**OSI MODEL**

**What’s the OSI model?**

The Open Systems Interconnection ([OSI](https://www.webopedia.com/definitions/osi/)) model is a framework that conceptualizes how computers within a network communicate. It splits this process into seven distinct layers, each one playing a specific role within the overall operation.

The OSI model was  the first standardized model for network communications. It was adopted by the [International Organization for Standardization](https://www.iso.org/home.html) (ISO) as an international standard in 1984. Even prior to this in the early 1908s, it had become an unofficial industry standard, having already been adopted by all major computer and telecommunication companies.

The OSI model is still used today to describe networking architecture.

**The 7 layers of the OSI model**

The OSI model divides networking up into a “vertical stack” consisting 7 layers. Networking starts on the application layer at the top (Layer 7) and proceeds to the bottom layer (Layer 1). It is then passed back up the same hierarchy.

The OSI model consists of the following seven layers:

* [Layer 7—Application](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-7-application)
* [Layer 6—Presentation](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-6-presentation)
* [Layer 5—Session](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-5-session)
* [Layer 4—Transport](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-4-transport)
* [Layer 3—Network](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-3-network)
* [Layer 2—Data Link](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-2-datalink)
* [Layer 1—Physical](https://www.webopedia.com/definitions/7-layers-of-osi-model/#layer-1-physical)

### **OSI Layer 7: Application**

The [application](https://www.webopedia.com/definitions/application-software/) layer provides networking processes to the end-user. Its protocols enable Layer 7 to work with whatever data the client is using. For example, it works with HTTP to support applications such as web browsers, specific applications and [email](https://www.webopedia.com/definitions/email/) clients.

The application layer sends data to, and receives data from, the presentation layer.

### **OSI Layer 6: Presentation**

The presentation layer handles “syntax processing” – in other words, it converts data from one format to another. For example, when you complete a transaction on an e-commerce site, your transaction data will exist in the language of the application. So the presentation layer takes this data and translates it into “networking-compatible” language, enabling it to be transmitted as part of the networking process.

The presentation layer takes any data transmitted by the application layer and prepares it for transmission over the session layer.

*Layer 6 Presentation examples include encryption, ASCII, EBCDIC, TIFF, GIF, PICT, JPEG, MPEG, MIDI.*

### **OSI Layer 5: Session**

The session layer handles connections between different devices in the network. It creates communication channels, called sessions, between devices. It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when communication ends.

The session layer can also set checkpoints during a data transfer. This means if the session is interrupted, devices can easily resume data transfer from the last checkpoint.

Once a “session” is established, the data is passed to or from the Transport Layer.

### **OSI Layer 4: Transport**

The Transport Layer within the OSI model manages the transfer of data across network connections, or [hosts](https://www.webopedia.com/definitions/host/). It takes data transferred in the session layer and breaks it into “segments” to be transmitted. Conversely, as data comes back through the stack, the Transport Layer is responsible for reassembling segmented data and turning it back into a format read able by the Session Layer.

The transport layer also manages [flow control](https://www.webopedia.com/definitions/flow-control/). It sends data at a rate that matches the connection speed of the receiving device. It also carries out error control, ensuring data was received correctly. If not, it requests the data again.

*Layer 4 Transport examples include SPX, TCP, UDP*

receiving device. It also carries out error control, ensuring data was received correctly. If not, it requests the data again.

### **OSI Layer 3: Network**

Layer 3, the Network Layer, manages the [routing](https://www.webopedia.com/definitions/routing/) of the data. When data arrives here, each frame of data is screened to confirm whether it reached its intended target.

This layer manages the mapping between addresses, forwarding packets of data to and from IP addresses. It uses network layer protocols to create logical paths, known as [virtual circuits.](https://www.webopedia.com/definitions/virtual-circuit/)

A packet is a data unit that contains source and destination IP addresses, a protocol specification field, data, and a trailer field. This includes information about error connections. Segmenting the data as packets makes it easier to retransmit interrupted or lost pieces of data.

To learn more about Networking, check out these [courses](https://academy.techrepublic.com/search?utf8=%E2%9C%93&query=Security) on TechRepublic Academy.

*Layer 3 Network examples include AppleTalk DDP, IP, IPX.*

### **OSI Layer 2: Data Link**

The Data Link layer is often divided into two sub layers: media access control ([MAC](https://www.webopedia.com/definitions/mac-address/)) and the [logical link control](https://www.webopedia.com/definitions/logical-link-control-layer/) (LLC) layer. The MAC sub layer controls how a computer on the network gains access to the data and permission to transmit it. The LLC layer controls frame [synchronization](https://www.webopedia.com/definitions/data-synchronization/), flow control, and error checking.

The Data Link layer packages Bits of information into data frames to be sent to the physical layer. A data frame is the protocol data unit, or PDU of the data link layer and represents a group of information. The physical layer just accepts and transmits data without analyzing the meaning of its structure. Therefore, it’s the job of the data link layer to create and recognize frame boundaries.

*Layer 2 Data Link examples include PPP, FDDI, ATM, IEEE 802.5/ 802.2, IEEE 802.3/802.2, HDLC, Frame Relay*

### **OSI Layer 1: Physical**

OSI Model Layer 1, or the physical layer, conveys the bit stream—electrical impulse, light, or radio signal—through the [network](https://www.webopedia.com/definitions/network) at the electrical and mechanical level. It provides the [hardware](https://www.webopedia.com/definitions/hardware/) means of sending and receiving data on a carrier, including defining cables, cards, and physical aspects. [Fast Ethernet](https://www.webopedia.com/definitions/100base-t/), [RS232](https://www.webopedia.com/definitions/rs-232c/), and [ATM](https://www.webopedia.com/definitions/atm/) are [protocols](https://www.webopedia.com/definitions/protocol/) with physical layer components.

*Layer 1 Physical examples include Ethernet, FDDI, B8ZS, V.35, V.24, RJ45.*

DID YOU KNOW….? The global standard OSI Model was published in 1984 as standard ISO 7498

**Advantages of the OSI model**

The OSI model helps users and operators of networks in a number of ways.

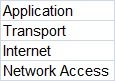
* It enables technicians to easily determine what components and software are required to build their network.
* Makes it easy to visualize the role and communication process of each component in a network.
* Having a standard model enables troubleshooting, identifying which network layer is causing an issue and focusing efforts on that layer.

The standardized OSI model also helps network device manufacturers and networking software vendors:

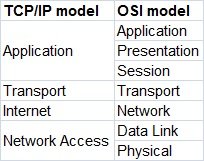
* It enables them to create fully interoperable devices and software, compatible with products from any other vendor.
* It clearly defines which parts of the network their components should work with.
* It enables them to communicate to users which network layers their product interacts with

**TCP/IP Model**

The TCP/IP model was created in the 1970s by the **Defense Advance Research Project Agency (DARPA)** as an open, vendor-neutral, public networking model. Like the OSI model, it describes general guidelines for designing and implementing computer protocols. It consists of four layers: Network Access, Internet, Transport, and Application:

[](https://study-ccna.com/wp-content/images/TCP_IP_model.jpg)

The following picture shows the comparison between the TCP/IP vs. OSI model:

[](https://study-ccna.com/wp-content/images/TCP_IP_and_OSI_model_comparison.jpg)

As you can see from the picture above, the TCP/IP model has fewer layers than the OSI model. The OSI model’s Application, Presentation, and Session layers are merged into a single layer in the TCP/IP model. Also, the Physical and Data Link layers are called the Network Access layer in the TCP/IP model. Here is a brief description of each layer:

1. **Network Access Layer** – defines the protocols and hardware required to deliver data across a physical network.
2. **Internet Layer** – defines the protocols for logically transmitting packets over the network.
3. **Transport Layer**– defines protocols for setting up the level of transmission service for applications. This layer is responsible for the reliable transmission of data and the error-free delivery of packets.
4. **Application Layer**– defines protocols for node-to-node application communication and provides services to the application software running on a computer

## Differences Between TCP/IP vs OSI Model

There are other differences between these two models besides the obvious difference in the number of layers. OSI model prescribes the steps needed to transfer data over a network, and it is very specific in it, defining which protocol is used at each layer and how. The TCP/IP model is not that specific. It can be said that the OSI model prescribes and TCP/IP model describes

**Difference Between TCP vs UDP**

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| --- | --- | --- |
|  | TCP | UDP |
| Full form | Transmission Control Protocol | User Datagram Protocol or Universal Datagram Protocol |
| Connection | Transmission Control Protocol is a connection-oriented protocol | User Datagram Protocol is a connectionless protocol |
| Function | As a message makes its way across the [internet](https://www.diffen.com/difference/Internet_vs_World_Wide_Web) from one computer to another. This is connection based | UDP is also a protocol used in message transport or transfer. This is not connection based which means that one program can send a load of packets to another and that would be the end of the relationship |
| Usage | TCP is suited for applications that require high reliability, and transmission time is relatively less critical | UDP is suitable for applications that need fast, efficient transmission, such as games. UDP's stateless nature is also useful for servers that answer small queries from huge numbers of clients |
| Use by other protocols | HTTP, HTTPs, FTP, SMTP, Telnet | DNS, DHCP, TFTP, SNMP, RIP, VOIP |
| Ordering of data packets | TCP rearranges [data](https://www.diffen.com/difference/Data_vs_Information) packets in the order specified | UDP has no inherent order as all packets are independent of each other. If ordering is required, it has to be managed by the application layer |
| Speed of transfer | The speed for TCP is slower than UDP | UDP is faster because error recovery is not attempted. It is a "best effort" protocol. |