Exp No: 7

**Date:** 11/10/2020

# Domain Name Server

**Name:** Swetha Saseendran

**Register Number**: 185001183

## Code:

### Client:

```
#include "table.h"

int main()
{
   char buffer[MAXLINE],IP[MAXLINE];
   char hostname[200] ;
   int sockfd;
   struct sockaddr_in serveraddr;
   socklen_t addr_size;

   //Conn with Local Server
   bzero(&serveraddr, sizeof(serveraddr));
   sockfd = setConn(&serveraddr, cliPORT, 0, "local server");

   addr_size = sizeof(serveraddr);
   bzero(&buffer, sizeof(buffer));

   while(1)
   {
      printf("\nEnter the host name: ");
         scanf("%s", hostname);
         strcpy(buffer,hostname);

         //send hostname to local
         sendto(sockfd, &buffer, sizeof(buffer), 0, (struct sockaddr*)&serveraddr, addr_size);

         //recv IP from local
         recvfrom(sockfd, &buffer, sizeof(buffer), 0, (struct sockaddr*)&serveraddr, &addr_size);

         printf("The IP Address is :\t\t%s\n", buffer);

   }

   close(sockfd);
   return 0;
}
```

## Authoritative Server:

```
//Only .COM auth
#include "table.h"

int main()
{
   struct sockaddr_in local;
   int sockfd, n;
   socklen_t addr_size, len;
   char buffer[MAXLINE], reply[50], *ip;
   struct hostent *he;

   sockfd = setConn(&local, authPORT, 1, "local server");

   addr_size = sizeof(local);

   while(1)
   {
         bzero(&buffer,sizeof(buffer));

         //recv hostname from local
         recvfrom(sockfd, &buffer, sizeof(buffer), 0, (struct sockaddr*)&local, &addr_size);
         printf("\nReceived IP request from local server for %s",buffer);

         he = gethostbyname(buffer);
         ip = inet_ntoa(*((struct in_addr *)he->h_addr_list[0]));//get the IP address from host entry

         //sending IP to local
         strcpy(reply, ip);
         sendto(sockfd,&reply, sizeof(reply), 0, (struct sockaddr*) &local, addr_size);
         printf("\nReplied back with IP %s to local server.\n", ip);
  }

  close(sockfd);
  return 0;
}
```

## Root Server:

```
//Root will be like a server to local
#include "table.h"
#define PORT "4004"


int main()
{
   int sockfd;
   char buffer[MAXLINE];
   socklen_t addr_size, len;
   struct sockaddr_in local;

   sockfd = setConn(&local, rootPORT, 1, "local server");

   addr_size = sizeof(local);

   while(1)
   {
         //recv hostname from local
         bzero(buffer,MAXLINE);
         recvfrom(sockfd, &buffer, MAXLINE, 0, (struct sockaddr*)&local, &addr_size);
         printf("\nReceived request from local DNS server for %s",buffer);

      strcpy(buffer,PORT);
      printf("\nReplied back with port address [%s] of TLD \n",buffer);

      //send to local server
      sendto(sockfd, &buffer, sizeof(buffer), 0, (struct sockaddr*) &local, addr_size);
   }

   close(sockfd);
   return 0;
}
```

## TLD Server:

```
//Only .COM TLD
#include "table.h"
#define PORT "4008" //here we only use .com auth

int main()
{
   int sockfd;
   char buffer[MAXLINE];
   socklen_t addr_size, len;
   struct sockaddr_in local;

   sockfd = setConn(&local, tldPORT, 1, "local server");

   addr_size = sizeof(local);

   while(1)
   {
         bzero(&buffer,sizeof(buffer));

         //recv hostname from local
         recvfrom(sockfd, &buffer, sizeof(buffer), 0, (struct sockaddr*)&local, &addr_size);
         printf("\nReceived request from local server for %s",buffer);

      strcpy(buffer,PORT);

      //send to local server
      sendto(sockfd,&buffer, sizeof(buffer), 0, (struct sockaddr*) &local, addr_size);
      printf("\nReplied back with port address [%s] of Authoritative Server.\n",buffer);


   }

   close(sockfd);
   return 0;
}
```

## Local Server:

```
#include "table.h"

Table lookup[30];
int cli_fd, root_fd, tld_fd, auth_fd;
struct sockaddr_in client_addr, local_addr, root_addr, tld_addr, auth_addr;
```

```
int main()
{
   int position, k = 0;
   char buffer[MAXLINE],hostname[1024],IPs[1024];
   socklen_t addr_size, len;


   cli_fd  = setConn(&local_addr, cliPORT, 1, "client");  //bind here since server
   root_fd = setConn(&root_addr, rootPORT, 0, "root server");   //do not bind here
   tld_fd  = setConn(&tld_addr, tldPORT, 0, "TLD server");   //do not bind here
   auth_fd = setConn(&auth_addr, authPORT, 0, "authoritative server"); //do not bind here

   addr_size = sizeof(client_addr);

   while(1)
   {
      bzero(&buffer, sizeof(buffer));
      //recv hostname from clients
   recvfrom(cli_fd, &buffer, sizeof(buffer), 0, (struct sockaddr*)&client_addr,&addr_size);
   printf("\n\nReceived a request for IP Address of %s from a client.",buffer);

   strcpy(hostname, buffer);
   position = checkTable(lookup, buffer, k);


   if (position == -1)   //if not in lookup
   {
    printf("\nLocal table does not have an entry for %s.\n\tRequesting Root Server.....",hostname);

    //store domain name in lookUp table
    strcpy(lookup[k].domainName,hostname);


    /*
     Communicating with ROOT
    */
    len = sizeof(root_addr);
    //send hostname to root
    bzero(buffer, MAXLINE);
    sendto(root_fd, &hostname, sizeof(hostname), 0, (struct sockaddr*)&root_addr, len);
    //recv tld addr from root
    recvfrom(root_fd, &buffer, MAXLINE, 0, (struct sockaddr*)&root_addr, &len);
    printf("\nRoot replied with address port [%s] to request the TLD Server.\n\tRequesting TLD Server.....
....",buffer);
```

```
    /*
      Communicating with TLD
    */
    len = sizeof(tld_addr);
    //send hostname to tld
    bzero(buffer, MAXLINE);
    sendto(tld_fd, &hostname, sizeof(hostname), 0, (struct sockaddr*) &tld_addr, len);
    //recv authaddr from tld
    recvfrom(tld_fd, buffer, MAXLINE, 0, (struct sockaddr*)&tld_addr, &len);
    printf("\nTLD replied with address port [%s] to request the Authoritative Server.\n\tRequesting Authori
tative Server.....",buffer);


    /*
      Communicating with Auth
    */
    len = sizeof(auth_addr);
    //send hostname to auth
    bzero(&buffer, MAXLINE);
    sendto(auth_fd, &hostname, sizeof(hostname), 0, (struct sockaddr*) &auth_addr, len);
    //recv authaddr from tld
    recvfrom(auth_fd,&buffer, MAXLINE, 0, (struct sockaddr*)&auth_addr, &len);
    printf("\nAuthoritative Server replied with IP address: %s.",buffer);

    //Setting IP's in table
    strcpy(lookup[k].ip,buffer);
    k++;
     }


     else //IP in lookup
     {
       printf("\nLocal table has an entry for %s.\n",hostname);
       bzero(&buffer, MAXLINE);
       strcpy(buffer,lookup[position].ip);
       printf("\nLocal Server replied with IP address: %s.",buffer);
     }

    //send IPs to client
    addr_size = sizeof(client_addr);
    sendto(cli_fd,&buffer,sizeof(buffer), 0, (struct sockaddr*)&client_addr, addr_size);
  }

  close(cli_fd);
  return 0;

}
```

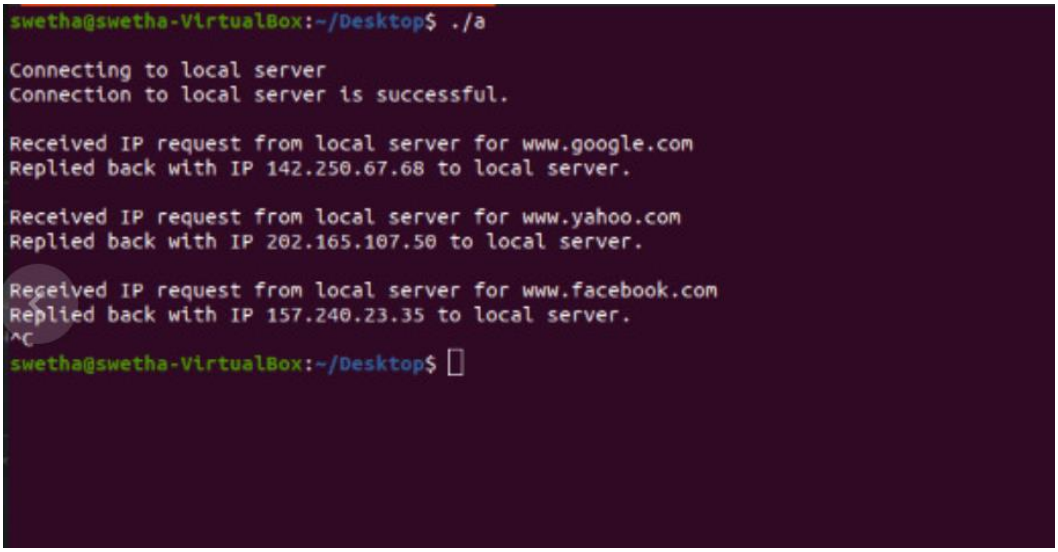
## “table” Header File:

```
#include <stdio.h>
#include <string.h>
#include <ctype.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>

#define MAXLINE 1024

//Named relative to local server
#define cliPORT 4000
#define rootPORT 4002
#define tldPORT 4004 //here we only use .com TLD
#define authPORT 4008 //here we only use .com auth


struct Table
{
   char domainName[200];
   char ip[10]; //IP
};

typedef struct Table Table;


//find if a string matches to domainName of list of Tables of size k

int error(char *msg)
{
   perror(msg);
   exit(1);
}

int setConn(struct sockaddr_in *conn, int port, int is_bound, char *conn_name)
{
   printf("\nConnecting to %s",conn_name);
   int sockfd;
   sockfd = socket(AF_INET, SOCK_DGRAM, 0);

   if(sockfd < 0)
      error("Error in creating socket.\n");

   bzero(conn, 16);
   conn->sin_family = AF_INET;
   conn->sin_addr.s_addr = inet_addr("127.0.0.1");
```

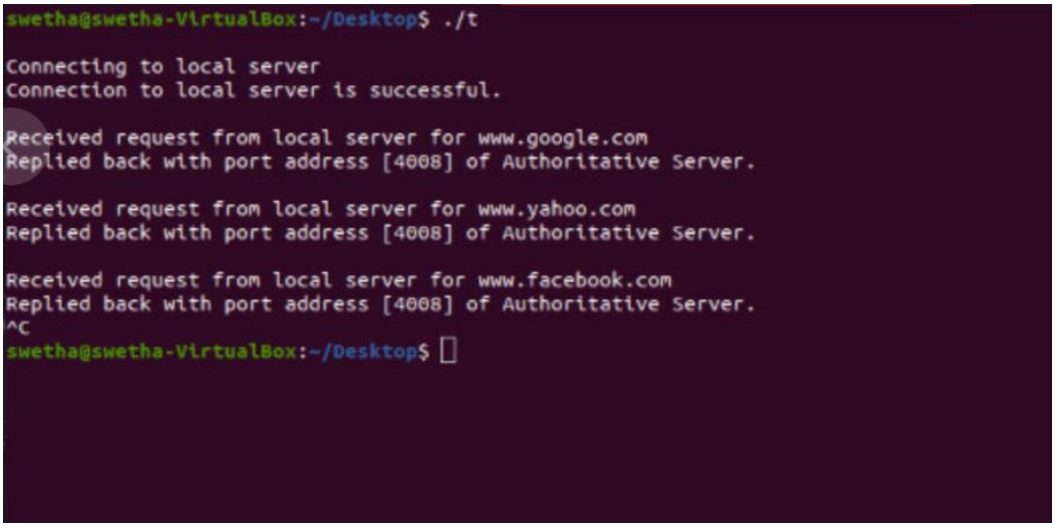
```
    conn->sin_port = htons(port);

    if(is_bound)
        if(bind(sockfd, (struct sockaddr *)conn, 16) < 0)
            error("Error in binding.\n");
        else
            printf("\nConnection to %s is successful.\n", conn_name);

    return sockfd;
}

int checkTable(Table lookup[50], char *hostname , int k)
{
    for(int i = 0; i < k; i++)
        if(strcmp(hostname, lookup[i].domainName) == 0)
            return i;

    return -1;
}
```

## Sample Input Output:

### Authoritative Server:

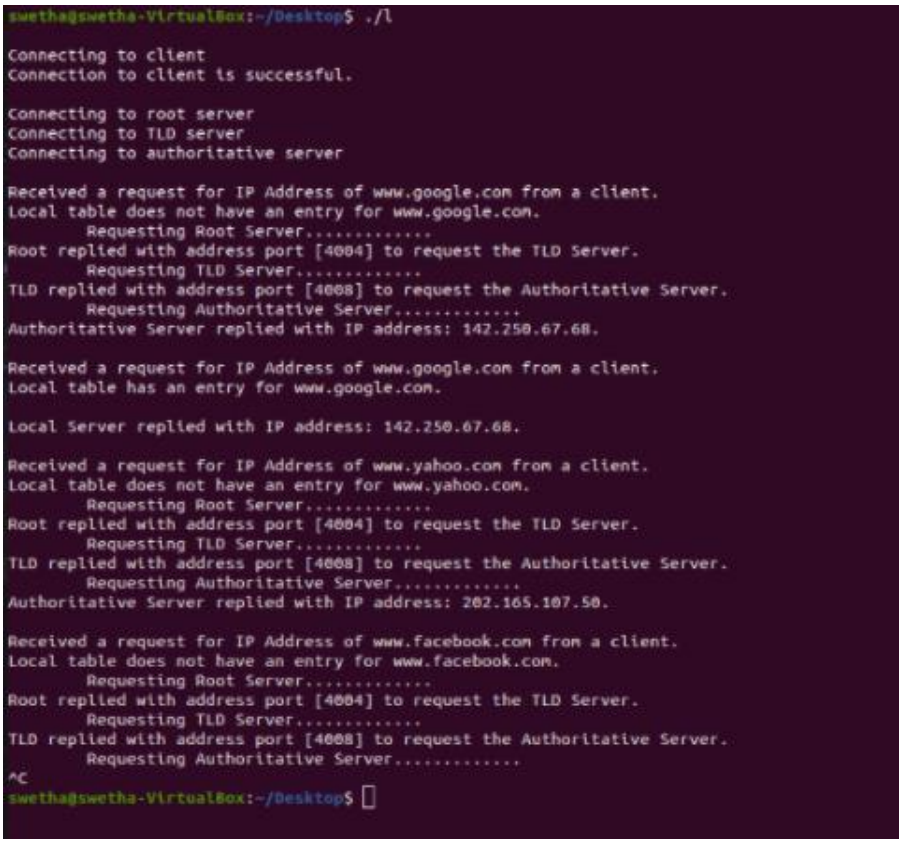


TLD Server:




Root Server:

## Local Server:




## Client: