The OSI Model

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WHAT'S COVERED

In this lesson, you will learn about the seven layers of the OSI Model (Open Systems Interconnection Model) and how they are used throughout the world of computer communications.

Specifically, this lesson will cover the following:

1. OSI Model
2. Communication Process

1. OSI Model

The **OSI Model**, also known as the OSI Stack or Open Systems Interconnection Model, is a fundamental concept used in computer development to standardize interactions of devices that need to communicate with each other. Whether it involves designing computer hardware, networking hardware, or software, the OSI Model plays a role in guiding developers on how data should flow through the various levels of computer technology.

WATCH

View this video to learn each of the seven layers of the Open Systems Interconnection, or OSI, model with this easy mnemonic trick.

The OSI Model contains seven layers described in the table below:

Layer	Name	Function
7	Application	Users interact with applications that use network services to access resources.
6	Presentation	Data is encoded into a usable format and may be encrypted for privacy.
5	Session	This layer maintains communication sessions between different systems.
4	Transport	This layer determines how the data will be transmitted, using Transport

		Layer Protocol (TCP) or User Datagram Protocol (UDP).
3	Network	This layer is responsible for determining the physical path the data will take across multiple networks.
2	Data Link	This layer defines the format of data on the network and associates the physical Media Access Control (MAC) address of the network interface card with the virtual IP address of the system.
1	Physical	The physical layer is responsible for converting the data into a physical signal representing the raw bits and transmitting it to another device.

IN CONTEXT

One way to remember the seven layers in the OSI model is to use the mnemonic “Please Do Not Throw Sausage Pizza Away.” Moving in order from Layer 1 to Layer 7.:

Please	1. Physical
Do	2. Data Link
Not	3. Network
Throw	4. Transport
Sausage	5. Session
Pizza	6. Presentation
Away	7. Application

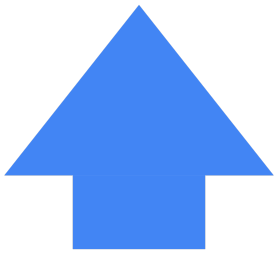
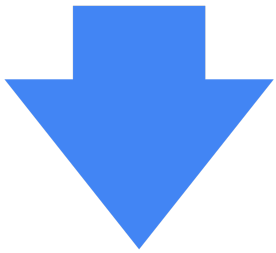
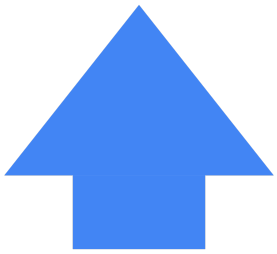
TERM TO KNOW

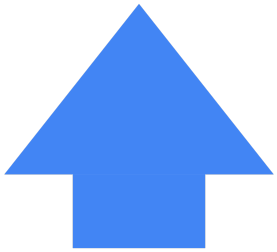
OSI Model (Open Systems Interconnection Model)
A fundamental concept that standardizes network protocols and technology. The OSI Model contains seven layers with specific responsibilities. Also called *OSI Stack*.

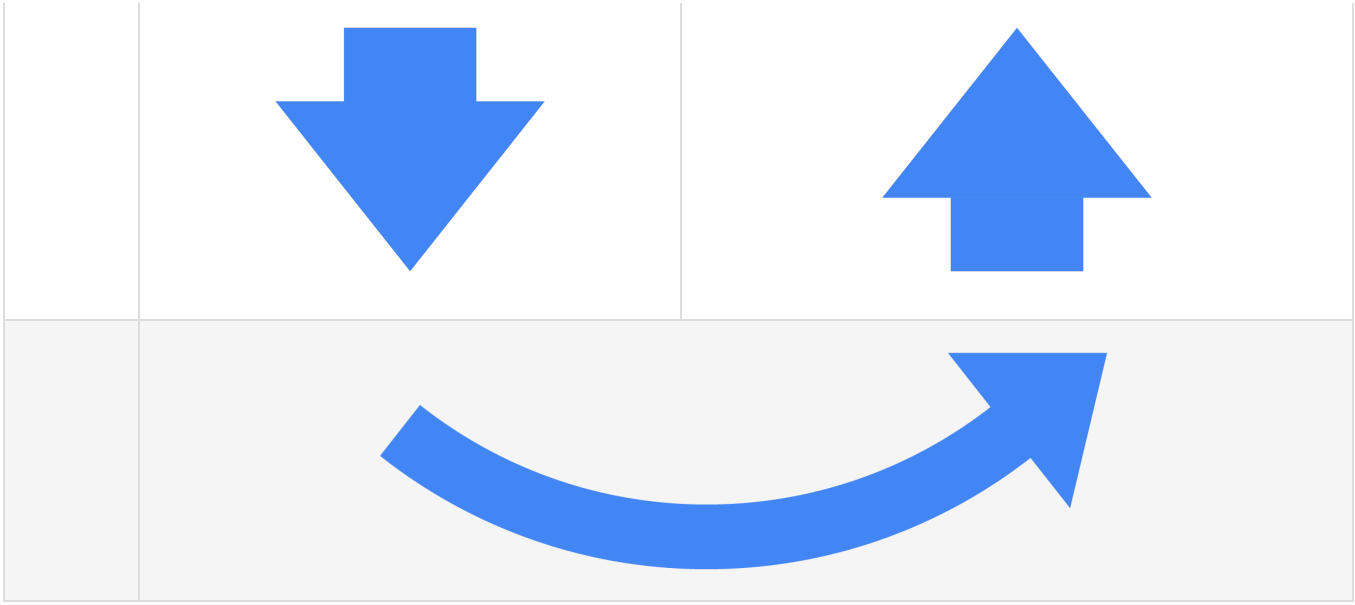
2. Communication Process

The following table shows how information is communicated through the OSI stack:

Layer	Computer A	Computer B
7	Information written by a user into a web-enabled messaging application enters the	The word “Hello” is displayed on the screen within the messaging application.

	word “Hello” into the text box and clicks Send. 	
6	The letters of the message are encoded as numbers using a character encoding set by the presentation layer. 	The presentation layer unencodes the message from numbers to the original, human-readable message “Hello”. 
5	The session layer was used to establish the connection between the user’s computer and a remote computer and associate the encoded message with the messaging session. 	Port numbers and identifiers are used to associate the incoming message with a particular application. 
4	The transport layer is used to determine how the message will be transmitted using either TCP or UDP.	The transport layer then reassembles the message using the appropriate mechanisms. For TCP, the sequence numbers are used to reassemble the original message, and any lost or damaged packets are resent by the origin. In the case of UDP, the

		packets are simply processed up to the next layer. 
3	The message is formatted into a network packet that uses IP addresses to track the origin and destination systems involved in the communication. 	The frames are then reassembled into the original network packet and the IP addresses are examined. 
2	The network packet is then segmented and formatted into data frames to be transmitted to the next device. Physical MAC addresses are used to track the frame from this device to the next connected device. 	The NIC sends the received frames to be reassembled and the MAC addresses are examined. 
1	The NIC (network interface card) converts the bits of the frame into either electrical, light, or radio signals and transmits them to the next device.	The bits are received and assembled in the NIC's memory.



KEY CONCEPT

Keep in mind that the table above only represents the data flow from the origin system to the destination system as if they were connected directly to each other. In reality, there are many other intermediate systems and networking devices that sit between the origin and destination. When the data reaches an intermediate system, the data must flow up through some, if not all, of the layers before being sent down through the layer again onto the next system. This process continues until the **network packet** finally reaches the system whose IP address matches the packet's destination IP address.

TERM TO KNOW

Network Packet
Formatted data units that contain control information and a payload of data and are transmitted across a network.

SUMMARY

In this lesson, you learned about the **OSI Model** and its role in guiding electronic communications. This also included a review of the **communication process** through the OSI Model stack as data is converted from human-readable content on screen into an electrical signal that can then be communicated through a network.

Source: This Tutorial has been adapted from "The Missing Link: An Introduction to Web Development and Programming " by Michael Mendez. Access for free at https://open.umn.edu/opentextbooks/textbooks/the-missing-link-an-introduction-to-web-development-and-programming. License: Creative Commons attribution: CC BY-NC-SA.

TERMS TO KNOW

Network Packet

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A fundamental concept that standardizes network protocols and technology. The OSI Model contains seven layers with specific responsibilities. Also called *OSI Stack*.