MIVA OPEN UNIVERSITY

Course:

Data Communication Systems and Network

Title:

The ISO-OSI Reference Model

School of Computing

LEARNING OBJECTIVES

At the end of this lesson, you should be able to:

- State the layers of the OSI model.
- Discuss the roles of each layer in the OSI model.
- Outline the data packet in each layer.
- Briefly describe the TCP/IP model.

PERSONAL GOALS FOR THIS TOPIC

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FLEX YOUR BRAIN 😊

If a network fails at the session layer, what implications might that have for higher and lower layers in the OSI model? How would this affect applications using the network?

INTRODUCTION

Open Systems Interconnection (OSI) Reference Model is a conceptual framework developed by the International Organization for Standardization (ISO) that standardises the functions of a telecommunication or computing system without regard to its underlying internal structure or technology. Its goal is to foster interoperability between different products and software by using a universally accepted set of standards.

The OSI model is structured into seven layers, each specifying particular network functions. By breaking down networking into a series of layers, it allows easier troubleshooting and understanding of how network communication works.

The OSI model

The OSI model is comprised of seven layers, each responsible for a different aspect of network communication. Each layer is dependent on the layer below it to function properly and provides services to the layer above it. The layers are organised as follows, from the lowest to the highest:

Layers of the OSI model

Physical Layer

Data Link Layer

Network Layer

Transport Layer

Session Layer

Presentation Layer

Application Layer

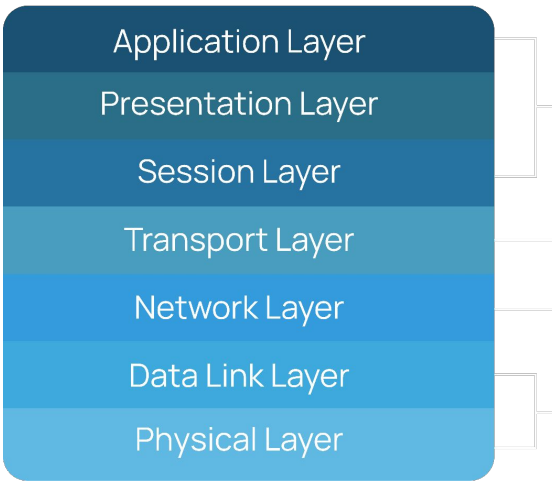
Description of the Layers

The physical layer manages the transmission of raw bits over a communications channel, starting at the bottom and working its way up. A stream of bits is then gathered by the data link layer into a bigger aggregate known as a frame. Usually, network adapters and device drivers that are installed on the node's operating system are what carry out the data connection layer.

This indicates that hosts get frames rather than raw bits. In a packet-switched network, routing between nodes is managed by the network layer. Despite being essentially the same, the unit of data transferred between nodes at this layer is usually referred to as a packet rather than a frame.

Next, the transport layer puts into practice what we have been referring to as a process-to-process channel up until this point. Instead of using packets or frames, the unit of data sent in this case is generally referred to as a message. Typically, only end hosts—not intermediate switches or routers—run the transport layer and higher layers.

Description of the Layers



The top (seventh) layer and working our way back down, we find the application layer. Application-layer protocols include things like the Hypertext Transfer Protocol (HTTP), which is the basis of the World Wide Web and is what enables web browsers to request pages from web servers. The format of data transferred between peers, such as whether an integer is 16, 32, or 64 bits long, whether the most important byte is communicated first or last, or the format of a video stream, is handled by the presentation layer, which sits below that. Lastly, to connect the possibly disparate transport streams that make up a single application, the session layer offers a namespace. For instance, a teleconferencing application could oversee the combination of an audio and video feed.

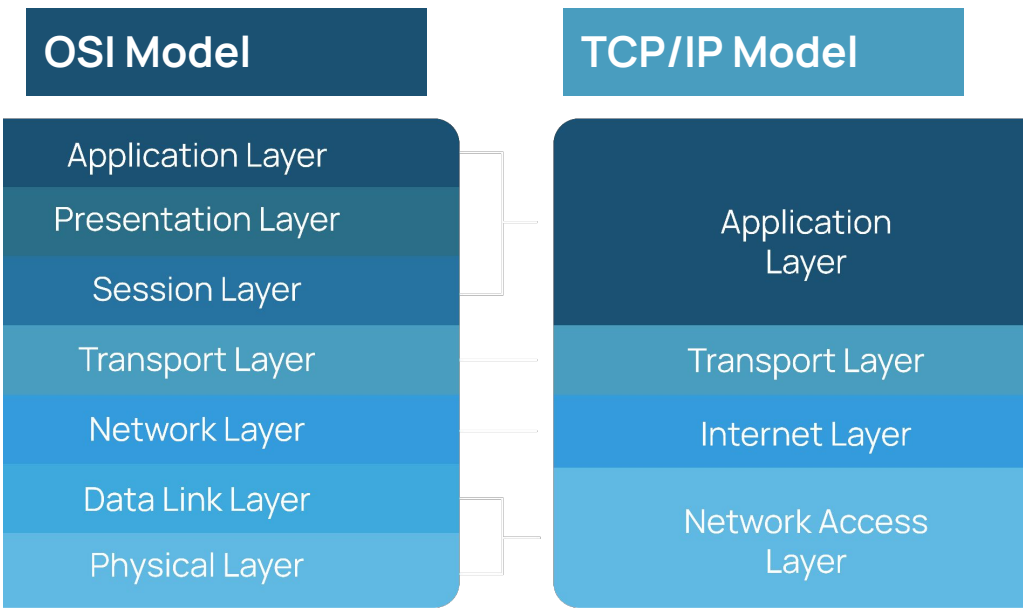
MID-LESSON QUESTION

1. Analyse the importance of the transport layer in managing error correction and flow control. Provide examples of protocols that function at this layer.

Comparison with the TCP/IP Model

The TCP/IP model is the actual model used in modern networks, especially the internet.
The TCP/IP model consolidates the OSI layers into four layers:

- Link layer
- Internet layer
- Transport layer
- Application layer



SUMMARY OF THE LESSON

- The OSI model is a conceptual framework for standardising networking functions into seven layers.
- Each layer performs specific roles in the transmission of data between devices, from physical hardware to application software.
- The physical layer handles raw bit transmission, while the application layer enables user interaction with network services.
- Error detection, data transmission, routing, and session control are managed by different layers of the model.
- The OSI model fosters interoperability, troubleshooting, and clear communication between different networking systems.
- The OSI model is often compared with the TCP/IP model, which simplifies the layers but is widely used for internet protocols.

REFERENCES

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- Kurose, J. F. (2005). Computer networking: A top-down approach featuring the internet, 3/E. Pearson Education India.

LESSON QUESTIONS

1. **Which of the following layers of the OSI model is responsible for data encryption and decryption?**

A. Transport Layer

B. Network Layer

C. Presentation Layer

D. Application Layer

2. **In which layer of the OSI model is the MAC address used for communication?**

A. Data Link Layer

B. Network Layer

C. Transport Layer

D. Application Layer

LESSON QUESTIONS

3. Which layer of the OSI model handles packet routing across different networks?

A. Physical Layer

B. Transport Layer

C. Network Layer

D. Data Link Layer

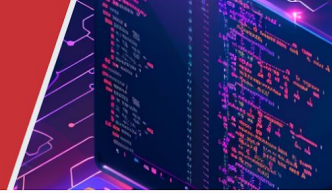
4. What is the main function of the Transport Layer in the OSI model?

A. Addressing and routing

B. Ensuring reliable data transfer and error correction

C. Data translation and encryption

D. Modulation of signals



LESSON QUESTIONS

5. Discuss the differences between the OSI and TCP/IP models and explain why the TCP/IP model is more commonly used in practice.

6. How does the Data Link Layer ensure that data is transferred error-free across a network?

Yipee! You are at the end!

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The ISO-OSI Reference Model

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