

CS425: Computer Networks
IIT Kanpur
Project 2: Designing a Proxy Server
Date: Wed, Aug 31

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Design Choice:

- If method is other than GET request of HTTP protocol, i am sending header with “501”, “Not Implemented” to the client
- As we can see in the below screenshot that if method is not GET, error message with status code “501” is being displayed

www.Football365.com

FOOTBALL365

headline day live: Wilshere, Balotelli, Issoko, Fabregas

Status	Method	File	Domain	Type	Trans...	Size
501	GET	teads_user_sync	sync.ad...	plain	—	0 KB
501	GET	/load/?p=204...	loadm.e...	plain	—	0 KB
501	OPTIONS	lg?uids=SH-83...	api.soci...	plain	—	0 KB
200	GET	a67f36c6ae0b...	fo-stati...	js	4.00 KB	12.79 K
501	POST	modifier?Atte...	fo-ssp.o...	json	0.85 KB	0 KB
200	GET	2	www.fo...	plain	—	0 KB

Headers Cookies Params

Request URL: http://fo-ssp.omnitagjs.com/fo-ssp/modifier?Attempt=ffcb0042

Request method: POST

Remote address: 127.0.0.1:5234

Status code: 501 Not Implemented

Version: HTTP/1.0

Filter headers

Response headers (0.097 KB)

Date: "Wed, 31 Aug 2016 15:59:20 GMT"

Server: "localhost:Neeraj.IITK"

Request headers (0.726 KB)

Host: "fo-ssp.omnitagjs.com"

User-Agent: "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:47.0) Gecko/20100"

Accept: "application/json"

Accept-Language: "en-US,en;q=0.5"

Accept-Encoding: "gzip, deflate"

Content-Type: "text/plain; charset=utf-8"

Referer: "http://www.football365.com/"

Content-Length: "125"

Origin: "http://www.football365.com"

Cookie: "ayl_visitor=1cad06b28172251cf746d9d0a908579e; ...uid=de3a6f"

Connection: "keep-alive"

- Also, if the method is GET but protocol is https instead of http, it will give an error with status code “501” as in below screenshot.

www.Football365.com

FOOTBALL365

headline day live: Wilshere, Balotelli, Issoko, Fabregas

Status	Method	File	Domain	Type	Trans...	Size
501	GET	teads_user_sync	sync.ad...	plain	—	0 KB
501	GET	/load/?p=204...	loadm.e...	plain	—	0 KB
501	OPTIONS	lg?uids=SH-83...	api.soci...	plain	—	0 KB
200	GET	a67f36c6ae0b...	fo-stati...	js	4.00 KB	12.79 KB
501	POST	modifier?Atte...	fo-ssp.o...	json	0.85 KB	0 KB
200	GET	2	www.fo...	plain	—	0 KB

Headers Cookies Params

Request URL: https://loadm.exelator.com/load/?p=204&g=810&j=0&buid=6b3f92a5

Request method: GET

Remote address: 127.0.0.1:5234

Status code: 501 Not Implemented

Version: HTTP/1.0

Filter headers

Request headers (0.399 KB)

Host: "loadm.exelator.com"

User-Agent: "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:47.0) Gecko/20100101"

Accept: "*/"

Accept-Language: "en-US,en;q=0.5"

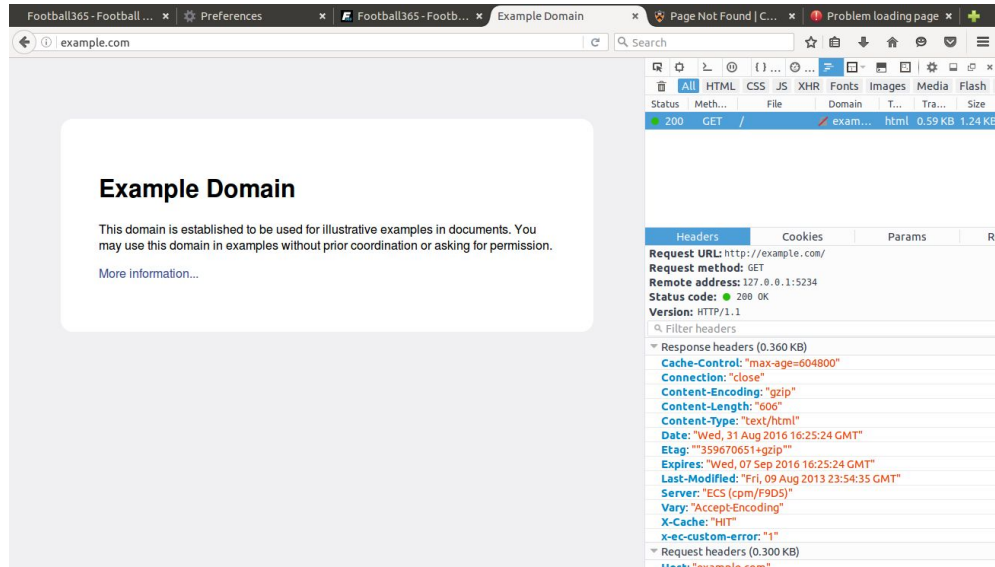
Accept-Encoding: "gzip, deflate, br"

Referer: "http://sync.teads.tv/iframe?pid=36855&userId=6b3f92a5-849d-4d5"

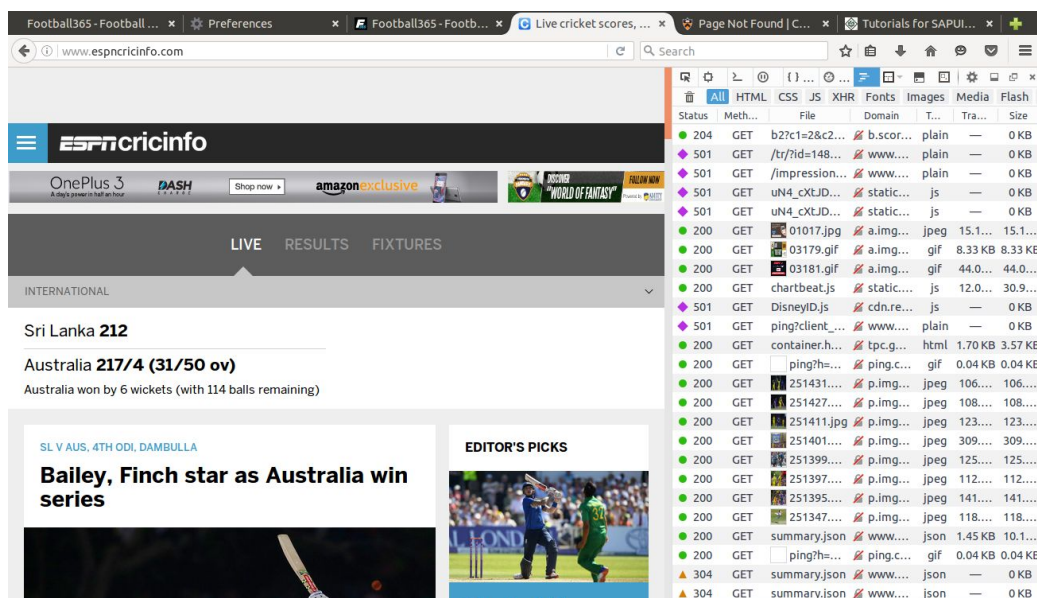
Connection: "keep-alive"

Testing procedures and results:

- Firstly, i compiled the files using Makefile
- I used Firefox browser for testing with browsers
- I changed the proxy of Firefox browser to "127.0.0.1" and the port on which proxy is running
- I cleaned all the cache on the browser before testing. (ctrl+shift+delete)
- Thereafter, i opened the link example.com on the the same browser and result is as shown in below screenshot



- I opened other http links as well and all was running fine if the request is GET with http protocol
- Some other screenshots are attached below



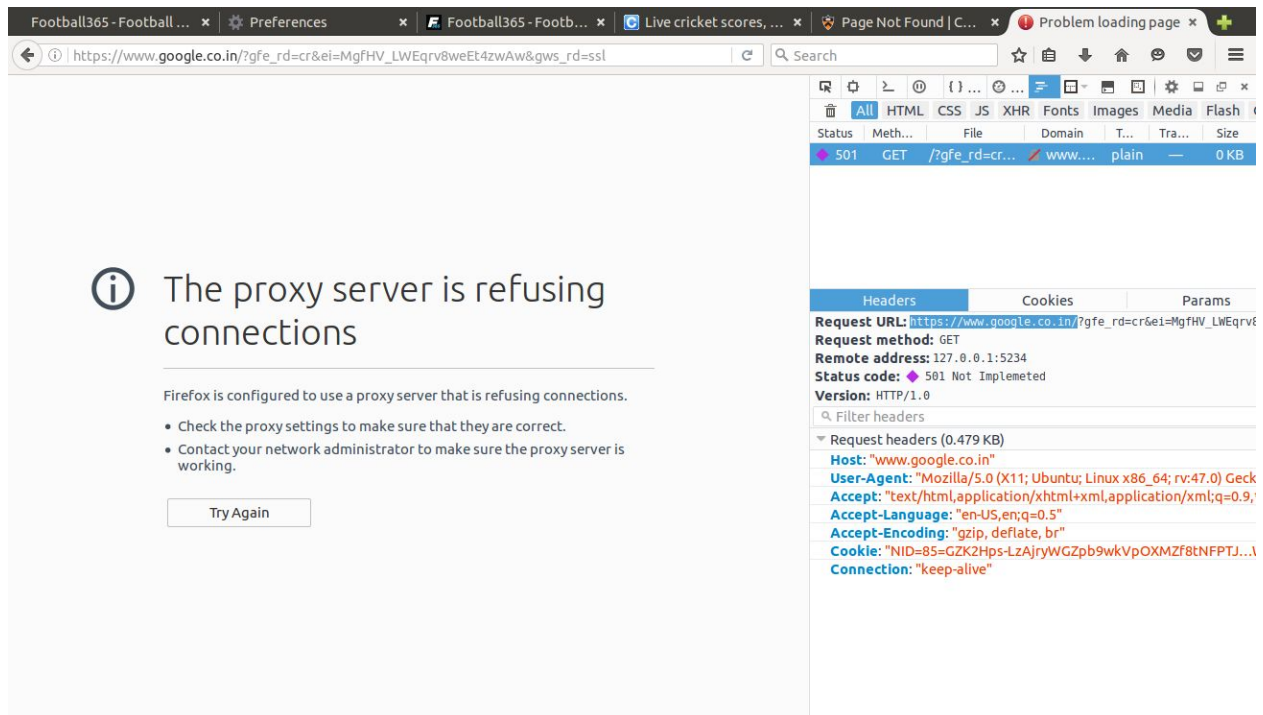
- Princeton site, some of the hyperlinks were not opening because of https protocol or method other than GET

The screenshot shows the Princeton University Computer Science website. The main heading is "COMPUTER SCIENCE". Below it, there are links for "Undergraduate Program", "Graduate Program", "Courses", "Research", "People", and "About". On the left, there is an "Events" section with dates and names of speakers. A "Page Not Found" message is displayed in the center, stating: "Sorry, but the requested page does not exist. You can try: • Checking the Computer Science Homepage • Using the search box to the top right to find what you're looking for". Below this, it says: "If you were linked here from another website, it's possible that link is outdated and needs to be adjusted. If you think the page should exist here and this is an error, please contact us." The browser's developer console on the right shows a list of failed requests, including CSS and JavaScript files, many of which returned 404 status codes.

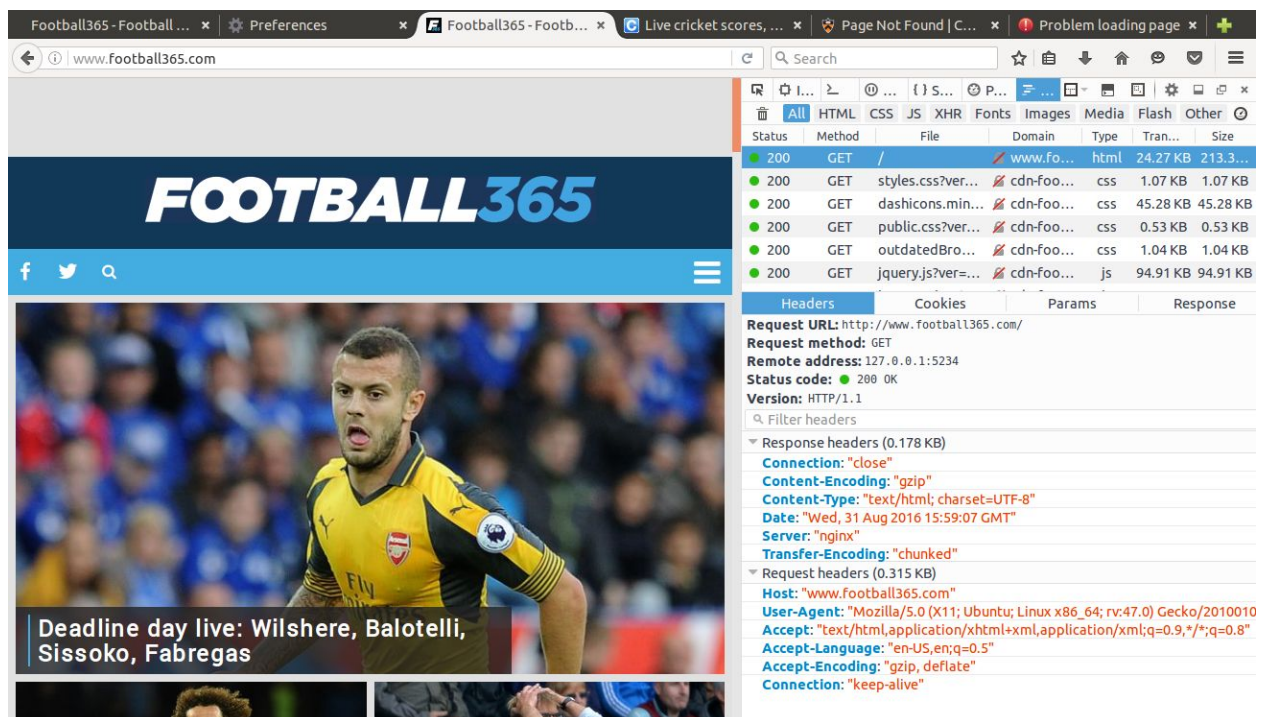
- Tutorialspoint site

The screenshot shows the Tutorialspoint website. The main heading is "Enjoy theory and lab at the same time, right here online". Below it, there is a search bar with the text "Search your favorite tutorials...". The website features a grid of icons for various technologies, including Rails, PHP, JavaScript, and Spark. The browser's developer console on the right shows a list of failed requests, including various images and fonts, many of which returned 404 status codes.

- Some of the sites like google.com, fb.com were not opening because they are https (secure http) and we have not implemented. So, we can see in below screenshot that “501” error msg is being displayed



- Football365.com site



Testing with Telnet:

I also tested with telnet and result are as below:

- For example.com

```
Connection closed by foreign host.
neeraj@neeraj-Lenovo-IdeaPad-Z510:~$ clear

neeraj@neeraj-Lenovo-IdeaPad-Z510:~$ telnet 127.0.0.1 5234
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.
GET http://www.example.com/ HTTP/1.0

HTTP/1.0 200 OK
Accept-Ranges: bytes
Cache-Control: max-age=604800
Content-Type: text/html
Date: Wed, 31 Aug 2016 16:44:00 GMT
Etag: "359670651+gzip"
Expires: Wed, 07 Sep 2016 16:44:00 GMT
Last-Modified: Fri, 09 Aug 2013 23:54:35 GMT
Server: ECS (cpm/F9D5)
Vary: Accept-Encoding
X-Cache: HIT
x-ec-custom-error: 1
Content-Length: 1270
Connection: close

<!doctype html>
<html>
<head>
  <title>Example Domain</title>

  <meta charset="utf-8" />
  <meta http-equiv="Content-type" content="text/html; charset=utf-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1" />
  <style type="text/css">
    body {
      background-color: #f0f0f2;
      margin: 0;
      padding: 0;
      font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
    }
  </style>
</head>
</html>
</doctype>
```

After typing telnet 127.0.0.1 port

Response is as below:

```
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.
GET http://www.example.com/ HTTP/1.0
```

```
HTTP/1.0 200 OK
Accept-Ranges: bytes
Cache-Control: max-age=604800
Content-Type: text/html
Date: Wed, 31 Aug 2016 16:44:00 GMT
Etag: "359670651+gzip"
Expires: Wed, 07 Sep 2016 16:44:00 GMT
Last-Modified: Fri, 09 Aug 2013 23:54:35 GMT
Server: ECS (cpm/F9D5)
Vary: Accept-Encoding
X-Cache: HIT
x-ec-custom-error: 1
Content-Length: 1270
Connection: close
```

```
<!doctype html>
<html>
<head>
  <title>Example Domain</title>

  <meta charset="utf-8" />
  <meta http-equiv="Content-type" content="text/html; charset=utf-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1" />
  <style type="text/css">
    body {
      background-color: #f0f0f2;
      margin: 0;
      padding: 0;
      font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
    }
  </style>
</head>
</html>
</doctype>
```

```

<style type="text/css">
body {
  background-color: #f0f0f2;
  margin: 0;
  padding: 0;
  font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
}
div {
  width: 600px;
  margin: 5em auto;
  padding: 50px;
  background-color: #fff;
  border-radius: 1em;
}
a:link, a:visited {
  color: #38488f;
  text-decoration: none;
}
@media (max-width: 700px) {
  body {
    background-color: #fff;
  }
  div {
    width: auto;
    margin: 0 auto;
    border-radius: 0;
    padding: 1em;
  }
}
</style>
</head>

<body>
<div>
  <h1>Example Domain</h1>
  <p>This domain is established to be used for illustrative examples in documents. You may use this
  domain in examples without prior coordination or asking for permission.</p>
  <p><a href="http://www.iana.org/domains/example">More information...</a></p>
</div>
</body>
</html>
Connection closed by foreign host.

```

- The above html output is same as what we get without proxy
- Similar result were for other sites on telnet

Testing using python script provided

- The result using python script was highly variable and dependent on location i.e. in my room 5/13 cases were passing and in one of my friends room, all cases were passing.

Appendix:

Sourcefile Code:

proxy.c file implemented by me

```
/* Proxy Server Program in which port number is provided at the terminal */

#include <stdio.h>                                /*libraries*/
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <sys/types.h>                            //contains definitions of data types used in system call
#include <sys/socket.h>                          //definition needed for socket structures
#include <netinet/in.h>                          //contains values of constants used in defition of Internet Domain Addresses
#include <iostream>
#include <cstdio>
#include <strings.h>
#include <sys/stat.h>
#include <time.h>
#include <string>
#include <netdb.h>
#include "proxy_parse.c"
#define BUF_SIZE 8192                            //Buffer size
using namespace std;

void process_server(char *, int);                //function declarations
void send_response_header_501(void);
string date_time_header(void);

socklen_t clien;
int sockfd, newsockfd, portno;                  //variables for socket and port no
struct sockaddr_in serv_addr, cli_addr;         //data structure to store internet addresses
struct ParsedRequest *req;

void error(const char *err){                    //error msg printing
    perror(err);
    exit(1);
}

string date_time_header(void){                  // function for getting current time
    char buf[1000];
    time_t now = time(0);
    struct tm tm = *gmtime(&now);
    strftime(buf, sizeof buf, "%a, %d %b %Y %H:%M:%S %Z", &tm);
    string str = string(buf);
    str="Date: "+str+"\r\n";
    return str;
}
```



```

void send_response_header_501(void){           //header response when GET method is not requested with http
    string http_version="HTTP/1.0 ";
    string status="501 Not Implemented\r\n";
    string headers;
    string dateTime=date_time_header();
    string server="Server: localhost:Neeraj,IITK\r\n";
    headers=http_version+status+dateTime+server+"\r\n";
    char Headers[4024] ;
    memset(Headers, '\0', sizeof(Headers));
    std::string::size_type i;
    for( i=0;i < headers.size(); ++i) {
        Headers[i]=headers[i];
    }
    write(newsockfd,Headers,strlen(Headers));           //responding to client with error msg og "501"
}

void process_server(char * send_data, int newsockfd){           // sending request to server and response from server
to client
    if (req->port == NULL){
        char p[] = "80\0";
        req -> port = p;
    }
    struct hostent *ServerName;
    struct sockaddr_in ServerAddr;
    int sock;
    if ((sock = socket(AF_INET, SOCK_STREAM, 0)) == -1 ){           //creating socket for server
        perror("Failed to establish Socket :(\n") ;
        exit(-1) ;
    }

    ServerName = gethostbyname(req->host);
    if (ServerName == NULL){
        printf("No such host exists\n");
        exit(-1);
    }

    int ServerPort = atoi(req -> port);
    ServerAddr.sin_family = AF_INET;
    ServerAddr.sin_port = htons(ServerPort);
    bcopy((char *)ServerName -> h_addr, (char *)&ServerAddr.sin_addr.s_addr, ServerName-> h_length);

    if (connect(sock, (struct sockaddr *)&ServerAddr, sizeof(ServerAddr)) == -1){ //connecting with server
        printf("Can't Connect to server");
        exit(-1);
    }

    send(sock, send_data, strlen(send_data), 0);           //sending request to server
    int bytes;
    char recv_data[8194];

```

```

        bzero(recv_data, sizeof(recv_data));
        while((bytes = recv(sock, recv_data, sizeof(recv_data), 0)) > 0){
            send(newsockfd, recv_data, bytes, 0);           //sending response to client from
server
            bzero(recv_data, sizeof(recv_data));
        }
    }

int main(int argc, char *argv[])           //main function and port number is taken in its argument
{
    char buffer[BUF_SIZE];                 //acts as a buffer
    int n;

    sockfd = socket(AF_INET, SOCK_STREAM, 0);           //sys call to create a new
socket for TCP connection
    if (sockfd < 0) error("socket creation error\n");    //error for unsuccessful creation of socket
    bzero((char *) &serv_addr, sizeof(serv_addr));
    portno = atoi(argv[1]);
//extracting port number in nuerical form
    serv_addr.sin_family = AF_INET;
    serv_addr.sin_addr.s_addr = INADDR_ANY;
    serv_addr.sin_port = htons(portno);

    if (bind(sockfd, (struct sockaddr *) &serv_addr, sizeof(serv_addr)) < 0) error("ERROR on binding");

    listen(sockfd, 10);                               //it
allows the system to listen for connections

    clien = sizeof(cli_addr);

    static int counter=0;
    int pid;

    while(1){
        newsockfd = accept(sockfd, (struct sockaddr *) &cli_addr, &clilen); //blocking the process unless a
client connects to server
        if ((pid = fork()) == -1){
            close(newsockfd);
            continue;
        }
        else if(pid>0){
            //parent process
            close(newsockfd);
            counter++;
            continue;
        }
        else if(pid==0){
            //child process

```

```

        bzero(buffer,BUF_SIZE);
//clearing the buffer to read file name from client side
        n = read(newsockfd,buffer,BUF_SIZE);
        if (n <= 0) error("ERROR reading from socket");

        req = ParsedRequest_create() ;
        int status = ParsedRequest_parse(req, buffer, strlen(buffer))    ;
        if(status<0)
            cout << "Parse Failed\n" << endl;

        ParsedHeader_remove(req, "Connection")    ;
        ParsedHeader_set(req, "Connection", "close")    ;

        int rlen = ParsedRequest_totalLen(req);
        char *b = (char *)malloc(rlen+1);
        if (ParsedRequest_unparse(req, b, rlen) < 0)
            printf("Failed Unparsing\n");
        b[rlen]='\0';

        std::string str2 ("GET");
        if (str2.compare(req->method) == 0){                                //if method is GET with
http protocol then send request to server
            process_server(b, newsockfd)    ;
        }
        else{
            send_response_header_501();
//else send not implemented msg
        }
        free(b) ;
        close(newsockfd);
        break;
    }

}
close(sockfd);
return 0;
}

```