

# CS536 Lab1(Spring 23)

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## Contents

<b>1</b>	<b>Readme</b>	<b>3</b>
1.1	server - client . . . . .	3
1.1.1	server . . . . .	3
1.1.2	client . . . . .	3
1.2	serverMul - client . . . . .	3
1.2.1	serverMul . . . . .	3
1.2.2	client . . . . .	4
1.3	server1 . . . . .	4
1.3.1	client . . . . .	4
1.4	server2 - client2 . . . . .	4
1.4.1	server2 . . . . .	4
1.4.2	client2 . . . . .	5
<b>2</b>	<b>Part B</b>	<b>5</b>
2.1	Responses Using Chrome Browser . . . . .	5
2.1.1	text.html . . . . .	5
2.1.2	picture.html . . . . .	5
2.1.3	bigpicture.html . . . . .	5
2.2	Responses Using Firefox Browser . . . . .	6
2.2.1	text.html . . . . .	6
2.2.2	picture.html . . . . .	6
2.2.3	bigpicture.html . . . . .	6
2.3	Responses Using Opera Browser . . . . .	7
2.3.1	text.html . . . . .	7
2.3.2	picture.html . . . . .	7
2.3.3	bigpicture.html . . . . .	7
2.4	Test with other HTTP responses . . . . .	7
2.4.1	404 Not Found . . . . .	7
2.4.2	400 Bad Request . . . . .	8
2.4.3	505 HTTP Version Not Supported . . . . .	8

<b>3</b>	<b>Part C</b>	<b>8</b>
3.1	server and your client both at localhost . . . . .	8
3.1.1	HTTP1.1 . . . . .	8
3.1.2	HTTP2.0 . . . . .	8
3.1.3	The main difference between HTTP/1.1 and HTTP/2.0 .	9
3.2	server and your client at different hosts . . . . .	9
3.2.1	HTTP1.1 . . . . .	9
3.2.2	HTTP2.0 . . . . .	9
3.2.3	Difference from running in localhost . . . . .	10

# 1 Readme

Please refer to the following subsections to compile and run the source codes

## 1.1 server - client

### 1.1.1 server

**compile:** In a terminal type

```
gcc server.c -o server.o
```

**run:** In a terminal type

```
./server.o <server_port_no>
```

**Example:**

```
./server.o 12000
```

### 1.1.2 client

**compile:** In a terminal type

```
gcc client.c -o client.o
```

**run:** In a terminal type

```
./client.o <server_ip_address> <server_port_no> <message>
```

**Example:**

```
./client.o "127.0.0.1" 12000 "Hi"
```

**Note:** The ip address of the server is by default 127.0.0.1. To change the address, modify the address in line 32 of **server.c**.

## 1.2 serverMul - client

### 1.2.1 serverMul

**compile:** In a terminal type

```
gcc serverMul.c -o serverMul.o
```

**Note:** If the above command gives pthread error, please use the following command

```
gcc serverMul.c -pthread -o serverMul.o
```

**run:** In a terminal type

```
./serverMul.o <server_port_no>
```

**Example:**

```
./serverMul.o 12000
```

**Note:** The ip address of the server is by default 127.0.0.1. To change the address, modify the address in line 57 of **serverMul.c**.

### 1.2.2 client

Same as 1.4.2.

## 1.3 server1

**compile:** In a terminal type

```
gcc server1.c -o server1.o
```

**Note:** If the above command gives pthread error, please use the following command

```
gcc server1.c -pthread -o server1.o
```

**run:** In a terminal type

```
./server1.o <server_port_no>
```

**Example:**

```
./server1.o 12000
```

**Note:** The ip address of the server is by default 127.0.0.1. To change the address, modify the address in line 126 of **server1.c**.

### 1.3.1 client

Use web browsers(Chrome, Firefox, Safari) as client. in the address bar type

`http://<server-ip-address>:<server port number>/<html file name>`

**Example:**

```
http://127.0.0.1:12000/video.html
```

## 1.4 server2 - client2

### 1.4.1 server2

**compile:** In a terminal type

```
gcc server2.c -o server2.o
```

**Note:** If the above command gives pthread error, please use the following command

```
gcc server2.c -pthread -o server2.o
```

**run:** In a terminal type

```
./server2.o <server_port_no>
```

**Example:**

```
./server2.o 12000
```

### 1.4.2 client2

**compile:** In a terminal type

```
gcc client2.c -o client.o
```

**run:** In a terminal type

```
./client2.o "http://<server-ip-address>:<server port number>/<html file name>"
```

**Example:**

```
./client2.o "http://127.0.0.1:12000/video.html"
```

**Note:** The ip address of the server is by default 127.0.0.1. To change the address, modify the address in line 171 of **server2.c**.

## 2 Part B

### 2.1 Responses Using Chrome Browser

#### 2.1.1 text.html

```
message-from-client: 127.0.0.1, 44494  
GET /text.html HTTP/1.1
```

```
message-to-client: 127.0.0.1, 44494  
HTTP/1.1 200 OK
```

#### 2.1.2 picture.html

```
message-from-client: 127.0.0.1, 47108  
GET /picture.html HTTP/1.1
```

```
message-to-client: 127.0.0.1, 47108  
HTTP/1.1 200 OK
```

```
message-from-client: 127.0.0.1, 47108  
GET /purdue.jpeg HTTP/1.1
```

```
message-to-client: 127.0.0.1, 47108  
HTTP/1.1 200 OK
```

#### 2.1.3 bigpicture.html

```
message-from-client: 127.0.0.1, 47108  
GET /bigpicture.html HTTP/1.1
```

```
message-to-client: 127.0.0.1, 47108
```

HTTP/1.1 200 OK

message-from-client: 127.0.0.1, 47108  
GET /bigpicture.jpeg HTTP/1.1

message-to-client: 127.0.0.1, 47108  
HTTP/1.1 200 OK

## **2.2 Responses Using Firefox Browser**

### **2.2.1 text.html**

message-from-client: 127.0.0.1, 58492  
GET /text.html HTTP/1.1

message-to-client: 127.0.0.1, 58492  
HTTP/1.1 200 OK

### **2.2.2 picture.html**

message-from-client: 127.0.0.1, 38244  
GET /picture.html HTTP/1.1

message-to-client: 127.0.0.1, 38244  
HTTP/1.1 200 OK

message-from-client: 127.0.0.1, 38244  
GET /purdue.jpeg HTTP/1.1

message-to-client: 127.0.0.1, 38244  
HTTP/1.1 200 OK

### **2.2.3 bigpicture.html**

message-from-client: 127.0.0.1, 38244  
GET /bigpicture.html HTTP/1.1

message-to-client: 127.0.0.1, 38244  
HTTP/1.1 200 OK

message-from-client: 127.0.0.1, 38244  
GET /bigpicture.jpeg HTTP/1.1

message-to-client: 127.0.0.1, 38244  
HTTP/1.1 200 OK

## **2.3 Responses Using Opera Browser**

### **2.3.1 text.html**

message-from-client: 127.0.0.1, 33438  
GET /text.html HTTP/1.1

message-to-client: 127.0.0.1, 33438  
HTTP/1.1 200 OK

### **2.3.2 picture.html**

message-from-client: 127.0.0.1, 33438  
GET /picture.html HTTP/1.1

message-to-client: 127.0.0.1, 33438  
HTTP/1.1 200 OK

message-from-client: 127.0.0.1, 33438  
GET /purdue.jpeg HTTP/1.1

message-to-client: 127.0.0.1, 33438  
HTTP/1.1 200 OK

### **2.3.3 bigpicture.html**

message-from-client: 127.0.0.1, 33438  
GET /bigpicture.html HTTP/1.1

message-to-client: 127.0.0.1, 33438  
HTTP/1.1 200 OK

message-from-client: 127.0.0.1, 33438  
GET /bigpicture.jpeg HTTP/1.1

message-to-client: 127.0.0.1, 33438  
HTTP/1.1 200 OK

## **2.4 Test with other HTTP responses**

### **2.4.1 404 Not Found**

message-from-client: 127.0.0.1, 46558  
GET /text1.html HTTP/1.1

message-to-client: 127.0.0.1, 46558  
HTTP/1.1 404 Not Found

### 2.4.2 400 Bad Request

message-from-client: 127.0.0.1, 35316  
SET /text.html HTTP/1.1

message-to-client: 127.0.0.1, 35316  
HTTP/1.1 400 Bad Request

### 2.4.3 505 HTTP Version Not Supported

message-from-client: 127.0.0.1, 55744  
GET /text.html HTTP/2.0

message-to-client: 127.0.0.1, 55744  
HTTP/1.1 505 HTTP Version Not Supported

## 3 Part C

### 3.1 server and your client both at localhost

#### 3.1.1 HTTP1.1

HTTP/1.1 200 OK  
Content-Type: text/html

HTTP/1.1 200 OK  
Content-Type: video/mp4

HTTP/1.1 200 OK  
Content-Type: image/jpeg  
HTTP/1.1 200 OK  
Content-Type: image/jpeg

#### 3.1.2 HTTP2.0

Object-Frame: [Object1] Frame\_1  
Object-Frame: [Object2] Frame\_1  
Object-Frame: [Object1] Frame\_101  
Object-Frame: [Object2] Frame\_101  
Object-Frame: [Object1] Frame\_201  
Object-Frame: [Object1] Frame\_301  
Object-Frame: [Object1] Frame\_401  
Object-Frame: [Object1] Frame\_501  
Object-Frame: [Object1] Frame\_601  
Object-Frame: [Object1] Frame\_701



Object-Frame: [Object1] Frame\_801  
Object-Frame: [Object1] Frame\_901  
Object-Frame: [Object1] Frame\_1001  
Object-Frame: [Object1] Frame\_1201  
Object-Frame: [Object1] Frame\_1301  
Object-Frame: [Object1] Frame\_1401  
Object-Frame: [Object1] Frame\_1501  
Object-Frame: [Object1] Frame\_1601  
Object-Frame: [Object1] Frame\_1701  
Object-Frame: [Object1] Frame\_1801  
Object-Frame: [Object1] Frame\_1901  
Object-Frame: [Object1] Frame\_2001  
Object-Frame: [Object1] Frame\_2201  
Object-Frame: [Object1] Frame\_2301  
Object-Frame: [Object1] Frame\_2401  
Object-Frame: [Object1] Frame\_2601

### 3.1.3 The main difference between HTTP/1.1 and HTTP/2.0

In HTTP 1.1 server responds in-order (FCFS: first-come-first-served scheduling) to GET requests with FCFS, small object may have to wait for transmission (head-of-line (HOL) blocking) behind large object(s). Here bigpicture.jpeg and picture.jpeg are smaller in size than video.mp4 but has to wait until video.mp4 is transmitted. But in HTTP2.0, all objects are sent in multiple frames in a round robin fashion. So no object block other objects. Transmission of smaller objects finishes before bigger objects.

## 3.2 server and your client at different hosts

### 3.2.1 HTTP1.1

HTTP/1.1 200 OK  
Content-Type: text/html

HTTP/1.1 200 OK  
Content-Type: video/mp4

### 3.2.2 HTTP2.0

Object-Frame: [Object1] Frame\_1  
Object-Frame: [Object2] Frame\_1  
Object-Frame: [Object1] Frame\_101  
Object-Frame: [Object2] Frame\_101  
Object-Frame: [Object1] Frame\_201  
Object-Frame: [Object1] Frame\_301  
Object-Frame: [Object1] Frame\_401

Object-Frame: [Object1] Frame\_501  
Object-Frame: [Object1] Frame\_601  
Object-Frame: [Object1] Frame\_701  
Object-Frame: [Object1] Frame\_801  
Object-Frame: [Object1] Frame\_901  
Object-Frame: [Object1] Frame\_1001  
Object-Frame: [Object1] Frame\_1201  
Object-Frame: [Object1] Frame\_1301  
Object-Frame: [Object1] Frame\_1401  
Object-Frame: [Object1] Frame\_1501  
Object-Frame: [Object1] Frame\_1601  
Object-Frame: [Object1] Frame\_1701  
Object-Frame: [Object1] Frame\_1801  
Object-Frame: [Object1] Frame\_1901  
Object-Frame: [Object1] Frame\_2001  
Object-Frame: [Object1] Frame\_2201  
Object-Frame: [Object1] Frame\_2301  
Object-Frame: [Object1] Frame\_2401  
Object-Frame: [Object1] Frame\_2601

### **3.2.3 Difference from running in localhost**

The HTTP1.1 took more time in different hosts than from the previous one in same hosts. In localhost the difference in performance was not much between HTTP1.1 and HTTP2.0, but when run in different hosts, HTTP2.0 gave superior performance than HTTP1.1.