APACHE SERVER OPTIMIZATION

Optimize Apache server performances, view usage statistics, create scripts with cgi and php, and configure a secure server

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Contents

TASK 1 – MULTI-PROCESS MODULE (MPM)

• The web pages for this project should be in the directory:

/var/www/html_ project3

```
[root@server15 conf]# ll
total 44
-rw-r--r--. 1 root root  4852 Apr 25 12:25 httpd.conf
-rw-r--r--. 1 root root  8070 Apr 21 20:50 httpd.conf.p1
-rw-r--r--. 1 root root 12013 Apr 15 20:05 httpd.original
-rw-r--r--. 1 root root 13430 Jan 21 16:24 magic
[root@server15 conf]# cp httpd.conf httpd.conf.p2
[root@server15 conf]# ll
total 52
-rw-r--r--. 1 root root  4852 Apr 25 12:25 httpd.conf
-rw-r--r--. 1 root root  8070 Apr 21 20:50 httpd.conf.p1
-rw-r--r--. 1 root root  4852 Apr 25 12:26 httpd.conf.p2
-rw-r--r--. 1 root root 12013 Apr 15 20:05 httpd.original
-rw-r--r--. 1 root root 13430 Jan 21 16:24 magic
[root@server15 conf]#
```

• Add links to all the web pages of this project in the following file:

var/www/html_project3/master_project3.html. See the example provided on the

last page of this document.

```
ServerRoot "/etc/httpd"

Listen 192.168.50.10:80

Include conf.modules.d/*.conf
User apache
Group apache
ServerAdmin root@localhost
ServerName www.patrick.ca:80

<Directory />
        AllowOverride None
        Require all denied
</Directory>

DocumentRoot "/var/www/html_project3"
DirectoryIndex master_project3.html
```

Create the temporary html file and test it in the browser

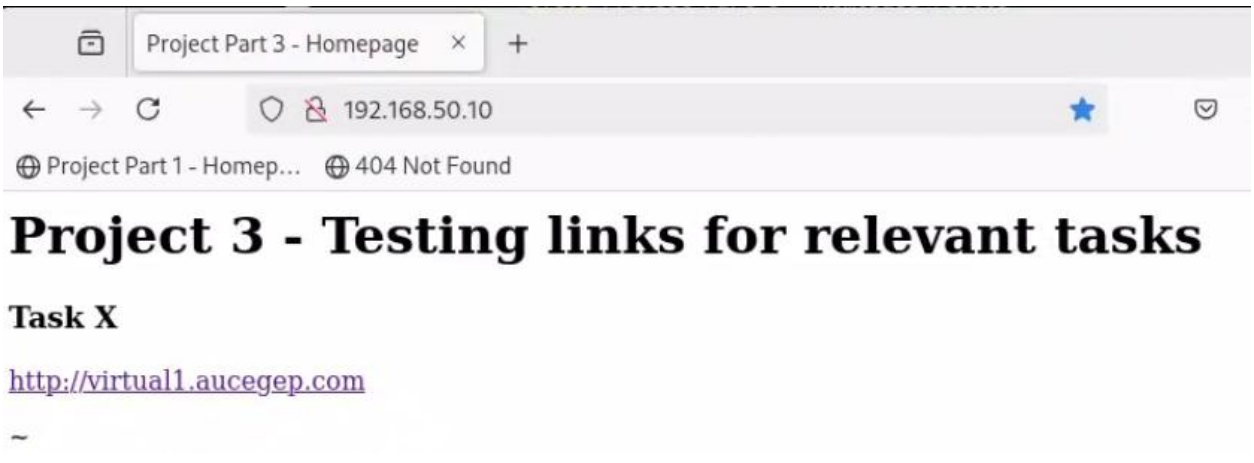
```
root@server15:/var/www/html_project3 118x24
<html>

        <head>
                <title>Project Part 3 - Homepage</title>
        </head>
        <body>
                <h1>Project 3 - Testing links for relevant tasks</h1>

                <h3>Task X</h3>
                <p><a href="http://virtual1.aucegep.com/">http://virtual1.aucegep.com</a></p>




        </body>
</html>
```



In this task, we're choosing to use the ***worker module*** for its hybrid-multi-threaded, multi process server implementation that is faster and uses less memory. It can **handle**

hundreds of simultaneous client connections efficiently (which fits the requirement of 180 simultaneous client requests).

• Configure your Apache web server with the following parameters:

➢ Start with 12 httpd server processes when the service starts.

➢ Maintain a minimum of 6 idle server processes at all times.

➢ Allow a maximum of 12 idle server processes.

➢ Handle up to 180 simultaneous client requests.

➢ Queue a maximum of 100 pending requests when the maximum of 180 simultaneous requests is reached.

➢ Enable persistent (KeepAlive) connections, with:

- o A maximum of 50 consecutive requests per connection.
- o A 20-second timeout between two consecutive requests from the same client.

➢ Limit the maximum request duration to 55 seconds per client request.

```
<IfModule mpm_worker_module>
StartServers 12
ServerLimit 12
MaxRequestWorkers 180
ThreadsPerChild 45
MinSpareThreads 60
MaxSpareThreads 180
KeepAlive On
ListenBackLog 100
MaxKeepAliveRequests 50
KeepAliveTimeout 20
Timeout 55
</IfModule>
```

Make sure the worker MPM is the uncommented MPM in the /etc/httpd/con.modules.d/ file

```
[root@server15 conf.modules.d]# pwd
/etc/httpd/conf.modules.d
[root@server15 conf.modules.d]# vim 00-mpm.conf
```

```
#LoadModule mpm_prefork_module modules/mod_mpm_prefork.so

# worker MPM: Multi-Processing Module implementing a hybrid
# multi-threaded multi-process web server
# See: http://httpd.apache.org/docs/2.4/mod/worker.html
#
LoadModule mpm_worker_module modules/mod_mpm_worker.so
```

Restart the httpd process

```
[root@server15 ~]# systemctl restart httpd
[root@server15 ~]#
```

It should now be able to handle the specified requirements.

TASK 2 – APACHE SERVER MONITORING

• Enable ExtendedStatus to allow detailed monitoring of Apache server activity.

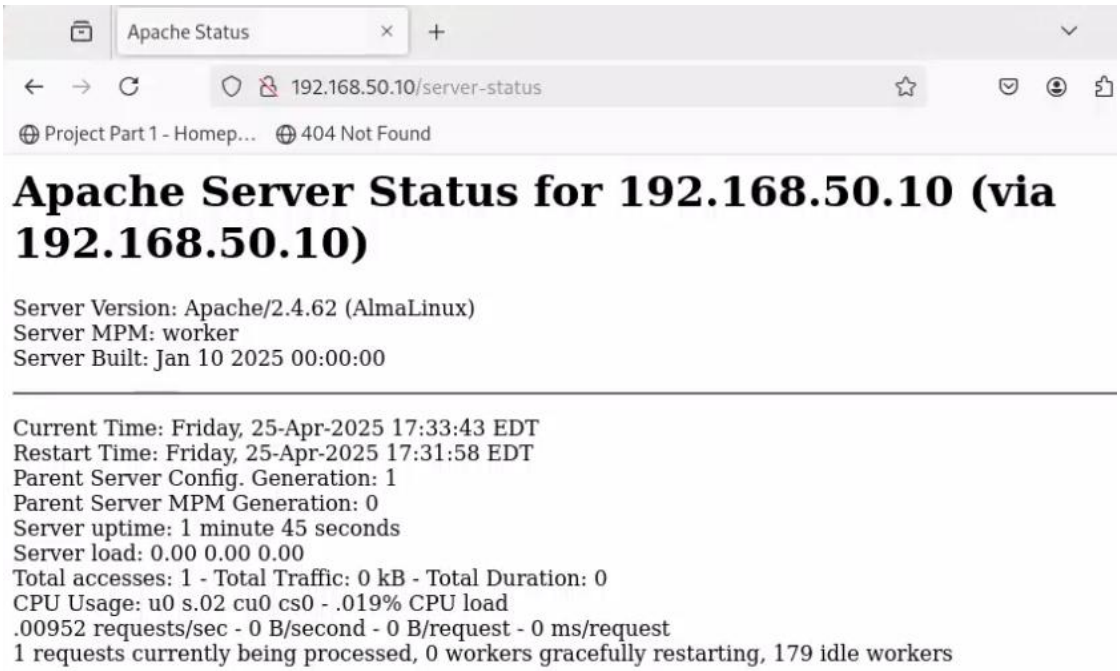
• Configure the server-status and server-info handlers so that they are accessible only to users on the 192.168.50.0/24 subnet.

Add these lines in the htttpd.conf file

```
<Location "/server-status">
        SetHandler server-status
        Require ip 192.168.50.0/24
</Location>

<Location "/server-info">
        SetHandler server-info
        Require ip 192.168.50.0/24
</Location>
```

Now test on the browser to see if it works



Task 3 - Configure your web server to use cgi-bins.

• Create a Perl script that displays the text “This is Task 3 (CGI)” in the web browser & place this script in the /var/www/cgi-bin directory.

```
[root@server15 cgi-bin]# touch task3.pl
[root@server15 cgi-bin]# vim task3.pl
[root@server15 cgi-bin]# pwd
/var/www/cgi-bin
```

root@server15:/var/www/cgi-bin 118x24

```
#!/usr/bin/perl

print "Content-type: text/html\n\n";
print "<html>\n";
print "<head><title>Task 3</title></head>\n";
print "<body>\n";
print "<h1>This is Task 3 (CGI)</h1>\n";
print "</body>\n";
print "</html>\n";

~
~
```

Make sure the script can be excecuted with the right permission

```
[root@server15 cgi-bin]# chmod +x /var/www/cgi-bin/task3.pl
[root@server15 cgi-bin]#
```

Add this Alias in the httpd.conf file.

```
ScriptAlias /cgi-bin/ "/var/www/cgi-bin/"

<IfModule alias_module>
    ScriptAlias /cgi-bin/ "/var/www/cgi-bin/"
</IfModule>

<Directory "/var/www/cgi-bin">
    Options +ExecCGI
    AllowOverride None
    AddHandler cgi-script .cgi .pl .py
    Require all granted
</Directory>
```

Now test in the browser

Task 4 : Configure your web server to use PHP.

Create a PHP script

Create a php script that displays the message "Hello my friend!" in the web browser for users whose IP address belongs to the 192.168.100.0/24 subnet and displays "Hello stranger!" for all other users outside this subnet and place this PHP script in the /var/www/html_project3/q4 directory.

Firstly, we need to install php:

```
[root@server15 ~]# dnf install -y php
Last metadata expiration check: 0:22:24 ago on Sat 26 Apr 2025 03:13:38 PM.
Dependencies resolved.
================================================================================
 Package                 Architecture  Version                       Repository
================================================================================
Installing:
 php                     x86_64        8.0.30-1.el9_2                appstream
```

Now navigate to q4 directory and create the php file to write the script:

```
[root@server15 ~]# cd /var/www/html_project3
[root@server15 html_project3]# ll
total 4
-rw-r--r--. 1 root root 364 Apr 25 15:50 master_project3.html
[root@server15 html_project3]# mkdir q4
[root@server15 html_project3]#
```

Create the php file and name it task4.php

```
[root@server15 q4]# pwd
/var/www/html_project3/q4
[root@server15 q4]# touch task4.php
```

```php
<?php
function isIPInSubnet($ip, $subnet) {
    $subnetParts = explode('/', $subnet);
    $subnetIp = $subnetParts[0];
    $maskBits = isset($subnetParts[1]) ? (int)$subnetPart
s[1] : 32;

    $ipLong = ip2long($ip);
    $subnetLong = ip2long($subnetIp);
    $mask = -1 << (32 - $maskBits);

    return ($ipLong & $mask) === ($subnetLong & $mask);
}

$client_ip = $_SERVER['REMOTE_ADDR'];

// Check if IP is in 192.168.100.0/24 subnet
if (isIPInSubnet($client_ip, '192.168.100.0/24')) {
    echo "Hello my friend!";
} else {
    echo "Hello stranger!";
}
?>
~
```

Setup for compatibility

Make sure the server has permission to execute the php file

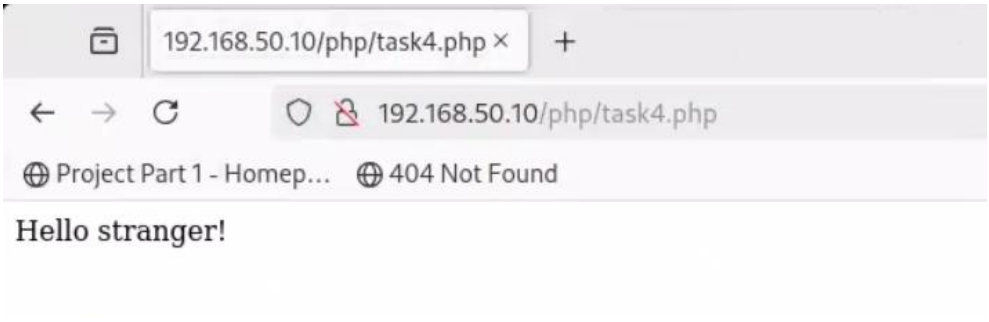
```
[root@server15 q4]# chown -R apache:apache /var/www/html_project3
[root@server15 q4]# chmod -R 755 /var/www/html_project3
[root@server15 q4]#
```

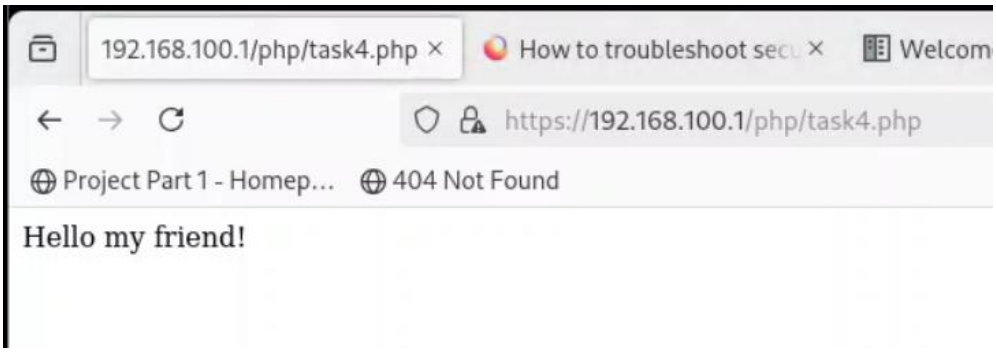
Add this ScriptAlias to the httpd.conf file, then restart the httpd service:

```
ScriptAlias /php/ "/var/www/html_project3/q4/"
```

```
[root@server15 q4]# systemctl restart httpd
[root@server15 q4]#
```

Now test in the browser, navigating to the desired .php file from two different IPs





TASK 5 – MYSQL/PHP

1. Install MySQL and make sure it is enabled and active.

```
[root@server15 q4]# dnf -y install mysql-server
```

```
[root@server15 ~]# systemctl enable --now mysqld
Created symlink /etc/systemd/system/multi-user.target.wants/mysqld.service → /usr/lib/systemd/
system/mysqld.service.
system[root@server15 ~]# systemctl status mysqld
● mysqld.service - MySQL 8.0 database server
     Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; preset: disabled)
     Active: active (running) since Sun 2025-04-27 19:59:56 EDT; 7s ago
```

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.00 sec)

mysql>
```

2. Create in this database an “employees” table that contains two fields: name and salary.

```
mysql> CREATE DATABASE company;
Query OK, 1 row affected (0.00 sec)
```

```
mysql> CREATE TABLE employees ( name VARCHAR(255) NOT NULL, salary DECIMAL(10, 2) NOT NULL );
Query OK, 0 rows affected (0.00 sec)

mysql>
```

3. Insert several records into the table, then verify the contents.

```
mysql> insert into employees (name, salary) values ("alain","25000");
Query OK, 1 row affected (0.00 sec)

mysql>
```

```
mysql> select * from employees alain;
+-------+----------+
| name  | salary   |
+-------+----------+
| alain | 25000.00 |
+-------+----------+
1 row in set (0.00 sec)
```

4. Create a PHP script that connects to this database and displays the contents of the employees table in the web browser as an HTML table.

Make sure root has all privileges for MySQL

```
mysql> create user 'root'@'server15' identified by 'alma';
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql> grant all privileges on *.* to 'root'@'server15' with grant option;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql> flush privileges
    -> ;
```

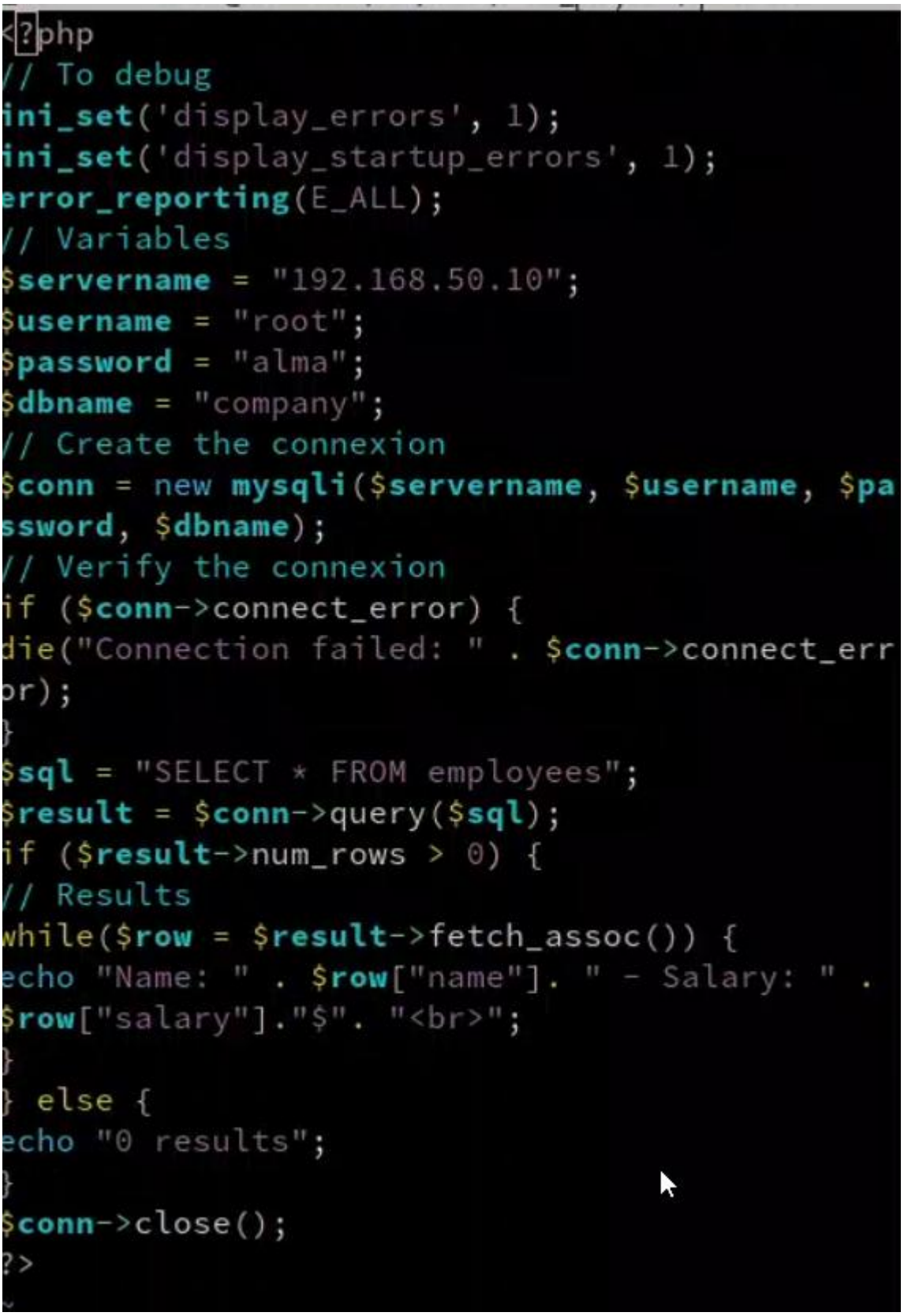
Download the php-mysqlnd service for connectivity

```
mysql> exit
Bye
[root@server15 q5]# dnf install -y php-mysqlnd
```

Restart then enable Apache to connect to the network and ocnnect to other netwrok services.

```
[root@server15 q5]# systemctl restart php-fpm
[root@server15 q5]# setsebool -P httpd_can_network_connect 1
[root@server15 q5]#
```

Write the provided php file



```php
<?php
// To debug
ini_set('display_errors', 1);
ini_set('display_startup_errors', 1);
error_reporting(E_ALL);
// Variables
$servername = "192.168.50.10";
$username = "root";
$password = "alma";
$dbname = "company";
// Create the connexion
$conn = new mysqli($servername, $username, $pa
ssword, $dbname);
// Verify the connexion
if ($conn->connect_error) {
die("Connection failed: " . $conn->connect_err
or);
}
$sql = "SELECT * FROM employees";
$result = $conn->query($sql);
if ($result->num_rows > 0) {
// Results
while($row = $result->fetch_assoc()) {
echo "Name: " . $row["name"]. " - Salary: " .
$row["salary"]."$". "<br>";
}
} else {
echo "0 results";
}
$conn->close();
?>
```

5. Place this PHP script in the /var/www/html_project3/q5 directory.

```
[root@server15 q5]# pwd
/var/www/html_project3/q5
[root@server15 q5]# ll
total 4
-rw-r--r--. 1 root root 675 Apr 27 20:17 employees.php
[root@server15 q5]#
```

Now test in the browser

TASK 6 – SSL

1.Configure your web server to use SSL.

```
[root@server15 ~]# dnf install -y mod_ssl
```

```
[root@server15 ~]# sudo openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout /etc/pki/tls/private/server.key -o
ut /etc/pki/tls/certs/server.crt
...+....+......+..+......+....+..+.+........++++++++++++++++++++++++++++++++++++++++++++.....+...+......+....+........+...
+.+.....................+.....+..............+....+.........+.....+.......+..+............+.+........+....+..+...+...
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+....+...+........+......+.+............+..+.+..+.......+...........+...+..........+..............+...+....+........+.
.++++++
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [XX]:
```

```
Country Name (2 letter code) [XX]:CA
State or Province Name (full name) []:QC
Locality Name (eg, city) [Default City]:Montreal
Organization Name (eg, company) [Default Company Ltd]:JAC
Organizational Unit Name (eg, section) []:
Common Name (eg, your name or your server's hostname) []:
Email Address []:
[root@server15 ~]#
```

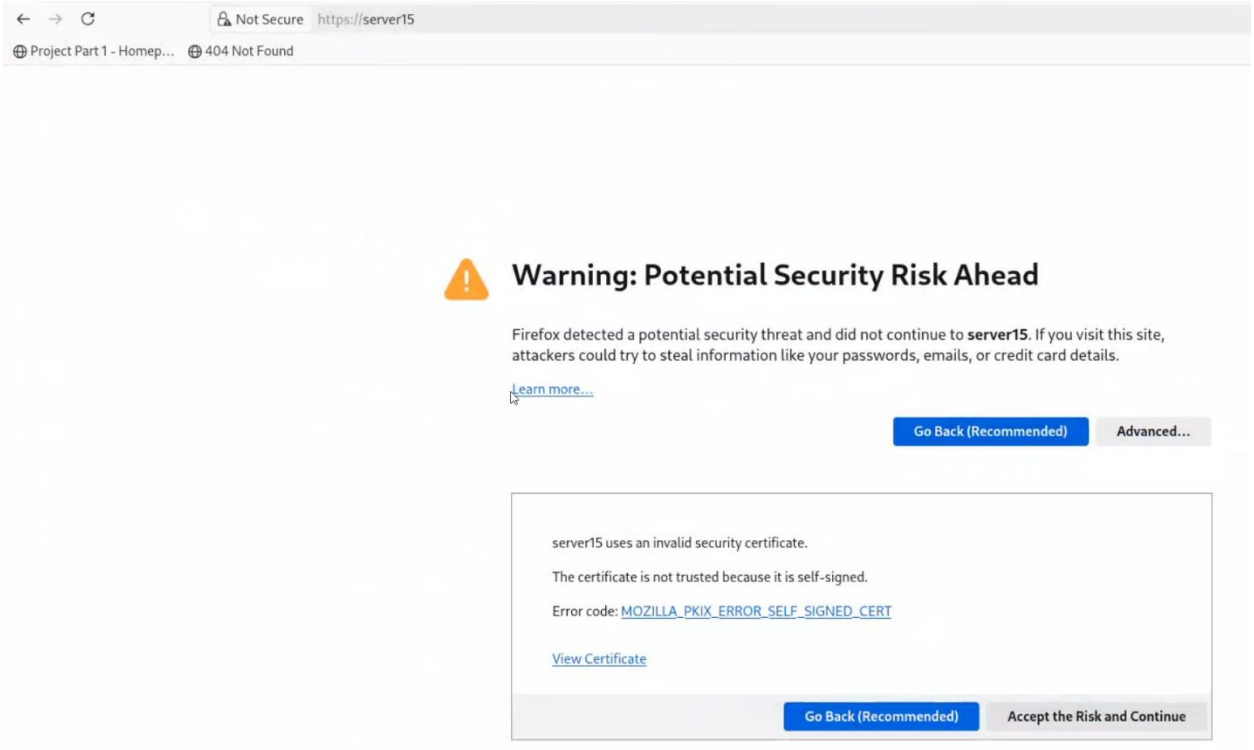
Make sure sslengine is on

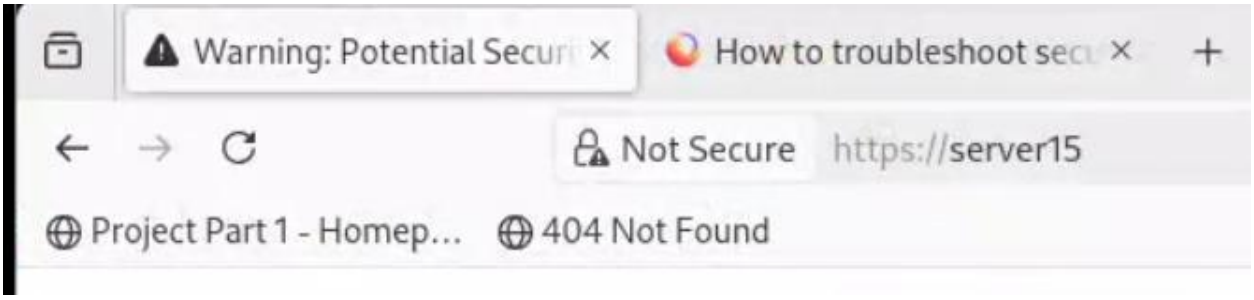
```
#   SSL Engine Switch:
#   Enable/Disable SSL for this virtual host.
SSLEngine on
```

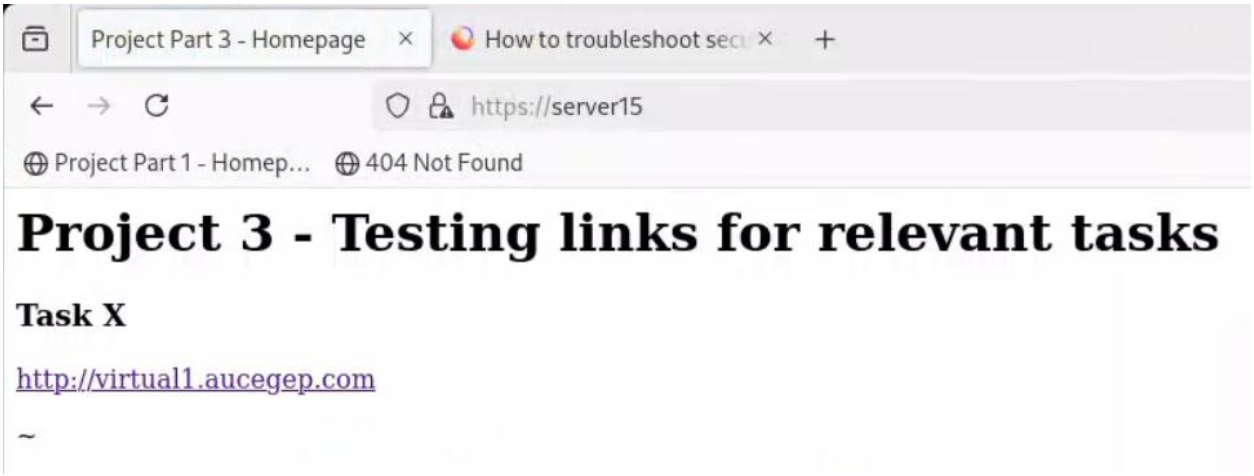
```
#   Point SSLCertificateFile at a PEM encoded certificate.  If
#   the certificate is encrypted, then you will be prompted for a
#   pass phrase.  Note that restarting httpd will prompt again.  Keep
#   in mind that if you have both an RSA and a DSA certificate you
#   can configure both in parallel (to also allow the use of DSA
#   ciphers, etc.)
#   Some ECC cipher suites (http://www.ietf.org/rfc/rfc4492.txt)
#   require an ECC certificate which can also be configured in
#   parallel.
SSLCertificateFile /etc/pki/tls/certs/localhost.crt

#   Server Private Key:
#   If the key is not combined with the certificate, use this
#   directive to point at the key file.  Keep in mind that if
#   you've both a RSA and a DSA private key you can configure
#   both in parallel (to also allow the use of DSA ciphers, etc.)
#   ECC keys, when in use, can also be configured in parallel
SSLCertificateKeyFile /etc/pki/tls/private/localhost.key
```

```
SSLCertificateFile /etc/pki/tls/certs/server.crt

#   Server Private Key:
#   If the key is not combined with the certificate, us
#   directive to point at the key file.  Keep in mind t
#   you've both a RSA and a DSA private key you can con
#   both in parallel (to also allow the use of DSA ciph
#   ECC keys, when in use, can also be configured in pa
SSLCertificateKeyFile /etc/pki/tls/private/server.key
```

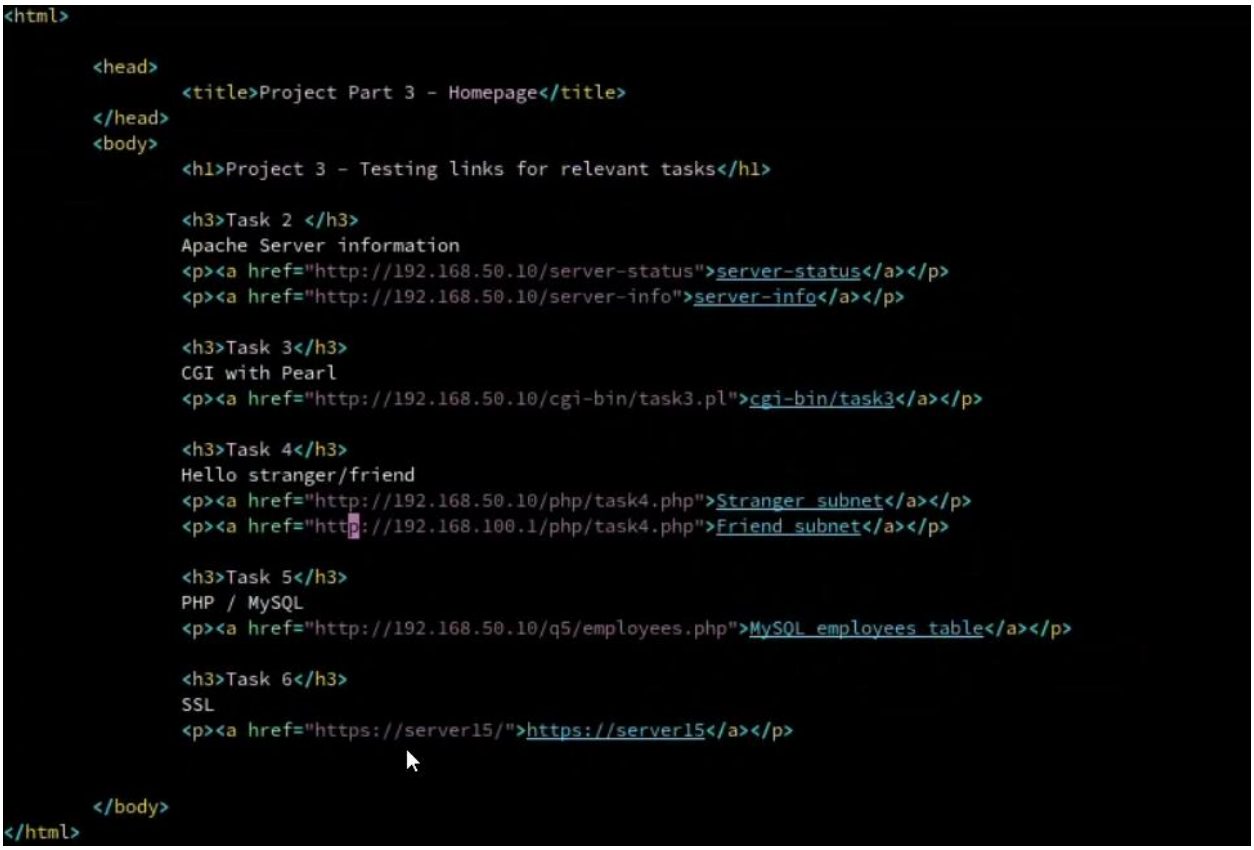
2.Test access to your server using the https security protocol by navigating to: https://serverX (where X is your assigned server number).


Not Secure
https://server15
Project Part 1 - Homep...
404 Not Found
Warning: Potential Security Risk Ahead
Firefox detected a potential security threat and did not continue to server15. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.
Learn more...
Go Back (Recommended)
Advanced...
server15 uses an invalid security certificate.
The certificate is not trusted because it is self-signed.
Error code: MOZILLA_PKIX_ERROR_SELF_SIGNED_CERT
View Certificate
Go Back (Recommended)
Accept the Risk and Continue

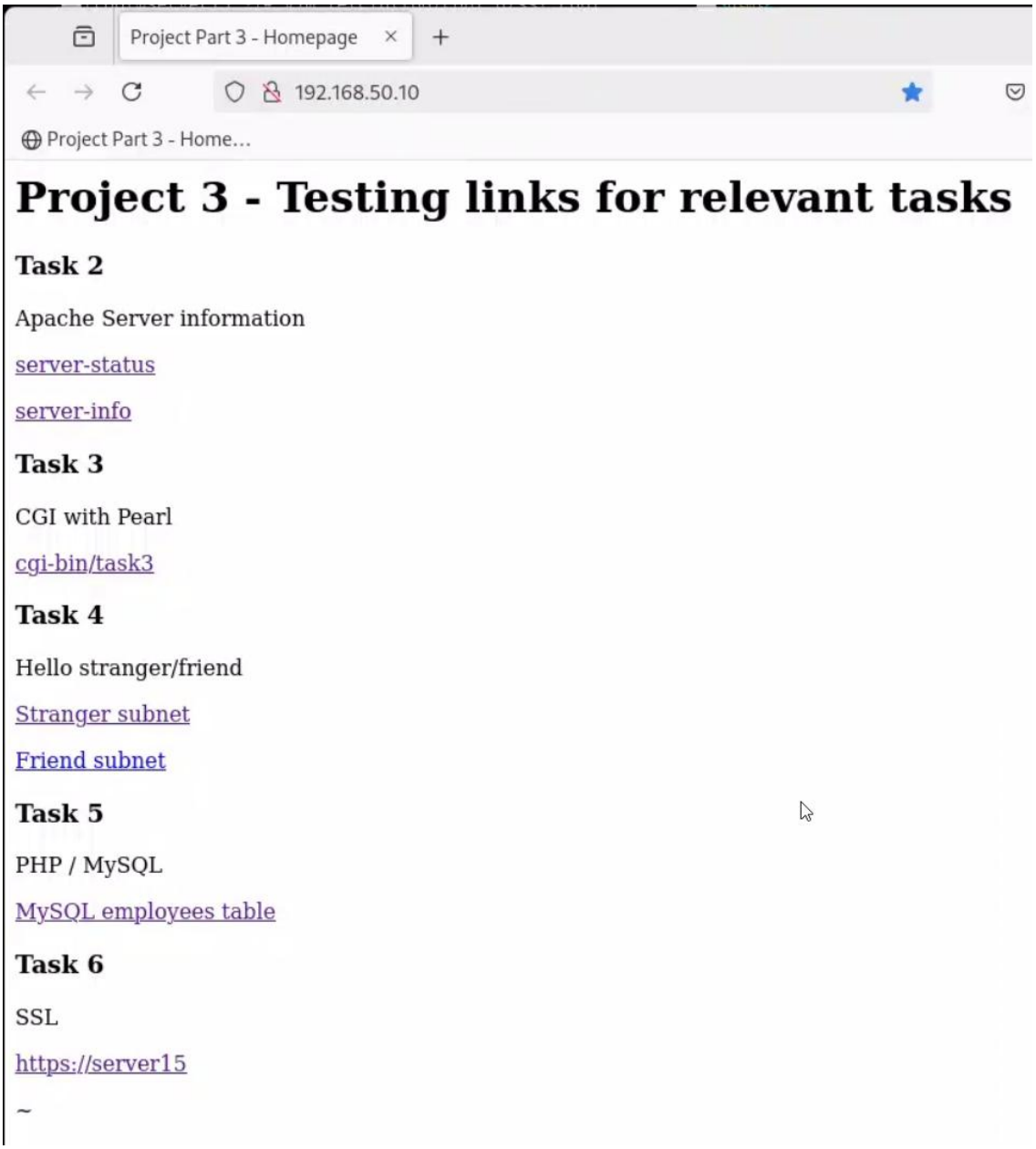

Warning: Potential Securi
How to troubleshoot secu
Not Secure
https://server15
Project Part 1 - Homep...
404 Not Found


Project Part 3 - Homepage
How to troubleshoot secu
https://server15
Project Part 1 - Homep...
404 Not Found
Project 3 - Testing links for relevant tasks
Task X
http://virtual1.aucegep.com
~

Add links to all the web pages of this project in the following file: var/www/html_project3/master_project3.html.



```
<html>

        <head>
                <title>Project Part 3 - Homepage</title>
        </head>
        <body>
                <h1>Project 3 - Testing links for relevant tasks</h1>

                <h3>Task 2 </h3>
                Apache Server information
                <p><a href="http://192.168.50.10/server-status">server-status</a></p>
                <p><a href="http://192.168.50.10/server-info">server-info</a></p>

                <h3>Task 3</h3>
                CGI with Pearl
                <p><a href="http://192.168.50.10/cgi-bin/task3.pl">cgi-bin/task3</a></p>

                <h3>Task 4</h3>
                Hello stranger/friend
                <p><a href="http://192.168.50.10/php/task4.php">Stranger subnet</a></p>
                <p><a href="http://192.168.100.1/php/task4.php">Friend subnet</a></p>

                <h3>Task 5</h3>
                PHP / MySQL
                <p><a href="http://192.168.50.10/q5/employees.php">MySQL employees table</a></p>

                <h3>Task 6</h3>
                SSL
                <p><a href="https://server15/">https://server15</a></p>


        </body>
</html>
```


Project Part 3 - Homepage
192.168.50.10
Project Part 3 - Home...
Project 3 - Testing links for relevant tasks
Task 2
Apache Server information
server-status
server-info
Task 3
CGI with Pearl
cgi-bin/task3
Task 4
Hello stranger/friend
Stranger subnet
Friend subnet
Task 5
PHP / MySQL
MySQL employees table
Task 6
SSL
https://server15
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