# SECURITY+ V4 LAB SERIES

# Lab 12: Setting Up a Load Balancer

**Document Version: 2022-04-29**

| Material in this Lab Aligns to the Following | |
|---|---|
| CompTIA Security+ (SY0-601)<br>Exam Objectives | 2.5: Given a scenario, implement cybersecurity resilience |
| All-In-One CompTIA Security+ Sixth Edition<br>ISBN-13: 978-1260464009<br>Chapters | 13: Cybersecurity Resilience |

# Contents



## Introduction

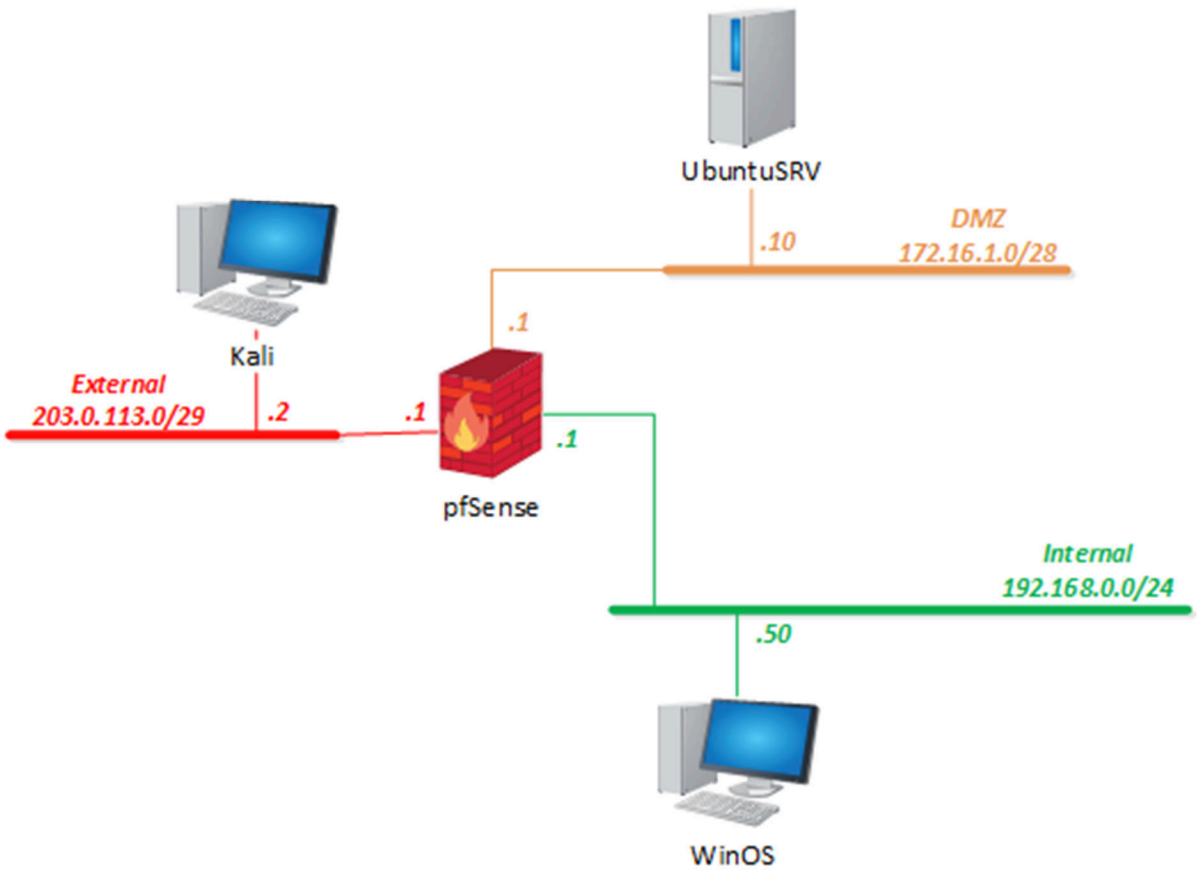
Load balancing will spread the stress from one server to multiple servers. Failover plays a big part in a continuity plan. When a server fails, we still want the business to continue to provide service to its customers. This is where failover kicks in. It detects the status on the production server and takes over when failure is detected.

## Objective

In this lab, you will perform the following tasks:

- Set up and test a load balancer
- Set up and test failover

## Lab Topology



## Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

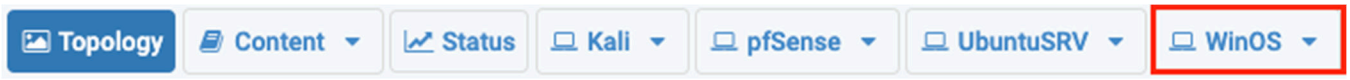
| **Virtual Machine** | **IP Address** | **Account** (if needed) | **Password** (if needed) |
|---|---|---|---|
| Kali | 203.0.113.2 | kali | kali |
| pfSense | 192.168.0.1 | sysadmin | NDGlabpass123! |
| UbuntuSRV | 172.16.1.10 | sysadmin | NDGlabpass123! |
| WinOS | 192.168.0.50 | Administrator | NDGlabpass123! |

# 1 Set Up the Web Servers

## 1.1 Set Up the Web Server on Windows

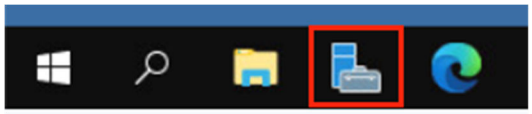
In this section, you will set up the load balance on the pfSense firewall. If the company is hosting a website, it is a good practice to load balance the traffic onto different servers, so no single server is getting overloaded.

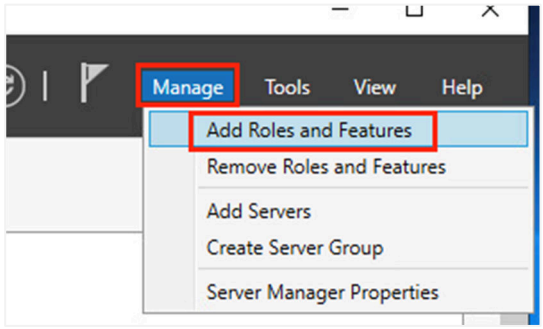
1. Click on the **WinOS** tab to access the *WinOS*.



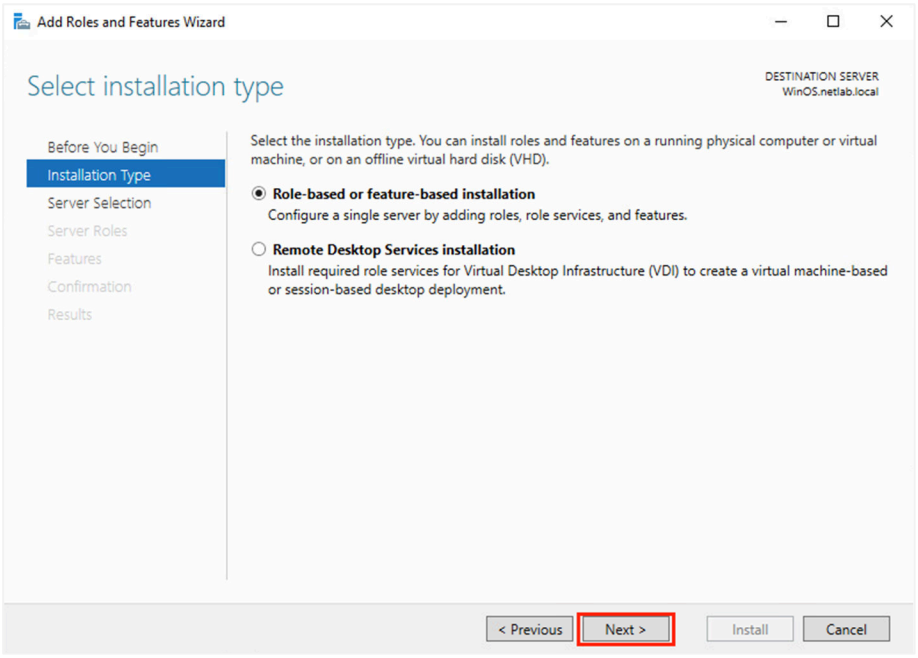

2. Click the dropdown menu, to send **Ctrl+Alt+Delete**. Then, log in to the Client PC as username `administrator`, password `NDGlabpass123!`.


3. Once logged in, click the **Server Manager** icon to launch it. In the *Server Manager* window, click the **Manage** button, then select **Add Roles and Features**. We will add the IIS Role to the server.

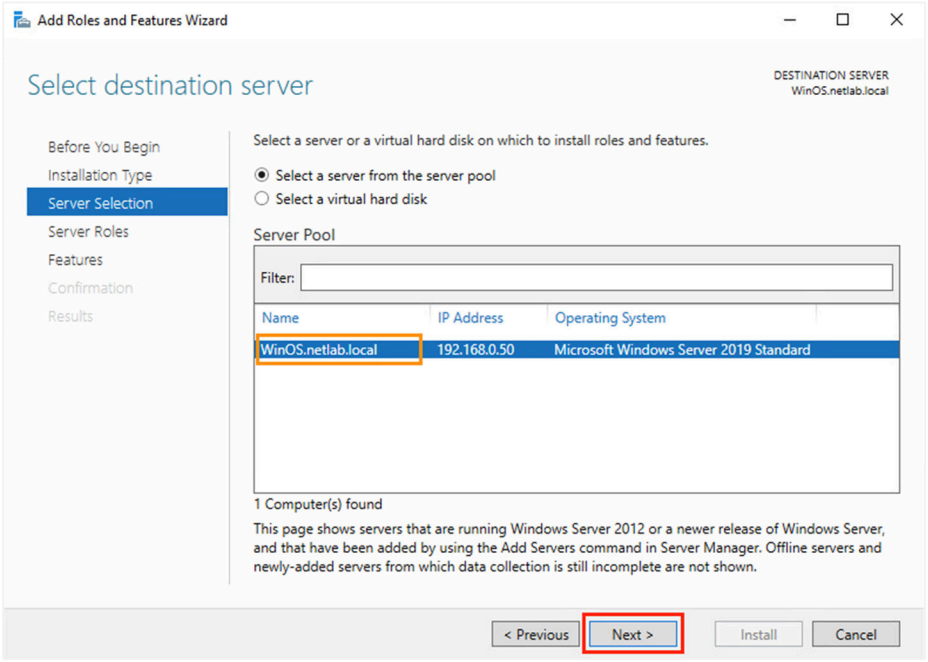




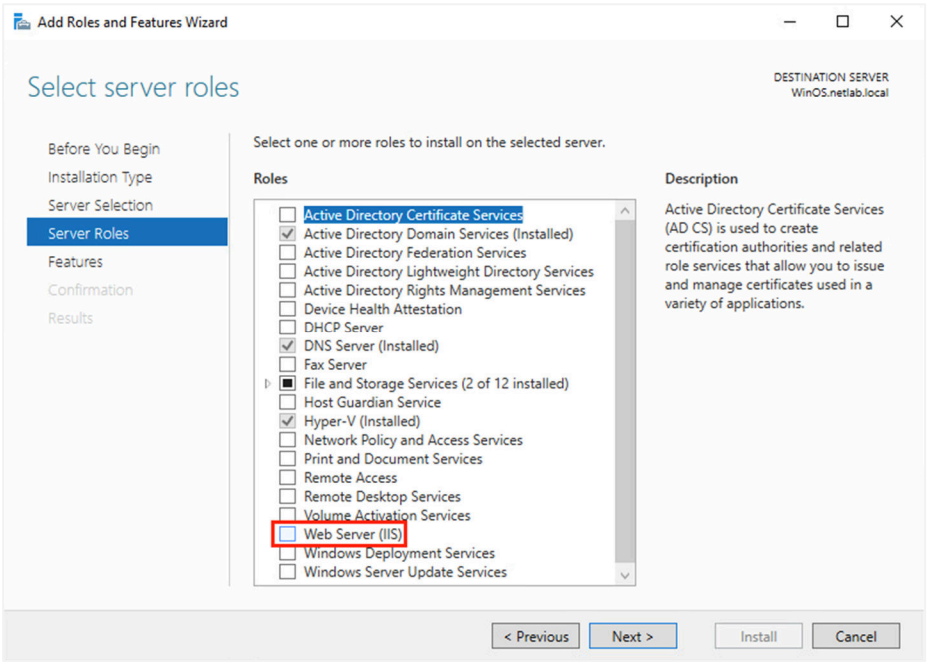
4. On the first *Select installation type* page, click **Next**.



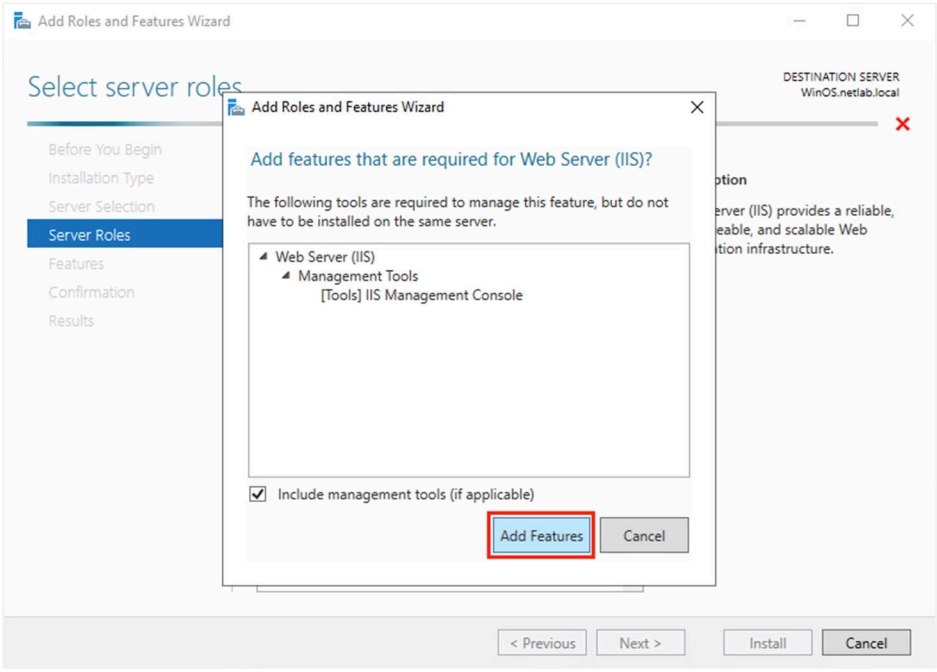

5. Make sure *WinOS.netlab.local* is selected, click **Next**.



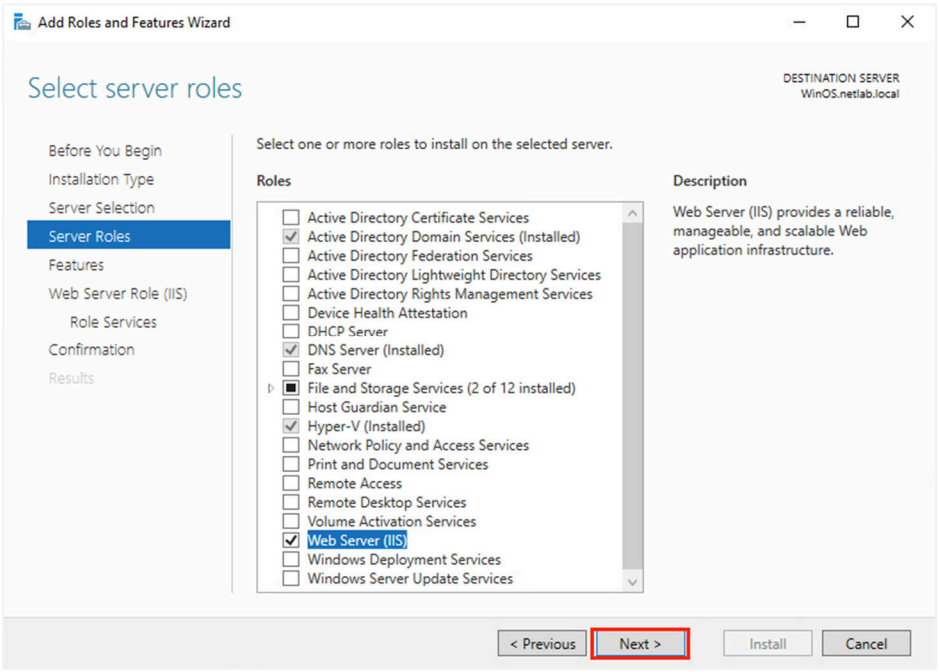
6. At the *Select server roles* step, check to select **Web Server (IIS)**.



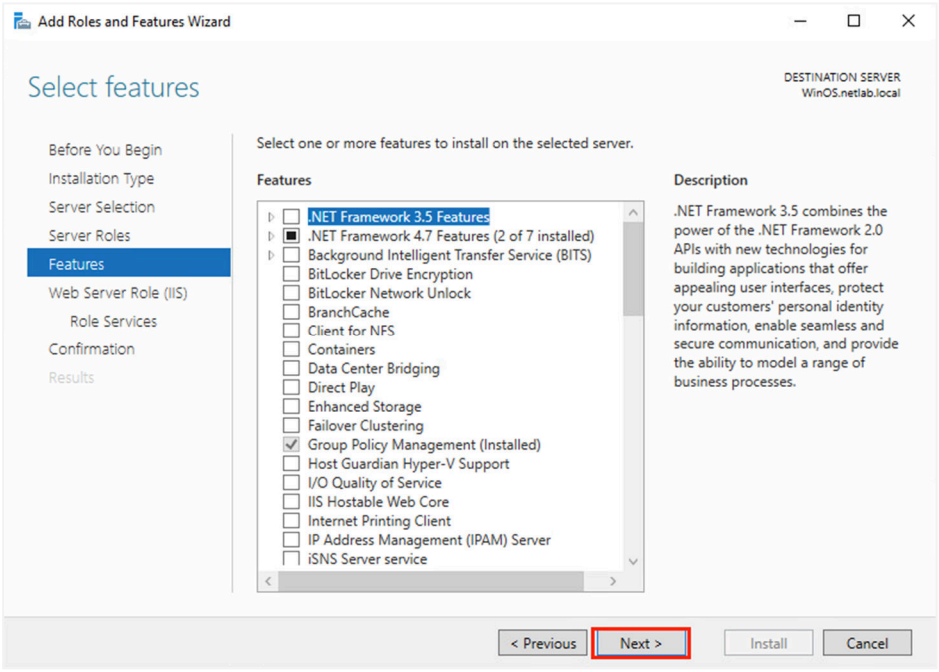

7. In the pop-up window, leave the default settings and click the **Add Features** button.



8. You will be brought back to the *Select server roles* page; click **Next**.

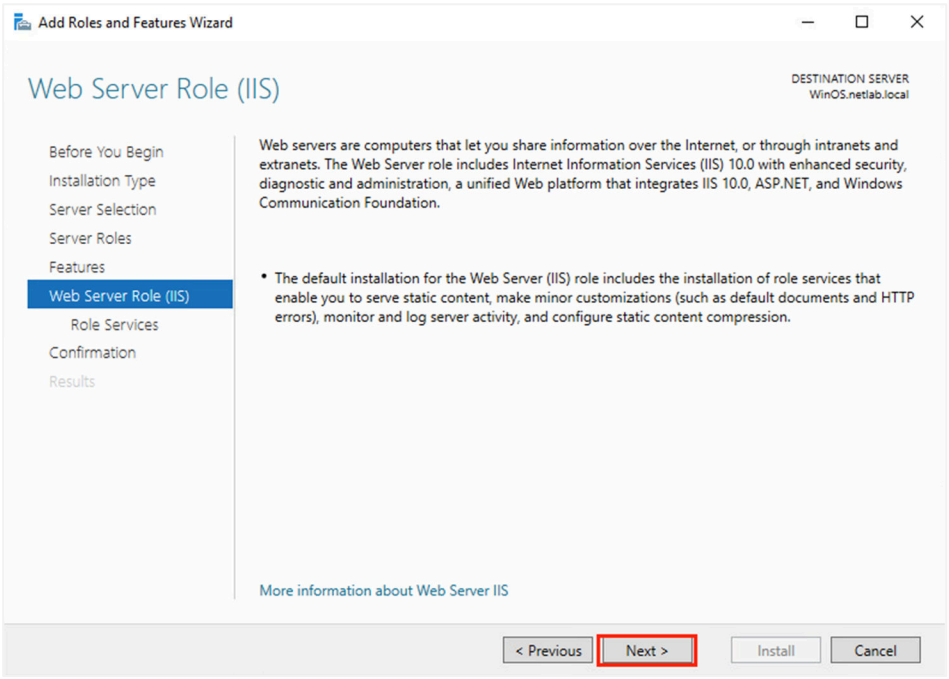



9. On the *Select features* page, click **Next**.

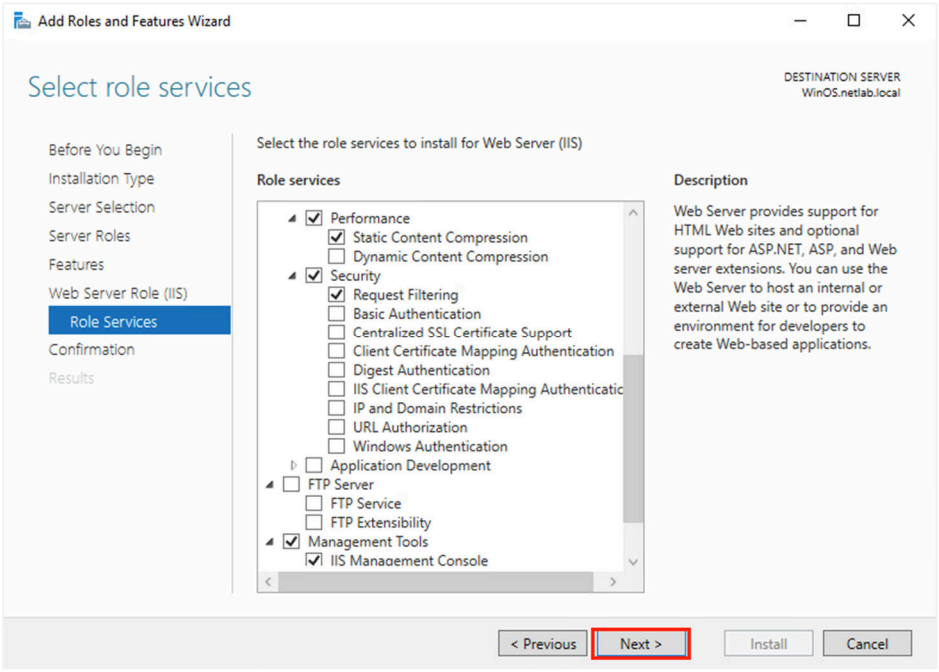


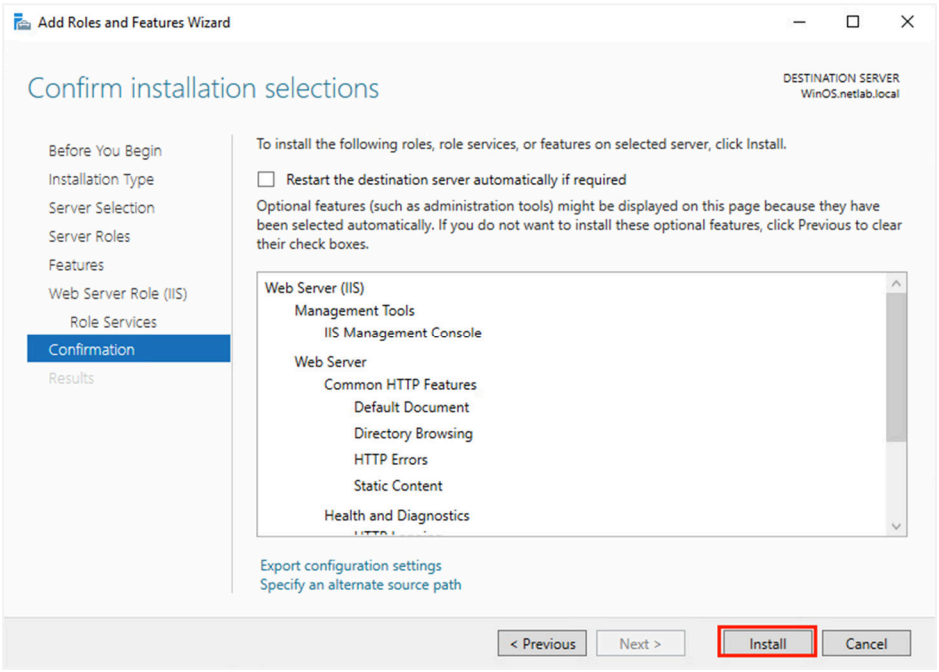
10. On the *Web Server Role(IIS)* page, click **Next**.



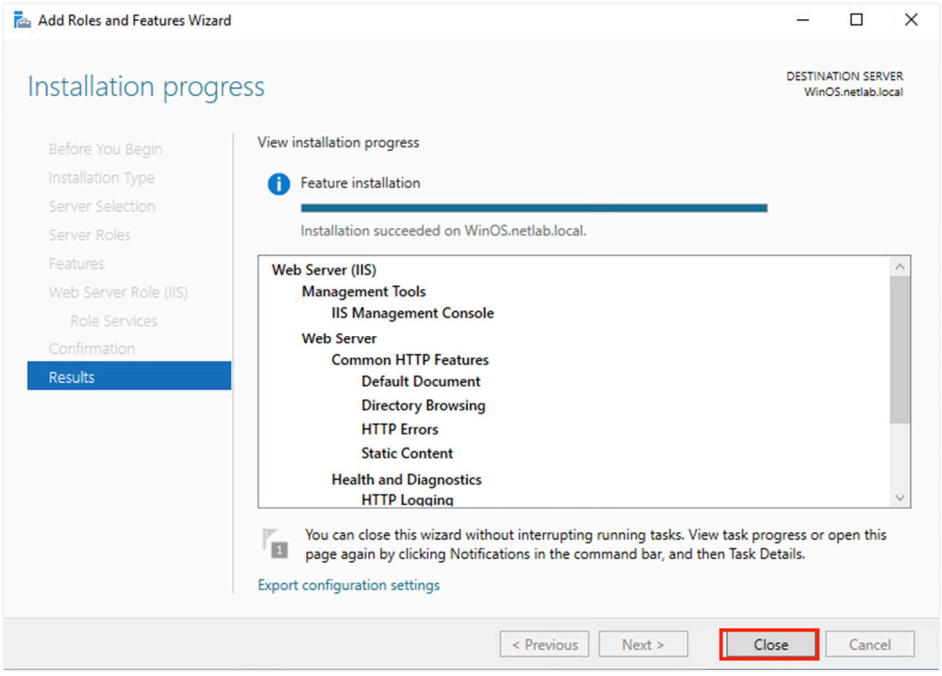

11. On the *Select role services* page, leave the default settings and click **Next**.



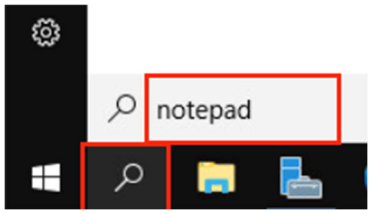
12. At the *Confirmation installation selections* page, click **Install**.



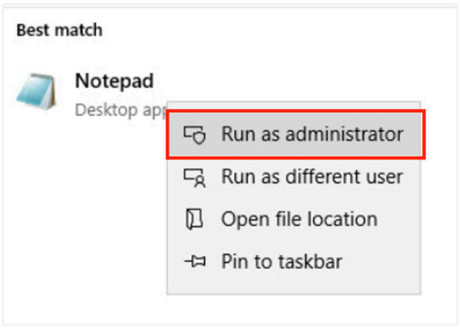

13. The installation should take 3 - 5 minutes to complete. Once finished, click the **Close** button.



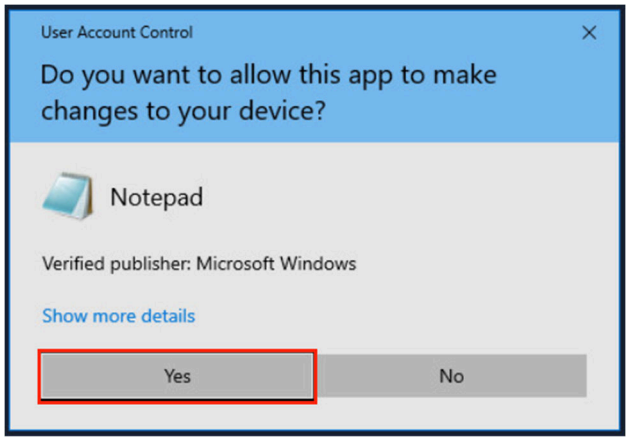
14. You will be brought back to the *Server Manager* window. *IIS Web server* should be running in the background now. Next, let's quickly add a simple index page to our web server. Click the **Magnifier** icon in the taskbar and type `notepad`.



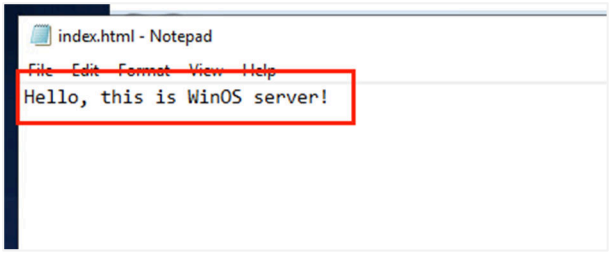

15. In the result, right-click on **Notepad** and select **Run as administrator**.



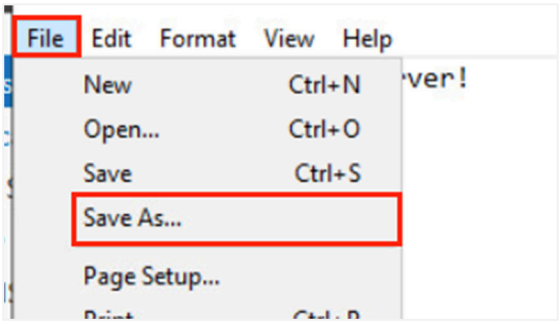

16. When prompted by *User Account Control*, answer **Yes**.



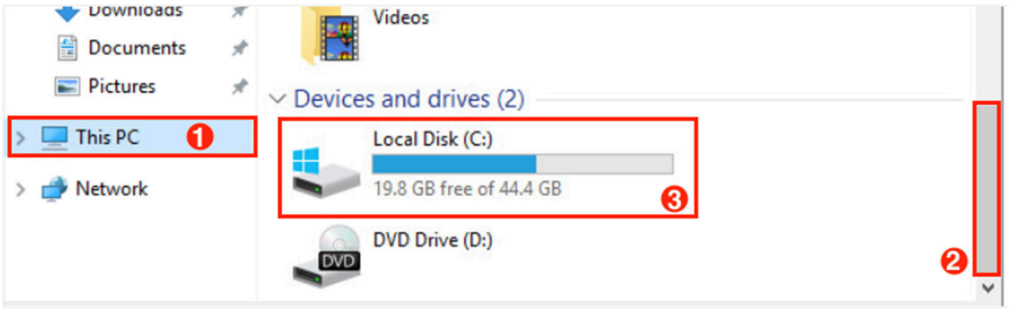

17. In the *Notepad* window, type: `Hello, this is WinOS server!`



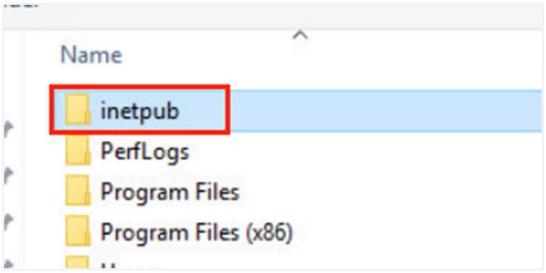
18. In the program menu, click **File**, then select the **Save As…** option.




19. The *Save As* window opens. On the left side, click **This PC.** Then, scroll down on the right side and double-click **Local Disk (C:)**.




20. Double-click **inetpub** to open it, then double-click **wwwroot** to open it.

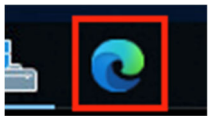




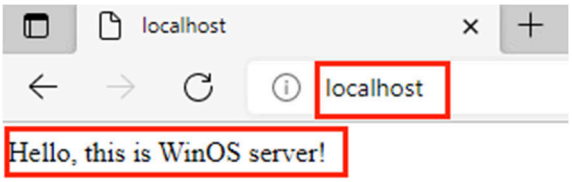
21. At the bottom of the *Save As* window, type `index.html` as the filename. Change the *Save as* type to **All Files (*.*)** , change the *Encoding* to **UTF-8.** At last, click **Save.**

22. The index page is set. Let's check it before we move to the next section. Click on the **Edge** icon to open a browser window.



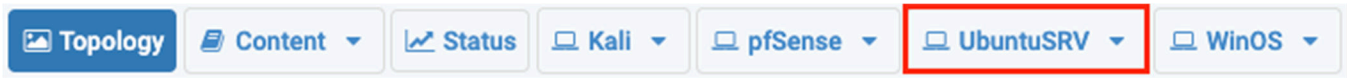
23. In the address bar, type `localhost`, and press **Enter**. You should see the index page showing the words we added in step 17.



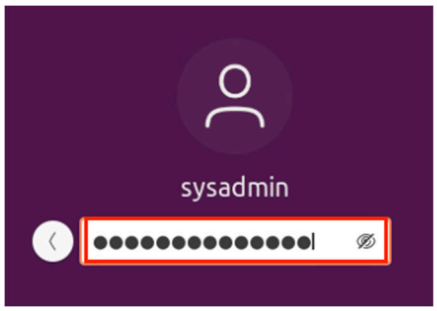

24. Leave everything in its place and proceed to the next section.

## 1.2 Set Up Web Server on UbuntuSRV

1. Click on the **UbuntuSRV** tab to access the *Ubuntu Server*.



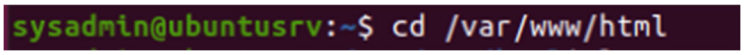

2. Log in by clicking on username `sysadmin`, then enter password `NDGlabpass123!`.



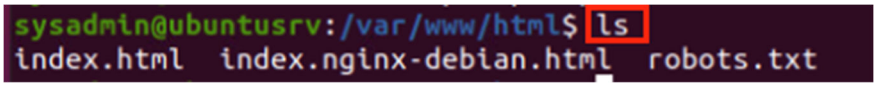

3. Click the **Terminal** icon to start a *Terminal*.

4. Type the following command in the *Terminal* window.

```
sysadmin@ubuntusrv:~$ cd /var/www/html
```

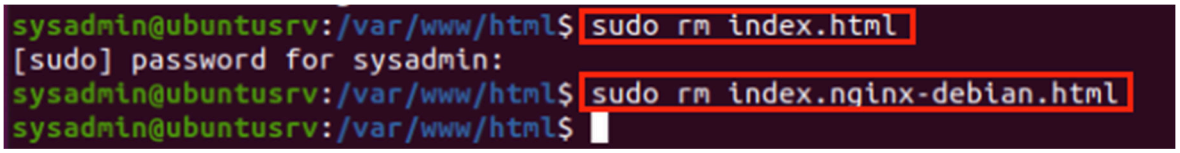



5. Let's check what's inside the folder. Type **`ls.`**



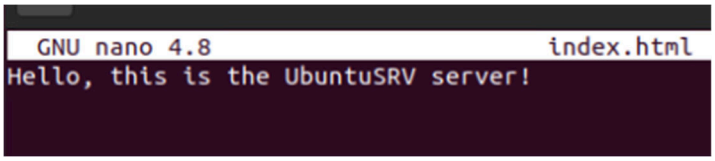

6. It shows there are three files. It looks like there is an nginx server running. Let's do some cleanup and start to build our own web server. Type and run the following commands; when prompted for the password, enter **`NDGlabpass123!`**.

```
sysadmin@ubuntusrv~:$ sudo rm index.html
sysadmin@ubuntusrv~:$ sudo rm index.nginx-debian.html
```

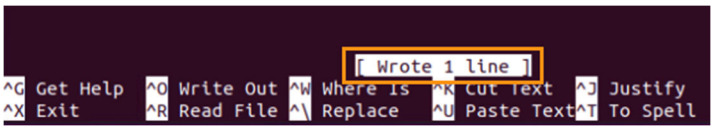



7. Then, let's stop the nginx service by typing **`sudo service nginx stop`**.


8. We will now add an index page. Type **`sudo nano index.html`** and you will enter the nano text editor. Type in the words: **`Hello, this is the UbuntuSRV server!`**

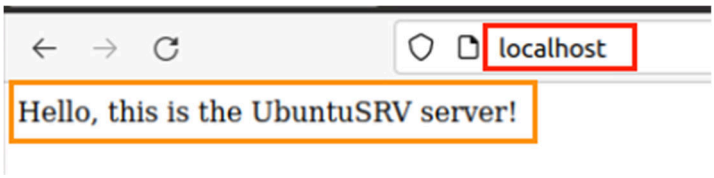



9. Press **Ctrl+S** to save, and then **Ctrl+X** to exit.




10. Now, let's start the web server. Type **`sudo service apache2 start`**. This will start the apache service and open port 80.

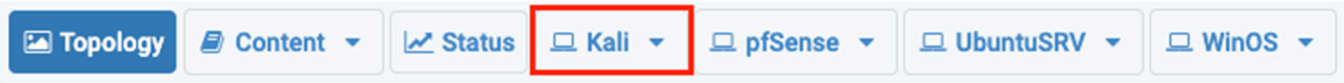
11. Click on the **Firefox** icon to start a browser. Same as before, go to address **`localhost`** to verify the web server is running.



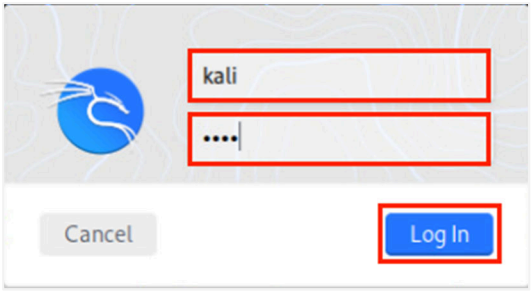
# 2 Set Up the Load Balancing

## 2.1 Set Up Load Balancing

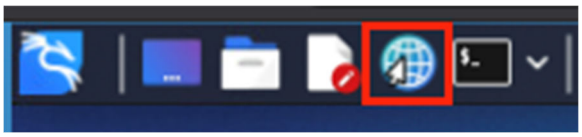
1. Click on the **Kali** tab to access the *Kali* machine.




2. Log in as username `kali`, password `kali`.

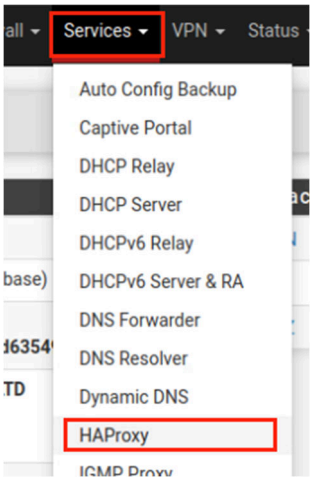



3. Click the browser icon to start the web browser.

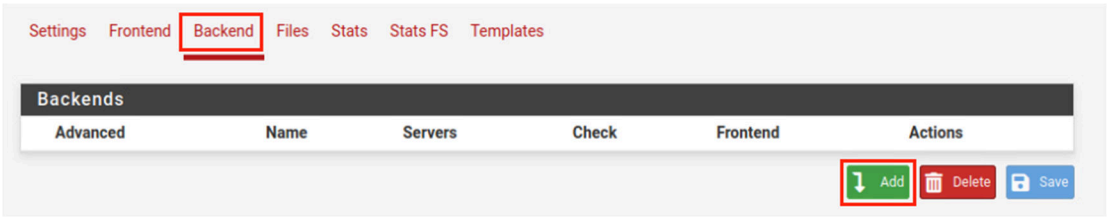


4. In the address bar, type `172.16.1.1`, then press **Enter** to open the pfSense login page. Log in as username `sysadmin`, password `NDGlabpass123!`. If the browser offers to save the password, click **Don't Save**.

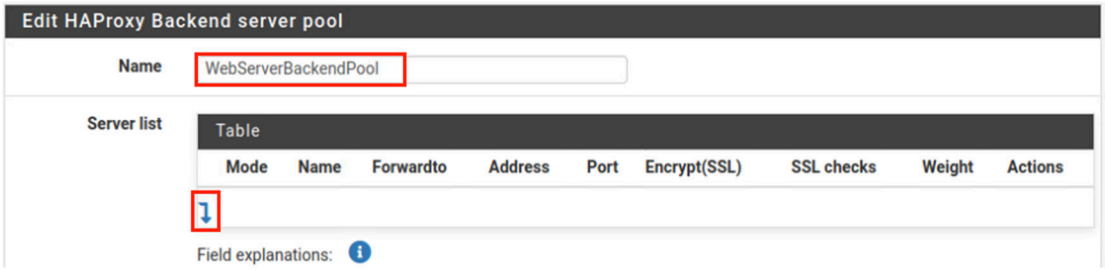
5. You will see the default *Dashboard* page. At the top, click on **Services** and select **HAProxy**.



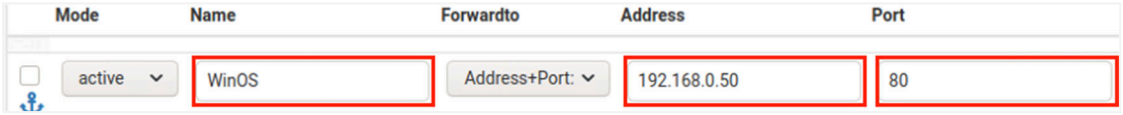

6. We will be configuring the *Backend* first, then configuring the *Frontend*. Click the **Backend** tab, then click the **Add** button.

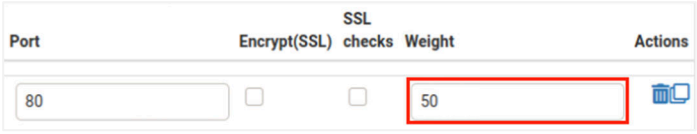



7. In the *Name* field, to make it easier to remember, we will put `WebServerBackendPool`. Then, in the **Server list** area, click the down-arrow to add a server.

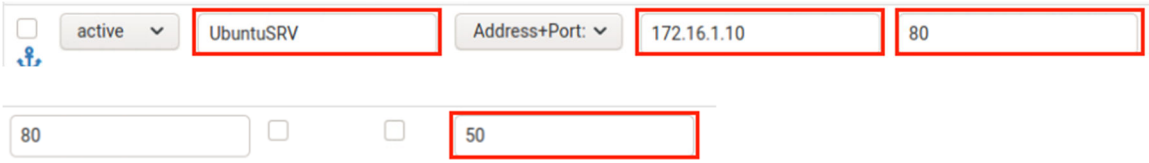



8. After you click the arrow, the page will expand. Fill in the blanks using the following information (You'll need to scroll right to see all fields):
   a. *Name*: `WinOS`
   b. *Address*: `192.168.0.50`
   c. Port: `80`
   d. Weight: `50`

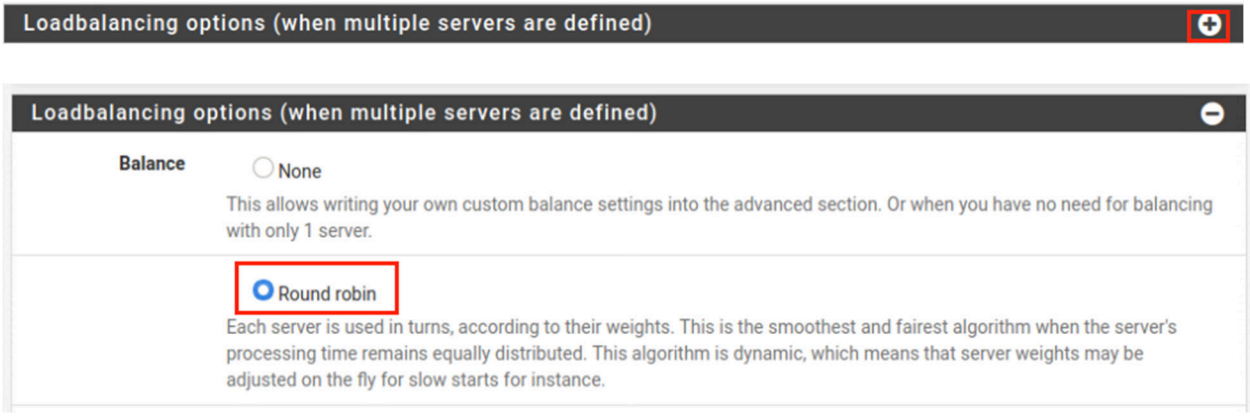





9. Once finished, click the arrow again to add another server to the pool. Fill each field with the following information:
   a. *Name*: `UbuntuSRV`
   b. *Address*: `172.16.1.10`
   c. *Port*: `80`
   d. *Weight*: `50`

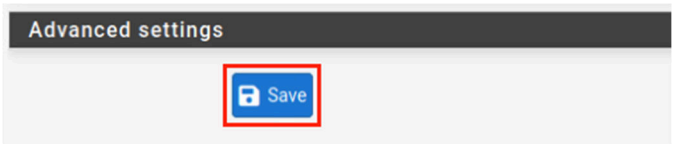



10. Next, we will choose the *Load Balancing* option. Click the **+** sign to expand the area to show options. Click to select **Round robin**.

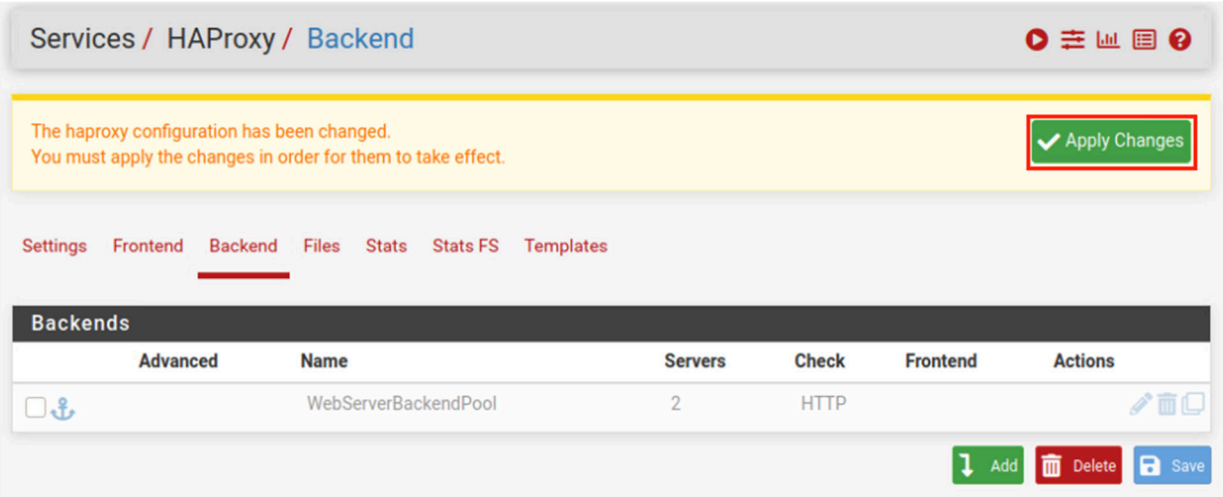



Round robin simply means the load balancer will be alternating the servers in the server pool depending on their assigned weights.

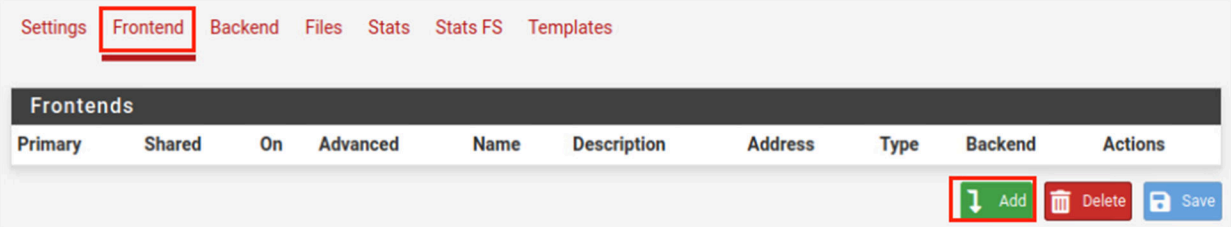
11. Leave the rest of the configurations untouched. Feel free to check and learn any of the other configurations. Once done, scroll down to the bottom and click the **Save** button.



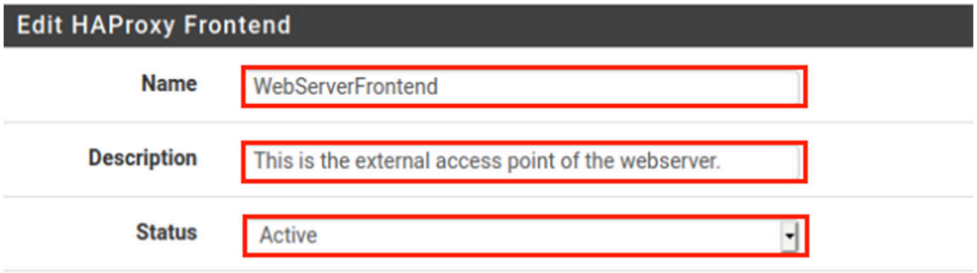
12. You will be brought back to the *Backend* tab. Notice the banner message prompting us the configuration has been changed; click the green **Apply Changes** button.



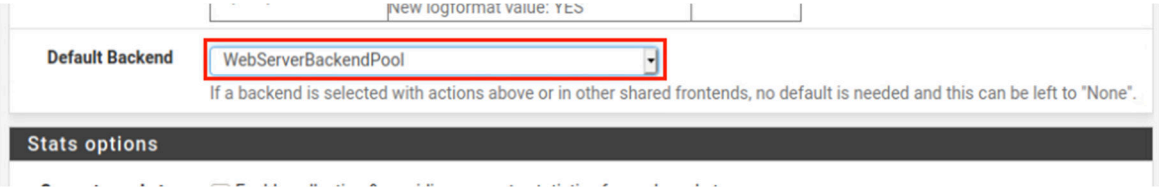

13. Click the **Frontend** tab, then the **Add** button to create an entry.



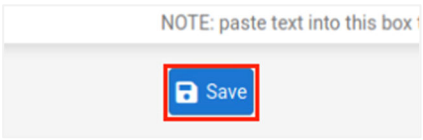

14. In the *Edit HAProxy Frontend* section, fill the following information in each field:
    a. Name: `WebServerFrontend`
    b. Description: `This is the external access point of the webserver.`
    c. Status: **Active**



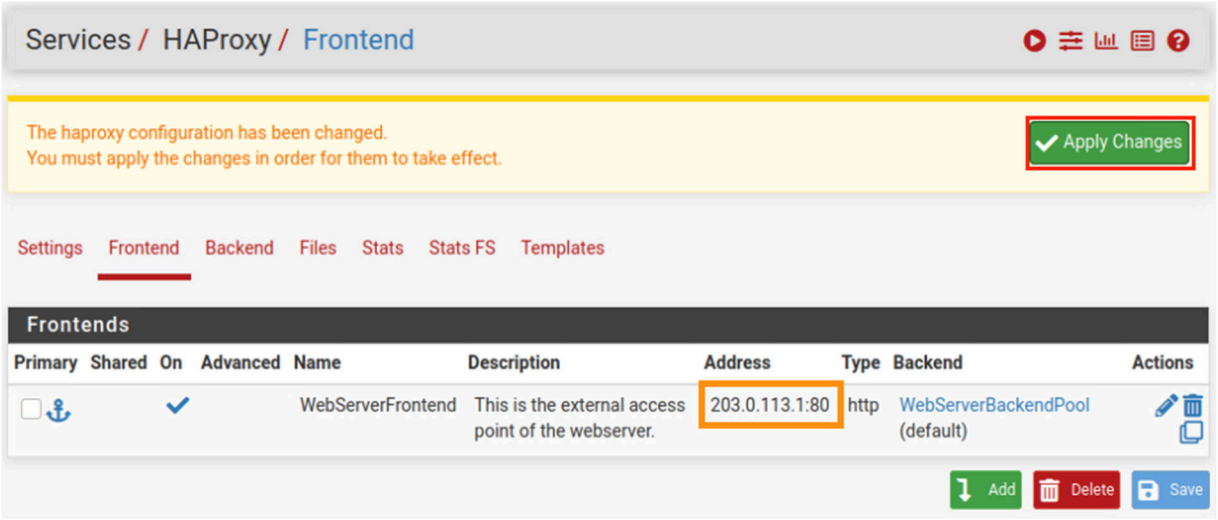

15. In the *External* address, leave its default setting untouched.
16. Scroll down to the right above the *Stats options* section, click the dropdown menu to select **WebServerBackendPool** as the *Default Backend*.



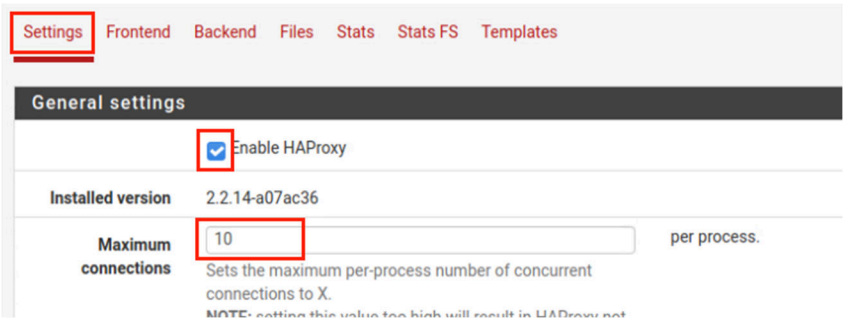
17. Leave the rest of the configurations untouched. Feel free to check and learn any of the other configurations. Once done, scroll down to the bottom and click the **Save** button.



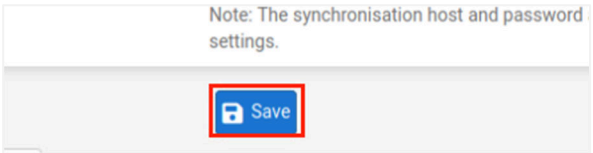

18. Once again, you will see the banner message prompting us the configuration has been changed; click the green **Apply Changes** button. Notice the address *203.0.113.1:80*; remember this. It will be the external/virtual server address we are visiting in a later section.




19. Now, let's activate the Load Balancer. Click on the **Settings** tab, then check the **Enable HAProxy** box, fill in the *Maximum connections* as **10**.

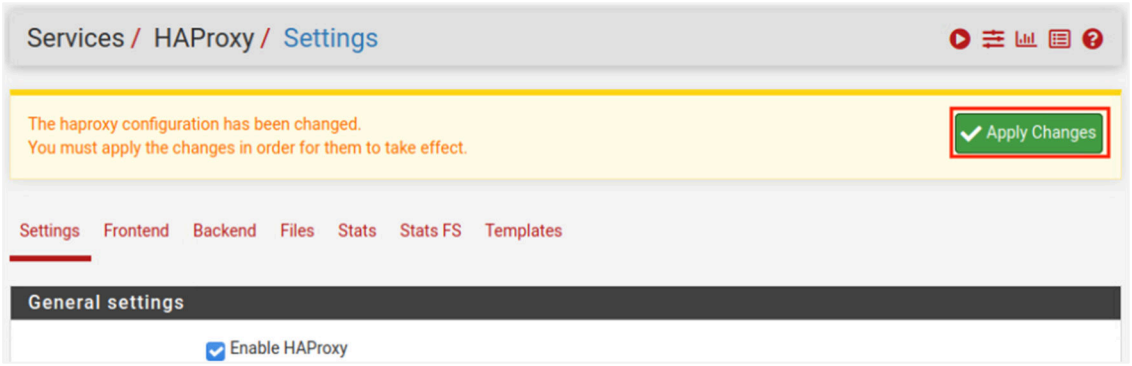



20. Leave the rest of the configurations untouched. Feel free to check and learn any of the other configurations. Once done, scroll down to the bottom and click the **Save** button.



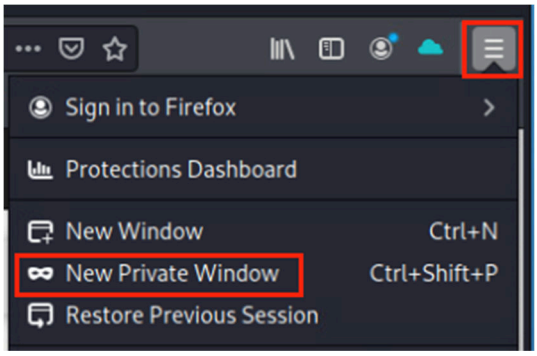
21. The banner message will pop once more; click the green **Apply Changes** button. We have finished setting up the Load Balancing.



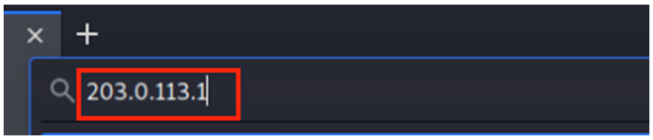

22. Ignore the warning message if it is shown. Proceed to the next section.

## 2.2 Test and Observe the Load Balance

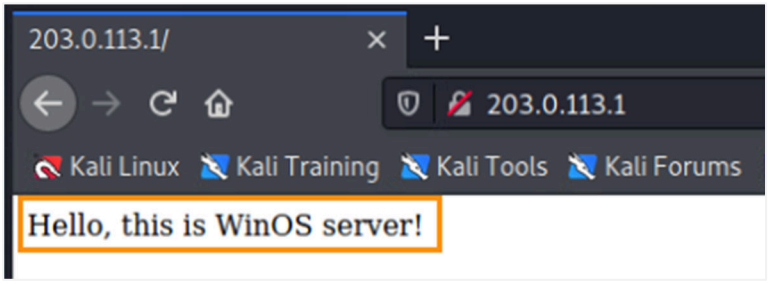
1. In the *Firefox* browser, let's start a private window. Click on the menu button at the top-right corner, then click the **New Private Window** option.



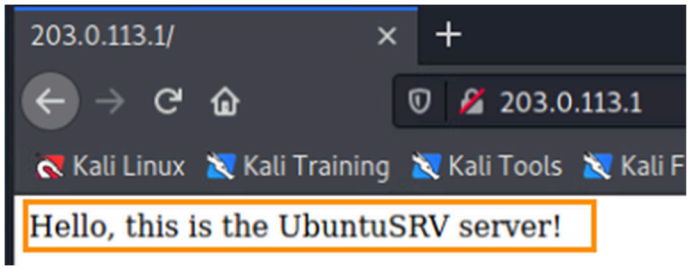

2. In the address bar, type the external/virtual server address shown in Section 2.1, step 18. You can ignore the port number since it is on default HTTP port 80. Press **Enter**.



3. You should see the hello message from the *WinOS server* (this server is the first one in the Backend Pool list).




4. Click the **Refresh** button a few times to observe the change in the hello message. It should be alternating between the *WinOS* and *UbuntuSRV* servers.




Thinking about how load balancer deals with sessions? For example, if a user is on an e-Commerce website, refreshing the page will likely clear the shopping cart. How annoying that is!
Our lab does not deal with sticky sessions, you may want to do a Google search and practice how to use a sticky session.

5. The lab is now complete; you may end the reservation.