TCP/IP Simulator Project Report

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1 Introduction

Virtual Simulation Labs is an interactive tool designed to simulate TCP/IP networks, offering users a comprehensive platform to explore networking concepts and protocols. From designing custom network topologies to simulating data transmission, Virtual Simulation Labs provides an immersive learning experience for network enthusiasts and students alike.

2 Key Features

2.1 Topology Design

Virtual Simulation Labs allows users to create custom network topologies or choose from predefined arrangements such as star and mesh. With an intuitive interface powered by React Flow, users can easily add, connect, and configure network components to design their ideal network layout.

2.2 Network Components

The application features a wide range of network components, including endpoints (laptops, datacenters, and workstations), switches, and hubs. These components simulate real-world networking devices and their functionalities.

2.3 Control Box

The Control Box provides users with detailed insights into selected components, including information about the physical layer topology, connectivity, and data link layer statistics.

2.4 Data Sharing

Users can define various aspects of data transmission, including specifying data in binary format, choosing error detection techniques (e.g., CRC, parity), error correction methods (e.g., Hamming codes), and framing techniques (e.g., bit stuffing).

2.5 Simulation

The simulation feature enables real-time data transmission between connected components, allowing users to observe the flow of data within the network and facilitating a deeper understanding of networking principles.

3 Network Layer

3.1 Router Configuration

Users can create and configure routers within their network topologies. Routers enable communication between different network segments and facilitate the routing of data packets based on IP addresses.

3.2 IP Addressing

Virtual Simulation Labs supports the assignment of well-formatted classless IPv4 addresses to network devices. Users can configure IP addresses according to their network design requirements.

3.3 Routing Protocols

The application implements static routing, allowing users to manually define routing paths within the network topology. Additionally, Virtual Simulation Labs supports the RIP (Routing Information Protocol) for dynamic routing, enabling automatic route determination based on network changes.

4 Transport Layer

4.1 Port Numbers

Users can specify port numbers for applications running on endpoints within the simulated network. Port numbers facilitate the identification of specific applications or services that are sending or receiving data.

4.2 Sliding Window Protocol

Virtual Simulation Labs incorporates the sliding window protocol for efficient and reliable data transmission between endpoints. This protocol manages the flow control and error handling during data exchange at the transport layer.

5 Application Layer

5.1 SSH (Secure Shell)

Users can simulate Secure Shell (SSH) connections between devices within the network. SSH provides secure access to remote systems over an encrypted communication channel.

5.2 FTP (File Transfer Protocol)

Virtual Simulation Labs supports File Transfer Protocol (FTP) simulations, enabling users to transfer files between networked devices. FTP is widely used for sharing files over TCP/IP networks.

6 Conclusion

Virtual Simulation Labs offers a practical and educational platform for understanding TCP/IP networks and related concepts. By providing users with tools to design, simulate, and analyze networks, the application enhances learning and experimentation in the field of networking.

7 Tools Used

- **React.js**:
- **React Flow**:

8 References

- *Behrouz A. Forouzan*
- *Lecture Notes*
- *React Documentation and AI Tools*

Note: For more detailed information about the project, refer to the README.md file included in the project repository.
GitHub Repository: `https://github.com/rmrajesofficial/VS-Labs--TCP-IP-version-.git`