# Creating a Home Network

And Block Ads!

# Overview

In this setup I cover setting up a home network that will use PFSense for the Firewall, DNS, and DHCP.  I will cover one way to set up a Virtual Machine Host that allows its guest VMs to grab IP addresses from the router.

**TLDR**:

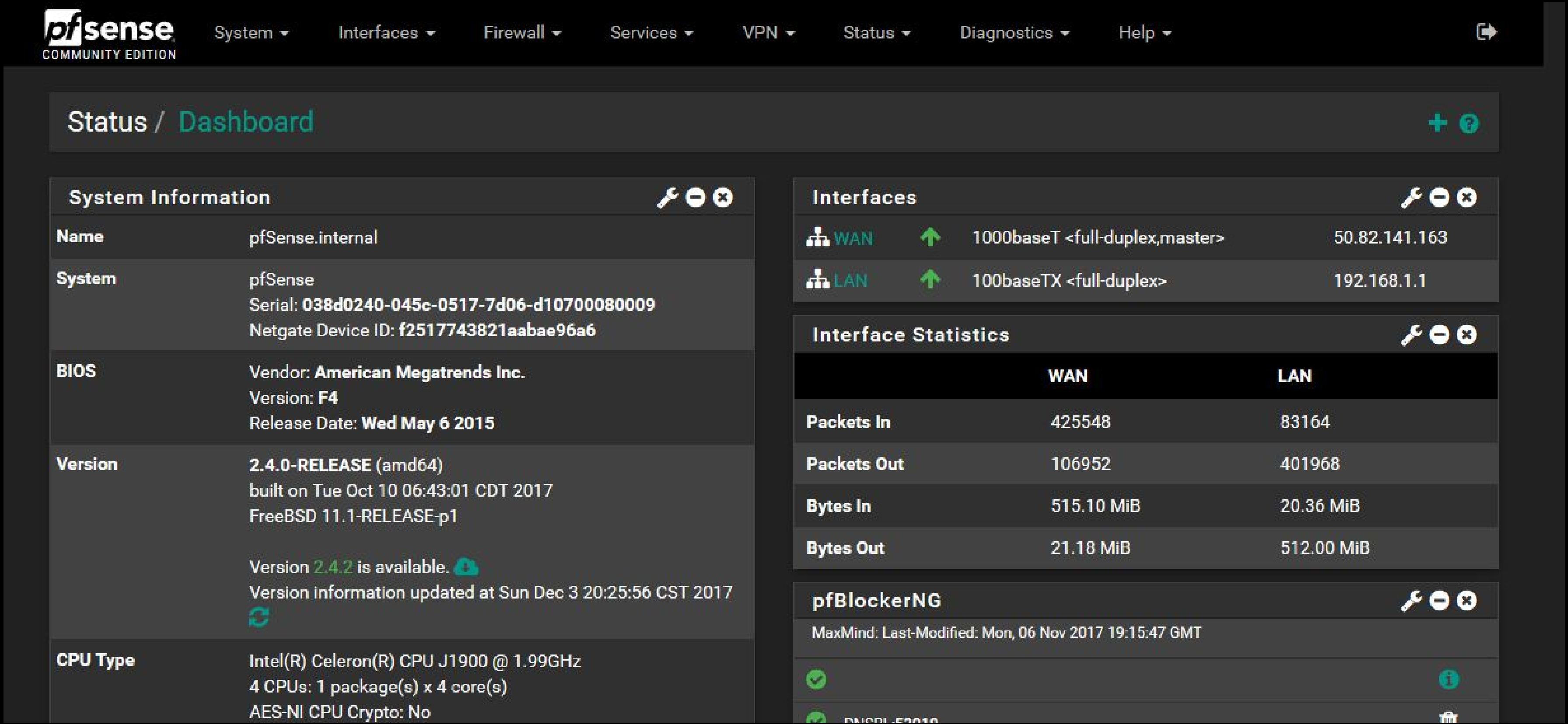
- PFSense: Firewall, Router, DNS, DHPC
- Storage: VM Host (with routable VMs) and Network Attached Storage

# Why PFSense?

I chose PFsense because it is an all-inclusive home network solution.  Once installed, there is a Web GUI to help with management.  PFSense is based on FreeBSD, a UNIX based OS that is well known to be robust in the networking world.

**Some Applictions Included:**

- DNS/DHCP
- IDS/IDP
- Firewall/Router
- VPN
- Load Balancing and more!



Status / Dashboard

**System Information**

| | |
|---|---|
| **Name** | pfSense.internal |
| **System** | pfSense<br>Serial: **038d0240-045c-0517-7d06-d10700080009**<br>Netgate Device ID: **f2517743821aabae96a6** |
| **BIOS** | Vendor: **American Megatrends Inc.**<br>Version: **F4**<br>Release Date: **Wed May 6 2015** |
| **Version** | **2.4.0-RELEASE** (amd64)<br>built on Tue Oct 10 06:43:01 CDT 2017<br>FreeBSD 11.1-RELEASE-p1<br>Version 2.4.2 is available.<br>Version information updated at Sun Dec 3 20:25:56 CST 2017 |
| **CPU Type** | Intel(R) Celeron(R) CPU J1900 @ 1.99GHz<br>4 CPUs: 1 package(s) x 4 core(s)<br>AES-NI CPU Crypto: No |

**Interfaces**

| | | | |
|---|---|---|---|
| WAN | ↑ | 1000baseT <full-duplex,master> | 50.82.141.163 |
| LAN | ↑ | 100baseTX <full-duplex> | 192.168.1.1 |

**Interface Statistics**

| | WAN | LAN |
|---|---|---|
| **Packets In** | 425548 | 83164 |
| **Packets Out** | 106952 | 401968 |
| **Bytes In** | 515.10 MiB | 20.36 MiB |
| **Bytes Out** | 21.18 MiB | 512.00 MiB |

**pfBlockerNG**

MaxMind: Last-Modified: Mon, 06 Nov 2017 19:15:47 GMT

What the home page looks like.

# Things to Consider

PFSense will work on almost any hardware but if you want to run the latest versions, you will need a processor with x64 architecture.

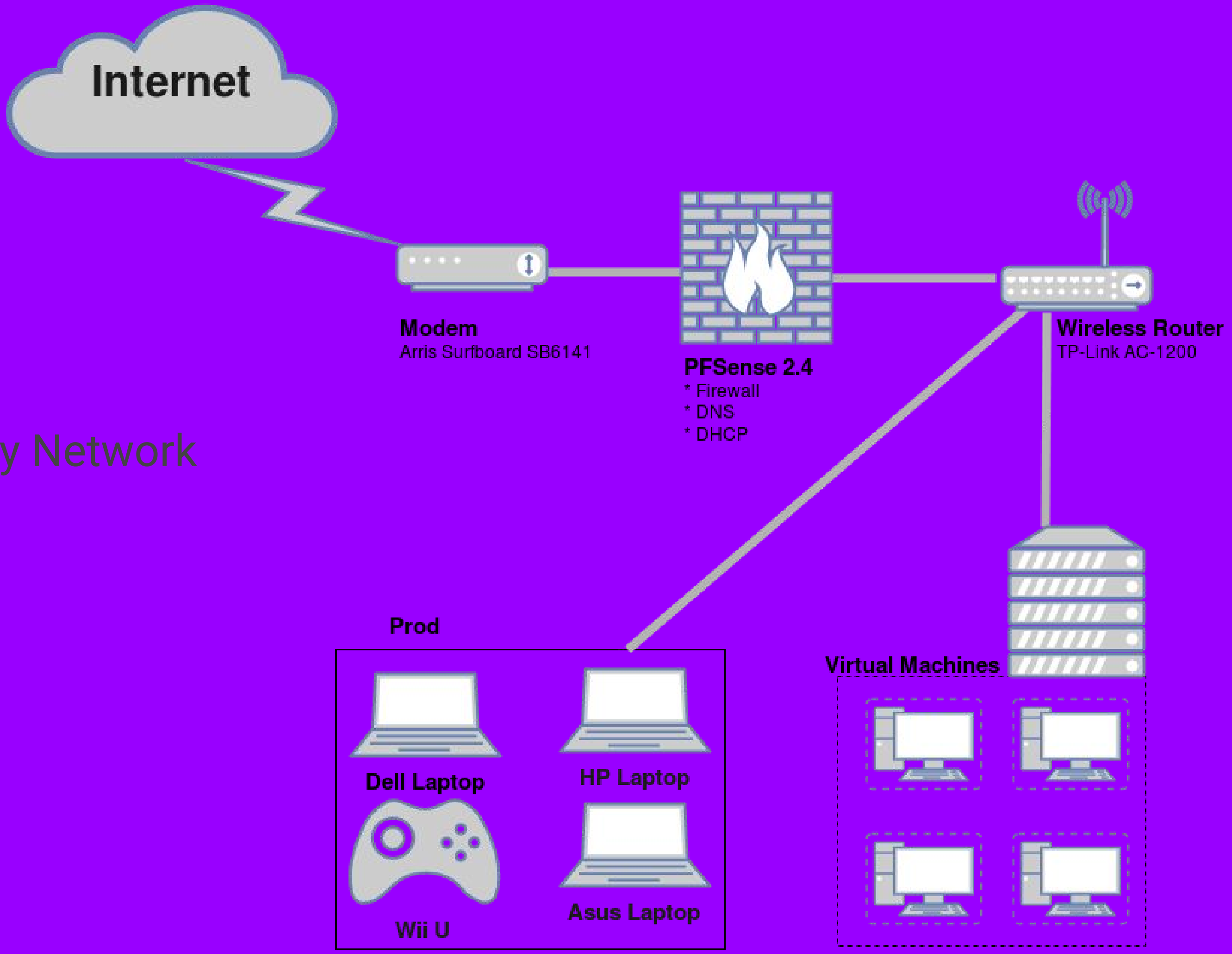
The next version (v2.5) will require a processor with AES-NI support

Requirements on RAM are very low, and should not need more than 2GB.

Installing: Outside the scope of this walkthrough, here is a link to the official docs

https://doc.pfsense.org/index.php/Installing_pfSense#Hardware_considerations

# Network Map of my Network



Internet

**Modem**
Arris Surfboard SB6141

**PFSense 2.4**
* Firewall
* DNS
* DHCP

**Wireless Router**
TP-Link AC-1200

**Prod**

**Dell Laptop**

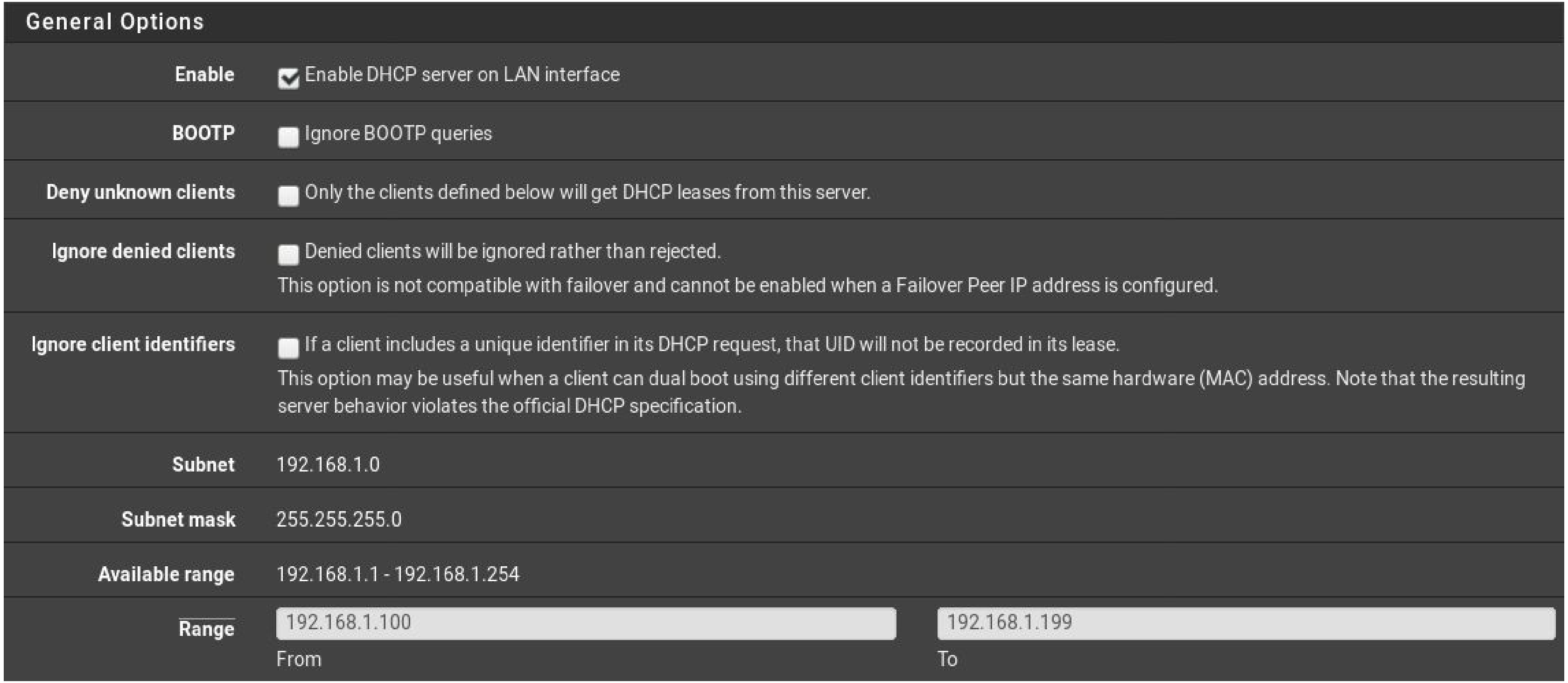
**HP Laptop**

**Wii U**

**Asus Laptop**

**Virtual Machines**

# DHCP Setup



General Options

| | |
|---|---|
| **Enable** | ☑ Enable DHCP server on LAN interface |
| **BOOTP** | □ Ignore BOOTP queries |
| **Deny unknown clients** | □ Only the clients defined below will get DHCP leases from this server. |
| **Ignore denied clients** | □ Denied clients will be ignored rather than rejected.<br>This option is not compatible with failover and cannot be enabled when a Failover Peer IP address is configured. |
| **Ignore client identifiers** | □ If a client includes a unique identifier in its DHCP request, that UID will not be recorded in its lease.<br>This option may be useful when a client can dual boot using different client identifiers but the same hardware (MAC) address. Note that the resulting server behavior violates the official DHCP specification. |
| **Subnet** | 192.168.1.0 |
| **Subnet mask** | 255.255.255.0 |
| **Available range** | 192.168.1.1 - 192.168.1.254 |
| **Range** | 192.168.1.100<br>From<br>192.168.1.199<br>To |

Make Sure these settings are set

# DNS Setup

PFSense offers two different DNS services, I have opted to use Unbound as my DNS service because it allows you to use the pfblockerng package.

Most of the defaults work well, however make sure to set in the custom options field: server:include: /var/unbound/pfb_dnsbl.*conf

# PFBlockerng

This is a package available in FreeBSD that extends the capabilities of the PFSense firewall.  Installation is simple, just go to the package manager and click install.  I specifically use this package to implement DNS filtering on my home network to mitigate the number of ads.

AD BLOCKING ON YOUR PHONE!

# Domain Name Service Block List (DNSBL)

DNSBL Tab in the Firewall section, under the PFBlockerng tab.  Here you will configure the package.  On the main configuration page, the defaults are pretty sane, make sure to check enable DNSBL.

On the next page, you can make a custom feed which is what I do for my network.

The last tab contains the EasyList settings, which I have not researched so I will not include an explanation here.

# Virtual Networking

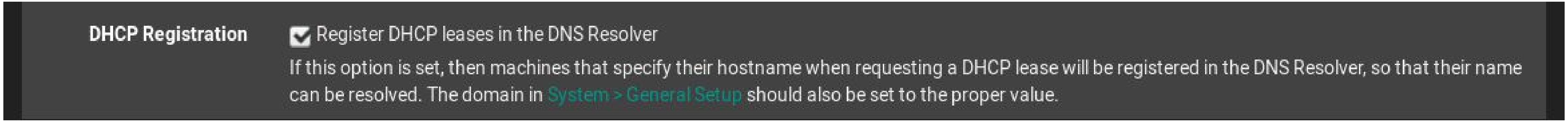
Now that we have control over our DHCP and DNS for our LAN network, we can do some neat things.

I will go over are setting up use of local DNS and how to setup a Virtual Machine Host that will be routable with the aforementioned local DNS.

After this, you will be able to spin up VMs, then be able to access them using DNS instead of IP Addresses!

# DNS for Local Machines

Located on System/General Setup

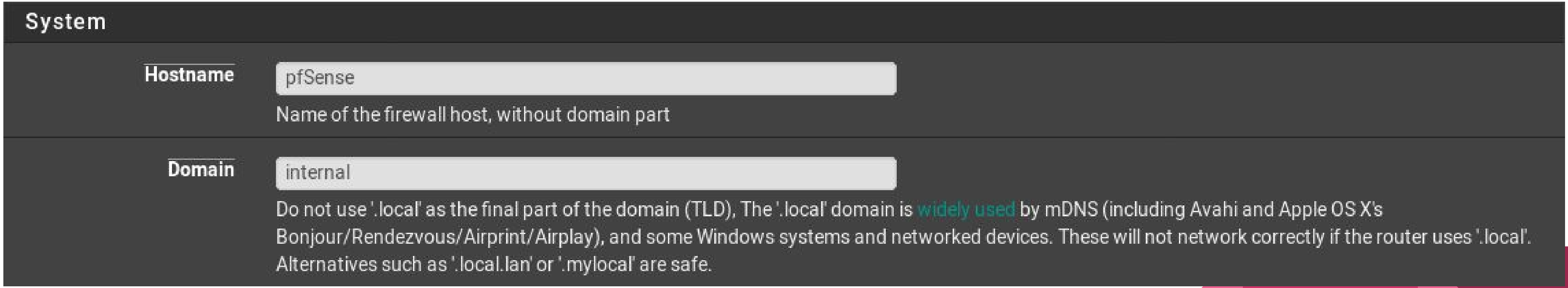


**DHCP Registration**

☑ Register DHCP leases in the DNS Resolver

If this option is set, then machines that specify their hostname when requesting a DHCP lease will be registered in the DNS Resolver, so that their name can be resolved. The domain in System > General Setup should also be set to the proper value.

Located on Services/DNS Resolver/General Settings



**System**

**Hostname**: pfSense

Name of the firewall host, without domain part

**Domain**: internal

Do not use '.local' as the final part of the domain (TLD), The '.local' domain is widely used by mDNS (including Avahi and Apple OS X's Bonjour/Rendezvous/Airprint/Airplay), and some Windows systems and networked devices. These will not network correctly if the router uses '.local'. Alternatives such as '.local.lan' or '.mylocal' are safe.

# Virtual Machine Host

In my setup I am using CentOS 7.4 running KVM/QEMU virtualization.  My VMs are then stored in a ZFS storage pool.

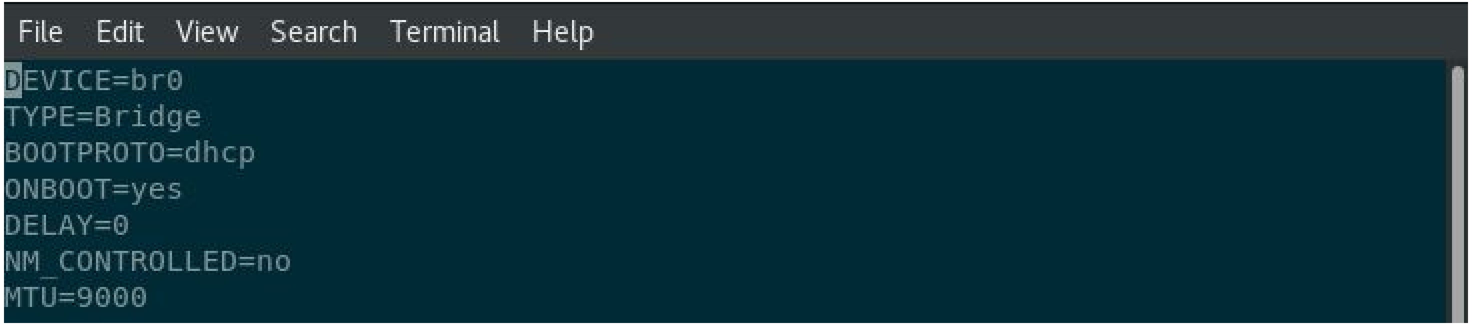
If you want to read on ZFS  https://pthree.org/?s=zfs&searchsubmit=Search

Each VM pulls a IP from PFSense and broadcasts its Hostname back so you can connect by DNS instead of IP.

To achieve this, you must configure the host with a Bridge to the VMs.

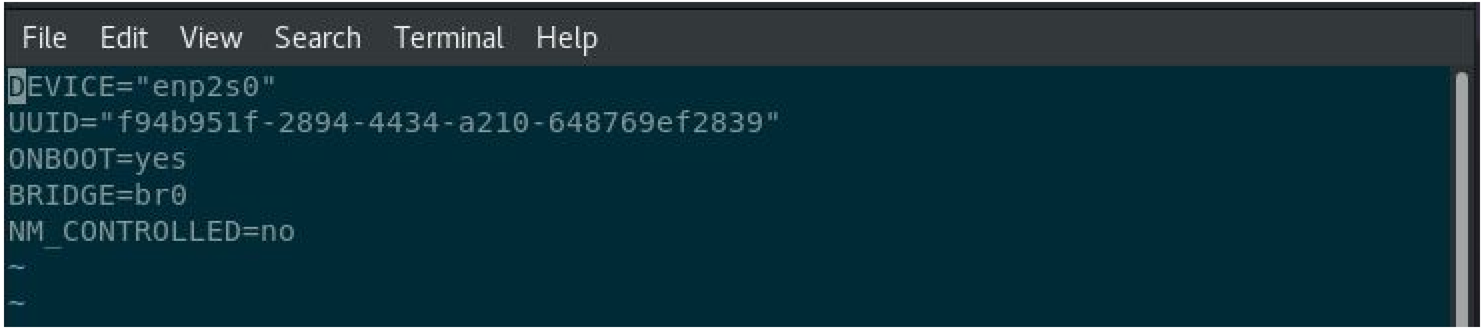
# Important Settings

Bridge
Settings
ifcfg-br0



```
DEVICE=br0
TYPE=Bridge
BOOTPROTO=dhcp
ONBOOT=yes
DELAY=0
NM_CONTROLLED=no
MTU=9000
```

Ethernet
Port
Settings
ifcfg-enp2s0



```
DEVICE="enp2s0"
UUID="f94b951f-2894-4434-a210-648769ef2839"
ONBOOT=yes
BRIDGE=br0
NM_CONTROLLED=no
~
~
```

Files are located in /etc/sysconfig/network-scripts/

# Now create a VM and try it out!