

■ C++ Network Programming Roadmap (Beginner to Advanced)

This is a complete syllabus and learning plan for mastering network programming in C++ from scratch. It includes weekly plans, hands-on tasks, exercises, and mini-projects. Perfect for self-paced learning.

■ Prerequisites

- 1 Basic C++ (variables, loops, functions, file I/O)
- 2 Familiarity with terminal/command line
- 3 Linux/WSL/Mac preferred for socket programming
- 4 Basic understanding of computer networks (helpful but not mandatory)

■■ Tools Required

- 1 g++ (C++ compiler)
- 2 Linux terminal or WSL on Windows
- 3 Libraries: , , ,

■ *Week 1: Introduction + TCP Client/Server*

- 1 Topics: Network basics, IP, Port, Sockets, TCP vs UDP
- 2 Tasks: Create socket, basic TCP client & server, message exchange
- 3 Exercise: Try different ports/IPs, test longer messages
- 4 Mini Project: Single-message chat server-client

■ *Week 2: TCP Deep Dive*

- 1 Topics: bind(), listen(), accept(), connect(), send(), recv()
- 2 Tasks: Build reusable functions, basic multi-client (threaded)
- 3 Exercise: Menu-driven chat, message variations
- 4 Mini Project: Two-way terminal chat

■ *Week 3: UDP Programming*

- 1 Topics: UDP basics, SOCK_DGRAM, sendto(), recvfrom()
- 2 Tasks: UDP echo server, timestamped messages
- 3 Exercise: Packet experiments
- 4 Mini Project: Fast Messaging App

■ *Week 4: Multi-Client TCP Server*

- 1 Topics: fork()/threads, multiple sockets
- 2 Tasks: Handle multiple connections, print client IPs
- 3 Exercise: Broadcasting messages
- 4 Mini Project: Group Chat Server

■ **Week 5: File Transfer**

- 1 Topics: File I/O + send/recv over socket
- 2 Tasks: Send and receive text/binary files
- 3 Exercise: Transfer images/PDFs
- 4 Mini Project: File Transfer Tool

■ **Week 6: Error Handling + Protocols**

- 1 Topics: perror(), errno, custom headers/protocols
- 2 Tasks: Retry logic, custom message formats
- 3 Exercise: Client disconnect handling
- 4 Mini Project: Custom Protocol Chat

■ **Week 7: C++ Classes + Socket Library**

- 1 Topics: OOP for sockets, client/server classes
- 2 Tasks: Reusable class-based structure
- 3 Exercise: Connection manager, logging
- 4 Mini Project: Reusable Chat Framework

■ **Week 8: Final Projects + Advanced Topics**

- 1 Topics: select(), poll(), OpenSSL (optional)
- 2 Final Projects: Multi-client chat, File sharing, Multiplayer game, Port scanner