

# Domain Name Basics

## OSI and TCP/IP Model

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# What is the OSI model?

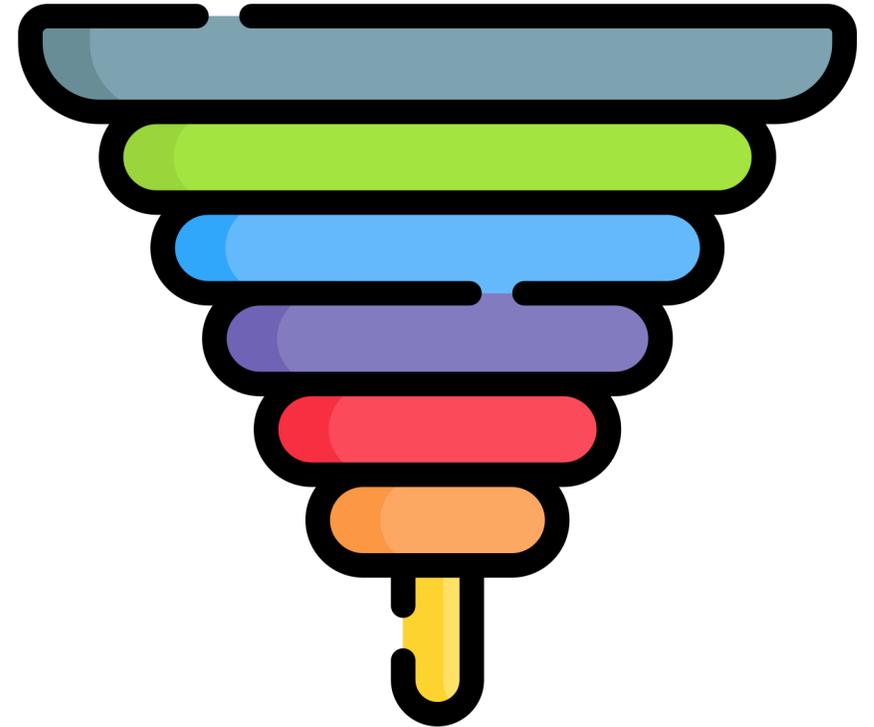
The Open Systems Interconnection (**OSI**) model is a reference model that can be used to **describe** and **define communication** between **systems**. The reference model has **seven** individual **layers**, each with clearly defined tasks.

Its development began in 1977. Since 1983 the International Telecommunication Union (ITU) and since 1984, the International Organization for Standardization (ISO) publish it as a standard.



# The Seven Layers

| Layer          | Function   |
|----------------|--|
| 1 Physical     | Physical adaptation of the bits to the transmission medium               |
| 2 Data Link    | Segmentation of data and backup with checksums                           |
| 3 Network      | Switching of packets to the next network node                            |
| 4 Transport    | Allocation of data to the application                                    |
| 5 Session      | Control and monitoring of the connection                                 |
| 6 Presentation | Conversion of data into independent formats                              |
| 7 Application  | Providing functions of the application such as the data input and output |

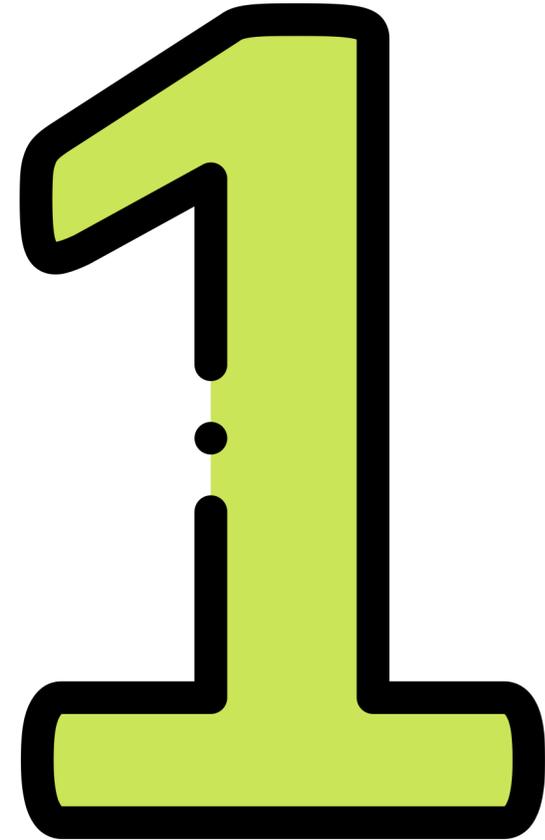


# Physical Layer

The physical layer is the lowest and is **responsible** for the **transmission** and **reception** of raw data between a device and a **physical** transmission **medium**.

It converts the digital bits into electrical, radio, or optical signals. Typical devices that operate on the physical layer are repeaters, cables, connectors, antennas, hubs, or amplifiers.

Layer 1 standards are, for example, V.24, X.21, or RS 232.



# Data Link Layer

The data link layer's task is to **ensure reliable**, i.e., mostly error-free, **transmission** and to regulate **access** to the transmission **medium**.

For this purpose, the bitstreams from layer one are divided into blocks or frames.

Typical hardware devices of layer 2 are switches or bridges. Protocols and standards of the data link layer are, for example, HDLC, ARP, or IEEE 802.11 (WLAN).



# Network Layer

On the networking layer, **connections** are **established** in circuit-switched networks, and data packets are forwarded in packet-switched networks.

One of the central tasks of the Network Layer is to **provide addresses** for communication over the network.

Routers are the typical devices of layer 3. Protocols of the network layer are, for example, IP or X.25.



# Transport Layer

In layer 4, end-to-end control of the transmitted data takes place. The transport layer can detect and avoid congestion situations and **segment data** streams.

The transport layer **provides** the **application-oriented** layers **above** it with transparent access to the data.

Therefore, layers 5 to 7 do not need to know the underlying communication networks and their properties.

The best-known protocols from layer 4 are TCP and UDP.



# Session Layer

The session layer controls the **logical connection** between two systems and prevents, for example, connection breakdowns or other problems. Using the services provided by layer 5, it is possible to **restart** and **synchronize** aborted **sessions** after the actual transport connection has failed.

Looking at the TCP/IP protocol family, protocols such as Telnet, FTP, TFTP, HTTP, or SMTP and NetBios provide the usual services and control mechanisms of layer 5.



# Presentation Layer

The presentation layer's task is to **transfer** the system-dependent representation of **data** into an independent **application form**.

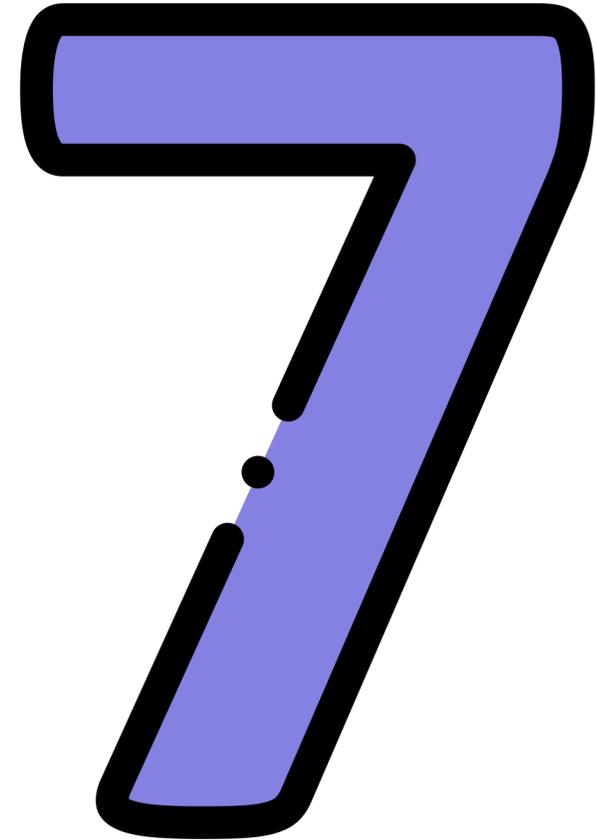
In protocols from the TCP/IP reference model such as Telnet, HTTP, NetBios, or FTP, the presentation layer's typical tasks are also implemented.



# Application Layer

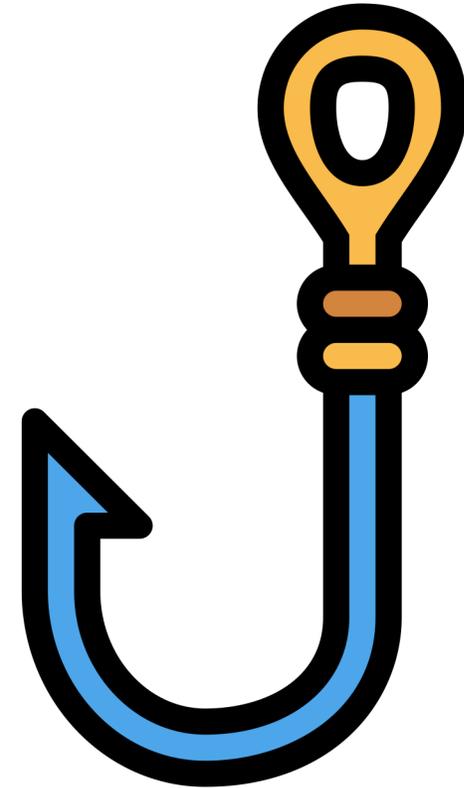
Layer 7, the application layer, completes the layer model in the direction of the application. Among other things, this layer **controls** the **input** and **output** of **data** and provides the application functions.

However, the actual application is not part of the application layer. Protocols such as Telnet, FTP, NNTP, HTTP, or SMTP fulfill layer seven functions.



# How to easily remember the layers

|               |   |              |
|---------------|---|--------------|
| <b>Please</b> | 1 | Physical     |
| <b>Do</b>     | 2 | Data Link    |
| <b>Not</b>    | 3 | Network      |
| <b>Throw</b>  | 4 | Transport    |
| <b>Salami</b> | 5 | Session      |
| <b>Pizza</b>  | 6 | Presentation |
| <b>Away</b>   | 7 | Application  |



# What is the TCP/IP model?

It was developed back in the 1960s at the instigation of the United States Department of Defense. The TCP/IP reference model describes communication on the Internet.

The names of the individual layers of the OSI model and this model differ. Since almost all networks today function based on TCP/IP, the TCP/IP protocol family is **also included in the OSI model**.

However, many protocols and transmission methods of the TCP/IP model use **more than one layer** and **extend over several OSI layers**.



# OSI and TCP/IP side-by-side

| OSI Layers     | TCP/IP Layers | Examples  |
|----------------|---------------|---|
| 1 Physical     | Link          | Ethernet, Token Bus,<br>Token Ring, FDDI                          |
| 2 Data Link    |               |   |
| 3 Network      | Internet      | IP (IPv4, IPv6), ICMP, IPsec                                      |
| 4 Transport    | Transport     | TCP, UDP, DCCP, SCTP  |
| 5 Session      | Applications  | BGP, DHCP, DNS, EPP, FTP,<br>HTTPS, IMAP, SMTP, SSH,<br>TLS, XMPP |
| 6 Presentation |               |   |
| 7 Application  |               |   |



# Simplified DNS and HTTPS Example

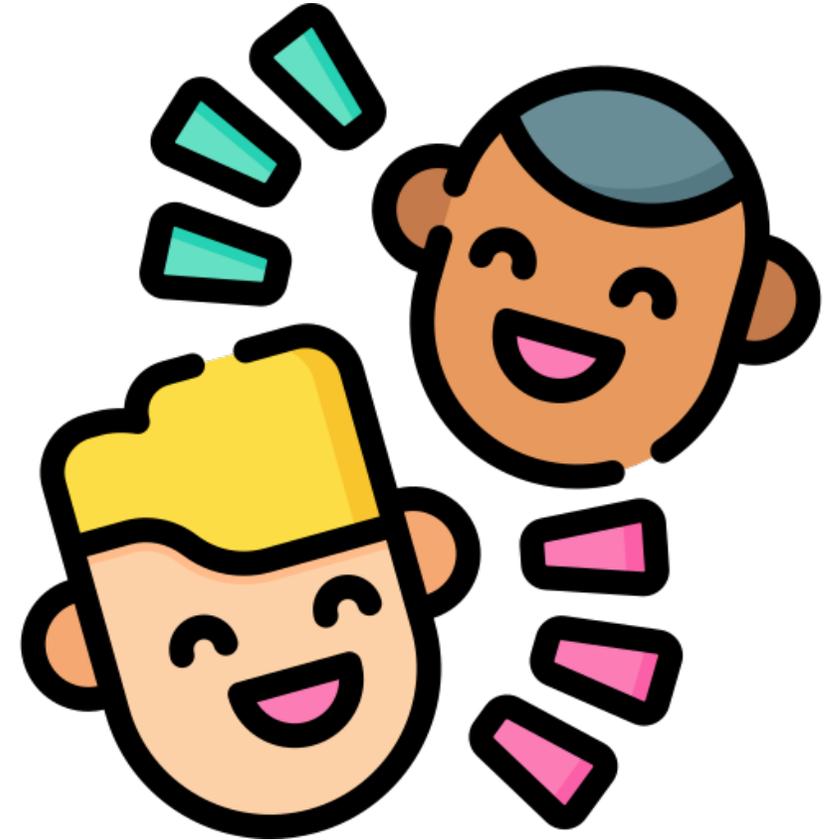
| OSI Model      | DNS                           | HTTPS                       | TCP/IP Model      |
|----------------|-------------------------------|-----------------------------|-------------------|
| 7 Application  |                               |                             |                   |
| -----          |                               |                             |                   |
| 6 Presentation | Resolve example.com           | Get video from e.g. YouTube | Application       |
| -----          |                               |                             |                   |
| 5 Session      |                               |                             |                   |
| -----          |                               |                             |                   |
| 4 Transport    | UDP (:53)                     | TCP (:443)                  | Transport         |
| -----          |                               |                             |                   |
| 3 Network      | IP (93.184.216.34)            | IP (142.250.185.110)        | Network           |
| -----          |                               |                             |                   |
| 2 Data Link    | Ethernet                      |                             | Network Interface |
| -----          |                               |                             |                   |
| 1 Physical     | Cables, network devices, etc. |                             |                   |

# Layer 8

Layer 8 is a term used to refer to a user. It is not part of the OSI model. Anyway, some also make their jokes about Layer 8 problems, such as

User: »The software isn't working.«

Admin: »It must be a layer 8 problem.«



Thank you!