Computer Network Lab(CSN-361)

Assignment - 3

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Problem Statement 1:

Write a socket program in C to determine class, Network and Host ID of an IPv4 address.

Code

```
#include <stdio.h>
#include <string.h>

char findIPClass(char str[])
{
    char arr[4];
    int i = 0;
    while (str[i] != '.')
    {
        arr[i] = str[i];
        i++;
    }
    i--;

    int ip = 0, j = 1;
    while (i >= 0)
    {
        ip = ip + (str[i] - '0') * j;
        j = j * 10;
        i--;
    }
```

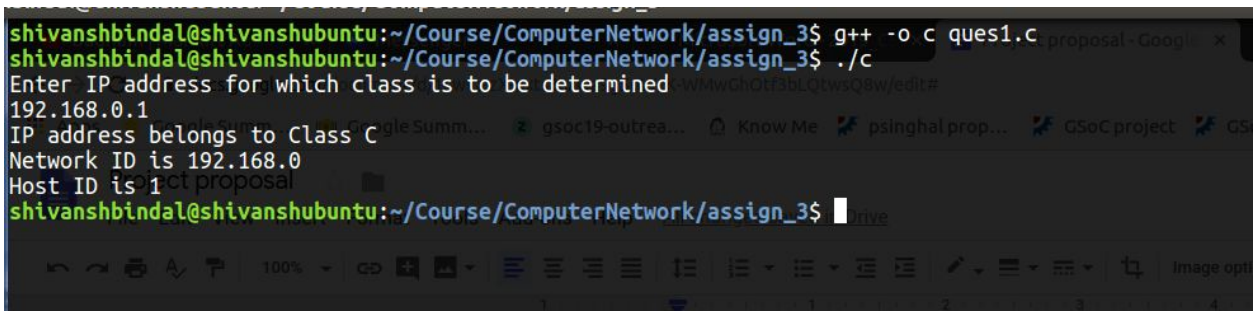
```
    if (ip >= 1 && ip <= 126)
        return 'A';

    else if (ip >= 128 && ip <= 191)
        return 'B';

    else if (ip >= 192 && ip <= 223)
        return 'C';

    else if (ip >= 224 && ip <= 239)
        return 'D';

    else
        return 'E';
}

void separate(char str[], char ipClass)
{
    char network[12], host[12];
    for (int k = 0; k < 12; k++)
        network[k] = host[k] = '\0';

    if (ipClass == 'A')
    {
        int i = 0, j = 0;
        while (str[j] != '.')
            network[i++] = str[j++];
        i = 0;
```

```
    j++;
    while (str[j] != '\0')
        host[i++] = str[j++];
    printf("Network ID is %s\n", network);
    printf("Host ID is %s\n", host);
}

else if (ipClass == 'B')
{
    int i = 0, j = 0, dotCount = 0;

    while (dotCount < 2)
    {
        network[i++] = str[j++];
        if (str[j] == '.')
            dotCount++;
    }
    i = 0;
    j++;

    while (str[j] != '\0')
        host[i++] = str[j++];

    printf("Network ID is %s\n", network);
    printf("Host ID is %s\n", host);
}

else if (ipClass == 'C')
{
```

```
        int i = 0, j = 0, dotCount = 0;

        while (dotCount < 3)
        {
            network[i++] = str[j++];
            if (str[j] == '.')
                dotCount++;
        }

        i = 0;
        j++;

        while (str[j] != '\0')
            host[i++] = str[j++];

        printf("Network ID is %s\n", network);
        printf("Host ID is %s\n", host);
    }

    else
        printf("In this Class, IP address is not"
               " divided into Network and Host ID\n");
}

int main()
{
    char str[100];
    printf("Enter IP address for which class is to be determined \n");
    scanf("%s", str);
```

```
    char ipClass = findIPClass(str);
    printf("IP address belongs to Class %c\n",
           ipClass);
    separate(str, ipClass);
    return 0;
}
```

Screenshot of running code



Problem Statement 2:

Write a C program to demonstrate File Transfer using UDP.

Code

Server

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

```
#include <unistd.h>

#define IP_PROTOCOL 0
#define PORT_NO 15050
#define NET_BUF_SIZE 32
#define cipherKey 'S'
#define sendrecvflag 0
#define nofile "File Not Found!"

void clearBuf(char *b)
{
    int i;
    for (i = 0; i < NET_BUF_SIZE; i++)
        b[i] = '\0';
}

char Cipher(char ch)
{
    return ch ^ cipherKey;
}

int sendFile(FILE *fp, char *buf, int s)
{
    int i, len;
    if (fp == NULL)
    {
        strcpy(buf, nofile);
        len = strlen(nofile);
        buf[len] = EOF;
```

```
        for (i = 0; i <= len; i++)
            buf[i] = Cipher(buf[i]);
        return 1;
    }

    char ch, ch2;
    for (i = 0; i < s; i++)
    {
        ch = fgetc(fp);
        ch2 = Cipher(ch);
        buf[i] = ch2;
        if (ch == EOF)
            return 1;
    }
    return 0;
}

int main()
{
    int sockfd, nBytes;
    struct sockaddr_in addr_con;
    socklen_t addrlen = sizeof(addr_con);
    addr_con.sin_family = AF_INET;
    addr_con.sin_port = htons(PORT_NO);
    addr_con.sin_addr.s_addr = INADDR_ANY;
    char net_buf[NET_BUF_SIZE];
    FILE *fp;

    sockfd = socket(AF_INET, SOCK_DGRAM, IP_PROTOCOL);
```

```
    if (sockfd < 0)
        printf("\nThe file descriptor is not received!!\n");
    else
        printf("\nThe file descriptor %d is received\n", sockfd);

    if (bind(sockfd, (struct sockaddr *)&addr_con, sizeof(addr_con))
== 0)
        printf("\nSuccessfully binded!\n");
    else
        printf("\nBinding Failed!\n");

    while (1)
    {
        printf("\nWaiting for file name...\n");

        clearBuf(net_buf);

        nBytes = recvfrom(sockfd, net_buf,
                          NET_BUF_SIZE, sendrecvflag,
                          (struct sockaddr *)&addr_con, &addrlen);

        fp = fopen(net_buf, "r");
        printf("\nFile Name Received: %s\n", net_buf);
        if (fp == NULL)
            printf("\nFile open failed!\n");
        else
            printf("\nFile Successfully opened!\n");

        while (1)
```

```
        {

            if (sendFile(fp, net_buf, NET_BUF_SIZE))
            {
                sendto(sockfd, net_buf, NET_BUF_SIZE,
                       sendrecvflag,
                       (struct sockaddr *)&addr_con, addrlen);
                break;
            }

            sendto(sockfd, net_buf, NET_BUF_SIZE,
                   sendrecvflag,
                   (struct sockaddr *)&addr_con, addrlen);
            clearBuf(net_buf);
        }
        if (fp != NULL)
            fclose(fp);
    }
    return 0;
}
```

Client

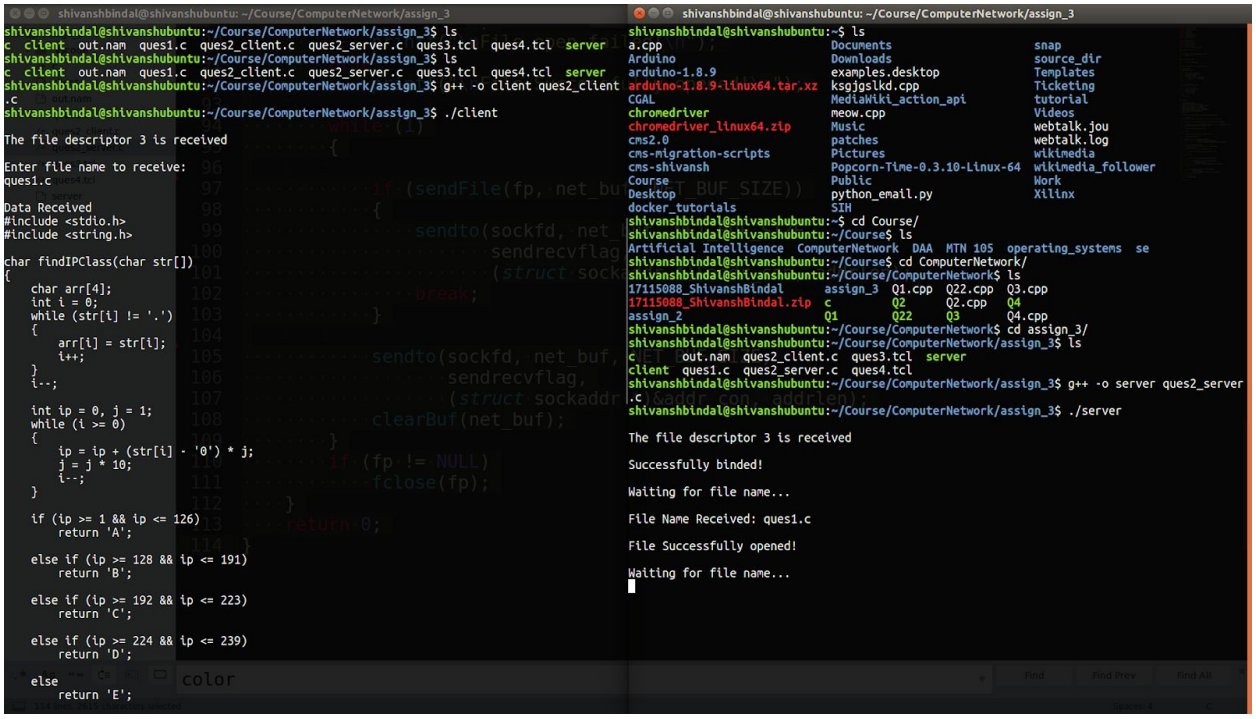
```
#include <arpa/inet.h>
#include <netinet/in.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
```

```
#include <sys/types.h>
#include <unistd.h>

#define IP_PROTOCOL 0
#define IP_ADDRESS "127.0.0.1"
#define PORT_NO 15050
#define NET_BUF_SIZE 32
#define cipherKey 'S'
#define sendrecvflag 0

void clearBuf(char *b)
{
    int i;
    for (i = 0; i < NET_BUF_SIZE; i++)
        b[i] = '\0';
}

char Cipher(char ch)
{
    return ch ^ cipherKey;
}

int recvFile(char *buf, int s)
{
    int i;
    char ch;
    for (i = 0; i < s; i++)
    {
        ch = buf[i];
```

```
        ch = Cipher(ch);
        if (ch == EOF)
            return 1;
        else
            printf("%c", ch);
    }
    return 0;
}

int main()
{
    int sockfd, nBytes;
    struct sockaddr_in addr_con;
    socklen_t addrlen = sizeof(addr_con);
    addr_con.sin_family = AF_INET;
    addr_con.sin_port = htons(PORT_NO);
    addr_con.sin_addr.s_addr = inet_addr(IP_ADDRESS);
    char net_buf[NET_BUF_SIZE];
    FILE *fp;

    sockfd = socket(AF_INET, SOCK_DGRAM,
                    IP_PROTOCOL);

    if (sockfd < 0)
        printf("\nThe file descriptor is not received!!\n");
    else
        printf("\nThe file descriptor %d is received\n", sockfd);

    while (1)
```

```
    {
        printf("\nEnter file name to receive:\n");
        scanf("%s", net_buf);
        sendto(sockfd, net_buf, NET_BUF_SIZE,
               sendrecvflag, (struct sockaddr *)&addr_con,
               addrlen);

        printf("\nData Received\n");

        while (1)
        {
            clearBuf(net_buf);
            nBytes = recvfrom(sockfd, net_buf, NET_BUF_SIZE,
                              sendrecvflag, (struct sockaddr
*)&addr_con,
                              &addrlen);

            // process
            if (recvFile(net_buf, NET_BUF_SIZE))
            {
                break;
            }
        }
        printf("\n------------------------------\n");
    }
    return 0;
}
```

Screenshot of running code



Problem Statement 3:

Write a TCL code for network simulator NS2 to demonstrate the star topology among a set of computer nodes. Given N nodes, one node will be assigned as the central node and the other nodes will be connected to it to form the star. You have to set up a TCP connection between k pairs of nodes and demonstrate the packet transfer between them using Network Animator (NAM). Use File Transfer protocol (FTP) for the same. Each link should have different color of packets to differentiate the packets transferred between each pair of nodes. The program should take the number of nodes (N) as input followed by k pairs of nodes.

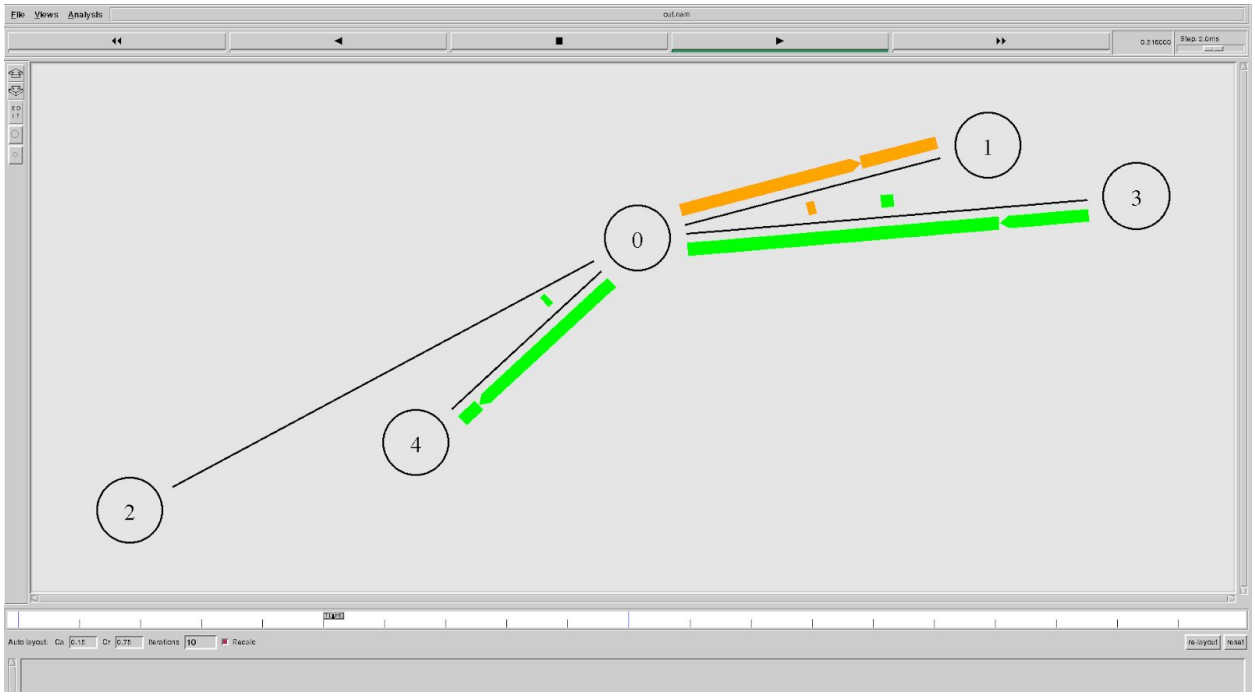
Code

```
set input [gets stdin]
scan $input "%d %d" N k

set ns [new Simulator]

$ns rtproto DV

set nf [open out.nam w]
$ns namtrace-all $nf

proc finish {} {
```

```
    global ns nf
    $ns flush-trace
    close $nf
    exec nam out.nam
    exit 0
}

for {set i 0} {$i < $N} {incr i} {
     set node($i) [$ns node]
}

for {set i 1} {$i < $N} {incr i} {
     $ns duplex-link $node($i) $node(0) 1Mb 10ms DropTail
}

set colors(0) Yellow
set colors(1) Green
set colors(2) Orange
set colors(3) Pink
set colors(4) Red
set colors(5) Blue


for {set i 0} {$i < $k} {incr i} {
     set input [gets stdin]
     scan $input "%d %d" u v

     set tcp_con [new Agent/TCP]
     $ns attach-agent $node($u) $tcp_con
```

```
    $tcp_con set class_ $i

    set sink_node [new Agent/TCPSink]
    $ns attach-agent $node($v) $sink_node
    $ns connect $tcp_con $sink_node

    $ns color $i $colors([expr ($i) % 6])
    $tcp_con set fid_ $i

    set ftp_con [new Application/FTP]
    $ftp_con attach-agent $tcp_con
    $ns at 0.1 "$ftp_con start"
    $ns at 1.5 "$ftp_con stop"
}

$ns at 2.0 "finish"
$ns run
```

Screenshot of running code



Problem Statement 4:

Write a TCL code for network simulator NS2 to demonstrate the ring topology among a set of computer nodes. Given N nodes, each node will be connected to two other nodes in the form of a ring. You have to set up a TCP connection between k pairs of nodes and demonstrate packet transfer between them using Network Animator (NAM). Use File Transfer protocol (FTP) for the same. Each link should have different color of packets to differentiate the packets transferred between each pair of nodes. The program should take the number of nodes (N) as input followed by k pairs of nodes.

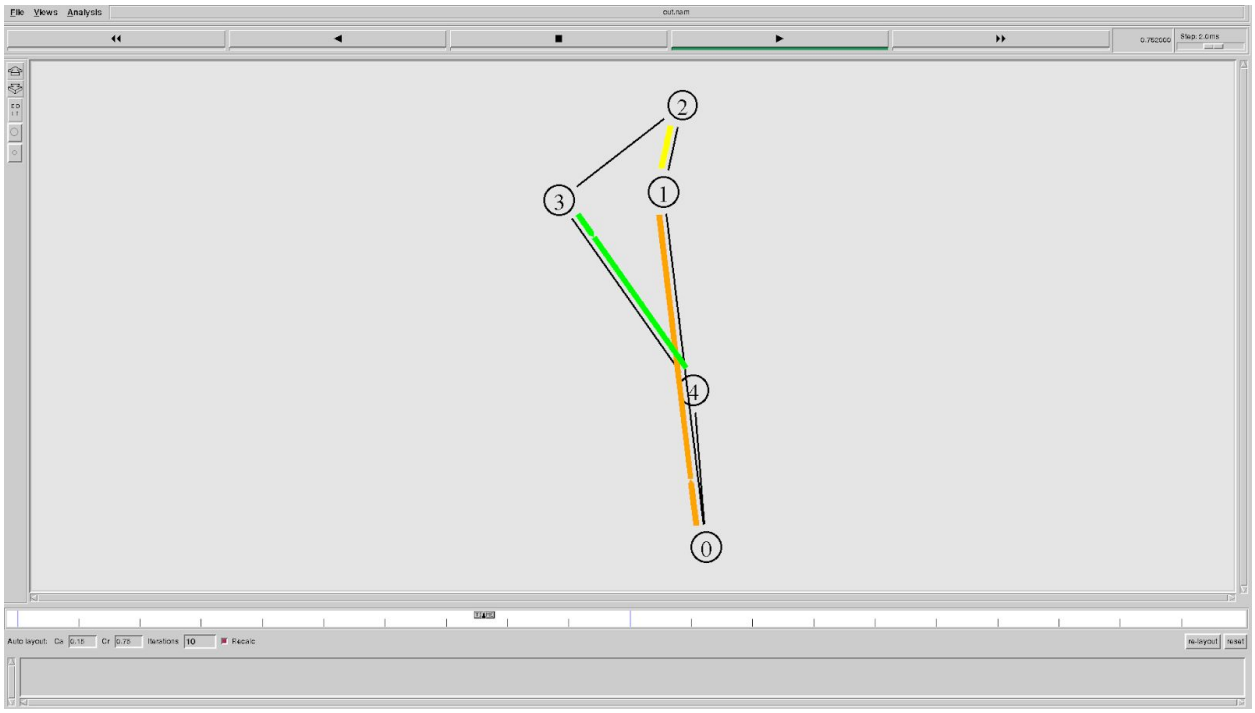
Code

```
set input [gets stdin]
scan $input "%d %d" N k

set ns [new Simulator]

$ns rtproto DV

set nf [open out.nam w]
$ns namtrace-all $nf

proc finish {} {
```

```
    global ns nf
    $ns flush-trace
    close $nf
    exec nam out.nam
    exit 0
}

for {set i 0} {$i < $N} {incr i} {
     set node($i) [$ns node]
}

for {set i 0} {$i < $N} {incr i} {
     $ns duplex-link $node($i) $node([expr ($i + 1) % $N]) 512Kb 5ms
DropTail
}

set colors(0) Yellow
set colors(1) Green
set colors(2) Orange
set colors(3) Pink
set colors(4) Red
set colors(5) Blue

for {set i 0} {$i < $k} {incr i} {
     set input [gets stdin]
     scan $input "%d %d" u v

     set tcp_con [new Agent/TCP]
     $ns attach-agent $node($u) $tcp_con
     $tcp_con set class_ $i
```

```
    set sink_node [new Agent/TCPSink]
    $ns attach-agent $node($v) $sink_node
    $ns connect $tcp_con $sink_node

    $ns color $i $colors([expr ($i) % 6])
    $tcp_con set fid_ $i

    set ftp_con [new Application/FTP]
    $ftp_con attach-agent $tcp_con
    $ns at 0.1 "$ftp_con start"
    $ns at 1.5 "$ftp_con stop"
}

$ns at 2.0 "finish"
$ns run
```

Screenshot of running code



Problem Statement 5:

Write a TCL code for network simulator NS2 to demonstrate the bus topology among a set of computer nodes. Given N nodes, each node will be connected to a common link. You have to set up a TCP connection between k pairs of nodes and demonstrate packet transfer between them using Network Animator (NAM). Use File Transfer protocol (FTP) for the same. Each link should have different color of packets to differentiate the packets transferred between each pair of nodes. The program should take the number of nodes (N) as input followed by k pairs of nodes.

Code

```
set input [gets stdin]
scan $input "%d %d" N k

set ns [new Simulator]

# $ns rtproto DV

set nf [open out.nam w]
$ns namtrace-all $nf

proc finish {} {
    global ns nf
    $ns flush-trace
    close $nf
    exec nam out.nam
    exit 0
}

set node(0) [$ns node]
set y "$node(0)"
for {set i 1} {$i < $N} {incr i} {
    set node($i) [$ns node]
    append y " "
    append y "$node($i)"
}
$ns make-lan $y 0.5Mb 40ms LL Queue/DropTail Mac/802_3
```

```
set colors(0) Yellow
set colors(1) Green
set colors(2) Orange
set colors(3) Pink
set colors(4) Red
set colors(5) Blue

for {set i 0} {$i < $k} {incr i} {
    set input [gets stdin]
    scan $input "%d %d" u v

    set tcp_con [new Agent/TCP]
    $ns attach-agent $node($u) $tcp_con
    $tcp_con set class_ $i

    set sink_node [new Agent/TCPSink]
    $ns attach-agent $node($v) $sink_node
    $ns connect $tcp_con $sink_node

    $ns color $i $colors([expr ($i) % 6])
    $tcp_con set fid_ $i

    set ftp_con [new Application/FTP]
    $ftp_con attach-agent $tcp_con
    $ns at 0.1 "$ftp_con start"
    $ns at 1.5 "$ftp_con stop"
}
```

```
$ns at 2.0 "finish"
$ns run
```

Screenshot of running code