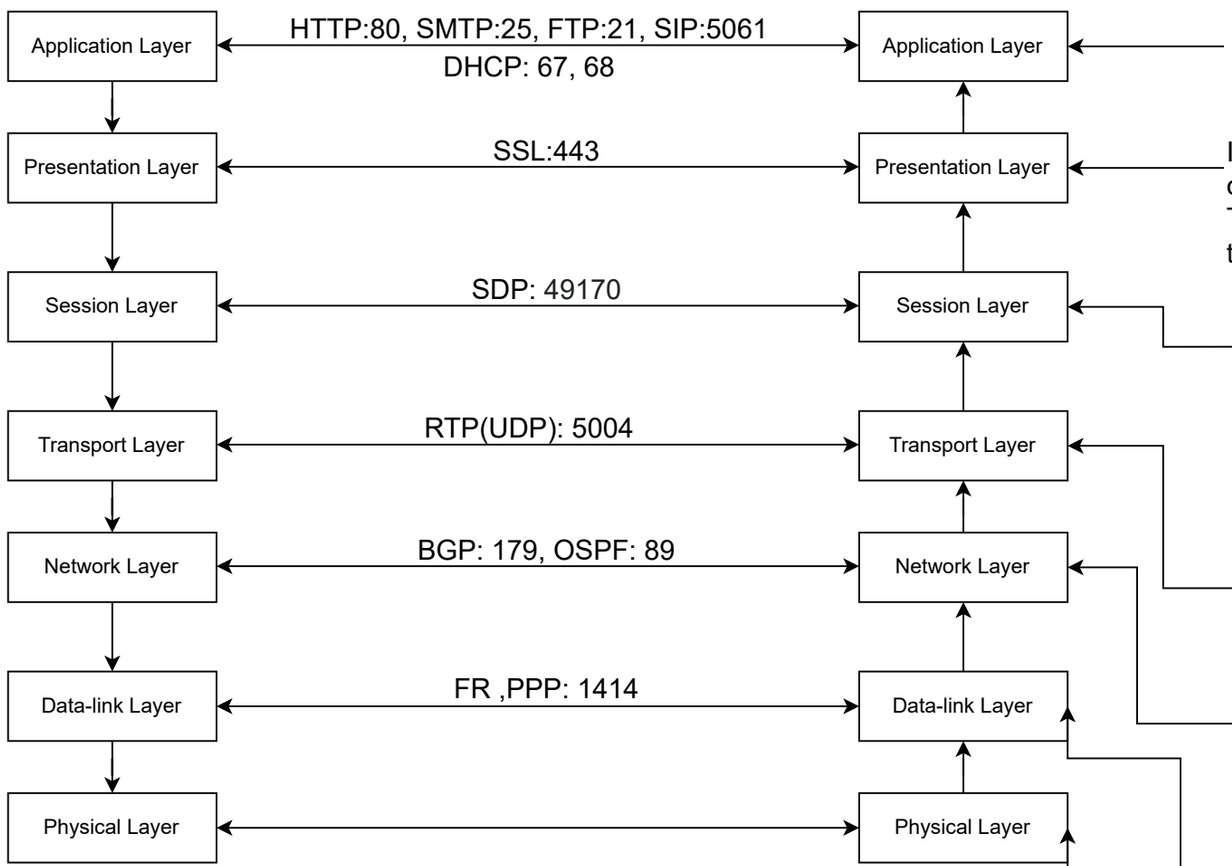
VoIP - OSI model



It allows the software to send and receive data. VoIP specifically uses SIP that define end-to-end call-signaling methods. All of these endpoints register to a SIP server which is used to coordinate advanced features such as call transfer, call hold, music on hold, and other traditional and enhanced telephony features.

It basically defines the form in which the data is to exchange between the two communicating entities. In this layer, data is compressed, decompressed, and encrypted. The audio of a call is also encoded into or decoded from VoIP. It also convert from one codec to other.

The communications between servers or PCs take place at this level. This layer provides the management structure for communication between applications and sets up the sessions used for VoIP. Before two peers start communicating with RTP, they need to agree on some parameters that will define the streaming itself: from network related considerations (such as what are their IP addresses and ports), to media-related stuff (like what codecs will be used for the audio or video encoding).To achieve this we use SDP messages

RTP inside of UDP to carry the payload across the network. Because IP voice packets can reach the destination out of order and unsynchronized, the packets must be reordered and resynchronized before playing them out to the user. Since UDP does not provide services such as sequence numbers or time stamps, RTP provides sequencing functionality.

It includes network routers as its primary hardware devices for processing packets. These routers are responsible for setting up the connections from end to end, keeping them active for the duration of the call, and tearing them down after the transmission is complete.

It handles error control, synchronization, and flow control. In this layer, network switches function to direct packets which is concerned with frame units, physical addressing (MAC) and signal attenuation.

It includes wired or wireless connection to connect elements of the network. This layer handles the electrical signal.

DETAILS:

- Application layer
  - HTTP: transmitting hypermedia documents like HTML. In this case the client initiates the request and the server reponds
  - SMTP: transmit e-mail between server and client
  - FTP: transfer files between computers on network
  - SIP: Session initiation protocol is a peer-to-peer protocol that takes care of creation, management and tear-down of SIP traffic for VoIP. It takes care of load balancing. It does not carry the voice or video itself as it operates in conjunction with several other protocols that carry the session media.
  - A DHCP server listens to UDP port 67 and dynamically assigns IP addresses and other network parameters to DHCP clients. These clients will listen for responses on UDP port 68.
- Presentation layer
  - SSL: HTTPS is the application layer protocol using ssl at layer 6 for encryption purposes.
  - TLS is an improved version of SSL. It works in much the same way as the SSL, using encryption to protect the transfer of data and information.
- Session layer
  - SDP: It describes a plain text files that follow a loosely formatted structure, containing all the details needed to describe the streaming parameters.
- Transport layer
  - Once the exchange of setup messages is completed, the media is exchanged using RTP (Real-Time Transmission Protocol). It carries the voice payload across the network. RTP provides sequence numbers and time stamps for the orderly processing of voice packets. Every RTP flow has a corresponding RTCP flow that reports statistics on the call. It includes the information like packet count and packet loss.
- Network layer: The router provides the private IP address using DHCP. NAT helps us map multiple local private addresses to a public one before transferring the information.
  - BGP(Border gateway protocol): It manages how packets get routed from network to network through the exchange of routing and reachability information among edge routers.
  - OSPF(Open shortest Path First): It is a intra-domain routing protocol.
- Data link layer
  - Frame relay: It defines how frames are routed through a fast-packet network based on the address field in the frame. It is commonly used to connect two or more LAN bridges over large distances
  - PPP: It is used over many types of physical networks, including serial cable, phone line, trunk line, cellular telephone