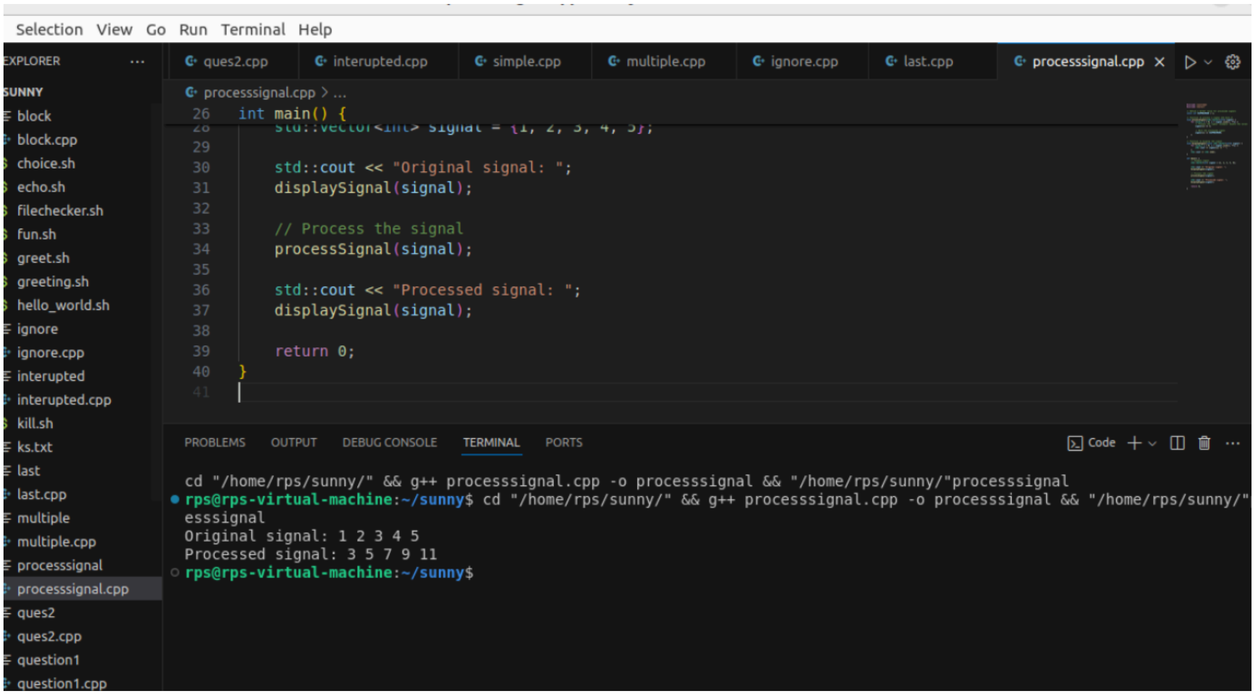
SUNNY KUMAR
24 JULY TASK
LSP

process a signal and mark

```
#include <iostream>
#include <vector>

// Define a marker value for processed signals
const int SIGPROCMARK = 1;

// Function to process a signal and mark it
void processSignal(std::vector<int>& signal) {
    for (size_t i = 0; i < signal.size(); ++i) {
        // Process the signal (example: double the value)
        signal[i] *= 2;

        // Mark the processed signal
        signal[i] |= SIGPROCMARK;
    }
}

// Function to display the signal
void displaySignal(const std::vector<int>& signal) {
    for (size_t i = 0; i < signal.size(); ++i) {
        std::cout << signal[i] << " ";
    }
    std::cout << std::endl;
}

int main() {
    // Example signal
    std::vector<int> signal = {1, 2, 3, 4, 5};

    std::cout << "Original signal: ";
    displaySignal(signal);

    // Process the signal
    processSignal(signal);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}
```



```cpp
int main() {
    std::vector<int> signal = {1, 2, 3, 4, 5};

    std::cout << "Original signal: ";
    displaySignal(signal);

    // Process the signal
    processSignal(signal);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}
```

```
cd "/home/rps/sunny/" && g++ processsignal.cpp -o processsignal && "/home/rps/sunny/"processsignal
rps@rps-virtual-machine:~/sunny$ cd "/home/rps/sunny/" && g++ processsignal.cpp -o processsignal && "/home/rps/sunny/"
esssignal
Original signal: 1 2 3 4 5
Processed signal: 3 5 7 9 11
rps@rps-virtual-machine:~/sunny$
```

Q. task is to implement a function to process a signal and mark the processed elements using a specific marker. The signal is represented as a vector of integers. You need to:

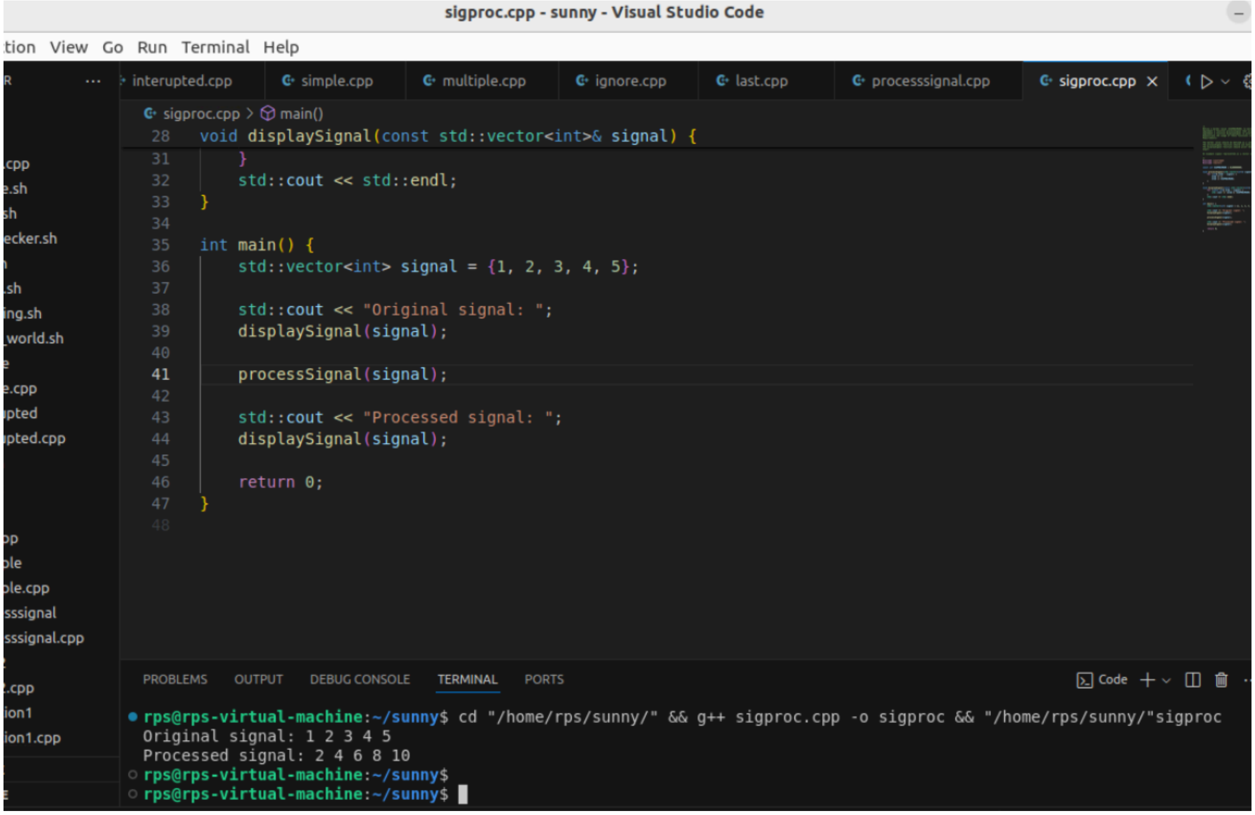
Define a marker value (SIGPROCMARK) to mark the processed signal elements.
Implement a function processSignal that processes each element of the signal by doubling its value and then marking it with SIGPROCMARK.
Implement a function displaySignal to print the signal values to the console.
Demonstrate the usage of these functions in a main function with an example signal.
Requirements:

The marker value should be defined as a constant.
The processSignal function should use bitwise operations to mark the processed elements.
The displaySignal function should print the signal values separated by spaces.
Input:

An example signal represented as a vector of integers, e.g., {1, 2, 3, 4, 5}.

```
#include <iostream>
#include <vector>
```

```
const int SIGPROCMARK = 0x80000000;


void processSignal(std::vector<int>& signal) {
    for (int& elem : signal) {

        elem *= 2;

        elem |= SIGPROCMARK;
    }
}


void displaySignal(const std::vector<int>& signal) {
    for (const int& elem : signal) {

        std::cout << (elem & ~SIGPROCMARK) << " ";
    }
    std::cout << std::endl;
}

int main() {

    std::vector<int> signal = {1, 2, 3, 4, 5};

    std::cout << "Original signal: ";
    displaySignal(signal);


    processSignal(signal);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}
```



```cpp
void displaySignal(const std::vector<int>& signal) {
    }
    std::cout << std::endl;
}

int main() {
    std::vector<int> signal = {1, 2, 3, 4, 5};

    std::cout << "Original signal: ";
    displaySignal(signal);

    processSignal(signal);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}
```

```
rps@rps-virtual-machine:~/sunny$ cd "/home/rps/sunny/" && g++ sigproc.cpp -o sigproc && "/home/rps/sunny/"sigproc
Original signal: 1 2 3 4 5
Processed signal: 2 4 6 8 10
rps@rps-virtual-machine:~/sunny$
rps@rps-virtual-machine:~/sunny$
```

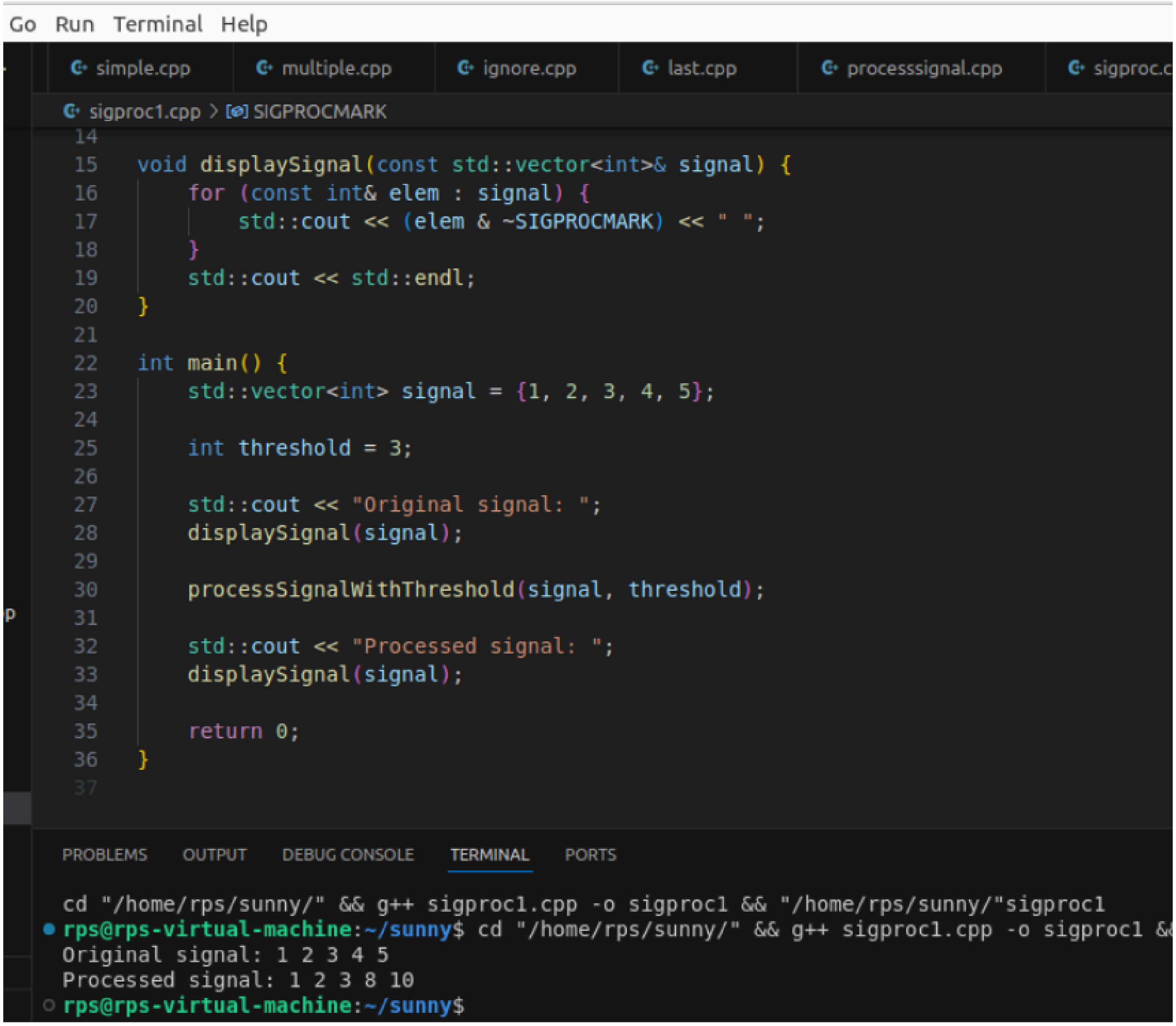
Q. Signal Processing with Threshold Marking
You are tasked with extending the signal processing project to include a threshold marking mechanism. Your goal is to:

Define a marker value (SIGPROCMARK) to mark the processed signal elements.
Implement a function processSignalWithThreshold that processes each element of the signal by doubling its value only if it is greater than a given threshold, and then marking it with SIGPROCMARK.
Implement a function displaySignal to print the signal values to the console.
Demonstrate the usage of these functions in a main function with an example signal and a threshold value.
Requirements:

The marker value should be defined as a constant.
The processSignalWithThreshold function should double the value of each element that exceeds the threshold and use bitwise operations to mark the processed elements.
The displaySignal function should print the signal values separated by spaces.

```
#include <iostream>
#include <vector>
```

```
const int SIGPROCMARK = 0x80000000;

void processSignalWithThreshold(std::vector<int>& signal, int threshold) {
    for (int& elem : signal) {
        if (elem > threshold) {

            elem *= 2;

            elem |= SIGPROCMARK;
        }
    }
}


void displaySignal(const std::vector<int>& signal) {
    for (const int& elem : signal) {

        std::cout << (elem & ~SIGPROCMARK) << " ";
    }
    std::cout << std::endl;
}

int main() {

    std::vector<int> signal = {1, 2, 3, 4, 5};


    int threshold = 3;

    std::cout << "Original signal: ";
    displaySignal(signal);

       processSignalWithThreshold(signal, threshold);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}
```



```cpp

void displaySignal(const std::vector<int>& signal) {
    for (const int& elem : signal) {
        std::cout << (elem & ~SIGPROCMARK) << " ";
    }
    std::cout << std::endl;
}

int main() {
    std::vector<int> signal = {1, 2, 3, 4, 5};

    int threshold = 3;

    std::cout << "Original signal: ";
    displaySignal(signal);

    processSignalWithThreshold(signal, threshold);

    std::cout << "Processed signal: ";
    displaySignal(signal);

    return 0;
}

```

```
cd "/home/rps/sunny/" && g++ sigproc1.cpp -o sigproc1 && "/home/rps/sunny/"sigproc1
● rps@rps-virtual-machine:~/sunny$ cd "/home/rps/sunny/" && g++ sigproc1.cpp -o sigproc1 &&
Original signal: 1 2 3 4 5
Processed signal: 1 2 3 8 10
○ rps@rps-virtual-machine:~/sunny$
```

Q. Develop a C++ application that demonstrates effective signal handling using SIGALRM, SIGDEFAULT, and SIG_IGN. The program should:

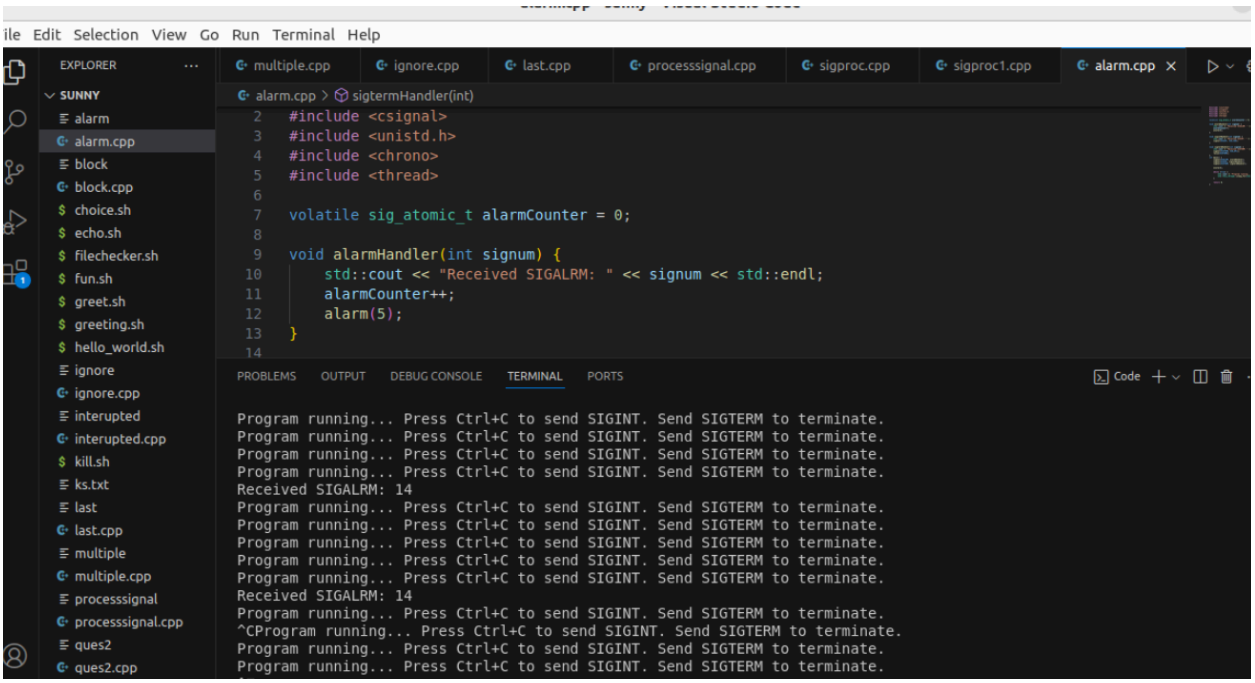
Set up a timer using alarm() to generate a SIGALRM signal after a specified interval.
Define a signal handler function to process the SIGALRM signal and perform specific actions, such as printing a message, updating a counter, or triggering an event.
Implement logic to handle other signals (e.g., SIGINT, SIGTERM) using SIGDEFAULT or SIG_IGN as appropriate.
Explore the behavior of the application under different signal combinations and handling strategies.
Additional Considerations:

Consider the impact of signal handling on program execution and potential race conditions.
Investigate the use of sigaction for more advanced signal handling capabilities.

Explore the application of signal handling in real-world scenarios, such as timeouts, asynchronous events, and error handling.

```
#include <iostream>
#include <csignal>
#include <unistd.h>
#include <chrono>
#include <thread>

volatile sig_atomic_t alarmCounter = 0;

void alarmHandler(int signum) {
   std::cout << "Received SIGALRM: " << signum << std::endl;
   alarmCounter++;
   alarm(5);
}

void sigintHandler(int signum) {
   std::cout << "Received SIGINT: " << signum << ". Ignoring." <<
std::endl;
   signal(SIGINT, SIG_IGN);
}

void sigtermHandler(int signum) {
   std::cout << "Received SIGTERM: " << signum << ". Exiting." <<
std::endl;
   signal(SIGTERM, SIG_DFL);
   raise(SIGTERM);
}
int main() {
   signal(SIGALRM, alarmHandler);
   signal(SIGINT, sigintHandler);
   signal(SIGTERM, sigtermHandler);

   alarm(5);

   while (true) {
       std::cout << "Program running... Press Ctrl+C to send SIGINT. Send
SIGTERM to terminate." << std::endl;
```

```
        std::this_thread::sleep_for(std::chrono::seconds(1));
    }

    return 0;
}
```



```
#include <csignal>
#include <unistd.h>
#include <chrono>
#include <thread>

volatile sig_atomic_t alarmCounter = 0;

void alarmHandler(int signum) {
    std::cout << "Received SIGALRM: " << signum << std::endl;
    alarmCounter++;
    alarm(5);
}
```

```
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Received SIGALRM: 14
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Received SIGALRM: 14
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
^CProgram running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
Program running... Press Ctrl+C to send SIGINT. Send SIGTERM to terminate.
```

```
#include <iostream>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <unistd.h>
#include <cstring>

#define PORT 8080

int main() {
    int server_fd, new_socket;
    struct sockaddr_in address;
    int opt = 1;
    int addrlen = sizeof(address);
    char buffer[1024] = {0};
    const char *hello = "Hello from server";
    // Creating socket file descriptor
    if ((server_fd = socket(AF_INET, SOCK_STREAM, 0)) == 0) {
        perror("socket failed");
        exit(EXIT_FAILURE);
    }

    // Forcefully attaching socket to the port 8080
    if (setsockopt(server_fd, SOL_SOCKET, SO_REUSEADDR | SO_REUSEPORT, &opt,
sizeof(opt))) {
        perror("setsockopt");
        exit(EXIT_FAILURE);
    }
    address.sin_family = AF_INET;
    address.sin_addr.s_addr = INADDR_ANY;
    address.sin_port = htons(PORT);

    // Forcefully attaching socket to the port 8080
    if (bind(server_fd, (struct sockaddr *)&address, sizeof(address)) < 0) {
        perror("bind failed");
        exit(EXIT_FAILURE);
    }
    if (listen(server_fd, 3) < 0) {
        perror("listen");
        exit(EXIT_FAILURE);
    }
    if ((new_socket = accept(server_fd, (struct sockaddr *)&address, (socklen_t *)&addrlen)) < 0)
{
        perror("accept");
        exit(EXIT_FAILURE);
    }
    read(new_socket, buffer, 1024);
    std::cout << "Message from client: " << buffer << std::endl;
    send(new_socket, hello, strlen(hello), 0);
    std::cout << "Hello message sent\n";
    close(new_socket);
    close(server_fd);
    return 0;
}
```

```
#include <iostream>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <cstring>

#define PORT 8080

int main() {
    int sock = 0, valread;
    struct sockaddr_in serv_addr;
    const char *hello = "Hello from client";
    char buffer[1024] = {0};

    if ((sock = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
        std::cout << "Socket creation error" << std::endl;
        return -1;
    }

    serv_addr.sin_family = AF_INET;
    serv_addr.sin_port = htons(PORT);

    // Convert IPv4 and IPv6 addresses from text to binary form
    if (inet_pton(AF_INET, "127.0.0.1", &serv_addr.sin_addr) <= 0) {
        std::cout << "Invalid address/ Address not supported" << std::endl;
        return -1;
    }

    if (connect(sock, (struct sockaddr *)&serv_addr, sizeof(serv_addr)) < 0) {
        std::cout << "Connection Failed" << std::endl;
        return -1;
    }
    send(sock, hello, strlen(hello), 0);
    std::cout << "Hello message sent\n";
    valread = read(sock, buffer, 1024);
    std::cout << "Message from server: " << buffer << std::endl;
    close(sock);
    return 0;
}
```

Chat client and server code in c++

server

```
#include <iostream>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <unistd.h>
#include <cstring>

#define PORT 8080

void handle_client(int client_socket) {
    char buffer[1024] = {0};
    while (true) {

        int valread = read(client_socket, buffer, 1024);
        if (valread <= 0) {
            std::cout << "Client disconnected" << std::endl;
            break;
        }
        std::cout << "Client: " << buffer << std::endl;


        std::string server_message;
        std::cout << "Server: ";
        std::getline(std::cin, server_message);
        send(client_socket, server_message.c_str(), server_message.length(), 0);
    }
    close(client_socket);
}

int main() {
    int server_fd, new_socket;
    struct sockaddr_in address;
    int opt = 1;
    int addrlen = sizeof(address);


    if ((server_fd = socket(AF_INET, SOCK_STREAM, 0)) == 0) {
        perror("socket failed");
        exit(EXIT_FAILURE);
    }
    if (setsockopt(server_fd, SOL_SOCKET, SO_REUSEADDR | SO_REUSEPORT, &opt, sizeof(opt))) {
        perror("setsockopt");
        exit(EXIT_FAILURE);
    }
    address.sin_family = AF_INET;
    address.sin_addr.s_addr = INADDR_ANY;
    address.sin_port = htons(PORT);


    if (bind(server_fd, (struct sockaddr *)&address, sizeof(address)) < 0) {
        perror("bind failed");
        exit(EXIT_FAILURE);
    }
    if (listen(server_fd, 3) < 0) {
        perror("listen");
        exit(EXIT_FAILURE);
    }
    std::cout << "Server listening on port " << PORT << std::endl;

    if ((new_socket = accept(server_fd, (struct sockaddr *)&address, (socklen_t *)&addrlen)) < 0) {
        perror("accept");
        exit(EXIT_FAILURE);
    }
    std::cout << "Accepted a new connection" << std::endl;

    handle_client(new_socket);

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

client

```
#include <iostream>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <cstring>

#define PORT 8080
```

```
int main() {
    int sock = 0;
    struct sockaddr_in serv_addr;
    char buffer[1024] = {0};

    if ((sock = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
        std::cout << "Socket creation error" << std::endl;
        return -1;
    }

    serv_addr.sin_family = AF_INET;
    serv_addr.sin_port = htons(PORT);

      if (inet_pton(AF_INET, "127.0.0.1", &serv_addr.sin_addr) <= 0) {
        std::cout << "Invalid address/ Address not supported" << std::endl;
        return -1;
    }

    if (connect(sock, (struct sockaddr *)&serv_addr, sizeof(serv_addr)) < 0) {
        std::cout << "Connection Failed" << std::endl;
        return -1;
    }

    while (true) {
              std::string client_message;
        std::cout << "Client: ";
        std::getline(std::cin, client_message);
        send(sock, client_message.c_str(), client_message.length(), 0);

               int valread = read(sock, buffer, 1024);
        if (valread <= 0) {
            std::cout << "Server disconnected" << std::endl;
            break;
        }
        std::cout << "Server: " << buffer << std::endl;
        memset(buffer, 0, sizeof(buffer));
    }

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