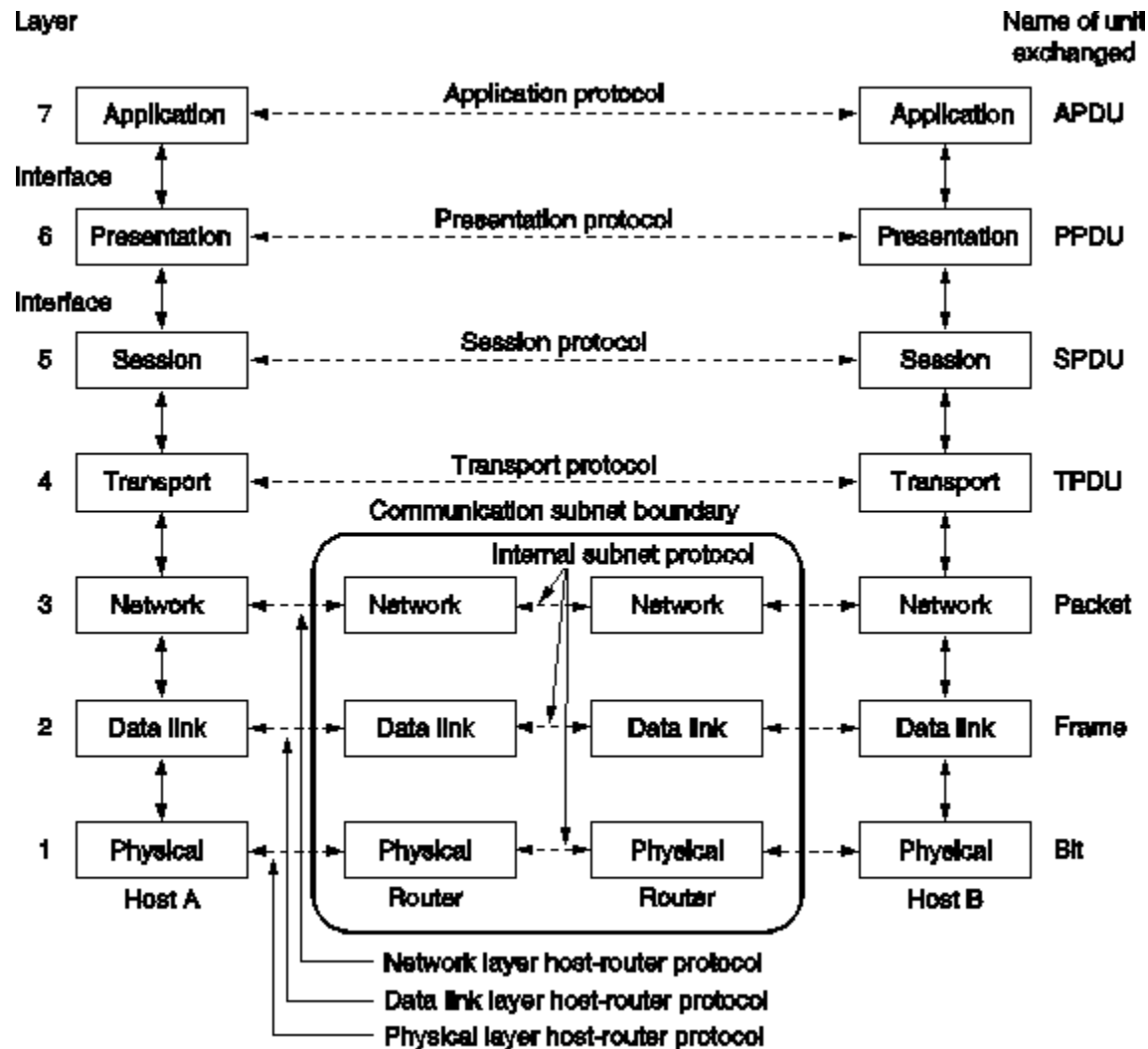# CO650 Advanced Programming - C++ Sockets

Sockets were initially developed for Unix. Windows developed their own version of the sockets called Winsock. On Windows systems, the core components of the socket come in the form of a dll file. (ws2_32.dll)

7 Layers of OSI model (Open Systems Interconnection)

The OSI model describes seven layers that computer systems use to communicate over a network. This is what happens underneath the surface when we send data from one machine to another over a network.

Architecture

- In order for connection to take place between two devices via the network, the data has to be sent from the application layer and descend down to the physical layer on a device sending data, and then ascend from the physical layer to the application layer on the device receiving the data.
- The connection is always between two devices, and each side uses its own IP and port number. Usually one side is called the **client**, the other side the **server**
- The server is continually waiting for incoming connections. This is called **listening** which is always done on a certain IP and port number.

IP addresses

- BOth the server and client use an IP and port number.
- THe IP address of both server and client is configured during Network setup unless it is allocated dynamically.
- A machine may have more than one network interface card(NIC), in which case it may have more than one IP address.
- When developing Network Programs the port number of the server is usually specified within the code, whereas the client port number is allocated by the O/S.
- The **Loopback address** 127.0.0.1 refers to the current machine. This can be used during development to test both client and server on a single machine.

Ports

- Port numbers (16 bit address) can be any integer between 1 and 65.535.
- Ports 1…1023 are described as well known ports and are reserved for specific applications (port 21 FTP).
- It is recommended to choose a number over 1024. To be sure that your desired port isn't already in use

Sockets
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- Definition "A pipe between two computers on a network through which data flows" (Mulholland 2004).
- Almost all Winsock functions operate on a socket, as it's your handle to the connection. Both sides of the connection use a socket.
- Sockets are also two-way, data can be both sent and received on a socket.
- There are two common types of socket
    - Streaming socket (SOCK_STREAM) TCP
    - Datagram socket (SOCK_DGRAM) UDP