

# **TEST DOCUMENT**

## **ASSIGNMENT QUESTION :**

**Design and implement an emergency server. It should answer the sample clients questions:**

- 1. Police Station number**
- 2. Ambulance Number**
- 3. Fire Station Number**
- 4. Vehicle Repair Number**
- 5. Food Delivery**
- 6. Blood Bank Number**

### **Constraints:**

- 1. Clients do not know the IP address or hostname of the emergency server.**
- 2. Emergency services should be reliable.**
- 3. You can assume an Emergency server running on a particular port number.**
- 4. Multiple clients may send queries parallelly to the emergency server.**

## Server Code :

```

GNU nano 6.2
#include <sys/types.h>
#include <sys/socket.h>
#include <string.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <fcntl.h>
#include <errno.h> // For error and EISDIR
#include <sys/select.h> // For select()
#define PORT 5555
#define BUFFER_SIZE 1024

// Emergency service data
typedef struct {
    char *service;
    char *response;
} EmergencyService;

EmergencyService emergency_services[] = {
    {"Police Station Number", "911"}, 
    {"Ambulance Number", "912"}, 
    {"Fire Station Number", "913"}, 
    {"Vehicle Repair Number", "914"}, 
    {"Food Delivery Number", "915"}, 
    {"Blood Bank Number", "916"}, 
};

// Function to find the emergency number for a given service
const char* get_emergency_number(const char *service) {
    static char response[BUFFER_SIZE]; // Static to retain memory after function call
    for (int i = 0; i < sizeof(emergency_services) / sizeof(EmergencyService); i++) {
        if (strcmp(service, emergency_services[i].service) == 0) {
            sprintf(response, "%s is %s", service, emergency_services[i].number);
            return response;
        }
    }
    return "Invalid request. Service not available!";
}

int main() {
    int server_socket;
    struct sockaddr_in server_addr;
    char buffer[BUFFER_SIZE];
    socklen_t client_addr_len = sizeof(client_addr);

    // Create a UDP socket
    server_socket = socket(AF_INET, SOCK_DGRAM, 0);
    if (server_socket < 0) {
        perror("Socket creation failed");
        exit(EXIT_FAILURE);
    }

    Help   Exit   Write Out   Read File   Where Is   Replace   Cut   Paste   Execute   Justify   Location   Go To Line   Undo   Redo
}

```

Fig : Server Code

## Client Code :

```

GNU nano 6.2
client.c
#include <sys/types.h>
#include <sys/socket.h>
#include <string.h>
#include <sys/types.h>
#include <sys/socket.h>

#define PORT 5555
#define SERVER_IP "192.168.1.255.255.255"
#define BUFFER_SIZE 1024

// Array of services and their numbers
const char *service_list[] = {
    "Police Station Number",
    "Ambulance Number",
    "Fire Station Number",
    "Vehicle Repair Number",
    "Food Delivery Number",
    "Blood Bank Number"
};

void query_emergency_server(const char *service) {
    int client_socket;
    struct sockaddr_in server_addr;
    char buffer[BUFFER_SIZE];
    socklen_t server_addr_len = sizeof(server_addr);

    // Create a UDP socket
    client_socket = socket(AF_INET, SOCK_DGRAM, 0);
    if (client_socket < 0) {
        perror("Socket creation failed");
        exit(EXIT_FAILURE);
    }

    // Enable broadcast option for the socket
    broadcast_enable = 1;
    if (setsockopt(client_socket, SOL_SOCKET, SO_BROADCAST, &broadcast_enable, sizeof(broadcast_enable)) < 0) {
        perror("Error setting socket options for broadcast");
        close(client_socket);
        exit(EXIT_FAILURE);
    }

    // Connect to server
    connect(client_socket, (struct sockaddr *)&server_addr, server_addr_len);
    sendto(client_socket, service, strlen(service), 0, (struct sockaddr *)&server_addr, server_addr_len);

    // Receive the response from the server
    int bytes_received = recvfrom(client_socket, buffer, BUFFER_SIZE - 1, 0, (struct sockaddr *)&server_addr, &server_addr_len);
    if (bytes_received < 0) {
        perror("Error receiving data from server");
    } else {
        buffer[bytes_received] = '\0';
        printf("Response from server: %s\n", buffer);
    }

    close(client_socket);
}

Help   Exit   Write Out   Read File   Where Is   Replace   Cut   Paste   Execute   Justify   Location   Go To Line   Undo   Redo

```

Fig : Client Code

## **TEST CASES :**

1. On starting the server first, it displays the message:  
**'Emergency server started on port 5555, waiting for client requests...'**

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
```

2. On starting the client, it displays the following message in the menu-driven option format where the client is asked to write the choice from 1 to 6 and 0 to terminate.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 
```

3. On the server side, if there is no data available to read from the socket, the server displays a message indicating that it is still responsive.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
No data available to read; server is still responsive.
```

4. Demonstration of multiple clients on a single server, namely 1 server and 2 clients (Client 1 with IP Address 172.16.108.50 and Client 2 with IP Address 172.16.108.90)

```
pratyush-parth@pratyush-parth-VirtualBox:~/Downloads/Emergency(1)/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
Received request: Police Station Number from client 172.16.108.50:58051
Received request: Police Station Number from client 172.16.108.90:45000
Received request: Ambulance Number from client 172.16.108.50:56989
```

**5. On the client side, output and response from the server on choosing option 1.**

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 1
Response from server: The Police Station Number is 911
```

**6. On the server side, output when the client makes a request of contact number of option 1.**

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
No data available to read; server is still responsive.
Received request: Police Station Number from client 172.22.153.162:39380
```

**7. On the client side, output and response from the server on choosing option 6.**

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 6
Response from server: The Blood Bank Number is 916
```

8. On the server side, output when the client makes second request of contact number of option 6. Also, it demonstrates client with repeated IP and port sending multiple requests.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
No data available to read; server is still responsive.
Received request: Police Station Number from client 172.22.153.162:55092
Received request: Blood Bank Number from client 172.22.153.162:53554
```

9. On starting the client first before starting the server and choosing option 2.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency_System$ ./client
Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 2
```

10. On the server side, this is the output on the request of client.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency_System$ ./server
Emergency server started on port 5555, waiting for client requests...
Received request: Ambulance Number from client 127.0.0.1:60286
```

11. On the client side, this is the response from the server.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency_System$ ./client
Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 2
Response from server: The Ambulance Number is 912
```

12. On the client side, output when the client chooses a text instead of appropriate numbers within 0 to 6.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: abcd
Invalid input. Please enter a number between 0 and 6.
```

13. On the client side, output when the client chooses a number outside the range 1 to 6.

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 8
Invalid choice. Please enter a number between 1 and 6.
```

14. On the client side, on choosing 0, client terminates .

```
pratyush_parth@LAPTOP-VEBSJD0U:~/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 0
Exiting the client program.
```

**Apart from these cases,**

- In case of any network issue, when the server is temporarily unreachable and client sends a request, the client handles the error gracefully and displays the message ‘Error receiving data from server.’
- On checking the server timeout test, if the client makes a request after a period of inactivity, the server correctly responds to the request without requiring a restart.
- In case of test with maximum data size, i.e., buffer size limit, the server handles the buffer size without crashing, responding correctly if the message size is within the limit.

## **DEMONSTRATION OF HANDLING MULTIPLE CLIENTS ON A SINGLE SERVER**

We successfully handled multiple clients on different systems from a single server, where we had 1 server and 3 clients, namely Client 1 with IP Address 172.16.108.50, Client 2 with IP Address 172.16.108.90 and Client 3 with IP Address 172.16.108.53 respectively, which we can clearly observe from the further screenshots in the next page.

```

Oct 21 00:18
pratyush-parth@pratyush-parth-VirtualBox:~/Downloads/Emergency(1)/Emergency$ ./server
Emergency server started on port 5555, waiting for client requests...
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
Received request: Police Station Number from client 172.16.108.50:58051
Received request: Police Station Number from client 172.16.108.90:45060
Received request: Ambulance Number from client 172.16.108.50:56989
No data available to read; server is still responsive.
No data available to read; server is still responsive.
Received request: Ambulance Number from client 172.16.108.90:35251
Received request: Fire Station Number from client 172.16.108.50:56910
Received request: Fire Station Number from client 172.16.108.90:40196
Received request: Food Delivery Number from client 172.16.108.50:41768
Received request: Vehicle Repair Number from client 172.16.108.90:37538
Received request: Blood Bank Number from client 172.16.108.50:68360
No data available to read; server is still responsive.
Received request: Vehicle Repair Number from client 172.16.108.90:51355
Received request: Police Station Number from client 172.16.108.50:43129
No data available to read; server is still responsive.
Received request: Ambulance Number from client 172.16.108.50:51247
No data available to read; server is still responsive.
Received request: Food Delivery Number from client 172.16.108.50:44252
Received request: Food Delivery Number from client 172.16.108.50:43565
Received request: Fire Station Number from client 172.16.108.50:38838
Received request: Food Delivery Number from client 172.16.108.90:59697
No data available to read; server is still responsive.
Received request: Police Station Number from client 172.16.108.90:46543
Received request: Vehicle Repair Number from client 172.16.108.50:34689
Received request: Ambulance Number from client 172.16.108.90:59806
Received request: Fire Station Number from client 172.16.108.90:59806
Received request: Blood Bank Number from client 172.16.108.90:58050
Received request: Vehicle Repair Number from client 172.16.108.50:42829
Received request: Food Delivery Number from client 172.16.108.90:68889
Received request: Fire Station Number from client 172.16.108.53:57424
Received request: Fire Station Number from client 172.16.108.50:46159
Received request: Blood Bank Number from client 172.16.108.90:44865
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
Received request: Blood Bank Number from client 172.16.108.90:58607
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
No data available to read; server is still responsive.
Received request: Vehicle Repair Number from client 172.16.108.53:47786

```

Fig: Server handling multiple clients parallelly

```

Oct 21 00:18
pratyush-parth@pratyush-parth-VirtualBox:~/Downloads/Emergency(1)/Emergency$ ./client
Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
> Enter your choice: 1
Response from server: The Police Station Number is 911

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
> Enter your choice: 2
Response from server: The Ambulance Number is 912

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
> Enter your choice: 6
Response from server: The Blood Bank Number is 916

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
> Enter your choice: 7
Invalid choice. Please enter a number between 1 and 6.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number

```

Fig: Client 1 with IP Address 172.16.108.50

```
Oct 21 00:20
ayush@ayush-VirtualBox:~/Downloads/Emergency-2/Emergency
client client.c server server.c
ayush@ayush-VirtualBox:~/Downloads/Emergency-2/Emergency$ gcc client.c -o client
ayush@ayush-VirtualBox:~/Downloads/Emergency-2/Emergency$ ./client

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 1
Response from server: The Police Station Number is 911

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 2
Response from server: The Ambulance Number is 912.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 3
Response from server: The Fire Station Number is 913.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 4
Response from server: The Vehicle Repair Number is 914.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 5
Response from server: The Food Delivery Number is 915.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 6
Response from server: The Blood Bank Number is 916.
```

Fig: Client 2 with IP Address 172.16.108.90

```
Oct 20 22:55
client.c - Emergency - Visual Studio Code
File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
satyan@satyan-HP-Pavilion-Gaming-Laptop-15-ec2xxx:~/Downloads/Emergency (1)/Emergency$ ./cl

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 5
Response from server: The Food Delivery Number is 915

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 3
Response from server: The Fire Station Number is 913.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 4
Response from server: The Vehicle Repair Number is 914.

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 1
Response from server: The Police Station Number is 911

Enter the service you need:
1. Police Station Number
2. Ambulance Number
3. Fire Station Number
4. Vehicle Repair Number
5. Food Delivery Number
6. Blood Bank Number
Type '0' to exit
Enter your choice: 6
Response from server: The Blood Bank Number is 916.
```

Fig: Client 3 with IP Address 172.16.108.53

\*\*\*\*\*THANK\*\*\*\*\*  
\*\*\*\*\*YOU\*\*\*\*\*