RIT | Golisano College of Computing and Information Sciences
School of Information

NSSA221 Systems Administration I
Lab 06: Apache, Email, Logging, and Cron

Introduction

This lab is the coup de grâce of all labs! So far, you have learned how to manage users, devices, file systems, storage and version control. In this lab, you will explore services that are found in many enterprise environments as well as smaller organizations, web and email. We will also look at approaches to remote logging and managing system tasks using the Cron utility.

Lab Summary

In this lab, you will use Windows 10 as the mail server, and Rocky Linux for a web server. The lab has three parts; the first part will have you configure an Apache web server. Once the server is running, you will create virtual hosts and produce a self-signed certificate to encrypt HTTP communications. Part 2 will explore the protocols and roles of various devices involved in email communication. The final part will give you experience running cron jobs and centralized logging in your environment.

Goals

At the end of this lab, you will…

- Have a better understanding of the role and function of a web server in an enterprise environment.
- Have experience creating virtual hosts on a web server.
- Have experience creating self-signed certificates and using Transport Layer Security in HTTP communications.
- Have experience installing and configuring an email server.
- Acquire knowledge about email communication and the protocols in play.
- Have a better understanding of email communications.
- Have experience deploying and configuring remote logging.
- Have experience setting up the Cron service.

Preparation

- Read chapters 13 and 17 from the Linux Bible.
- Read chapters 7, 8, and 9 from Windows Server 2016 Inside Out.
- Read Cron Job: a Comprehensive Guide for Beginners 2019.

Activity Summary

Activity 1 – Configuring an Apache Web Server
Activity 2 – Creating Virtual Web Servers
Activity 3 – Creating a Self-Signed Certificate
Activity 4 – Configuring Apache for Transport Layer Security
Activity 5 – Installing and Configuring MailEnable
Activity 6 – Email Client Configuration

Activity 7 – Capturing Email Network Traffic
Activity 8 – Remote Logging
Activity 9 – Setting up the Cron Service

ACTIVITIES

Activity 1 – Deploying a Basic Web Server

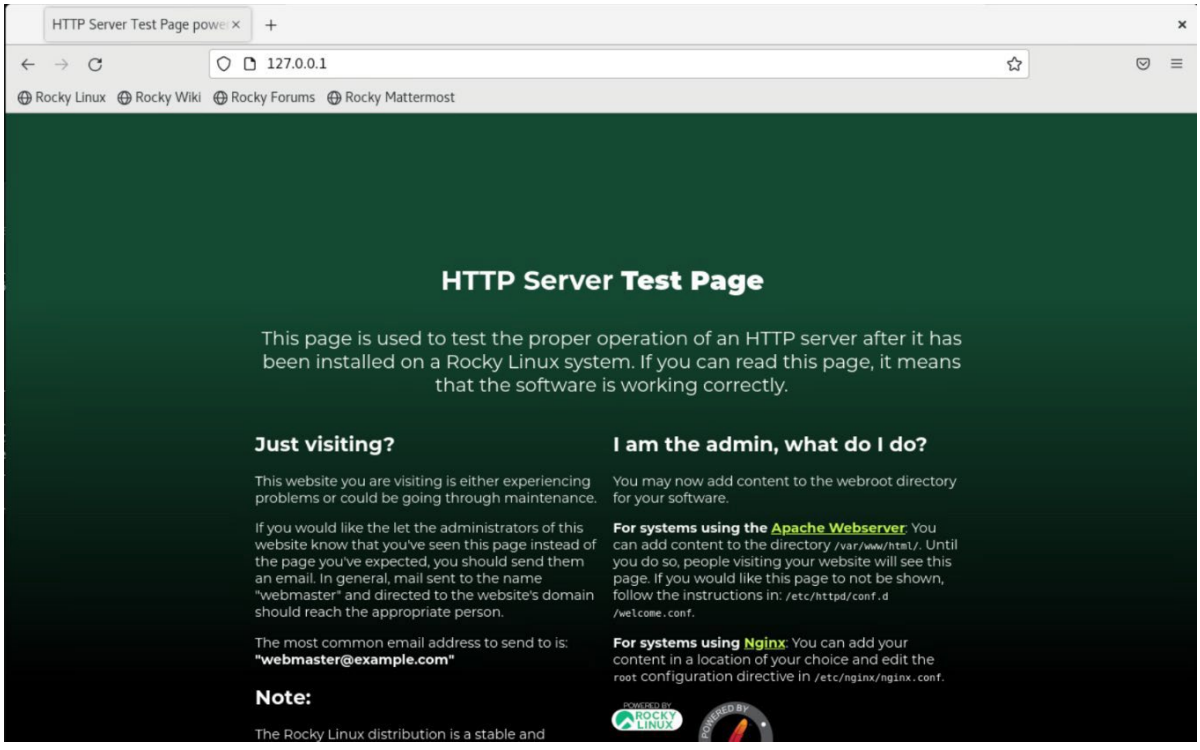
For this activity, you will be installing and configuring the Apache web service on the Rocky Linux 8 virtual machine in your environment. Feel free to "scale out," another virtual machine or use an existing Rocky VM in your deployment.

a. The Rocky Linux 8 should be assigned the same hostname from Lab 1 and have a DNS record in the DNS server. If you "scaled out," a new deployment, make sure to update DNS and assign a hostname to the new virtual machine.
b. In the previous lab, you had exercises involving SELinux, be mindful of the SELinux status of the deployment. You can edit the configuration file and set SELinux to permissive, or use the **`setenforce`** command to set it to permissive during runtime.
c. Install the required packages using the following command.

```
$ dnf -y install httpd
```

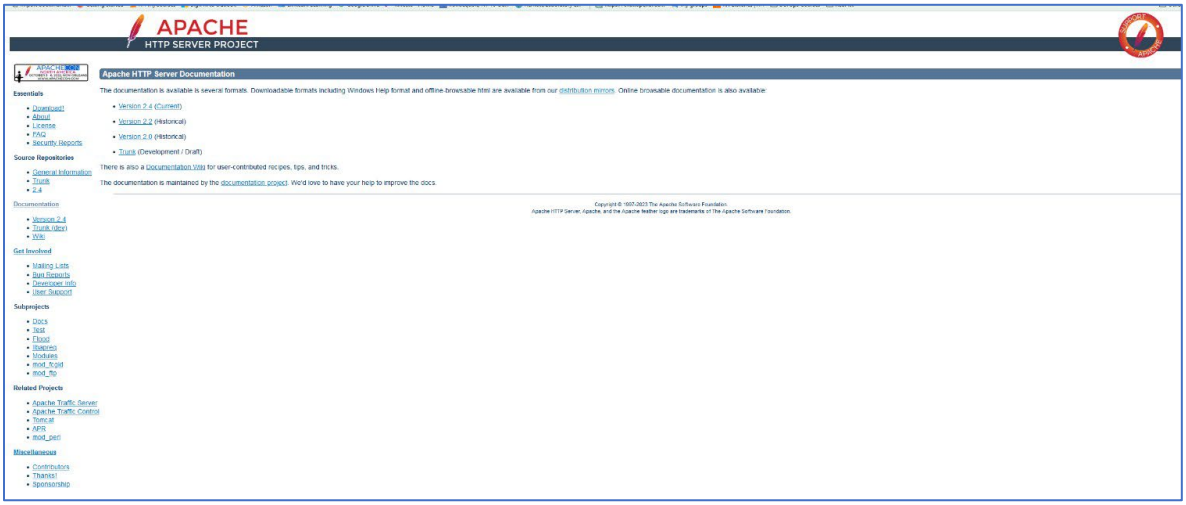
d. Start the httpd service (refer to the **`systemctl`** cheat sheet for help) and verify the installation by starting the *httpd* service and entering "*localhost*" into a web browser to bring up the default Apache webpage (Figure 1).
e. Enable the HTTP service so that it starts when the system boots.

Figure 1 – Default Apache Webpage



e. To view the Apache documentation, use the following URL https://httpd.apache.org/docs/ (Figure 2).

Figure 2 – The Official Apache Documentation

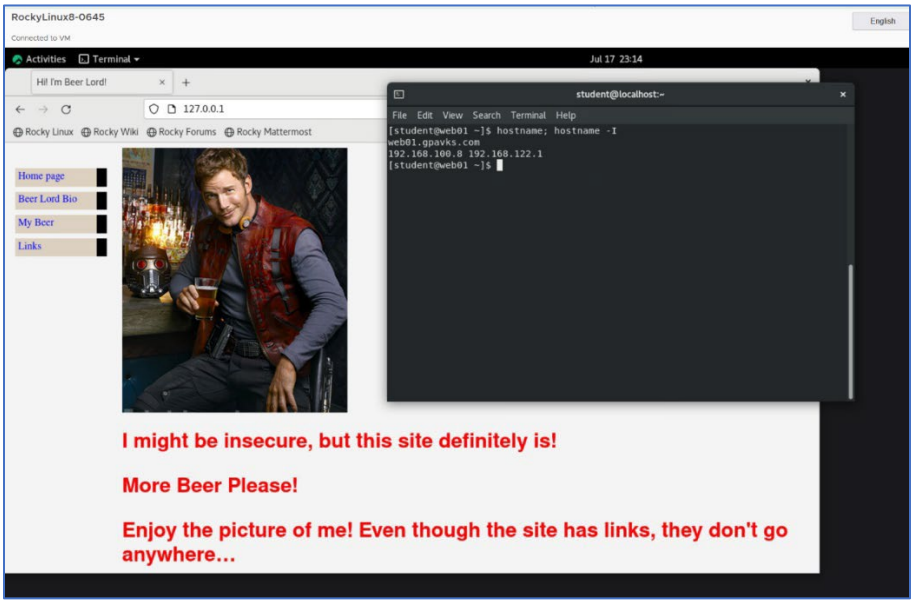


f. Add an *index.html* file, to the default Apache directory, located in */var/www/html*. You may use the sample index file provided in myCourses, or create your own.

g. Remember to restart the httpd service (**`systemctl restart httpd`**) after any changes are made to the configuration files and verify that the webpage loads correctly.

For the report, include a single screenshot showing your FQDN (the output of the **`hostname`** command), and the output of the **`hostname -I`** command. In the same screenshot, open a browser to launch the webpage. The figure must be a single screen shot properly labelled and included in the report. Refer to Figure 3 for an example.

Figure 3 – Sample Apache Server Verification Screenshot



Activity 2 – Creating Virtual Web Servers

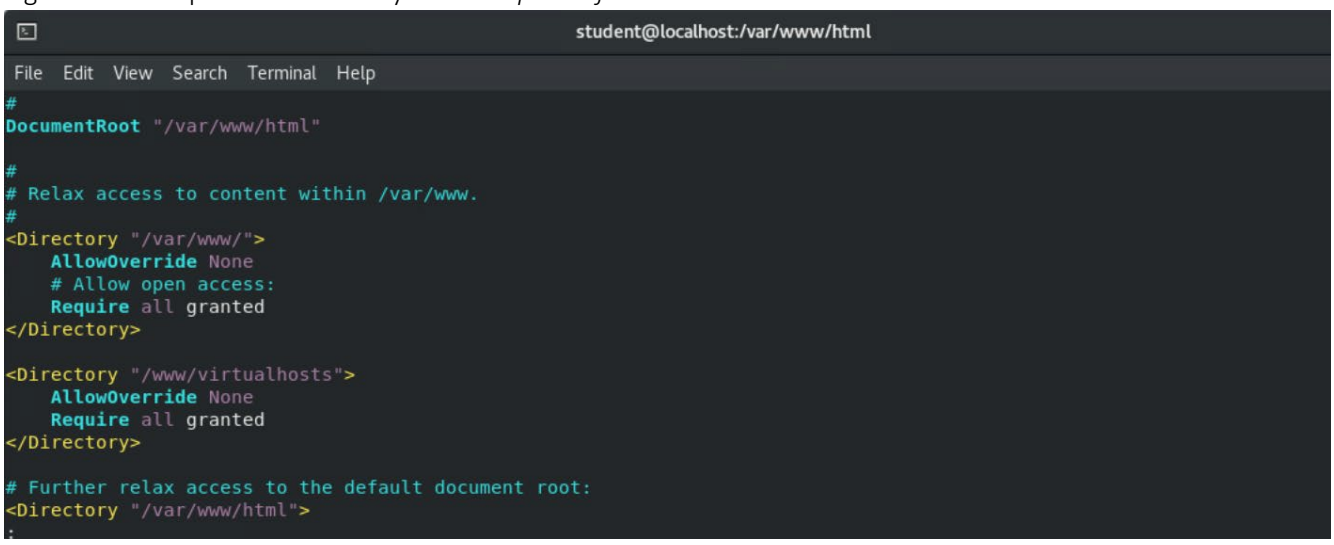
In an enterprise environment, it is unlikely that you will have multiple servers, physical or virtual, for each website. Instead, you will find a dedicated Apache server hosting many sites through virtual web servers. This activity is designed to introduce you to this concept by having you create three sites on a single (and in your case, a virtual) Apache webserver. One of the sites will be the default site, and the other two will be virtual host sites. The examples in these instructions use the following sites.

- www.gpavks.com
- starlord.gpavks.com
- gamora.gpavks.com

a. Edit the *httpd.conf* file by adding a directive to allow access to the virtual hosts. In the example provided, the virtual hosts are in the */www/virtualhosts/* directory; you may choose a different directory; and if you do, make sure to check the permissions. We will worry about creating the directories later, for now; edit the *httpd.conf* file by adding the following directive. Figure 4 provides an example of an entry.

```
<Directory "/www/virtualhosts">
   AllowOverride None
   Require all granted
</Directory>
```

Figure 4 – Example Directive Entry in the *httpd.conf* File.



b. Create the necessary configuration files for each of the virtual hosts in the */etc/httpd/conf.d* directory. To keep track of things, I recommend you name the file so that it associates to the site. For example, for "*startlord.gpavks.com,*" I have named it *"starlord.gpavks.com.conf"*. Yes, all I am doing is using the URL and adding ".conf" at the end. Trust me, when you have several virtual hosts, it is much easier to manage them when the configuration files are clearly descriptive.

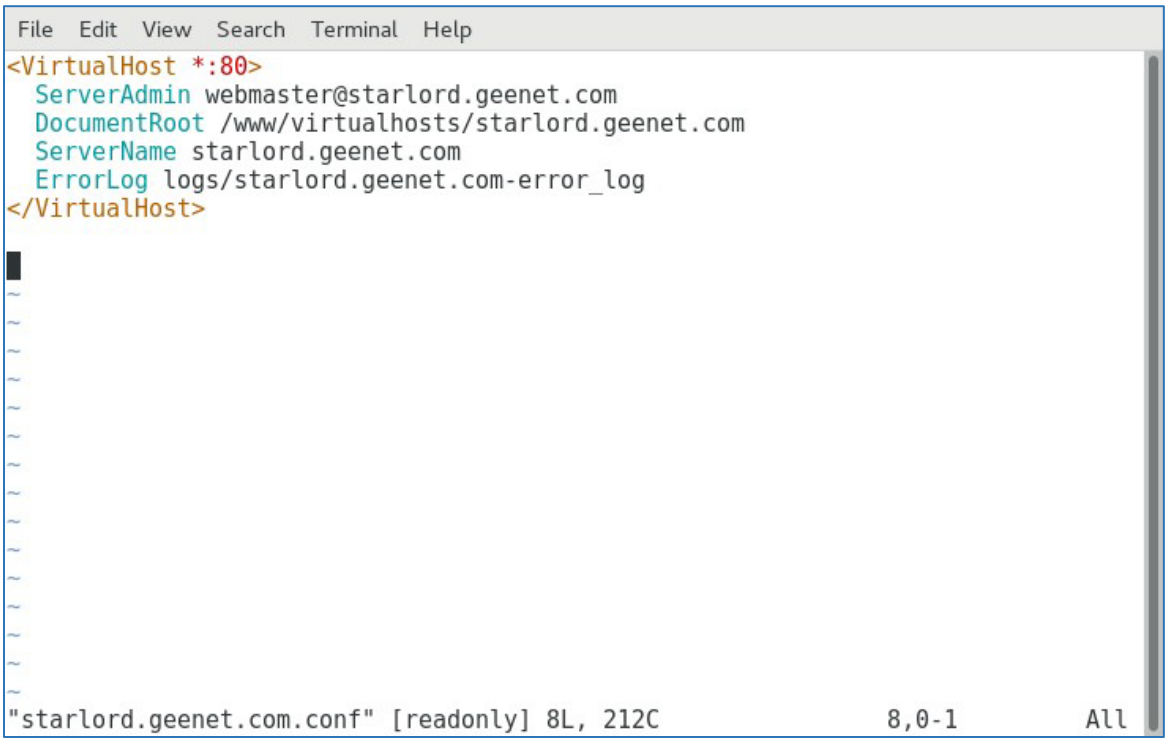
Please Note: The *"ServerAdmin"* statement is not necessary, it is purely an exercise in simulating a real-world entry, however, the other entries are required for the lab.

```
<VirtualHost *:80>
  ServerAdmin grock@gpavks.com
  DocumentRoot /www/virtualhosts/starlord.gpavks.com
  ServerName starlord.gpavks.com
  ErrorLog logs/starlord.gpavks.com-error.log
</VirtualHost>
```

See Figure 5 for a sample entry. Below is a summary of each statement in the file.

- The VirtualHost directive identifies the IP and port. The asterisk symbol, allows access through all interfaces followed by a colon and the HTTP well-known port, port 80.
- The ServerAdmin statement provides the email address of the administrator responsible for the site.
- The DocumentRoot statement is the location of the index.html file for the site.
- The ServerName statement is the virtual host server name for the site.
- The ErrorLog statement is where the error logs for each site are located.

Figure 5 – Example Virtual Host Entry



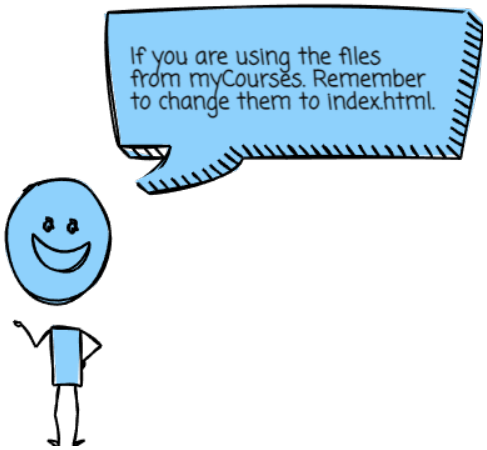
c. Create the directory path to point to the *index.html* file for the virtual host created for the site. In the following example, the path is */www/virtualhosts/starlord.gpavks.com/*.

```
$ mkdir -p /www/virtualhosts/starlord.gpavks.com
```

d. Navigate to the */www/virtualhosts/starlord.gpavks.com* directory and create a simple index.html file for testing purposes, or use the files provided in myCourses.

e. Restart the httpd service and verify that the virtual host works.

f. Repeat steps, b through e, for the second virtual host. The instructions use *gamora.gpavks.com* for the second virtual host.

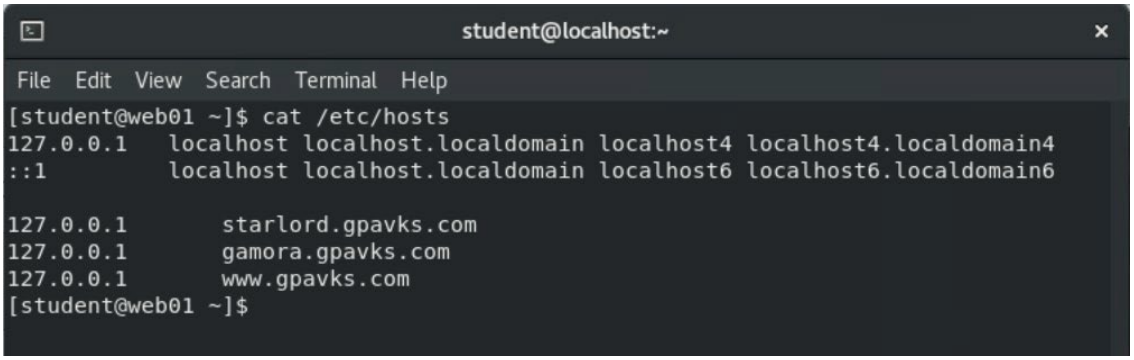


g. Finally, we need to create the default site, after all we want a default site in case something goes wrong with the virtual hosts. To do this, create a third configuration file in the */etc/httpd/conf.d* directory. The file name must be, "*_default_.conf*". No typos, it is underscore, followed by "default, and another underscore.

h. The statements in the directive are similar to the virtual hosts; except that the DocumentRoot is */var/www/html*.

i. For a quick test to verify that the three sites work on the local server, you can add entries to the /etc/hosts file (see Figure 6 for an example). All the sites will point to server IP address, or you can use the loopback.

Figure 6 – Example Hosts Configuration File

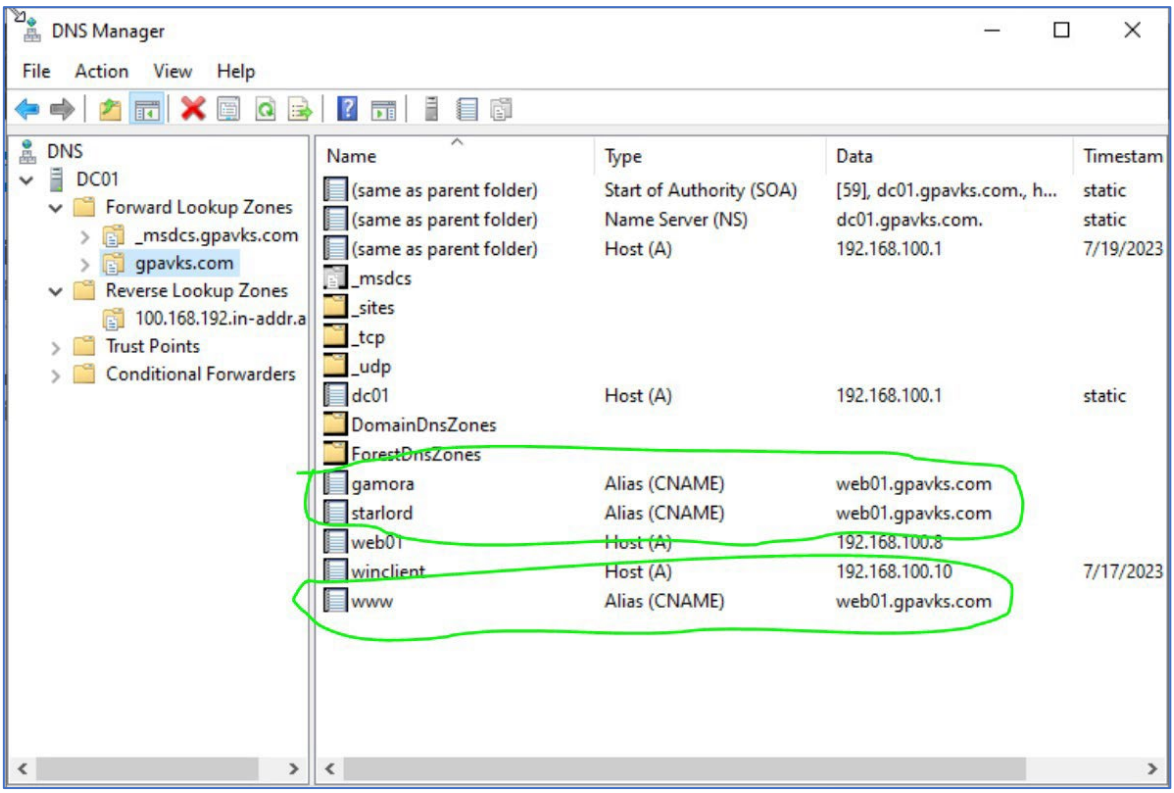


j. Ideally, we want to access the sites remotely. First we need to create a firewall rule to allow incoming HTTP traffic on the web server. And then reload firewalld.

```
$ firewall-cmd --zone=public --add-service=http –permanent
$ firewall-cmd --reload
```

k. Next, on Windows Server 2022, create aliases on the DNS server for each site. To do this, go to the Server Manager Dashboard and select *Tools → DNS* to launch the DNS Manager (Figure 7). Notice that three aliases are created for the two virtual hosts and one for the default. This is done by creating CNAME resource records.

Figure 7 – DNS Manager



DNS Configuration Recap

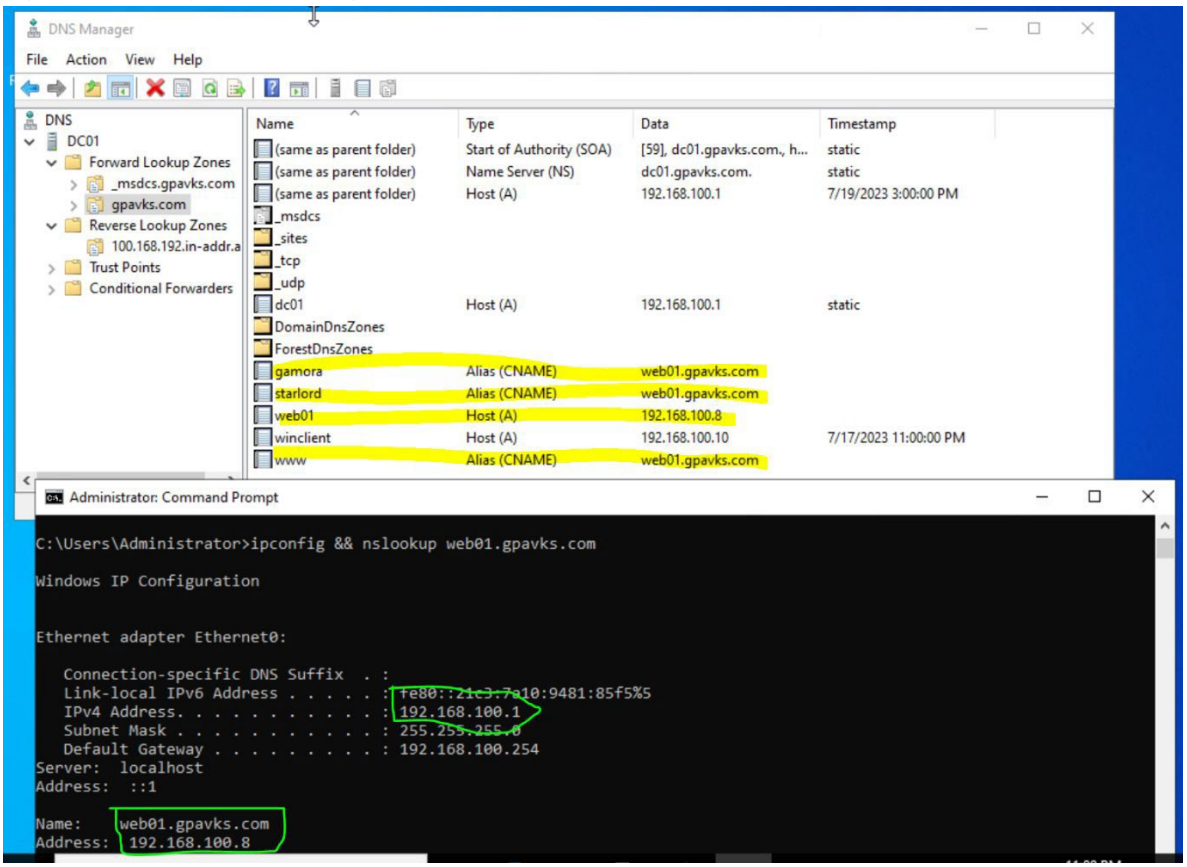
- Create a host record to map the hostname of the web server to its associated IP address (1). This may have been done in Lab 2. Referring to Figure 7, hostname web01 maps to the IP address 192.168.100.8.
- Map the default website using "www" as the DNS prefix (2), so when someone types in www.yourdomain.com, it directs them to the default website. The is mapped to the FQDN of the web server.
- Map the two virtual sites to their respective DNS prefixes (3 & 4), starlord and gamora respectively. Again, both of these are mapped to the FQDN of the web server.
- Using Figure 7 as an example, the default site is www.gpavks.com, and the other sites, starlord.gpavks.com and gamora.gpavks.com are associated to their respective sites but they all resolve to the FQDN of the web server, and the FQDN of the web server maps to its IP address.

For the report, include four screenshots.

1. The DNS configuration from Windows Server 2022. The screenshot must show the correct configurations for the following.
    a. The A resource record that maps the Fully Qualified Domain Name (FQDN) or the web server.
    b. The CNAME resource record that maps the default site to the FQDN of the web server.
    c. The CNAME resource record that maps one of the virtual hosts to the FQDN of the web server.
    d. The CNAME resource record that maps the other virtual host to the FQDN of the web server.

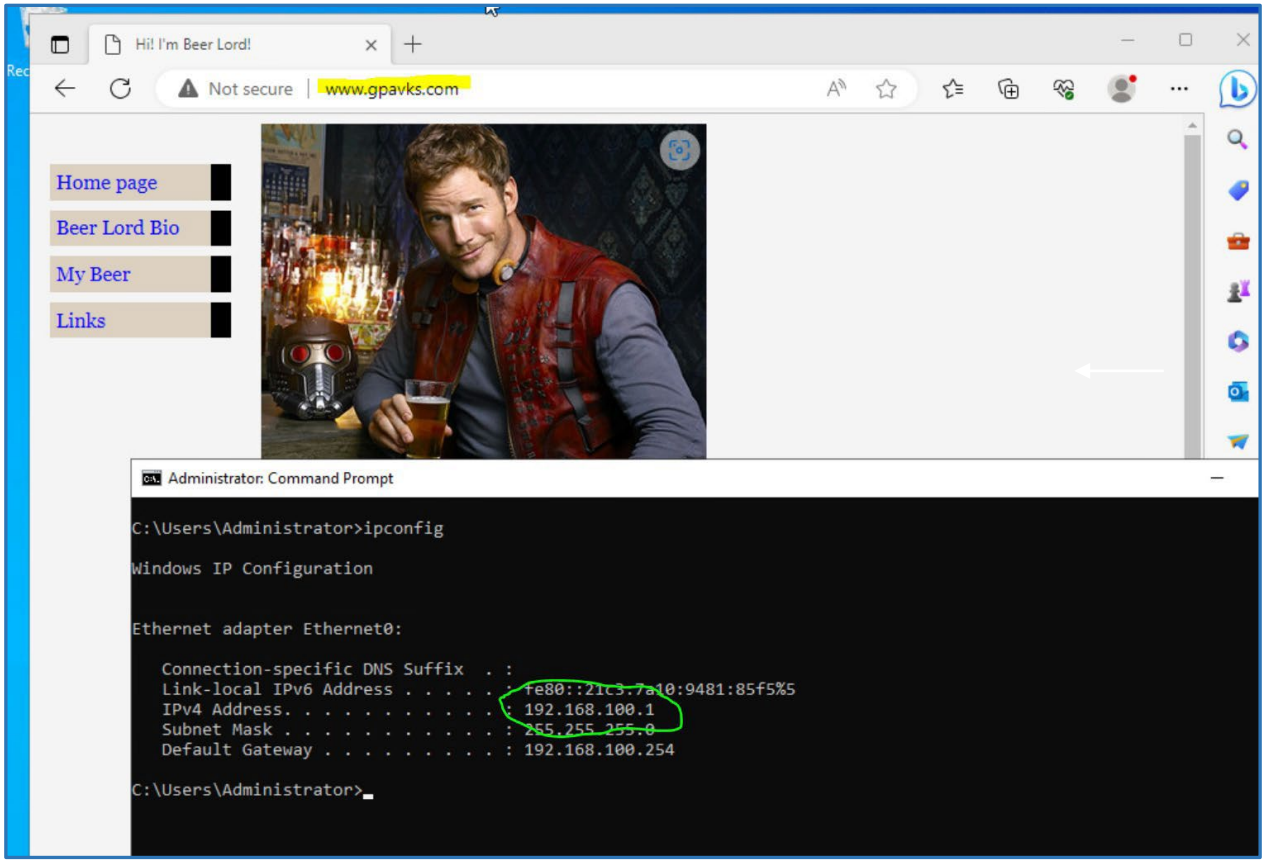
To validate the DNS CNAME resource record configuration, you must include a screenshot showing the records as they appear in the DNS manager. In the same screenshot, use the Windows Command Prompt, and show the output from the **`ipconfig`** command and **`nslookup`** on the web server. Refer to Figure 13 for an example.

Figure 8 – Example DNS Configuration



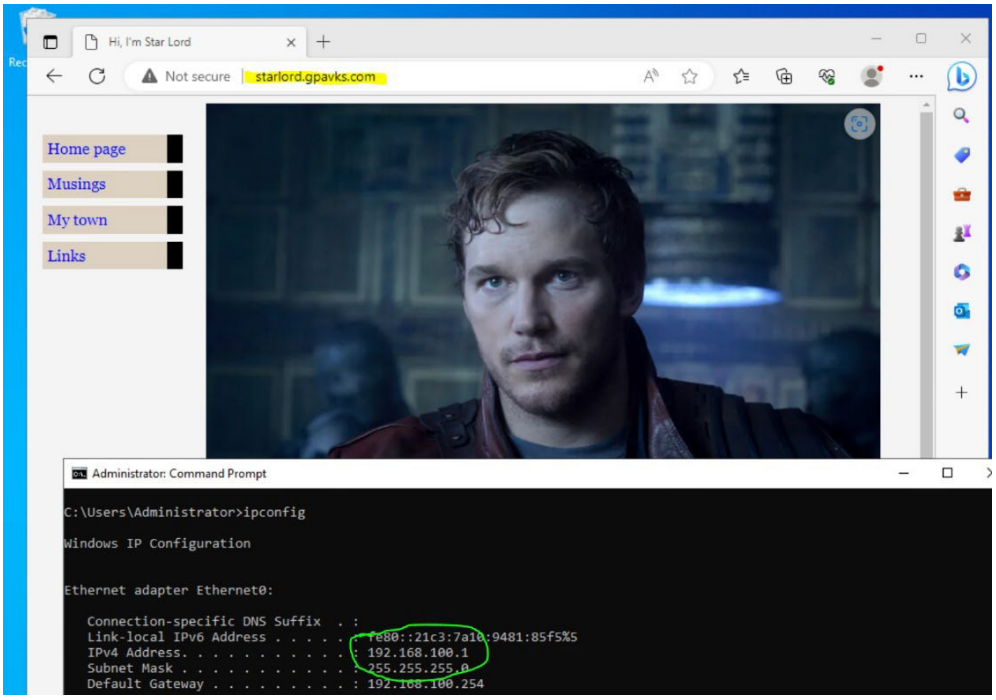
2. The second screenshot must show that the default site loads correctly from Windows Server 2022 using the default URL. The single screenshot must include the output from the **`ipconfig`** command, along with the web page; see Figure 9 for an example.

Figure 9 – Default Site



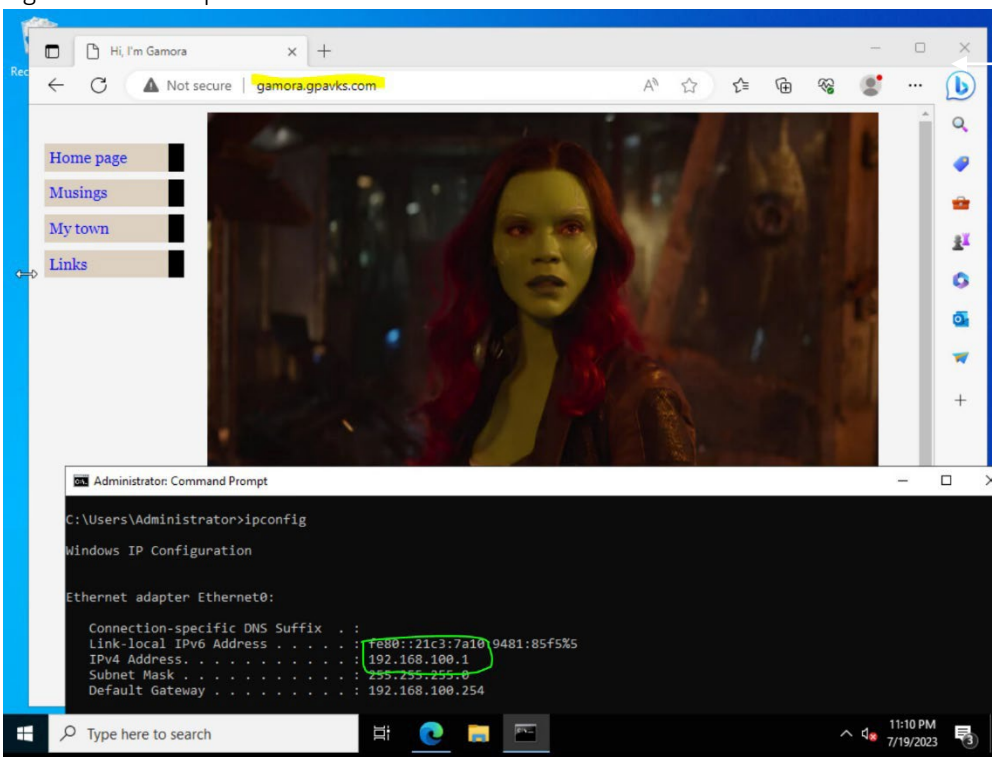
3. The third screenshot must show that the first virtual host loads correctly from Windows Server 2022 using the associative URL. The single screenshot must include the output from the **`ipconfig`** command, along with the web page; see Figure 15 for an example.

Figure 10 – Example for the First Virtual Host



4. The fourth screenshot must show that the site for the second virtual host loads correctly from Windows Server 2016 using the associative URL. The single screenshot must include the output from the **`ipconfig`** command, along with the web page; see Figure 11 for an example.

Figure 11 – Example for the Second Virtual Host



Activity 3 – Creating a Self-Signed Certificate

The next two activities focus on securing the web server. For this activity, you will create a self-signed certificate. The client uses the certificate to validate the authenticity of the web server and encrypt HTTP communications between itself and the server. Activity 4 will configure Apache to use Transport Layer Security.

a. Log into the web server as root.
b. As a reminder, SELinux can be disabled or set to permissive mode.
c. You may need to install OpenSSL, depending on the version of Rocky it may already be installed, you can check with the following command, **`rpm -qa openssl`**. Otherwise, install using the following command.

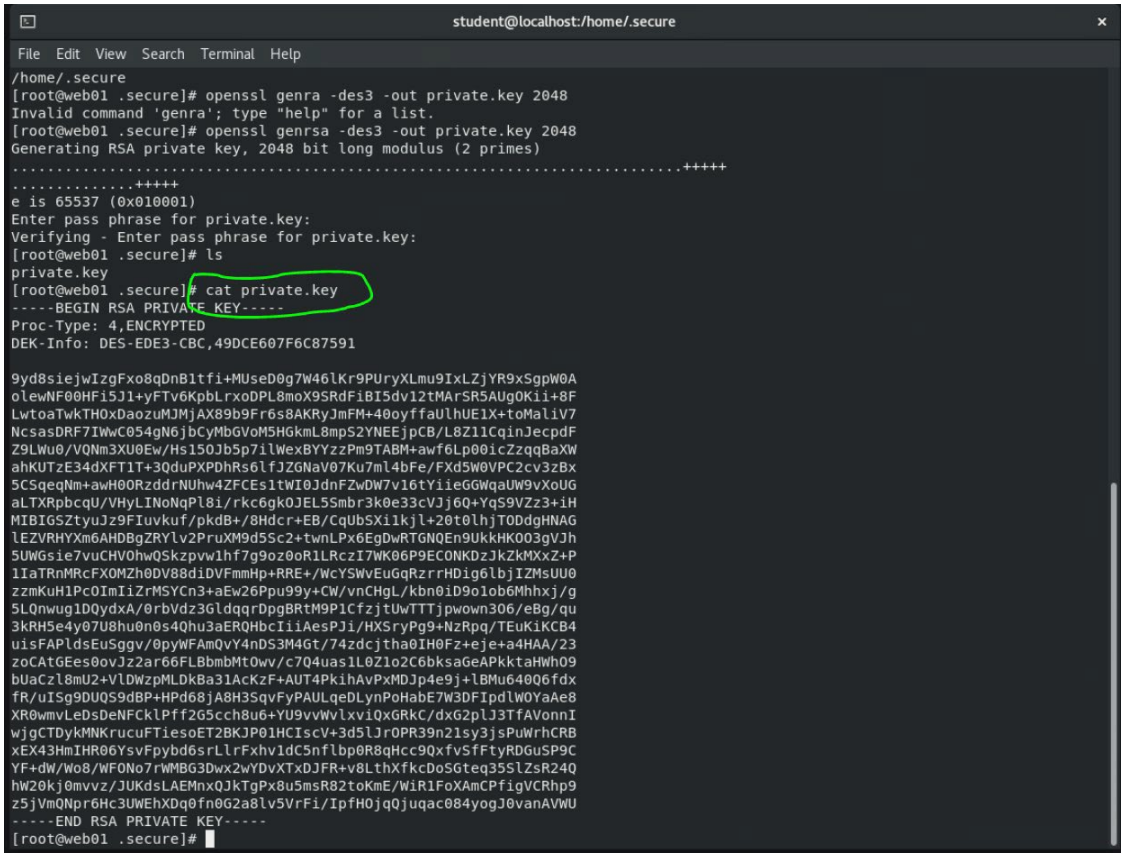
```
$ dnf install openssl -y
```

d. Next, as root, create the private key using the following command. Be mindful of what directory you are in when the key is created, because that is the directory that it will reside. These instructions use the directory */etc/pki/tls/private*.

```
$ openssl genrsa -des3 -out private.key 2048
```

e. You will be prompted for a pass phrase for the key. Enter a passphrase, and commit to memory!
f. To view the key, use the **`cat`** command.

Figure 12 – Example RSA Private Key



g. Next, create the Certificate Signing Request (CSR) which is used to (you guessed it), sign your certificate. When prompted enter the following information. These instruction store the

```
$ openssl req -key private.key -new -out server.csr
```

- Country: US
- State: New York
- Locality: Rochester
- Company: RIT
- Organizational Unit: NSSA221
- FQDN of the web server: web01.gpavks.com
- Email: me@me.com
- Challenge Password: <you decide>
- Optional Company Name: RIT

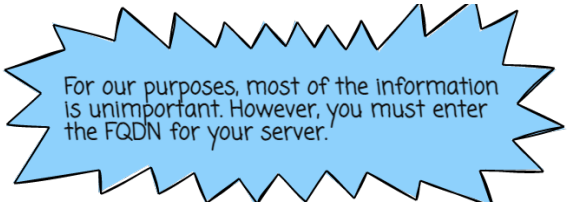
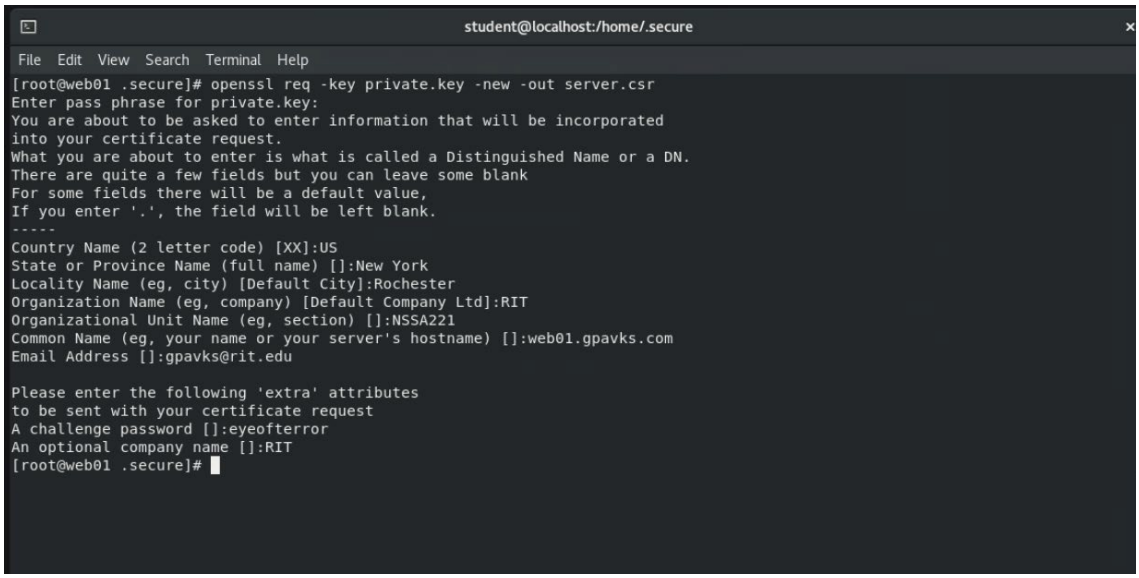


Figure 13 – Sample CSR Configuration

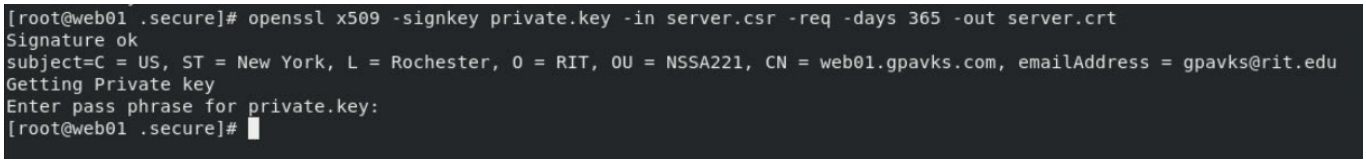


h. Next, create the Self-Signed Certificate. This certificate will be used to encrypt the HTTP traffic. Using the CSR and private key created in the previous steps enter the following command. These instructions create the certificate in the /etc/pki/tls/certs directory. Please note that the command is a single line.

```
$ openssl x509 -signkey /etc/pki/tls/private/private.key -in
/etc/pki/tls/private/server.csr -req -days 365 -out server.crt
```

i. Upon completion of the command, you will be prompted to enter the pass phrase for the private key (hope you remembered it!). Once complete the output will look similar to Figure 14.

Figure 14 – Certificate Creation



For the report, use the following command to show the contents of the certificate in plain text, **`openssl x509 -text -noout -in server.crt`**. Make sure to include the **`hostname`** and **`date`**. Figure 15 provides sample output.

Figure 15 – Certificate Verification Example

```
student@localhost:/home/.secure
File  Edit  View  Search  Terminal  Help
[root@web01 .secure]# hostname; date; openssl x509 -text -noout -in server.crt
web01.gpavks.com
Thu Jul 20 08:55:02 EDT 2023
Certificate:
    Data:
        Version: 1 (0x0)
        Serial Number:
            16:52:1e:b9:11:ce:03:36:34:13:4b:7a:68:c9:bf:93:e2:9c:e7:7c
        Signature Algorithm: sha256WithRSAEncryption
        Issuer: C = US, ST = New York, L = Rochester, O = RIT, OU = NSSA221, CN = web01.gpavks.com, emailAddress = gpavks@rit.edu
        Validity
            Not Before: Jul 20 12:44:26 2023 GMT
            Not After : Jul 19 12:44:26 2024 GMT
        Subject: C = US, ST = New York, L = Rochester, O = RIT, OU = NSSA221, CN = web01.gpavks.com, emailAddress = gpavks@rit.edu
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
                RSA Public-Key: (2048 bit)
                Modulus:
                    00:df:58:00:e7:ed:4e:f0:bf:24:86:4c:0c:4f:29:
                    82:da:17:3b:fb:de:a3:bf:2d:da:ca:5c:32:a4:c5:
                    88:5f:04:c9:8e:ce:48:b2:62:0f:ee:ce:a1:9f:a3:
                    60:8e:1f:af:1e:ad:da:94:ac:74:21:8a:50:b1:d9:
                    87:84:08:11:e0:a0:c5:fa:da:dd:bd:58:bc:5d:26:
                    61:33:eb:59:99:0e:ab:ee:4e:41:81:7c:08:3f:f7:
                    ed:0b:6c:6e:db:da:cd:d2:5e:84:6d:30:f6:0c:4a:
                    17:f4:4b:b9:97:8c:a5:6a:85:19:55:e4:7b:ff:9b:
                    8f:08:bc:11:d7:db:6c:80:bd:b5:3e:23:8c:1a:b1:
                    36:f2:af:ed:b9:f3:4b:d6:e6:b6:a5:55:22:9d:77:
                    af:e9:51:f6:a3:1b:c0:09:54:5a:ed:a9:46:44:90:
                    c1:1a:ac:27:61:61:07:f0:12:65:36:36:5c:96:5d:
                    e8:e7:41:08:dd:43:a5:83:76:bf:9d:93:fc:7e:aa:
                    26:6c:e2:64:af:ce:83:71:f7:45:f9:5c:00:c9:4b:
                    a9:0b:09:41:e8:cc:ba:22:f3:e6:6f:ef:a9:a9:d8:
                    13:84:7b:dd:d7:9c:a8:ab:97:94:a9:9a:aa:7a:8c:
                    99:e2:3d:fd:ee:46:82:4d:a5:f8:b8:b3:d4:b5:46:
                    9a:5d
                Exponent: 65537 (0x10001)
    Signature Algorithm: sha256WithRSAEncryption
         11:a4:02:c1:c1:85:a6:c5:be:ae:f3:d2:c8:ad:6e:9f:a0:5a:
         42:0f:b8:6c:3e:03:e6:72:31:14:63:76:a6:41:04:15:ae:54:
         dd:b7:e5:6b:27:ed:dd:a7:c3:e9:1e:80:dc:22:b0:e4:a2:dc:
         f8:ad:f3:70:f5:c8:ec:f2:23:4b:9e:23:31:50:03:88:b2:73:
         4b:b1:56:91:25:67:58:8f:52:b1:db:0b:32:c1:93:46:2d:ae:
         9a:d1:10:89:2e:96:ba:31:8c:fc:02:5a:ee:96:8f:e7:74:98:
         89:c4:19:99:07:8c:2b:ec:7e:e3:0c:e2:89:68:e3:99:59:a7:
         b0:bc:7f:05:a6:82:69:60:47:64:3e:19:e1:27:4a:2c:6e:a5:
         52:78:ee:76:c7:e5:e8:42:fb:75:27:09:37:55:1c:6b:48:37:
         46:52:27:9e:bf:69:a5:2c:8e:68:83:b3:a9:a9:9f:6c:b1:c5:
         d6:4c:82:05:4d:af:f5:18:78:55:30:c3:6a:12:34:71:c5:f1:
         f6:0e:26:5b:5b:2e:92:b9:a3:32:24:be:bb:cb:14:c1:6d:11:
         97:d4:da:1f:08:19:58:1f:d7:26:11:d7:b9:9f:73:4c:f1:88:
         96:53:19:01:de:32:eb:0f:fb:fa:8f:a0:84:d6:24:2b:f6:7c:
         ab:e2:a7:07
[root@web01 .secure]#
```

Activity 4 – Configuring Apache for Transport Layer Security

Now that we have the certificate, the next step is to configure the Apache server for TLS. All examples in this activity will use the following FQDN for the web server, web01.gpavks.com.

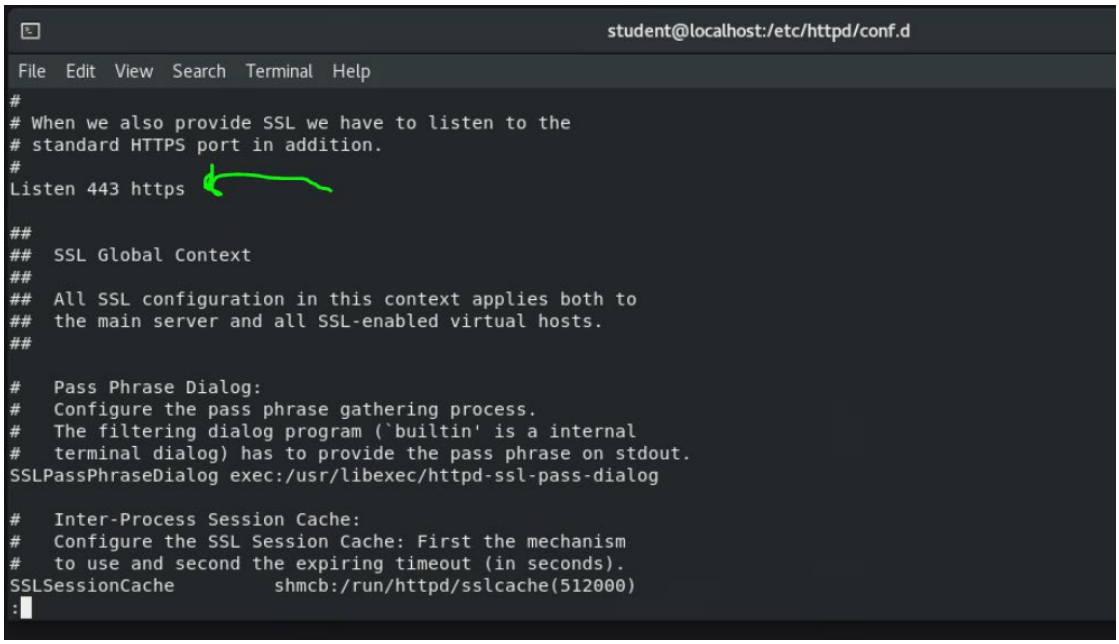
a. First, we need to install the required Apache modules.

```
$ dnf -y install mod_ssl
```

b. Navigate to the */etc/httpd/conf.d/* directory and locate the *ssl.conf* file. This file contains the information needed to create the secure virtual host. Before moving on to the next steps look at some of the statements in the file that are relevant to the exercise (steps c through e).

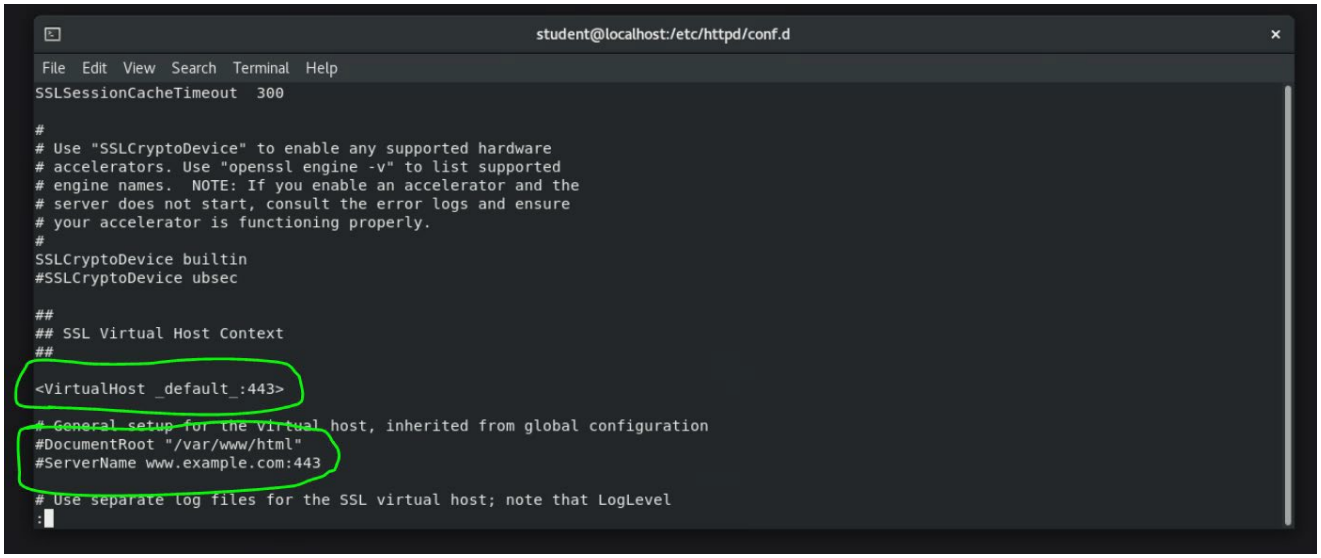
c. Figure 16 shows the directive that uses port 443 for HTTPS.

Figure 16 – SSL Port



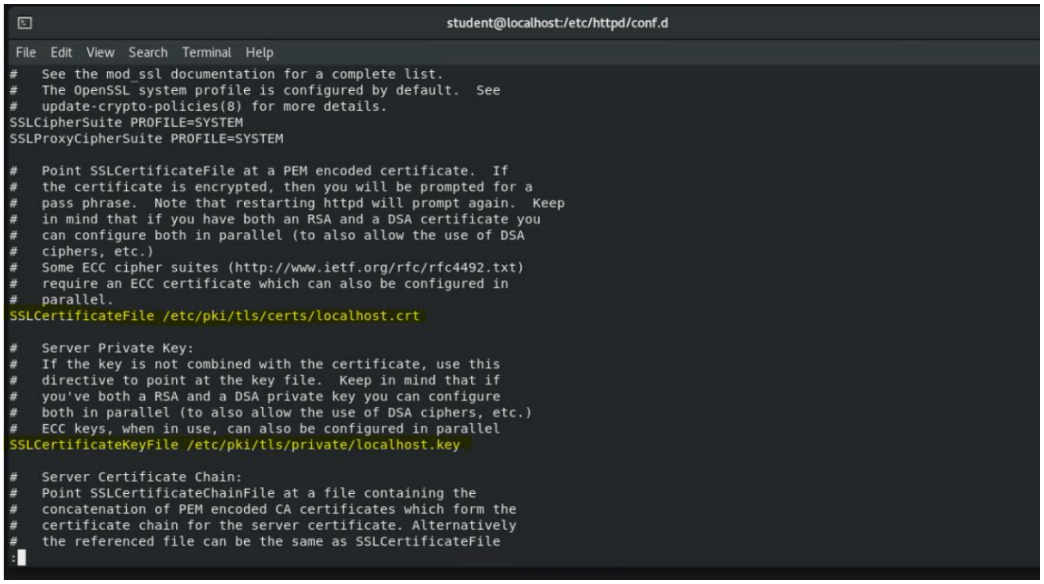
d. Figure 17 shows the statements that define the default virtual host configuration settings; we do not need to change the information because it is already set up in the global configuration of the *httpd.conf* file. For this activity, you will use the default virtual host from the previous exercise whose *index.html* file is located in */var/www/html*.

Figure 17 – Default Virtual Host



e. Now we get to the important stuff. This section of the SSL configuration file tells the http daemon service the location of the private key and the self-signed certificate created in the previous activity. You will need to edit the file for the location of the key and certificate on your server. The screenshot shows the default locations.

Figure 18 – Certificate and Key Default Location



f. Next, create the secure virtual host in the */etc/httpd/conf.d/* directory. Using a text editor create a file for the secure virtual host and give it a descriptive name, for example, "*webserver_ssl.yourid.com.conf*". Figure 19 provides a sample configuration file; the statements should be familiar to you with the exception of the SSLEngine, SSLCertifcateFile, and SSLCertificateKeyFile. As always, for more information you can refer to the Apache documentation.

Figure 19 – Sample Secure Virtual Host File

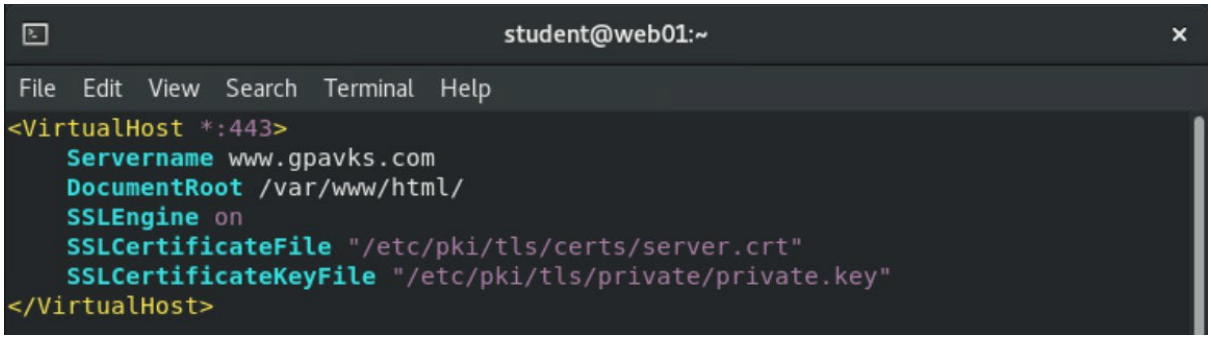
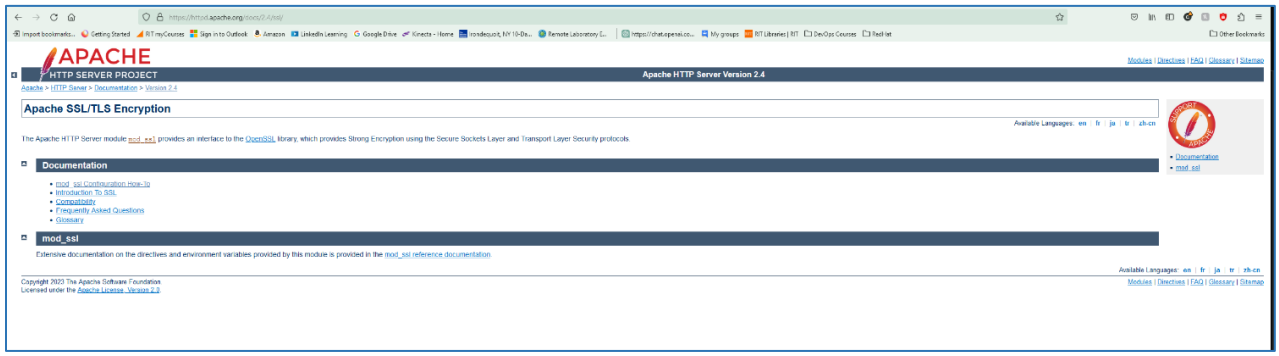
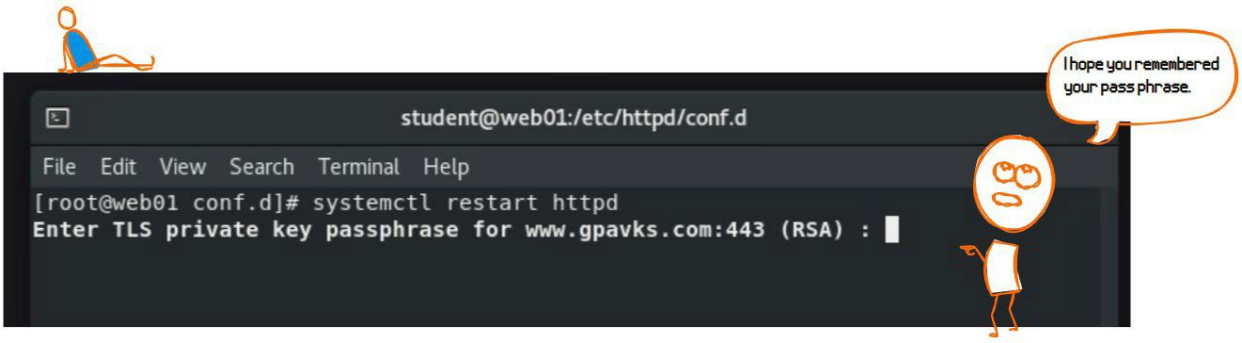


Figure 20 – Apache Documentation for SSL/TLS Encryption



g. Next, restart the http daemon process. Assuming you configured correctly a passphrase for the key will need to be entered when the service restarts.

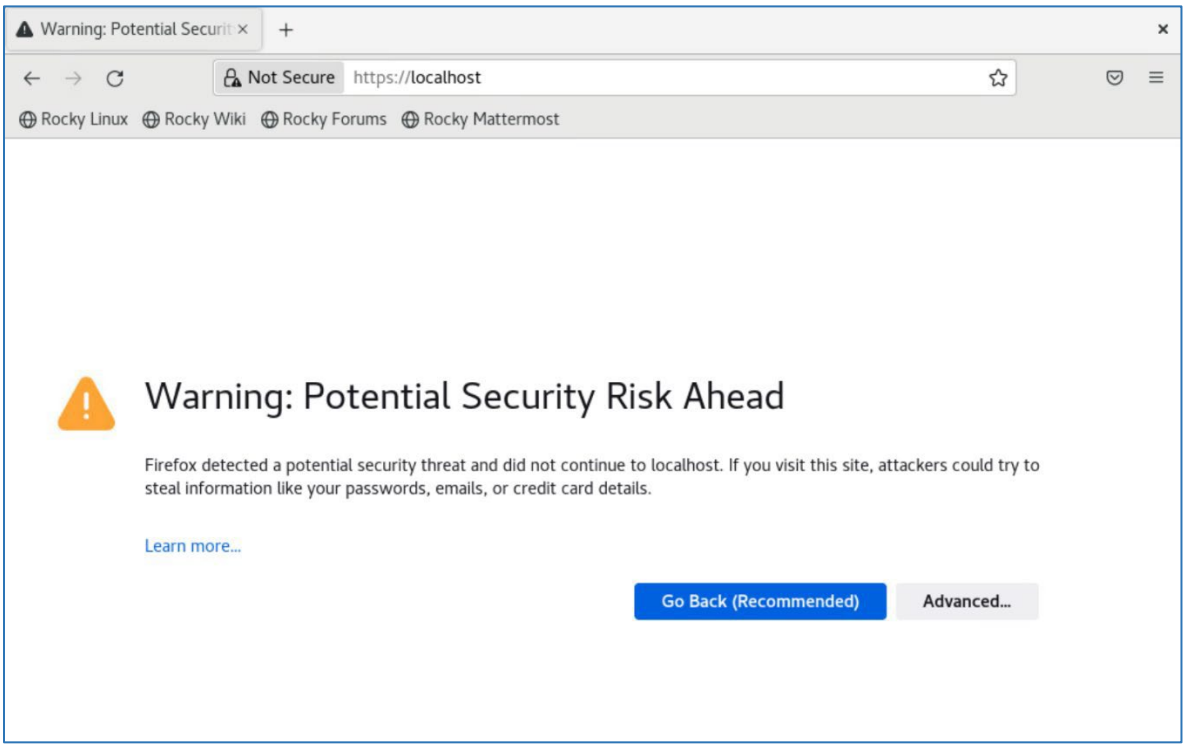
Figure 21 – Enter Key Passphrase



h. Using the browser on the local server, enter https://localhost ("s" in bold for emphasis). The site will inform you that the connection is a potential security risk (Figure 22).

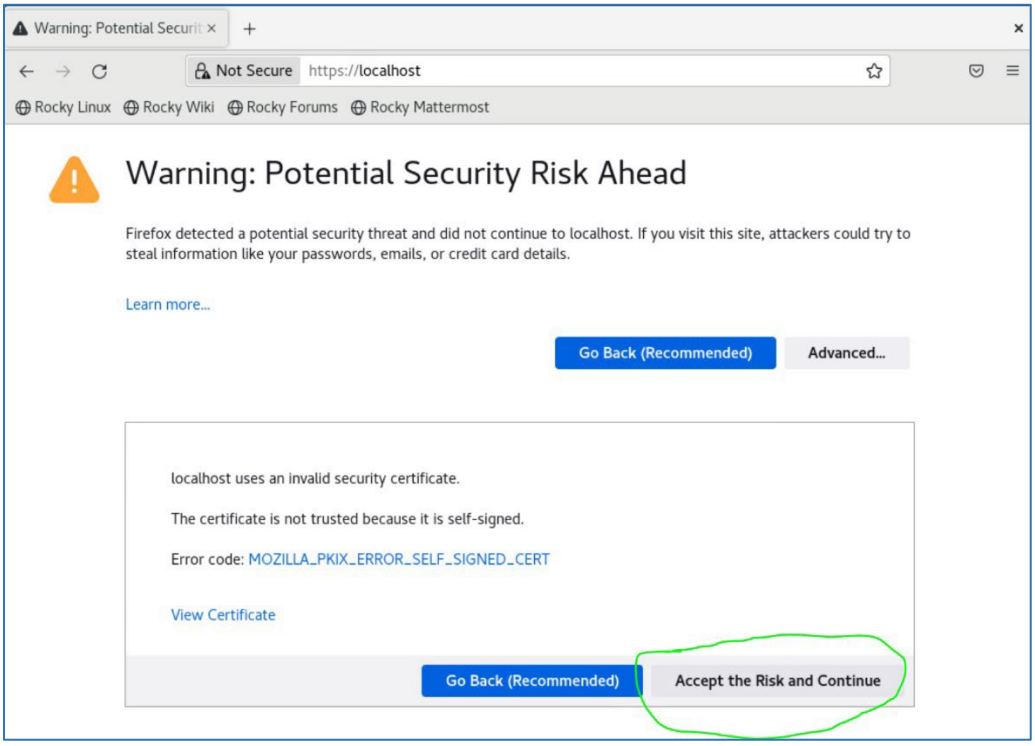
i. Click the "*Advanced*" button (Figure 22).

Figure 22 – Warning



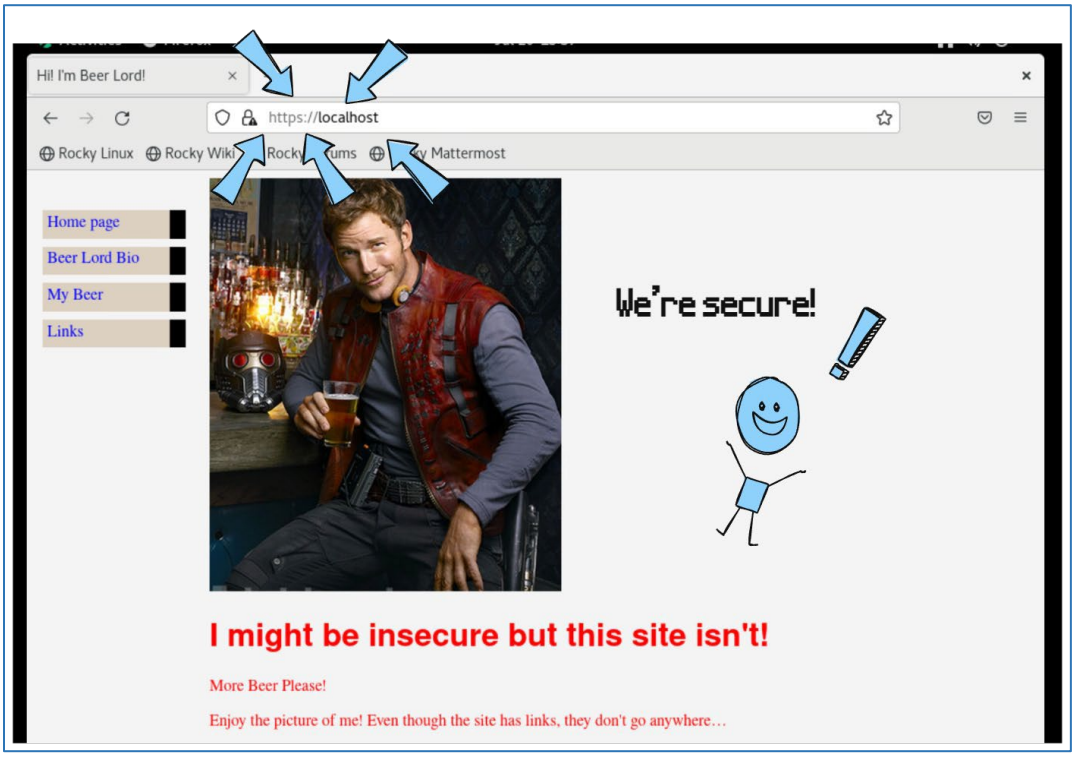
j. To retrieve the self-signed certificate from the server, click the "*Accept the Risk and Continue*" button (Figure 23).

Figure 23 – Accept Risk



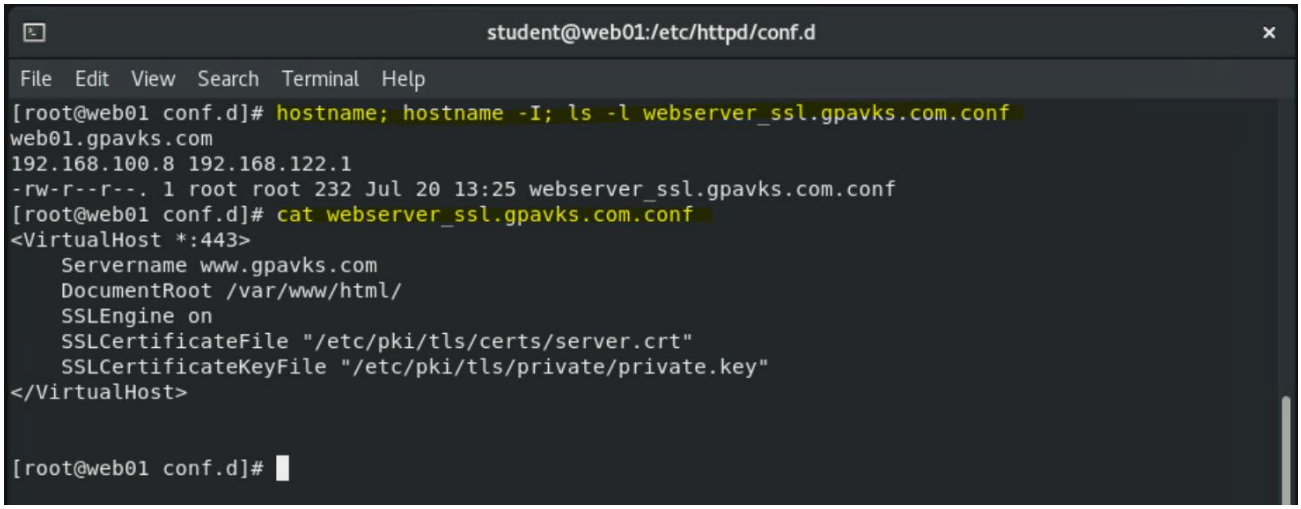
k. This will launch the secure site (Figure 24).

Figure 24 – Secure Virtual Site



For the report, two screenshots are needed. The first screenshot must show that the secure site loads correctly (Figure 24). The second is a single screenshot showing your FQDN, and the output from the **`hostname -I`** command, and the **`ls -l`** command for the file that you created for the secure virtual host. In the same screenshot, use the **`cat`** command to show the contents of the file. The diagram must be a single screen shot properly labelled and included in the report. Refer to Figure 25 for an example.

Figure 25 – Example Screenshot for SSL Virtual Host Validation



Activity 5 – Installing and Configuring MailEnable

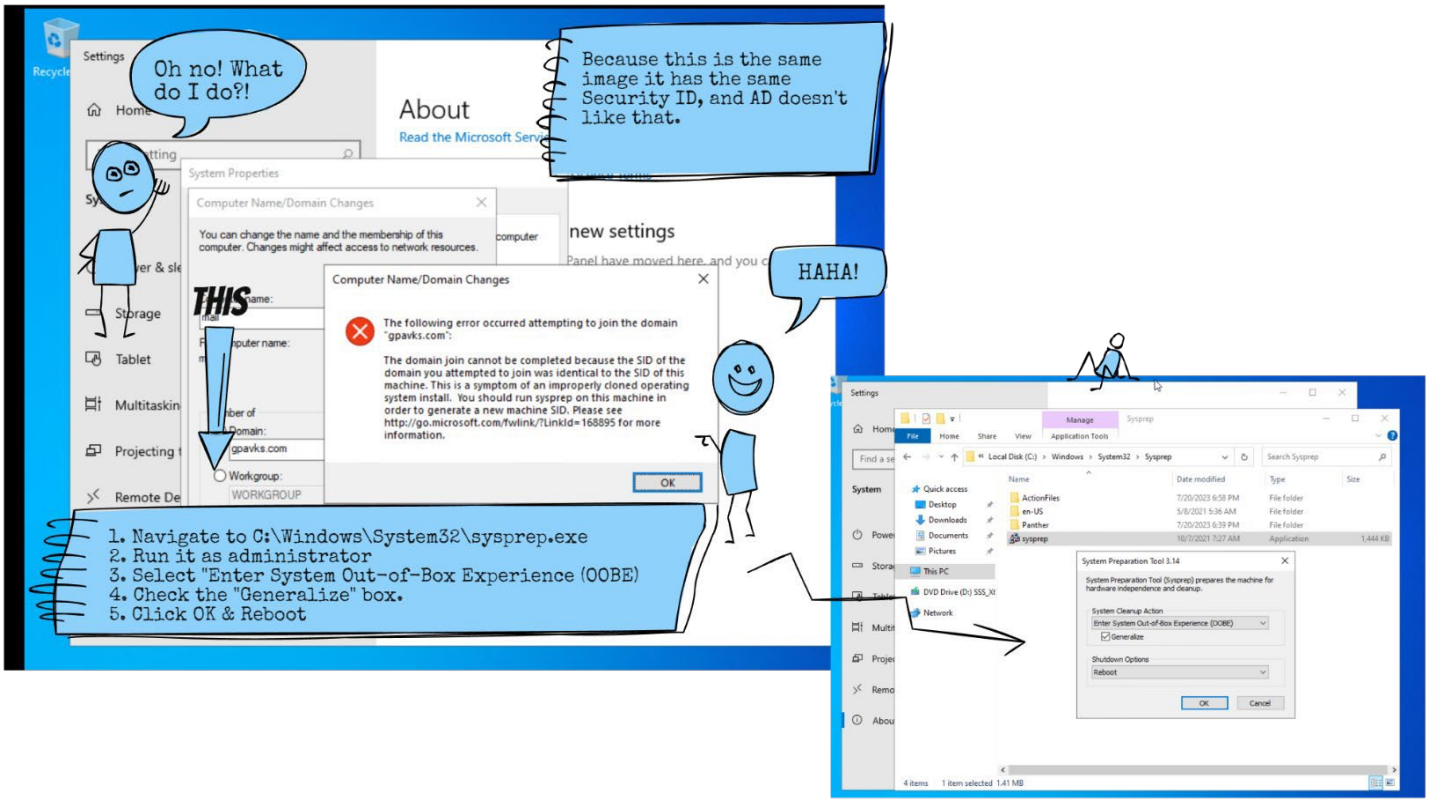
In this activity, you're tasked with setting up and configuring a mail server within your infrastructure. This process will involve using MailEnable, a free mail server software, which you'll install on Windows Server 2022. MailEnable will serve dual roles as both the Mail Delivery Agent (MDA) and the Mail Transfer Agent (MTA). This means it will handle both SMTP and IMAP traffic.

Subsequently, you'll need to install the Mail User Agent (MUA), which is the client software, on Windows 10 and Rocky Linux. Your task also includes creating two mailboxes and sending an email from one user to another.

Once you have everything set up and functional, your final task will be to capture and analyze email traffic. This process is crucial for understanding the active protocols and learning the intricacies of email communication.

a. Deploy a new instance of Windows Server 2022. You will need to run the **`sysprep`** utility because it has the same Security ID as the Windows Server in your deployment (see Figure 26).

Figure 26 – Sysprep Procedure



b. After the system reboots, give it a meaningful hostname (i.e., something that will identify it as the mail server). Configure static network settings. Make sure to join the server to the domain using a domain admin account.
c. Update your DNS with an MX and A records for the mail server.
d. Using the "Add Roles and Features Wizard," install Web Server (IIS) and add the default features. This is a prerequisite for MailEnable.
e. Using the following URL – https://www.mailenable.com, download and install the free Standard Edition. You DO NOT need to register to download MailEnable.

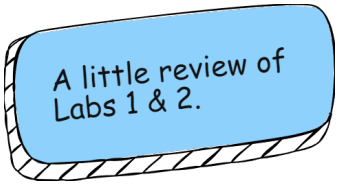
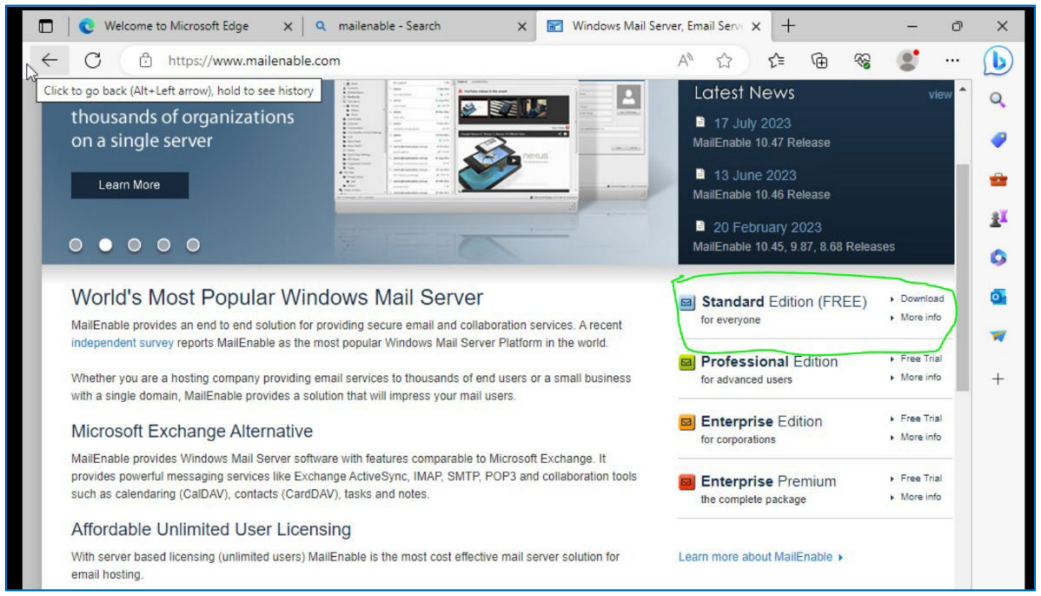
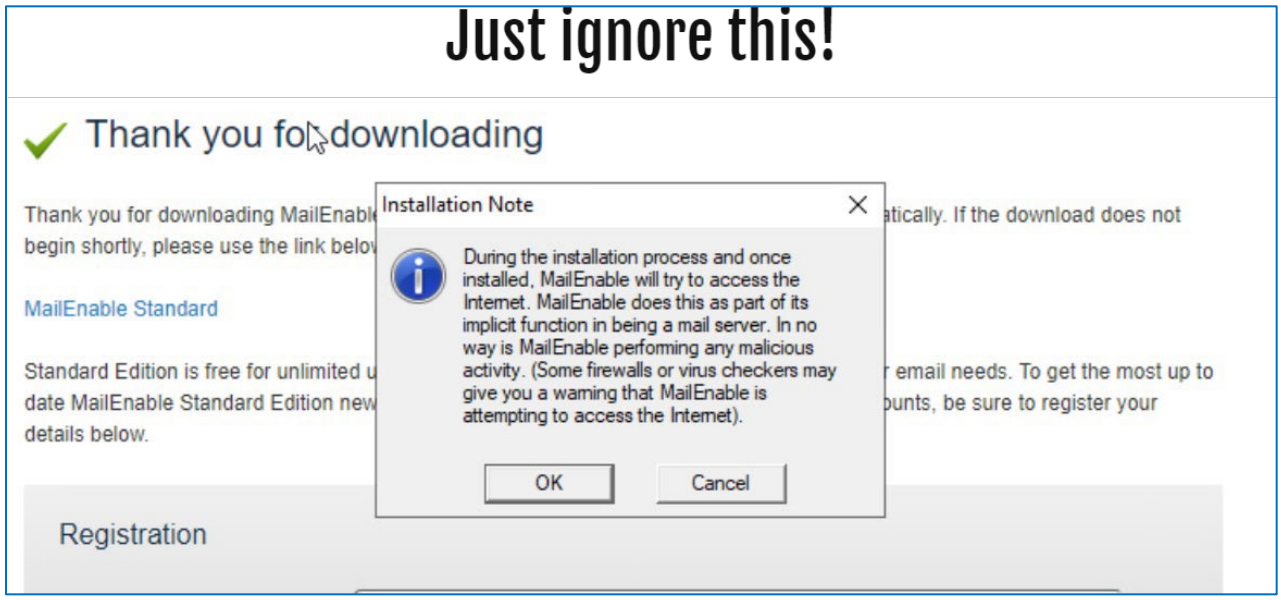


Figure 27 – MailEnable Standard Edition



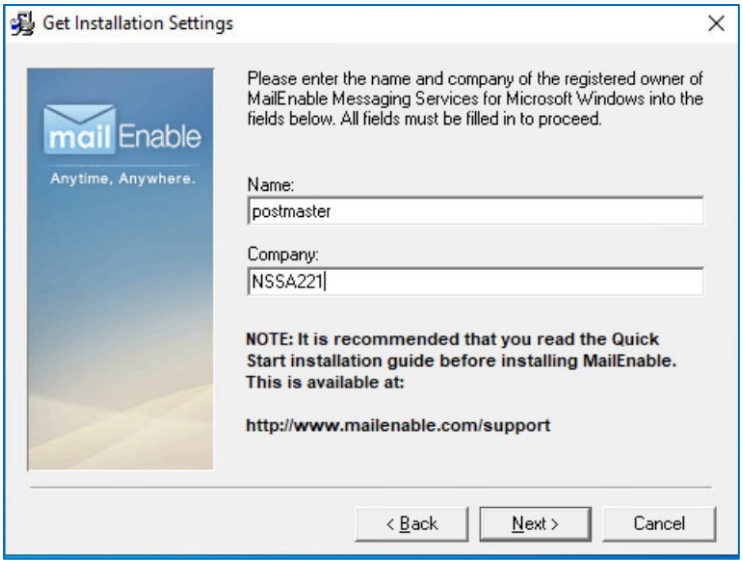
f. During the installation, unless otherwise noted select the default settings.
g. You can read the installation note (but you probably won't).

Figure 28 – Installation Note



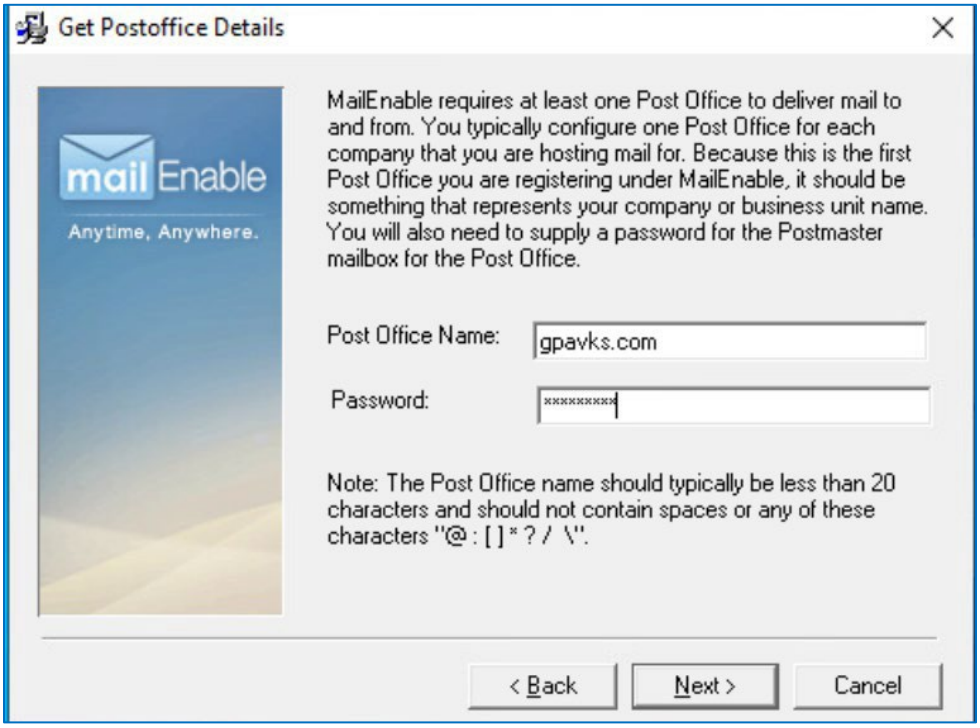
h. When prompted input a name and the company (make it up), and click Next.

Figure 29 – Installation Settings



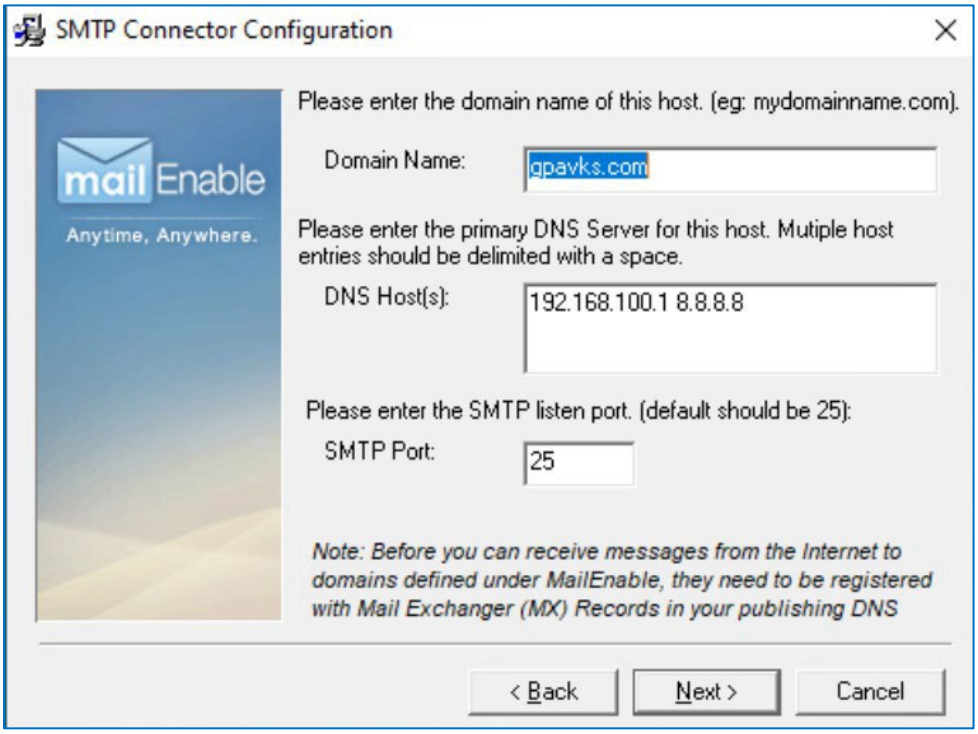
i. Hit Next a bunch of times until you get to "*Get Postoffice Details*." The Post Office Name field will be populated with your domain (not mine, like Figure 30). And enter a password, then hit Next.

Figure 30 – Post Office Details



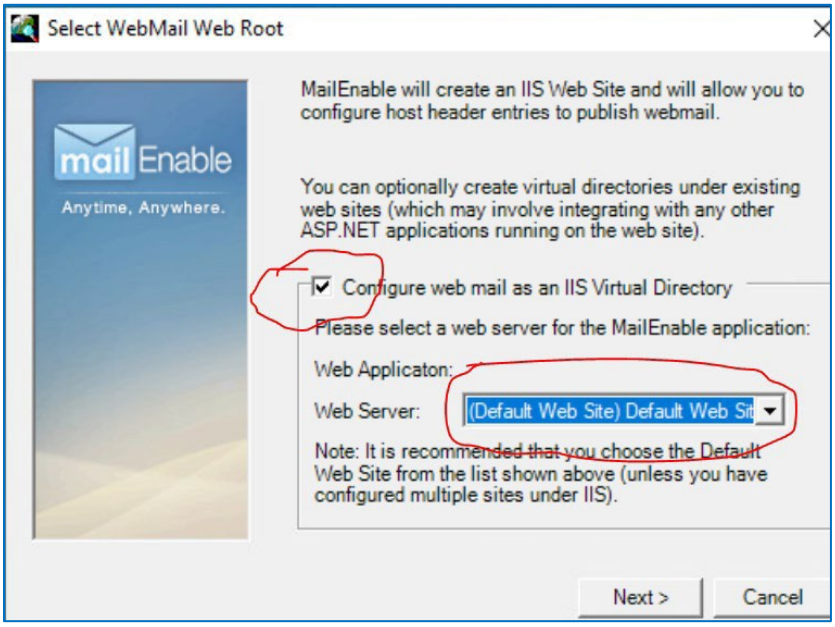
j. Hit next a couple more times and verify that the information in the SMTP Connector Configuration is correct. Again, it should be your domain, and DNS information, not what's in the image (the image just for reference).

Figure 31 – Example SMTP Connector Configuration



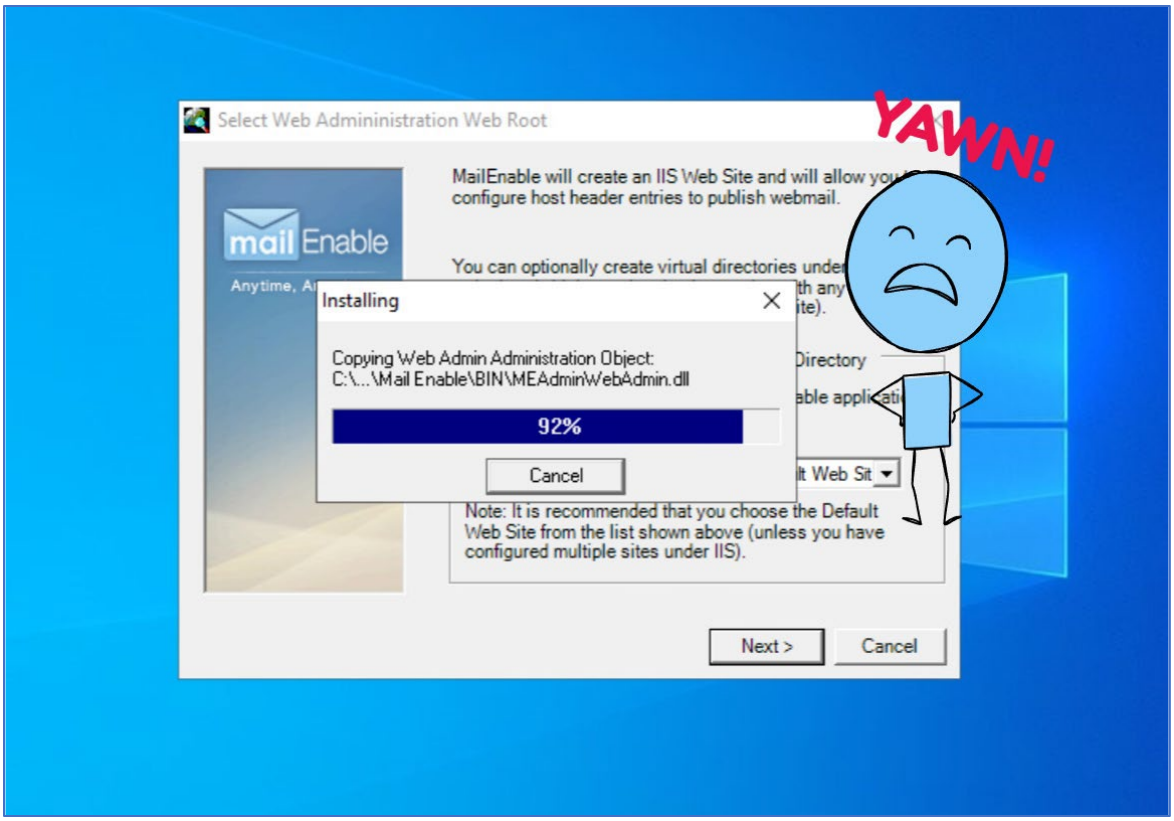
k. Hit next a couple more times, until you come to the "Select Webmail Web Root," windows. Make sure that the box is checked and the default web site is selected (it's recommended!). If not, that means you did not install the Web Server IIS role (shame on you).

Figure 32 - Webmail Web Root



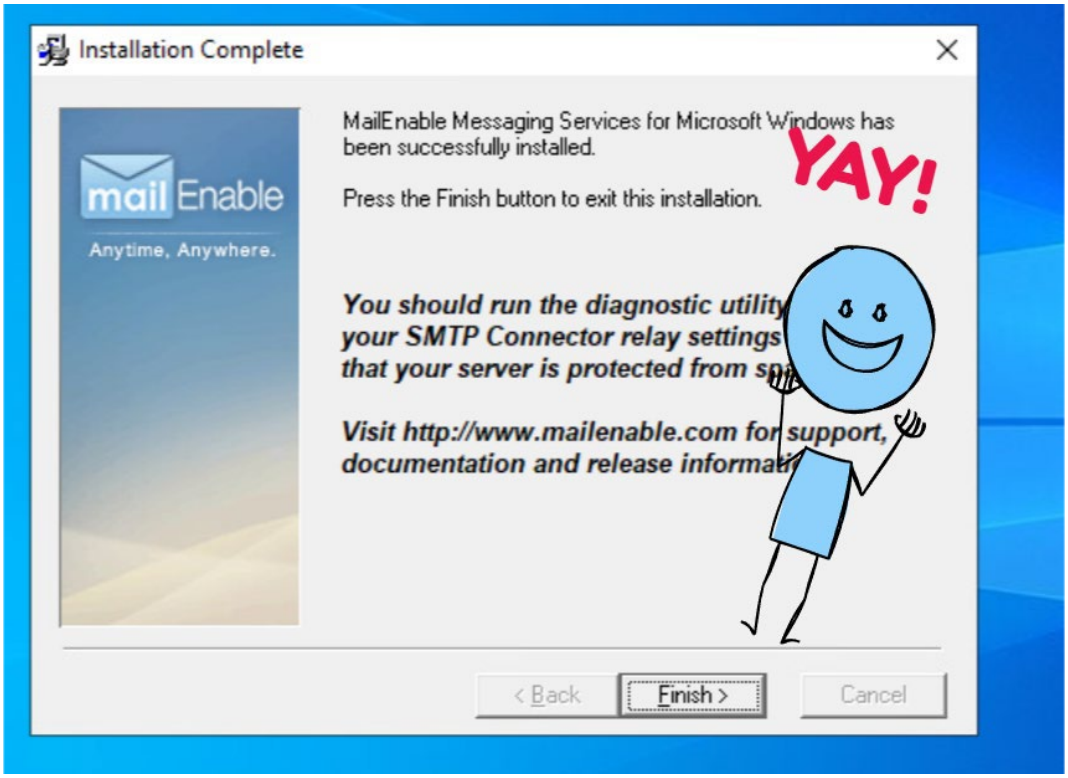
l. Hit Next again and wait….BE PATIENT…. while the install completes.

Figure 33 – YAWN!



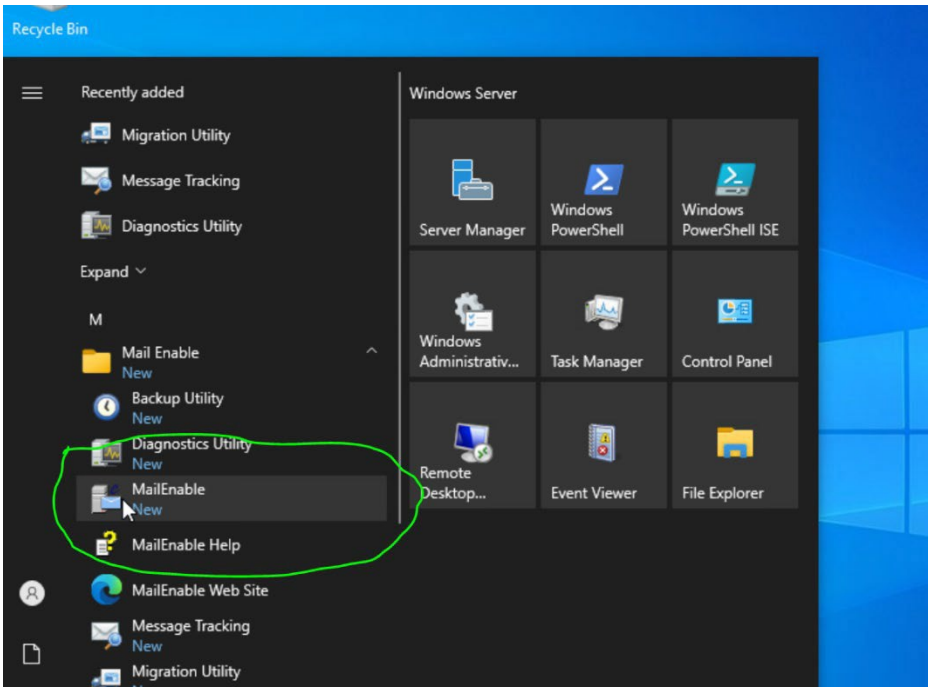
j. Hit Next again and then Finish.

Figure 34 – Installation Complete



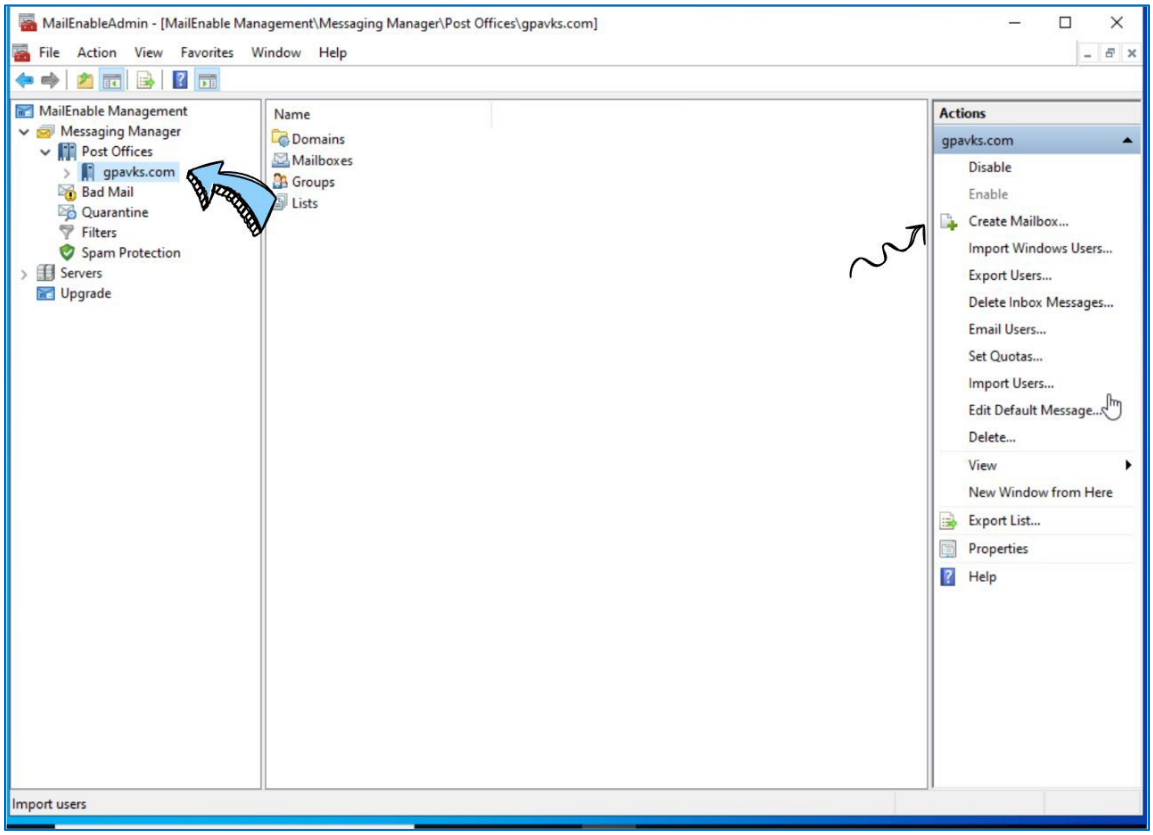
k. When your done lots of stuff with your web browser is going to happen, just ignore it and close your browser.
l. You can find MailEnable in your programs list (Figure 34), select it to open the program.

Figure 34 – MailEnable (in program list)



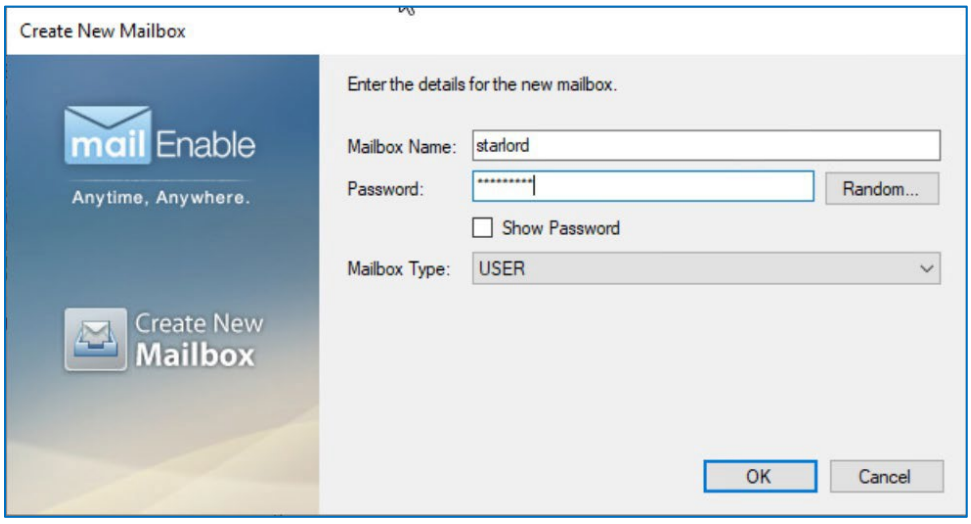
m. Next, we need to create a couple mail boxes. To do this, from the MailEnable Management menu, expand "Messaging Manager," then "Post Offices," select your domain and on the right under *Actions*, select *Create Mailbox*.

Figure 35 – Create Mailbox



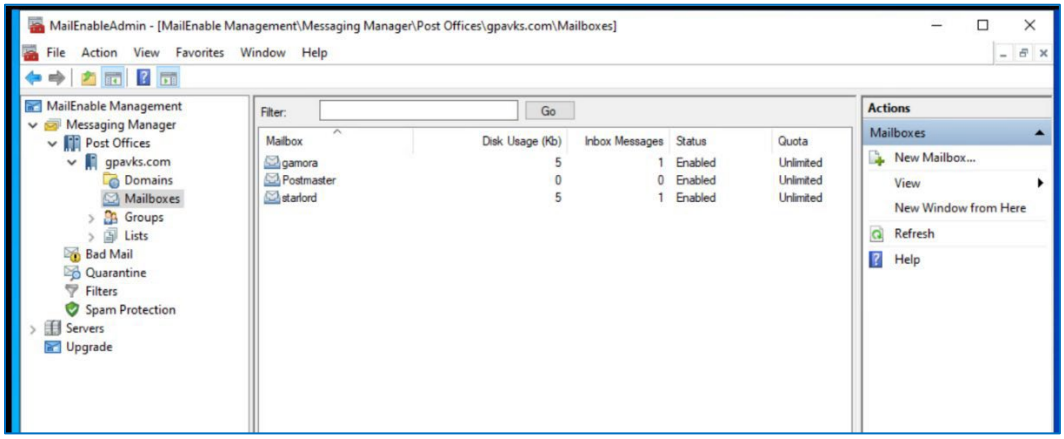
n. These instructions use starlord and gamora as the mailboxes.

Figure 36 – Sample Mailbox Creation



o. For reference, Figure 37 shows the mailboxes listed for the post office gpavks.com.

Figure 37 – Mailboxes for gpavks.com



Activity 6 – Email Client Configuration

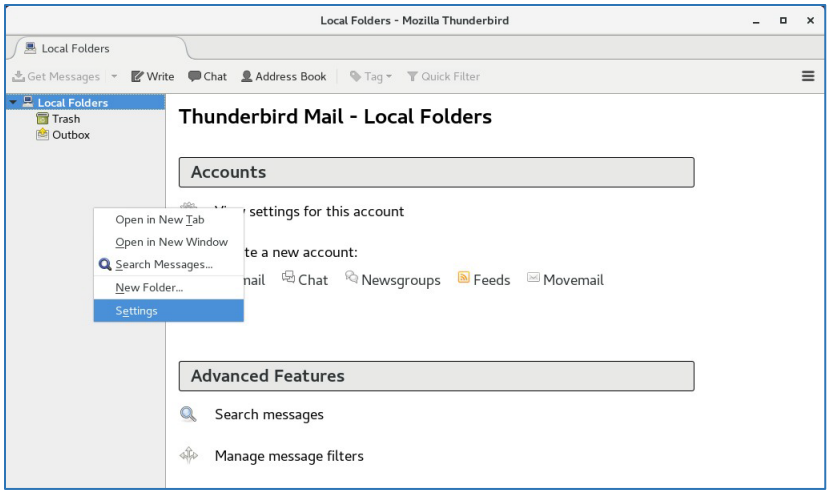
For this activity, you will configure Linux and Windows email clients. The screenshots and examples provided in this activity use the Tunderbird for Rocky Linux 8. For Windows 10,

a. Install Thunderbird on Rocky Linux (At this point installing software on Linux should be familiar to you, if not, a quick Google search should help. Here's a little hint.

https://www.thunderbird.net/en-US/

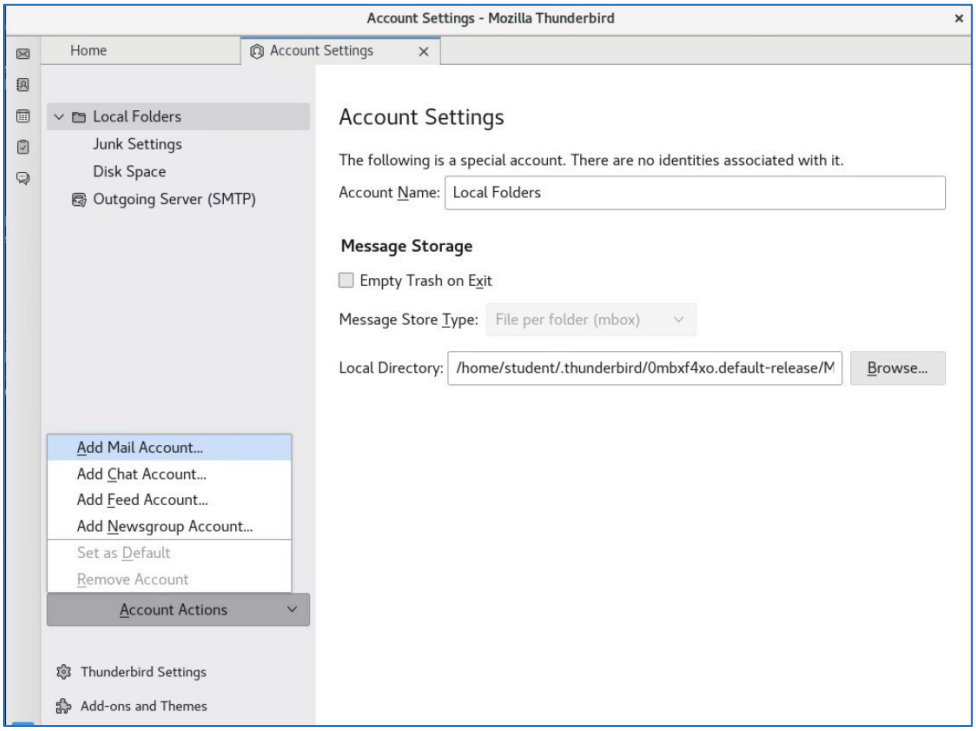
b. Launch Thunderbird. To add an account, right click on "Local Folders," and select settings.

Figure 38 - Settings



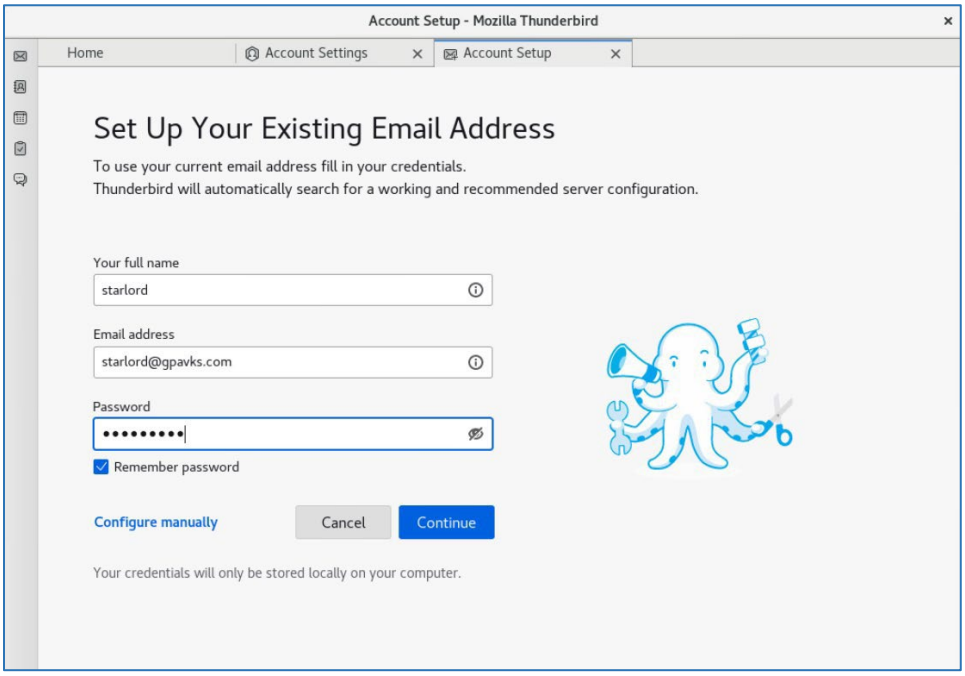
c. From the "Account Settings" window select "*Account Actions*" and the "*Add Mail Account… "*.

Figure 39 – Add Account



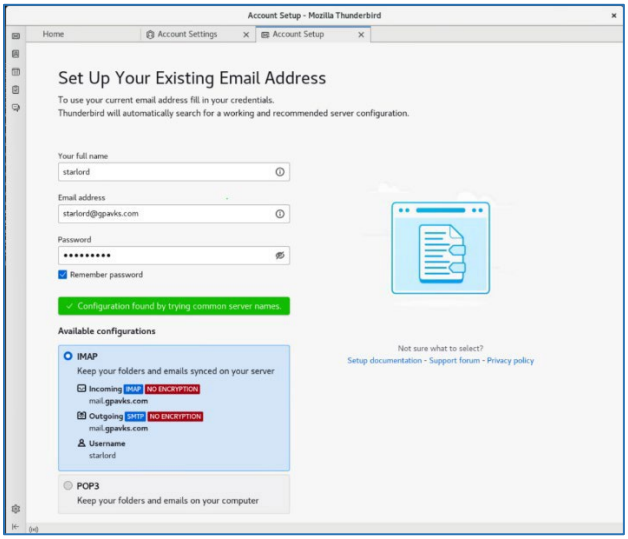
d. Enter the user information for one of the accounts. (Figure 40). Click *Continue*.

Figure 40 - Add User Account



e. If you have DNS configured correctly (especially the MX resource record), then Thunderbird will find your mail server automatically and all you need to do is click Done.

Figure 41 – Configuration Found



f. If not, you'll need to do some troubleshooting. By default, Thunderbird uses the FQDN of the mail server. Select "Manual Configuration," and check to see if it is using the FQDN, if not enter it. If it is still not connecting try entering the IP Address of the server, if that works then your issue is with DNS. If not then check firewall settings, trying pinging the mail server from the client to make sure there is network connectivity. Does DNS resolve to the correct IP for the mail server (Figure 43)?

Figure 42 – Checking the Mail Servers FQDN

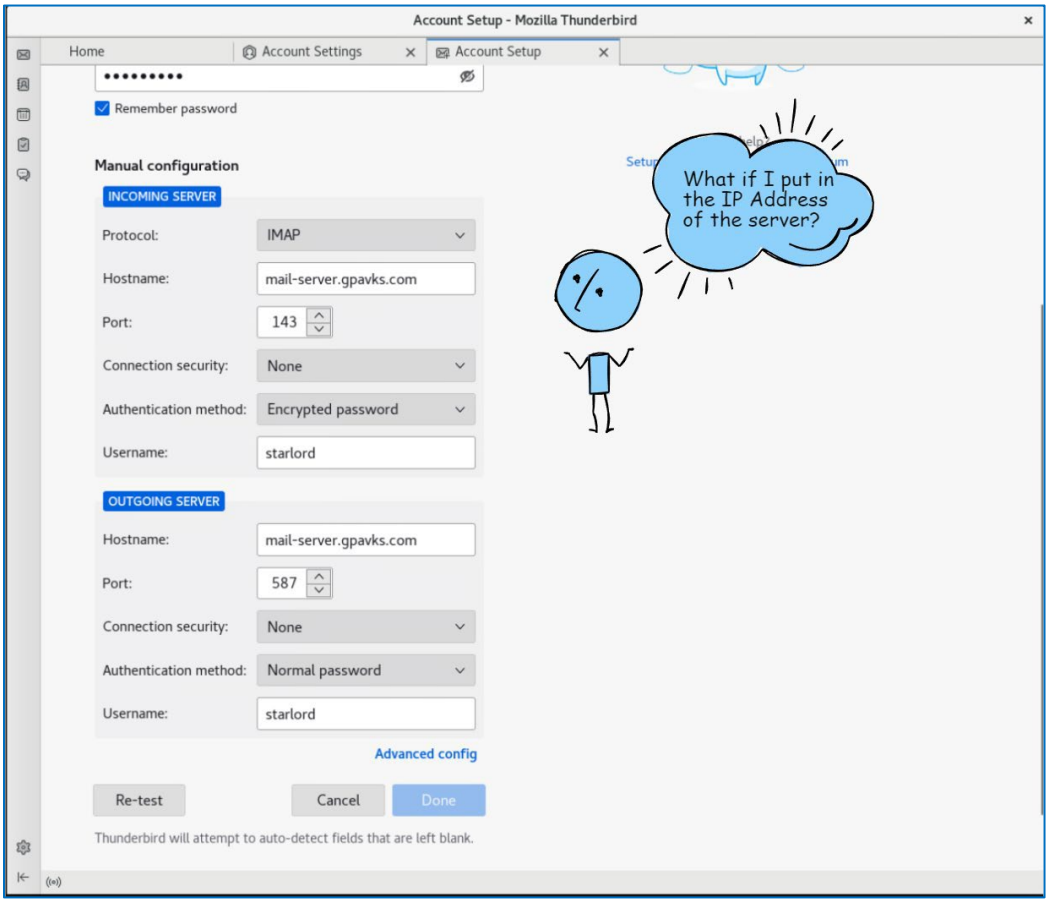
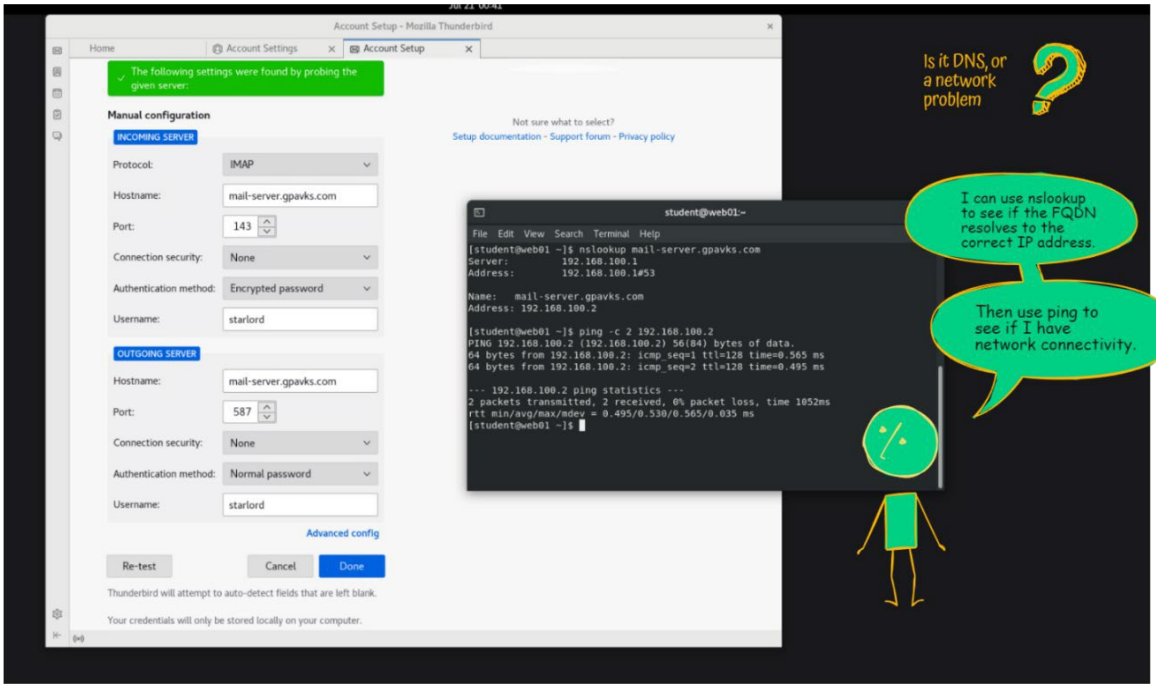
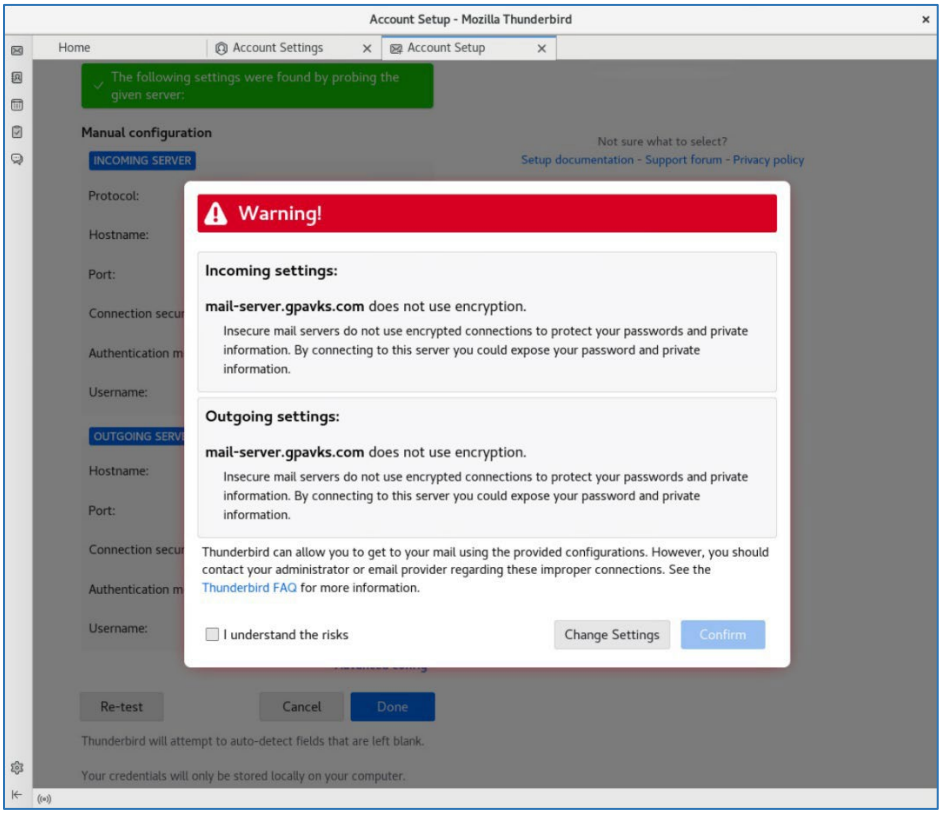


Figure 43 –Troubleshooting with nslookup and ping



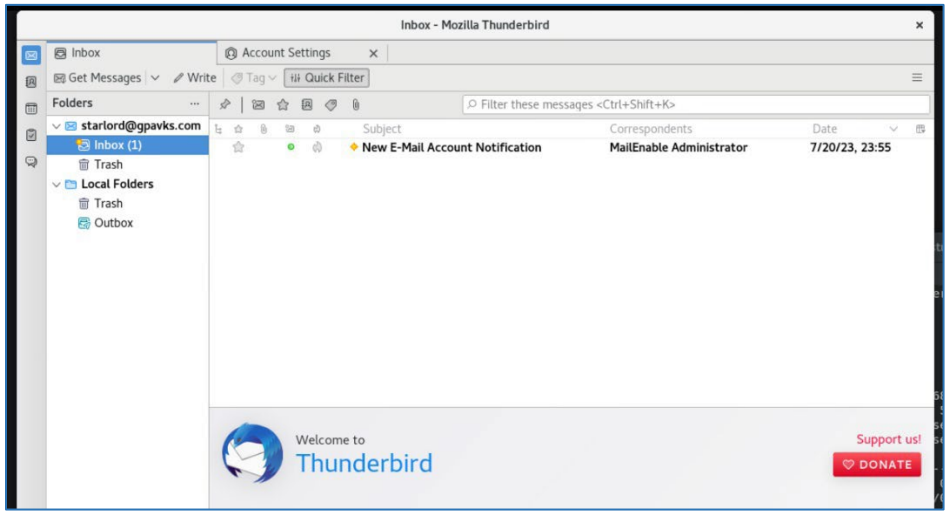
g. Once the correct hostname for the mail server is configured and the ports are populated, click *Done*. Because we did not configure Transport Layer Security for the mail server, a warning is shown (Figure 44), check the box "I understand the risks." Click "Confirm," and then "Finish".

Figure 44 – Warning



h. If everything goes well, you should see the mailbox and an email notification (Figure 45). To do a quick test, try sending an email to the user to see if they receive it. Using this as an example, starlord would send an email to itself.

Figure 45 – Account Notification



i. Now it's time for you to take charge. Install an MUA on Windows 10 and configure it. There are several free an open-source mail clients available. You can use Thunderbird, or give another one a try, like eM.

For the report, include two screenshots. The first screenshot will show the email being sent from one client and received by the other. In these examples, the email is being sent from the Windows client by Gamora (Figure 46), and received on the Linux client by Starlord (Figure 47).

Figure 46 – Sent Email from Windows Client

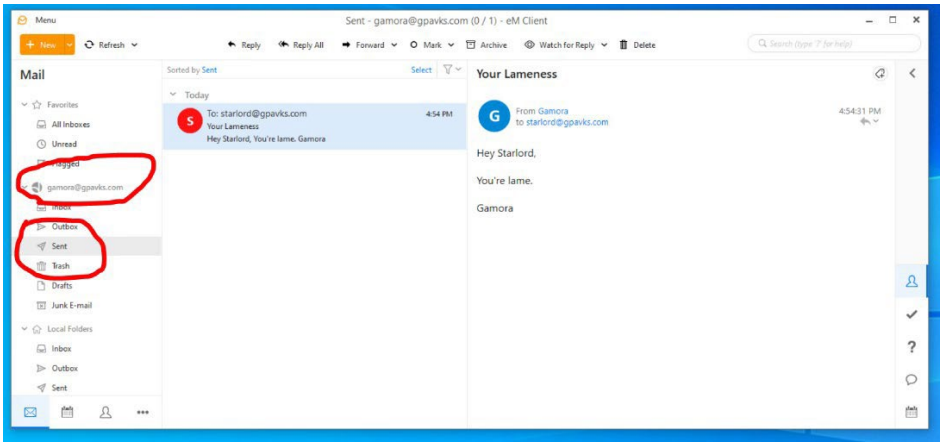
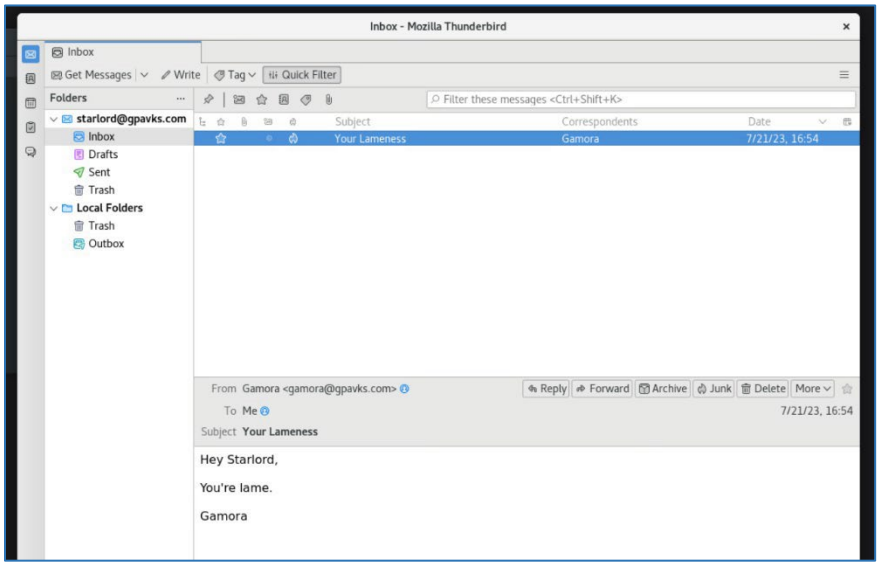


Figure 47 – Received Email on Linux Client



Activity 7 – Capturing Email Network Traffic

For this activity, you will be using Wireshark to capture IMAP and SMTP traffic.

a. Launch Wireshark on the email server.
b. Send an email from one account to another, it does not matter who the sender or the receiver is for this exercise.
c. Capture the traffic and filter for IMAP and SMTP traffic (Figures 48 and 49).

Figure 48 – Example SMTP Network Trace

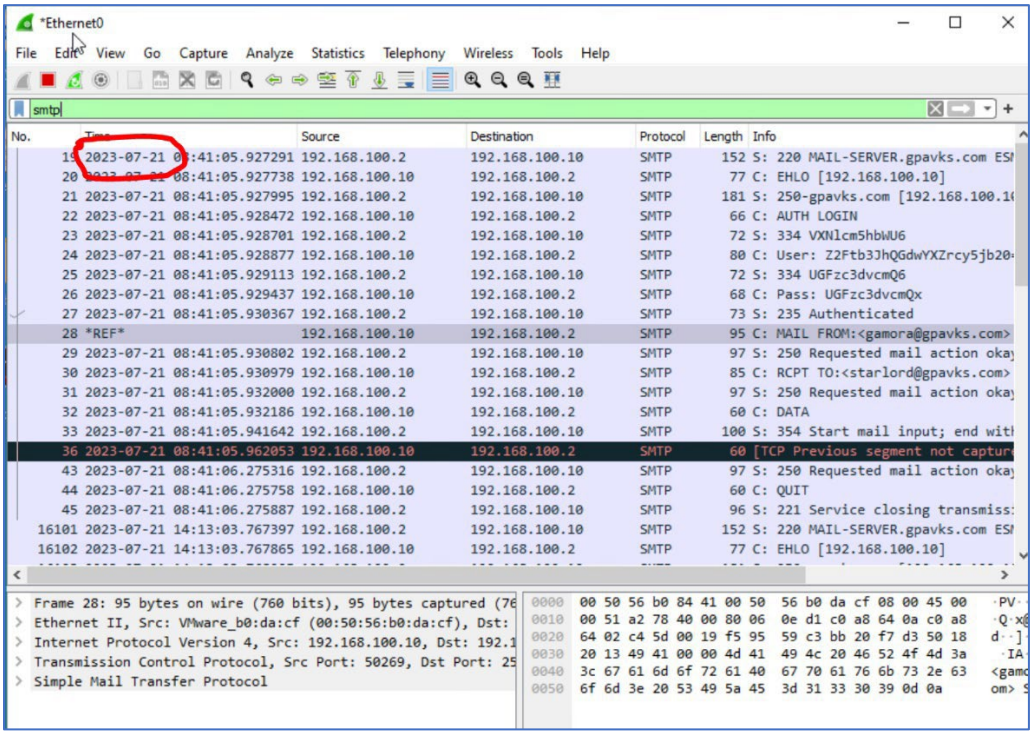
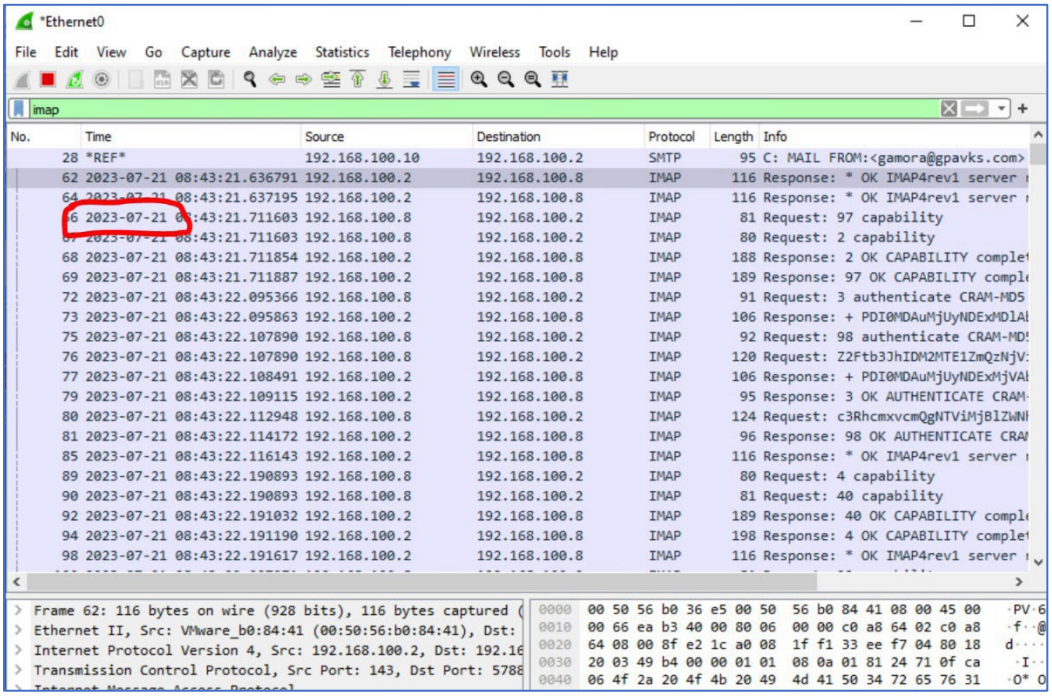


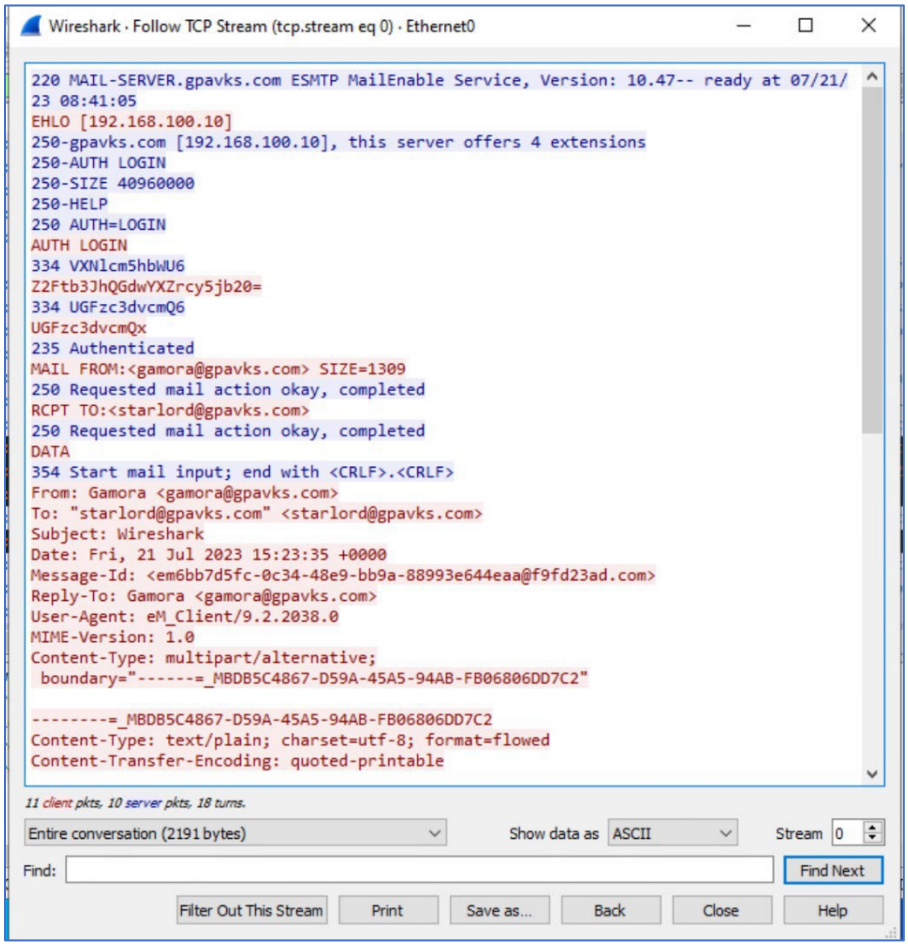
Figure 49 – Example IMAP Network Trace



For the report, include screenshots from the email network traces. The traces must show the IP address of the server and clients involved in the communication and the date/time stamp must be visible. Use the screenshots to explain the communication that occurs between the client and server when forwarding and receiving the email message. The explanation must be included with the screenshot, in the report. If you do not explain the communication, you will not receive credit. The explanation must be in your own words.

You may also follow the TCP stream (Figure 65) and include that screenshot, in addition to the other traces for your explanation.

Figure 50 – Example Screenshot of "Following the TCP Stream"



Activity 8 – Remote Logging

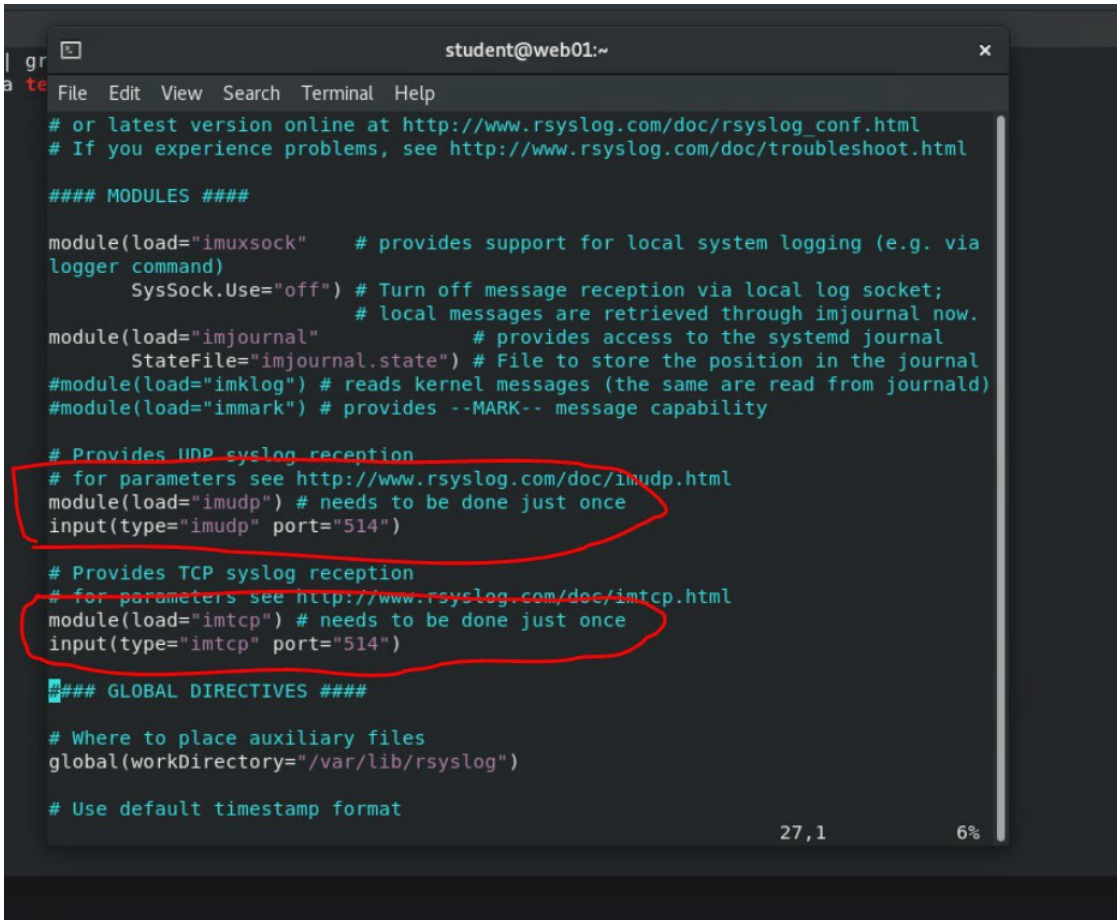
Rsyslog serves the purpose of logging and organizing system messages according to specific categories for storage. For this task, you have the option to either add another Rocky Linux 8 virtual machine to your existing infrastructure (requiring two virtual machines) or use the ones you already have. One of these devices will act as the centralized log server responsible for collecting logs, while the other will be responsible for sending the logs to the central server. The ability to aggregate logs on a central server is vital for most organizations as it greatly simplifies log management. Moreover, it aligns with NIST recommendations and plays a crucial role in enhancing security, making it an indispensable component for establishing a robust log management system in an enterprise environment.

a. Select a Rocky Linux VM to be the centralized log server. Again, you can deploy another Rocky VM, or use an existing one.
b. Update the system and make any necessary configuration changes.
c. You may disable SELinux or set it to permissive mode.
d. By default, rsyslog is installed on Rocky Linux 8; to see the version type **`rpm -qa rsyslog`** into the terminal.
e. Next, edit the rsyslog configuration file in /etc/resyslog.conf. Rsyslog can be configured to receive logs via TCP or UDP. For this activity we'll configure both.
f. Uncomment the following lines in the file by removing the # symbol.

```
module(load="imudp") # needs to be done just once
input(type="imudp" port="514"


module(load="imtcp") # needs to be done just once
input(type="imtcp" port="514"
```

Figure 51 – Rsyslog Configuration Edit



g. Next, create a firewall rule to allow traffic through the port rsyslog is listening on, which is port 514. In addition, allow TCP and UDP traffic. Yes, enable the firewall.

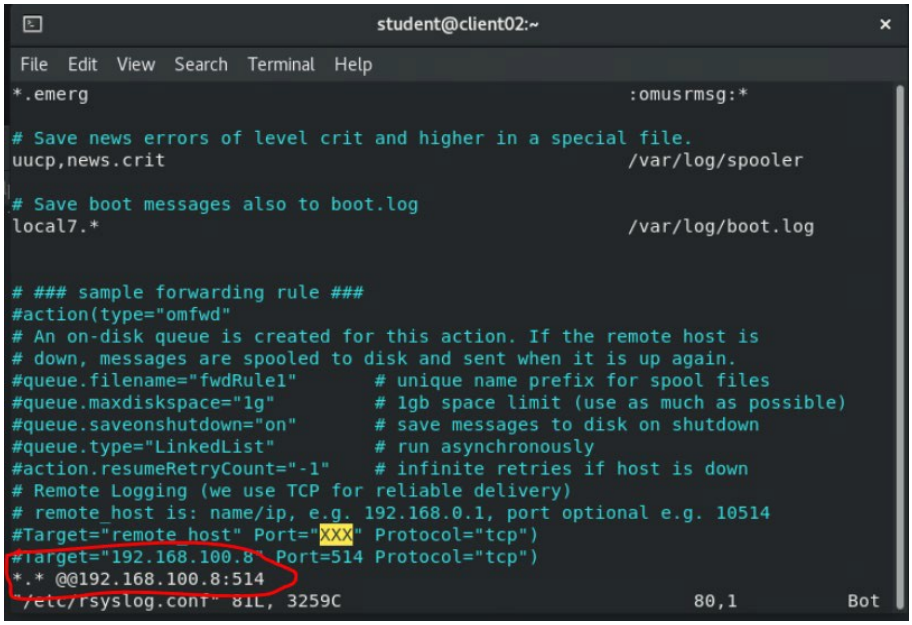
```
$sudo firewall-cmd --permanent --add-port=514/tcp
$sudo firewall-cmd --permanent --add-port=514/udp
$sudo firewall-cmd --reload
```

h. Restart the rsyslog and firewall services.

i. Next, configure the client to forward logs to the centralized log server. To do this, you will need to edit the rsyslog configuration file on the client. In the configuration file add the following line to the end of the file.

```
*.* @@<server IP Address or hostname>:514
```

j. Figure 52 – Client rsyslog Configuration File



k. Restart rsyslog on the client.

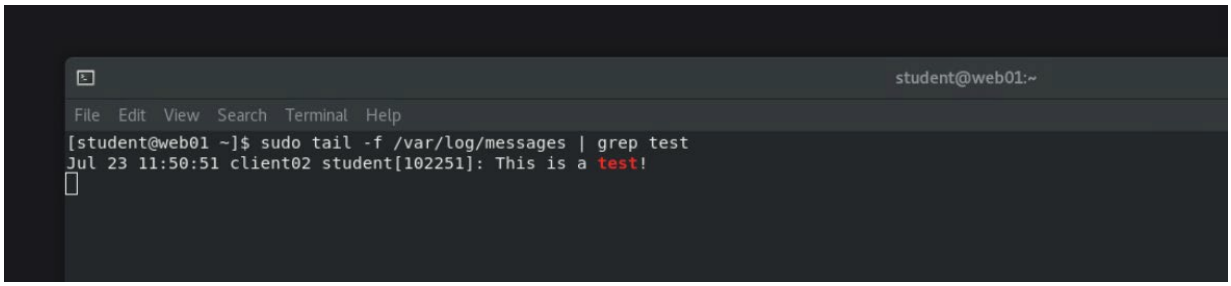
l. Use the following command on the central log server to capture messages.

```
$ tail –f var/log/messages
```

m. Using the **`logger`** command, test to verify that the central log server is receiving messages from the webserver.

```
$ logger This is a test!
```

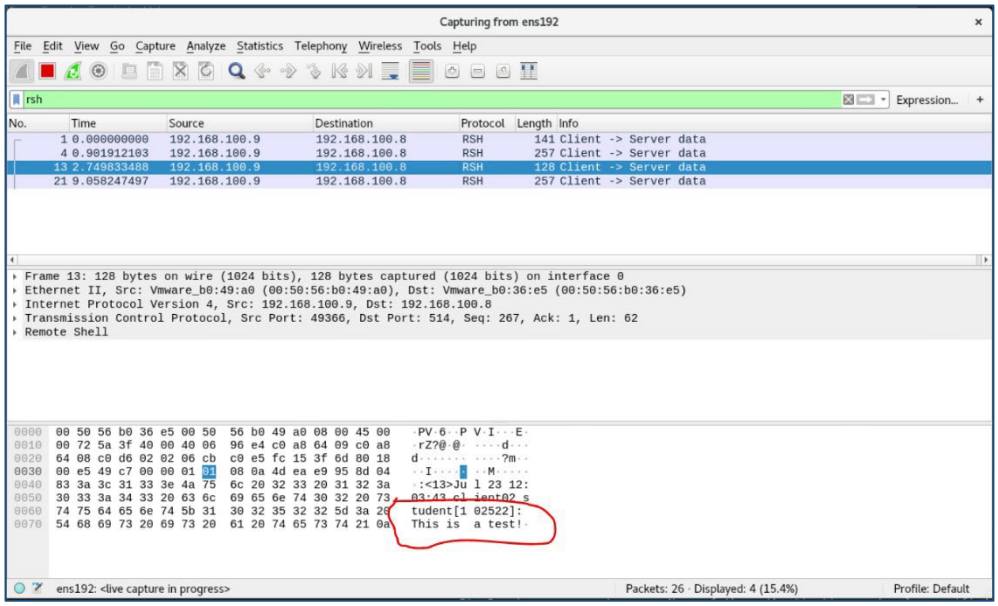
Figure 53 – Sample Log



For the report, include a single screenshot showing that the rsyslog server received the message. Refer to Figure 53 for an example. The image must show the hostname of the client and the message.

Additionally, capture a Wireshark trace of the exchange, for brevity, you can filter using “rsh”. The trace must include the message and the IP addresses of the client and log server. Refer to Figure 54 for an example.

Figure 54 – Network Trace Example



Activity 9 – The Cron Service

Crond is a daemon process designed for automating tasks, allowing them to run in the background without user intervention. A "cron job" refers to a scheduled task that executes at specific intervals. To manage these tasks, the main file used is called the crontab, which instructs the cron daemon on when to run each task. In this context, Figure 55 represents an example of a crontab file typically located in the /etc directory.

Before you proceed with configuring cron jobs, it's essential to familiarize yourself with the file's format. Each user has their crontab file, which can be found in the /var/spool/cron directory. However, please note that the file for a user is created only after they run their first cron job.

Figure 55 – Crontab file format

```
File  Edit  View  Search  Terminal  Help

[root@webserver etc]# cat crontab
SHELL=/bin/bash
PATH=/sbin:/bin:/usr/sbin:/usr/bin
MAILTO=root

# For details see man 4 crontabs

# Example of job definition:
# .---------------- minute (0 - 59)
# |  .------------- hour (0 - 23)
# |  |  .---------- day of month (1 - 31)
# |  |  |  .------- month (1 - 12) OR jan,feb,mar,apr ...
# |  |  |  |  .---- day of week (0 - 6) (Sunday=0 or 7) OR sun,mon,tue,wed,thu,fri,sat
# |  |  |  |  |
# *  *  *  *  * user-name  command to be executed

[root@webserver etc]#
```

Example 1:

```
30 08 10 06 * /home/backups/full-backup.sh
```

The first example runs the shell script "*full-backup.sh*", every June (06), on the tenth day (10) at 8:30am. Note that the time value is in the 24-hour format, if it was 8:30 PM, the hour would be 20 and not 8. The use of the asterisk means to run this job every day of the week.

Example 2:

```
00 11, 16 * * * /home/bin/incremental-backup.py
```

This example introduces something a little more interesting. The following is a Python script. However, notice the "*11, 16*" in the hour column, this means to run the job during the 0th minute (00) at 11 AM (11) and 4 PM (16), every day, every month, and every day of the week.

Now that we have an idea of what information goes into the crontab file how do we go about adding or editing entries in the file. To add an entry to the crontab file use the **`crontab -e`** command as the current user. The user that creates the job must also be the same user that is the owner of the script.

Please Note: Red Hat recommends that you do not edit /etc/crontab directly! Use the crontab utility!

The following commands provide a summary of the crontab command and some of its options.

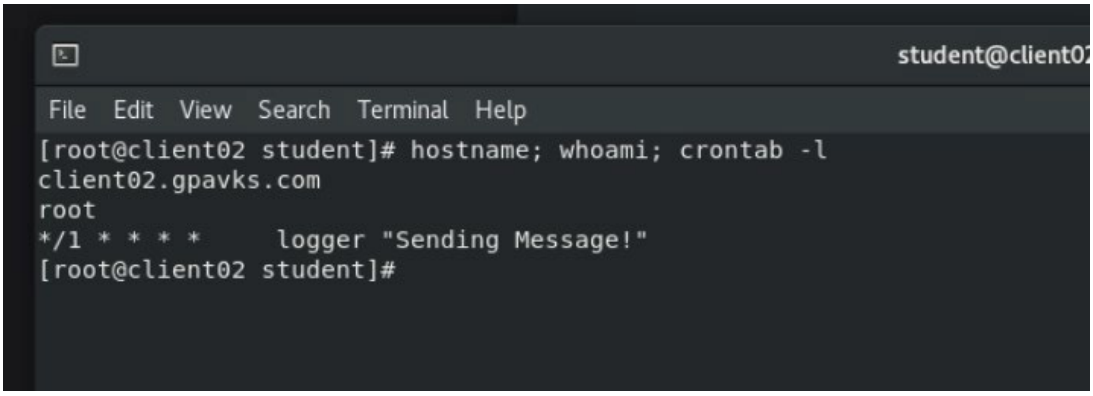
`crontab -l`	lists the user's crontab.
`crontab -e`	edits the user's crontab.
`crontab -r`	deletes the user's crontab.

Of course, reviewing the crontab man page will help too.

Create a cron job that uses the **`logger`** command to send a message from the client to the central log server every minute.

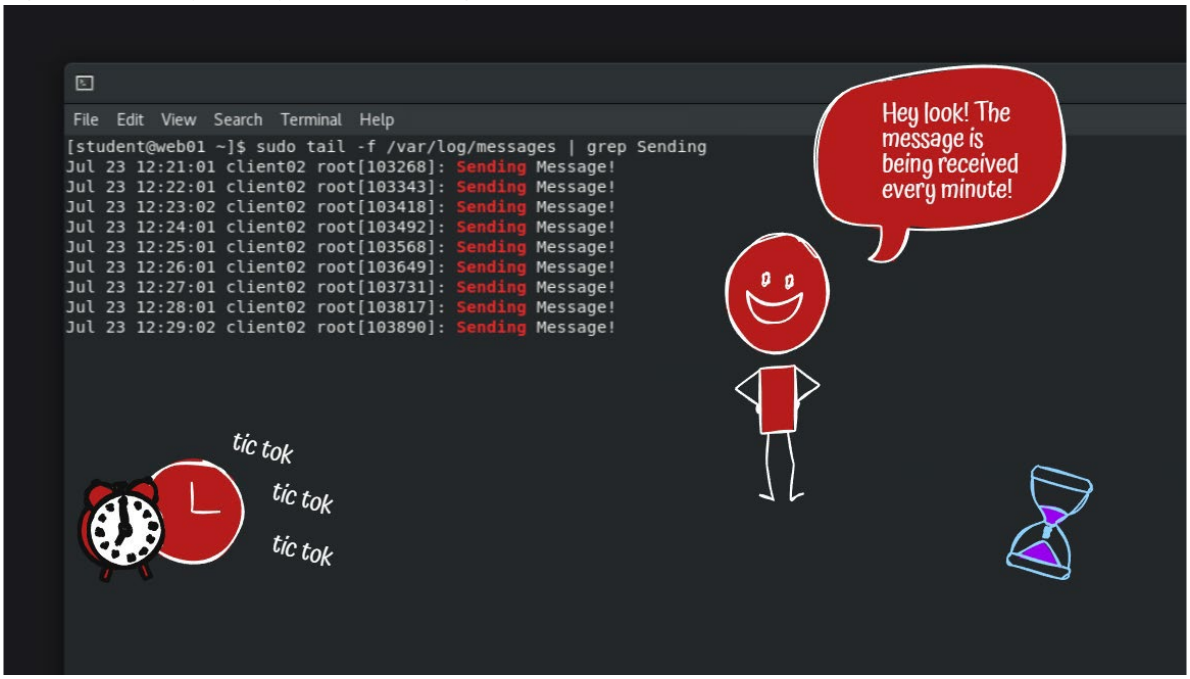
For the report, include a screenshot showing the output of the **`hostname`**, **`whoami`**, and **`crontab -l`** commands. See Figure 56 for an example.

Figure 56 – Example Cronjob List Validation



Using the **`tail -f /var/log/messages`** command, provide a second screenshot showing that the log server received the message. The screenshot must show at least two instances of the message received with the time stamp showing a 2-minute interval. It must be the same message that appears in the cronjob list. Refer to Figure 72 for an example.

Figure 57 – Sample Output from the Log Server



All screenshots for Lab 06 must be included in the lab report. For each missing screenshot, you will receive a 5% penalty on the report grade. If your screenshots do not include the required information, are illegible, blurry, or otherwise unreadable, you will not receive credit. Any attempt to alter the information in the screenshots in any way is academic dishonesty, and you will receive a zero grade for the report.

Screenshot Summary