1: Programming 1

(a) Algorithm: The implement of Server

```
import select
import socket
import struct
from socketserver import StreamRequestHandler, ThreadingTCPServer

SOCKS_VERSION = 5

class Socks5Proxy(StreamRequestHandler):
    def handle(self):
        print('Accepting connection from {}'.format(self.client_address))

        # read 2 bytes data from client
        header = self.connection.recv(2)
        version, nmethods = struct.unpack("!BB", header)

        # set socks5, nmethods
        assert version == SOCKS_VERSION
        assert nmethods > 0

        # 1.Get authentication method
        methods = self.get_methods(nmethods)

        # 2.Select method 0x00(NO AUTHENTICATION REQUIRED)
        if 0 not in set(methods):
            self.server.close_request(self.request)
            return
        self.connection.sendall(struct.pack("!BB", SOCKS_VERSION, 0))

        # 3.Requests
        version, cmd, _, address_type = struct.unpack("!BBBB", self.connection.recv
        assert version == SOCKS_VERSION
        # DST.ADDR
        # IPv4
        if address_type == 1:
            address = socket.inet_ntoa(self.connection.recv(4))
        # Domain name
        elif address_type == 3:
            domain_length = self.connection.recv(1)[0]
            address = self.connection.recv(domain_length)
        # IPV6
        elif address_type == 4:
            addr_ip = self.connection.recv(16)
```

```
            address = socket.inet_ntop(socket.AF_INET6, addr_ip)
        else:
            self.server.close_request(self.request)
            return
        port = struct.unpack('!H', self.connection.recv(2))[0]

        # Response to only connect 0x01
        try:
            if cmd == 1:
                remote = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
                remote.connect((address, port))
                bind_address = remote.getsockname()
                print('Connected to {} {}'.format(address, port))
            else:
                self.server.close_request(self.request)
            addr = struct.unpack("!I", socket.inet_aton(bind_address[0]))[0]
            port = bind_address[1]


                    # VER, CMD, RSV, ATYP, ADDR, PORT
            reply = struct.pack("!BBBBIH", SOCKS_VERSION, 0, 0, 1, addr, port)
        except Exception as err:
            logging.error(err)

            reply = self.failed_reply(address_type, 5)
        self.connection.sendall(reply)

        # connect success, change data
        if reply[1] == 0 and cmd == 1:
            self.exchange_loop(self.connection, remote)
        self.server.close_request(self.request)


    def get_methods(self, n):
        methods = []
        for i in range(n):
            methods.append(ord(self.connection.recv(1)))
        return methods

    def failed_reply(self, address_type, error_number):
        return struct.pack("!BBBBIH", SOCKS_VERSION, error_number, 0, address_type,

    def exchange_loop(self, client, remote):
        while True:
            r, w, e = select.select([client, remote], [], [])
            if client in r:
                data = client.recv(4096)
                if remote.send(data) <= 0:
```

```
                break
            if remote in r:
                data = remote.recv(4096)
                if client.send(data) <= 0:
                    break


if __name__ == '__main__':
    # use ThreadingTCPServer to strat proxy
    with ThreadingTCPServer(('127.0.0.1', 8848), Socks5Proxy) as server:
        server.serve_forever()
```

(b) Algorithm: The implement of Client

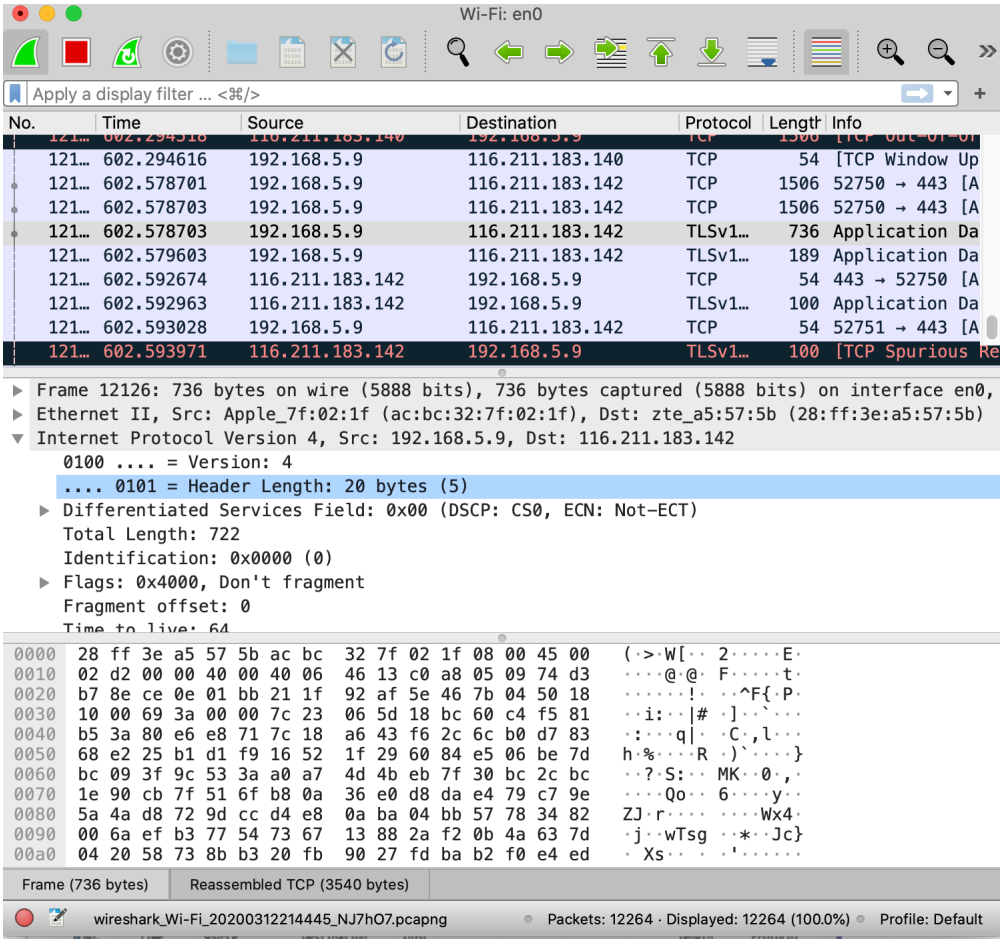
```
import socket
import socks
import requests

socks.set_default_proxy(socks.SOCKS5, "127.0.0.1", 8848, username=None, password=N
socket.socket = socks.socksocket
print(requests.get('http://www.baidu.com').text)
```

(c) Output:

```
 △ ~/Desktop py3 server.py
Accepting connection from ('127.0.0.1', 50562)
Connected to b'blog.csdn.net' 443
Accepting connection from ('127.0.0.1', 50564)
Accepting connection from ('127.0.0.1', 50566)
Connected to b'g.csdnimg.cn' 443
Accepting connection from ('127.0.0.1', 50567)
Connected to b'csdnimg.cn' 443
Connected to b'g.csdnimg.cn' 443
Accepting connection from ('127.0.0.1', 50570)
Connected to b'profile.csdnimg.cn' 443
Accepting connection from ('127.0.0.1', 50572)
Accepting connection from ('127.0.0.1', 50574)
Accepting connection from ('127.0.0.1', 50575)
Connected to b'img-blog.csdnimg.cn' 443
Connected to b'img-blog.csdn.net' 443
Accepting connection from ('127.0.0.1', 50578)
Connected to b'avatar.csdnimg.cn' 443
Accepting connection from ('127.0.0.1', 50580)
Connected to b'statistic.csdn.net' 443
Accepting connection from ('127.0.0.1', 50582)
Connected to b'event.csdn.net' 443
Accepting connection from ('127.0.0.1', 50584)
Connected to b'event.csdn.net' 443
Accepting connection from ('127.0.0.1', 50586)
Connected to b'zhuanlan.zhihu.com' 443
Accepting connection from ('127.0.0.1', 50588)
Connected to b'unpkg.zhimg.com' 443
Accepting connection from ('127.0.0.1', 50590)
Connected to b'www.zhihu.com' 443
Accepting connection from ('127.0.0.1', 50592)
Connected to b'www.zhihu.com' 443
Accepting connection from ('127.0.0.1', 50594)
Connected to b'static.zhihu.com' 443
Accepting connection from ('127.0.0.1', 50596)
Connected to b'blog.pgyjz.cn' 80
Accepting connection from ('127.0.0.1', 50598)
Connected to b'pan.baidu.com' 80
Accepting connection from ('127.0.0.1', 50600)
```

```
△ ~/Desktop py3 client.py
<!DOCTYPE html>
<!--STATUS OK--><html> <head><meta http-equiv=content-type content=text/html;c
harset=utf-8><meta http-equiv=X-UA-Compatible content=IE=Edge><meta content=al
ways name=referrer><link rel=stylesheet type=text/css href=http://s1.bdstatic.
com/r/www/cache/bdorz/baidu.min.css><title>ç ¾å°¦ä¸ ä¸ ï¼ ä½ å°±ç ¥é  </title>
</head> <body link=#0000cc> <div id=wrapper> <div id=head> <div class=head_wra
pper> <div class=s_form> <div class=s_form_wrapper> <div id=lg> <img hidefocus
=true src=//www.baidu.com/img/bd_logo1.png width=270 height=129> </div> <form
id=form name=f action=//www.baidu.com/s class=fm> <input type=hidden name=bdor
z_come value=1> <input type=hidden name=ie value=utf-8> <input type=hidden nam
e=f value=8> <input type=hidden name=rsv_bp value=1> <input type=hidden name=r
sv_idx value=1> <input type=hidden name=tn value=baidu><span class="bg s_ipt_w
r"><input id=kw name=wd class=s_ipt value maxlength=255 autocomplete=off autof
ocus></span><span class="bg s_btn_wr"><input type=submit id=su value=ç ¾å°¦ä¸
ä¸  class="bg s_btn"></span> </form> </div> </div> <div id=u1> <a href=http://
news.baidu.com name=tj_trnews class=mnav>æ °é »</a> <a href=http://www.hao123.
com name=tj_trhao123 class=mnav>hao123</a> <a href=http://map.baidu.com name=t
j_trmap class=mnav>å °å ¾</a> <a href=http://v.baidu.com name=tj_trvideo class
=mnav>è§ é¢ </a> <a href=http://tieba.baidu.com name=tj_trtieba class=mnav>è´´
å §</a> <noscript> <a href=http://www.baidu.com/bdorz/login.gif?login&amp;tpl=
mn&amp;u=http%3A%2F%2Fwww.baidu.com%2f%3fbdorz_come%3d1 name=tj_login class=lb
>ç »å½ </a> </noscript> <script>document.write('<a href="http://www.baidu.com/
bdorz/login.gif?login&tpl=mn&u='+ encodeURIComponent(window.location.href+ (wi
ndow.location.search === "" ? "?" : "&")+ "bdorz_come=1")+ '" name="tj_login"
class="lb">ç »å½ </a>');</script> <a href=//www.baidu.com/more/ name=tj_briico
n class=bri style="display: block;">æ ´å¤ ä°§å  </a> </div> </div> </div> <div
 id=ftCon> <div id=ftConw> <p id=lh> <a href=http://home.baidu.com>å ³ä° ç ¾å°
¦</a> <a href=http://ir.baidu.com>About Baidu</a> </p> <p id=cp>&copy;2017&nbs
p;Baidu <a href=http://www.baidu.com/duty/>ä¼¿ç ¨ç ¾å°¦å  å¿ è¯»</a> 
; <a href=http://jianyi.baidu.com/ class=cp-feedback>æ  è§ å  é¦ </a> ä°¬
ICPè¯ 030173å ·  <img src=//www.baidu.com/img/gs.gif> </p> </div> </div>
</div> </body> </html>
```


Wi-Fi: en0
Apply a display filter ... <⌘/>
No. Time Source Destination Protocol Length Info
121… 602.294616 192.168.5.9 116.211.183.140 TCP 54 [TCP Window Up
121… 602.578701 192.168.5.9 116.211.183.142 TCP 1506 52750 → 443 [A
121… 602.578703 192.168.5.9 116.211.183.142 TCP 1506 52750 → 443 [A
121… 602.578703 192.168.5.9 116.211.183.142 TLSv1… 736 Application Da
121… 602.579603 192.168.5.9 116.211.183.142 TLSv1… 189 Application Da
121… 602.592674 116.211.183.142 192.168.5.9 TCP 54 443 → 52750 [A
121… 602.592963 116.211.183.142 192.168.5.9 TLSv1… 100 Application Da
121… 602.593028 192.168.5.9 116.211.183.142 TCP 54 52751 → 443 [A
121… 602.593971 116.211.183.142 192.168.5.9 TLSv1… 100 [TCP Spurious Re
Frame 12126: 736 bytes on wire (5888 bits), 736 bytes captured (5888 bits) on interface en0,
Ethernet II, Src: Apple_7f:02:1f (ac:bc:32:7f:02:1f), Dst: zte_a5:57:5b (28:ff:3e:a5:57:5b)
Internet Protocol Version 4, Src: 192.168.5.9, Dst: 116.211.183.142
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 722
Identification: 0x0000 (0)
Flags: 0x4000, Don't fragment
Fragment offset: 0
0000 28 ff 3e a5 57 5b ac bc 32 7f 02 1f 08 00 45 00
0010 02 d2 00 00 40 00 40 06 46 13 c0 a8 05 09 74 d3
0020 b7 8e ce 0e 01 bb 21 1f 92 af 5e 46 7b 04 50 18
0030 10 00 69 3a 00 00 7c 23 06 5d 18 bc 60 c4 f5 81
0040 b5 3a 80 e6 e8 71 7c 18 a6 43 f6 2c 6c b0 d7 83
0050 68 e2 25 b1 d1 f9 16 52 1f 29 60 84 e5 06 be 7d
0060 bc 09 3f 9c 53 3a a0 a7 4d 4b eb 7f 30 bc 2c bc
0070 1e 90 cb 7f 51 6f b8 0a 36 e0 d8 da e4 79 c7 9e
0080 5a 4a d8 72 9d cc d4 e8 0a ba 04 bb 57 78 34 82
0090 00 6a ef b3 77 54 73 67 13 88 2a f2 0b 4a 63 7d
00a0 04 20 58 73 8b b3 20 fb 90 27 fd ba b2 f0 e4 ed
Frame (736 bytes)
Reassembled TCP (3540 bytes)
wireshark_Wi-Fi_20200312214445_NJ7hO7.pcapng
Packets: 12264 · Displayed: 12264 (100.0%)
Profile: Default