CS5700 Fundamentals of Computer Networking

Course Project Log Book

Team Members: Yiwei Tao, Yu Wu, Xilong Cai

Week 1 [Oct 22 - Oct 28]

Meeting 1 [Oct 25, 4PM - 6PM]:

Discussions on Environment Setup and Role Assignment: Discussed the creation of a UDPFileSender class, focusing on its constructor which initializes key variables like local and remote IP, ports, and sequence numbers. This class is crucial for establishing the initial connection and sending data over UDP.

Yiwei Tao: Focused on initial role assignments and project documentation.
Xilong Cai: Python development environment setup, began researching RAW sockets.
Yu Wu: Concentrated on rawUDPClient development, particularly the 'send_and_receive' function.

Meeting 2 [Oct 28, 3PM - 6PM]:

RAW Sockets Research:
Explored the usage of socket.socket(socket.AF_INET, socket.SOCK_RAW, socket.IPPROTO_UDP) for creating a raw socket in Python, which is essential for sending and receiving custom-made UDP packets.

Yiwei Tao: Continued project documentation, focusing on RAW socket research.
Xilong Cai: Deepened research on RAW sockets, focusing on packet parser, IP and UDP header construction, checksum verification, and UI design.
Yu Wu: Continued development of rawUDPClient, focusing on IP and UDP header construction and checksum verification.

Week 2 [Oct 29 - Nov 4]

Meeting 3 [Oct 31, 2PM - 3PM]:

Begin Coding for rawUDPClient and rawUDPServer:
Started implementing the receiver_thread and processor_thread functions in UDPFileSender for handling incoming UDP packets and processing them, respectively.
Initiated the development of the packet parsing functionality in the packetParser class.

Yiwei Tao: Documented team's strategy and progress, focusing on the rawUDPServer.
Xilong Cai: Progressed in coding the rawUDPServer, emphasizing socket operations and error handling.

Yu Wu: Advanced coding of rawUDPClient, working on IP and UDP header construction and checksum verification.

Meeting 4 [Nov 3, 10:30AM- 1PM]:

Testing Phase 1 functionalities in Mininet, particularly in error and code review.
Focused on establishing basic communication and identifying issues with checksums and packet loss during testing in Mininet. Focused on error handling and socket timeout management in receiver_thread using except socket.timeout.

Week 3 [Nov 5 - Nov 11]

Meeting 5 & 6 [Nov 5 & Nov 9]:

Yiwei Tao: Began preparing the documentation for Phase 2, focusing on the requirements for reliable data transfer mechanisms.
Xilong Cai: Finalized rawUDPServer development for Phase 1 and initiated planning for Phase 2, particularly on retransmission mechanisms for reliable data transfer.
Yu Wu: Successfully completed the development of rawUDPClient for Phase 1 and started planning for Phase 2, focusing on sequence and acknowledgement numbers.

Completed the send_and_receive method in UDPFileSender which includes sending data, handling acknowledgements, and managing sequence numbers.

Week 4 [Nov 12 - Nov 18]

Meeting 7 [Nov 13] & Meeting 8 [Nov 16]:

Yiwei Tao: Documented the design and implementation of the UDP file sender, began formulating test scenarios for Phase 2.
Xilong Cai: Led the design and initial implementation of the UDP file sender, focusing on reliable file transfer components.
Yu Wu: Assisted in implementing the UDP file sender, conducted preliminary tests with small text files, focusing on error handling and packet loss.

UDP File Sender's Design and Implementation:
Discussed and finalized the udp_send method in UDPFileSender, which includes packing data into UDP packets, creating pseudo-headers, and computing checksums.

Week 5 [Nov 19 - Nov 25]

Meeting 9 & 10 [Nov 20 & Nov 23]:

Performance Optimization and Multi-threading:
Integrated multi-threading in the UDPFileSender class to enhance data processing and transmission speed.

Week 6 [Nov 26 - Dec 3]

Meeting 11 & 12 [Nov 27 & Nov 30]:

Yiwei: Compiled comprehensive testing results. Initiated the design of a user interface with fields for IP address, port number, and file name, complemented by a progress bar.
Xilong: Collaborated in final system adjustments for Phase 2. Assisted Yiwei in conceptualizing the user interface design and finalized the ui design.
Yu: Conducted final testing and optimizations. Contributed to the user interface design, focusing on the client-side interface and real-time feedback mechanisms.

Comprehensive Testing and UI Implementation:
Conducted extensive testing to ensure the stability of the multi-threaded implementation.
Began integrating a user interface design, focusing on real-time feedback during file transfer.

Meeting 13 [Dec 3, 7PM - 8:30PM]:

Final Adjustments and Bug Fixes:
Implemented IPPROTO_RAW in the udp_send method for enhanced control over packet transmission.
Fixed bugs related to sequence and acknowledgement number handling in send_and_receive. Addressed the “Message too long” error by adjusting MTU settings.