How to install PFSense and configure LAN, WAN and DMZ network on it

Introduction

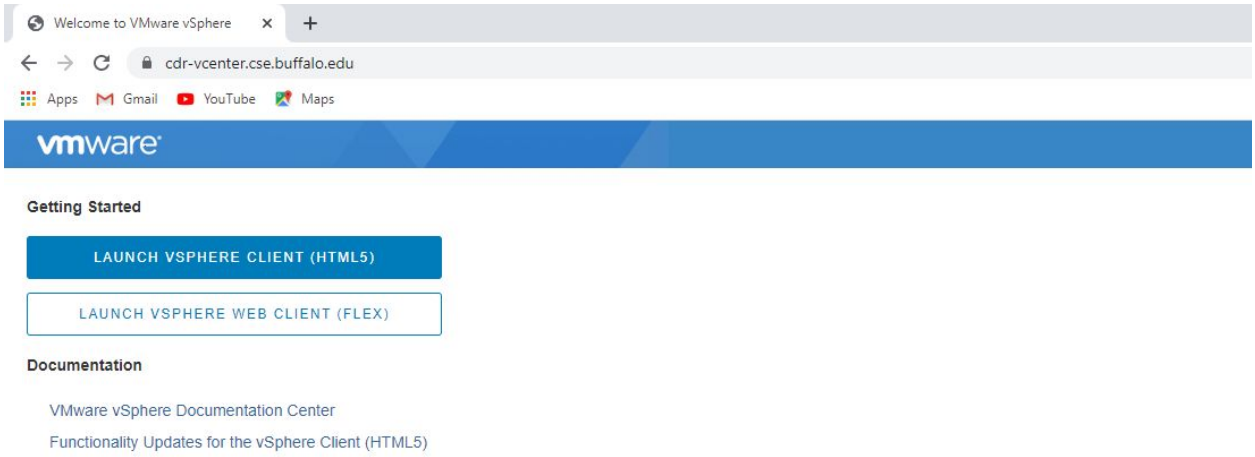
The pfSense project is a free network firewall distribution, based on the FreeBSD operating system with a custom kernel and including third party free software packages for additional functionality. pfSense software, with the help of the package system, is able to provide the same functionality or more of common commercial firewalls, without any of the artificial limitations. pfSense software includes a web interface for the configuration of all included components. There is no need for any UNIX knowledge, no need to use the command line for anything, and no need to ever manually edit any rule sets.
For more info you can go to https://www.pfsense.org/getting-started/ .
In this module, we are going to setup pfSense and configure our LAN, WAN and DMZ network on it.

Prerequisites

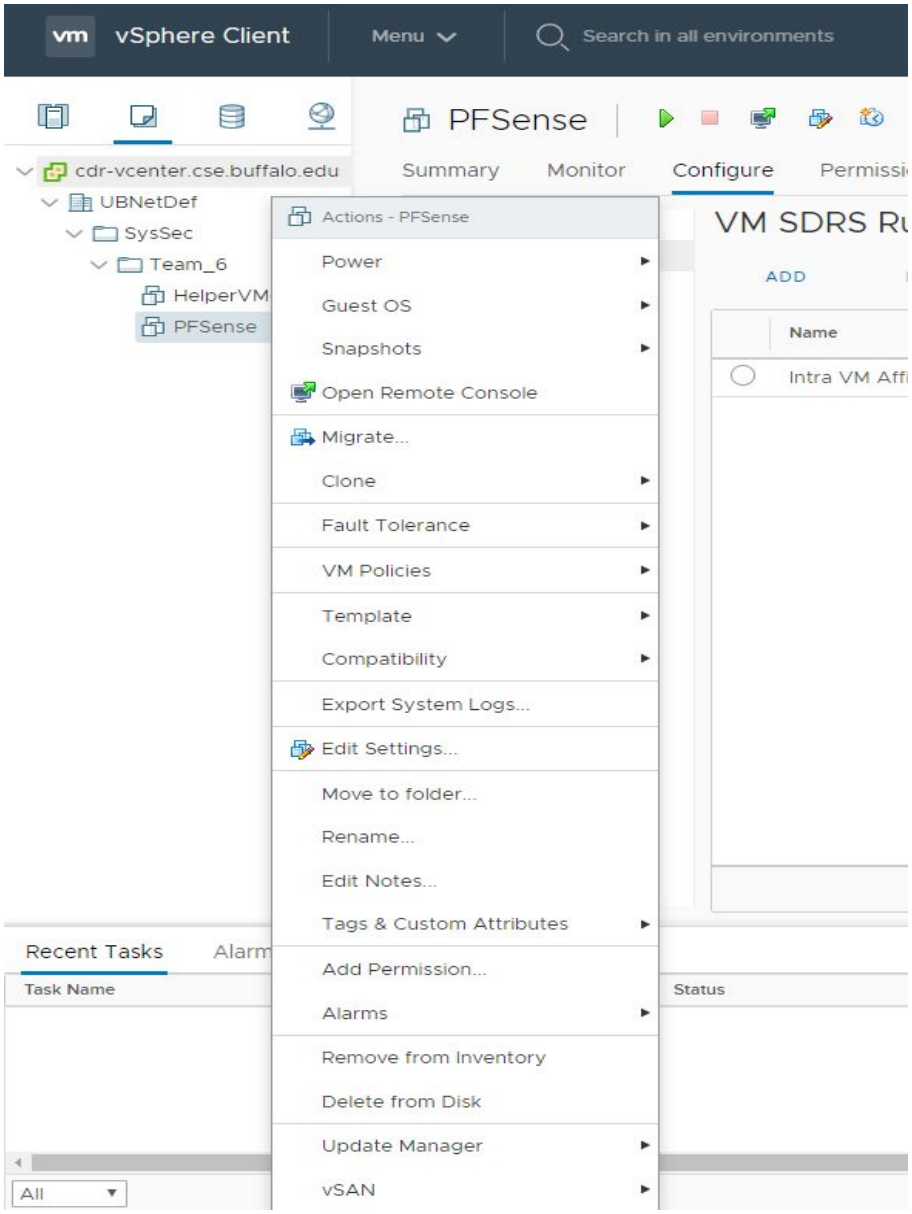
In a general scenario need to have a router, 2 switches and one helper machine(ubuntu based will work) and some connecting medium(wires). We also need to have a pfsense ISO file to install it on the router. In our case, since we are using vms on the vcenter and resources are already provided to us including pfsense ISO, we don't need to do much beforehand.
Also, we are connecting to the internet via our server gretzky which may not be there in a regular home network(for example.).
You check check your internet connection, that's important!

Loading the ISO Image on vCenter

1. First goto cdr-vcenter.cse.buffalo.edu and click on LAUNCH VSHPERE CLIENT (HTML5) as shown below -

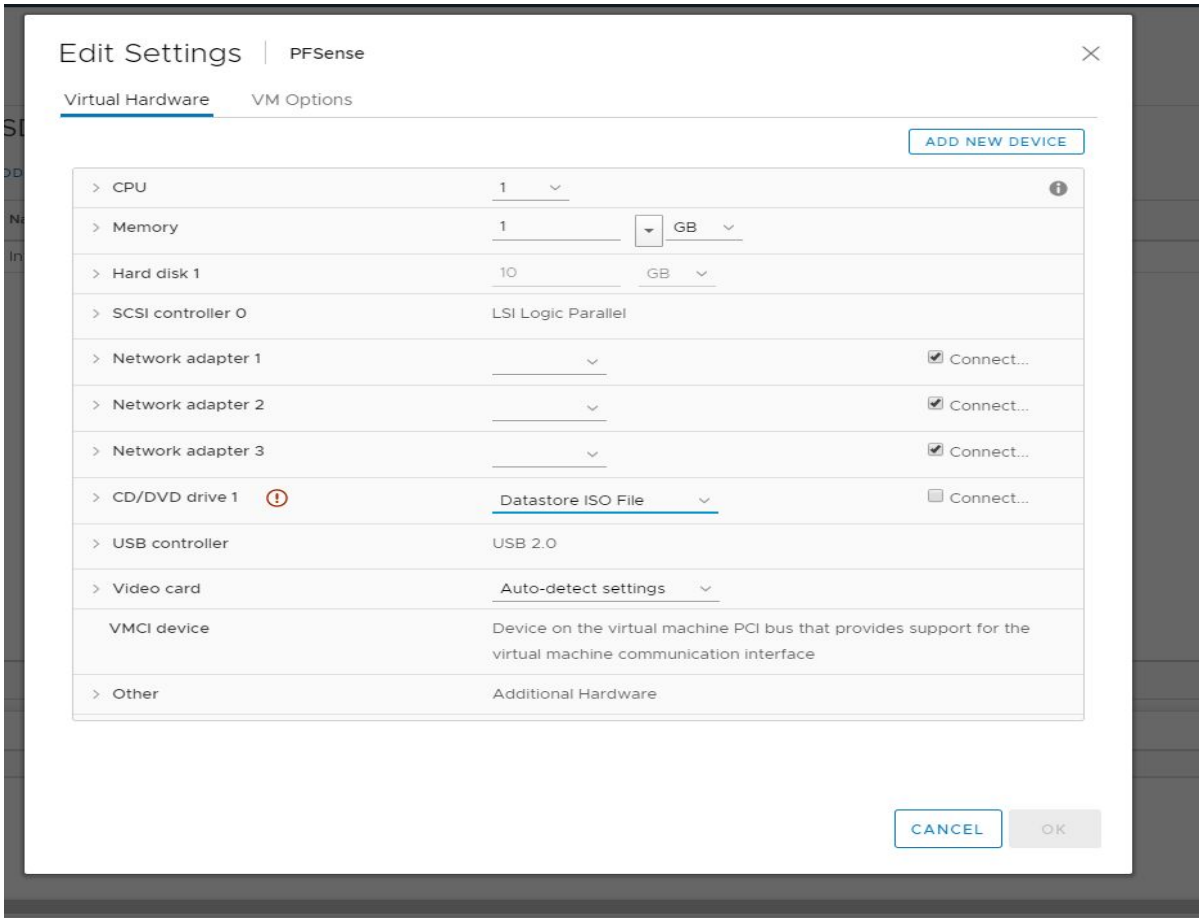


2. Login with your vcenter username and password which will be as follows -
   'ad/UBITName'
   'UBIT-password'
3. On the first screen, goto the VMs and Templates option (second tab) on the left bar as shown in the figure below and go inside cdr-vcenter.cse.buffalo.edu > UBNetDef > SysSec > Team6. Here you can find two vm's , HelperVM and PFSense. Right click on PFSense and go to Edit Settings option.

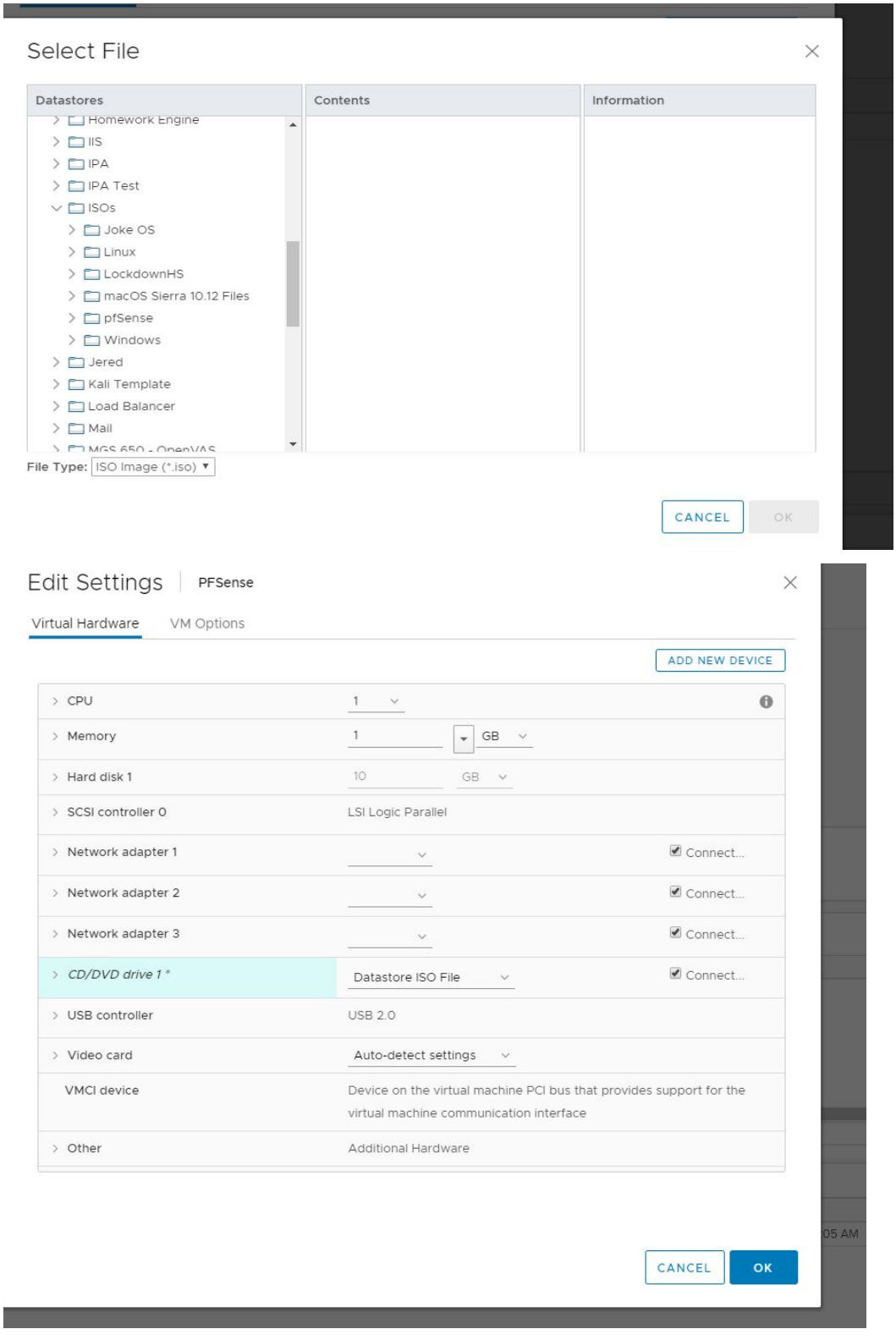


4. In Edit Settings , select Virtual Hardware tab , goto CD/DVD drive 1 and select Datastore ISO File option as shown below, and then a prompt will open(Ignore the red warning in the figure

below, if you get one, try to reopen the prompt as mentioned in step 3).

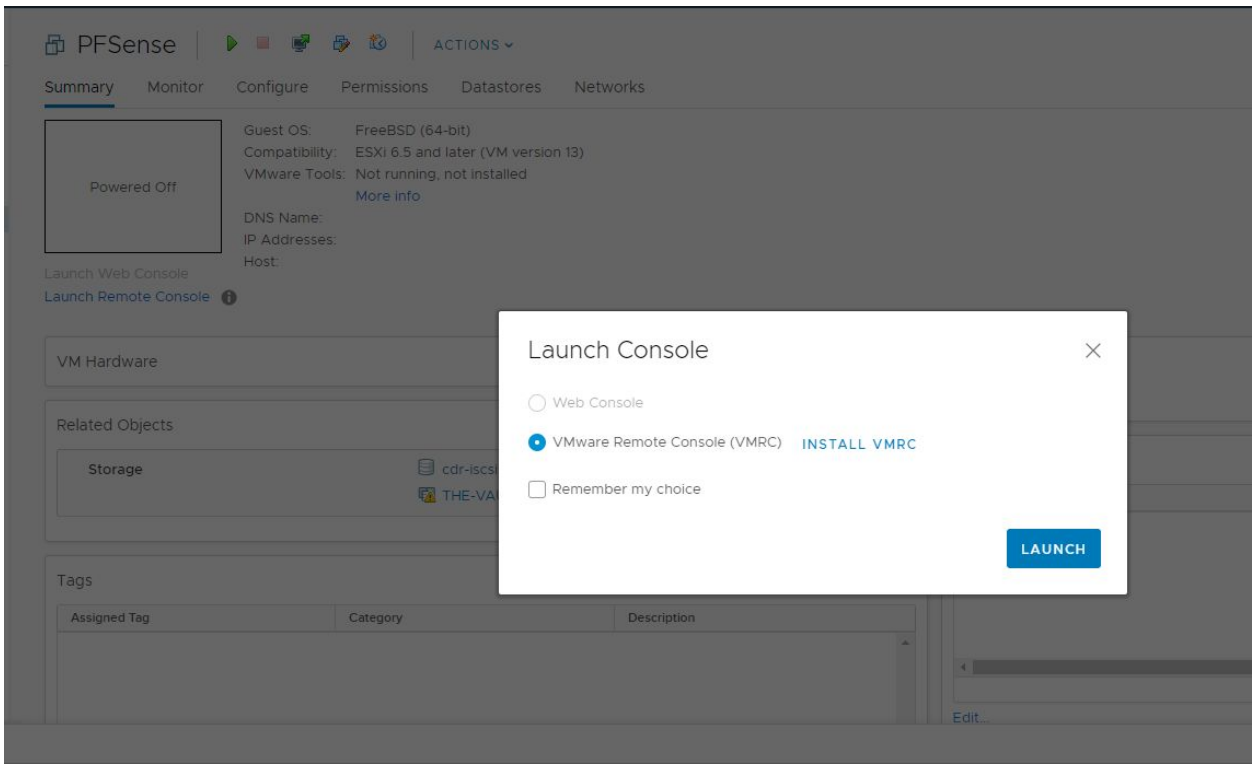


5. In this prompt, select cdr-iscsi1>ISO>pfsense to select an ISO. Also, you need to check the connect box next to the Datastore ISO File as shown in figure(second) below and click OK.

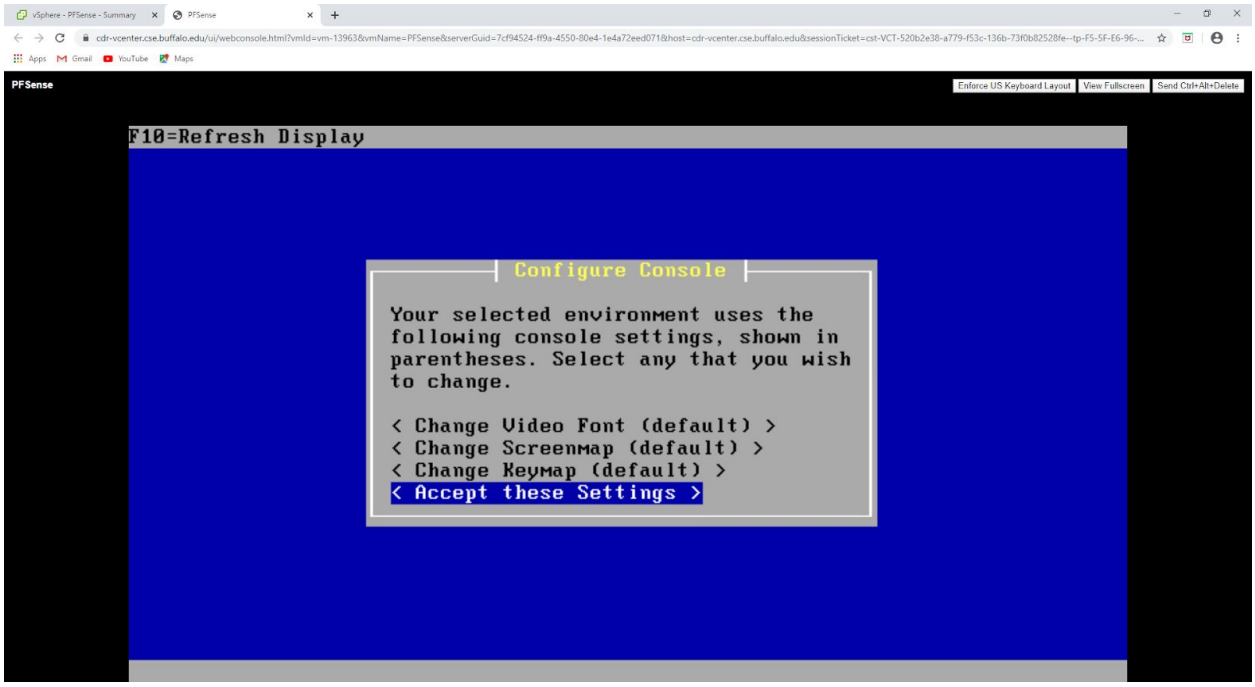

Select File
Datastores
Contents
Information
Homework Engine
IIS
IPA
IPA Test
ISOs
Joke OS
Linux
LockdownHS
macOS Sierra 10.12 Files
pfSense
Windows
Jered
Kali Template
Load Balancer
Mail
File Type: ISO Image (*.iso)
CANCEL
OK
Edit Settings | PFSense
Virtual Hardware
VM Options
ADD NEW DEVICE
CPU 1
Memory 1 GB
Hard disk 1 10 GB
SCSI controller 0 LSI Logic Parallel
Network adapter 1 Connect...
Network adapter 2 Connect...
Network adapter 3 Connect...
CD/DVD drive 1 * Datastore ISO File Connect...
USB controller USB 2.0
Video card Auto-detect settings
VMCI device Device on the virtual machine PCI bus that provides support for the virtual machine communication interface
Other Additional Hardware
CANCEL
OK

Installing PFSense

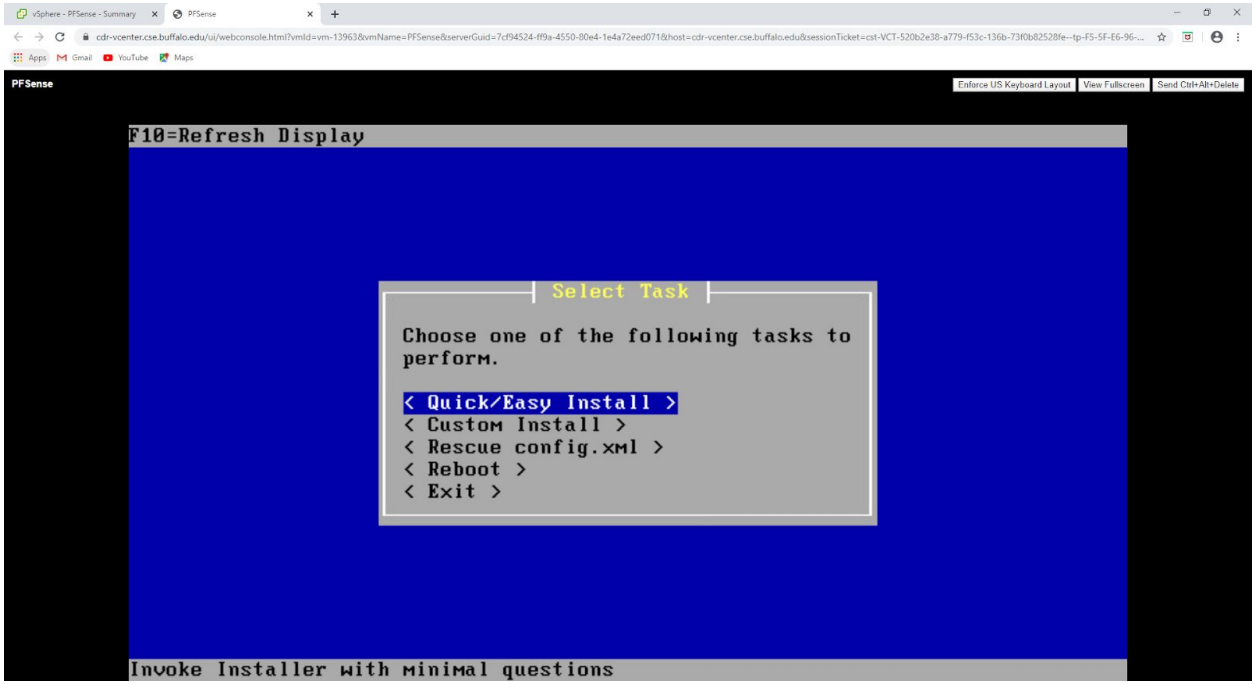
1. On the PFSense Tab, click on the play button to turn on the VM and click Launch Web Console or Launch Remote Console (If you have VMWare Workstation or Player).



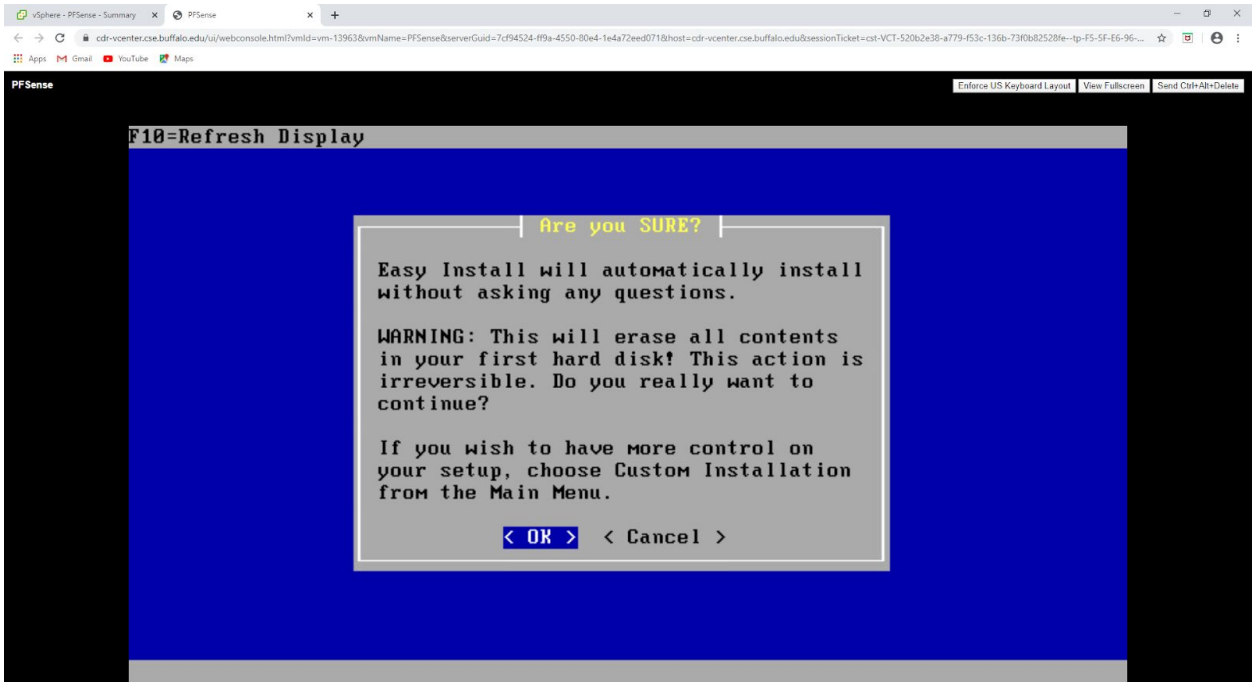
2. On the first screen as shown below, there is an option to modify the console settings, but for now you don't need to change them, so select Accept these Settings option.



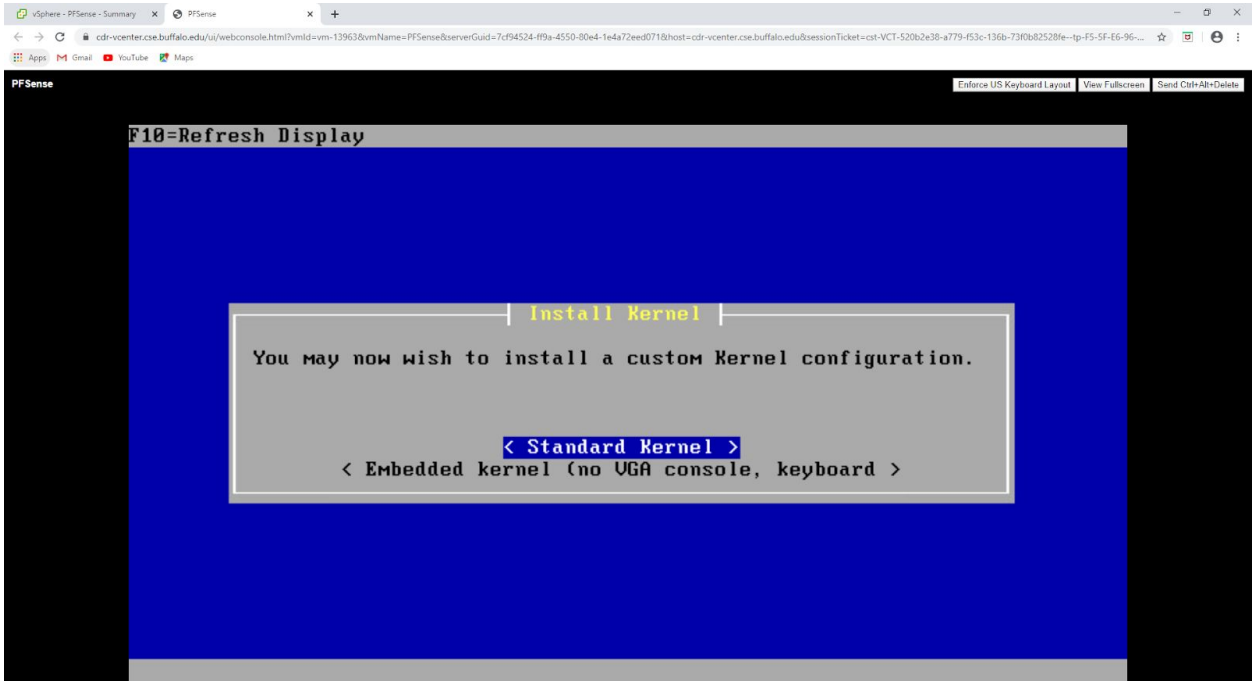
3. On the next screen, we should choose the Quick/Easy Install option for now.



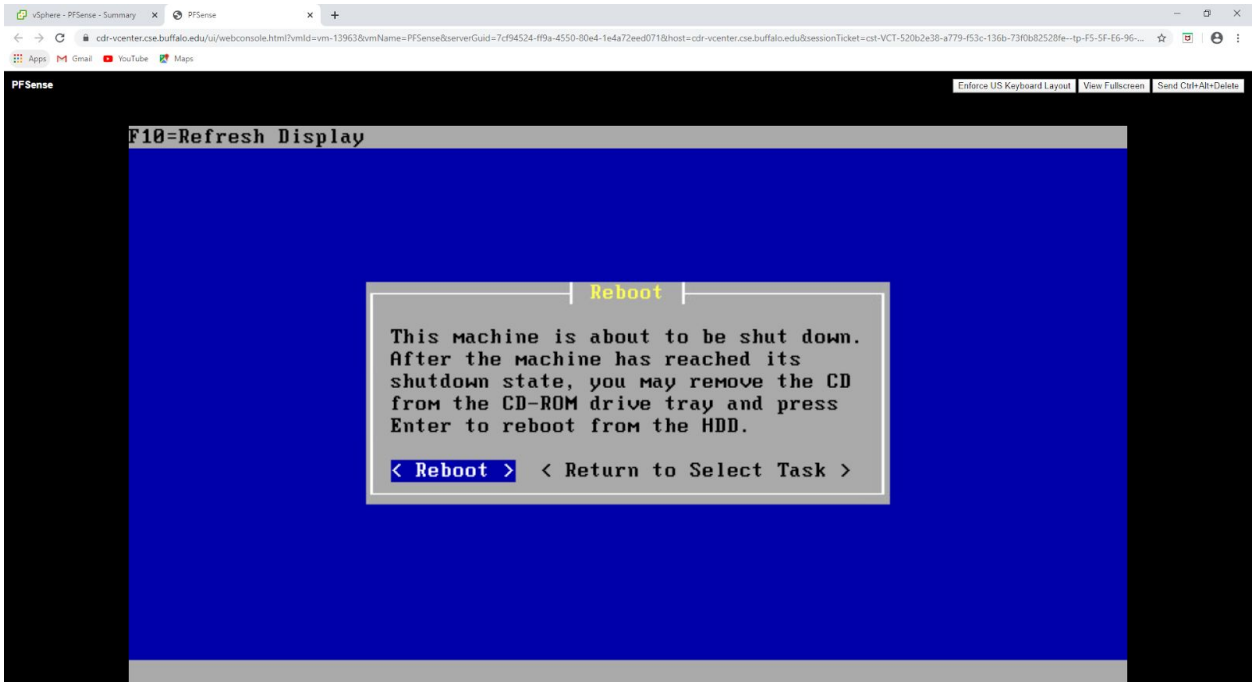
4. Then it confirms our choice and gives a warning regarding going with this option. You can ignore that warning for now.



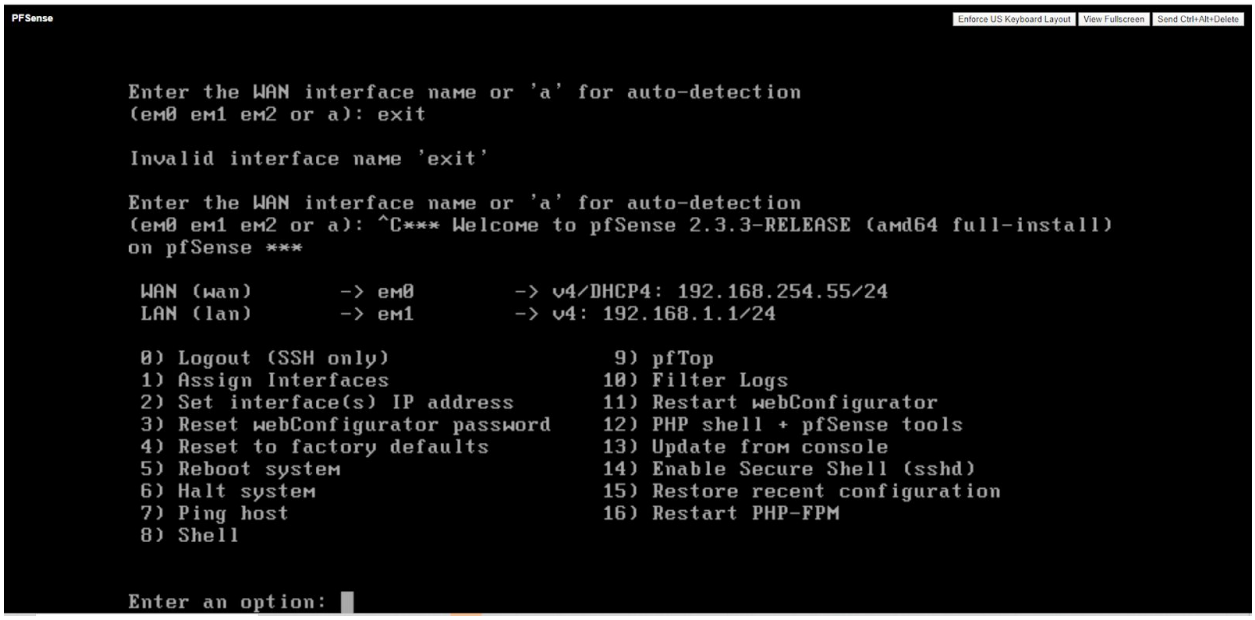
5. Now it will take some time to execute commands. After that, it will ask for kernel installation. Choose the standard kernel option as shown.



6. Now the Installation is complete and its asking for a reboot permission. Select the Reboot option.

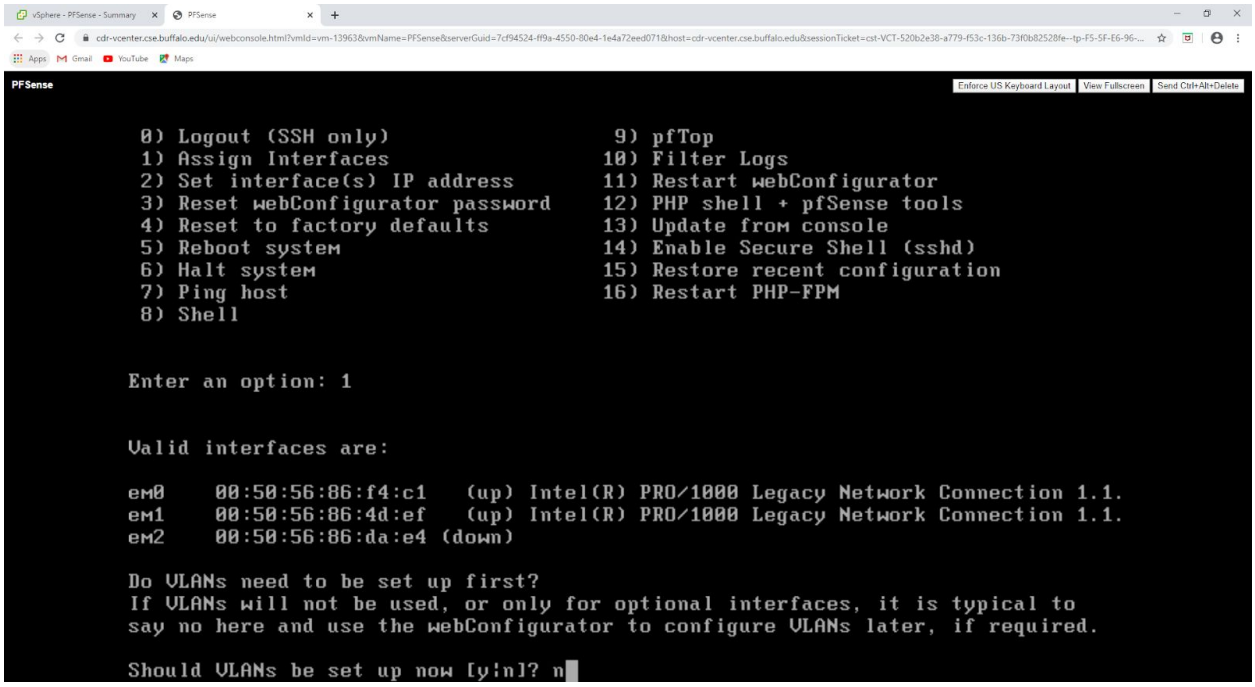


7. The following is the screen that you will get after the first reboot.



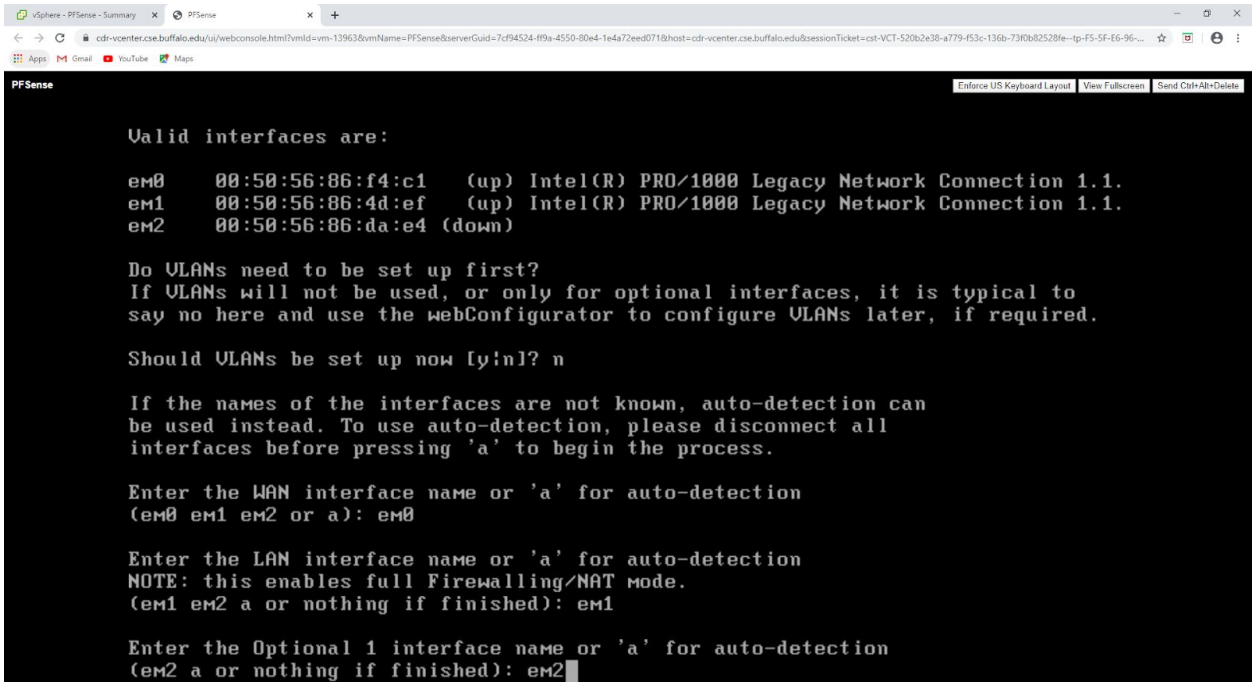
Assigning Interfaces

1. Select option 1 , i.e., Assign Interfaces. It will show a list of valid interfaces and it will ask to setup VLANs, choose n for now.

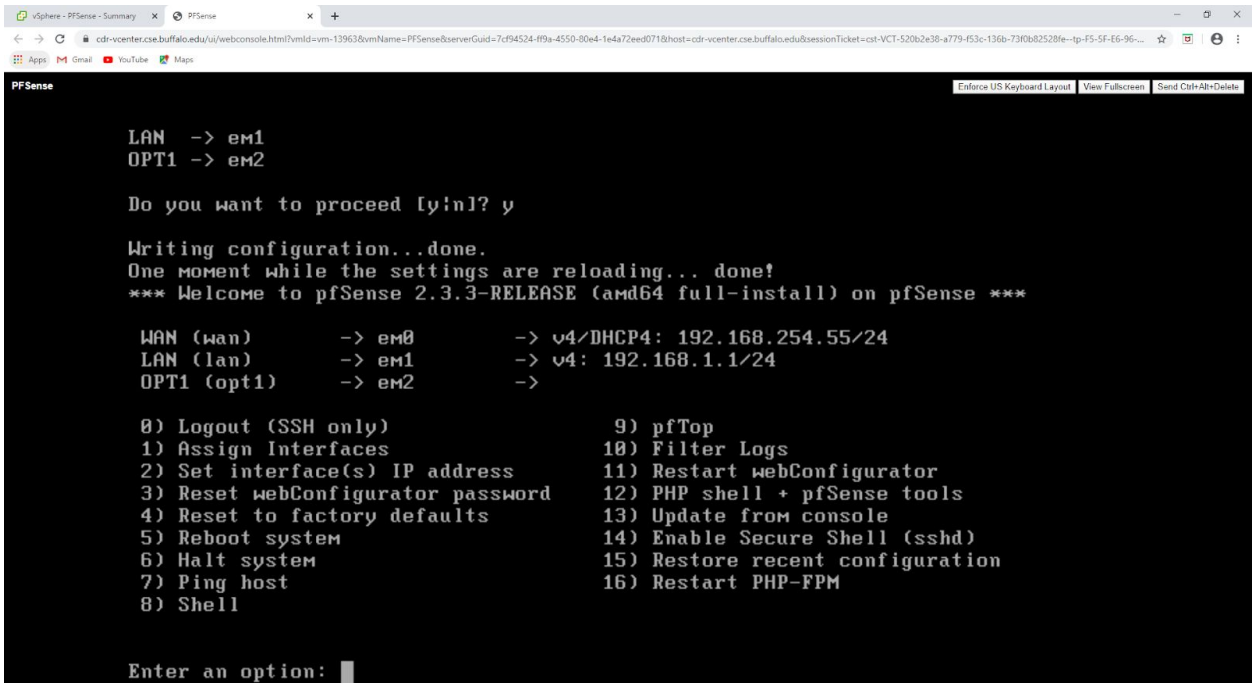


2. Now we need to assign interfaces, first it will ask for wan interface, then lan interfaces and after that it will ask if we want to select any other interface. Since we need 3 interfaces for wan, lan and dmz, we will assign em0 to wan, em1 to lan and em2 to dmz(currently option 1), and when

we are done we need to press enter without entering a response(mentioned on the console).

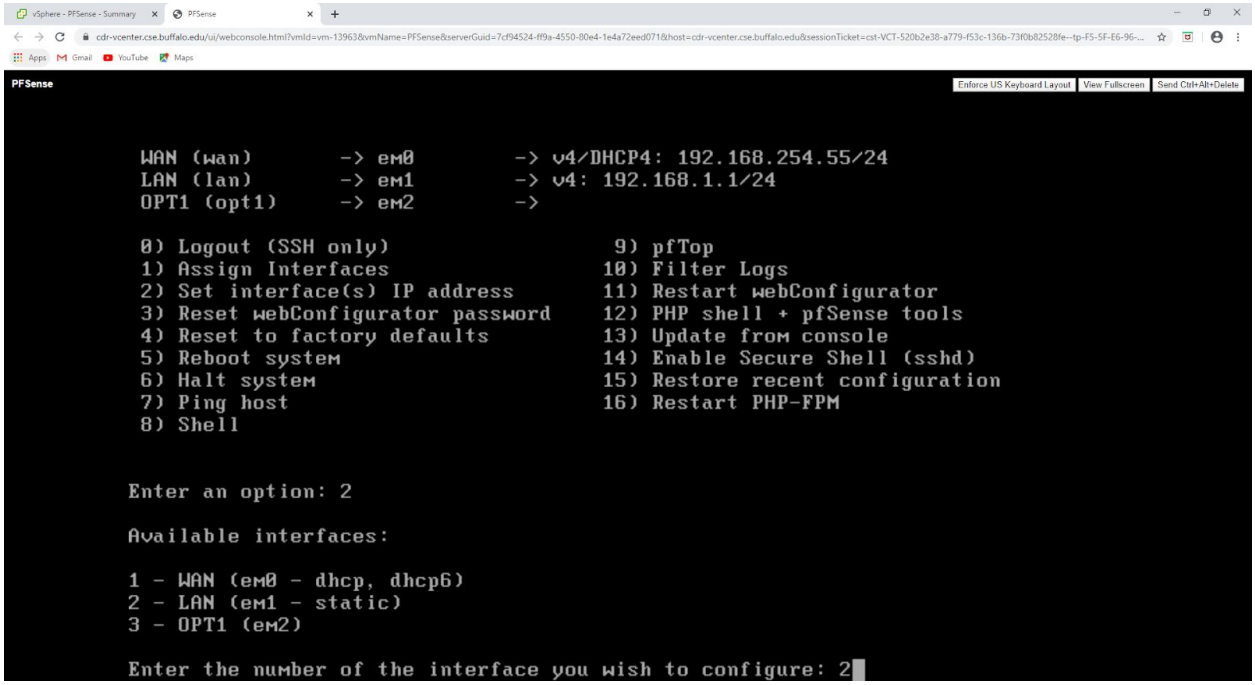


3. Now we can see that the interfaces have been assigned as shown below.



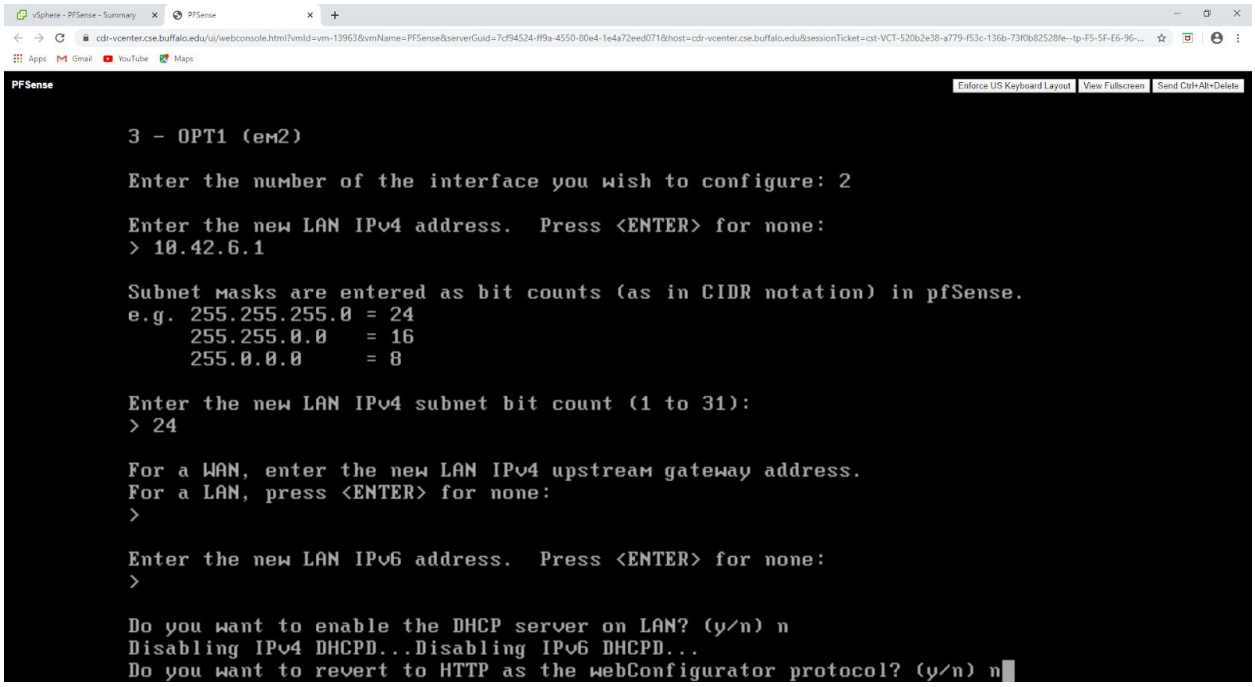
Configure LAN

1. Now select option 2 ,i.e., Set interface(s) IP address. It will show a list of available interfaces. Select the option for LAN as shown below.

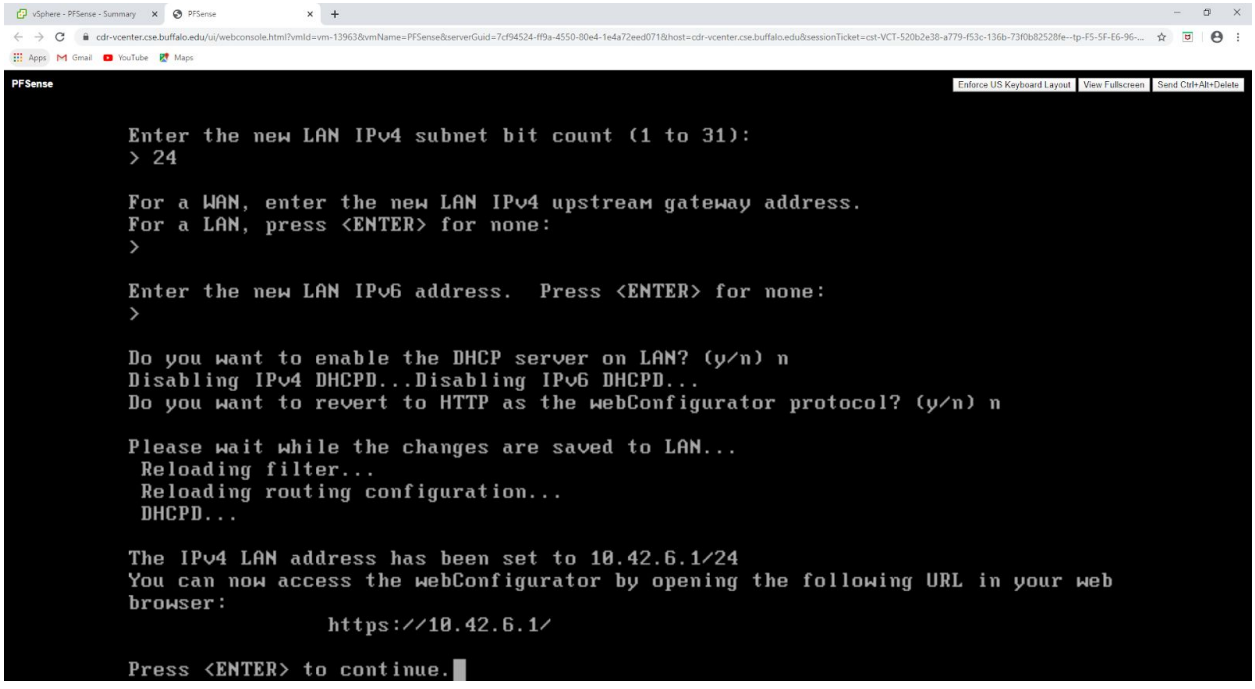


2. Now enter the IP address you want to assign to LAN interface, in my case its, 10.42.6.1 . Now it will ask for subnet bit count, enter 24, which is standard. It will ask for upstream gateway and IPv6 address, leave them empty. For Enabling DHCP type n and for revert to HTTP option type n

as well and press enter.

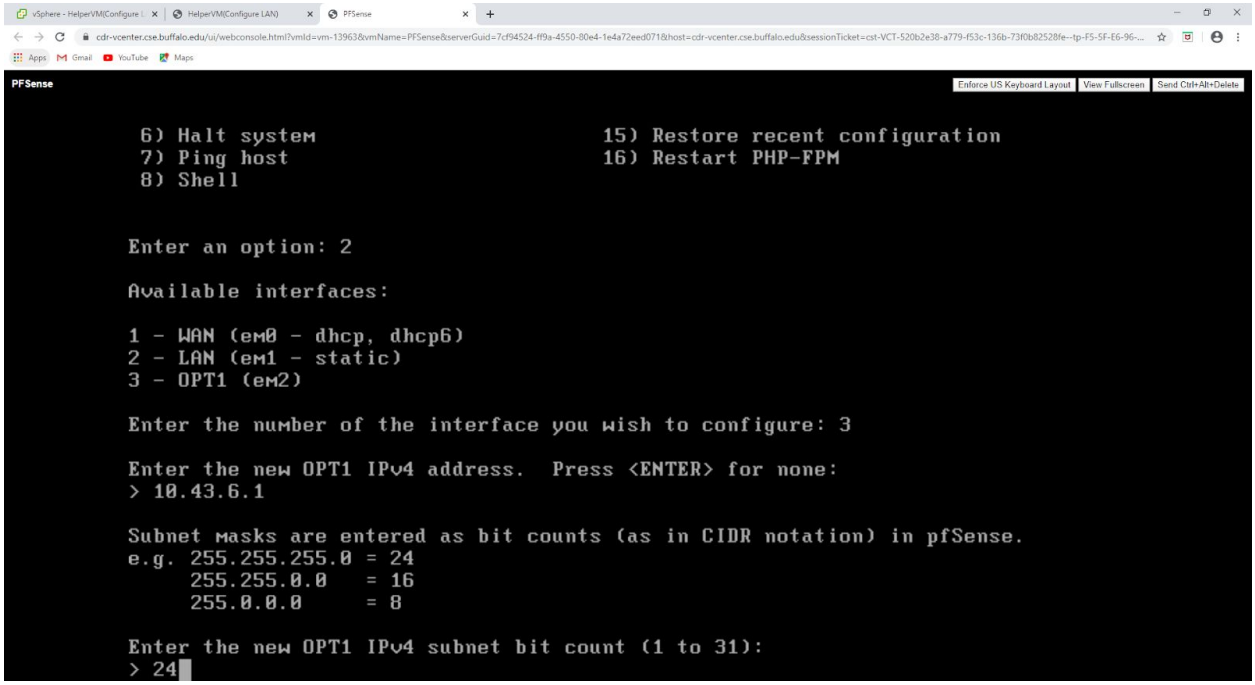


3. Now it will ask to press enter and now you have configured LAN.

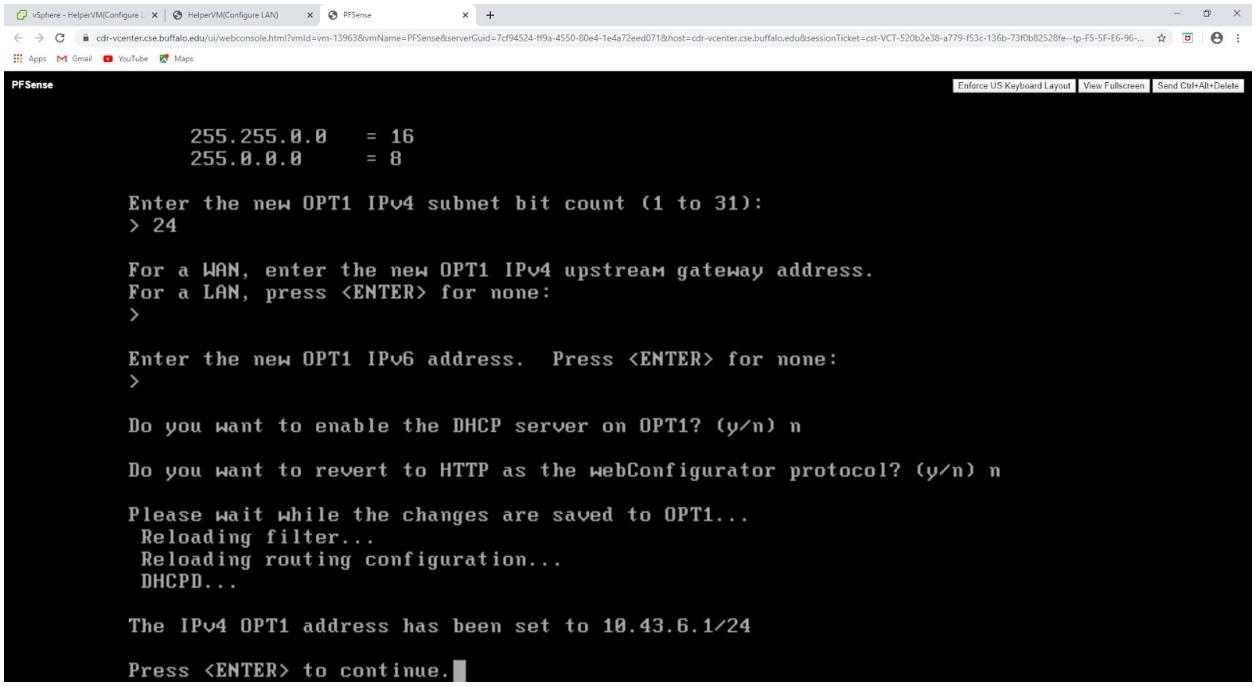


Configure DMZ(Option 1) and WAN

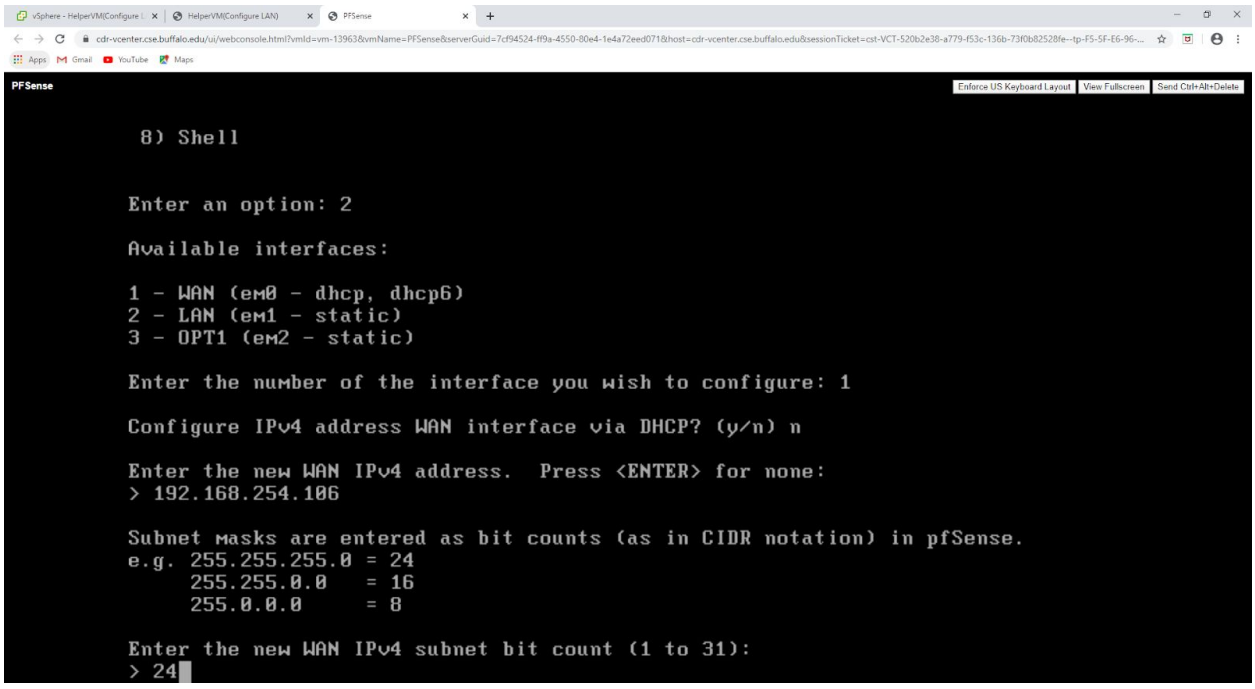
1. Now we need to configure DMZ and WAN in the similar fashion as LAN. Let's start with DMZ(Option 1, I will refer it as DMZ). Select option 2 from main menu (Set interface(s) IP address) and select interface 3 which we assigned to the DMZ. After that enter the IP address of DMZ which is 10.43.6.1 in our case and then enter subnet mask bit count as 24.



2. Leave the upstream gateway address and IPv6 address empty. Select the DHCP server as n and revert to http as n as well. Press enter to finish DMZ configuration.

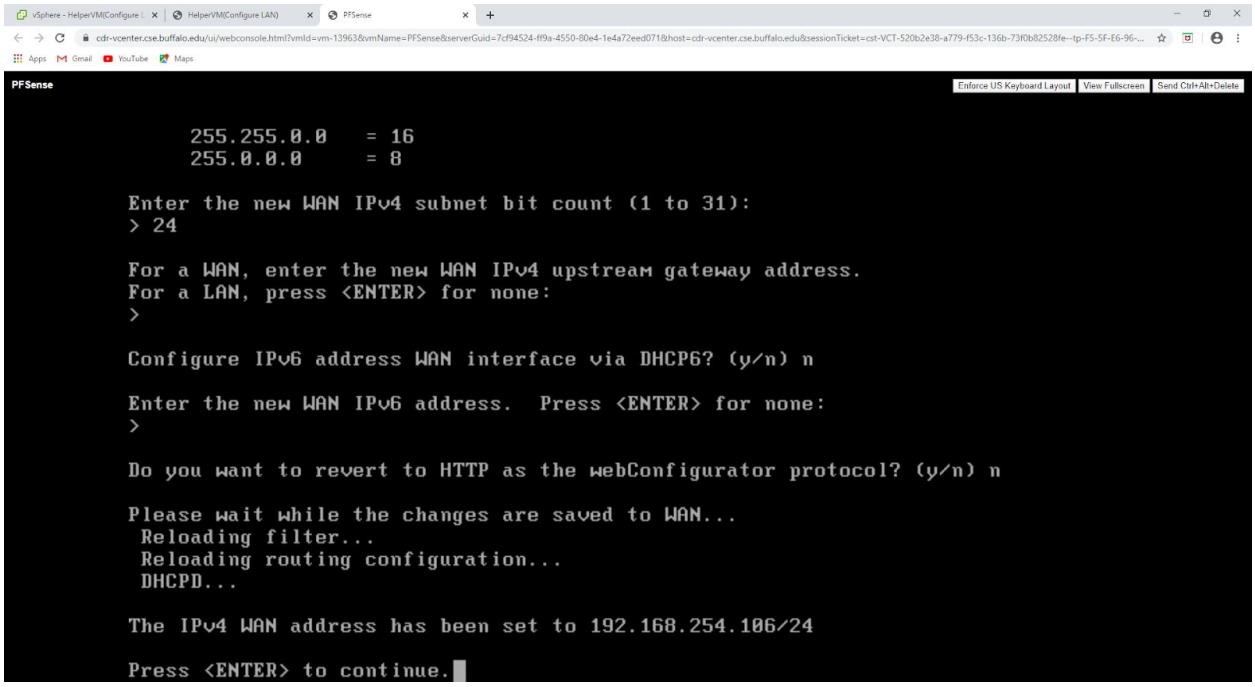


3. For WAN, select option 2 from main menu (Set interface(s) IP address) and select an interface for WAN which is 1 in our case. Enter the WAN ip address which is 192.168.254.106 and subnet mask bit count as 24.



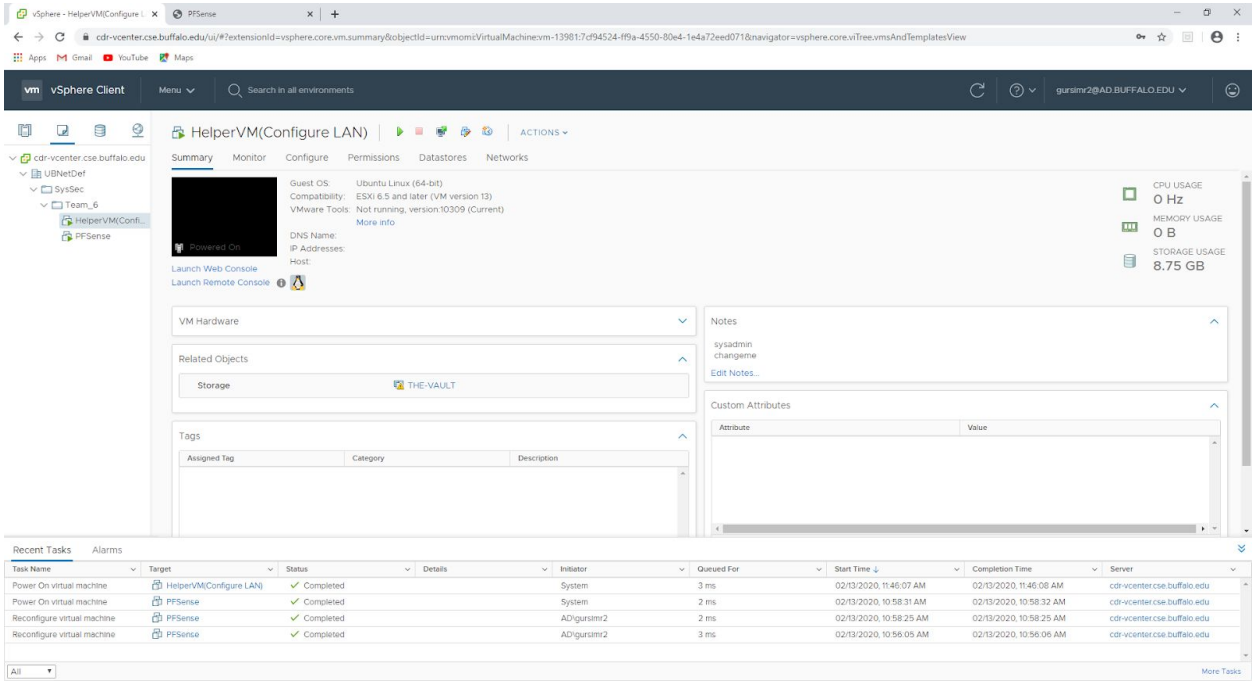
4. Select upstream gateway empty, then type n for DHCP6 and then leave empty for IPv6 address. Enter revert to HTTP as n as well. Then press enter. Please follow the screen shots if you have

any doubts in it.

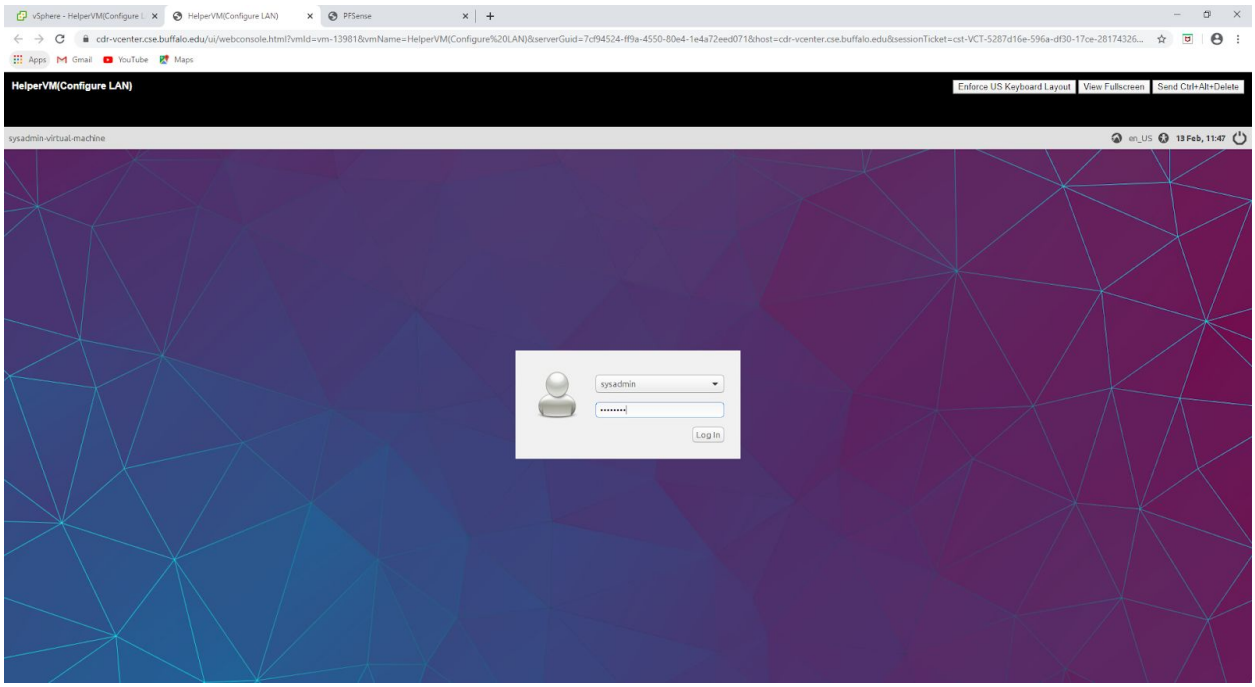


Helper VM Configuring LAN

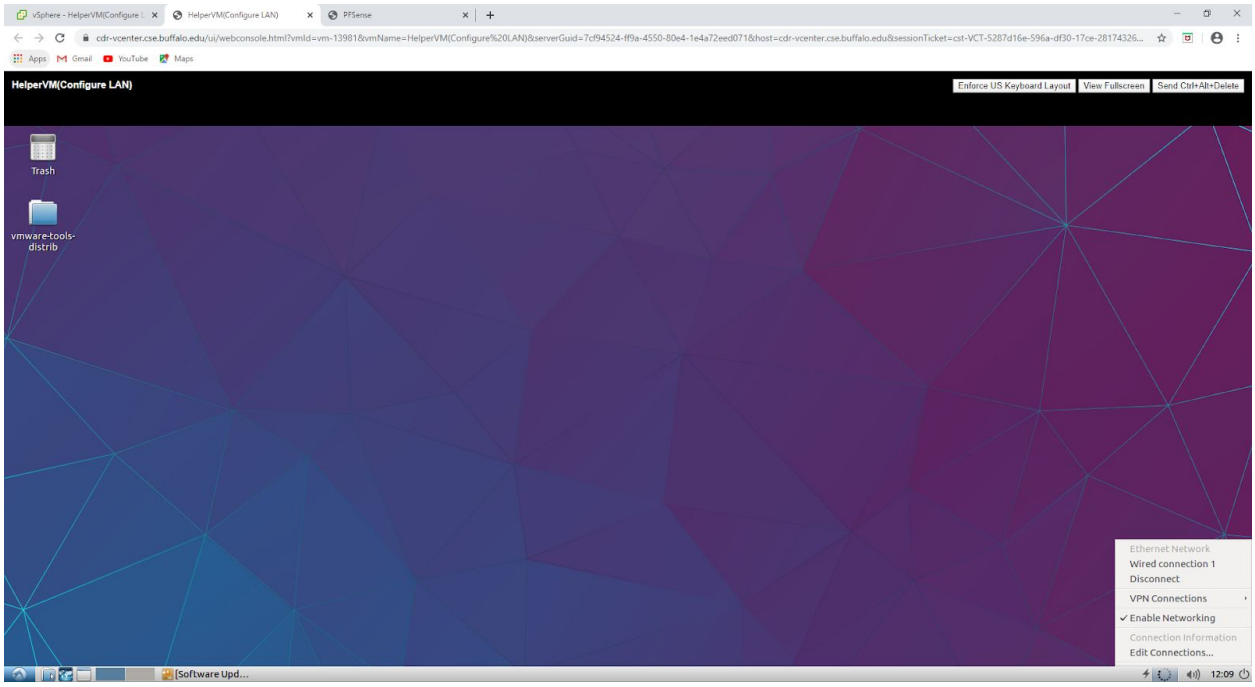
1. Go back to the vSphere Client tab, and click on the HelperVM option next to PFSense mentioned on the left sidebar. Click the play option to start the VM.



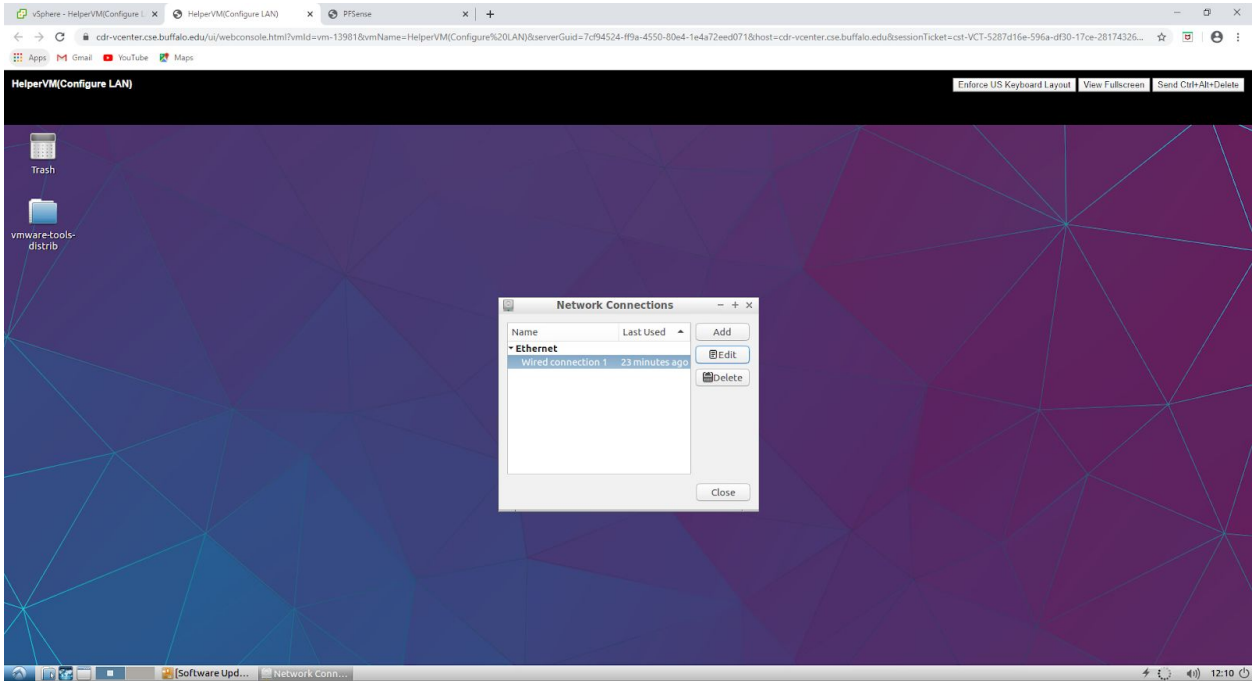
2. Login to VM as sysadmin with password changeme.



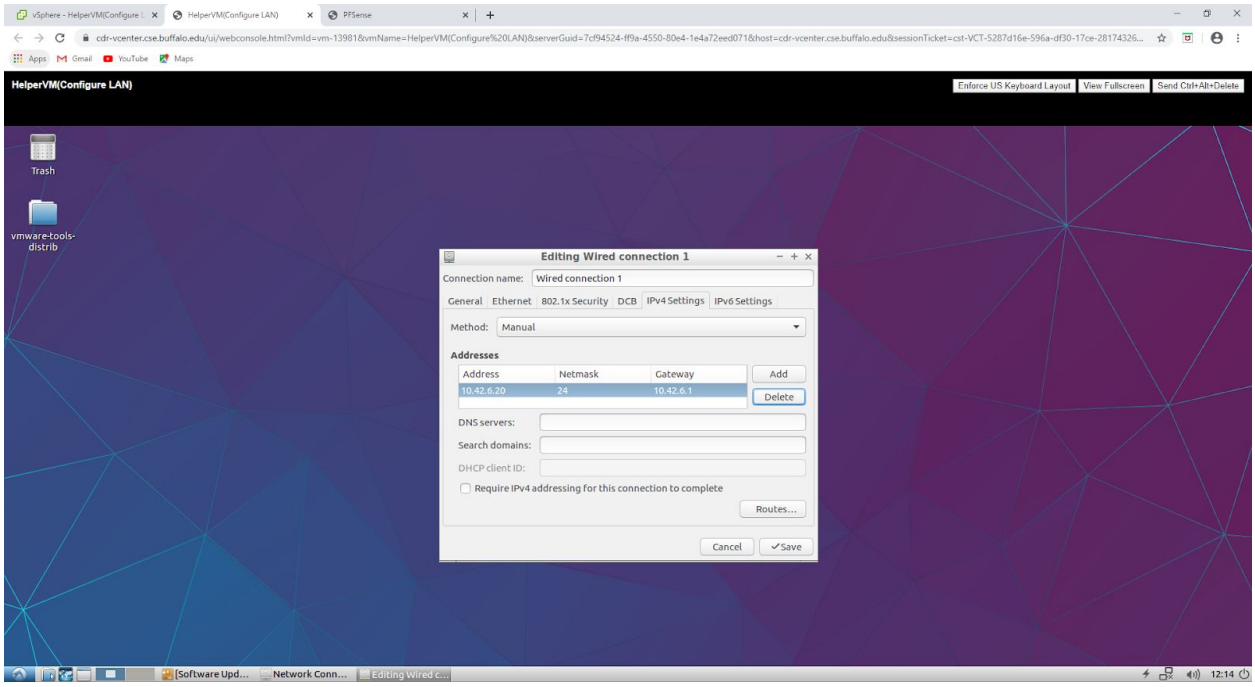
3. After the VM is loaded, click on the network icon in the bottom right of the screen and select Edit Connections.



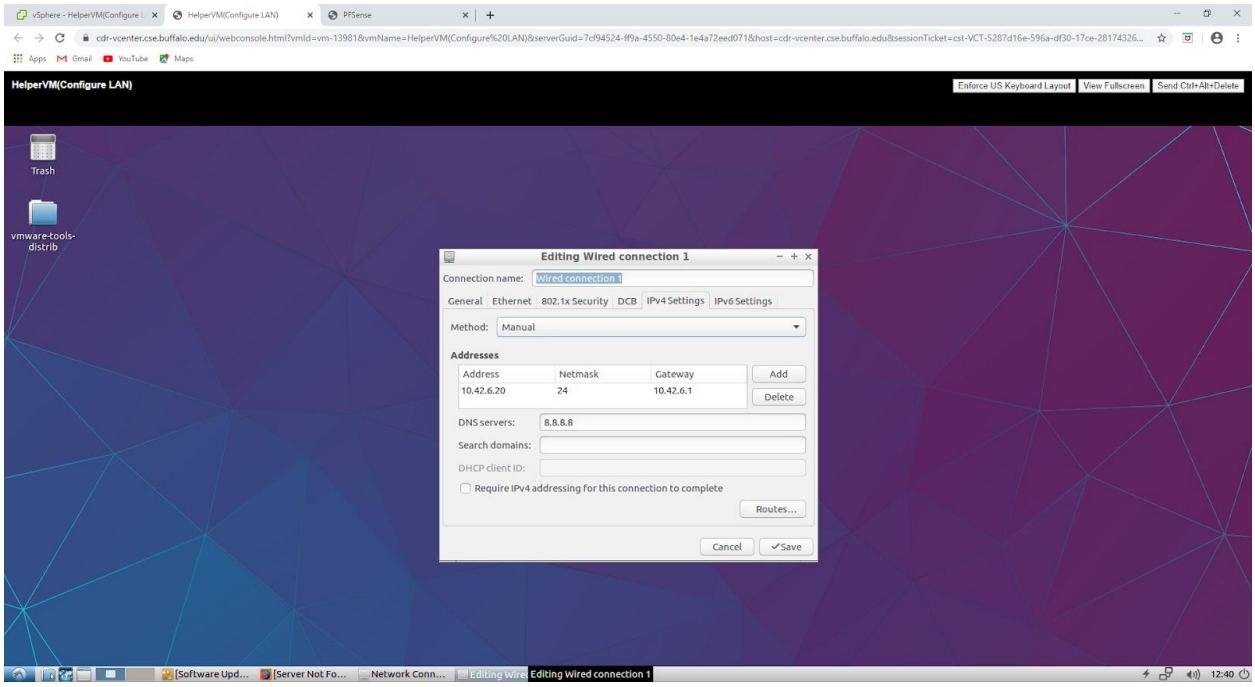
4. Select the wired connection and click on edit.

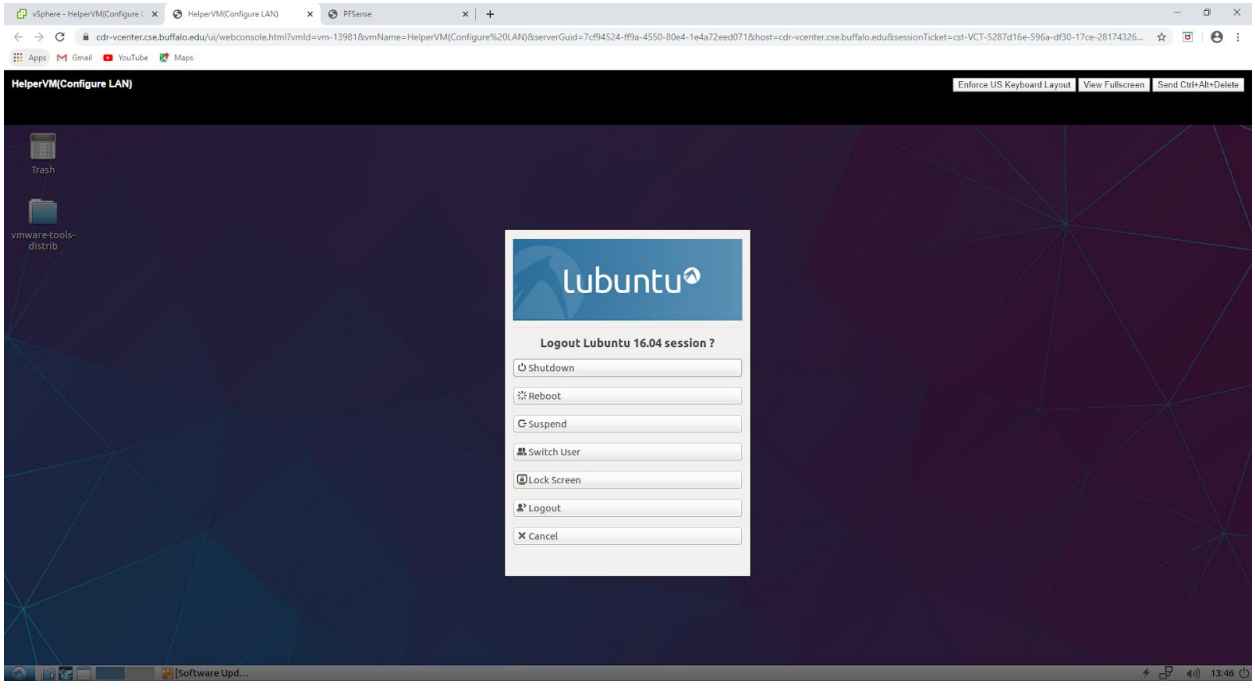


5. Click on IPv4 Settings Tab, select the Method as manual and click on Add next to Addresses to enter address, netmask and gateway which will be 10.42.6.20 , 24 and 10.42.1.1 in our case. The address can be anything between 10.42.6.2 and 10.42.6.253.



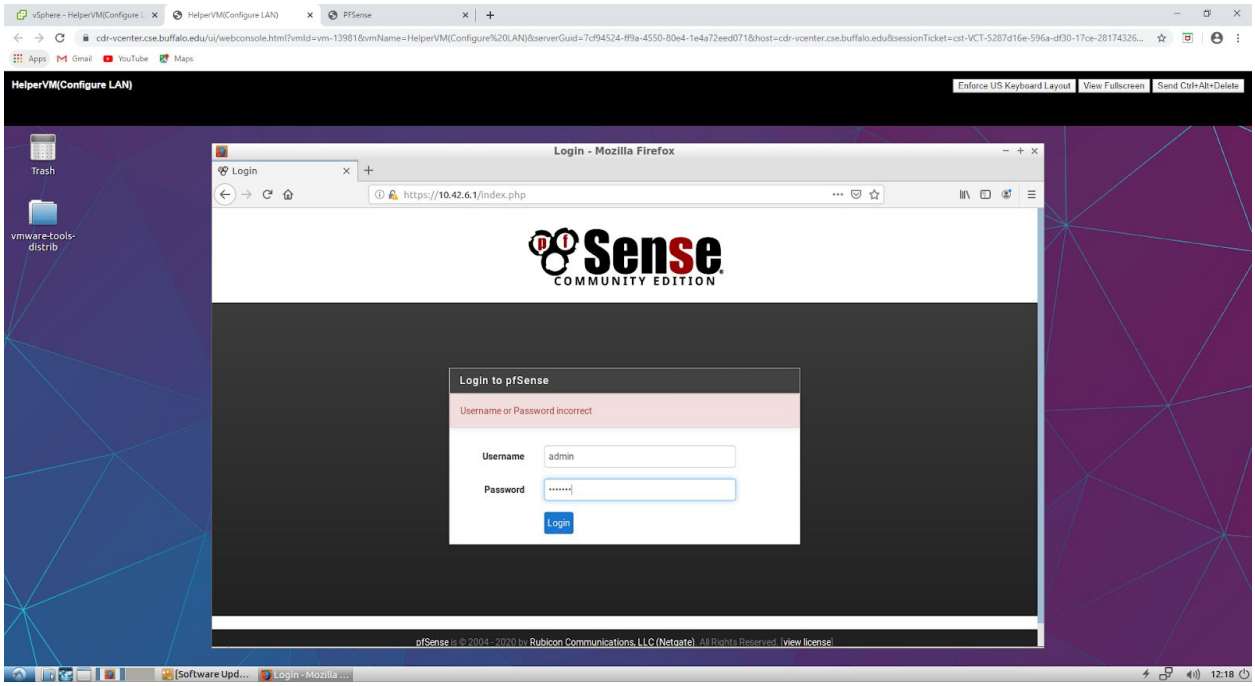
6. Set DNS Server as 8.8.8.8 which is a public DNS. Click Save to finalize the settings. You will need to reboot to apply these settings.


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
Editing Wired connection 1
Connection name: Wired connection 1
General
Ethernet
802.1x Security
DCB
IPv4 Settings
IPv6 Settings
Method: Manual
Addresses
Address
Netmask
Gateway
10.42.6.20
24
10.42.6.1
Add
Delete
DNS servers: 8.8.8.8
Search domains:
DHCP client ID:
Require IPv4 addressing for this connection to complete
Routes...
Cancel
Save
[Software Upd...
[Server Not Fo...
Network Conn...
Editing Wired connection 1
12:40

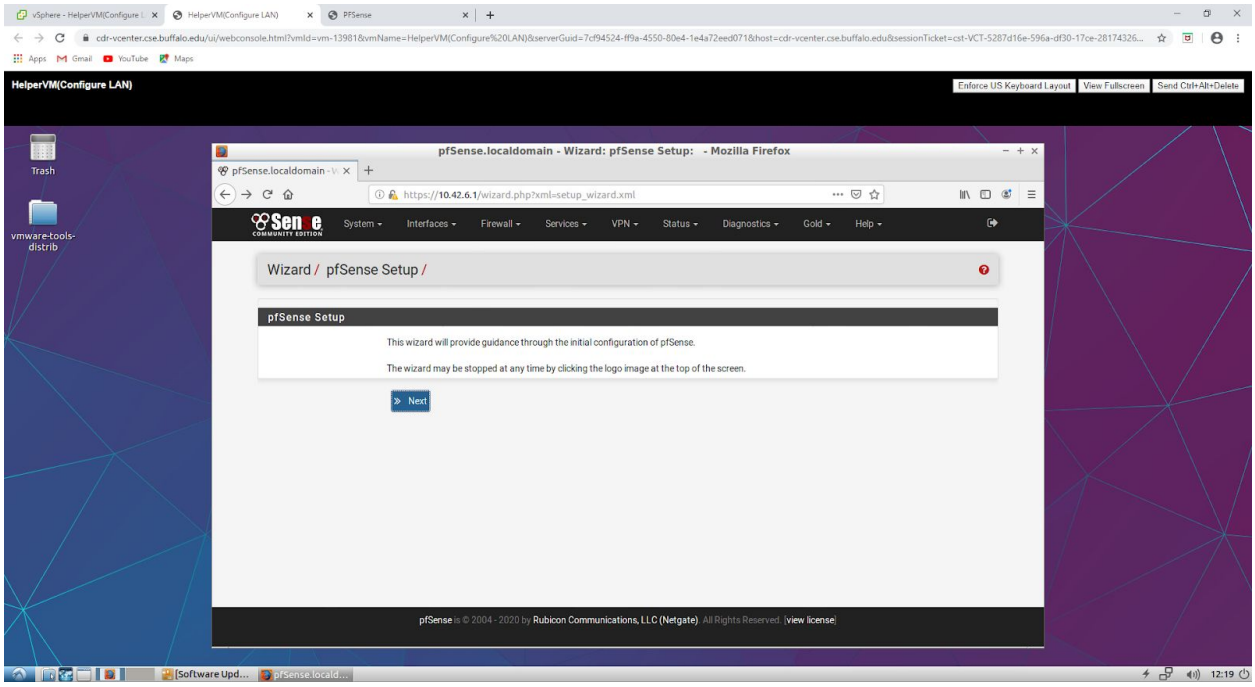

HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
Lubuntu
Logout Lubuntu 16.04 session ?
Shutdown
Reboot
Suspend
Switch User
Lock Screen
Logout
Cancel
[Software Upd...
13:46

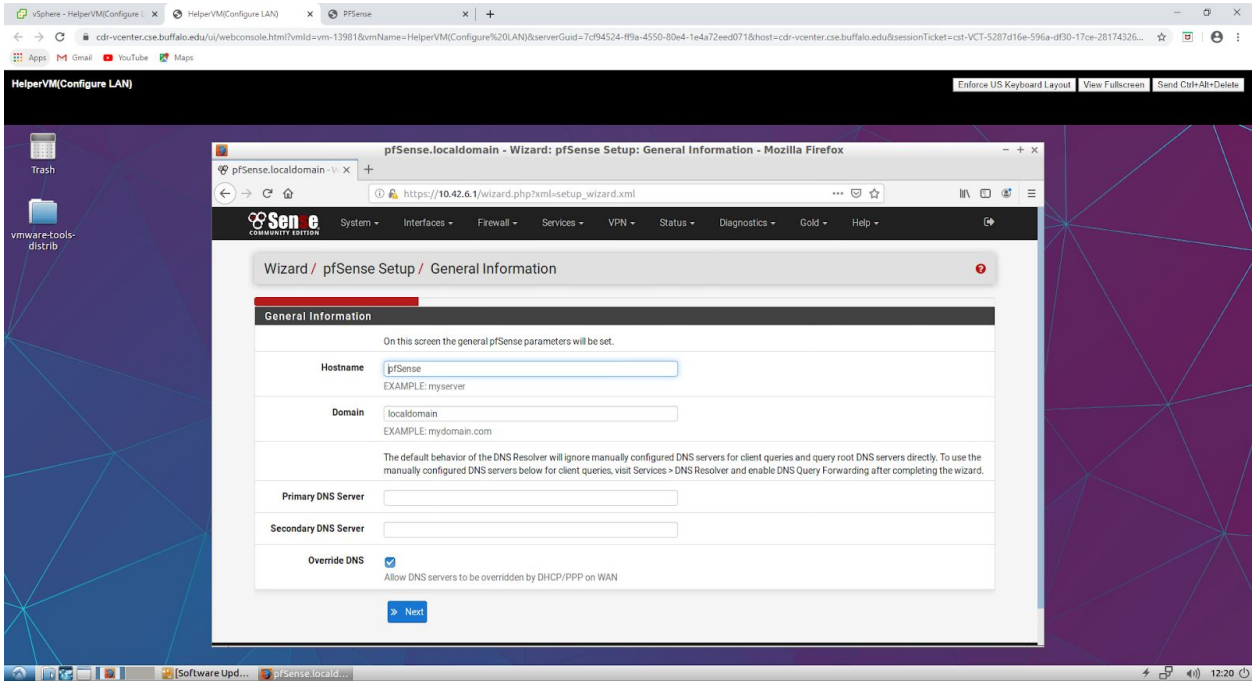
Setup PFSense through GUI

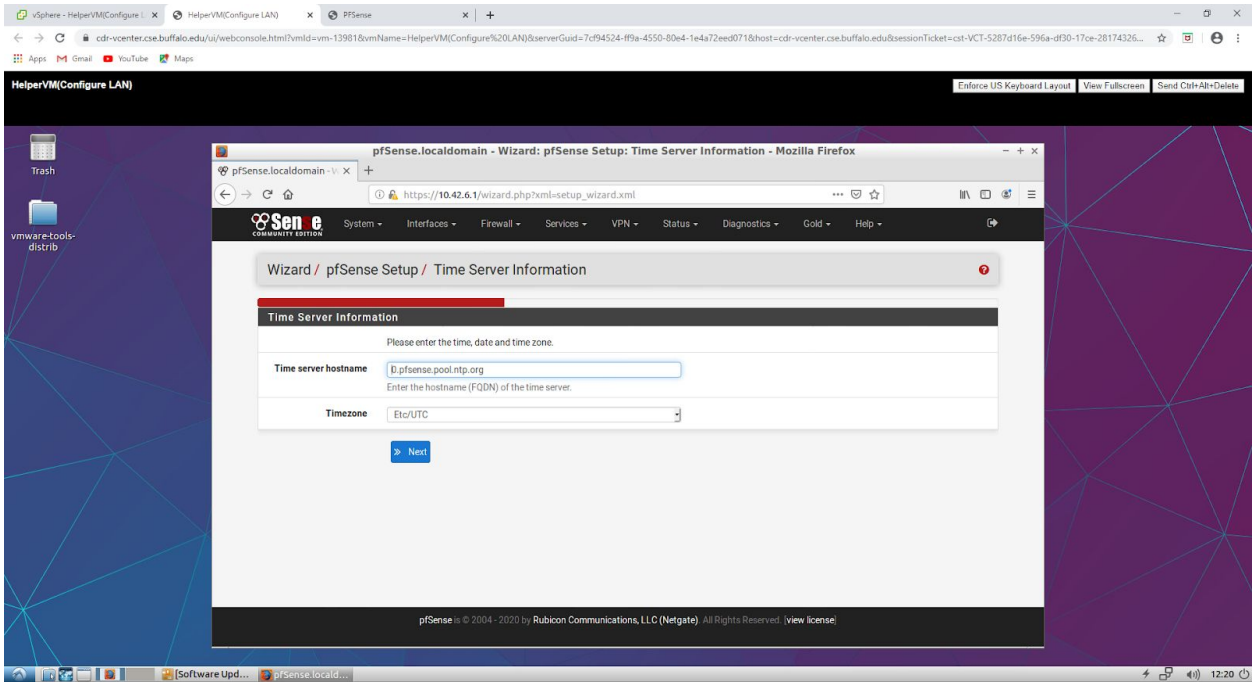
1. First open a web browser in the helper machine and type your gateway address which was 10.42.6.1 in our case. You will land into a login page, where you can log into pfsense using username ‘admin’ and password ‘pfsense’. This password will be updated in the setup process in the following steps.

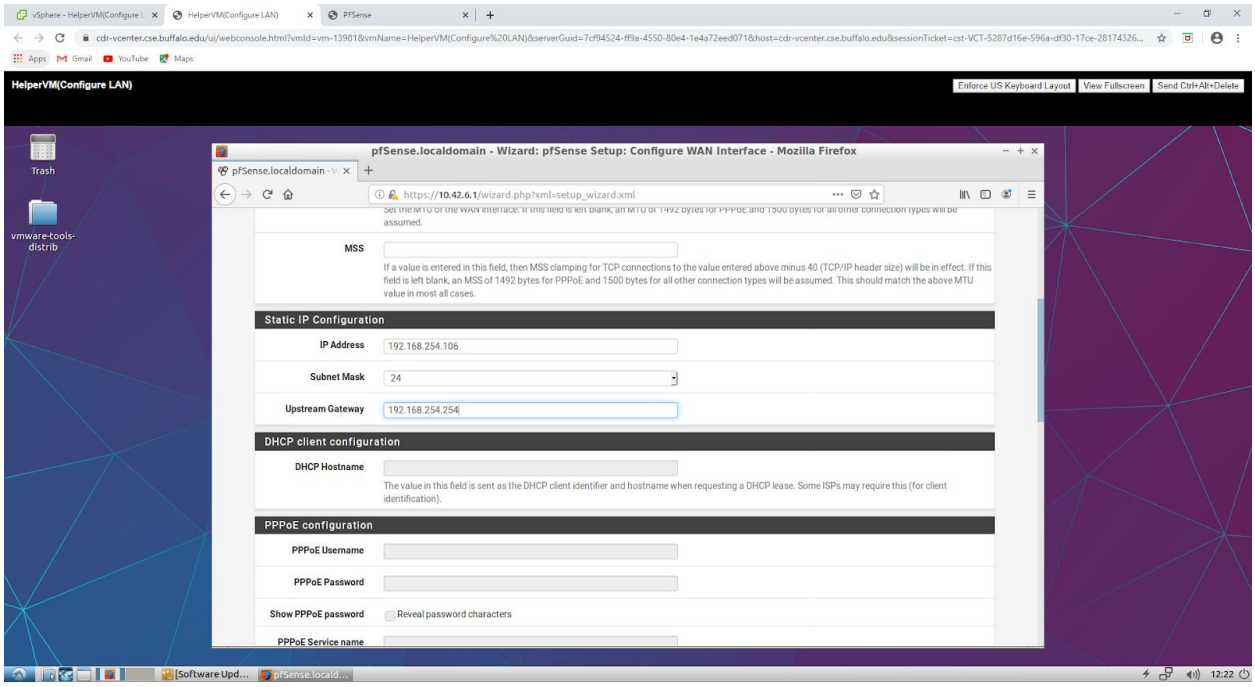


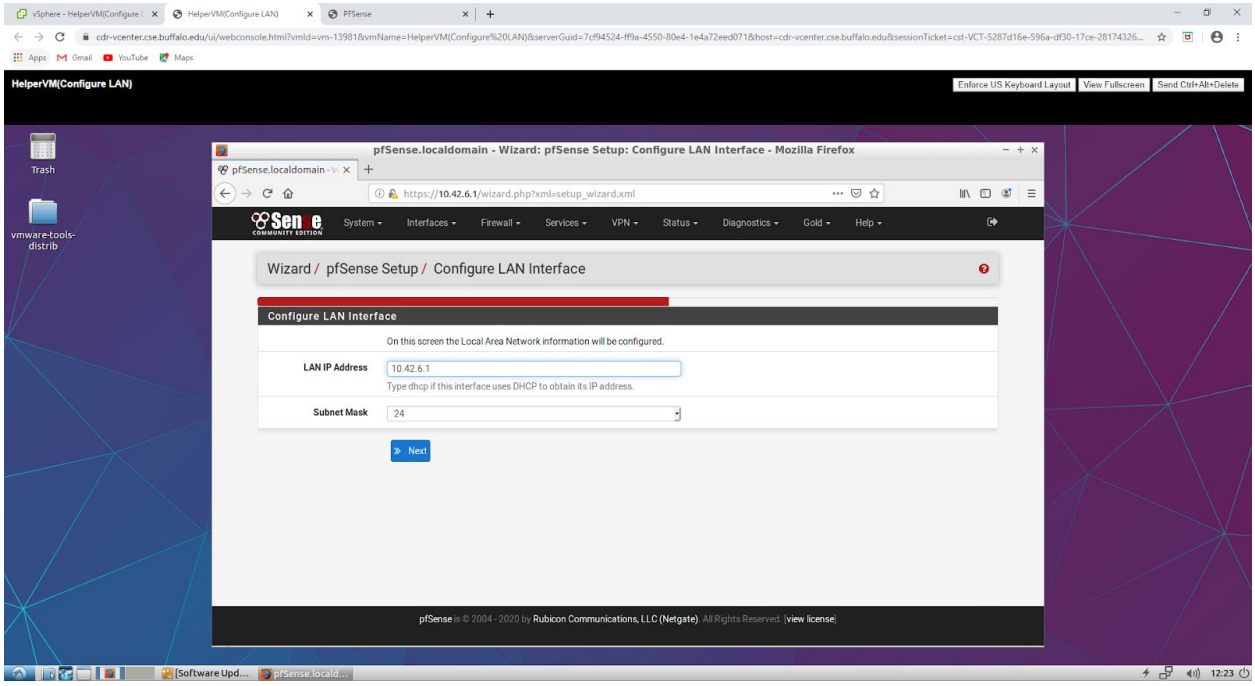
2. Then it will show a wizard which will provide assistance in the setup. Click next. You don’t need to make any changes in the general information, so click next again. For the Time Server Interface again click next. Under Configure WAN interface, go under static IP Configuration and set upstream gateway as 192.168.254.254, which is the address for our gretzky server. Then click next. For LAN configuration, check if the information mentioned is correct and click next. All these steps are shown below -


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
pfSense.localdomain - Wizard: pfSense Setup: - Mozilla Firefox
https://10.42.6.1/wizard.php?xml=setup_wizard.xml
System
Interfaces
Firewall
Services
VPN
Status
Diagnostics
Gold
Help
Wizard / pfSense Setup /
pfSense Setup
This wizard will provide guidance through the initial configuration of pfSense.
The wizard may be stopped at any time by clicking the logo image at the top of the screen.
Next
pfSense is © 2004 - 2020 by Rubicon Communications, LLC (Netgate) All Rights Reserved [view license]


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
pfSense.localdomain - Wizard: pfSense Setup: General Information - Mozilla Firefox
https://10.42.6.1/wizard.php?xml=setup_wizard.xml
Wizard / pfSense Setup / General Information
General Information
On this screen the general pfSense parameters will be set.
Hostname
pfSense
EXAMPLE: myserver
Domain
localdomain
EXAMPLE: mydomain.com
The default behavior of the DNS Resolver will ignore manually configured DNS servers for client queries and query root DNS servers directly. To use the manually configured DNS servers below for client queries, visit Services > DNS Resolver and enable DNS Query Forwarding after completing the wizard.
Primary DNS Server
Secondary DNS Server
Override DNS
Allow DNS servers to be overridden by DHCP/PPP on WAN
Next


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
pfSense.localdomain - Wizard: pfSense Setup: Time Server Information - Mozilla Firefox
https://10.42.6.1/wizard.php?xml=setup_wizard.xml
System
Interfaces
Firewall
Services
VPN
Status
Diagnostics
Gold
Help
Wizard / pfSense Setup / Time Server Information
Time Server Information
Please enter the time, date and time zone.
Time server hostname
0.pfsense.pool.ntp.org
Enter the hostname (FQDN) of the time server.
Timezone
Etc/UTC
Next
pfSense is © 2004 - 2020 by Rubicon Communications, LLC (Netgate) All Rights Reserved [view license]
12:20


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
pfSense.localdomain - Wizard: pfSense Setup: Configure WAN Interface - Mozilla Firefox
https://10.42.6.1/wizard.php?xml=setup_wizard.xml
MSS
If a value is entered in this field, then MSS clamping for TCP connections to the value entered above minus 40 (TCP/IP header size) will be in effect. If this field is left blank, an MSS of 1492 bytes for PPPoE and 1500 bytes for all other connection types will be assumed. This should match the above MTU value in most all cases.
Static IP Configuration
IP Address
192.168.254.106
Subnet Mask
24
Upstream Gateway
192.168.254.254
DHCP client configuration
DHCP Hostname
The value in this field is sent as the DHCP client identifier and hostname when requesting a DHCP lease. Some ISPs may require this (for client identification).
PPPoE configuration
PPPoE Username
PPPoE Password
Show PPPoE password
Reveal password characters
PPPoE Service name


HelperVM(Configure LAN)
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Trash
vmware-tools-distrib
pfSense.localdomain - Wizard: pfSense Setup: Configure LAN Interface - Mozilla Firefox
https://10.42.6.1/wizard.php?xml=setup_wizard.xml
System
Interfaces
Firewall
Services
VPN
Status
Diagnostics
Gold
Help
Wizard / pfSense Setup / Configure LAN Interface
Configure LAN Interface
On this screen the Local Area Network information will be configured.
LAN IP Address
10.42.6.1
Type dhcp if this interface uses DHCP to obtain its IP address.
Subnet Mask
24
Next
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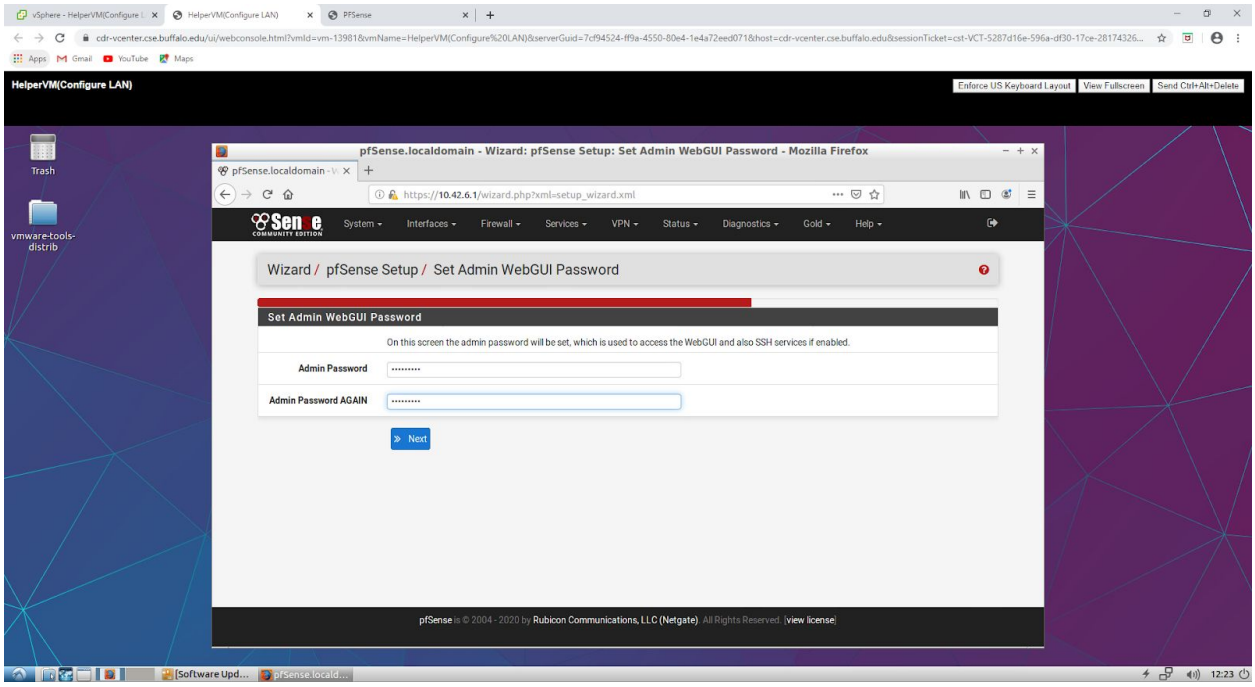
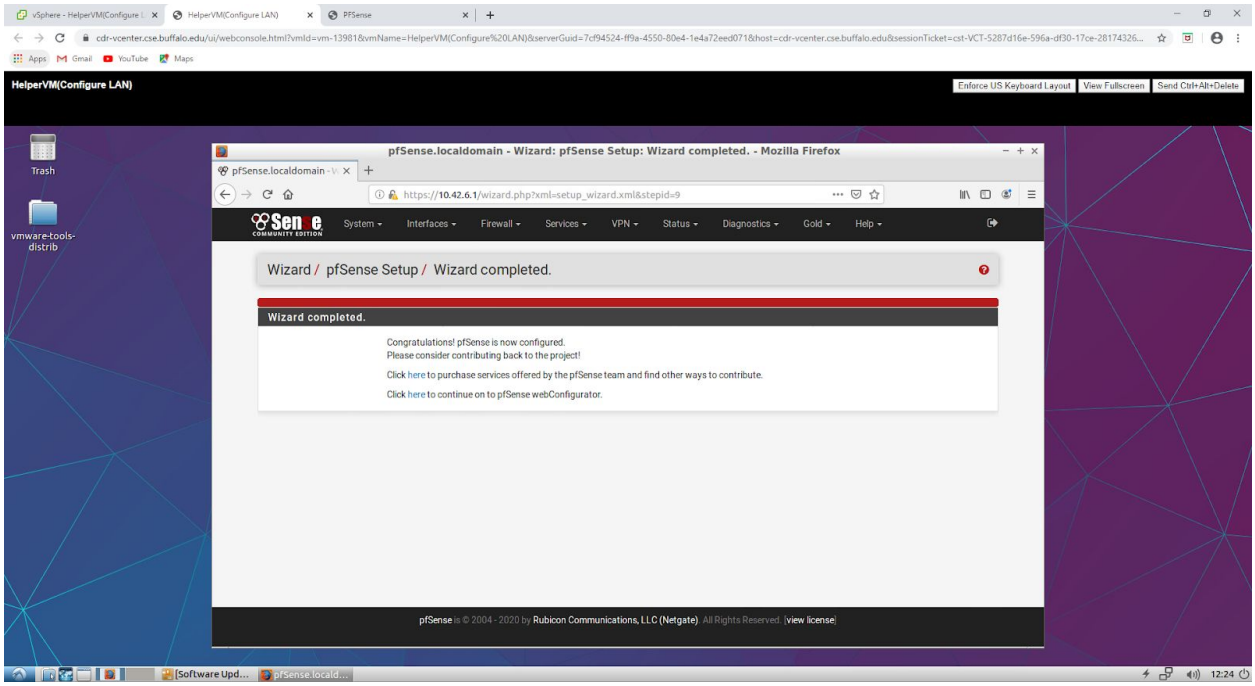
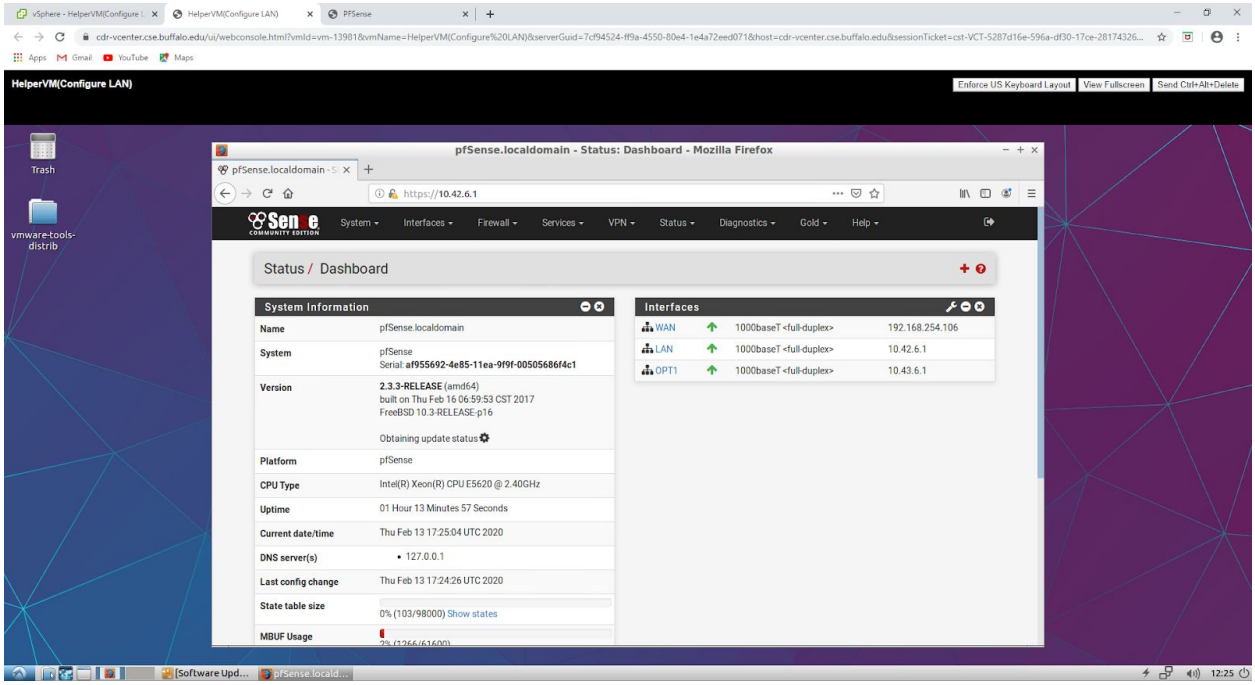
3. Now you need to set admin password for the GUI interface. Type a new password that you can remember and confirm it and click next. After that click reload to reload the gui interface.



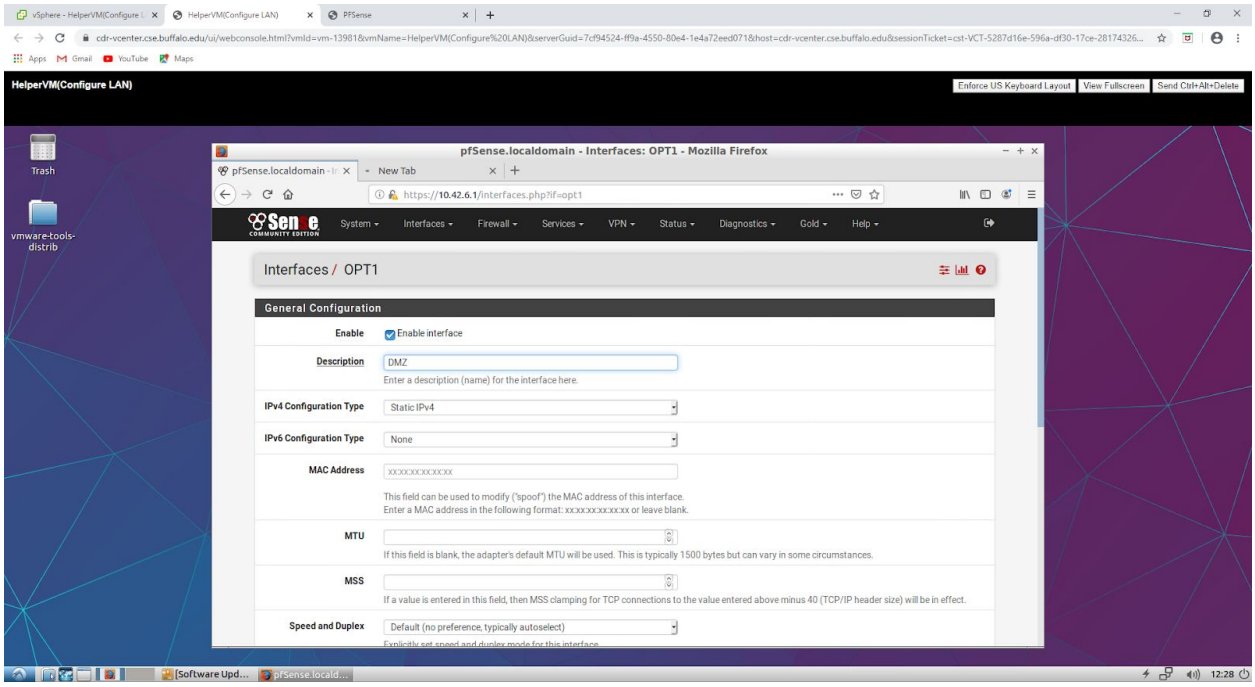
4. Now it will show the wizard is complete and there will be an option to goto pfsense webconfigurator. Click on it to open the page as shown below.





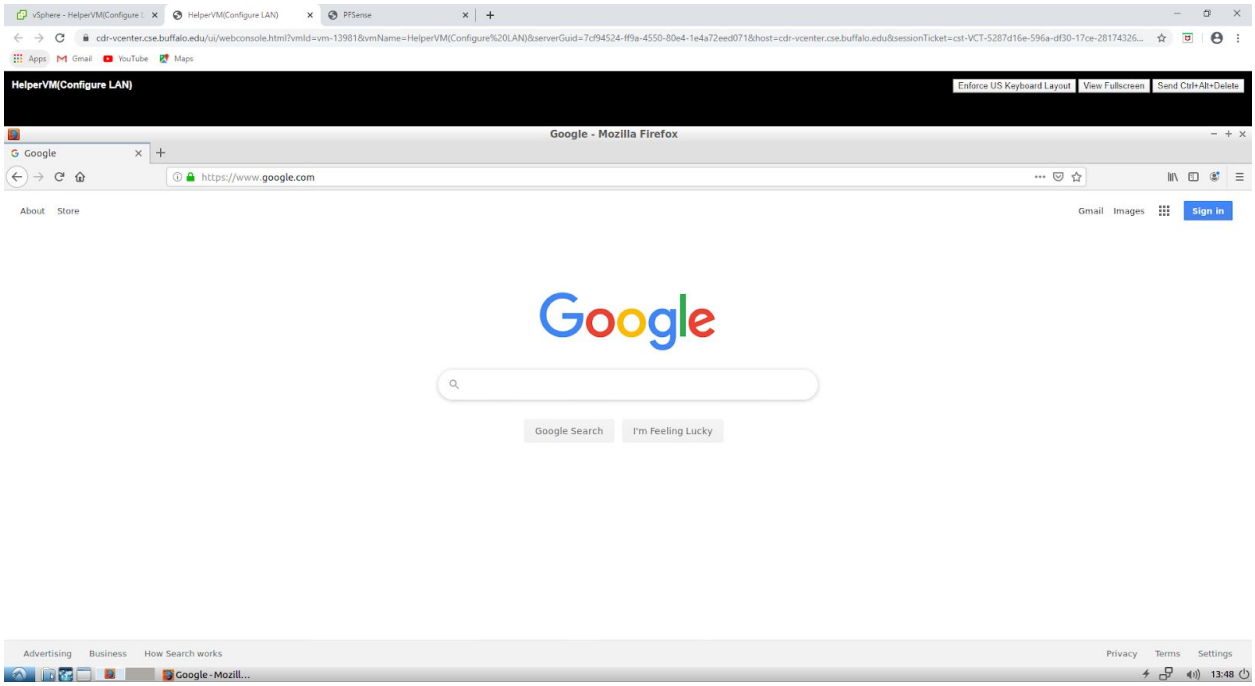
5. You also rename the OPT1(DMZ) to DMZ by clicking on OPT1.

6. Inside OPT1 configuration, change Description to DMZ and Save.



Testing the Functionality

1. You can type google.com in the web browser and if you can connect to the internet without any problem, you are good to go.



2. You can also check by selecting a ping option on pfsense console(option 7) or GUI and typing ping 8.8.8.8 (public dns) will send ping to 8.8.8.8, and if it is successful, you are good to go. You can search about how ping works for more details on this.