Base Lab Configuration For CentOS 7

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1. Abstract

This Test Lab Guide (TLG) will provide the user with step-by-step instructions on how to configure a basic network configuration using CentOS 7 servers and a CentOS 7 client. The resulting test lab environment will provide a stable base for building other test labs. It is recommended that users preserve the start of their test machines once this walk-through has been successfully completed. In a physical environment the hard drive of the machine can be imaged. In a virtual environment, the “snapshot” or equivalent feature can be used to preserve the current state of the operating system. Preserving the working conditions of the basic test lab will allow the user to experiment without fear of having to completely rebuild their environment. The ultimate goal of the TLG is to familiarize the user with the CentOS 7 Operating system and how to deploy common network services based on that operating system, and ultimately enable the user to conduct their own experiments in a CentOS 7 based environment.

2. Introduction

The purpose of the Test Lab Guides (TLGs) is providing users with practical guidelines for deploying current operating systems in a way that results in a functional configuration. Using a TLG will instruct the user in which servers to create, how to configure the operating systems and services, and how to install and configure additional software. A TLG experience enables the user to experience the entire set-up process from start to finish.

This TLG is written with the goals of reusability and extensibility in mind. The purpose of this particular TLG is to enable the creation of a basic network utilizing CentOS 7 as the central operating system. Once this network is complete several other TLGs can be built on top of this base configuration.

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Once this lab is completed, it would be wise to save the initial configuration. How this is best done will depend on how the test environment was originally deployed. A physical environment can be preserved by imaging the drives of each machine to be stored in a separate location and retrieved when needed. In a network deployed virtually, a snapshot can be taken of each machine. This will preserve the current settings and configurations. Preserving the lab in a functional state is important, because it allows for a functional configuration to be restored without completely repeating the base lab configuration steps. This is helpful for correcting after a mistake or generating a test environment for a new product.

> Note: If you are completing these TLG's in a virtual environment using VMWare and have access to an electronic copy of this document, and you have VMWare Tools installed on the Virtual Machine, utilize the ability to copy and paste text from the host machine to the VM. Copying and pasting will help to reduce typos and command errors.
>
> - Highlight and right-click a command from this document
> - Click Copy
> - Right-click in the virtual machine where you would like to copy the text to and click Paste
> - If you are working inside a terminal, you may only need to right click in order to copy the command over

Terminology

A Records.
AAAA Records.
Active Directory (AD).
CNAME Records.
Domain Controller (DC).
Domain Name System (DNS).
Dynamic Host Configuration Protocol (DHCP).
Firewalld.
Google Public DNS.
GNU's Not Linux (GNU).

GNU nano.
IP Forwarding.
iptables.
Network Address Translation (NAT).
Network Interface Controller (NIC).
Network Manager (nmtui).
NS Records.
PTR Records.
Samba.
Xfce Desktop Environment.

3. Disclaimer

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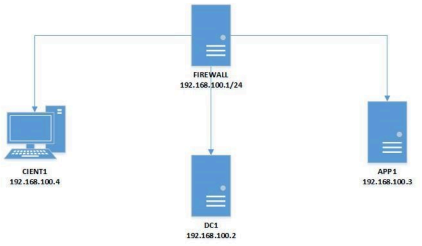
4. Overview of this Test Lab Guide

This document contains instructions for settings up the CentOS 7 base configuration test lab by deploying two servers running CentOS 7, one client running CentOS 7 and one firewall built on CentOS 7. Once completed, the lab will simulate the functioning of a private intranet.

Important: The instructions provided in this document are for educational purposes. They do not represent best practices nor are they recommendations for a production network. These configurations should not be put into place on a production network. This network should be deployed on a separate network specific to testing (physical or virtual).

4.1. Network Design



Firewall

IP Address: 192.168.100.1/24

Hostname: firewall.college.com

```
The Firewall’s purpose is to handle traffic between the Intranet and
 Internet. This means that it will act as a router directing traffic.
 There are two interfaces on Firewall, one is the external/Internet-
facing called ens192 and the other is the internal/Intranet-facing
 called ens224.
```

DC1

IP Address: 192.168.100.2

Gateway: 192.168.100.1

DNS Server: 127.0.0.1

Hostname: dc1.college.com

```
This will be configured as the Intranet’s Domain Name System (DNS) and
 the Dynamic Host Configuration Protocol (DHCP) server.
```

App1

IP Address: 192.168.100.3

Gateway: 192.168.100.1

DNS Server: 192.168.100.2

Hostname: app1.college.com

```
This is an internal web and application server.
```

Client1 IP Address: Dynamic

DNS Server: 192.168.100.2

Hostname: client1.college.com

```
Client1 is a workstation that has the ability to switch between the
 Intranet and Internet subnet.
```

4.2. Hardware and Software Requirements

Minimum requirements:

- Four functioning computers or VMs for configuration with OpenBSD installed.

4.3. Using “Sudo”

When running many commands throughout these TLGs you may be required to use ‘sudo’ depending on the level of privilege the current user has. The ‘sudo’ command allows the command following it to be run at superuser privileges. It is important to note that the user must be in the ‘sudoers’ file in order to successfully use this command. If you make the account an administrator while installing, it will be added to the ‘sudoers’ file automatically. Once a command is preceded by ‘sudo’ the user will be prompted for the password for the account and then the command can be run at superuser privilege. For details on how to give a user ‘sudo’ privilege see the Appendix (How to Give a User to Sudo Privileges).

5. Configuring the Environment

5.1. Step One - Configure Firewall

The below instructions detail the installation and setup of Firewall. The last section, Troubleshooting, has some information on common problems that people come across.

5.2. Install the Operating System on Firewall

1. Start CentOS7 Firewall.
2. Hit Enter to select “Install CentOS 7.”
3. On the “Welcome to CentOS Linux 7” page, select the appropriate language and region.
4. On “Installation Summary,” under “System,” select “Installation Destination.”
   a. Check and click that the VMware Virtual disk has been selected. It will highlight in blue.
   b. Click “Done” in the top left-hand corner to move back to the “Installation Summary” page.
5. To continue, click “Begin Installation.”
6. In “Configuration,” set the appropriate Root Password.
   a. Recommended Root Password: Ch@mplain!18
7. On the same “Configuration” screen, Create a User.
   a. Recommended Full Name: Champlain
   b. Recommended User Name: champlain
   c. Check box “Make this user administrator”
   d. Recommended Password: S3cur1ty!18
8. Once installation is complete, click “Reboot.”
9. Logon to the credentials you just created.
   a. User: root

  - Password: Ch@mplain!18

b. User: champlain

  - Password: S3cur1ty!18

5.3. Configure TCP/IP

1. Ensure that Network Manager is running. Type `systemctl status NetworkManager`.

   a. You should see “Active: active (running)” in green if it is running.

   b. If it is not running, enter the command sudo `systemctl start NetworkManager.service`.

   c. If the service fails to launch, check the logs by entering the command `sudo systemctl status NetworkManager.service -l`.

2. This is for the Internet-facing interface. Enter the command `nmtui` to enter the Network Manager.

   a. Select “Edit a connection.”

   b. Select the Internet-facing interface, ens192, and use the arrow keys to select “<Edit…>”

   c. Use the arrow keys to ensure that “IPv4 CONFIGURATION” is set to “<Automatic>”

   d. At the very bottom, ensure that the brackets in front of “Automatically connect” have an X by hitting the spacebar while highlighting them.

   e. Use the arrow keys to select “<OK>” then “<Back>” and press Enter to go back to the main menu of Network Manager.

   f. Use the arrow keys to select “Quit” and press Enter to exit the editor.

3. Now, repeat for Intranet-facing interface.

   a. Select “Edit a connection.”

   b. Select the Intranet-facing interface, ens224, and use the arrow keys to select “<Edit…>”

   c. Use the arrow keys to ensure that “IPv4 CONFIGURATION” is set to “<Manual>”
   d. Under “Addresses” add in “192.168.100.1/24”
   e. At the very bottom, ensure that the brackets in front of “Automatically connect” have an X by hitting the spacebar while highlighting them.
   f. Use the arrow keys to select “<OK>” then “<Back>” and press Enter to go back to the main menu of Network Manager.
   g. Use the arrow keys to select “Quit” and press Enter to exit the editor.
4. Change the hostname. To change the hostname to firewall.college.com use the following command: `sudo hostnamectl set-hostname firewall.college.com`.
5. Restart the network using `sudo systemctl restart network`.

5.4. Install and Use of Nano

1. Run the command sudo `yum install nano -y`.

5.5. Configure NAT Rules

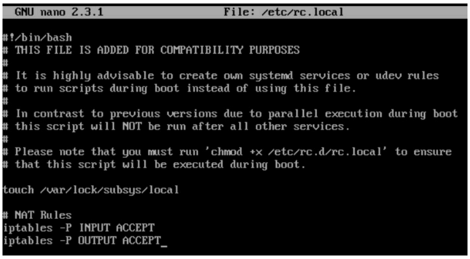
```
This will allow the system to act as a router and to allow traffic from
 the internal network out to the external network.
```

1. Enable IP forwarding by entering the command `sudo echo “net.ipv4.ip_forward = 1” >> /etc/sysctl.d/ip_forward.conf`.
   a. You will need to be root to perform this task.
   b. Switch back to champlain user afterwards using su champlain.
2. Add the external-facing NIC to Firewalld’s “public” zone by typing: `sudo firewall-cmd --zone=public --add-interface=ens192 --permanent`
   a. Where ens192 is the name of the external interface
3. Add the internal-facing NIC to Firewalld’s “internal” zone by typing: `sudo firewall-cmd --zone=internal --add-interface=ens224 --permanent`
   a. Where “ens224” is the name of the internal interface

4. Apply masquerading to the external Firewalld zone by typing: `sudo firewall-cmd --zone=public --add-masquerade --permanent`
5. Save those changes by typing: `sudo firewall-cmd --complete-reload`
6. Enable NAT by entering the command `sudo firewall-cmd --permanent --direct --passthrough ipv4 -t nat -l POSTROUTING -o ens224 -j MASQUERADE -s 192.168.100.0/24`.
7. Restart the firewall to save using `sudo firewall-cmd --reload`.
8. Configure NAT rules on iptables. Enter the following commands. `sudo iptables -F` `sudo iptables -P INPUT ACCEPT` `sudo iptables -P OUTPUT ACCEPT`
9. Ensure NAT rules on iptables remains on boot. Add in the commands from earlier for NAT by entering the command `sudo nano /etc/rc.local`. This will open the file in Nano Editor.

   a. Add in the following at the end:

```
# NAT Rules
iptables -P INPUT ACCEPT
iptables -P OUTPUT ACCEPT
```



```
  GNU nano 2.3.1                 File: /etc/rc.local

#!/bin/bash
# THIS FILE IS ADDED FOR COMPATIBILITY PURPOSES
#
# It is highly advisable to create own systemd services or udev rules
# to run scripts during boot instead of using this file.
#
# In contrast to previous versions due to parallel execution during boot
# this script will NOT be run after all other services.
#
# Please note that you must run 'chmod +x /etc/rc.d/rc.local' to ensure
# that this script will be executed during boot.

touch /var/lock/subsys/local

# NAT Rules
iptables -P INPUT ACCEPT
iptables -P OUTPUT ACCEPT_
```

a. The above ensures that the NAT rules are still in place on reboot.

b. Press Ctrl+X to exit the Nano Editor then hit Y to save the file and hit Enter to save it with the same name.

Congratulations, Firewall is now configured.

5.6. Step Two - Configure DC1

The below instructions detail the installation and setup of DC1. The last section, Troubleshooting, has some information on common problems that people come across.

5.7. Install the Operating System on DC1

1. Start CentOS7 DC1.
2. Hit Enter to select “Install CentOS 7.”
3. On the “Welcome to CentOS Linux 7” page, select the appropriate language and region.
4. On “Installation Summary,” under “System,” select “Installation Destination.”
    a. Check and click that the VMware Virtual disk has been selected. It will highlight in blue.
    b. Click “Done” in the top left-hand corner to move back to the “Installation Summary” page.
5. To continue, click “Begin Installation.”
6. In “Configuration,” set the appropriate Root Password.
    a. Recommended Root Password: Ch@mplain!18
7. On the same “Configuration” screen, Create a User.
    a. Recommended Full Name: Champlain
    b. Recommended User Name: champlain
    c. Check box “Make this user administrator”
    d. Recommended Password: S3cur1ty!18
8. Once installation is complete, click “Reboot.”
9. Logon to the credentials you just created.
    a. User: root
        - Password: Ch@mplain!18
    b. User: champlain

- Password: S3cur1ty!18

5.8. Configure TCP/IP on DC1

1. Ensure that Network Manager is running. Type `systemctl status NetworkManager`.
    a. You should see "Active: active (running)" in green if it is running.
    b. If it is not running, enter the command `sudo systemctl start NetworkManager.service`.
    c. If the service fails to launch, check the logs by entering the command `sudo systemctl status NetworkManager.service -l`.
2. Enter the command nmtui to enter the Network Manager.
    a. Select "Edit a connection."
    b. Select ens192, and use the arrow keys to select "<Edit…>"
    c. Use the arrow keys to ensure that "IPv4 CONFIGURATION" is set to "<Manual>"
    d. Under "Addresses" add in 192.168.100.2/24.
    e. Under "Gateway" add in the address of the router: 192.168.100.1.
    f. Under "DNS servers" add in the address of Google: 8.8.8.8.
    g. This is a temporary setting to ensure Internet connectivity while downloading the required packages to configure DNS and DHCP.
    h. At the very bottom, ensure that the brackets in front of "Automatically connect" have an X by hitting the spacebar while highlighting them.
    i. Use the arrow keys to select "<OK>" then "<Back>" and press Enter to go back to the main menu of Network Manager.
    j. Use the arrow keys to select "Quit" and press Enter to exit the editor.
3. Change the hostname. To change the hostname to dc1.college.com use the following command: `sudo hostnamectl set-hostname dc1.college.com`.
4. Restart the network using `sudo systemctl restart network`.

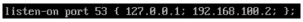
5.9. Install and Use of Nano

1. Run the command `sudo yum install nano -y`.

5.10. Configure DC1 as DNS Server

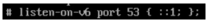
1. Install DNS using the command `sudo yum install bind bind-utils -y`.
2. Configure bind by editing named.conf. Use the command `sudo nano /etc/named.conf` to do so. Make the following edits.

   a. Edit this line to look like by adding in the IP address of the DNS server:

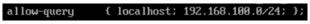
   ```
   listen-on port 53 { 127.0.0.1; 192.168.100.2; };
   ```

   b. Comment out “listen-on-v6 port 53 { ::1; };” by adding a pound (#) sign:

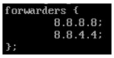
   ```
   # listen-on-v6 port 53 { ::1; };
   ```

   c. Edit “allow-query” to add in the subnet to look like:

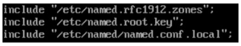
   ```
   allow-query     { localhost; 192.168.100.0/24; };
   ```

   d. Add in a section for “forwarders”:

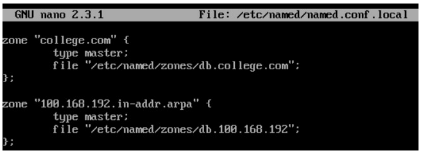
   ```
   forwarders {
           8.8.8.8;
           8.8.4.4;
   };
   ```

   e. At the end add in “include “/etc/named/named.conf.local”;”

   ```
   include "/etc/named.rfc1912.zones";
   include "/etc/named.root.key";
   include "/etc/named/named.conf.local";
   ```

3. Create and edit named.conf.local. Edit using: `sudo nano etc/named/named.conf.local`. Fill in this new, blank file with the following information.

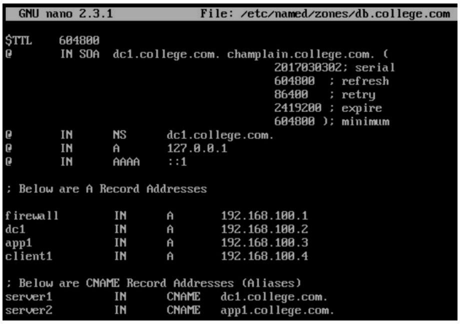
   

   ```
     GNU nano 2.3.1             File: /etc/named/named.conf.local

   zone "college.com" {
           type master;
           file "/etc/named/zones/db.college.com";
   };

   zone "100.168.192.in-addr.arpa" {
           type master;
           file "/etc/named/zones/db.100.168.192";
   };
   ```

4. Now, you will need to create the two files referenced in “etc/named/named.conf.local”
   First, create the forwarder configuration.

a. Make the zones directory in /etc/named, `sudo mkdir /etc/named/zones`.

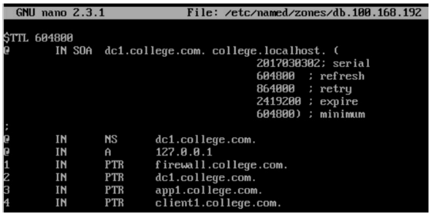
b. Create a file using `sudo nano /etc/named/zones/db.college.com`. In the end, it should like like the below screenshot.



```
  GNU nano 2.3.1              File: /etc/named/zones/db.college.com

$TTL    604800
@       IN SOA  dc1.college.com. champlain.college.com. (
                                        2017030302; serial
                                        604800  ; refresh
                                        86400   ; retry
                                        2419200 ; expire
                                        604800 ); minimum
@       IN      NS      dc1.college.com.
@       IN      A       127.0.0.1
@       IN      AAAA    ::1

; Below are A Record Addresses

firewall        IN      A       192.168.100.1
dc1             IN      A       192.168.100.2
app1            IN      A       192.168.100.3
client1         IN      A       192.168.100.4

; Below are CNAME Record Addresses (Aliases)
server1         IN      CNAME   dc1.college.com.
server2         IN      CNAME   app1.college.com.
```

5. Next, setup the reverse zone configuration file.

a. Create a file using sudo nano /etc/named/zones/db.100.168.192. In the end, it should like the below screenshot.



```
  GNU nano 2.3.1              File: /etc/named/zones/db.100.168.192

$TTL 604800
@       IN SOA  dc1.college.com. college.localhost. (
                                        2017030302; serial
                                        604800  ; refresh
                                        864000  ; retry
                                        2419200 ; expire
                                        604800) ; minimum
;
@       IN      NS      dc1.college.com.
@       IN      A       127.0.0.1
1       IN      PTR     firewall.college.com.
2       IN      PTR     dc1.college.com.
3       IN      PTR     app1.college.com.
4       IN      PTR     client1.college.com.
```

6. Start the DNS server.

a. Enable the DNS server: `sudo systemctl enable named`

b. Start the DNS server: sudo systemctl start named

7. Allow port 53 for DNS queries.

a. Allow port 53/tcp and 53/udp through on the firewall: `sudo firewall-cmd --permanent --add-port={53/tcp,53/udp}`

b. Reload the firewall: `sudo firewall-cmd --reload`

5.11. Reconfigure TCP/IP on DC1

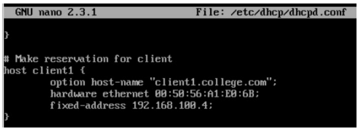
1. Enter the command `nmtui` to enter the Network Manager.

   a. Select “Edit a connection.”
   b. Select ens192, and use the arrow keys to select “<Edit…>”
   c. Under “DNS servers” remove 8.8.8.8 and add in the address: 127.0.0.1
   d. Use the arrow keys to select “<OK>” then “<Back>” and press Enter to go back to the main menu of Network Manager.
   e. Use the arrow keys to select “Quit” and press Enter to exit the editor.
2. Restart the network: `sudo systemctl restart network`

5.12. Configure DHCP on DC1

1. Install DHCP: `sudo yum install dhcp -y`
2. Open the DHCP configuration file: `sudo nano /etc/dhcp/dhcpd.conf`
3. Edit the configuration file to look like the following:

   a. Make sure to change the hardware ethernet address to your Client1’s address .



```
  GNU nano 2.3.1                File: /etc/dhcp/dhcpd.conf

}

# Make reservation for client
host client1 {
        option host-name "client1.college.com";
        hardware ethernet 00:50:56:A1:E0:6B;
        fixed-address 192.168.100.4;
}
```

4. Start the DHCP server: `sudo systemctl start dhcpd`
5. Enable the DHCP server: `sudo systemctl enable dhcpd`

Congratulations, DC1 is now configured.

5.13. Step Four - Configure App1

The below instructions detail the installation and setup of App1. The last section, Troubleshooting, has some information on common problems that people come across.

5.14. Install the Operating System on App1

1. Start CentOS7 App1.
2. Hit Enter to select “Install CentOS 7.”
3. On the “Welcome to CentOS Linux 7” page, select the appropriate language and region.
4. On “Installation Summary,” under “System,” select “Installation Destination.”
    a. Check and click that the VMware Virtual disk has been selected. It will highlight in blue.
    b. Click “Done” in the top left-hand corner to move back to the “Installation Summary” page.
5. To continue, click “Begin Installation.”
6. In “Configuration,” set the appropriate Root Password.
    a. Recommended Root Password: Ch@mplain!18
7. On the same “Configuration” screen, Create a User.
    a. Recommended Full Name: Champlain
    b. Recommended User Name: champlain
    c. Check box “Make this user administrator”
    d. Recommended Password: S3cur1ty!18
8. Once installation is complete, click “Reboot.”
9. Logon to the credentials you just created.
    a. User: root
        - Password: Ch@mplain!18
    b. User: champlain
        - Password: S3cur1ty!18

5.15. Configure TCP/IP on App1

1. Ensure that Network Manager is running. Type `systemctl status NetworkManager`.
   a. You should see "Active: active (running)" in green if it is running.
   b. If it is not running, enter the command `sudo systemctl start NetworkManager.service`.
   c. If the service fails to launch, check the logs by entering the command `sudo systemctl status NetworkManager.service -l`.
2. Enter the command `nmtui` to enter the Network Manager.
   a. Select "Edit a connection."
   b. Select ens192, and use the arrow keys to select "<Edit…>"
   c. Use the arrow keys to ensure that "IPv4 CONFIGURATION" is set to "<Manual>"
   d. Under "Addresses" add in 192.168.100.3/24.
   e. Under "Gateway" add in the address of the router: 192.168.100.1.
   f. Under "DNS servers" add in the address of the DNS Server: 192.168.100.2
   g. At the very bottom, ensure that the brackets in front of "Automatically connect" have an X by hitting the spacebar while highlighting them.
   h. Use the arrow keys to select "<OK>" then "<Back>" and press Enter to go back to the main menu of Network Manager.
   i. Use the arrow keys to select "Quit" and press Enter to exit the editor.
   j. Change the hostname. To change the hostname to app1.college.com use the following command: `sudo hostnamectl set-hostname app1.college.com`.
3. Restart the network using `sudo systemctl restart network`.

5.16. Install and Use of Nano

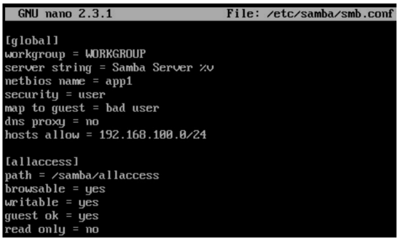
1. Run the command `sudo yum install nano -y`.

5.17. Install Web Server Role on App1

1. Install Apache: `sudo yum install httpd -y`
2. Enable Apache: `sudo systemctl enable httpd`
3. Start Apache: `sudo systemctl start httpd`
4. Allow Apache through the firewall: `sudo firewall-cmd --permanent --add-service=http`
5. Reload the firewall: `sudo firewall-cmd --reload`

5.18. Configure File Sharing on App1

1. Install Samba: `sudo yum install samba samba-client samba-common -y`
2. Create a backup of the default Samba configuration: `sudo mv /etc/samba/smb.conf /etc/samba/smb.conf.bak`
3. Create a new Samba configuration file: `sudo nano /etc/samba/smb.conf`
4. Edit it to look like the following:



```
  GNU nano 2.3.1                    File: /etc/samba/smb.conf

[global]
workgroup = WORKGROUP
server string = Samba Server %v
netbios name = app1
security = user
map to guest = bad user
dns proxy = no
hosts allow = 192.168.100.0/24

[allaccess]
path = /samba/allaccess
browsable = yes
writable = yes
guest ok = yes
read only = no
```

5. Create the actual share: `sudo mkdir -p /samba/allaccess`
6. Allow Samba through the firewall: `sudo firewall-cmd --permanent --add-service=samba`
7. Reload the firewall: `sudo firewall-cmd --reload`
8. Move into Samba’s directory: `cd /samba`
9. Change the permissions: `sudo chmod -R 0755 allaccess/`
10. Change the permissions: `sudo chown -R nobody:nobody allaccess/`
11. Configure SELinux to allow access to the Samba directory: `sudo chcon -t samba_share_t allaccess/`

12. Enable SMB and NMB: `sudo systemctl enable smb` and `sudo systemctl enable nmb`
13. Start SMB and NMB: `sudo systemctl start smb` and `sudo systemctl start nmb`
14. This finishes the creation of the Samba share that is accessible to all users on the LAN.
15. Set the specific SELinux Boolean values that you will need to install another package containing some utilities: `sudo yum install policycoreutils-python -y`
16. Create a group for users who will be allowed access to the share: `sudo groupadd samby`
17. Create some users: `sudo useradd user1` and `sudo useradd user2`
18. Add new users to the new group: `sudo usermod -a -G samby user1` and `sudo usermod -a -G samby user2`
19. Create passwords for the new users: `sudo smbpasswd -a user1` and `sudo smbpasswd -a user2`
20. May be beneficial to use the same password: Pr1vacy!
21. Make the directory that will be used for the share: `cd /` and `sudo mkdir /samby`
22. Modify the permissions of the /samby share: `sudo chmod 0770 /samby` and `sudo chgrp samby /samby`
23. Edit the SELinux settings for the /Samby share:

    - `sudo setsebool -P samba_export_all_ro=1 samba_export_all_rw=1`
    - `getsebool -a | grep samba_export`
    - `sudo semanage fcontext -at samba_share_t ‘/samby(/.*)?’`
    - `sudo restorecon /samby`

24. Edit the smb.conf file: `sudo nano /etc/samba/smb.conf`
25. Keep everything in there and add the following section to the smb.conf; that section should look like:
26. Restart the SMB services: sudo systemctl restart nmb and sudo systemctl restart smb

Congratulations, App1 is now configured.

5.19. Step Four - Configure Client1

The below instructions detail the installation and setup of the Client. The last section, Troubleshooting, has some information on common problems that people come across.

5.20. Install the Operating System on Client1

1. Start CentOS7 Client1.
2. Hit Enter to select "Install CentOS 7."
3. On the "Welcome to CentOS Linux 7" page, select the appropriate language and region.
4. On "Installation Summary," under "System," select "Installation Destination."
    a. Check and click that the VMware Virtual disk has been selected. It will highlight in blue.
    b. Click "Done" in the top left-hand corner to move back to the "Installation Summary" page.
5. To continue, click "Begin Installation."
6. In "Configuration," set the appropriate Root Password.
    a. Recommended Root Password: Ch@mplain!18
7. On the same "Configuration" screen, Create a User.
    a. Recommended Full Name: Champlain
    b. Recommended User Name: champlain
    c. Check box "Make this user administrator"
    d. Recommended Password: S3cur1ty!18
8. Once installation is complete, click "Reboot."
9. Logon to the credentials you just created.
    a. User: root

- Password: Ch@mplain!18

b. User: champlain

- Password: S3cur1ty!18

5.21. Configure TCP/IP on Client1

1. Ensure that Network Manager is running. Type `systemctl status NetworkManager`.

   a. You should see "Active: active (running)" in green if it is running.

   b. If it is not running, enter the command `sudo systemctl start NetworkManager.service`.

   c. If the service fails to launch, check the logs by entering the command `sudo systemctl status NetworkManager.service -l`.

2. Enter the command `nmtui` to enter the Network Manager.

   a. Select "Edit a connection."

   b. Select ens192, and use the arrow keys to select "<Edit…>"

   c. Under "DNS servers" add in the address of the DNS Server: 192.168.100.2

   d. At the very bottom, ensure that the brackets in front of "Automatically connect" have an X by hitting the spacebar while highlighting them.

   e. Use the arrow keys to select "<OK>" then "<Back>" and press Enter to go back to the main menu of Network Manager.

   f. Use the arrow keys to select "Quit" and press Enter to exit the editor.

3. Change the hostname. To change the hostname to dc1.college.com use the following command: `sudo hostnamectl set-hostname client1.college.com`.

4. Restart the network using `sudo systemctl restart network`.

5.22. Install GUI

1. Install epel-release: `sudo yum install epel-release -y`

2. Install groupinstall: `sudo yum groupinstall "Server with GUI" -y`

   a. This will be very time-intensive.

3. Install XFCE: `sudo yum groupinstall “XFCE” -y`
4. Tell the machine to boot to the GUI by default: `sudo systemctl set-default graphical.target`
5. Reboot the machine: `sudo reboot`
6. When the machine is rebooted, you may be taken to a screen that looks similar to the initial install screen.

   a. Click “License Information”

   b. Click the box next to “I accept the license agreement” and then click “Done”

   c. Click “Finish Configuration”, which will take you to the login screen of the GUI

7. Login.
8. Click the gear icon and select “Xfce Session”

   a. Enter your password and click “Sign In”

   b. When you first login, you will get a pop-up for the first start of the panel. Click “Use default config”

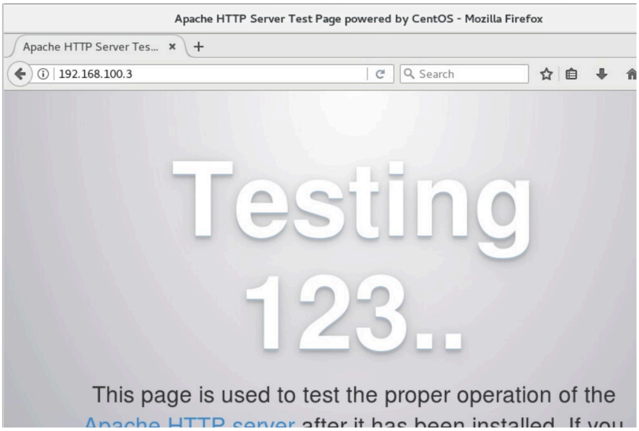
5.23. Test Access to Resources on BUSNET Subnet

1. Test Access to the Web Server

   a. Under Applications, open Firefox Web Browser.

   b. Enter the IP address of App1 (192.168.100.3) into the URL bar.

   c. If it is configured correctly, you should see the Apache test page, shown below.

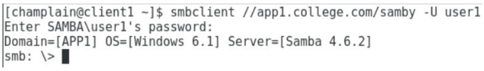

Apache HTTP Server Test Page powered by CentOS - Mozilla Firefox
Apache HTTP Server Tes...
192.168.100.3
Search

Testing 123..

This page is used to test the proper operation of the Apache HTTP server after it has been installed. If you

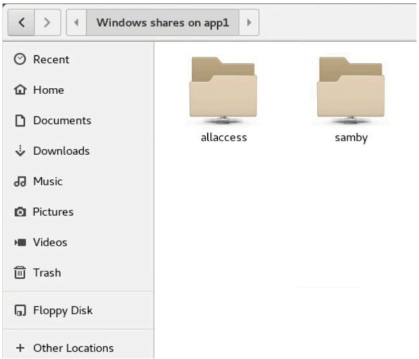
2. Test Access to the Samba Share

   a. Under Applications, open a Terminal.
   b. Install Samba: `sudo yum install samba-client samba-common cifs-utils -y`
   c. Allow Samba through the firewall: `sudo firewall-cmd --permanent --add-service=samba`
   d. Reload the firewall: `sudo firewall-cmd --reload`
   e. Log into the SMB share: `smbclient //app1.college.com/samby -U user1`



```
[champlain@client1 ~]$ smbclient //app1.college.com/samby -U user1
Enter SAMBA\user1's password:
Domain=[APP1] OS=[Windows 6.1] Server=[Samba 4.6.2]
smb: \> █
```

   f. Alternatively, you should be able to access the “WORKGROUP” share through “File Manager” and then either browse to “allaccess” share, which allows all users or sign into the “samby” share.



Congratulations, Client1 is now configured.

Congratulations, the Base Lab Configuration is finished.

6. Troubleshooting

6.1. Location to Logs & Configuration Files

- General Logs: /var/log/messages

- Samba Configuration: /etc/samba/smb.conf

6.2. I. Firewall - Installing Nano - Cannot install nano

1. Check to see if you can ping out by using `ping 8.8.8.8`. If you can't then this should be a solution.
2. Sometimes, when interfaces are edited in Network Manager, there will be a second ens192. Delete it.
3. First check Network Manager by using `nmtui` to see if the interfaces are set up properly.
    a. The external/Internet interface, ens192, should have:
        i. IPv4 Configuration set to Automatic
        ii. Automatically connect check-boxed
    b. The internal/Intranet interface, ens224, should have:
        i. IPv4 Configuration set to Manual
        ii. IP Address: 192.168.100.1/24
        iii. Automatically connect check-boxed
4. Restart your network by using `sudo systemctl restart network`.

6.3. II. Firewall - systemctl restart network

1. It's okay if network won't restart.

6.4. III. Firewall - tcpdump

1. Install tcpdump on your Firewall: `sudo yum install tcpdump -y`
2. Switches:
    a. -D: Display available interfaces
        - Ex: `sudo tcpdump -D`
    b. -i: Capture packets from a specific interface
        - Ex: `sudo tcpdump -i ens224`

c. -n: Capture IP address

- Ex: `sudo tcpdump -n`

d. port: Captures from a specific port

- Ex: `tcpdump -i ens224 port 22`

e. src: Captures packets from source IP

- Ex: `tcpdump -i ens224 src 192.168.0.2`

f. tcp: Captures only TCP packets

- Ex: `sudo tcpdump -i ens224 tcp`

7. Contributors

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