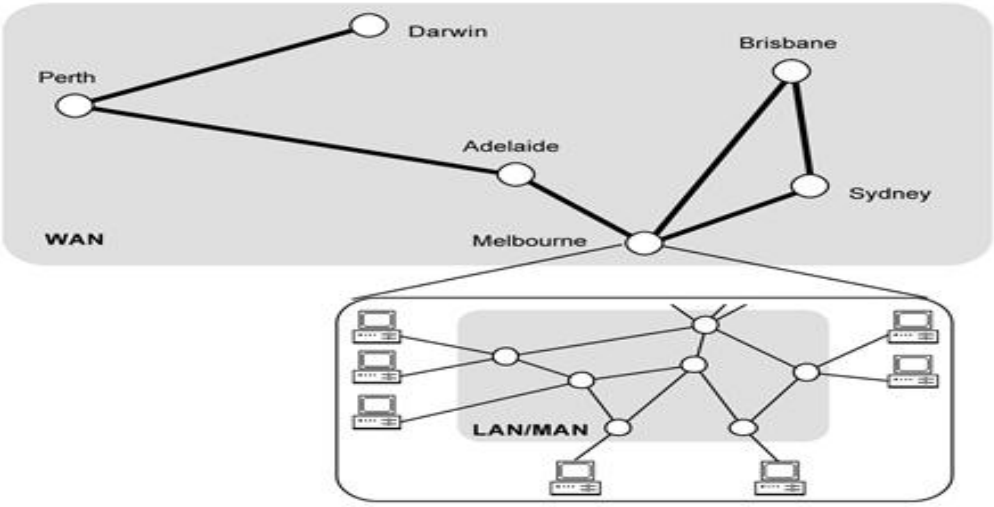
Figure 1.2 Example of a WAN between LANs.



THE OSI MODEL

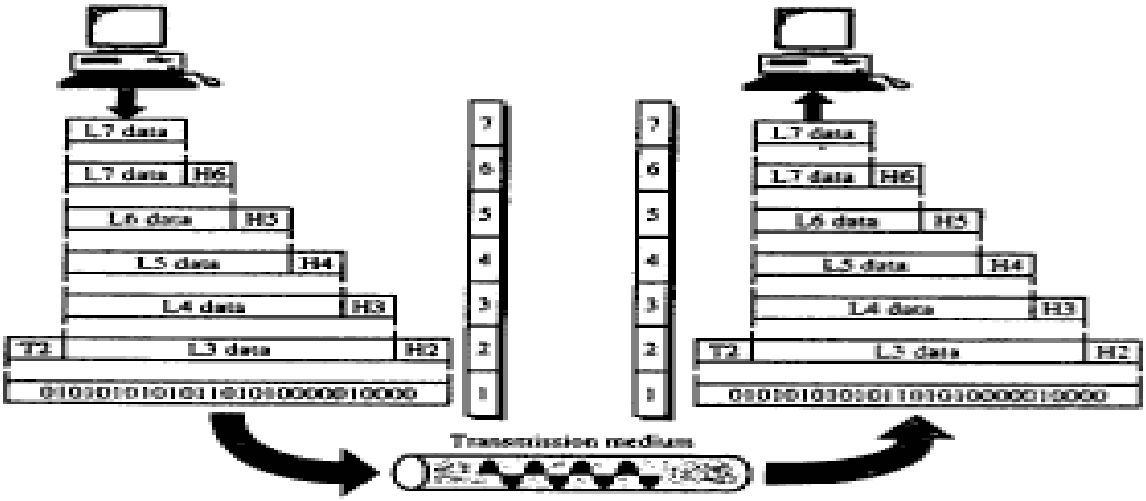
The International Standards Organization **(ISO)** is a multinational body dedicated to worldwide agreement on international standards (Established in 1947). An ISO standard that covers all aspects of network communications is the Open Systems Interconnection **(OSI)** model. An ***open system*** is a ***set of protocols that allows any two different systems to communicate regardless of their underlying architecture.*** The **purpose of** the OSI model is to open communication between ***different systems without requiring, changes to the logic of the underlying hardware and software.***

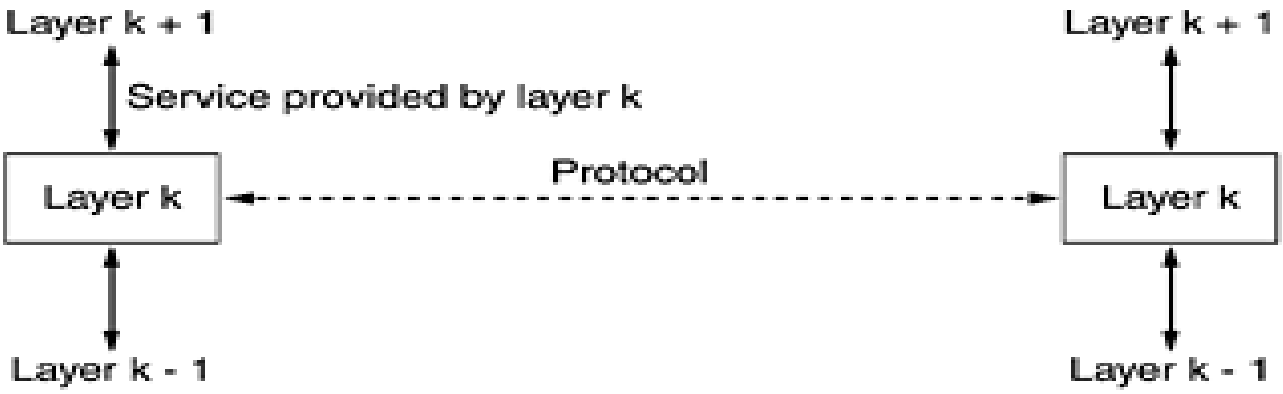
Peer-to-Peer Processes

Within a single machine, each layer **calls** upon the services of the layer just below it. Layer 3, for example, uses the services provided by layer 2 and provides services for layer 4. Between machines, layer *x* on one machine communicates with layer *x* on another machine. This communication is governed by an agreed-upon series of rules and conventions called ***protocol.*** The processes on each machine that communicate at a given layer are called ***peer-to-peer processes***. Each layer in the sending machine **adds** its own information to the message it receives from the layer just above it, and **passes** the whole package to the layer just below it. This information is added in the **form of** headers or trailers (control data appended to the beginning or end of a data parcel). Headers are added to the message at layers 6, 5, 4, 3, and 2. A trailer is added at layer 2.

At layer 1 the entire package is converted to a form that can be transferred, to the receiving machine. **At the receiving** machine, the message is unwrapped layer by layer; with each process receiving and removing the data meant for it

Service is a set of primitives (operations) that a layer provides to the layer above it. The service defines what operations the layer is prepared to perform on behalf of its users, but it says nothing at all about how these operations are implemented

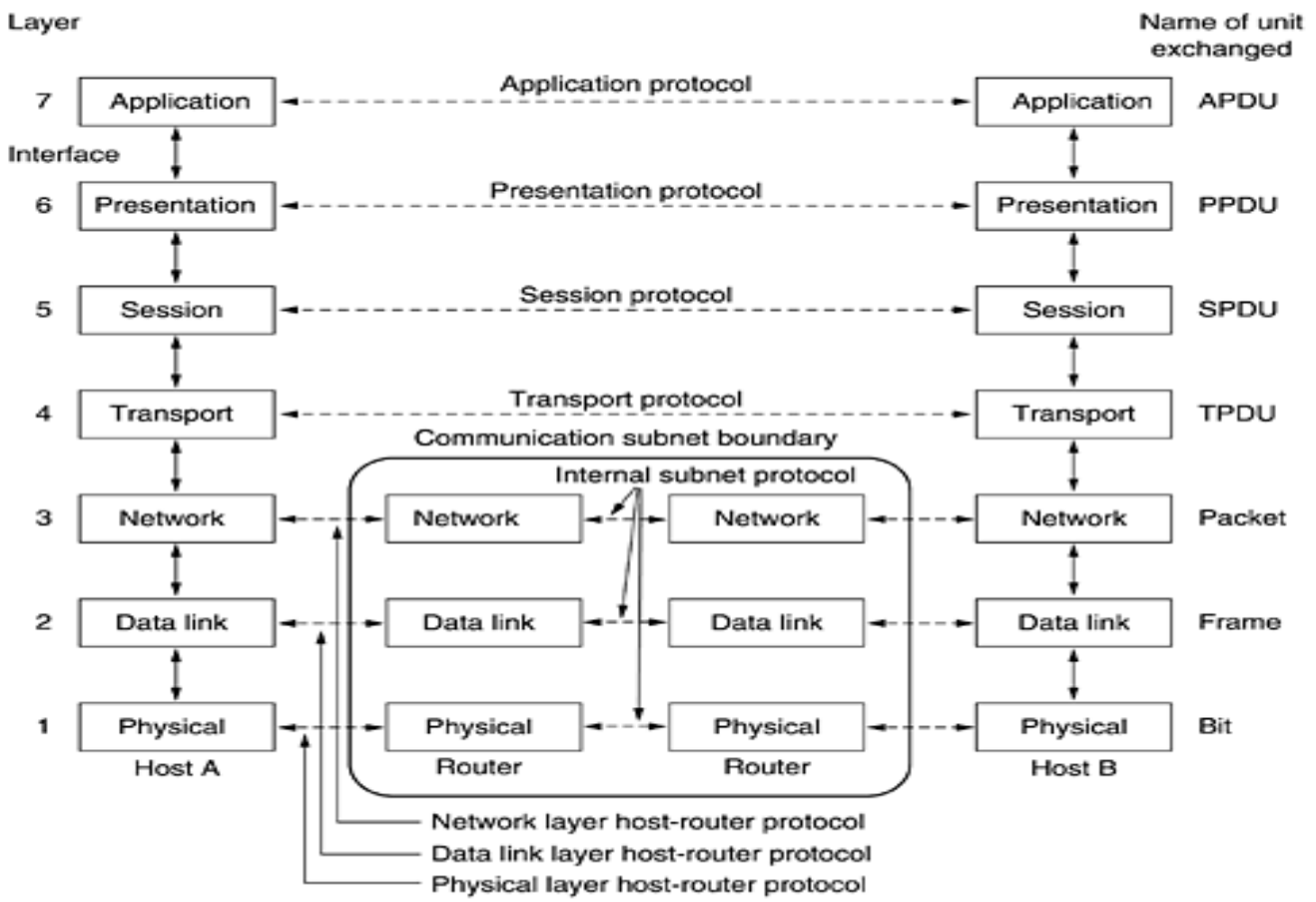




Interfaces between Layers

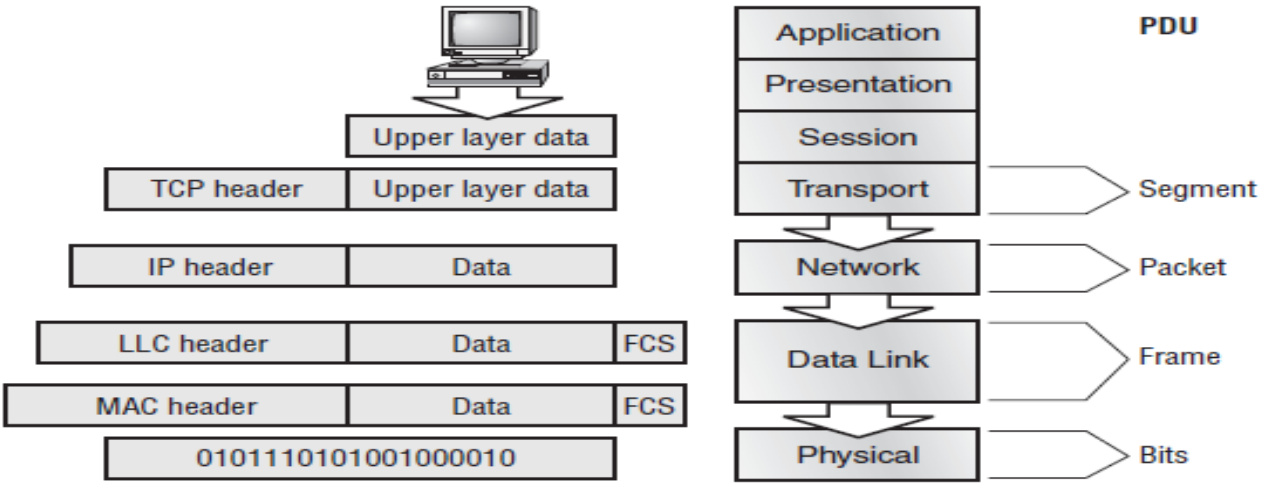
The passing of the data and network information down through the layers of the sending machine and back up through the layers of the receiving machine is made possible by an ***interface*** between each pair of adjacent layers. Each interface **defines** what information and services a layer must provide for the layer above it.

The grouping of data used to exchange information at a particular OSI layer is known as a protocol data unit (PDU). Thus, the PDU at Layer 4 is a segment, at Layer 3 is a packet, and at Layer 2 is a frame.



Data Encapsulation

Figure below shows the PDUs and how they attach control information to each layer. This figure demonstrates how the upper-layer user data is converted for transmission on the network.

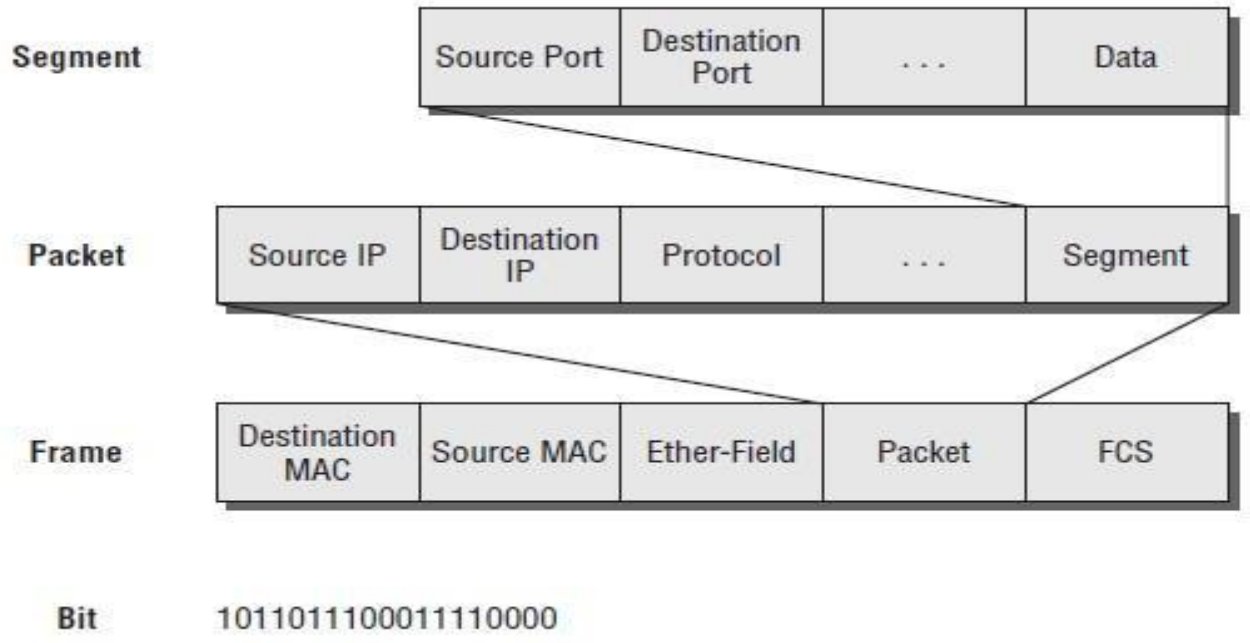


At a transmitting device, the data encapsulation method works like this:

Five steps of Encapsulation

1. User information is converted into data.
2. Data is converted into **segments** for transport across the network.
3. Segments are converted into **packet** for transport across the network.
4. Packets and datagram's are converted into **frames** and the Data Link header is added.
5. The data in the frames is converted into **bits** for transmission over the physical media.

To explain this in more detail using the layer addressing, I'll use Figure below.



FUNCTIONS OF THE LAYERS

1)Physical Layer

The physical layer coordinates the functions **required to** transmit a bit streams over a physical medium. It **deals with** the **mechanical and electrical specifications** of the primary connections, such as cables, connectors, and signalling options that physically link two nodes on a network and timing interfaces, and the physical transmission medium Specifications include voltage levels, maximum cable lengths, connector types, and maximum data rates.

This task requires a number of considerations:

- **Line configuration**: How can two or more devices are linked physically? Are transmission lines to be shared or limited to use between two devices? Is the line available or not?