

Documentation:

Step 2 Implementations:

Note: Despite being able to make requests via browser, we haven't found a way to modify get requests coming from the browser (ie: changing header fields, altering text), so some testing is done within the terminal. However, any returned html messages have been tested independently before implementation.

400 Bad Request:

Sending any get request where the beginning of the request is not 'GET /' will result in a '400 Bad Request' message being displayed.

Request:

```
request = ""ACQUIRE /test.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-CA,en-US;q=0.7,en;q=0.3
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Content-Length: 0
If-Modified-Since: Sun, 10 Oct 2023 02:01:00 GMT
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1""
```

Client Result:

```
From Server: HTTP/1.1 400 Bad Request
Content-Type: text/html

<html><body><h1>400 Bad Request</h1><p>Your request is invalid.</p></body></html>
...
```

403 Forbidden:

We decided to handle the forbidden code with a forbidden directory as opposed to authentication headers because it seemed more streamlined to implement and easier to test. Attempting to access any file in the directory ./forbidden will return a webpage with '403 Forbidden':

Request:

```
request = """GET /forbidden/secret_passwords.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-CA,en-US;q=0.7,en;q=0.3
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Content-Length: 0
If-Modified-Since: Sun, 10 Oct 2023 02:01:00 GMT
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1"""
```

Client Result:

403 Forbidden

Access to the requested resource is forbidden.

411 Length Required:

Any request that doesn't contain the header 'Content-Length' will return a '411 Length Required' status message:

Request:

```
request = ""GET /test.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-CA,en-US;q=0.7,en;q=0.3
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
If-Modified-Since: Sun, 10 Oct 2023 02:01:00 GMT
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1""
```

Client Result:

411 Length Required

Content-Length header is required.

404 Not Found:

Simply enough, if the specified path in the GET request is not found in the server directory (ie: filepath does not exist), then a '404 Not Found' status message is shown to the client:

Request:

```
request = """GET /doesnotexist.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-CA,en-US;q=0.7,en;q=0.3
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Content-Length: 0
If-Modified-Since: Sun, 10 Oct 2023 02:01:00 GMT
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1"""
```

Client Result:

404 Not Found

Page not found.

304 Not Modified:

For simplicity in implementing this status code, we hardcoded a datetime object with a specific date as the web server's 'last modified date', equal to November 30th, 2023, and used it to compare against the requests 'If-Modified-Since' conditional header value. If the header's date was before the web server's 'last modified date', then the client received the web page along

with a '200 OK' status, but if the header's date was after, the client would receive a '304 Not Modified' status code in lieu of the web browser loading the webpage from the cache and displaying it.

Request (If-Modified-Since before the server's last modified date):

```
request = """GET /test.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html
Connection: keep-alive
Content-Length: 0
If-Modified-Since: Sun, 10 Oct 2023 02:01:00 GMT"""
```

Client Result:

```
From Server: HTTP/1.1 200 OK
Content-Type: text/html

<!DOCTYPE html>
<html>

<head>
  <meta charset="utf-8">
  <title></title>
  <meta name="author" content="">
  <meta name="description" content="">
  <meta name="viewport" content="width=device-width, initial-scale=1">
</head>

<body>

  <p>Congratulations! Your Web Server is Working!</p>

</body>

</html>
```

Request (If-Modified-Since after the server's last modified date):

```
request = """GET /test.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html
Connection: keep-alive
Content-Length: 0
If-Modified-Since: Sun, 10 Dec 2023 02:01:00 GMT"""

clientSocket.send(request.encode('utf-8'))
```

Client Result:

```
From Server: HTTP/1.1 304 Not Modified
Content-Type: text/html

<h1>304 Not Modified</h1>
...
```

200 OK:

Finally, if there are no discrepancies in the GET request as mentioned above, the server will return the requested webpage

Request:

```
request = ""GET /test.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html
Connection: keep-alive
Content-Length: 0
If-Modified-Since: Sun, 10 Nov 2023 02:01:00 GMT""
```

Client Result:

```
From Server: HTTP/1.1 200 OK
Content-Type: text/html

<!DOCTYPE html>
<html>

<head>
  <meta charset="utf-8">
  <title></title>
  <meta name="author" content="">
  <meta name="description" content="">
  <meta name="viewport" content="width=device-width, initial-scale=1">
</head>

<body>

  <p>Congratulations! Your Web Server is Working!</p>

</body>

</html>
```

Request:

```
request = ""GET /index.html HTTP/1.1
Host: localhost:12000
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0
Accept: text/html
Connection: keep-alive
Content-Length: 0
If-Modified-Since: Sun, 10 Nov 2023 02:01:00 GMT""
```

Client Result:

```
From Server: HTTP/1.1 200 OK
Content-Type: text/html

<!DOCTYPE html>
<html>

<head>
  <meta charset="utf-8">
  <title></title>
  <meta name="author" content="">
  <meta name="description" content="">
  <meta name="viewport" content="width=device-width, initial-scale=1">
</head>

<body>

  <p>Welcome to the website homepage!</p>

</body>

</html>
```

Step 3 Implementation: