



MANIPAL INSTITUTE OF TECHNOLOGY
BENGALURU
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A Mini Project

on

UDP-based Online Quiz System using Socket Programming

Submitted by

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Abstract & Objectives

Abstract:

This project implements an Online Quiz System using the UDP protocol and socket programming. The system allows a server to send quiz questions to clients over a local network, with each client submitting their responses in real-time. The implementation demonstrates how UDP can be used for lightweight, low-latency communication where minor data loss is acceptable. The project strengthens understanding of socket programming, client-server architecture, and real-world UDP applications. The system was implemented in C using UDP sockets to demonstrate client-server communication.

Objectives

- To design and implement a quiz system using the UDP protocol.
- To demonstrate client-server communication.
- To analyze the advantages and limitations of UDP in real-time data transmission.
- To understand connectionless communication and its performance characteristics.
- To create a functional and interactive model simulating online quiz behavior.

Introduction & Problem Statement

Introduction:

In today's digital world, online quiz platforms play a major role in education and skill assessment. Most of these systems use reliable communication protocols like TCP to ensure data delivery. However, for applications prioritizing speed and real-time interaction, UDP can be more effective. UDP's connectionless nature minimizes delays, making it suitable for games, quizzes, and streaming systems.

This project focuses on developing an online quiz platform where a server sends multiple-choice questions to clients using UDP, and clients respond with their chosen answers. The system highlights the behavior and performance of UDP sockets in a real-time scenario.

Problem Statement:

The goal of this project is to design and implement a real-time, low-latency quiz system using the UDP protocol. The system should enable:

- Server broadcasting quiz questions to clients.
- Clients responding instantly with answers.
- The server evaluating responses and returning final scores.

This project addresses the challenge of building a functional application that operates effectively despite UDP's unreliability, emphasizing performance and simplicity over guaranteed message delivery.

Methodology / Design / Implementation

Technologies Used:

Technologies: C Programming Language, Socket API (BSD Sockets), UDP Protocol.

Tools: CodeBlocks / GCC Compiler / Visual Studio Code (with C extension)

Operating System: Windows

Steps Followed:

1. *Server Setup:*

A UDP socket is created and bound to a specific host and port to listen for client messages.

2. *Quiz Data Structure:*

A list of questions, options, and correct answers is defined for the quiz.

3. *Client Connection & Registration:*

Clients send an initial “connect” message, which the server acknowledges and registers.

4. *Data Flow:*

The server sends each question sequentially to clients.

5. *Answer Handling:*

Clients reply with their chosen answers, which the server verifies and scores.

6. *Result Display:*

After all questions are answered, the server sends the final score back to each client.

Results, Conclusion & References

Results:

- *Functional System*: A fully working UDP-based online quiz system was developed and tested.
- *Performance*: The system showed very low latency, confirming UDP's speed advantage.
- *Observation*: Occasional packet drops were observed, demonstrating UDP's unreliable nature.
- *Scalability*: Multiple clients could participate simultaneously with minimal delay.

Conclusion:

The program was compiled and executed successfully in C using the GCC compiler. The client and server communicated using UDP sockets with minimal delay. The quiz server and clients were run on separate terminal windows to simulate real-time UDP communication. The project successfully implemented a real-time online quiz using UDP and socket programming. It demonstrated that UDP is suitable for applications requiring fast, connectionless communication, even if some data loss occurs.

The project deepened understanding of practical socket programming concepts and the trade-offs between TCP (reliability) and UDP (speed).

Future Scope:

- Implement multicast or broadcast for efficient message delivery.
- Add a GUI for user-friendly interaction.
- Introduce a reliability layer with sequence numbers and acknowledgments.
- Extend the system to support quizzes over the internet instead of LAN.

References:

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5. Beej's Guide to Network Programming (2019). *Using Sockets in C*. <https://beej.us/guide/bgnet/>