Computer Networks Assignment 2

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1 Introduction

This report presents a detailed analysis of the concepts covered in Assignment 2, focusing on network security protocols, OSI model enhancements, subnetting scenarios, and practical tools like Wireshark and firewalls.

2 Questions and Answers

2.1 Question 1

The OSI (Open Systems Interconnection) model provides a conceptual framework for understanding network communication. Let's explore its layers and functionalities.

2.1.1 Layers of the OSI Model

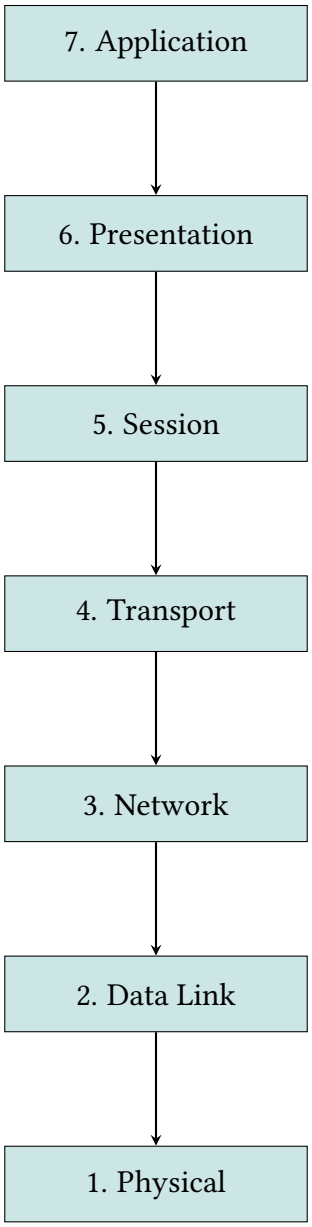

Figure 1: OSI Model Layers

The OSI model consists of seven layers, each serving specific functions:

- **Application Layer:** Provides services directly to user applications, such as email and web browsers.
- **Presentation Layer:** Handles data formatting and encryption, ensuring compatibility between different systems.
- **Session Layer:** Manages communication sessions, establishing, maintaining, and terminating connections.
- **Transport Layer:** Ensures reliable data transfer between end systems, providing error recovery and flow control.

- **Network Layer:** Routes data packets across different networks, handling logical addressing and routing.
- **Data Link Layer:** Transmits data frames over the physical medium, ensuring error-free communication within a local network.
- **Physical Layer:** Transmits raw binary data over physical cables or wireless signals, defining electrical and mechanical specifications.

2.2 Question 2

Discuss the differences between the OSI model and the TCP/IP model.

> Here are several key differences between the OSI (Open Systems Interconnection) model and the TCP/IP (Transmission Control Protocol/Internet Protocol) model:

OSI Model	TCP/IP Model
The OSI model is a theoretical framework that standardizes network functions into seven layers.	The TCP/IP model is a practical implementation that focuses on the transmission of data over networks.
The OSI model has seven layers: Physical, Data Link, Network, Transport, Session, Presentation, and Application.	The TCP/IP model has four layers: Link, Internet, Transport, and Application.
The OSI model provides clear separation between different functions and services in each layer.	The TCP/IP model often has overlapping functionalities between layers.
The OSI model is rarely implemented as a whole but serves as a guideline for network architecture.	The TCP/IP model is widely used in the Internet and is the de facto standard for network communication.
The OSI model's layer names are abstract and universal, allowing for easy comprehension and discussion of network concepts.	The TCP/IP model's layers are based on the protocols developed for the ARPANET and are more focused on practical implementation.
The OSI model is a closed model that does not directly map to existing network technologies.	The TCP/IP model is an open model that directly corresponds to the Internet and its protocols.
The OSI model includes a dedicated session layer for managing communication sessions between applications.	The TCP/IP model does not explicitly define a session layer, leaving session management to applications or protocols like HTTP.
The OSI model's transport layer provides both connection-oriented (e.g., TCP) and connectionless (e.g., UDP) communication services.	The TCP/IP model's transport layer primarily supports connection-oriented communication (TCP) and offers basic connectionless services (UDP).
The OSI model's physical layer specifies physical medium standards and electrical signaling characteristics.	The TCP/IP model does not explicitly define standards for the physical layer, adapting to various physical mediums.
The OSI model facilitates interoperability among different vendors' networking equipment.	The TCP/IP model's flexibility allows for easier adaptation to new technologies and environments.

2.3 TCP/IP Model

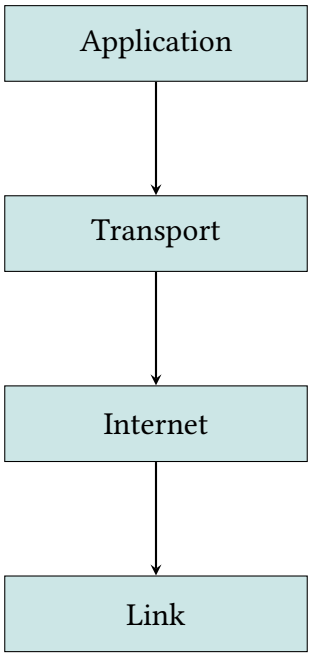

Figure 2: TCP/IP Model Layers

The TCP/IP model, as shown in Figure 2, consists of four layers:

- **Application Layer:** Provides high-level APIs for network services, including protocols like HTTP, FTP, and SMTP.
- **Transport Layer:** Manages end-to-end communication, providing reliable data transfer and error recovery using protocols like TCP and UDP.
- **Internet Layer:** Handles addressing, routing, and packet forwarding across interconnected networks (the Internet).
- **Link Layer:** Transmits data over the physical medium within a single network segment, defining protocols like Ethernet and Wi-Fi.

3 Conclusion

This assignment explored fundamental concepts in computer networks, focusing on the OSI model, TCP/IP model, and their respective roles in network communication. Understanding these models is crucial for designing, analyzing, and troubleshooting modern networks.