COMPUTER NETWORKS AND INTERNET PROTOCOLS

Application Layer - I

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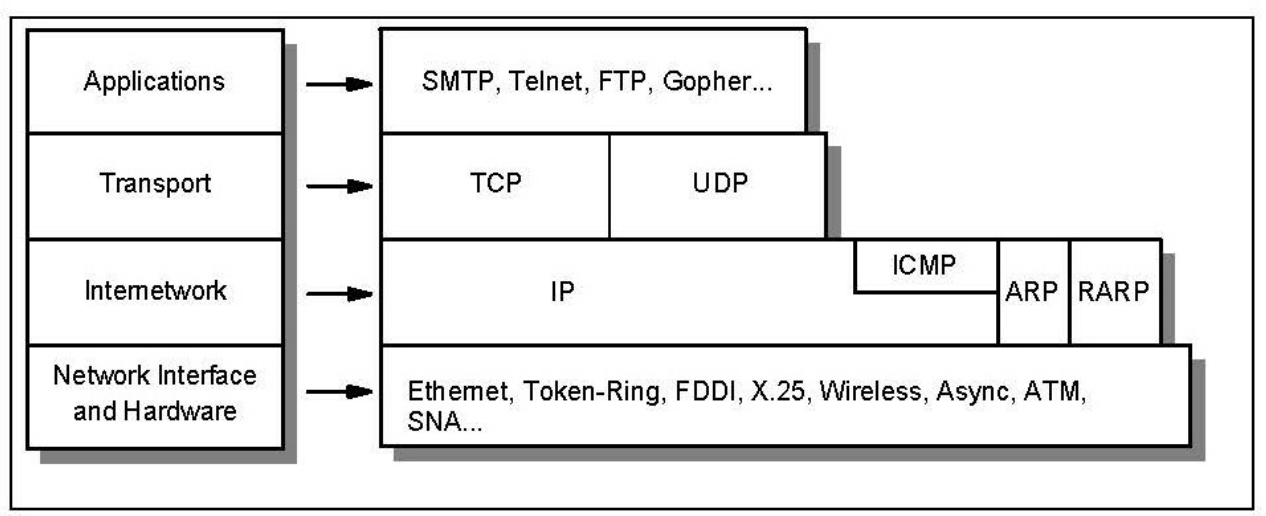
TCP/IP Protocol Stack

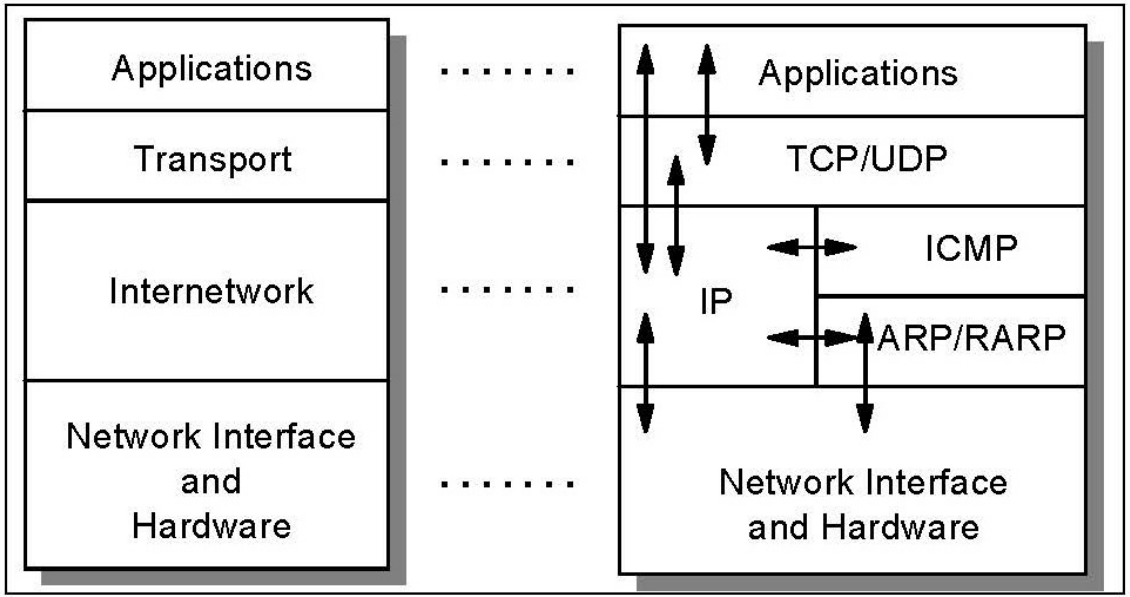
TCP/IP specifications do not describe or standardize any network-layer protocols per se; they only standardize ways of accessing those protocols from the internetwork layer.



TCP/IP Architecture

Ref: IBM Redbooks - TCP/IP Tutorial and Technical Overview

TCP/IP Protocol Stack



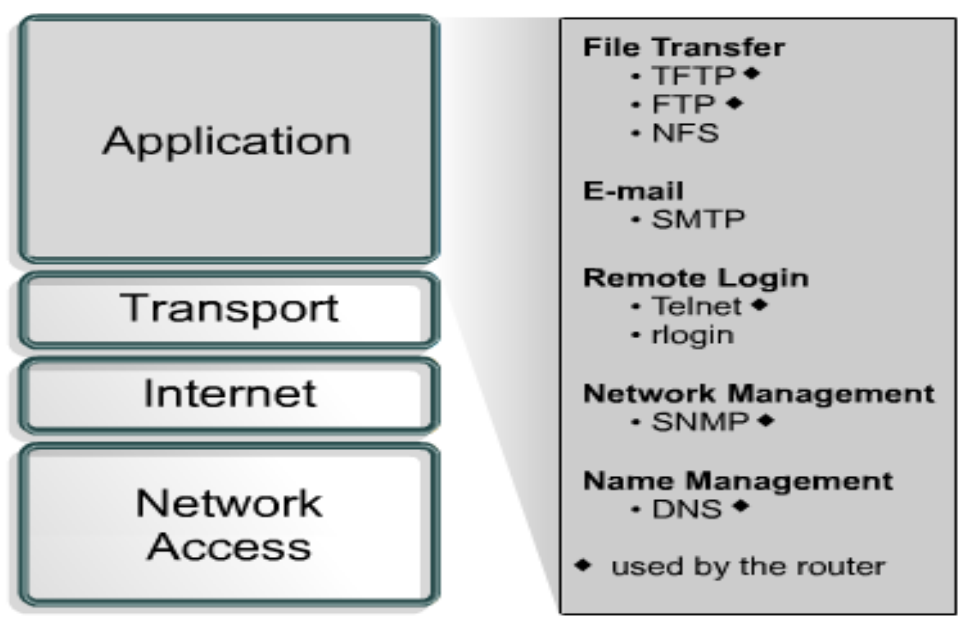
TCP/IP Layers – Group of functions in each layer

Ref: IBM Redbooks - TCP/IP Tutorial and Technical Overview

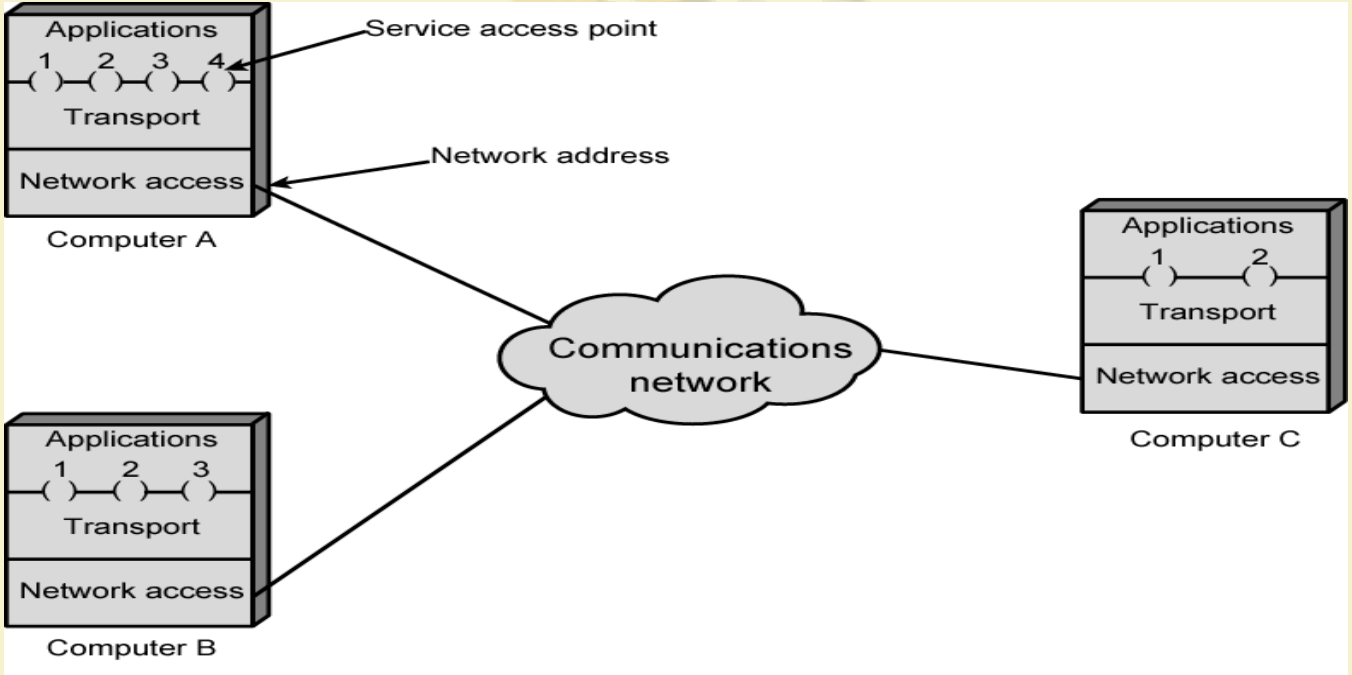
TCP/IP Protocol Stack – Application Layer

- **Application layer**
  - Application layer is provided by the program that uses TCP/IP for communication.
  - An application is a user process cooperating with another process usually on a different host (there is also a benefit to application communication within a single host).
  - Examples of applications: Telnet, SMTP, FTP etc.
  - Interface between the application and transport layers is defined by port numbers and “sockets”

TCP/IP - Application Layer

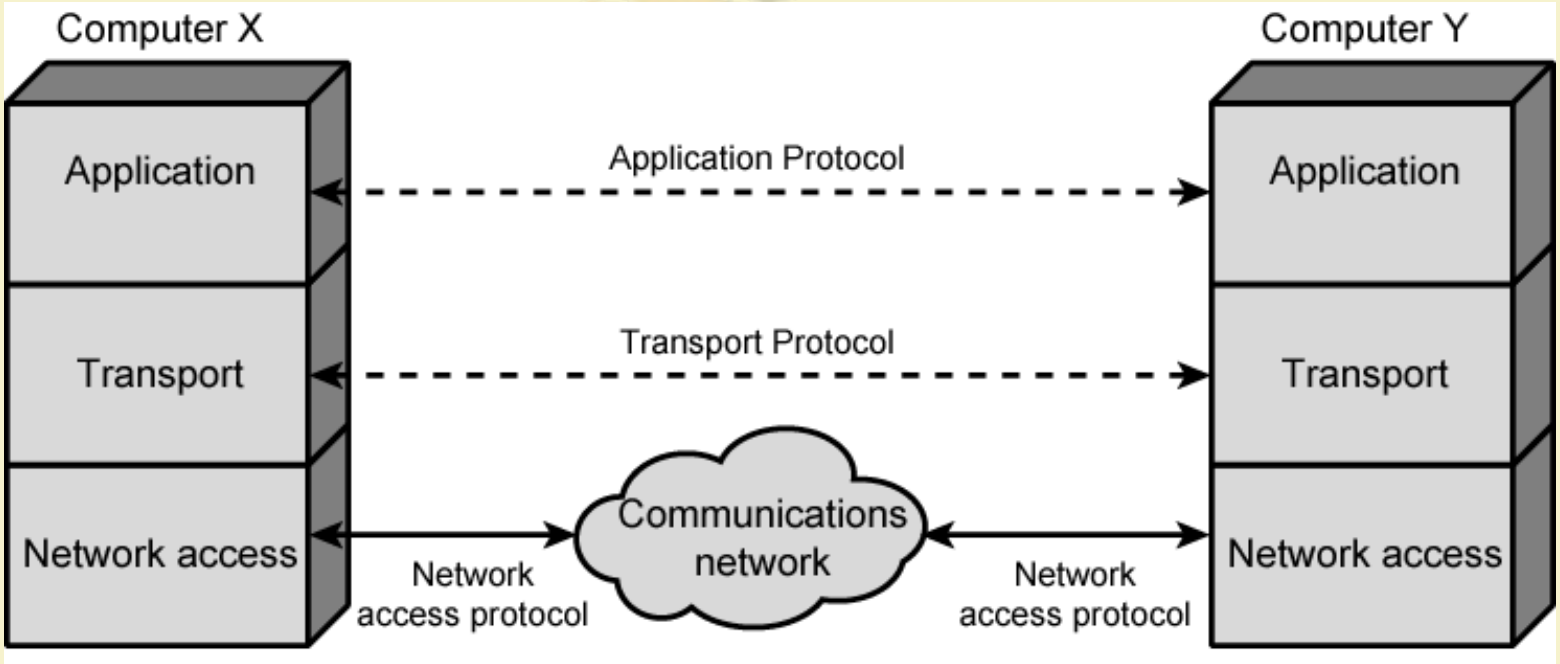


TCP/IP : Protocol Architecture and Communication Network



Ref: Data and Computer Communications, by William Stallings

TCP/IP : Protocol Architecture and Communication Network



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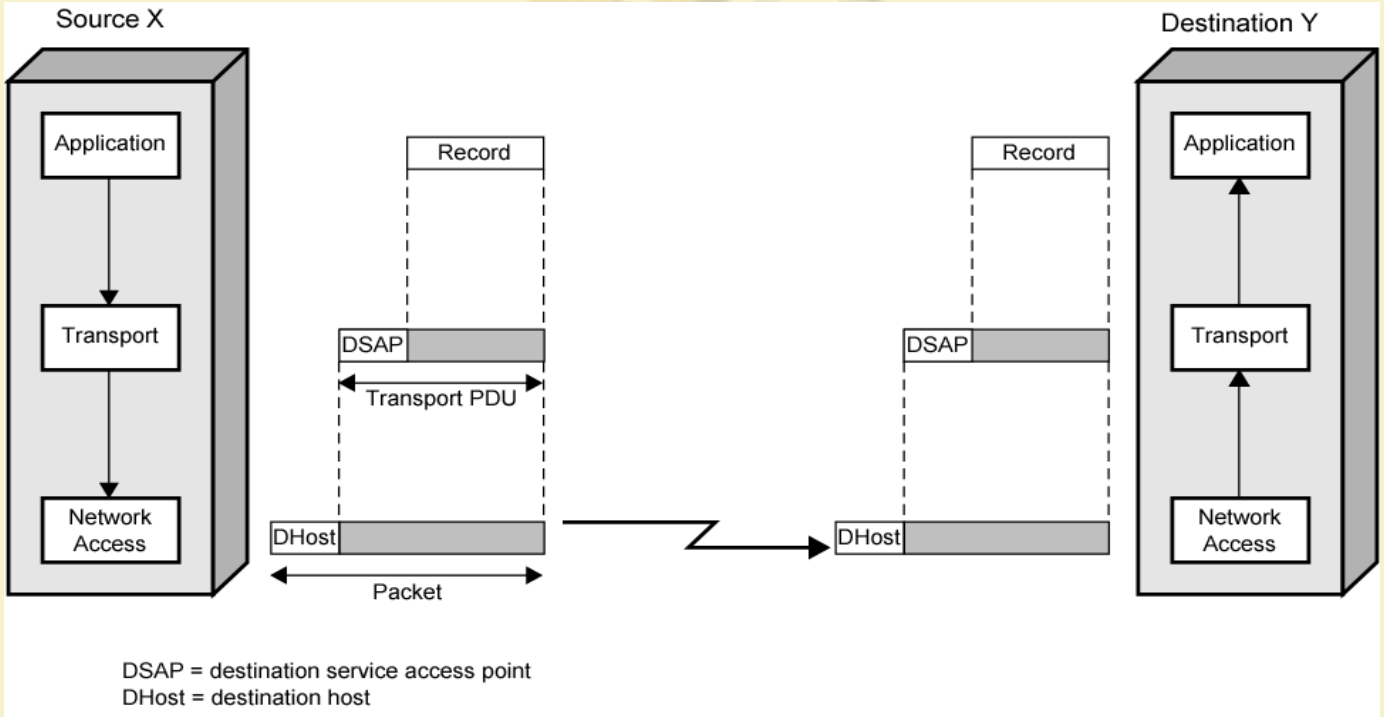
TCP/IP : Operation



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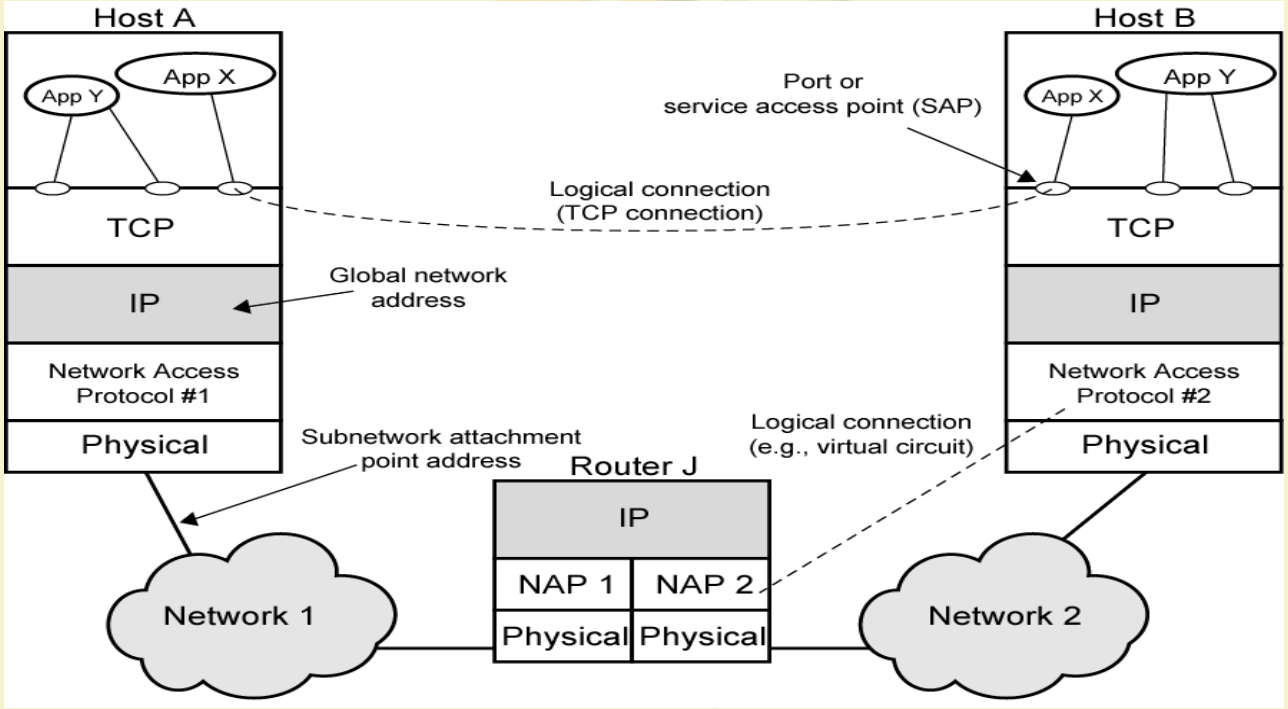
TCP/IP : Concept



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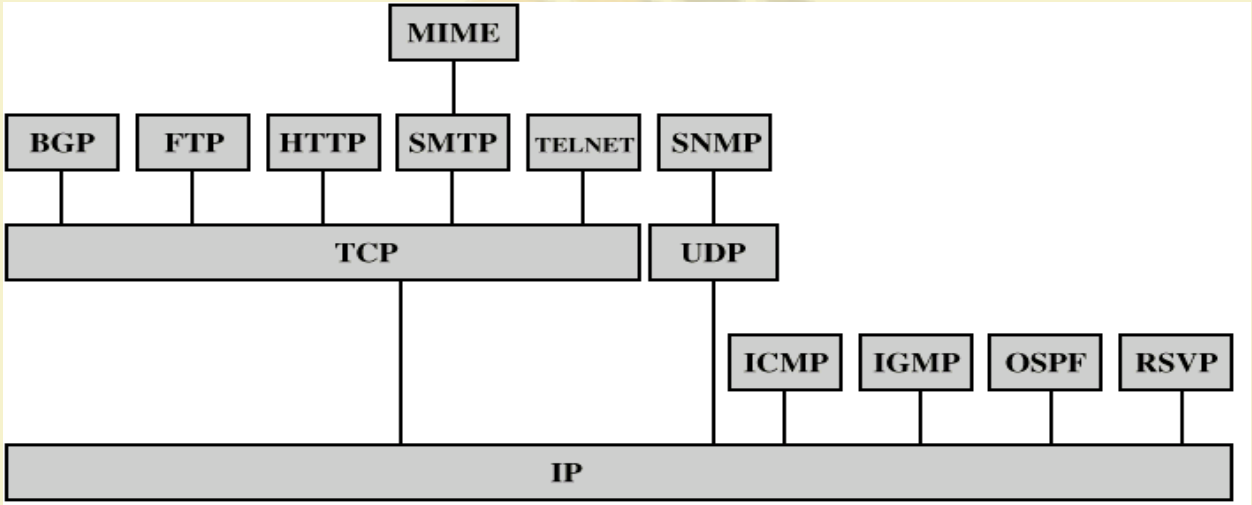
TCP/IP : Sample Protocols



BGP = Border Gateway Protocol
FTP = File Transfer Protocol
HTTP = Hypertext Transfer Protocol
ICMP = Internet Control Message Protocol
IGMP = Internet Group Management Protocol
IP = Internet Protocol
MIME = Multi-Purpose Internet Mail Extension
OSPF = Open Shortest Path First
RSVP = Resource ReSerVation Protocol
SMTP = Simple Mail Transfer Protocol
SNMP = Simple Network Management Protocol
TCP = Transmission Control Protocol
UDP = User Datagram Protocol

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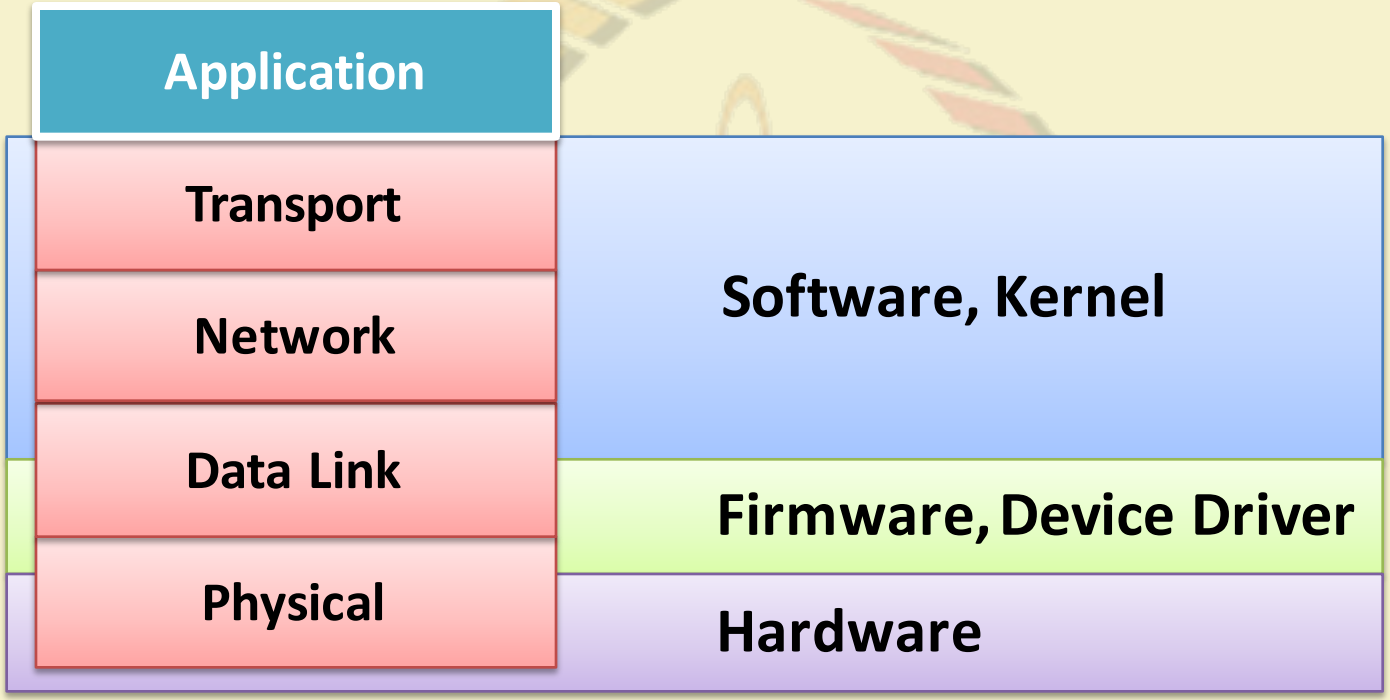
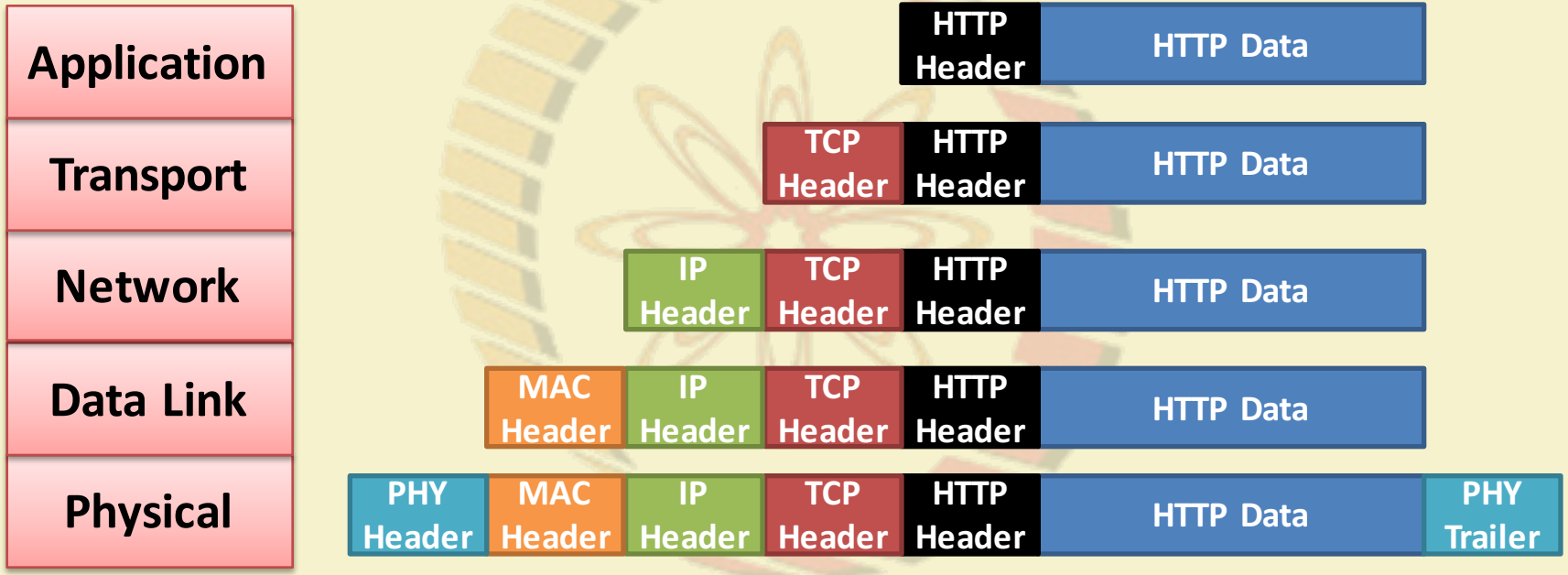
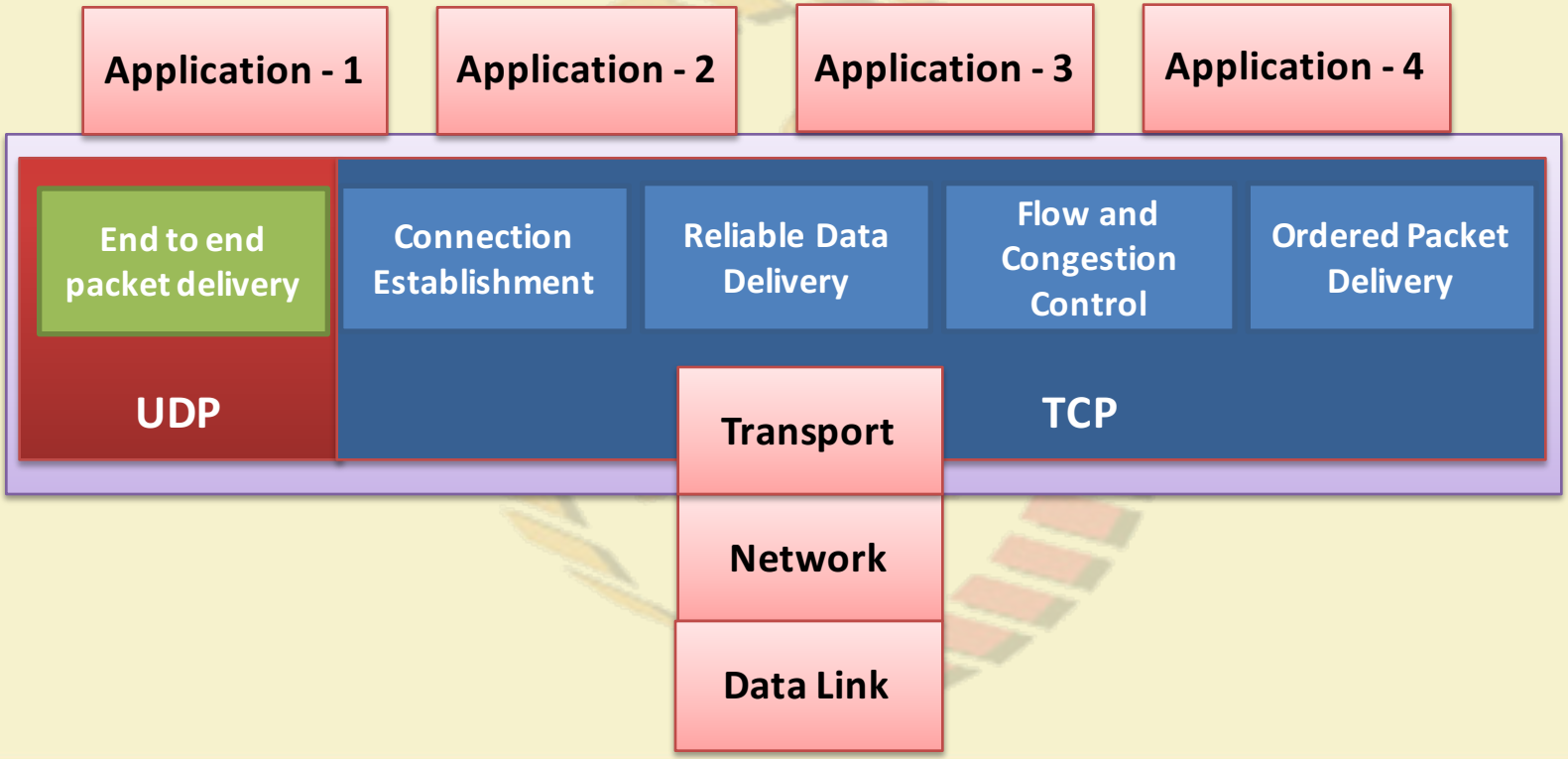
Protocol Stack Implementation in a Host



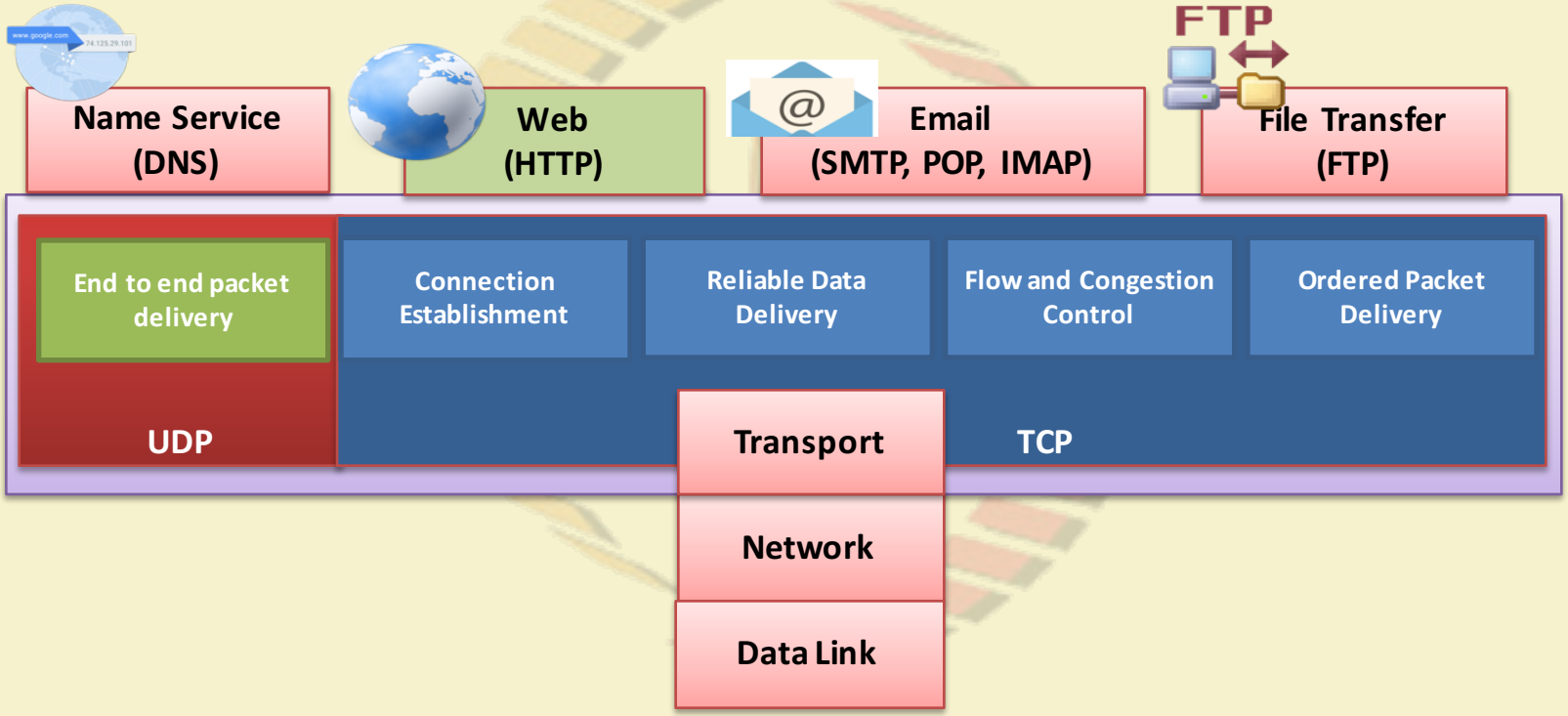
How Application Data Passes Through Different Layers



Application Layer Interfacing



Application Layer Interfacing



Responsibilities of Application Layer

- Identifying and establishing the availability of intended communication partners
- Synchronizing cooperating applications
- Establishing agreement on procedures for error recovery
- Controlling data integrity

Application Layer Examples

- Domain Name System (DNS)
- File Transfer Protocol (FTP)
- Hypertext Transfer Protocol (HTTP)
- Simple Mail Transport Protocol (SMTP)
- Simple Network Management Protocol (SNMP)
- Telnet
- ….

DNS

- Domain Name System (DNS) is a system used for translating names of domains into IP addresses.
- There are more than 200 top-level domains on the Internet, examples of which include the following:

.in - India
.us - United States
.uk - United Kingdom
.edu - educational sites
.com - commercial sites

.gov - government sites
.org - non-profit sites
.net - network service

FTP and TFTP

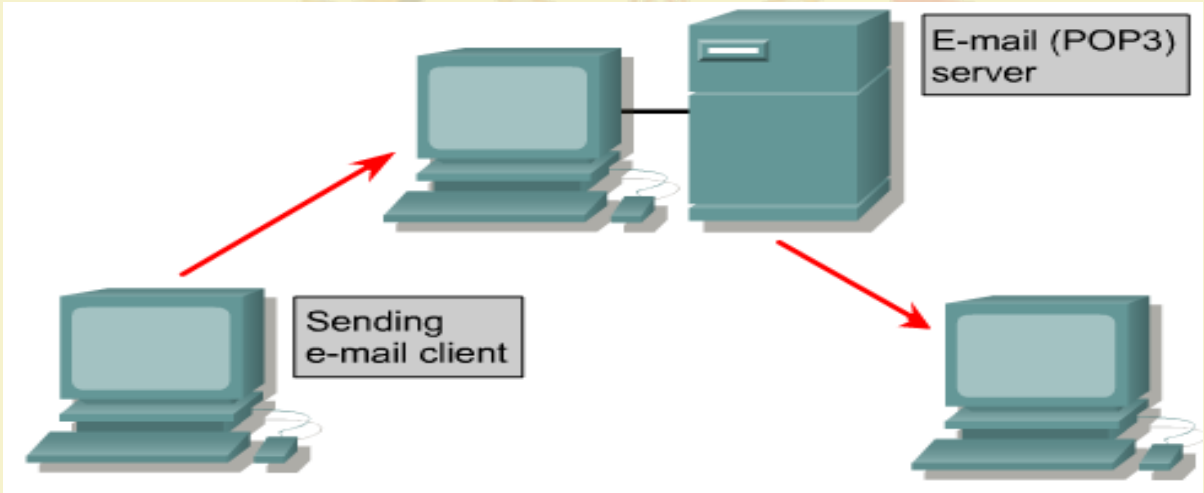
- FTP is a reliable, connection-oriented service that uses TCP to transfer files between systems that support FTP.
- TFTP is a connectionless service that uses User Datagram Protocol (UDP).
  - TFTP is used on routers to transfer configuration files and Cisco IOS images.
  - TFTP is designed to be small and easy to implement.

HTTP


HTTP
Request Message
HTTP
Response Message
HTTP Clients
(Web Browser)
HTTP over TCP/IP
HTTP Server (Web Server)

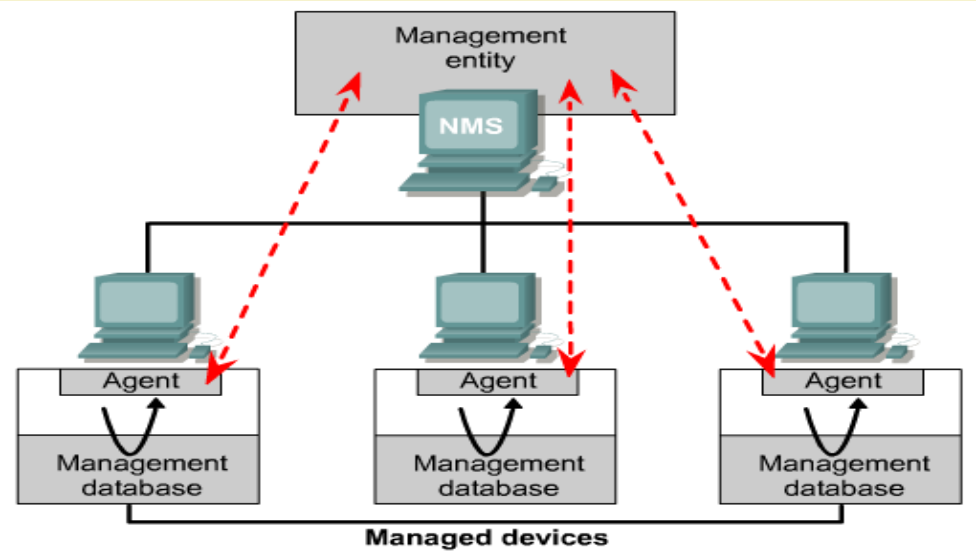
SMTP

- E-mail servers communicate with each other using the Simple Mail Transport Protocol (SMTP) to send and receive mail.



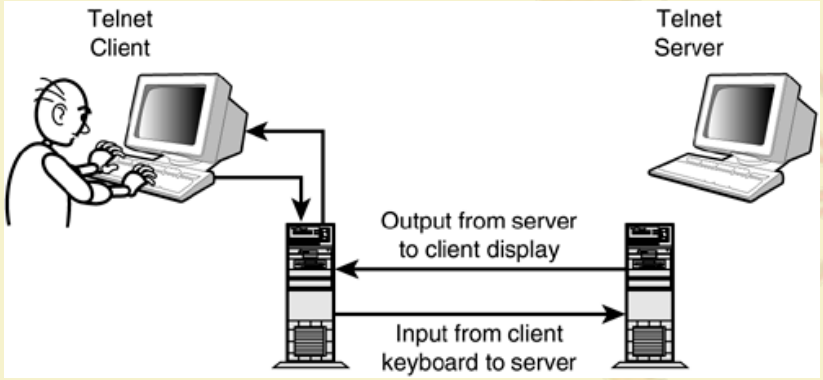
SNMP

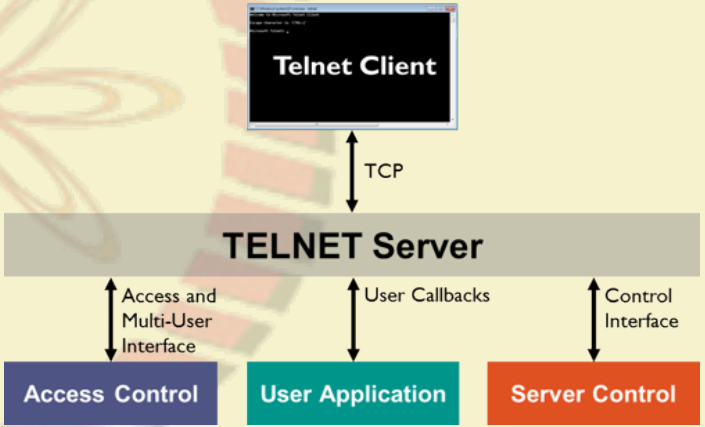
The Simple Network Management Protocol (SNMP) is an application layer protocol that facilitates the exchange of management information between network devices.



Telnet

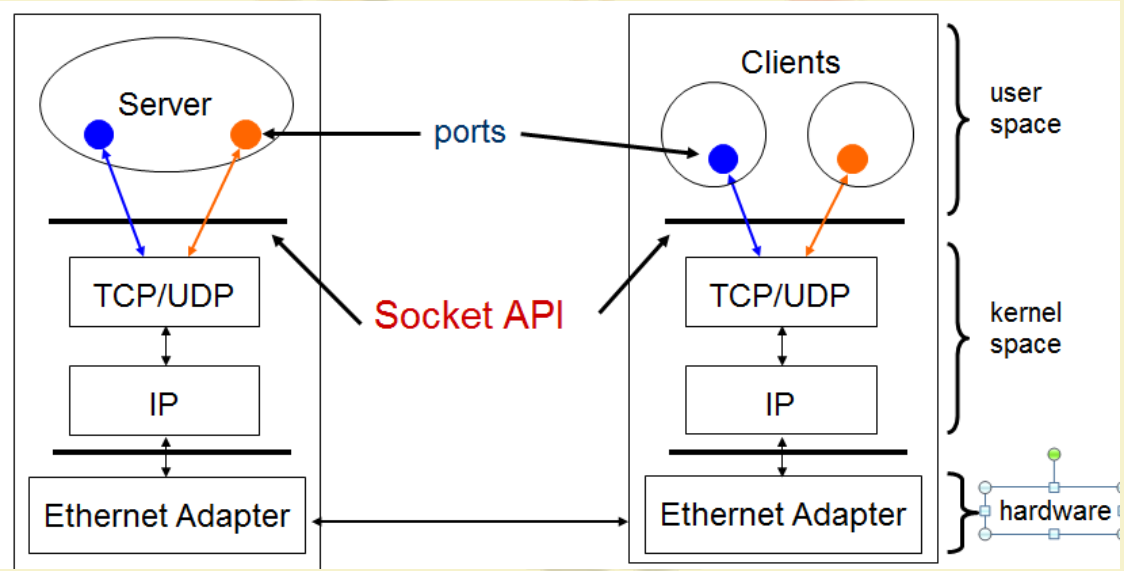
Telnet client software provides the ability to log in to a remote Internet host that is running a Telnet server application and then to execute commands from the command line.





Network API: “Socket”

Server and Client exchange messages over the network through a common **Socket API**




thank you!