

Communication protocols: the ISO/OSI model

A **communication protocol** is a description of the rules that computers must follow in order to communicate with each other and to send data packets over a network.

The **Open System Interconnection (OSI)** • is a theoretical model developed by the **International Organisation of Standardisation (ISO)** to ensure national and worldwide communication through the use of compatible systems. Commonly known as the **OSI** or **ISO/OSI model**, it consists of 7 layers, each one with its own specific function, which together form a complete communication system, starting from level 1 at the bottom ••.

■ Lower layers

- **Layer 1: physical layer.** It is the lowest layer and it activates, maintains and deactivates the physical connection. It is responsible for the transmission and reception of unstructured raw data over the network. It converts digital and analogue bits into electrical or optical signals and is responsible for data encoding.
- **Layer 2: data link layer.** It synchronises the information which is to be transmitted over the physical layer. It ensures that data transmission is error free and manages the transmission and reception of data frames sequentially. It also sends and expects

acknowledgements for frames received or sent.

- **Layer 3: network layer.** It routes the signal through different channels and from one node to another and decides which route should be taken. It divides the messages into packets and assembles the incoming packets into messages for the higher levels.



OSI Model
Open Systems Interconnection



■ Upper layers

- **Layer 4: transport layer.** It decides if data transmission should be on a parallel or single path. It receives messages from the session layer, converts them into smaller units and passes them to the network layer. This level can be very complex, depending on the network requirements.
- **Layer 5: session layer.** It manages and synchronises the conversation between two different applications. Streams of data are marked and resynchronised properly, so that the messages are not cut prematurely and data loss is avoided.
- **Layer 6: presentation layer.** It ensures that the data is sent in such a way that the receiver will understand the information and will be able to use the data. When it receives data, it transforms it for the application layer, in other words it acts as a translator. It also performs data compression and encryption.
- **Layer 7: application layer.** It is the topmost layer. It provides mail services, directory services and network resources. It mainly holds application programs.

acknowledgment: *conferma*

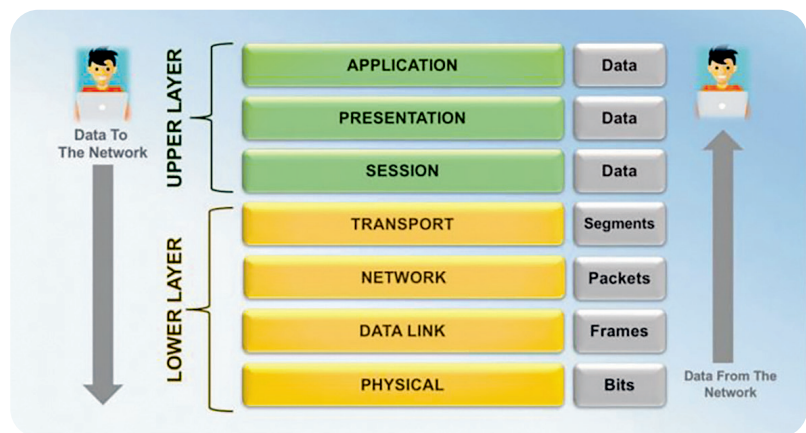
The ISO/OSI is a very precise model which clearly distinguishes between services, interfaces and protocols. The model supports both online and off-line services.

Each layer of the ISO/OSI system includes a set of protocols.

1 Find out which layer corresponds to these functions.

Function	Layer No.	Layers name
Provision of cables or physical characteristics of the network media.		
End-to-end delivery of packets through a parallel or single path transmission.		
End user services provided by application programs, such as web browsing, e-mail, audio and video applications.		
Management of sessions between nodes and data flow from higher layers to lower layers and proper resynchronisation of messages to prevent data loss.		
Routing of the packets across a given network.		
Standardisation of data presentation, such as handling data syntax, problems and file compression.		
Transmission and reception of packets through the physical link.		

2 Look at the picture and complete the text. How does communication with the ISO/OSI model take place?



Imagine that user A, called layer 8, wants to send an e-mail to user B. So, he uses a program to write the e-mail and sends data at the application level. Then, data travels through the 1. and 2.

layer. Next, data becomes segments in the 3. layer and are sent to the network layer to become 4. or 5. Then, packets go to the 6. layer and become frames or 7. and then become bits in the 8. layer. After that, a 9. or medium, called layer 0, sends the bits to the physical layer or user B. Then, the bits travel up all the 10. of user B and undergo all the transformations until they are data that can be read by user B, i.e. layer 8.

