Computer Networks

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Course Title : Computer Networks

Course code : BCSE308P

Slot : L45-46

Faculty : Dr Neelanarayanan V

S.No	Experiment Name	Date	Page No.	Marks
1.	**Basic Network Configuration Commands**	**10-01-2024**		
2.	**Client-Server Application Echo**	**17-01-2024**		
3.	**IP Address Validation and Simple application of ATM using TCP**	**24-01-2024**		
4.	**CRC code generator using socket programming**	**07-02-2024**		
5. a)	**Echo programming using UDP**	**21-02-2024**		
5. b)	**IP address validation using UDP**	**21-02-2024**		

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5. c)	**ATM simulation using UDP**	**21-02-2024**		

Experiment No. 5

Experiment Name: IP address validation and simulation of ATM using UDP socket-client server

Date: 21-2-2024

Problem Statement

1) **Write a program to validate IP address**
2) **Implement a simulation of ATM functions using a UDP socket client server program**

Aim

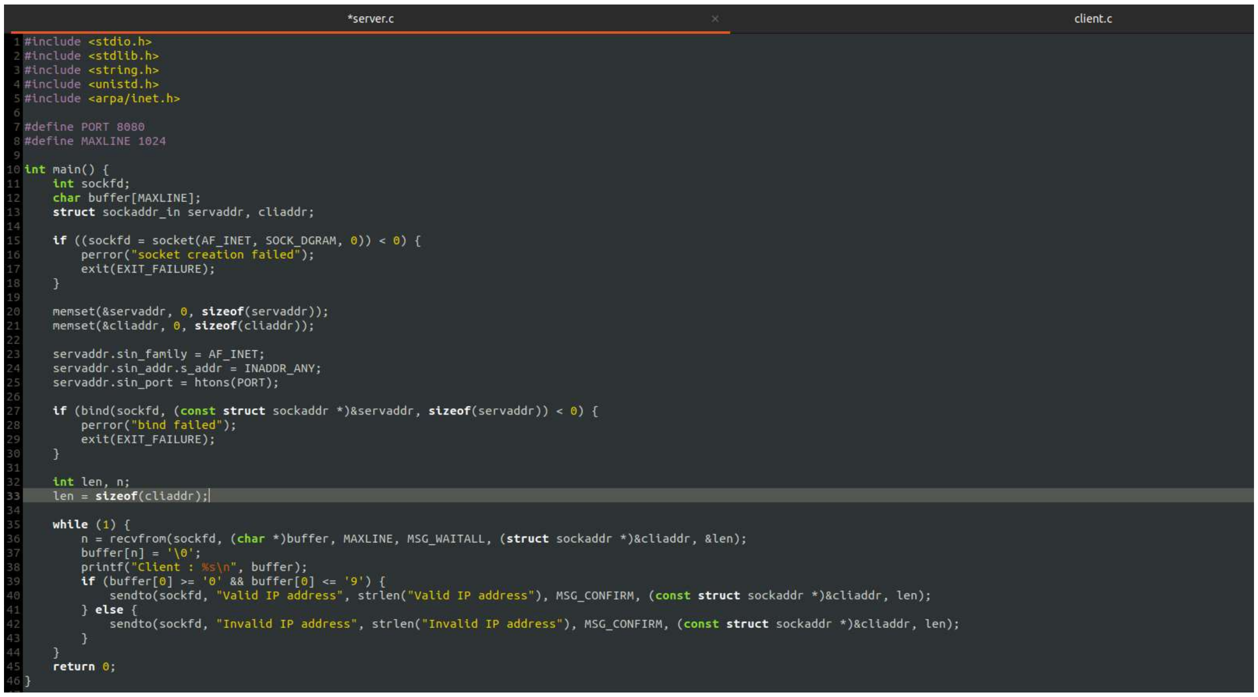
To write a c program for IP address validation and implementation of ATM basic functions using UDP socket client server program

Algorithm or Procedure

IPv4 Validation :

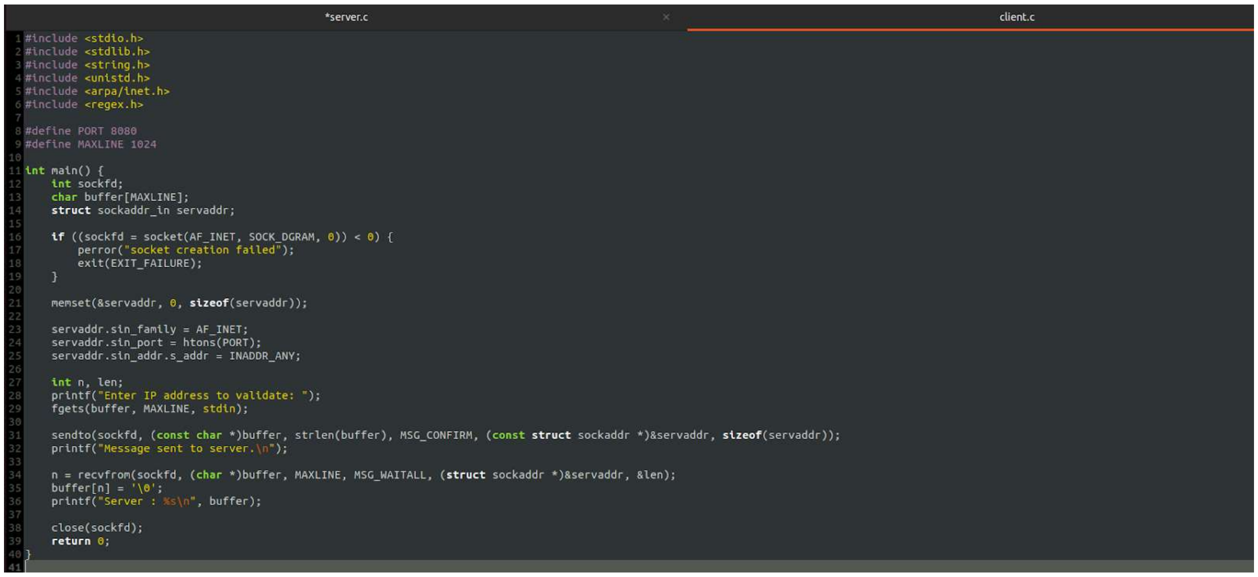
1. Split string by ., ensure exactly 4 parts.
2. Each part: convert to int, check 0-255 range.
3. No part can have leading zeros (except "0" itself).
4. No alpha characters allowed in any part.
5. If all checks pass, valid; else, invalid.

Server side program


*server.c ×   client.c

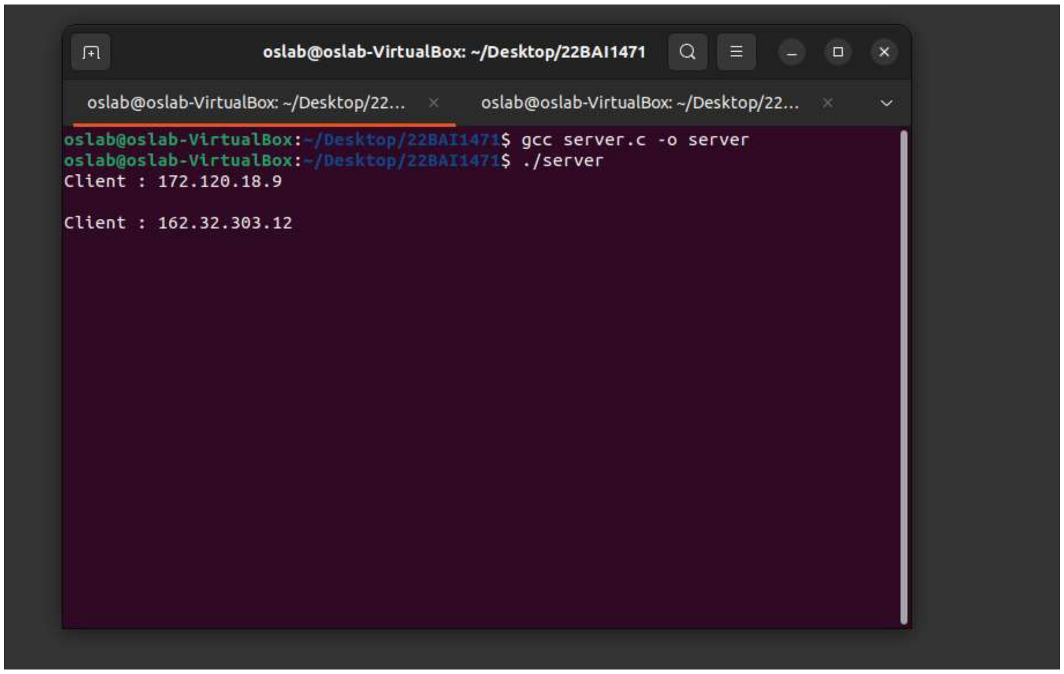
```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>

#define PORT 8080
#define MAXLINE 1024

int main() {
    int sockfd;
    char buffer[MAXLINE];
    struct sockaddr_in servaddr, cliaddr;

    if ((sockfd = socket(AF_INET, SOCK_DGRAM, 0)) < 0) {
        perror("socket creation failed");
        exit(EXIT_FAILURE);
    }

    memset(&servaddr, 0, sizeof(servaddr));
    memset(&cliaddr, 0, sizeof(cliaddr));

    servaddr.sin_family = AF_INET;
    servaddr.sin_addr.s_addr = INADDR_ANY;
    servaddr.sin_port = htons(PORT);

    if (bind(sockfd, (const struct sockaddr *)&servaddr, sizeof(servaddr)) < 0) {
        perror("bind failed");
        exit(EXIT_FAILURE);
    }

    int len, n;
    len = sizeof(cliaddr);

    while (1) {
        n = recvfrom(sockfd, (char *)buffer, MAXLINE, MSG_WAITALL, (struct sockaddr *)&cliaddr, &len);
        buffer[n] = '\0';
        printf("Client : %s\n", buffer);
        if (buffer[0] >= '0' && buffer[0] <= '9') {
            sendto(sockfd, "Valid IP address", strlen("Valid IP address"), MSG_CONFIRM, (const struct sockaddr *)&cliaddr, len);
        } else {
            sendto(sockfd, "Invalid IP address", strlen("Invalid IP address"), MSG_CONFIRM, (const struct sockaddr *)&cliaddr, len);
        }
    }
    return 0;
}
```

Client side program:


*server.c ×   client.c

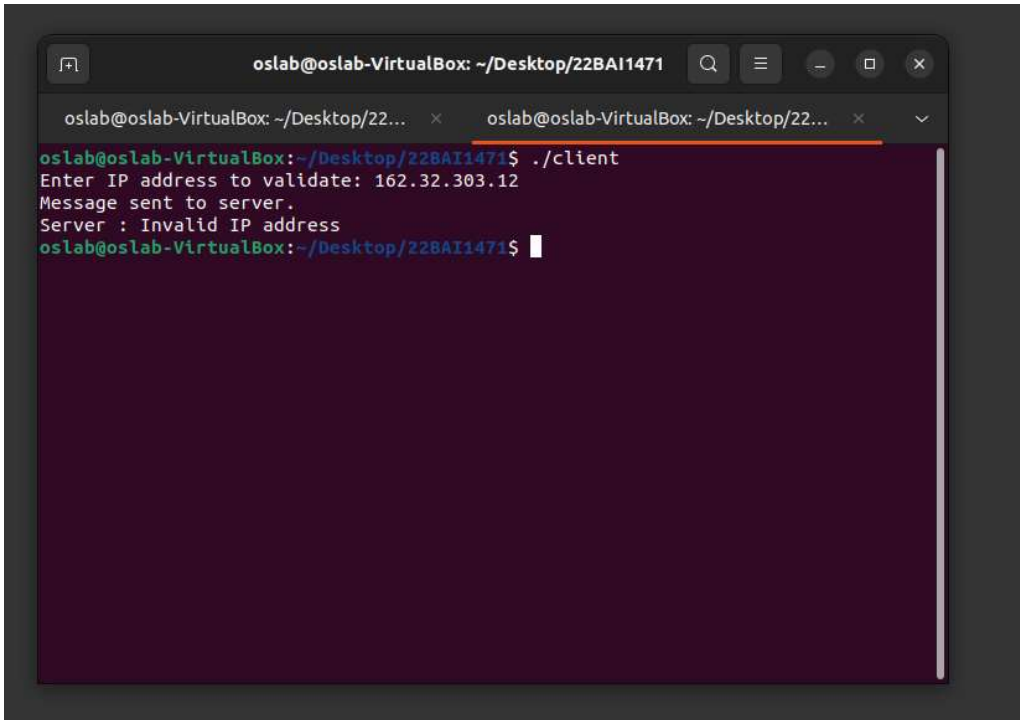
```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <regex.h>

#define PORT 8080
#define MAXLINE 1024

int main() {
    int sockfd;
    char buffer[MAXLINE];
    struct sockaddr_in servaddr;

    if ((sockfd = socket(AF_INET, SOCK_DGRAM, 0)) < 0) {
        perror("socket creation failed");
        exit(EXIT_FAILURE);
    }

    memset(&servaddr, 0, sizeof(servaddr));

    servaddr.sin_family = AF_INET;
    servaddr.sin_port = htons(PORT);
    servaddr.sin_addr.s_addr = INADDR_ANY;

    int n, len;
    printf("Enter IP address to validate: ");
    fgets(buffer, MAXLINE, stdin);

    sendto(sockfd, (const char *)buffer, strlen(buffer), MSG_CONFIRM, (const struct sockaddr *)&servaddr, sizeof(servaddr));
    printf("Message sent to server.\n");

    n = recvfrom(sockfd, (char *)buffer, MAXLINE, MSG_WAITALL, (struct sockaddr *)&servaddr, &len);
    buffer[n] = '\0';
    printf("Server : %s\n", buffer);

    close(sockfd);
    return 0;
}

```

Server side

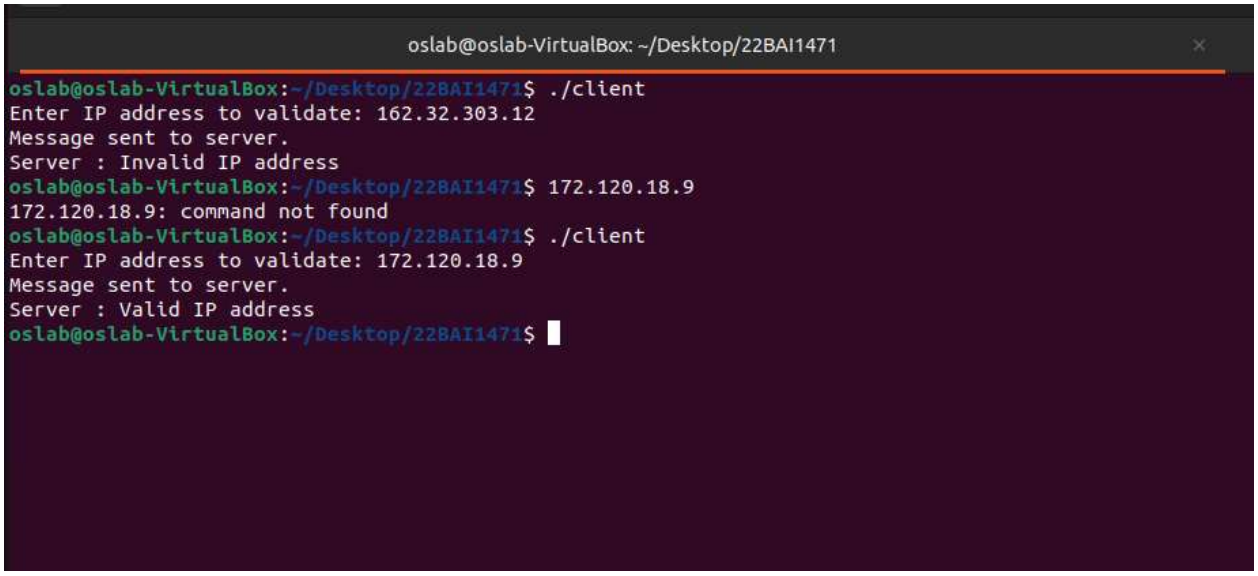

oslab@oslab-VirtualBox: ~/Desktop/22BAI1471

```
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ gcc server.c -o server
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ ./server
Client : 172.120.18.9

Client : 162.32.303.12
```

Client side


oslab@oslab-VirtualBox: ~/Desktop/22BAI1471

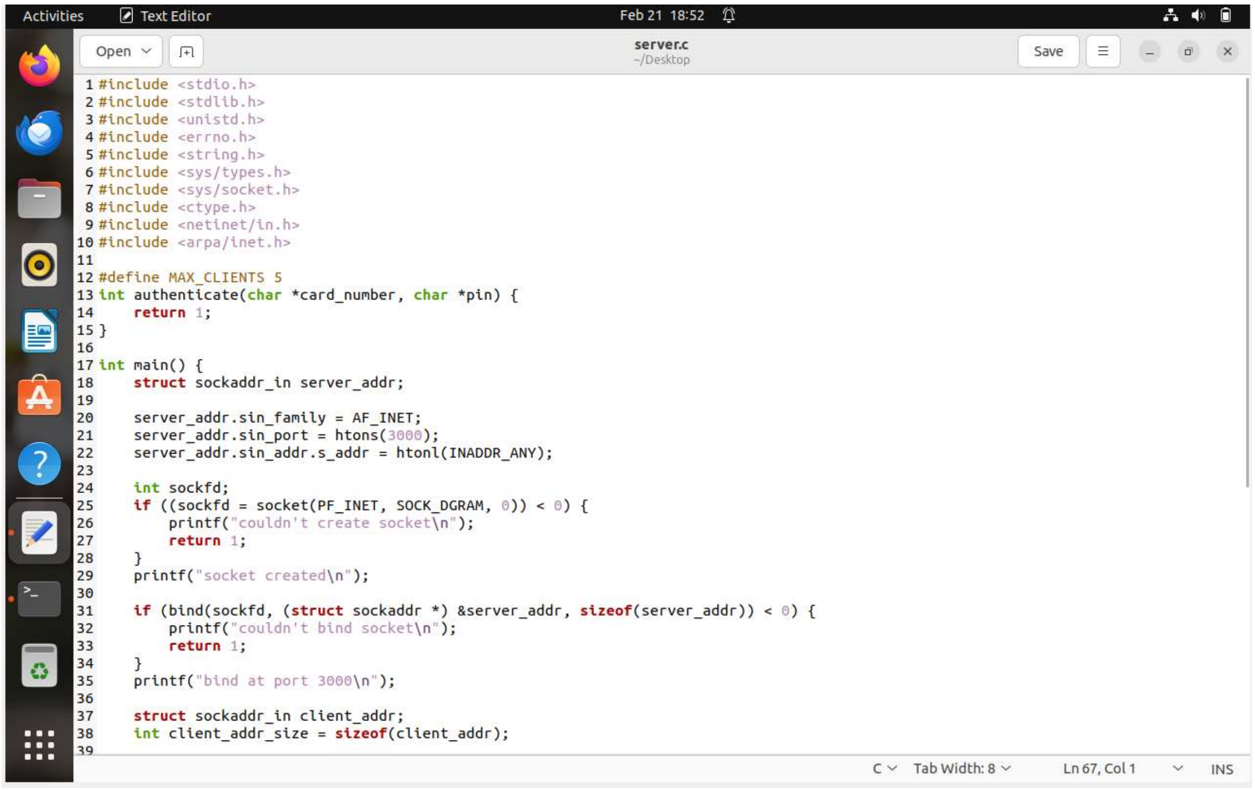
```
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ ./client
Enter IP address to validate: 162.32.303.12
Message sent to server.
Server : Invalid IP address
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ 
```



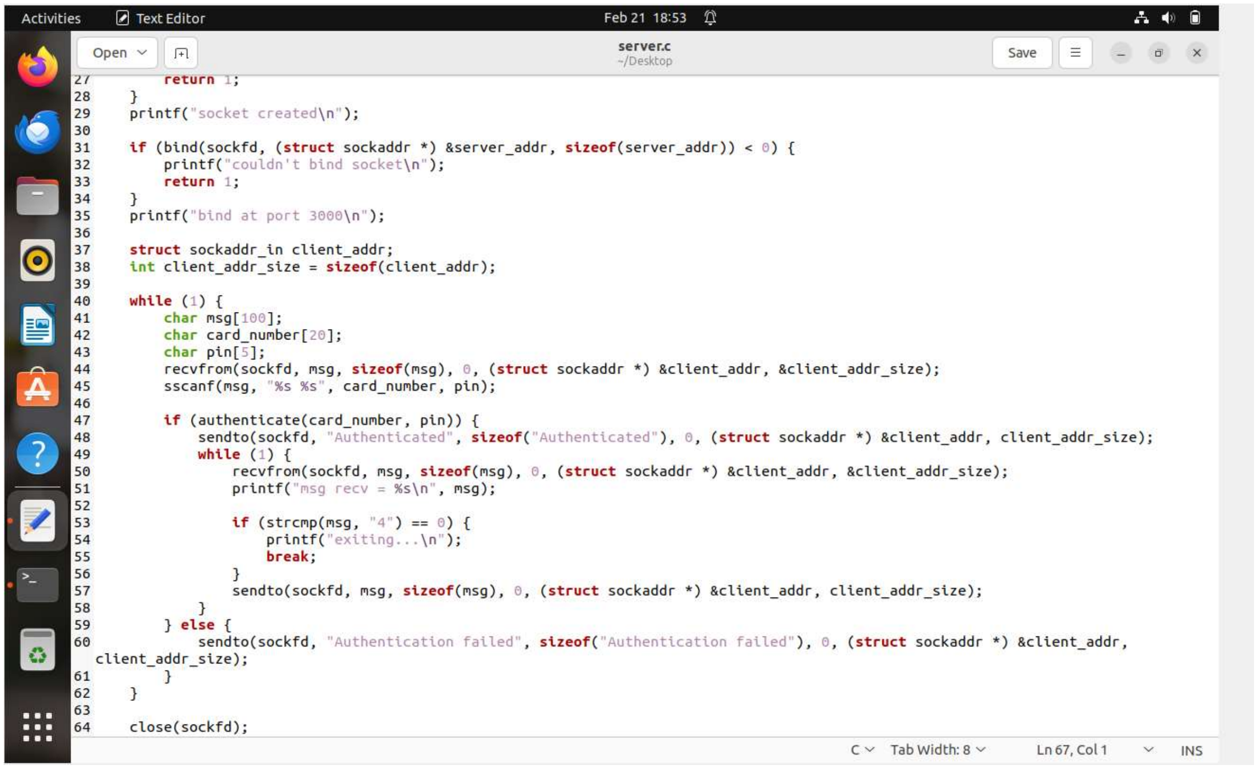
```
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ ./client
Enter IP address to validate: 162.32.303.12
Message sent to server.
Server : Invalid IP address
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ 172.120.18.9
172.120.18.9: command not found
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$ ./client
Enter IP address to validate: 172.120.18.9
Message sent to server.
Server : Valid IP address
oslab@oslab-VirtualBox:~/Desktop/22BAI1471$
```

2) ATM simulation using UDP socket client server program

Server program

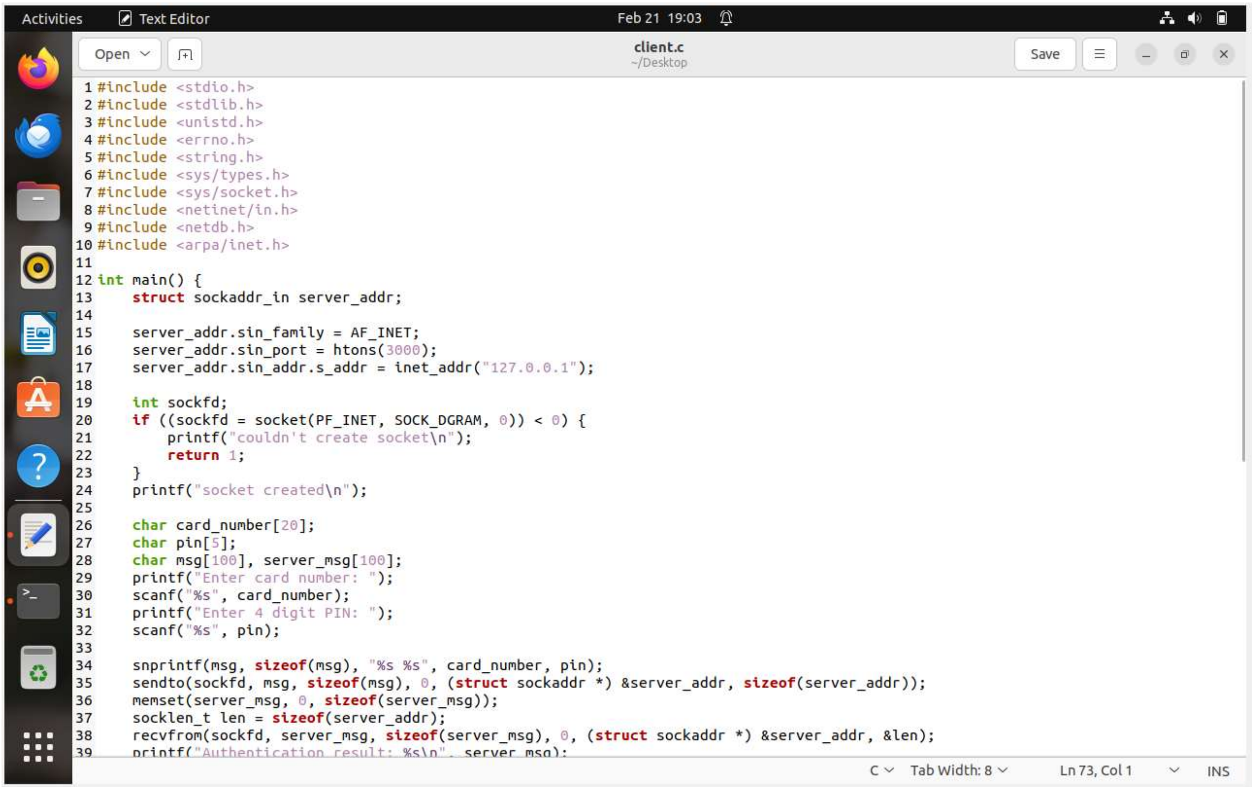


```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <ctype.h>
#include <netinet/in.h>
#include <arpa/inet.h>

#define MAX_CLIENTS 5
int authenticate(char *card_number, char *pin) {
    return 1;
}

int main() {
    struct sockaddr_in server_addr;

    server_addr.sin_family = AF_INET;
    server_addr.sin_port = htons(3000);
    server_addr.sin_addr.s_addr = htonl(INADDR_ANY);

    int sockfd;
    if ((sockfd = socket(PF_INET, SOCK_DGRAM, 0)) < 0) {
        printf("couldn't create socket\n");
        return 1;
    }
    printf("socket created\n");

    if (bind(sockfd, (struct sockaddr *) &server_addr, sizeof(server_addr)) < 0) {
        printf("couldn't bind socket\n");
        return 1;
    }
    printf("bind at port 3000\n");

    struct sockaddr_in client_addr;
    int client_addr_size = sizeof(client_addr);
```

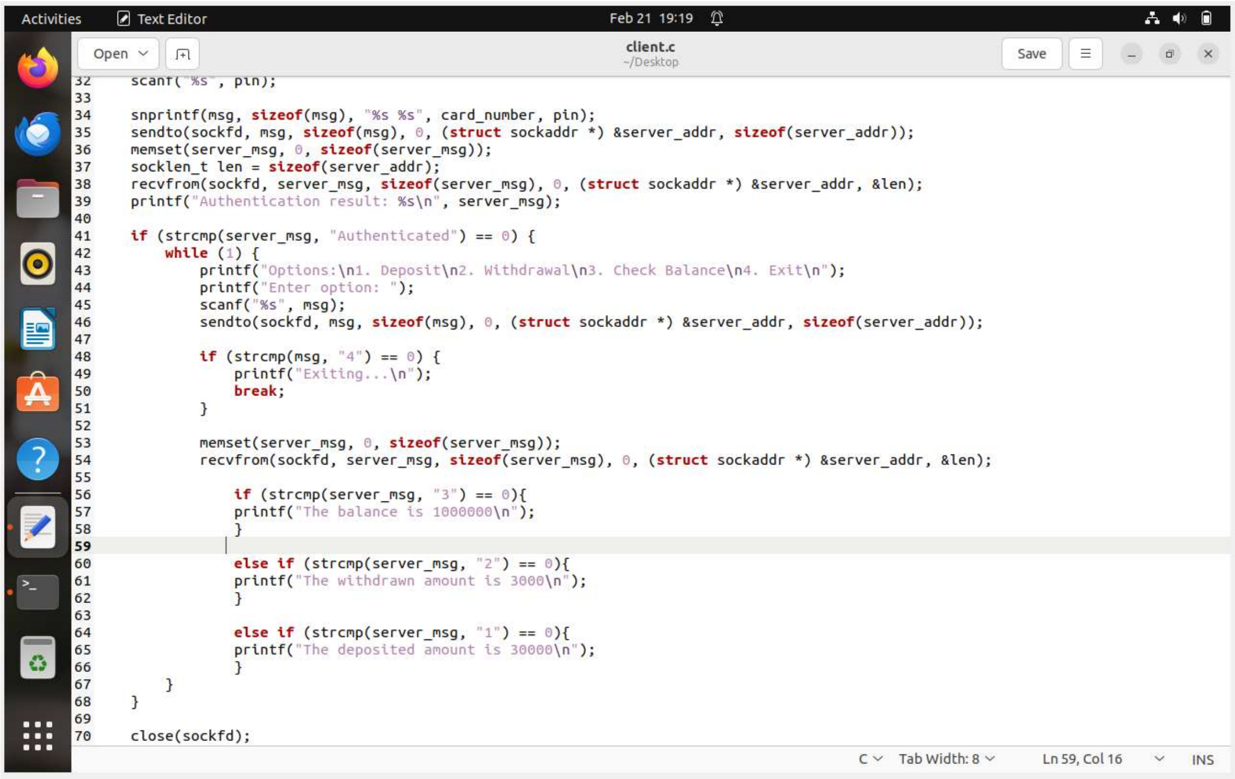


```c
        return 1;
    }
    printf("socket created\n");

    if (bind(sockfd, (struct sockaddr *) &server_addr, sizeof(server_addr)) < 0) {
        printf("couldn't bind socket\n");
        return 1;
    }
    printf("bind at port 3000\n");

    struct sockaddr_in client_addr;
    int client_addr_size = sizeof(client_addr);

    while (1) {
        char msg[100];
        char card_number[20];
        char pin[5];
        recvfrom(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &client_addr, &client_addr_size);
        sscanf(msg, "%s %s", card_number, pin);

        if (authenticate(card_number, pin)) {
            sendto(sockfd, "Authenticated", sizeof("Authenticated"), 0, (struct sockaddr *) &client_addr, client_addr_size);
            while (1) {
                recvfrom(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &client_addr, &client_addr_size);
                printf("msg recv = %s\n", msg);

                if (strcmp(msg, "4") == 0) {
                    printf("exiting...\n");
                    break;
                }
                sendto(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &client_addr, client_addr_size);
            }
        } else {
            sendto(sockfd, "Authentication failed", sizeof("Authentication failed"), 0, (struct sockaddr *) &client_addr,
client_addr_size);
        }
    }

    close(sockfd);
```

Client program

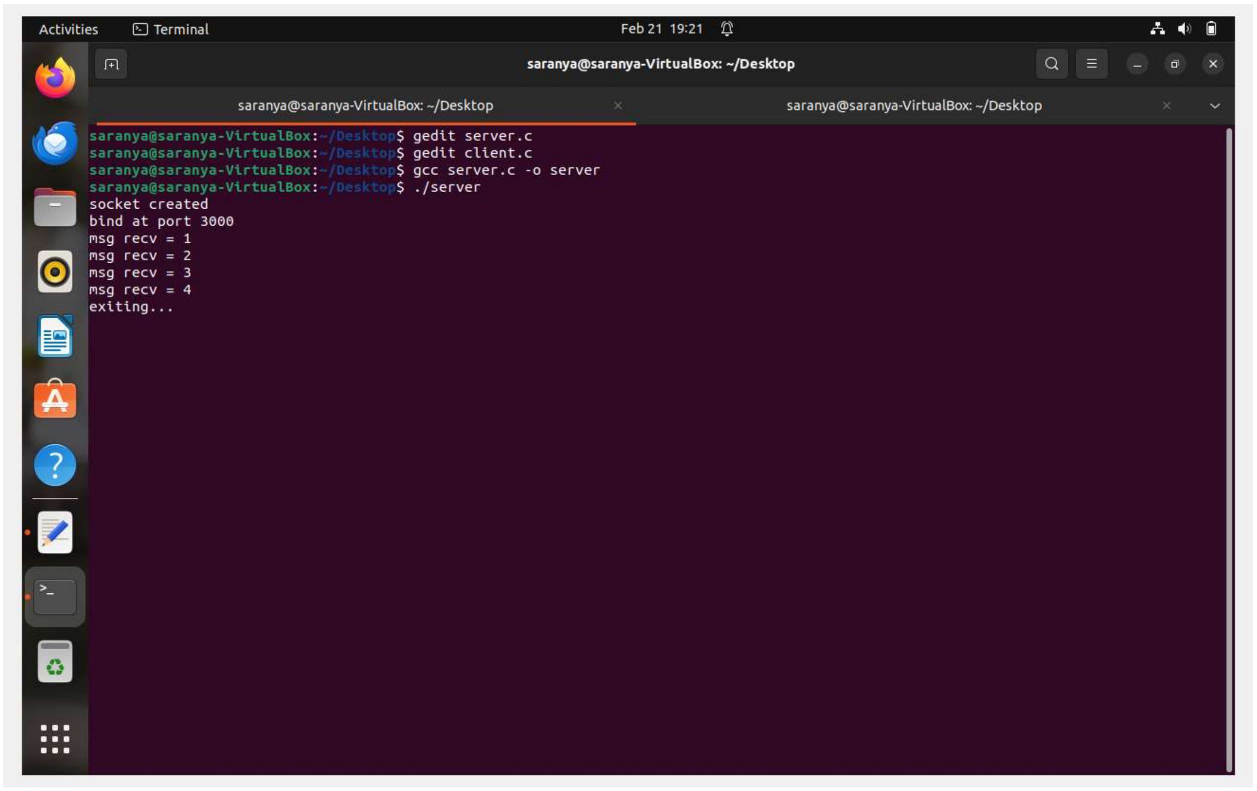


```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>
#include <arpa/inet.h>

int main() {
    struct sockaddr_in server_addr;

    server_addr.sin_family = AF_INET;
    server_addr.sin_port = htons(3000);
    server_addr.sin_addr.s_addr = inet_addr("127.0.0.1");

    int sockfd;
    if ((sockfd = socket(PF_INET, SOCK_DGRAM, 0)) < 0) {
        printf("couldn't create socket\n");
        return 1;
    }
    printf("socket created\n");

    char card_number[20];
    char pin[5];
    char msg[100], server_msg[100];
    printf("Enter card number: ");
    scanf("%s", card_number);
    printf("Enter 4 digit PIN: ");
    scanf("%s", pin);

    snprintf(msg, sizeof(msg), "%s %s", card_number, pin);
    sendto(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &server_addr, sizeof(server_addr));
    memset(server_msg, 0, sizeof(server_msg));
    socklen_t len = sizeof(server_addr);
    recvfrom(sockfd, server_msg, sizeof(server_msg), 0, (struct sockaddr *) &server_addr, &len);
    printf("Authentication result: %s\n", server_msg);
```



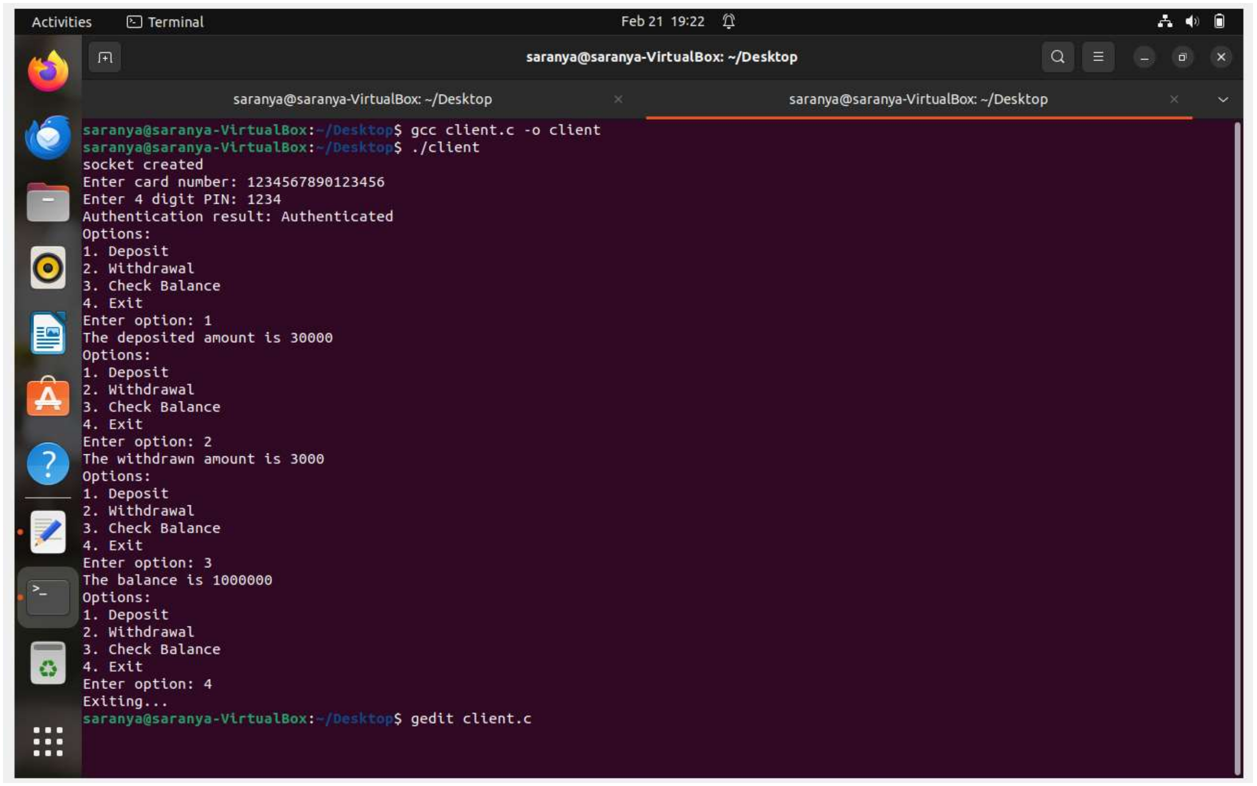
```c
    scanf("%s", pin);

    snprintf(msg, sizeof(msg), "%s %s", card_number, pin);
    sendto(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &server_addr, sizeof(server_addr));
    memset(server_msg, 0, sizeof(server_msg));
    socklen_t len = sizeof(server_addr);
    recvfrom(sockfd, server_msg, sizeof(server_msg), 0, (struct sockaddr *) &server_addr, &len);
    printf("Authentication result: %s\n", server_msg);

    if (strcmp(server_msg, "Authenticated") == 0) {
        while (1) {
            printf("Options:\n1. Deposit\n2. Withdrawal\n3. Check Balance\n4. Exit\n");
            printf("Enter option: ");
            scanf("%s", msg);
            sendto(sockfd, msg, sizeof(msg), 0, (struct sockaddr *) &server_addr, sizeof(server_addr));

            if (strcmp(msg, "4") == 0) {
                printf("Exiting...\n");
                break;
            }

            memset(server_msg, 0, sizeof(server_msg));
            recvfrom(sockfd, server_msg, sizeof(server_msg), 0, (struct sockaddr *) &server_addr, &len);

                if (strcmp(server_msg, "3") == 0){
                printf("The balance is 1000000\n");
                }

                else if (strcmp(server_msg, "2") == 0){
                printf("The withdrawn amount is 3000\n");
                }

                else if (strcmp(server_msg, "1") == 0){
                printf("The deposited amount is 30000\n");
                }
        }
    }

    close(sockfd);
```

Output
Server side terminal



```
saranya@saranya-VirtualBox:~/Desktop$ gedit server.c
saranya@saranya-VirtualBox:~/Desktop$ gedit client.c
saranya@saranya-VirtualBox:~/Desktop$ gcc server.c -o server
saranya@saranya-VirtualBox:~/Desktop$ ./server
socket created
bind at port 3000
msg recv = 1
msg recv = 2
msg recv = 3
msg recv = 4
exiting...
```

Client side



```
saranya@saranya-VirtualBox:~/Desktop$ gcc client.c -o client
saranya@saranya-VirtualBox:~/Desktop$ ./client
socket created
Enter card number: 1234567890123456
Enter 4 digit PIN: 1234
Authentication result: Authenticated
Options:
1. Deposit
2. Withdrawal
3. Check Balance
4. Exit
Enter option: 1
The deposited amount is 30000
Options:
1. Deposit
2. Withdrawal
3. Check Balance
4. Exit
Enter option: 2
The withdrawn amount is 3000
Options:
1. Deposit
2. Withdrawal
3. Check Balance
4. Exit
Enter option: 3
The balance is 1000000
Options:
1. Deposit
2. Withdrawal
3. Check Balance
4. Exit
Enter option: 4
Exiting...
saranya@saranya-VirtualBox:~/Desktop$ gedit client.c
```

Conclusion

The program gives the user options to choose various banking services.
This program uses User Datagram Protocol which is feedback-less connection and also provides faster data transfer than TCP