CS210 : COMPUTER NETWORKS LAB

LAB ASSIGNMENT 7

Submitted By:

Name: AKSHAT SAHU

Roll No: U22CS034

Branch: CSE

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Division : A

Department of Computer Science and Engineering

SV NATIONAL INSTITUTE OF TECHNOLOGY SURAT

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SOCKET PROGRAMMING

Implement echo client-server message passing application. Messages sent from the client should be displayed on the server and then the program should terminate.

1. Python Client Program that opens a listening socket and waits to serve clients.

```python
import socket
HOST = '127.0.0.1'
PORT = 65432
with socket.socket(socket.AF_INET, socket.SOCK_STREAM) as s:
    s.bind((HOST, PORT))
    s.listen()
    print('Server listening on', (HOST, PORT))
    conn, addr = s.accept()
    with conn:
        print('Connected by', addr)
        data = conn.recv(1024)
        print('Received:', data.decode())
```

15. Python Server Program that connects with the server program knowing IP address and port number.

```python
import socket
HOST = '127.0.0.1'
PORT = 65432
with socket.socket(socket.AF_INET, socket.SOCK_STREAM) as s:
    s.connect((HOST, PORT))
    message = input("Enter message: ")
    s.sendall(message.encode())
```

24. Get the input string from console on client and send it to server, server displays the same string.

```
PS C:\Users\hp\OneDrive\Desktop\CN\socket> python client.py
Enter message: AKSHAT
PS C:\Users\hp\OneDrive\Desktop\CN\socket>
```

```
PS C:\Users\hp\OneDrive\Desktop\CN\socket> python -u "c:\Users\hp\OneDrive\Desktop\CN\socket\server.py"
Server listening on ('127.0.0.1', 65432)
Connected by ('127.0.0.1', 65116)
Received: AKSHAT
PS C:\Users\hp\OneDrive\Desktop\CN\socket>
```

HTTP

1. Give brief details about HTTP. What is the difference between HTTP and HTTPS?

HTTP, or Hypertext Transfer Protocol, is an application layer protocol used for the transfer of data on the World Wide Web. It defines the rules for how messages are formatted and transmitted between a client (typically a web browser) and a server, enabling the retrieval and display of web content.

2. Write down the steps to capture HTTP request packets for the following URL.
URL: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html

Step 1 Open Wireshark and start capturing packets.
Step 2 Open the above link given in browser.
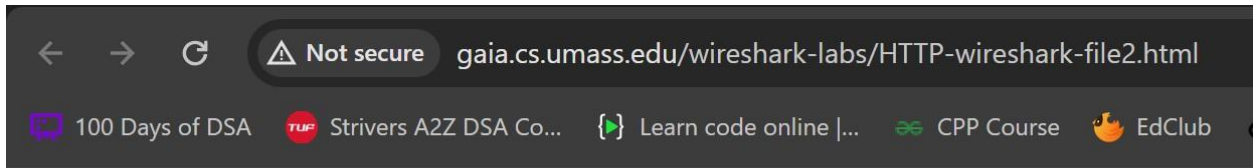
Congratulations again! Now you've downloaded the file lab2-2.html.
This file's last modification date will not change.

Thus if you download this multiple times on your browser, a complete copy
will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE
field in your browser's HTTP GET request to the server.

Step 3 Stop capturing packets and type in filter: http The packets
from above link will be displayed.

File   Edit   View   Go   Capture   Analyze   Statistics   Telephony   Wireless   Tools   Help

http

No.	Time	Source	Destination	Protocol	Length	Info
1346	28.717303	2409:40c1:101b:ce8d…	64:ff9b::8077:f50c	HTTP	546	GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1
1358	29.056929	64:ff9b::8077:f50c	2409:40c1:101b:ce8d…	HTTP	804	HTTP/1.1 200 OK (text/html)

TCP payload (750 bytes)
Hypertext Transfer Protocol
⌄ HTTP/1.1 200 OK\r\n
  ⌄ [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
      [HTTP/1.1 200 OK\r\n]
      [Severity level: Chat]
      [Group: Sequence]
    Response Version: HTTP/1.1
    Status Code: 200
    [Status Code Description: OK]
    Response Phrase: OK
  Date: Mon, 04 Mar 2024 13:29:10 GMT\r\n
  Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
  Last-Modified: Mon, 04 Mar 2024 06:59:02 GMT\r\n
  ETag: "173-612d042b811fd"\r\n
  Accept-Ranges: bytes\r\n
⌄ Content-Length: 371\r\n
    [Content length: 371]
  Keep-Alive: timeout=5, max=100\r\n
  Connection: Keep-Alive\r\n
  Content-Type: text/html; charset=UTF-8\r\n
  \r\n
  [HTTP response 1/1]
  [Time since request: 0.339626000 seconds]
  [Request in frame: 1346]
  [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
  File Data: 371 bytes
Line-based text data: text/html (10 lines)

Hypertext Transfer Protocol
∨ GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
  ∨ [Expert Info (Chat/Sequence): GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n]
      [GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n]
      [Severity level: Chat]
      [Group: Sequence]
    Request Method: GET
    Request URI: /wireshark-labs/HTTP-wireshark-file2.html
    Request Version: HTTP/1.1
  Host: gaia.cs.umass.edu\r\n
  Connection: keep-alive\r\n
  Upgrade-Insecure-Requests: 1\r\n
  User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/122.0.0.0 Safari/537.36\r\n
  Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7\r\n
  Accept-Encoding: gzip, deflate\r\n
  Accept-Language: en-US,en;q=0.9\r\n
  \r\n
  [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
  [HTTP request 1/1]
  [Response in frame: 1358]

Transmission Control Protocol, Src Port: 63027, Dst Port: 80, Seq: 1, Ack: 1, Len: 472
    Source Port: 63027
    Destination Port: 80
    [Stream index: 104]
    [Conversation completeness: Complete, WITH_DATA (31)]
    [TCP Segment Len: 472]
    Sequence Number: 1   (relative sequence number)
    Sequence Number (raw): 3298753417
    [Next Sequence Number: 473   (relative sequence number)]
    Acknowledgment Number: 1   (relative ack number)
    Acknowledgment number (raw): 2016405080
    0101 .... = Header Length: 20 bytes (5)
  > Flags: 0x018 (PSH, ACK)
    Window: 257
    [Calculated window size: 65792]
    [Window size scaling factor: 256]
    Checksum: 0xb338 [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
  > [Timestamps]
  > [SEQ/ACK analysis]
    TCP payload (472 bytes)
Hypertext Transfer Protocol

3. Answer the following questions for the above URL request.

a) Which version your browser and server are running on?

```
Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
Last Modified: Wed  06 Mar 2024 06:59:02 GMT\r\n
```

b) What is the IP address of your host machine and server?

Source	Destination	Protocol	Length	Info
2409:40c1:10dc:fa3a…	64:ff9b::8077:f50c	HTTP	546	GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1

c) List out the languages accepted by your browsers.

- english

d) What is the status code returned from the server to your browser?

- 200 (OK)

e) What is the size of the content received from the server?

```
Accept-Ranges: bytes\r\n
Content-Length: 371\r\n
Keep-Alive: timeout=5, max:
```

f) Check the last modification date of the retrieved HTML file.

- Mon, 04 March 2024 , 06 59 02

g) Did you receive the content of the file as a response? -   Yes

```
[Request in frame: 232]
[Next request in frame: 281]
[Next response in frame: 284]
[Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
File Data: 371 bytes
```
```
Line-based text data: text/html (10 lines)
    \n
    <html>\n
    \n
    Congratulations again!  Now you've downloaded the file lab2-2.html. <br>\n
    This file's last modification date will not change.  <p>\n
    Thus  if you download this multiple times on your browser, a complete copy <br>\n
    will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE<br>\n
    field in your browser's HTTP GET request to the server.\n
    \n
    </html>\n
```
```
00c0   5f 70 65 72 6c 2f 32 2e  30 2e 31 31 20 50 65 72     _perl/2. 0.11 Per
```

DNS

Apply nslookup on the following URL and answer the following questions related to the DNS.

URL: www.mit.edu

```
C:\Users\hp>nslookup www.mit.edu
Server:   UnKnown
Address:  192.168.189.233

Non-authoritative answer:
Name:      e9566.dscb.akamaiedge.net
Addresses: 2405:200:1630:984::255e
           2405:200:1630:9ad::255e
           104.71.98.24
Aliases:   www.mit.edu
           www.mit.edu.edgekey.net
```

1. **Are DNS queries sent and received using TCP or UDP?**
   - Dns queries are sent and received using UDP
2. **What is the destination port of the DNS query and source port of the DNS response?**
   - Destination Port no. is 53.
3. **What is the IP address of the DNS query message? Verify the IP address of the local DNS server using ipconfig.**

```
C:\Users\hp>ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : AKSHAT
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Mixed
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Ethernet 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : ExpressVPN TAP Adapter
   Physical Address. . . . . . . . . : 00-FF-E0-84-7B-DA
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Unknown adapter Local Area Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : ExpressVPN TUN Driver
   Physical Address. . . . . . . . . :
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 38-7A-0E-A3-97-8E
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
   Physical Address. . . . . . . . . : 3A-7A-0E-A3-97-8D
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Wi-Fi 6E AX211 160MHz
   Physical Address. . . . . . . . . : 38-7A-0E-A3-97-8D
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IPv6 Address. . . . . . . . . . . : 2409:40c1:101b:32fb:5ca2:6300:52cc:81c4(Preferred)
   Temporary IPv6 Address. . . . . . : 2409:40c1:101b:32fb:5424:60aa:4944:4af4(Preferred)
   Link-local IPv6 Address . . . . . : fe80::dd9d:7e2c:f3a6:cf7e%2(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.189.135(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 20 March 2024 13:11:01
   Lease Expires . . . . . . . . . . : 20 March 2024 14:11:01
   Default Gateway . . . . . . . . . : fe80::44d9:4fff:fe81:4ff8%2
                                       192.168.189.233
   DHCP Server . . . . . . . . . . . : 192.168.189.233
   DHCPv6 IAID . . . . . . . . . . . : 37255694
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2A-94-18-EA-5C-60-BA-BE-95-7E
   DNS Servers . . . . . . . . . . . : 192.168.189.233
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek Gaming GbE Family Controller
   Physical Address. . . . . . . . . : 5C-60-BA-BE-95-7E
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
```

4. What is the "Type" of the DNS query sent?
Type: A