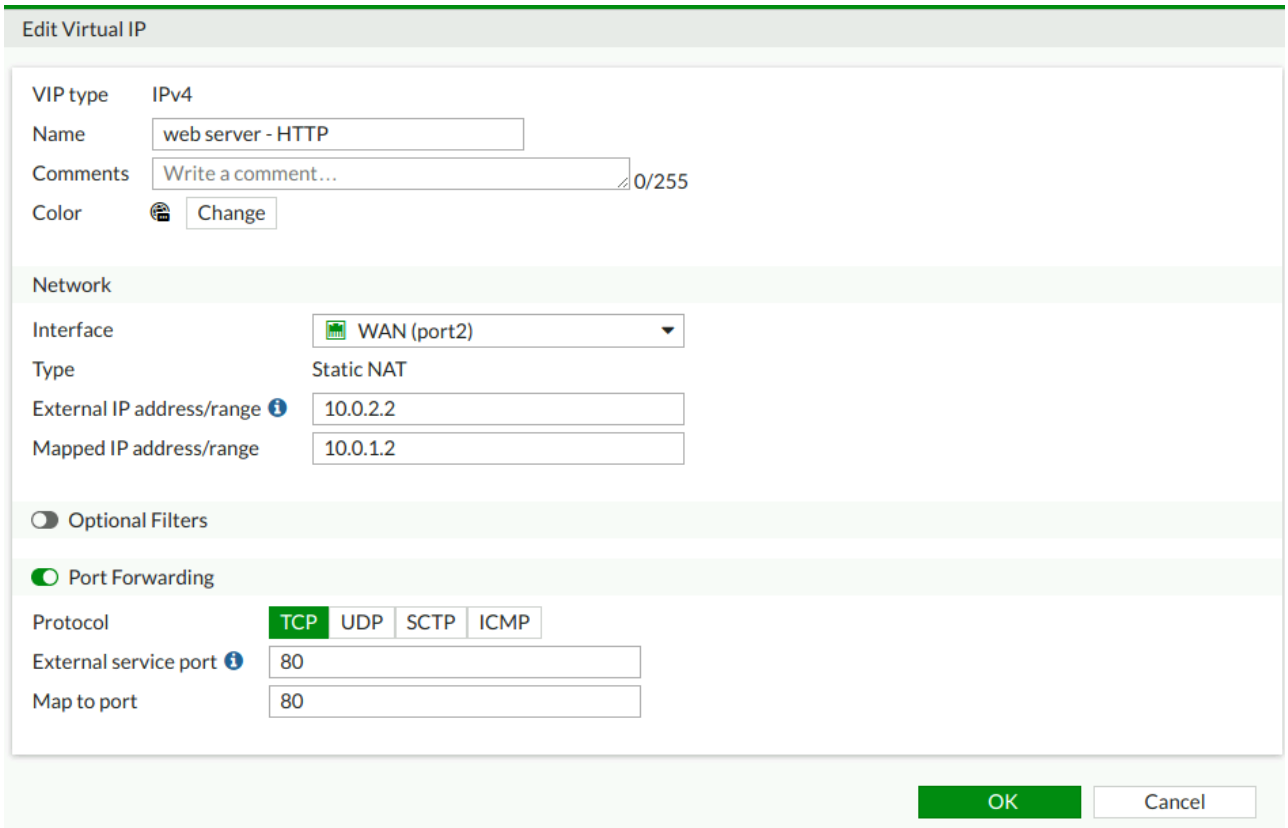
1. Where can I find to modify and create Virtual IP?

→ On the left hand side of the Page, go to **Policy & Objects** > **Virtual IPs**.

- Here is what it looks like before creating a new Virtual IP:



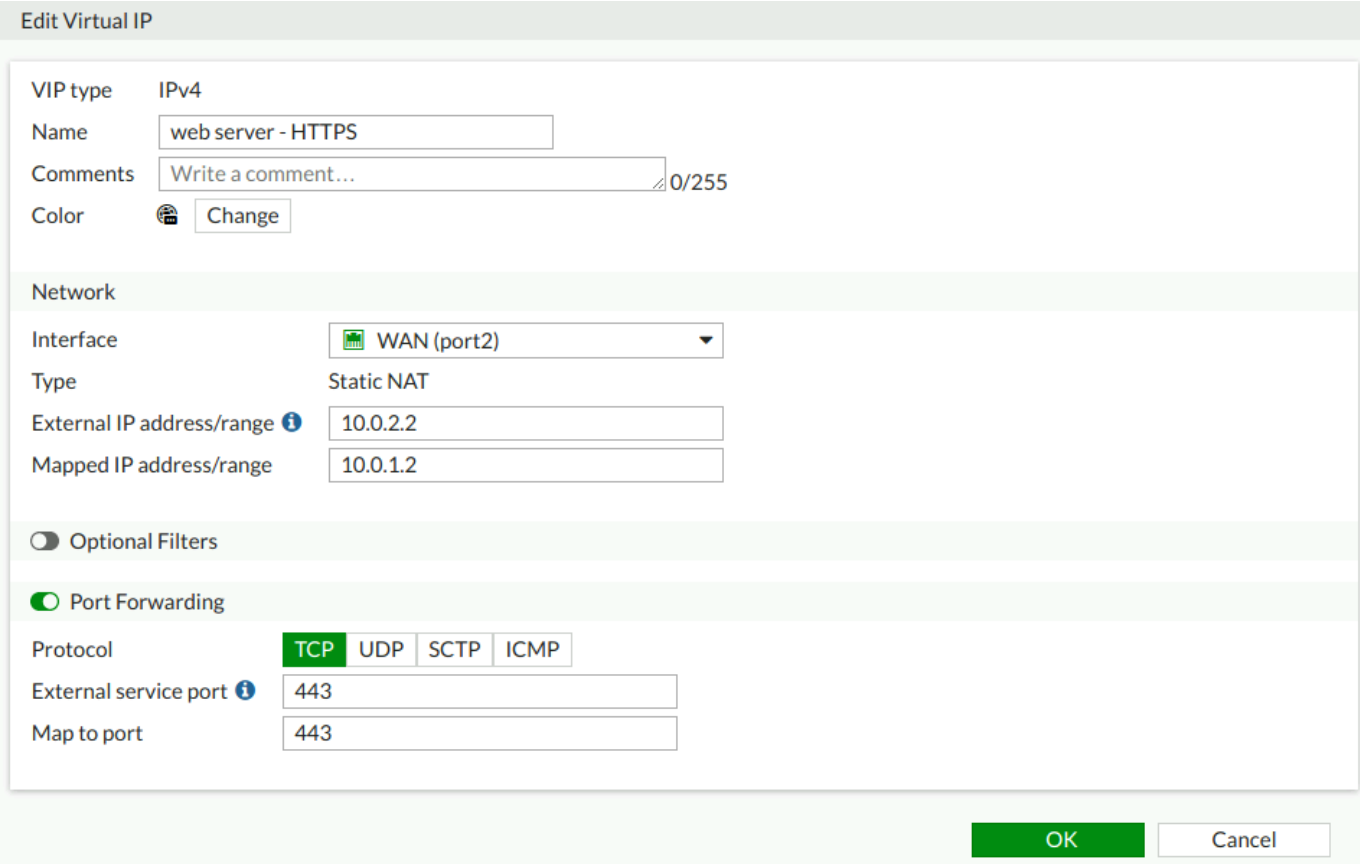
2. Now, create the **first Virtual IP**.



Note: Not sure about the external IP and mapped IP address!
→ I think what is happening here is that since the router is the only thing reachable from the Internet, anyone trying to connect to the web server(DMZ) will go through the router first, then to the Firewall in which the firewall will redirect the packets to the web server! Correct! Basically we redirect packets receive from the Firewall interface to DMZ interface:

```
10.0.2.2 -> 10.0.1.2
```

Question: Wouldn't this be dangerous for the router to be at the receiving end BEFORE the firewall? Or do we assume first that the Router itself is secure and has its own software firewall activated? What are the presumptions not stated in here?



→ Same thing happens here!

Firewall Policies

- Firewall policies are the backbone of Fortinet firewall solutions.
- All traffic going through the FortiGate VM has to be associated with a policy.
- **Firewall policies are set of instructions that control the traffic flowing through the firewall.**
- These policies control the destination of the traffic, how it is processed, whether it processed or not, and decide to allow or deny the traffic to pass through.
- By completing the previous objectives, you have assigned correct roles and access permissions to ports as well as created a link between firewall's WAN interface and a web server in the DMZ.
- That link will direct ALL HTTP and HTTPS requests made to the firewall's WAN interface IP address to the web server in the DMZ.
- However, at it's current state **firewall does NOT allow that redirection to work**.
- Furthermore, devices in LAN network cannot connect to the internet or the web server in the DMZ.

- **The reason for this is the default firewall policy that denies all traffic coming from all interfaces and destined for all interfaces**. You can observe this "Implicit Deny" policy on the:

  ```
  Policy & Objects -> Firewall Policy
  ```

  page.

- Furthermore, you can verify this behavior by viewing logs from the:

  ```
  Log & Report -> Forward Traffic
  ```

  page.

In this objective, you will create policies to:

- allow HTTP and HTTPS requests made to the WAN interface of the firewall machine to be directed to the web server in the DMZ.
- allow devices connected to the LAN interface of the Fortigate firewall to access the web server in the DMZ using its internal IP address.
- allow devices connected to the LAN interface of the Fortigate firewall to access the outside world.

WAN to DMZ

- Firewall policies can be added/edited/removed from the Web GUI via:

  ```
  Policy & Objects -> Firewall Policy
  ```

"**+ Create New**" : button from the top menu in the Firewall Policy page alloows you to create new policies.

The following fields need to be specified during policy creation:

- **Name** : A descriptive name for the policy for better future management;
- **Incoming Interface** : Interface through which the traffic first enters the FortiGate firewall.
- **Outgoing Interface** : Interface through which the traffic leaves the FortiGate firewall after it has been processed.
- **Source** : Addresses from which the policy can receive the traffic. Depending on the case, you can allow everybody (by setting "all") or limit the traffic source to a branch of organization or a list of addresses.
- **Destination** : Similar concept to source addresses, but deals with destination addresses. Depending on the case, you might be interested in limiting the traffic to specific list of addresses, organization branches or allow it to all the addresses (for example, giving Internet access to LAN)
- **Service** : services that this policy deals with.

- **Action** : whether to accept or deny the traffic that matches the previously set characteristics.

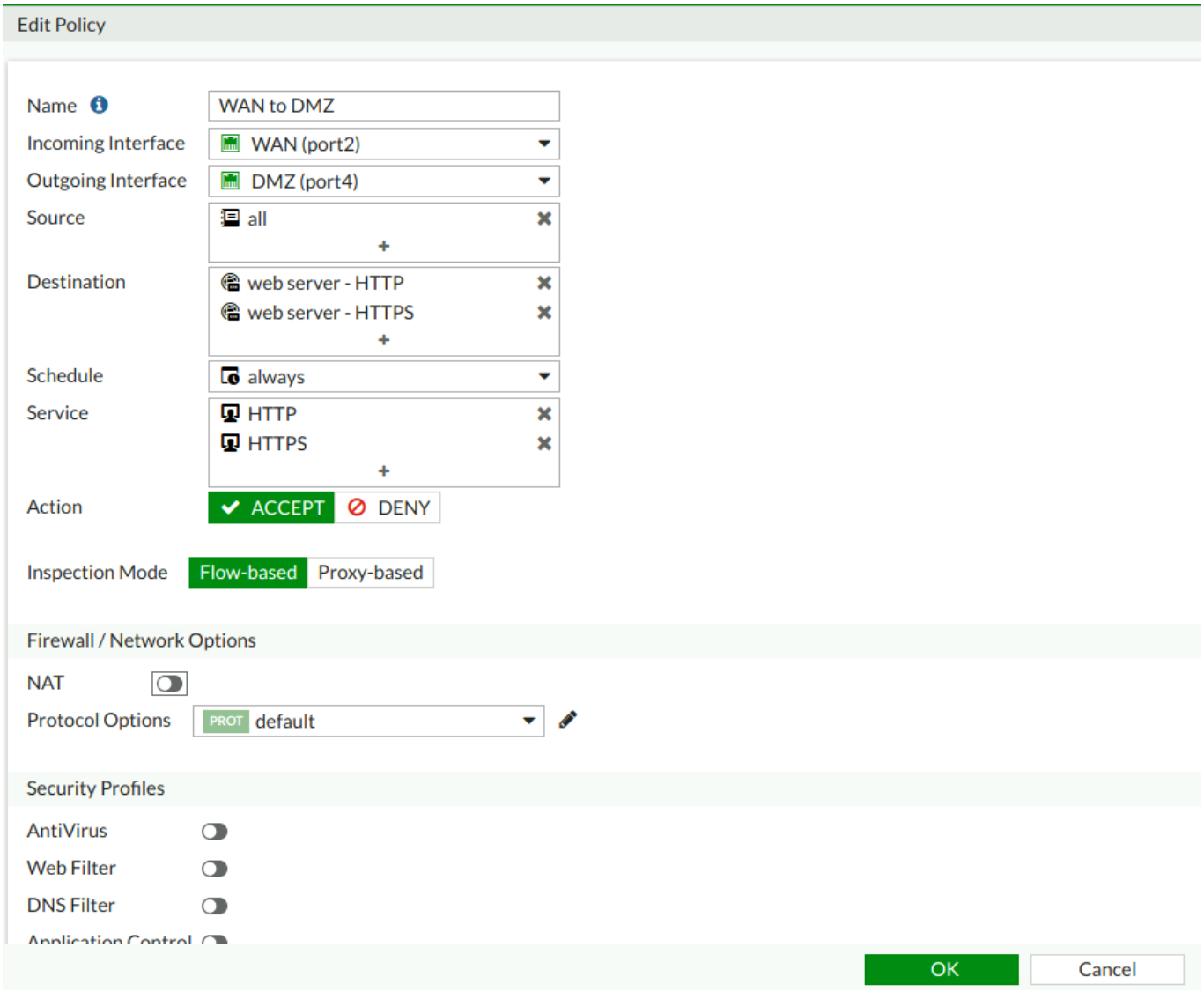
→ **In this step, you will add a policy that will utilize the previously created Virtual IPs to direct (accept) HTTP and HTTPS requests to the web server.**

Note: Do NOT enable NAT. Network Address Translation for this policy is handled by the Virtual IPs that were created during previous steps. If NAT is enabled, web server will still provide services to clients. However, the web server will see Firewall's IP address as source address, hence it will lose information about users.
→ It will lose information about users because it will think that the Firewall itself made the request(s) but in reality it just redirect user's requests to the web server!
→ Note that the source of the packet will be changed if the NAT is enabled in this case and each request made by users of the web application redirected by the Firewall will come as if the Firewall itself made the requests to the web server and we do NOT want that cause otherwise, the web server will have no memory of the web app user's actions in the web application.

Objectives:

- **Create a new Firewall Policy**:
  - Policy name: **WAN to DMZ**
  - Incoming Interface: ***select correct interface***
  - Outgoing Interface: ***select correct interface***
  - Source: **all**
  - Destination: ***both of the previously created Virtual IPs***
  - Schedule: **always**
  - Service: **HTTP, HTTPS**
  - Action: **Accept**
  - NAT: **Disabled**

Result of the new Firewall policy:



Conclusion:

- This allows the users from the outside network to access your web application found in the DMZ.
- The ***Incoming Interface*** is where the request comes from and the ***Outgoing Interface*** is where the response to the request comes from.

LAN to DMZ

- Excellent. In the previous step, you allowed the users from the outside network to access your web application.

- However, currently your internal network users CANNOT access the web servre with the internal IP address of the web server. The reason for this again is the lack of a policy that would allow such traffic. Basically, the LAN part of the network cannot make any connections whatsoever. This is the default of the firewall on ANY of its interface.

- In this step, you will create a policy that will allow **ALL** LAN users to access the web server with the internal IP address of the web server in the DMZ.
- Keep in mind that more servers can be added to DMZ in the future and you would like to be able to access them **ALL** with their internal IP address.

Note: there's no necessity to create Virtual IPs for this step.

→ Same caution:
Do NOT enable NAT. For the same reason as the previous objective, the web server from the DMZ will not know the user information of the LAN users of the web application if this is the case because the Firewall itself will replace its identity as someone who passed the original request.

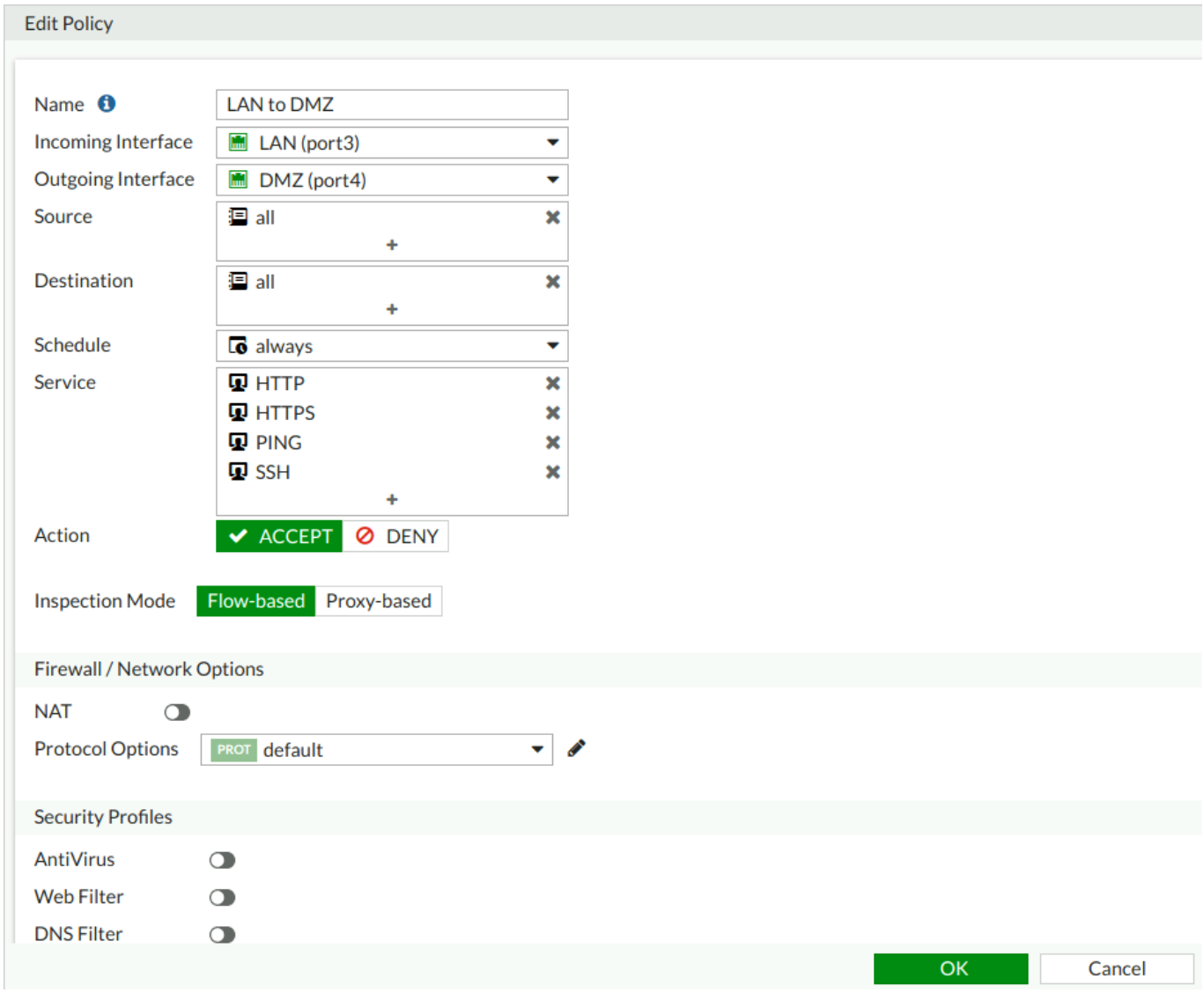
Objectives:

- **Create a new Firewall Policy**:
  - Name: **LAN to DMZ**
  - Incoming Interface: ***select correct interface***
  - Outgoing Interface: ***select correct interface***
  - Source: ***select correct option***
  - Destination: ***select correct option***
  - Schedule: **always**
  - Service: **HTTP, HTTPS, PING, SSH**
  - Action: **Accept**
  - NAT: **Disabled**

Hints:

1. Communications will be **entering** the firewall machine from its LAN facing interface.
2. Communicatons will **leave** the firewall machine from its DMZ facing interface.
3. Lab description specifies that **ALL** devices in the LAN network should be able to reach DMZ with its internal IP. Those devices are the **source** for this policy.
4. Lab description specifies the amount of servers in the DMZ can increase and LAN users should be able to reach them **ALL** with their internal IP addresses. Those DMZ servers are the **destination** of this policy.

Screenshot of the setup:



LAN to WAN

- If you have completed the previous steps, LAN users can access the web server in the DMZ with its internal IP address and the outside world can browse the web application hosted in the web server with WAN IP address of the firewall machine.
- **However, currently LAN users CANNOT access the internet**. Once again, this is due to the fact that a policy allowing such traffic has NOT been created yet.
- Firewall mahcine is set as default gateway for the server in LAN.
- All traffic is already routed to firewall machine but dropped there.
- You can observe this from:

  ```
  Log & Report -> Forward Traffic
  ```

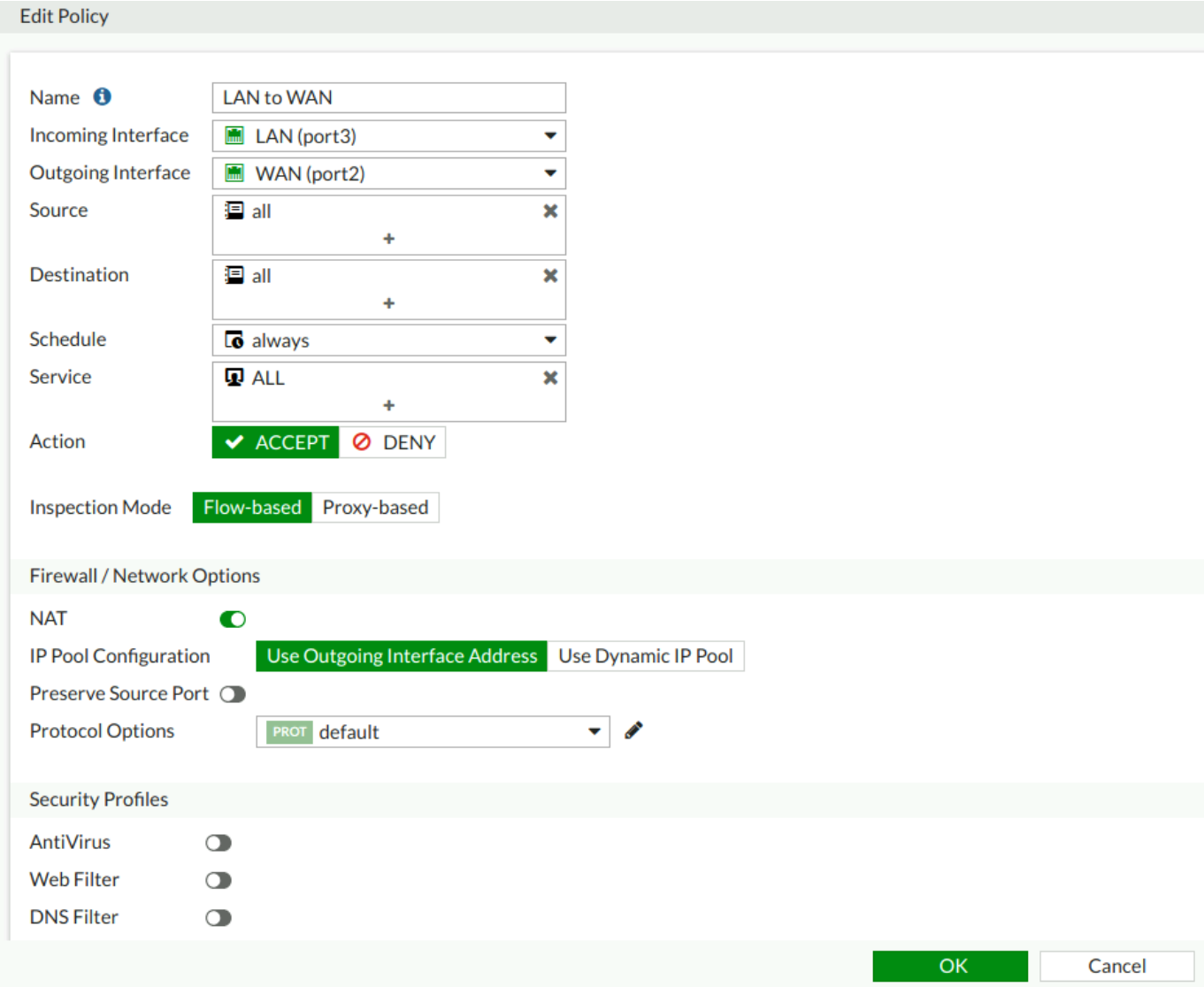
  section of the firewall web GUI.

- **Note: Enable NAT. In contrast to previously created policies, NAT must be enabled for this policy.**
  → When NAT is enabled, source IP address of the traffic is replaced with Firewall machine's WAN facing IP address.
  → This is necessary so that services in the outside world can reply back correctly since they know the router/firewall, but do NOT know the local machine!

Objectives:

- **Create a new Firewall Policy**:
  - Name: **LAN to WAN**
  - Incoming Interface: ***select correct interface***
  - Outgoing Interface: ***select correct interface***
  - Source: **all**
  - Destination: ***select correct option***
  - Schedule: **Always**
  - Service: **ALL**
  - Action: **Accept**
  - NAT: **Enabled**

Result of the setup firewall policy:



Final look for the current firewall policy for the topology: