
CS-558 ASSIGNMENT-2

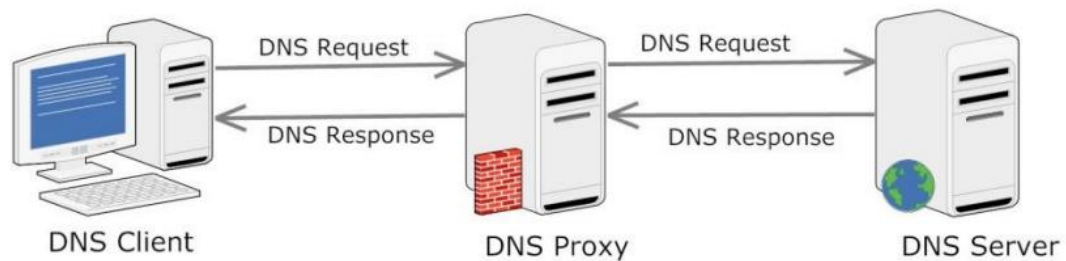
Application #4: Multi-stage DNS Resolving System using Client-Server socket programming

Report submitted by:

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Problem Statement:

In this application, you require implementing three C++ programs, namely Client, Proxy Server (which will act both as client and server) and DNS Server, and they communicate with each other based on TCP sockets. The aim is to implement a simple 2 stage DNS Resolver System.



Message formats:

Request Message format:

Request Type	Message
--------------	---------

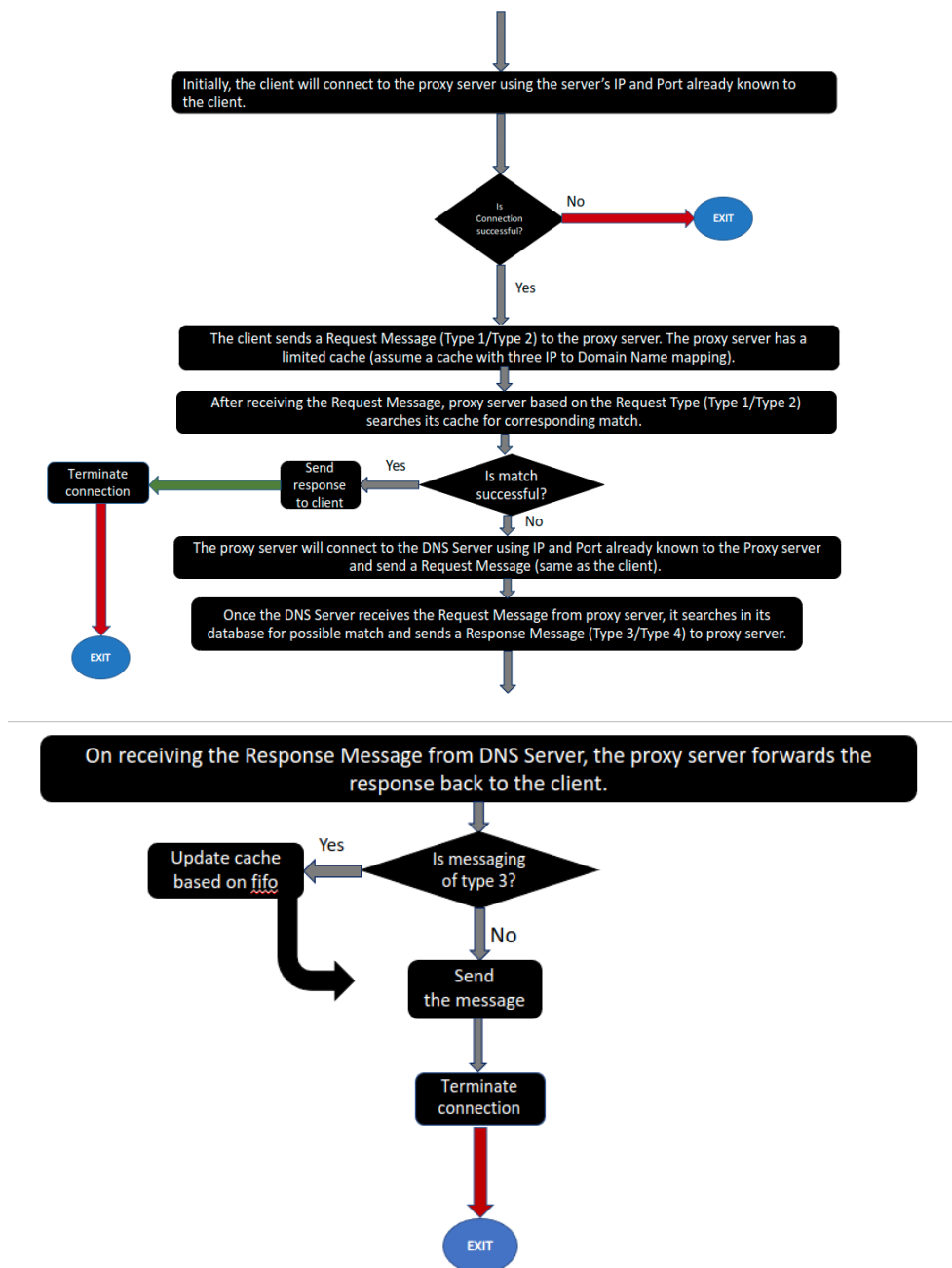
- Type 1: Message field contains Domain Name and requests for corresponding IP address.
- Type 2: Message field contains IP address and request for the corresponding Domain Name.

Response Message Format:

Response Type	Message
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- Type 3: Message field contains Domain Name/IP address.
- Type 4: Message field contains error message "entry not found in the database".

Flow of the program:



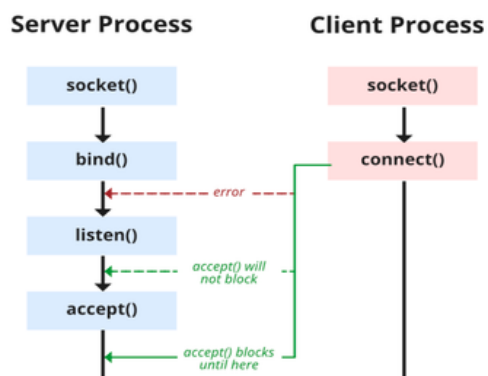
List of files submitted:

- dnsClient.cpp : contains client executable code
- dnsServer.cpp : contains server executable code
- proxyServer.cpp : contains proxy server executable code
- Report.docx : report of submission
- allheaders.h : contains header files used
- proxy_cache.txt : contains proxy cache
- database_mappings.txt : contains dns mappings

To Run:

1. Run DNS Server File providing the port in command line.
2. Run Proxy Server with port in command line
3. Run Client with IP and Port of Proxy Server.
4. Use interactive menu of client to make a request of different type.
5. To change IP of Server used, use "allHeaders.h" file and make necessary changes.

Steps for connection:



Some of the screenshots of program are added below:

1. After INITIALIZING all three programs:

The screenshot displays three terminal windows and two file editors. The first terminal window shows the DNS Server initialization, which successfully binds to port 8080 and listens on 127.0.1.4. The second terminal window shows the Proxy Server initialization, which successfully binds to port 8090 and listens on 127.0.1.5. The third terminal window shows the DNS Client initialization, which successfully creates a socket and connects to the proxy server at 127.0.1.5:8090. Below the terminals, two file editors are open: 'database_mappings.txt' and 'proxy_cache.txt'. The database_mappings.txt file contains a list of domain names and their corresponding IP addresses, including www.google.com, www.facebook.com, www.iitg.ernet.in, www.yahoo.com, www.youtube.com, www.dailymotion.com, www.geeksforgeeks.org, www.codechef.com, and www.twitter.com. The proxy_cache.txt file contains a list of IP addresses and their corresponding domain names, including 14.4.4.4, 2.5.5.5, and 3.7.7.7.

```
vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsServer 8080
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->DNS SERVER SOCKET CREATION: Successful, SocketID: 3 ..
-->BIND Successful, port: 8080.
-->LISTEN: DNS Server listening on address: 127.0.1.4 ....

vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./proxyServer 8090
-----
PROXY SERVER | 2Stage DNS Resolver      <Proxy Server Port: 8090>
-----
-->PROXY SERVER SOCKET CREATION: Successful, SocketID: 3 ..
-->BIND Successful, port: 8090.
-->LISTEN: Server listening on address: 127.0.1.5 ....
-----PROXY SERVER: Waiting For Connection.-----
--> ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 57784
Adding to list of sockets as 0

vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsClient 127.0.1.5 8090
-----
2 STAGE DNS RESOLVER | Welcome to DNS Client Program
Connecting to <Server Addr: 127.0.1.5> <Server Port: 8090>
-----
-->DNS CLIENT SOCKET CREATION: Successfully Created, ID: 3 ..
-->Connection Established With PROXY SERVER: 127.0.1.5, PORT: 8090
Press Enter to continue..

Open  database_mappings.txt  proxy_cache.txt
Save  Save
-----
1 www.google.com 1.1.1.1      1 4.4.4.4 www.yahoo.com
2 www.facebook.com 2.2.2.2      2 5.5.5.5 www.youtube.com
3 www.iitg.ernet.in 3.3.3.3      3 7.7.7.7 www.geeksforgeeks.org
4 www.yahoo.com 4.4.4.4
5 www.youtube.com 5.5.5.5
6 www.dailymotion.com 6.6.6.6
7 www.geeksforgeeks.org 7.7.7.7
8 www.codechef.com 8.8.8.8
9 www.twitter.com 9.9.9.9
```

2.Client REQUEST of type 1 to proxy server:

The screenshot displays three terminal windows and two file editors. The first terminal window shows the DNS Server initialization, which successfully binds to port 8080 and listens on 127.0.1.4. The second terminal window shows the Proxy Server initialization, which successfully binds to port 8090 and listens on 127.0.1.5. The third terminal window shows the DNS Client initialization, which successfully creates a socket and connects to the proxy server at 127.0.1.5:8090. Below the terminals, two file editors are open: 'database_mappings.txt' and 'proxy_cache.txt'. The database_mappings.txt file contains a list of domain names and their corresponding IP addresses, including www.google.com, www.facebook.com, www.iitg.ernet.in, www.yahoo.com, www.youtube.com, www.dailymotion.com, www.geeksforgeeks.org, www.codechef.com, and www.twitter.com. The proxy_cache.txt file contains a list of IP addresses and their corresponding domain names, including 14.4.4.4, 2.5.5.5, and 3.7.7.7.

```
vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsServer 8080
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->DNS SERVER SOCKET CREATION: Successful, SocketID: 3 ..
-->BIND Successful, port: 8080.
-->LISTEN: DNS Server listening on address: 127.0.1.4 ....

vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./proxyServer 8090
-----
PROXY SERVER | 2Stage DNS Resolver      <Proxy Server Port: 8090>
-----
-->PROXY SERVER SOCKET CREATION: Successful, SocketID: 3 ..
-->BIND Successful, port: 8090.
-->LISTEN: Server listening on address: 127.0.1.5 ....
-----PROXY SERVER: Waiting For Connection.-----
--> ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 57784
Adding to list of sockets as 0

vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsClient 127.0.1.5 8090
-----
2 STAGE DNS RESOLVER | Welcome to DNS Client Program
Connecting to <Server Addr: 127.0.1.5> <Server Port: 8090>
-----
-->DNS CLIENT SOCKET CREATION: Successfully Created, ID: 3 ..
-->Connection Established With PROXY SERVER: 127.0.1.5, PORT: 8090
Press Enter to continue..

Open  database_mappings.txt  proxy_cache.txt
Save  Save
-----
1 www.google.com 1.1.1.1      1 4.4.4.4 www.yahoo.com
2 www.facebook.com 2.2.2.2      2 5.5.5.5 www.youtube.com
3 www.iitg.ernet.in 3.3.3.3      3 7.7.7.7 www.geeksforgeeks.org
4 www.yahoo.com 4.4.4.4
5 www.youtube.com 5.5.5.5
6 www.dailymotion.com 6.6.6.6
7 www.geeksforgeeks.org 7.7.7.7
8 www.codechef.com 8.8.8.8
9 www.twitter.com 9.9.9.9

-----RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----
1www.youtube.com
Domain Name Received: www.youtube.com
-->SEND TO CLIENT IP 127.0.0.1, PORT 57784:-----
35.5.5.5

vi@vjaypd-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsClient 127.0.1.5 8090
-----
DNS CLIENT | 2Stage DNS Resolver
Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.
Choice : Enter the Message Request Type: 1
Enter the Message String (Domain Name: www.sitename.com): www.youtube.com
1: www.youtube.com --> 5.5.5.5
Do You Want To Continue: (y/n):
```

3.RESPONSE from DNS server of type 3 probed by Client of type 1:

```
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 33170

----RECV FROM CLIENT:-----
1www.google.com

Domain Name Received: www.google.com

----SEND TO CLIENT:-----
31.1.1.1

DNS SERVER: CLOSING CONNECTION: IP 127.0.0.1, PORT: 33170
..

-->LISTEN: DNS Server listening on address: 127.0.1.4 ....

-----
--RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----
1www.google.com

Domain Name Received: www.google.com

Miss in Proxy server cache, Sending request to DNS server.

--> Connection Established With DNS SERVER: 127.0.1.4, PORT: 8080

-----SEND TO DNS SERVER:-----
1www.google.com

-->PROXY SERVER: 31.1.1.1

-->CLIENT SOCKET: CONNECTION CLOSED.
CLIENT: BYE BYE.

----SEND TO CLIENT IP 127.0.0.1, PORT 57784:-----
31.1.1.1
]

-----
DNS CLIENT | 2Stage DNS Resolver

Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.
-----
Choice : Enter the Message Request Type: 1

Enter the Message String (Domain Name: www.sitename.com): www.google.com

1: www.google.com --> 1.1.1.1

-----
Do You Want To Continue: (y/n): ]
```

4.RESPONSE from DNS server of type 4 probed by Client of type 1:

```
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 33174

----RECV FROM CLIENT:-----
1www.deno.com

Domain Name Received: www.deno.com

----SEND TO CLIENT:-----
4entry not found in the database.
..

DNS SERVER: CLOSING CONNECTION: IP 127.0.0.1, PORT: 33174
..

-->LISTEN: DNS Server listening on address: 127.0.1.4 ....

-----
--RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----
1www.deno.com

Domain Name Received: www.deno.com

Miss in Proxy server cache, Sending request to DNS server.

--> Connection Established With DNS SERVER: 127.0.1.4, PORT: 8080

-----SEND TO DNS SERVER:-----
1www.deno.com

-->PROXY SERVER: 4entry not found in the database.

-->CLIENT SOCKET: CONNECTION CLOSED.
CLIENT: BYE BYE.

----SEND TO CLIENT IP 127.0.0.1, PORT 57784:-----
4entry not found in the database.
]

-----
DNS CLIENT | 2Stage DNS Resolver

Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.
-----
Choice : Enter the Message Request Type: 1

Enter the Message String (Domain Name: www.sitename.com): www.deno.com

1: www.deno.com --> entry not found in the database.

-----
Do You Want To Continue: (y/n): ]
```

5.Client REQUEST of type 2 to proxy server:

```
vijayp@d-vin-u:~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Resolver-System$ ./dnsServer 8080

-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->DNS SERVER SOCKET CREATION: Successful, SocketID: 3 ..
-->BIND Successful, port: 8080.
-->LISTEN: DNS Server listening on address: 127.0.1.4 ....
[]

-----RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----
27.7.7.7
IP Address Received: 7.7.7.7
----SEND TO CLIENT IP 127.0.0.1, PORT 57784:-----
3www.geeksforgeeks.org
[]

DNS CLIENT | 2Stage DNS Resolver
Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.
-----
Choice : Enter the Message Request Type: 2
Enter the Message String (IP Address: xyz.abc.def.mno): 7.7.7.7
2: 7.7.7.7 --> www.geeksforgeeks.org
-----
Do You Want To Continue: (y/n): []
```

6.RESPONSE from DNS server of type 3 probed by client of type 2:

```
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
-->ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 33178
-----RECV FROM CLIENT:-----
24.4.4.4
IP Address Received: 4.4.4.4
----SEND TO CLIENT:-----
3www.yahoo.com
DNS SERVER: CLOSING CONNECTION: IP 127.0.0.1, PORT: 33178
--
-->LISTEN: DNS Server listening on address: 127.0.1.4 ....
[]

-----RECV FROM CLIENT IP 127.0.0.1, PORT 57786:-----
24.4.4.4
IP Address Received: 4.4.4.4
Miss in Proxy server cache, Sending request to DNS server.
--> Connection Established With DNS SERVER: 127.0.1.4, PORT: 8080
----SEND TO DNS SERVER:-----
24.4.4.4
-->PROXY SERVER: 3www.yahoo.com
-->CLIENT SOCKET: CONNECTION CLOSED.
CLIENT: BYE BYE.

----SEND TO CLIENT IP 127.0.0.1, PORT 57786:-----
3www.yahoo.com
[]

DNS CLIENT | 2Stage DNS Resolver
Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.
-----
Choice : Enter the Message Request Type: 2
Enter the Message String (IP Address: xyz.abc.def.mno): 4.4.4.4
2: 4.4.4.4 --> www.yahoo.com
-----
Do You Want To Continue: (y/n): []
```


7. RESPONSE from DNS server of type 4 probed by client of type 2:

```
-----
DNS SERVER | 2Stage DNS Resolver      <DNS Server Port: 8080>
-----
--->ACCEPT: Connection Established With Client. IP : 127.0.0.1 , PORT: 33176
---RECV FROM CLIENT:-----
21.2.34.4

IP Address Received: 1.2.34.4

----SEND TO CLIENT:-----
4entry not found in the database.
--
DNS SERVER: CLOSING CONNECTION: IP 127.0.0.1, PORT: 33176
--

--->LISTEN: DNS Server listening on address: 127.0.1.4 ....

-----RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----
21.2.34.4

IP Address Received: 1.2.34.4

Miss in Proxy server cache, Sending request to DNS server.

---> Connection Established With DNS SERVER: 127.0.1.4, PORT: 8080
-----SEND TO DNS SERVER:-----
21.2.34.4

--->PROXY SERVER: 4entry not found in the database.

--->CLIENT SOCKET: CONNECTION CLOSED.
CLIENT: BYE BYE.

----SEND TO CLIENT IP 127.0.0.1, PORT 57784:-----
4entry not found in the database.

-----
DNS CLIENT | 2Stage DNS Resolver

Type 1: Domain Name --> IP Address.
Type 2: IP Address --> Domain Name.
0: Close Connection.

Choice : Enter the Message Request Type: 2

Enter the Message String (IP Address: xyz.abc.def.mno): 1.2.34.4


2: 1.2.34.4 ---> entry not found in the database.

-----
Do You Want To Continue: (y/n):
```

Open	database_mappings...	Save	Open	proxy_cache.txt	Save
1	www.google.com	1.1.1.1	1	5.5.5.5	www.youtube.com
2	www.facebook.com	2.2.2.2	2	7.7.7.7	www.geeksforgeeks.org
3	www.iitg.ernet.in	3.3.3.3	3	1.1.1.1	www.google.com
4	www.yahoo.com	4.4.4.4			
5	www.youtube.com	5.5.5.5			
6	www.dailymotion.com	6.6.6.6			
7	www.geeksforgeeks.org	7.7.7.7			
8	www.codechef.com	8.8.8.8			
9	www.twitter.com	9.9.9.9			

8.client closing connection:

```
-----RECV FROM CLIENT IP 127.0.0.1, PORT 57784:-----  
0EXIT  
--  
PROXY SERVER: CLIENT CLOSING CONNECTION: IP 127.0.0.1, PORT: 57784  
█
```

 vijayp@d-vin-u: ~/Desktop/IITG/SYSLAB PROJ/2Stage-DNS-Reso

vijayp@d-vin-u: ~/Desktop/IITG/SYSLAB PROJ/2Stage... ×

vijayp@d-vin-u: ~/Desk

```
DNS CLIENT | 2Stage DNS Resolver  
  
Type 1: Domain Name --> IP Address.  
Type 2: IP Address --> Domain Name.  
0: Close Connection.  
-----  
Choice : Enter the Message Request Type: 0  
  
DNS CLIENT: Closing Connection.  
-----  
--->DNS CLIENT SOCKET: CONNECTION CLOSED.  
DNS CLIENT: EXITED.
```