CSCI 2930: Practical System Administration
Final Project
Spring 2014

You have been tasked with setting up a small Development environment for an application development team. You have only one physical server to do this with. As such, it will be up to you to deploy a virtual environment containing:

- Firewall/Router - pfSense virtual appliance that will be protecting your systes based on a set of rules you can configure.
- Windows 2008 R2 DHCP server - Easy to use graphical interface. Will hand out IP addresses to any clients connected to your private network.
- FreeBSD-based BIND DNS server - Internal name server running the latest ISC version of the BIND software. It will act as your internal master DNS server and forward any requests it does not know about to the firewall to be passed on to outside DNS systems.
- CentOS graphical Workstation for testing and management.

Total Completion Time is 2 Hours and 35 min at the shortest.

When creating new guest VM's and installing their operating systems you may want to have all other VM's turned off so your hard drive runs at its peak in order to get the OS files copied as quickly as possible.

The DHCP section is the most difficult as it requires ZERO typing errors to get working properly. You will most likely need to come in outside of class to complete this project.

1.) Plan your deployment (Time to complete: 5 min)
   a. Open start menu on your host and type cmd in the search bar and hit enter

   b. Type ipconfig in the command window and hit enter

   c. What is the Network address for your Host Only virtual network VMnet1 (referred to from this point forward as the "Private Network")? 192.168.211.1
   d. What is the Network address for your NAT virtual network VMnet8 (referred to from this point forward as the "Public Network")? 192.168.13.1

Based on the above information, fill in the blanks below with the private IP addresses that your servers will have:

   e. Firewall Private network ip address 192.168.211.5
   f. DHCP Server Private Address 192.168.211.10
        i. DHCP SCOPE NAME: CSCI_DEVEL
       ii. DHCP SCOPE Starting IP Address: 192.168.211.128
      iii. DHCP SCOPE Ending IP Address: 192.168.211.254
       iv. DHCP SCOPE Subnet mask: 255.255.255.0

v. DHCP SCOPE Default Gateway: 192.168.211.5

    g. FreeBSD DNS server Private address 192.168.211.15
    h. CentOS Workstation Private network address 192.168.211.20

2.) Deploy CentOS 6.5 graphical workstation with GNOME window manager
(Time to complete: 20 min)
    a. Open VMware Workstation and click File -> New Virtual Machine
    b. Click the radio button next to Custom
    c. Click Next
    d. Verify it is a Workstation 10 Hardware compatibility and click Next
    e. Select the Radio Button next to I will install the operating system later and click next
    f. Select your guest operating system to be Linux and the version to be Red Hat Enterprise Linux 6 64-bit
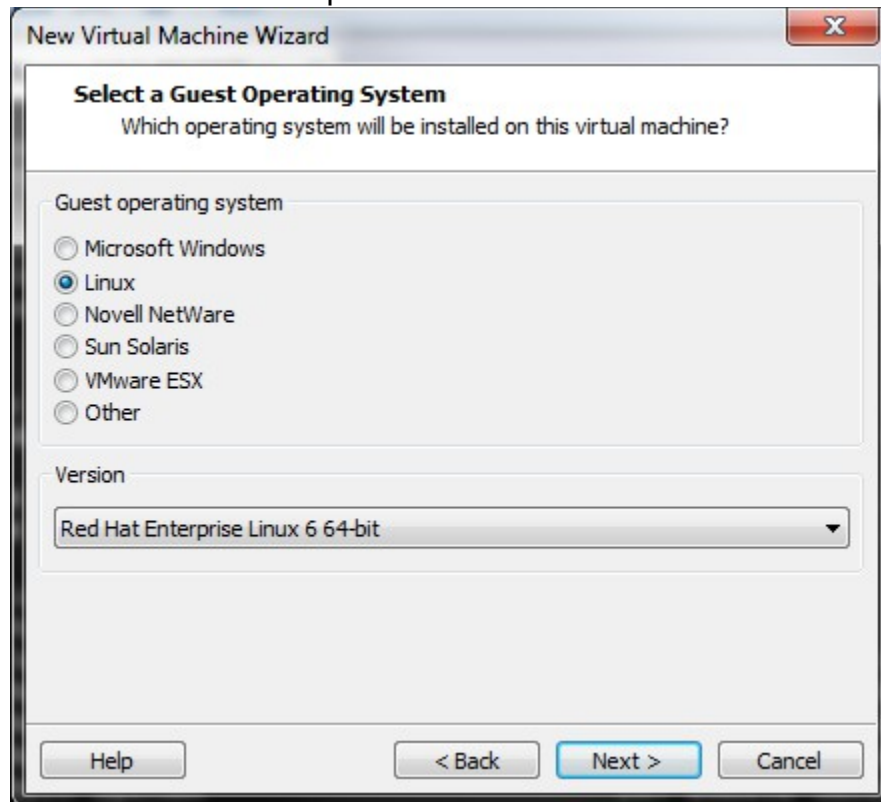
    g. Change the virtual machine name to be CentOS64_Workstation and click next
    h. Select 1 processor and 2 cores click next
    i. Select 1024 MB of memory click next
    j. Select Host-only networking and click next
    k. Click next (LSI Logic)
    l. Click next (SCSI)

m. Click next (Create new virtual disk)
n. Click Next (Max Disk size 20GB and Split virtual disk into multiple files)
o. Click Next (Disk Name)
p. Click Customize hardware
q. Click on New CD/DVD and select the radio button next to use ISO image file and click browse
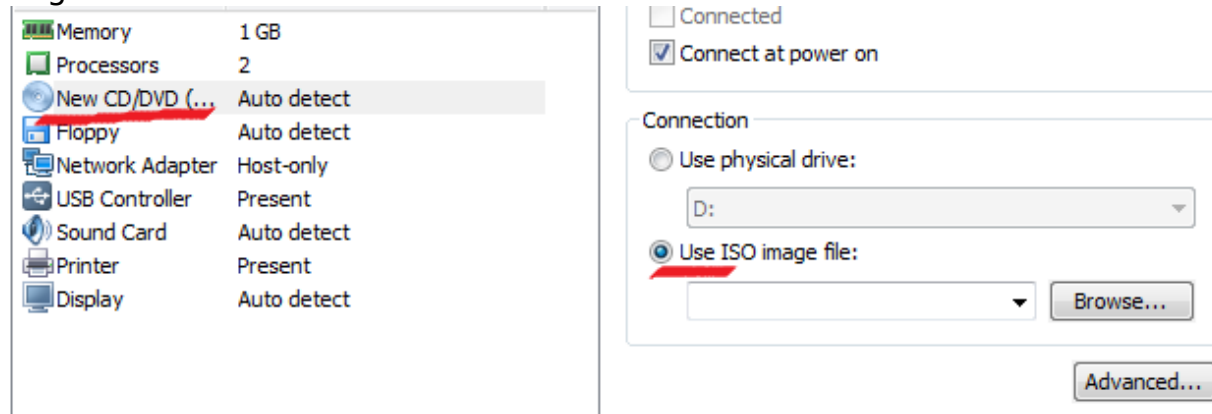
r. Browse to \\milo\StudentSoftware\CentOS and select CentOS-6.5-x86_64-bin-DVD1.iso and click Open
s. Close the Hardware customization window
t. Click Finish
u. Click Power on this virtual machine

▶ Power on this virtual machine

v. When the boot menu comes up just hit enter
w. Select Skip and hit enter
x. Click Next (English)
y. Click Next (US English)
z. Click Next (Basic Storage)
aa. Click Yes Discard any data
ab. Set hostname to be centos65.csci.pvt click next
ac. Select America/Denver for the timezone city and click Next
ad. Enter the root password as 12345678 and click next and click Use Anyway
ae. Select Use All Space and click Next
af. Write Changes to disk
ag. Click on the Desktop radio button and click next

The default installation of CentOS is a minim
different set of software now.

- ⊙ Desktop
- ○ Minimal Desktop
- ○ Minimal
- ○ Basic Server
- ○ Database Server
- ○ Web Server
- ○ Virtual Host
- ○ Software Development Workstation
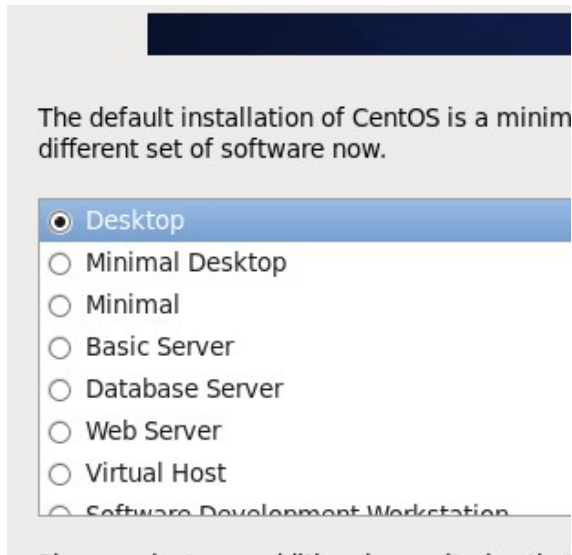
ah. Installation will begin.
ai. Click Reboot after it is done.
aj. Click Forward
ak. Click Forward (License)
al. Click Forward and then Yes to tell the system you don't want to make another user
am.   Set the time and click Forward
an. Click Finish (ignore the error regarding Kdump)
ao. Log in as root
ap. Right click on the desktop background and select Open in

Create Folder
Create Launcher...
Create Document   >
Open in Terminal
Clean Up by Name
☑ Keep Aligned
Paste
Change Desktop Background
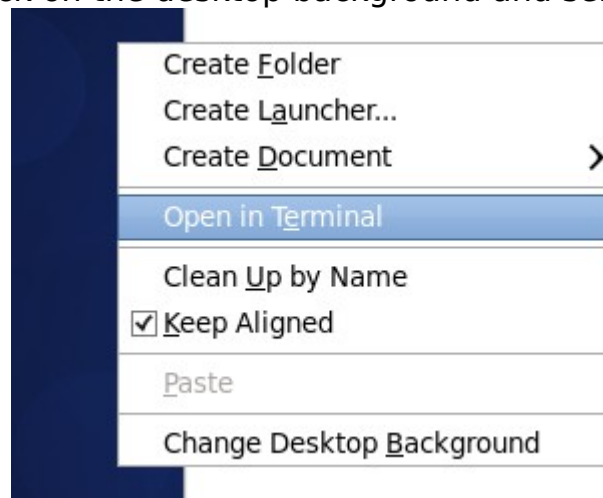
Terminal
aq. cd to /etc/sysconfig/network-scripts
ar. Make a backup of the original eth0 configuration file using the copy command:
  i. # cp ifcfg-eth0 ifcfg-eth0.dhcp.bak
as. edit ifcfg-eth0 using either vi or nano to look like this (filling the blanks in with you private subnet address):
TYPE=Ethernet
DEVICE=eth0

```
BOOTPROTO=static
ONBOOT=yes
IPADDR=192.168._____.20
NETMASK=255.255.255.0
GATEWAY=192.168._____.5
DNS1=192.168._____.15
DOMAIN="csci.pvt"
DEFROUTE=yes
NAME="eth0"
```

at. Save changes to file and quit back to the command line
au. Issue the command "service network restart" to restart networking and read the new config file
av. Use the ifconfig command to make sure your configuration changes took place

```
[root@centos64 network-scripts]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:D9:E0:25
          inet addr:192.168.35.20  Bcast:192.168.35.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fed9:e025/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6 errors:0 dropped:0 overruns:0 frame:0
          TX packets:27 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2755 (2.6 KiB)  TX bytes:1566 (1.5 KiB)
```

aw.   Shutdown your CentOS 6.4 system
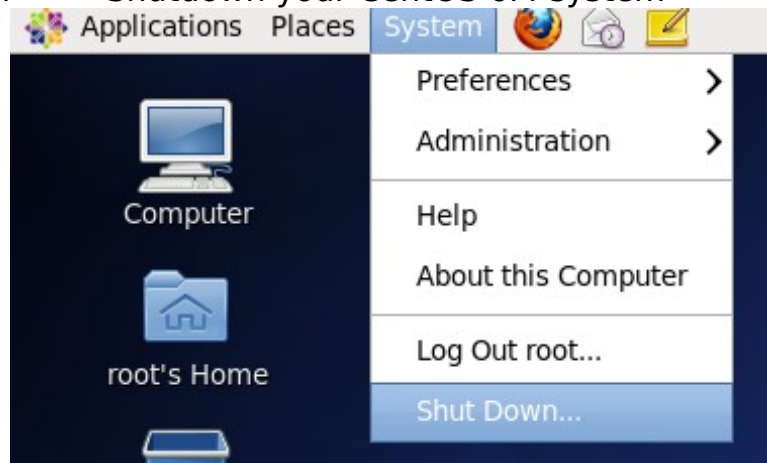
3.) Deploy Firewall OVA Appliance for protection of your new environment (Time to complete: 20 min)

    a. Browse to the file \\milo\StudentSoftware\pfSense\pfSense-2.0.3-RELEASE-amd64.ova and double-click it.
        i. This will open VMware Workstation (it will be simulating your VMware vSphere DR server) and start the appliance import wizard
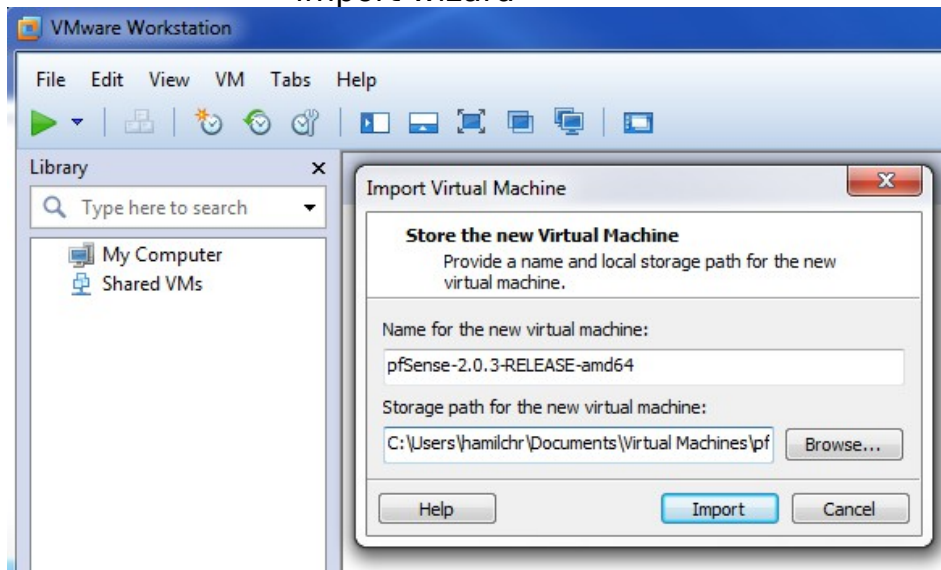
    b. Click on the import button
    c. When the license agreement pops up click on Accept and wait until the appliance is done importing
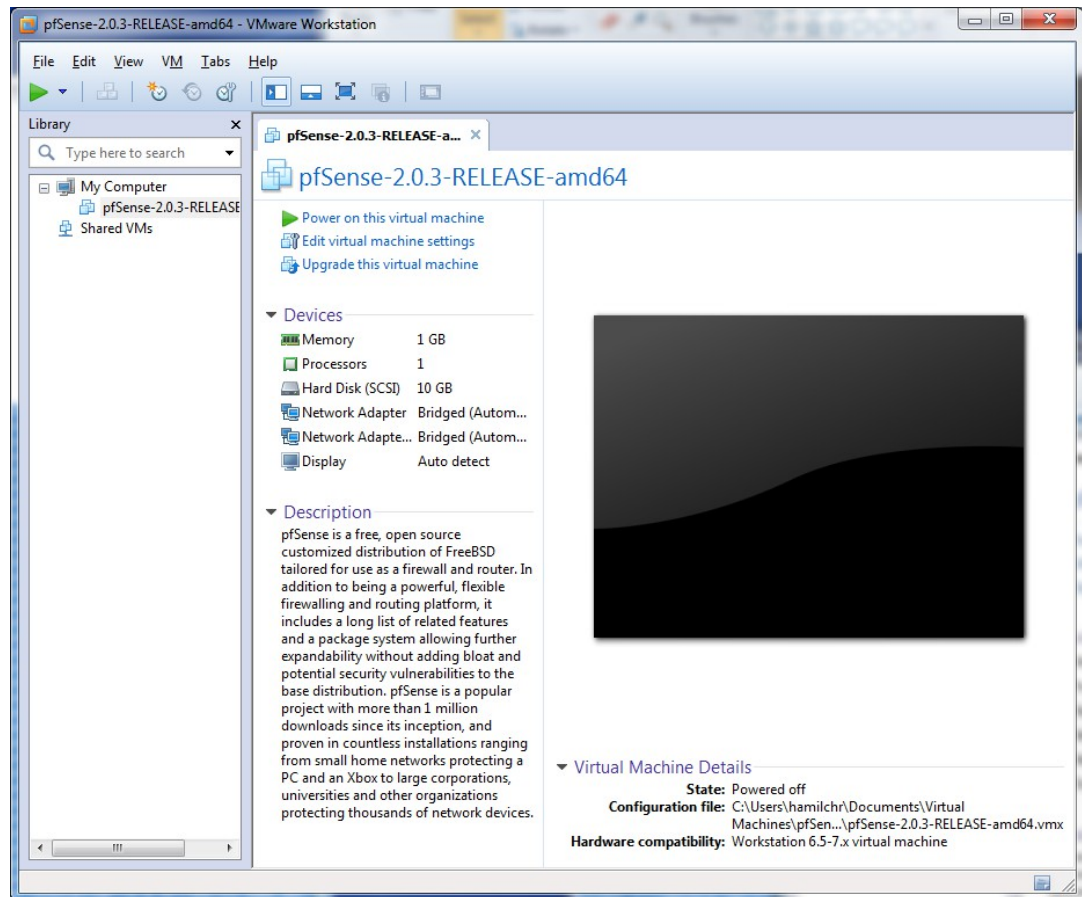
d. You will see the above screen after the appliance has been imported. Click on "Edit virtual machine settings"
e. Select the hardware device called Network Adapter and set it to use the NAT network
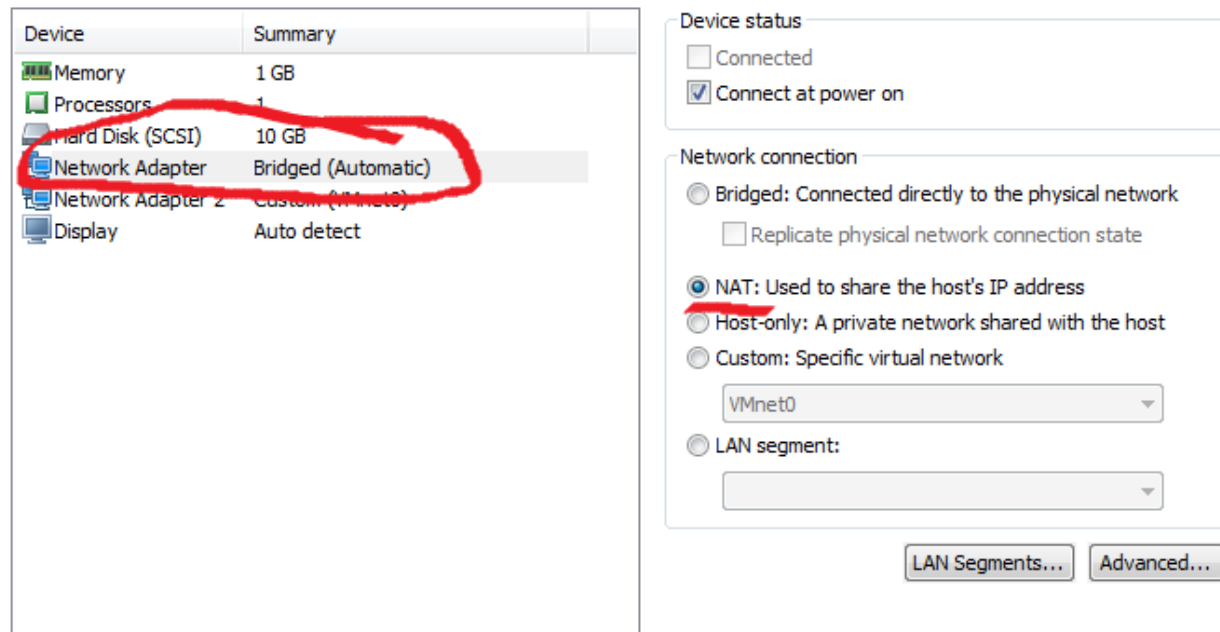
f. Select the hardware device called Network Adapter 2 and set it to use the Host-only network
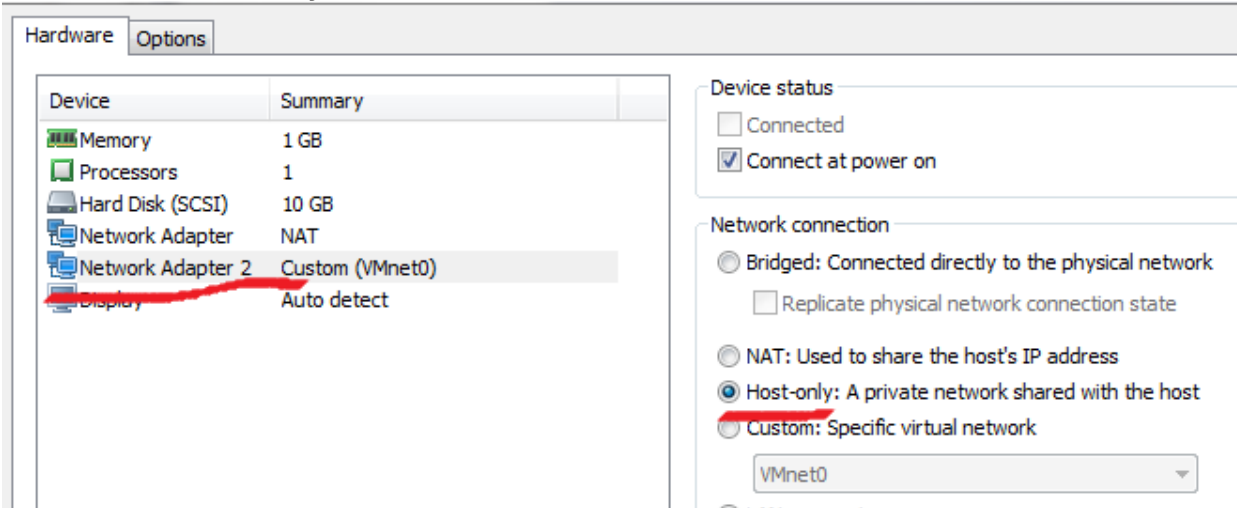
g. Close the VM settings window and click Power on this virtual machine ▶ Power on this virtual machine

h. After the firewall boots you will see the management console. Type 1 for Assign Interfaces to properly set your WAN (public

interface) and LAN (private interface) devices

```
Configuring CRON...done.
Starting NTP time client...Starting DHCP service...done.
Starting DNS forwarder...done.
Configuring firewall......done.
Generating RRD graphs...done.
Starting CRON... done.
Bootup complete

FreeBSD/amd64 (pfSense.localdomain) (ttyv0)

*** Welcome to pfSense 2.0.3-RELEASE-pfSense (amd64) on pfSense ***

  WAN (wan)                    -> em1        -> 192.168.35.128 (DHCP)
  LAN (lan)                    -> em0        -> 192.168.1.1

 0) Logout (SSH only)                 8) Shell
 1) Assign Interfaces                 9) pfTop
 2) Set interface(s) IP address      10) Filter Logs
 3) Reset webConfigurator password   11) Restart webConfigurator
 4) Reset to factory defaults        12) pfSense Developer Shell
 5) Reboot system                    13) Upgrade from console
 6) Halt system                      14) Enable Secure Shell (sshd)
 7) Ping host

Enter an option: █
```

i. Answer n for No to setting up VLANS
j. You will then be asked to enter the interface to use for the WAN. Type em0 and hit enter
k. For the LAN interface type em1 and hit enter
l. When asked to enter an optional interface do not type anything just hit the enter key
m. You should then see the summary of what you are going to set. It should look like this

```
The interfaces will be assigned

WAN  -> em0
LAN  -> em1

Do you want to proceed [y¦n]?█
```

n. Type y to proceed
o. Your WAN interface should now have a DHCP address from your Host Only or Public Network. If not first reboot the system and if still not properly configured redo the configuration but switch the assignment of the NICS
p. We now need to set an address for the LAN interface. Type 2 to Set Interface IP Address
q. Select the LAN interface by typing 2 and hitting enter
r. Enter the IP address you wrote down in 1(e) of this document
s. Enter your number of bits for your subnet mask
t. Say n for No to the question "Do you want to enable DHCP server on LAN?"
u. Say y to the webConfigurator protocol question

v. You will now see a summary similar to the one below including the web address of your firewall where you will be able to login to finish the configuration

```
The IPv4 LAN address has been set to 192.168.35.5/24
You can now access the webConfigurator by opening the following URL in your web
browser:
                http://192.168.35.5/

Press <ENTER> to continue.
```

w. Power on you CentOS workstation if it is off and connect to the internal web address of your firewall (http://192.168._____.5) using the Firefox web browser

Applications   Places   System
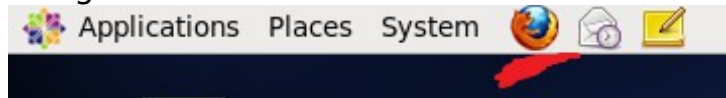
x. Login to the pfSense firewall with the default credentials login: admin password: pfsense

y. Go through the initial configuration setting the following fields:
    i. Hostname: pfSense
    ii. Domain: csci.pvt
    iii. Primary DNS: 132.194.70.65
    iv. Uncheck Allow DNS servers to be overridden by DHCP

General Information	
Hostname:	pfSense EXAMPLE: myserver
Domain:	csci.pvt EXAMPLE: mydomain.com
Primary DNS Server:	132.194.70.65
Secondary DNS Server:	
Override DNS:	☐ Allow DNS servers to be overridden by DHCP/PPP on WAN
	Next

    v. Time Server Hostname: 132.194.10.82
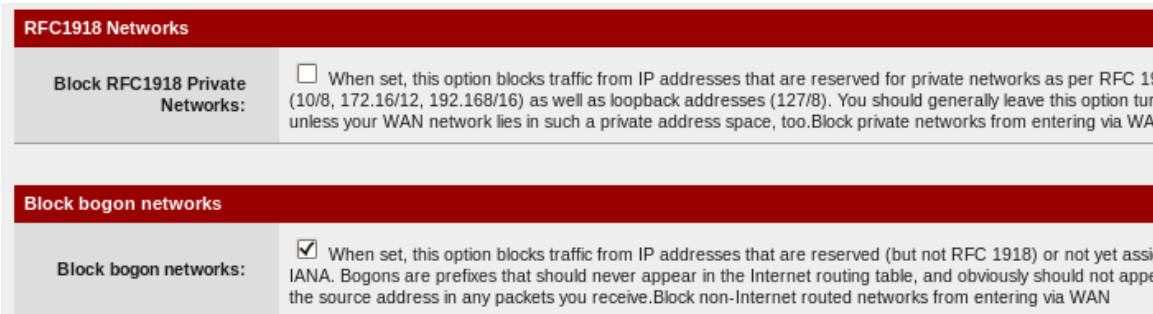
vi. Timezone: America\Denver

Time Server Information

Time server hostname:	✎ 132.194.10.82 Enter the hostname (FQDN) of the time server.
Timezone:	America/Denver ⌄

Next

vii. Leave the WAN interface configuration to DHCP but uncheck Block RFC1918 Private Networks

RFC1918 Networks

Block RFC1918 Private Networks:	☐ When set, this option blocks traffic from IP addresses that are reserved for private networks as per RFC 1(10/8, 172.16/12, 192.168/16) as well as loopback addresses (127/8). You should generally leave this option turunless your WAN network lies in such a private address space, too.Block private networks from entering via WA

Block bogon networks

| Block bogon networks:	☑ When set, this option blocks traffic from IP addresses that are reserved (but not RFC 1918) or not yet assiIANA. Bogons are prefixes that should never appear in the Internet routing table, and obviously should not appethe source address in any packets you receive.Block non-Internet routed networks from entering via WAN

viii. Leave your LAN address as 192.168.211.5 and the subnet mask 24 bits

ix. Set the admin password to 12345678 and click next

x. click reload to load the new configuration into the firewall

xi. After the reload click on the "click here to go to the webconfigurator"

Click **here** to continue on to pfSense webConfigurator.

Wizard completed.

xii. Click on Diagnostics -> Ping
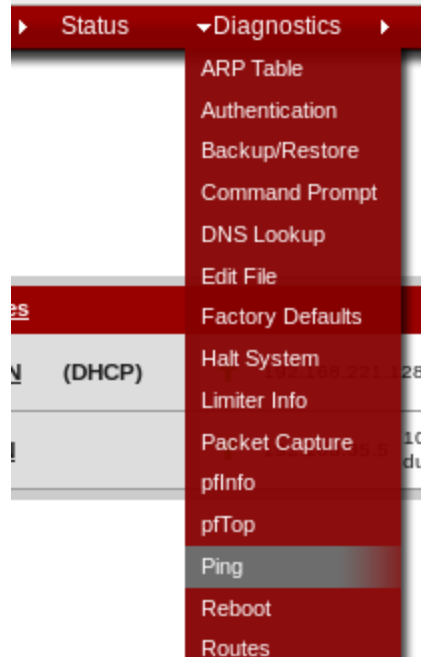
xiii. Enter 8.8.8.8 as the host to ping and click on the ping button. You should see 3 successful pings. What was your average ping time? 12.004 ms

Diagnostics: Ping

Ping output:

```
PING 8.8.8.8 (8.8.8.8) from 192.168.221.128: 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=128 time=12.716 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=128 time=11.560 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=128 time=11.675 ms

--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 11.560/11.984/12.716/0.520 ms
```

xiv. Now try to ping google.com. What was your average ping time? 1.896 ms

Diagnostics: Ping

Ping

Host	google.com
Interface	WAN ⇕
Count	3 ⇕

Ping

Ping output:

```
PING google.com (74.125.225.174) from 192.168.221.128: 56 data bytes
64 bytes from 74.125.225.174: icmp_seq=0 ttl=128 time=1.864 ms
64 bytes from 74.125.225.174: icmp_seq=1 ttl=128 time=1.911 ms
64 bytes from 74.125.225.174: icmp_seq=2 ttl=128 time=2.333 ms

--- google.com ping statistics ---
3 packets transmitted, 3 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 1.864/2.036/2.333/0.211 ms
```

xv. Open up a terminal on the CentOS workstation and try to ping 8.8.8.8
Let a few pings go through and then hit control-c to stop the pings. What was your average ping time from the CentOS system? 12.054 ms   (note: pinging google.com will not work yet.)

4.) Deploy a FreeBSD DNS server (Time to complete: 60 min): You will be deploying an Internet Systems Consortium (ISC) BIND (Berkeley Internet Name Domain) server. BIND is the most widely used DNS server application on the Internet. The domain name system is responsible for the conversion of domain names such as http://www.google.com to its routable IP address like 74.125.225.180. It is considered one of the most critical components of the Internet. Your server will be what is called a local master authoritative name server for your development domain. The system will have a small zone file (a list of known IP addresses) for your domain as well as act as a forwarder for any requests it does not specifically know about. When a DNS query is received for your domain BIND looks at your zone file and returns the requested information. If the query is for a domain other than yours, the query is forwarded to other DNS specified in your forwarder's configuration.

   a. Open VMware Workstation and click File -> New Virtual Machine
   b. Click the radio button next to Custom
   c. Click Next
   d. Verify it is a Workstation 10 Hardware compatibility and click Next
   e. Select the Radio Button next to I will install the operating system later and click next

f. Select your guest operating system to be Other and the version to be FreeBSD 64-bit
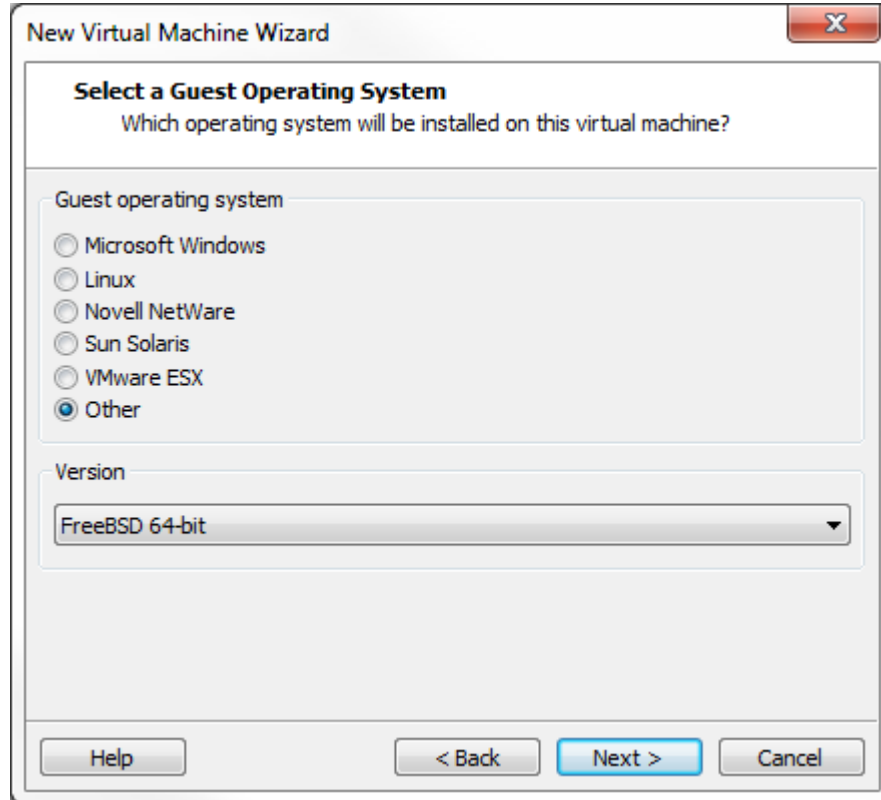
g. Change the virtual machine name to be FreeBSD_DNS and click next
h. Select 1 processor and 2 cores click next
i. Select 512 MB of memory click next
j. Select Host-only networking and click next
k. Click next (LSI Logic)
l. Click next (SCSI)
m. Click next (Create new virtual disk)
n. Click Next (Max Disk size 20GB and Split virtual disk into multiple files)
o. Click Next (Disk Name)
p. Click Customize hardware

q. Click on New CD/DVD and select the radio button next to use ISO image file and click browse
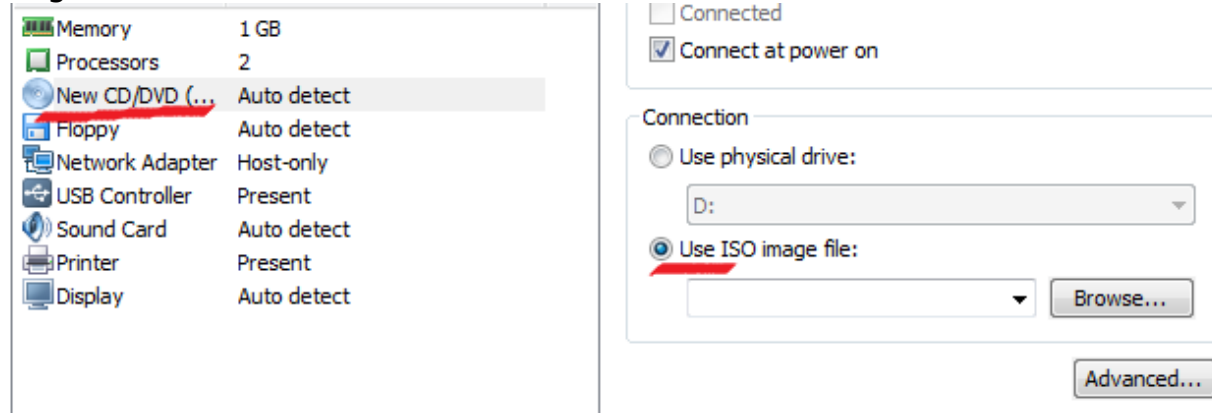
r. Browse to \\milo\StudentSoftware\FreeBSD and select FreeBSD-10.0-RELEASE-amd64-dvd1.iso and click Open
s. Close the Hardware Customization window
t. Click Finish
u. Click Power on this virtual machine

v. When the boot menu comes up just hit enter
w. Select Install
x. Hit Continue to select the Default keymap.
y. Enter ns1.csci.pvt as the hostname
z. **Uncheck GAMES AND PORTS** but leave lib32 checked (arrow down and hit Space).
aa. Use guided partitioning
ab. Select the Entire Disk

ac. Select Finish and the Commit

ad. The OS will begin to install

ae. Set Root password to 12345678
af. Network Configuration:

i. Select em0 click ok

```
FreeBSD Installer
--------------------------------------------------------------------------------

              +-------------------Network Configuration-------------------+
              | Please select a network interface to configure:          |
              | +------------------------------------------------------+  |
              | : em0      Intel(R) PRO/1000 Legacy Network Connection 1.0.3 :  |
              | : plip0  PLIP network interface                       :  |
              | +------------------------------------------------------+  |
              |                                                          |
              |                                                          |
              | -------------------------------------------------------- |
              |              <  OK  >           <Cancel>                 |
              +----------------------------------------------------------+
```
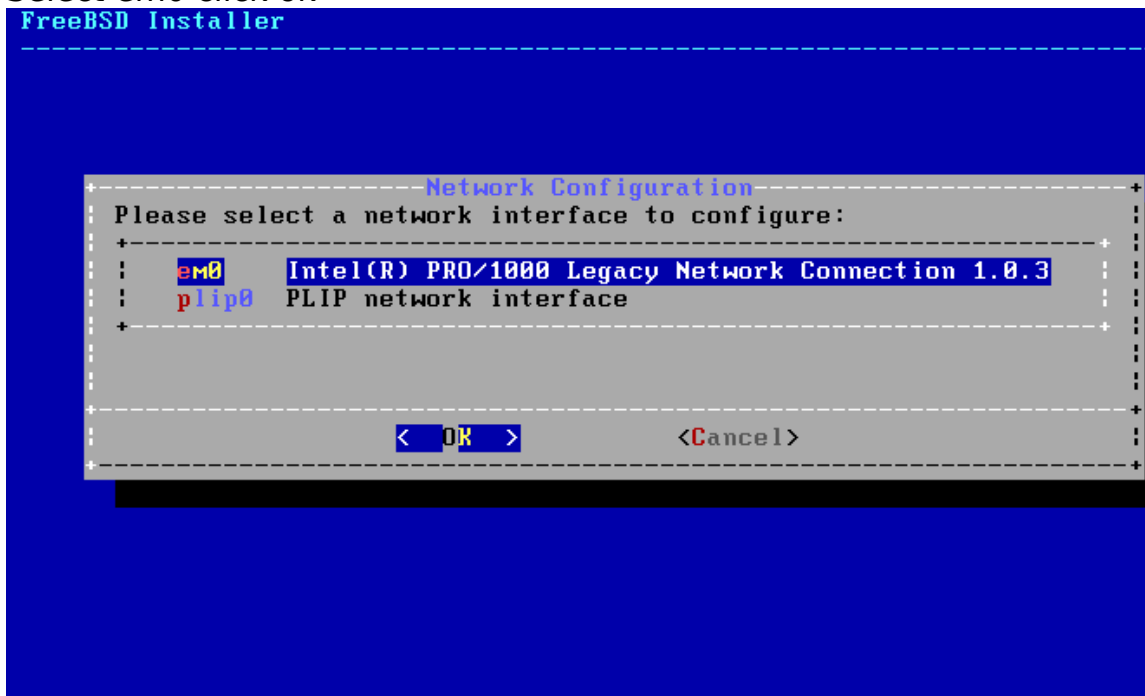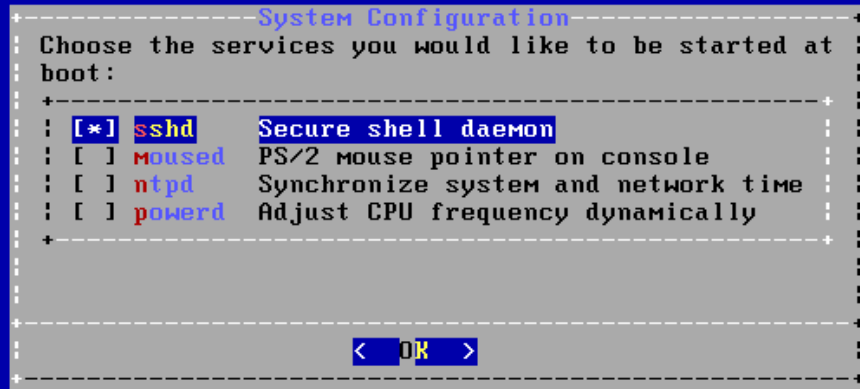
ii. Yes to configure IPv4
iii. No to using DHCP
iv. IP Address 192.168.211.15
v. Subnet mask 255.255.255.0
vi. Gateway 192.168.211.5
vii. Say no to IPv6 configuration
viii. Resolver configuration set csci.pvt for the Search and 127.0.0.1 as the DNS #1 since we want our system to look to itself and also include 132.194.70.65 as DNS#2

```
                    -------------------Network Configuration-------------------
              | Resolver Configuration                                   |
              | +------------------------------------------------------+  |
              | :Search         csci.pvt                              :  |
              | :IPv4 DNS #1    127.0.0.1                             :  |
              | :IPv4 DNS #2    132.194.70.65                         :  |
              | +------------------------------------------------------+  |
              |                                                          |
              |              <  OK  >           <Cancel>                 |
              +----------------------------------------------------------+
```
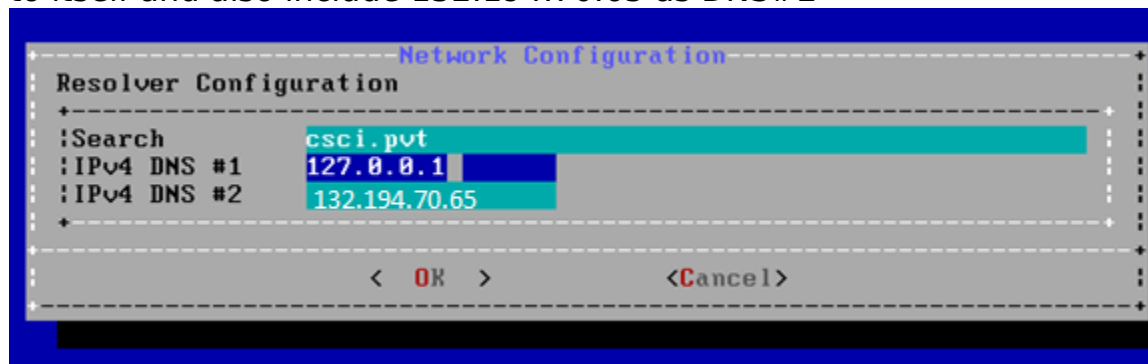
ag. Set time America (2) -> United States (49) -> Mountain (18)

ah. Check sshd to start at boot and uncheck Crash Dumps.

```
FreeBSD Installer
--------------------------------------------------------------------------------


                   +---------------System Configuration---------------+
                   | Choose the services you would like to be started at |
                   | boot:                                             |
                   |  +---------------------------------------------+  |
                   |  | [*] sshd     Secure shell daemon            |  |
                   |  | [ ] moused   PS/2 mouse pointer on console  |  |
                   |  | [ ] ntpd     Synchronize system and network time |
                   |  | [ ] powerd   Adjust CPU frequency dynamically |  |
                   |  +---------------------------------------------+  |
                   |                                                  |
                   +--------------------------------------------------+
                   |              <  OK  >                            |
                   +--------------------------------------------------+
```

ai. do not add other user accounts

aj. Exit the installer

ak. No to manual configuration

al. Reboot

am.   login as root

an. Check that /etc/rc.conf has your hostname ns1.csci.pvt and your ip address 192.168.211.15   (you can use a text editor or 'cat')

ao. ping 8.8.8.8 to verify network is working

ap. ping google.com to verify DNS is working

aq. Install BIND 9.9 with the pkg install command.
   i. First, install pkg:
      1. # pkg
      2. Select yes when asked if you want to install.
   ii. # pkg install bind99
   iii. BIND uses a utility called "rndc," which allows command line administration of the "named" daemon (which is your DNS service). Rndc uses a shared secret key authentication method to prevent unauthorized access to the "named" daemon. As such, we'll need to create and configure this key:
      1. # rndc-confgen –a
         a. This command generates the "rndc.key" file with an encrypted secret.
      2. # ee /usr/local/etc/namedb/rndc.key
         a. This will open the key file you just generated. Note down its EXACT contents – we need to

copy this over to a configuration file. Exit the text editor when you're finished.

3. Next, we'll open the configuration file and have it use the same shared secret key:
   a. # ee /usr/local/etc/namedb/rndc.conf
   b. Scroll through the page to the section that says "options."
   c. Change the line that says "default-key" to read:
      i. Default-key "rndc-key";
   d. Scroll down to the "server localhost" section.
   e. Change the line that says "key" to read:
      i. Key   "rndc-key";

```
options {
        default-server  localhost;
        default-key       "rndc-key";
};

server  localhost {
        key       "rndc-key";
};
```

   f. Scroll down to the bottom of the file and add the entire contents of the rndc.key file to the end

```
key "rndc-key" {
        algorithm hmac-md5;
        secret "go+ohGW+6BGbsaZQz46g7g==";
};
```

gNuNUZu97BQZzUd+v6DH/g==

The secret for your file will be different, as it's randomly generated each time.

   g. Save and exit your text editor.
iv. Now let's move forward with the DNS configuration:
v. # ee /usr/local/etc/namedb/named.conf
vi. Scroll down and comment out the *listen-on* declaration by putting to forward slashes (//). This will tell the system to listen for external DNS requests not just local ones. The line should look like:

//   listen-on   { 127.0.0.1; };

vii. Scroll down and remove the forward slash and asterisk (/*) on the line above the *forwarders* declaration. Replace

127.0.0.1 with your pfSense firewall's address. Also remove the */ that follows the *forwarders* declaration. This declaration tells the system to forward any request it doesn't know to the pfSense firewall

```
forwarders {
        192.168._____.5;
};
```

viii. Scroll down to the bottom of named.conf and add the following lines to add your forward lookup zone and a reverse lookup zone (used to translate IP to Name). Fill the blank space in with your private subnet number.

```
zone "csci.pvt" {
        type master;
        file "/usr/local/etc/namedb/master/csci.pvt";
};

zone "_____.168.192.in-addr.arpa" {
        type master;
        file "/usr/local/etc/namedb/master/csci.pvt.rev";
};
```

ix. Save and exit editing file
x. # cd /usr/local/etc/namedb/master
Create your zone file and make its contents be the same as the screen capture below except replace 35 with your private subnet number:
xi. # ee csci.pvt

```
$TTL  3600
csci.pvt.      IN      SOA   ns1.csci.pvt.          root.csci.pvt. (
                              1               ;       Serial
                              10800           ;       Refresh
                              3600            ;       Retry
                              604800          ;       Expire
                              86400 )         ;       Minimum TTL
; DNS Server
csci.pvt.              IN      NS              ns1.csci.pvt.

;Machine Names
ns1.csci.pvt.          IN      A               192.168.35.15
pfSense.csci.pvt.  IN      A           192.168.35.5
centos64.csci.pvt.     IN      A               192.168.35.20
dhcp.csci.pvt.         IN      A               192.168.35.10
```

```
$TTL    3600
csci.pvt.       IN      SOA     ns1.csci.pvt.   root.csci.pvt. (
                                1       ;       Serial
                                10800   ;       Refresh
                                3600    ;       Retry
                                604800  ;       Expire
                                86400 ) ;       Minimum TTL
; DNS Server
csci.pvt.               IN      NS              ns1.csci.pvt.

;Machine Names
ns1.csci.pvt.           IN      A               192.168.35.15
pfSense.csci.pvt.       IN      A               192.168.35.5
centos64.csci.pvt.      IN      A               192.168.35.20
dhcp.csci.pvt.          IN      A       █       192.168.35.10
```

We are going to create the Reverse lookup file make its contents be the same as the screen capture below except replace 35 with your private subnet number

xii. # vi /var/named/etc/namedb/master/csci.pvt.rev
$TTL 3600
35.168.192.in-addr.arpa.   IN   SOA   ns1.csci.pvt.
        root.csci.pvt. (
                                1   ;   Serial
                                10800   ;   Refresh
                                3600 ;   Retry
                                604800   ;   Expire
                                86400)   ;   Minimum TTL
; DNS Server
35.168.192.in-addr.arpa.   IN   NS   ns1.csci.pvt.

;Machine Names
15   IN   PTR   ns1.csci.pvt.
5   IN   PTR   pfSense.csci.pvt.
20   IN   PTR   centos64.csci.pvt.
10   IN   PTR   dhcp.csci.pvt.

```
$TTL    3600
35.168.192.in-addr.arpa.          IN      SOA     ns1.csci.pvt.    root.csci.
                                  1       ;       Serial
                                  10800   ;       Refresh
                                  3600    ;       Retry
                                  604800  ;       Expire
                                  86400 ) ;       Minimum TTL
; DNS Server
35.168.192.in-addr.arpa.          IN      NS      ns1.csci.pvt.

;Machine Names
15                       IN      PTR             ns1.csci.pvt.
5                        IN      PTR             pfSense.csci.pvt.
20                       IN      PTR             centos64.csci.pvt.
10                       IN      PTR             dhcp.csci.pvt.
~
~
~
~
~
~
~
~
~
```

xiii. Configure named (BIND service) to start automatically at
       boot time.
           1. # ee /etc/rc.conf
           2. add the following line:
              named_enable="YES"
           3. Save and Exit
xiv. Edit /etc/resolv.conf and comment out the University name
      server
           1. # ee /etc/resolv.conf

2. Put a # in front of nameserver 132.194.70.65

```
search csci.pvt
nameserver 127.0.0.1
#nameserver 132.194.70.65
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
/etc/resolv.conf: unmodified: line 1
```

3. Save and exit file

xv. Start named service and test
  1. # /usr/local/etc/rc.d/named start
  2. # dig google.com

```
COM.                          172626  IN      NS      e.gtld-servers.net.
COM.                          172626  IN      NS      h.gtld-servers.net.
COM.                          172626  IN      NS      c.gtld-servers.net.
COM.                          172626  IN      NS      f.gtld-servers.net.
COM.                          172626  IN      NS      g.gtld-servers.net.
COM.                          172626  IN      NS      d.gtld-servers.net.
COM.                          172626  IN      NS      b.gtld-servers.net.
COM.                          172626  IN      NS      M.gtld-servers.net.
COM.                          172626  IN      NS      j.gtld-servers.net.
COM.                          172626  IN      NS      k.gtld-servers.net.
COM.                          172626  IN      NS      i.gtld-servers.net.
COM.                          172626  IN      NS      l.gtld-servers.net.
COM.                          172626  IN      NS      a.gtld-servers.net.

;; ADDITIONAL SECTION:
a.gtld-servers.net.           172626  IN      A       192.5.6.30
a.gtld-servers.net.           172626  IN      AAAA    2001:503:a83e::2:30
b.gtld-servers.net.           172626  IN      A       192.33.14.30

;; Query time: 4 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Mon Jul 29 04:49:58 2013
;; MSG SIZE  rcvd: 488

root@ns1:/root #
```

  3. If successful you should see the above output with
     the line SERVER: 127.0.0.1#53

4. Power on your CentOS 6.4 system if it is off log in, open a terminal terminal (right click desktop and select Open in terminal) and run "dig google.com"

```
                                                                root@centos64:~/Desktop

File   Edit   View   Search   Terminal   Help

.                              12297    IN     NS     b.root-servers.net.
.                              12297    IN     NS     g.root-servers.net.
.                              12297    IN     NS     h.root-servers.net.
.                              12297    IN     NS     d.root-servers.net.
.                              12297    IN     NS     a.root-servers.net.
.                              12297    IN     NS     k.root-servers.net.
.                              12297    IN     NS     i.root-servers.net.
.                              12297    IN     NS     l.root-servers.net.
.                              12297    IN     NS     f.root-servers.net.
.                              12297    IN     NS     j.root-servers.net.

;; ADDITIONAL SECTION:
a.root-servers.net.            7753     IN     A      198.41.0.4
a.root-servers.net.            14410    IN     AAAA   2001:503:ba3e::2:30
b.root-servers.net.            25639    IN     A      192.228.79.201
c.root-servers.net.            20359    IN     A      192.33.4.12
d.root-servers.net.            27079    IN     A      199.7.91.13

;; Query time: 8 msec
;; SERVER: 192.168.35.15#53(192.168.35.15)
;; WHEN: Mon Jul 29 11:07:48 2013
;; MSG SIZE   rcvd: 507

[root@centos64 Desktop]# ▌
```

You should see the line SERVER: 192.168.35.15 #53 which means our DNS server fetched the results and forwarded them to your CentOS system.

5.) Deploy a Windows Server 2008 R2 DHCP server (Time to complete: 30 min)
- a. Open VMware Workstation and click File -> New Virtual Machine
- b. Click the radio button next to Custom
- c. Click Next
- d. Verify it is a Workstation 10 Hardware compatibility and click Next
- e. Select the Radio Button next to Installer disc image file and click browse
- f. Browse to \\milo\StudentSoftware and select the eng_windows_server_2008_r2_st_ent_dc_web_retail_x64_X15-503 65 file (you may need to "view all files" as it's not an iso) and click Open then click Next
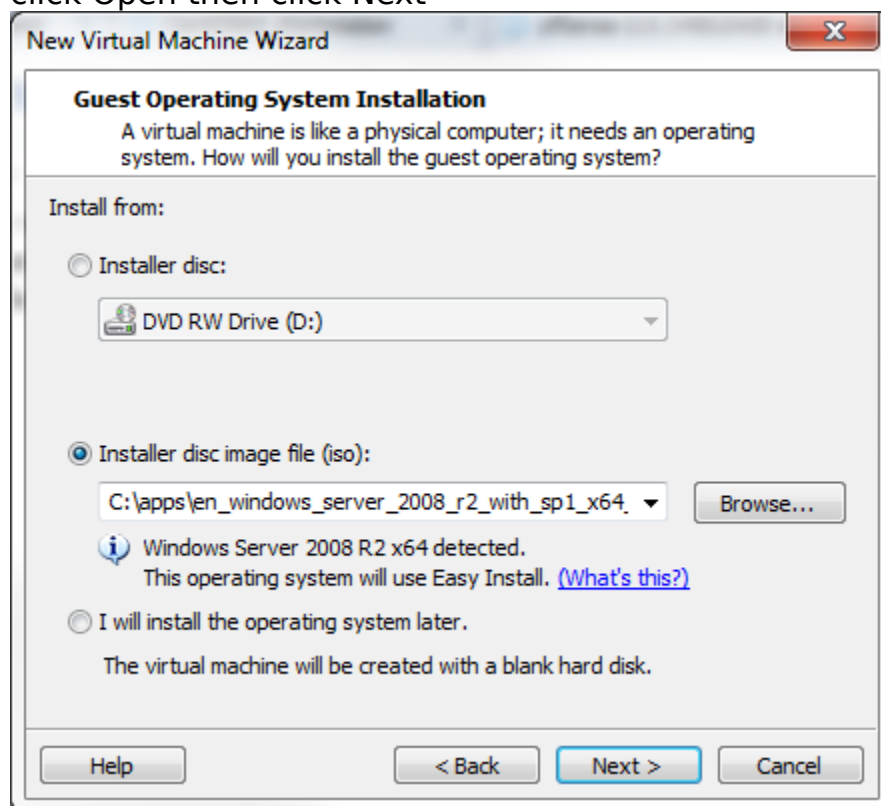
- g. Set the windows version to R2 Standard and set the username as csciadmin and password 12345678 click next and say continue

when it asks about the code
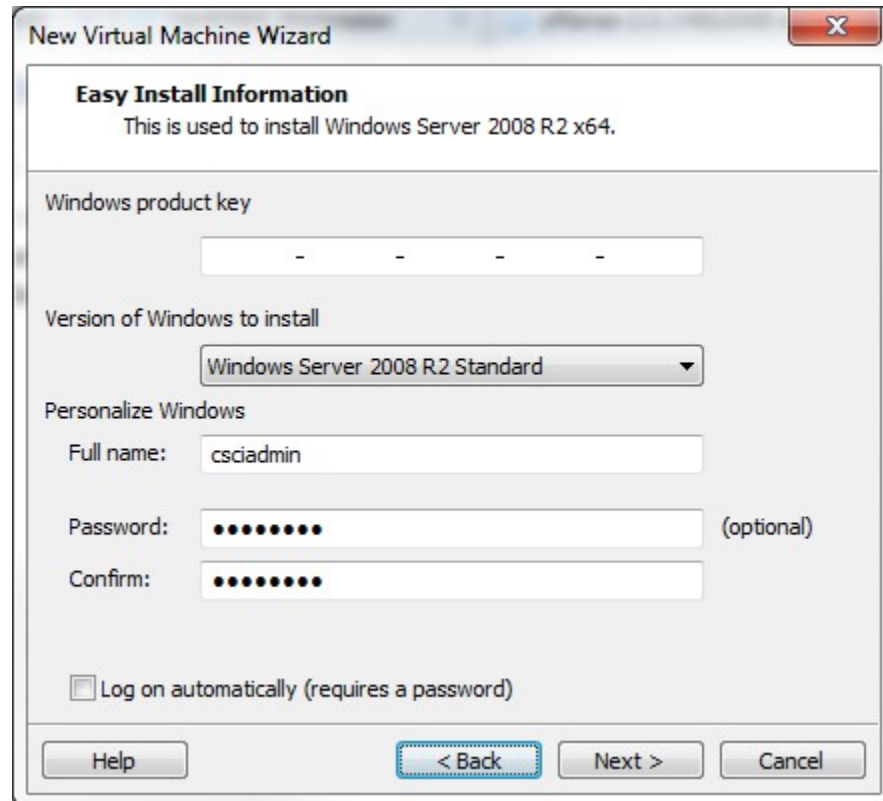
h. Change the virtual machine name to be Win2008r2_DHCP and click next
i. Select 1 processor and 2 cores click next
j. Select 1024 MB of memory click next
k. Select Host-only networking and click next
l. Click next (LSI Logic SAS)
m. Click next (SCSI)
n. Click next (Create new virtual disk)
o. Click Next (Max Disk size 40GB and Split virtual disk into multiple files)
p. Click Next (Disk Name)
q. Click Finish
r. System should power itself on if not click

s. OS installation will be complete automatically and reboot itself
t. Upon first start up the system will login and install VMware tools automatically and again reboot the system...be patient and let the VMware tools install finish before continuing.
u. After the system reboots begin configuration
    i. Click on Configure Networking

ii. Right click on the Local Area Connection and select
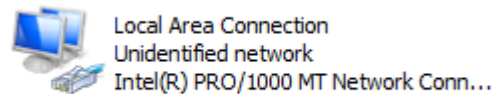
Properties

iii. Select Internet Protocol Version 4 and click the properties button
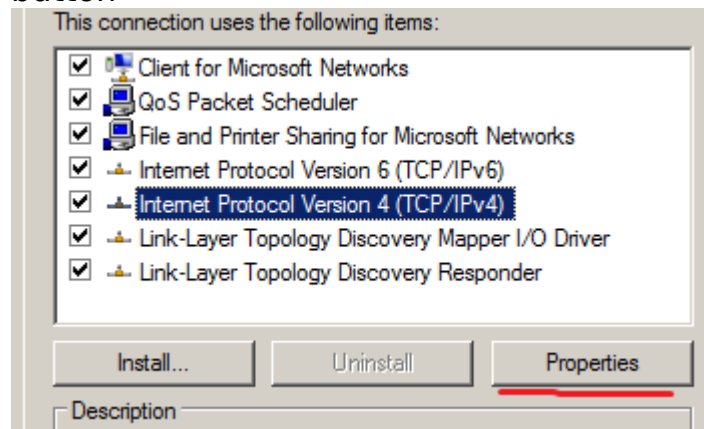
iv. Click the radio button next to Use the following IP address: and configure as shown below but replace 35 with your private subnet address and click OK
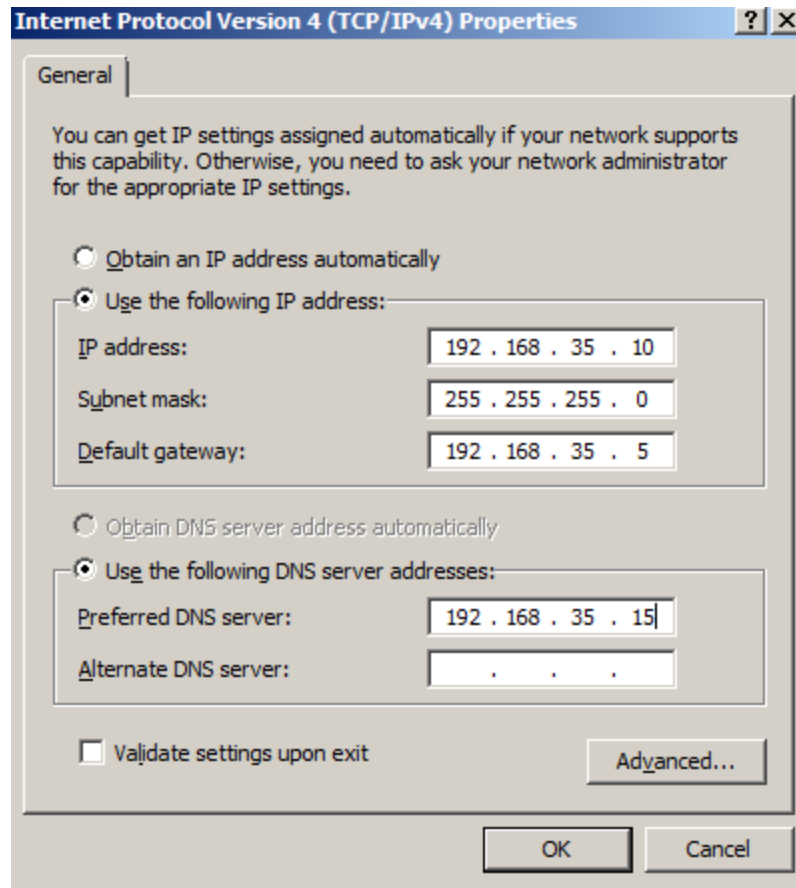
v. Now click on Provide Computer name and domain

vi. Click on the Change button

vii. Change the computer name to dhcp and click on the More button

viii. Set the Primary DNS suffix to csci.pvt (so when you try to ping a hostname it will append this domain without asking)

DNS Suffix and NetBIOS Computer Name

Primary DNS suffix of this computer:

csci.pvt

☑ Change primary DNS suffix when domain membership changes

NetBIOS computer name:

DHCP

This name is used for interoperability with older computers and services.

OK   Cancel
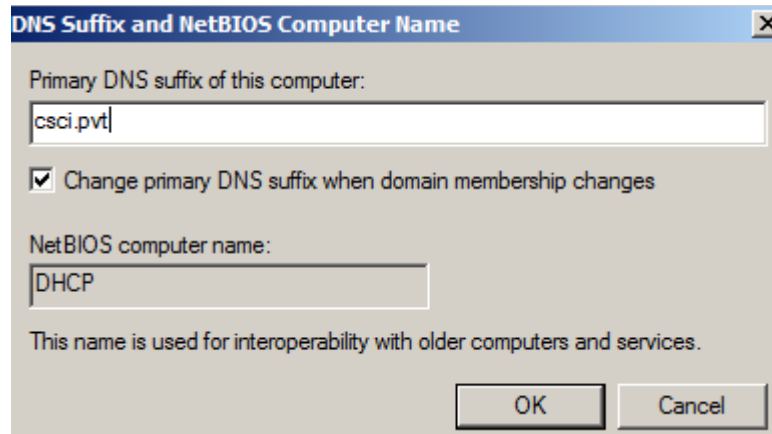
    ix. Click Ok
    x. Click OK
    xi. Click OK (Reboot Required Message)
    xii. Click Close
    xiii. Click Restart Now
    xiv. After the reboot log in and your screen should now display your new IP address and domain name

Product ID: Not activated

Time Zone: (UTC-07:00) Mountain Time (L

Local Area Connection: 192.168.35.10, IPv6 enabled

Full Computer Name: dhcp.csci.pvt
Workgroup: WORKGROUP

  v. Install DHCP Server Role
    i. Click on Add Roles

③ Customize This Server

Add roles   R(

Add features   F(
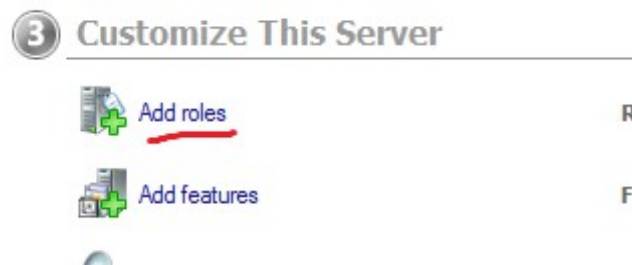
    ii. Click Next
    iii. Check the box next to DHCP Server and click Next

iv. Read the following screen and click Next
v. Make sure you have a Network Connection list and click Next
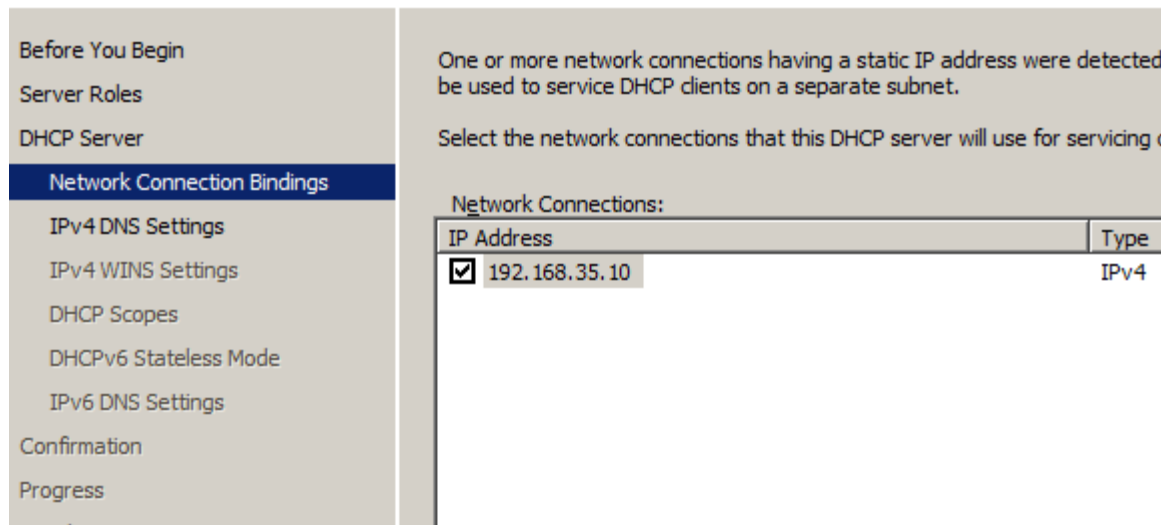
vi. Set the Parent Domain to csci.pvt and the Preferred DNS Server IPv4 address to 192.168.35.15 click validate and if Valid click Next

    vii. Make sure radio button next to WINS is not required is check and click Next

    viii. Add a scope or range of possible IP addresses for our network
1. Click Add
2. Enter information based on Section 1 (d) of this worksheet's planning section (replace 35 below with your private subnet)

 ix. Click Next

 x. Select Disable DHCPv6 stateless mode for this server and click Next

 xi. You should now see a summary of your configuration that looks similar to the one below.

 xii. Click the Install button

 xiii. When the Installation succeeded message appears click on Close and reboot the server

 xiv. After the reboot log in to the system and you will see DHCP Server listed next to Roles

Roles: DHCP Server

xv. Click the close button on the initial configuration screen
xvi. The Server Manager page will display
xvii. Expand the Tree on the right by clicking on the plus signs next to Roles - > DHCP Server -> dhcp.csci.pvt -> IPv4 ->Scope ->Address Pool
xviii. Verify your address range is listed
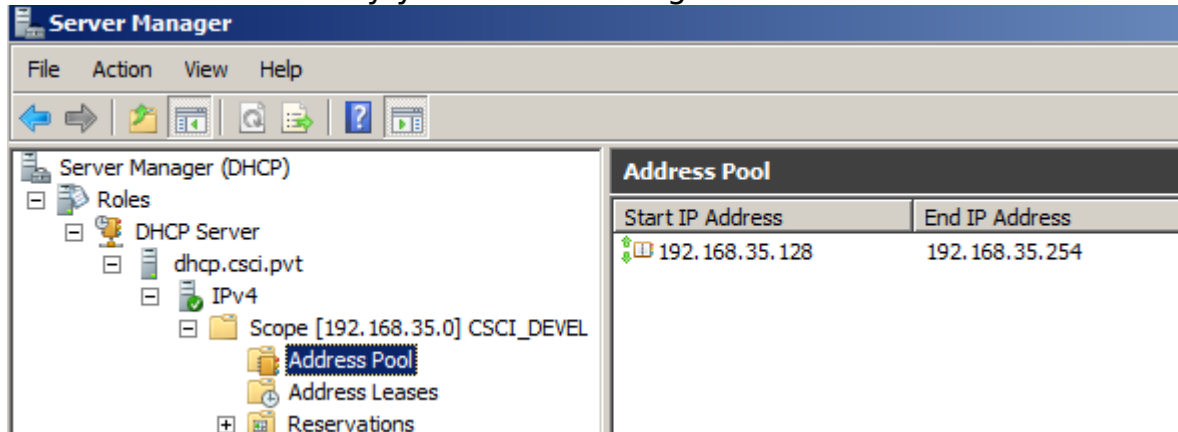
xix. Verify your scope options that will be sent to hosts that request IP addresses are correct...Click on Scope Options Router should be .5 DNS server .15 and domain csci.pvt
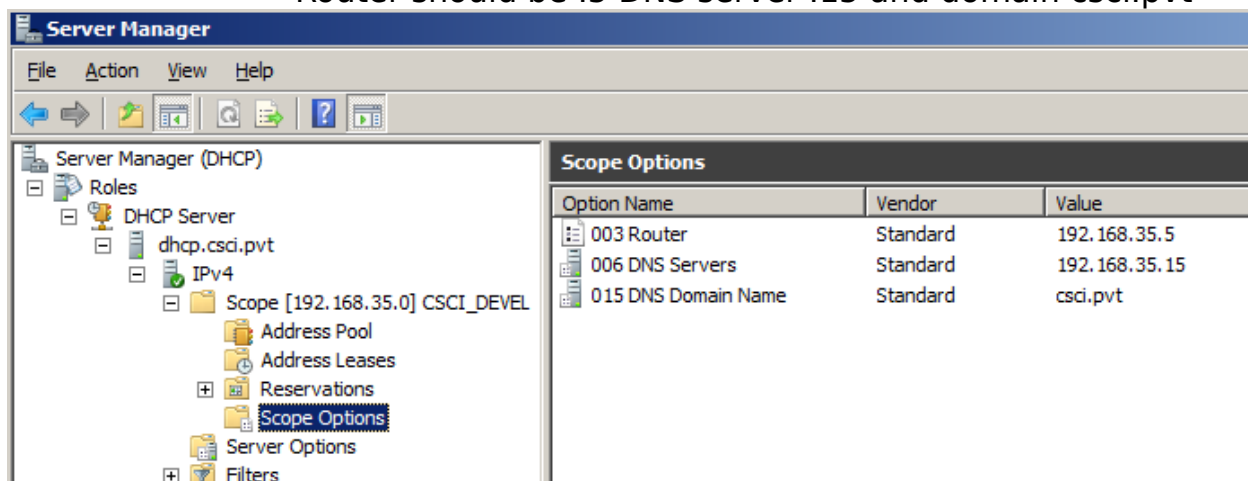
6.) Testing and verification of environment (Time to complete: 20 min)
  a. Set CentOS to DHCP and verify address
    i. Log in to your CentOS 6.4 workstation and open a terminal (right click desktop and select Open in terminal)
    ii. # cd /etc/sysconfig/network-scripts
       Rename ifcfg-eth0 in order to keep a backup of the file
    iii. # mv ifcfg-eth0 ifcfg-eth0.static.bak
       Copy our original file with DHCP configuration to ifcfg-eth0
    iv. # cp ifcfg-eth0.dhcp.bak ifcfg-eth0
       Edit ifcfg-eth0 to enable the device and stop Network Manager control
    v. # vi ifcfg-eth0
       DEVICE=eth0
       HWADDR=00:0C:29:E7:91:29
       TYPE=Ethernet
       UUID=0173e644-613c-4347-a94c-4f0180bcddcb
       ONBOOT=**yes**
       NM_CONTROLLED=**no**
       BOOTPROTO=dhcp

    vi. Edit /etc/resolv.conf
       1. # vi /etc/resolv.conf
       2. Remove the line nameserver 192.168.211.1
       3. Save and exit
       Restart networking
    vii. # service network restart
    viii. # ifconfig
    ix. You should now see a configuration similar to the one below with the address 192.168.211.128

```
[root@centos64 network-scripts]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:D9:E0:25
          inet addr:192.168.35.128  Bcast:192.168.35.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fed9:e025/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7802 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4301 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:9769942 (9.3 MiB)  TX bytes:235941 (230.4 KiB)
```

    x. Go back to your Windows 2008 R2 server and click on Address Leases, Right click in the white area where the leases get listed and select Refresh. You should now see your CentOS 6.4 systems lease listed
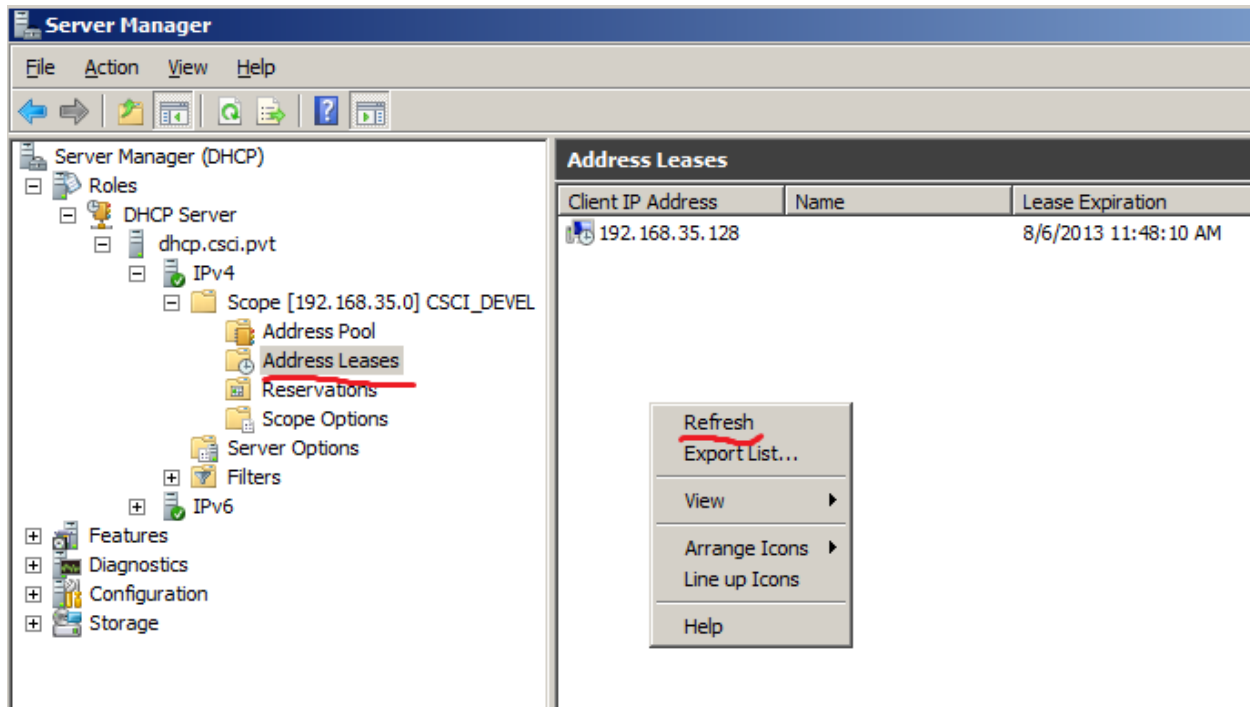
b. TEST DNS: On your CentOS 6.4 system ping all hosts by their csci.pvt DNS names
    i. Open terminal and issue the following commands
    ii. # ping pfSense.csci.pvt
    iii. # ping ns1.csci.pvt
    iv. # ping centos64.csci.pvt
    v. # ping dhcp.csci.pvt
    vi. Which system will not answer pings? Centos64 did not ping, and dhcp did not ping, but the other two did.

    vii. Can you guess why? I believe we can't ping the centos64 because it changed the IP and dhcp now because of our firewall.