Lecture 19

Introduction to TCP/IP

CT4005NI - Computer Hardware and Software Architectures

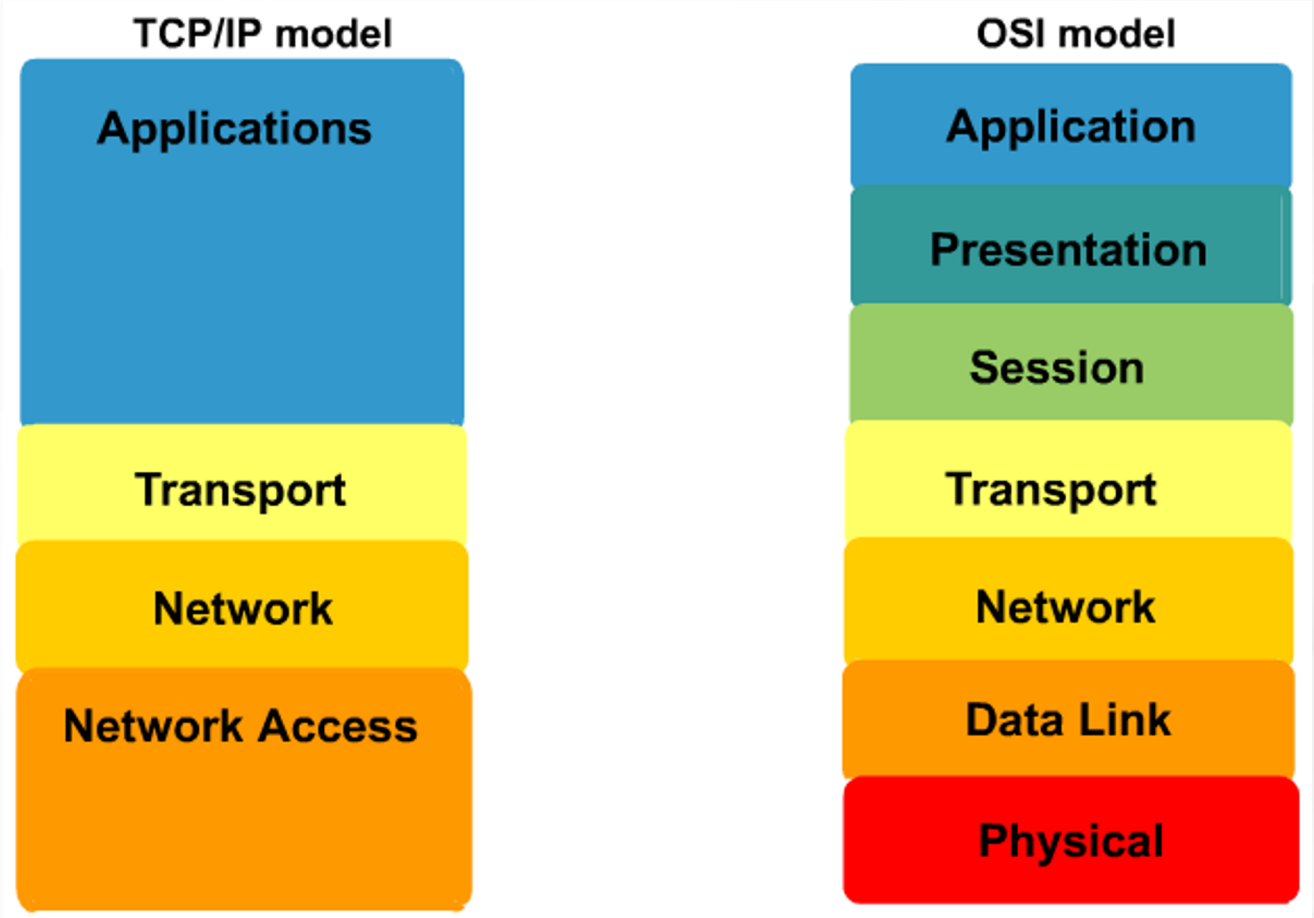
Introduction to TCP/IP

- TCP/IP (Transmission Control Protocol / Internet Protocol) was created by DOD.
- Computer Networks uses this TCP/IP schemes for Internetwork communication.
- TCP/IP first came on the scene in 1973, but was later divided into two distinct protocols, TCP and IP.
- In 1983, TCP/IP replaced NCP and was the authorized set of rules for data transmission over a computer network.

TCP/IP and the OSI Model

- TCP/IP model is a condensed version of the OSI reference model.
- It has four layers instead of the seven layers of the OSI model.
- The four layers are Application/Process layer, Host-to-host or the Transport layer, the Internet or the Network layer and the Network Access Layer.

TCP/IP and the OSI Model



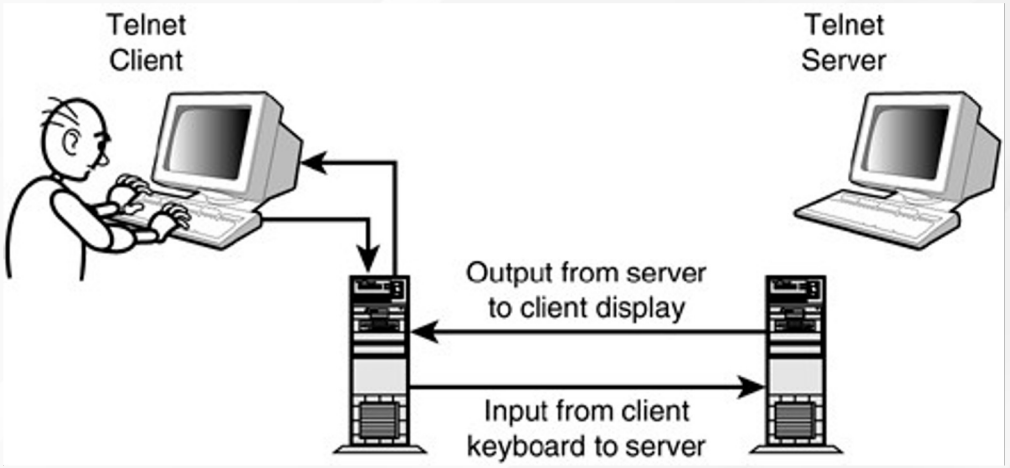
TCP/IP and the OSI Model

- The Process/Application layer defines protocols for node to node application communication and also controls user interface specifications.
- The Host-to-host or transport layer parallels the function of the OSI's Transport layer by setting up transmission service for applications.
- The Internet or Network layer corresponds to the OSI's Network Layer, looking over the logical transmission of packets.
- The Network Access layer implements the data exchange between the host and the network using hardware addressing.

The Process/Application Layer Protocols

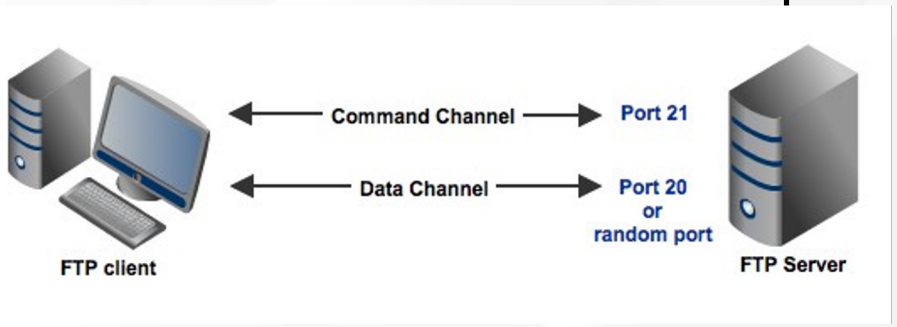
In the following sections, we will now cover the different Application Layer protocols used in an IP network.

1. TELNET: Used for terminal emulation and has a telnet client and a telnet server. Uses TCP port 23.

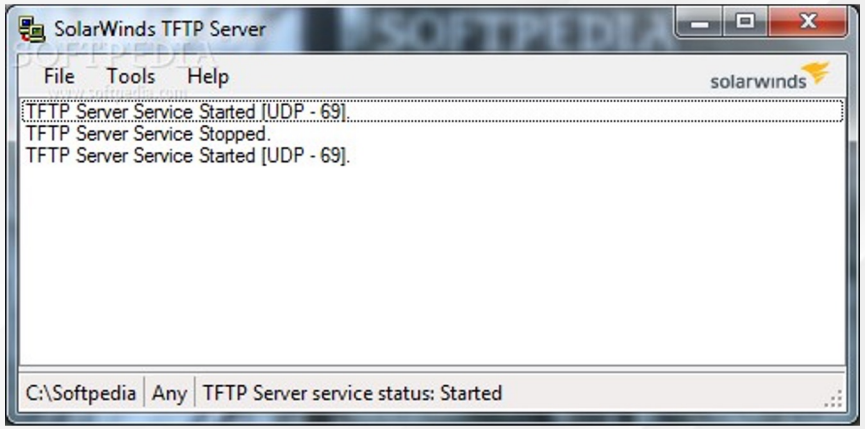


The Process/Application Layer Protocols

2. FTP: A protocol that allows us to transfer files. Requires proper authentication modes set up.



3. TFTP: A stripped-down version of FTP that is mainly used for quick backups of data. Uses port 69.



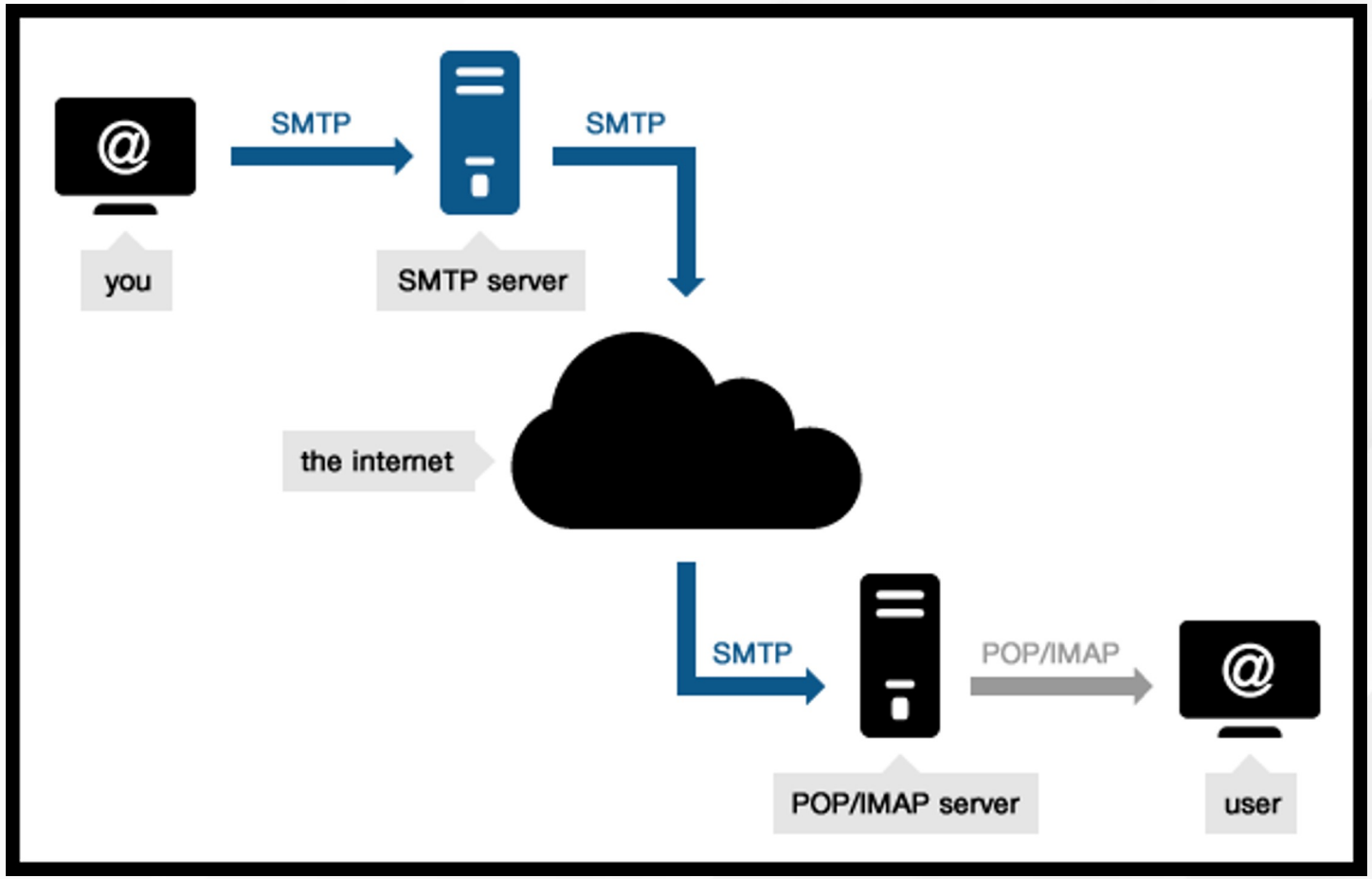
The Process/Application Layer Protocols

4.SMTP: Simple Mail Transfer Protocol (SMTP) is used to send mail using a spooled or queued method of mail delivery. Uses port 25.

4. POP and POP3: The Post Office Protocol (POP) is used to retrieve mail from a mail server to a host. Uses port 110.

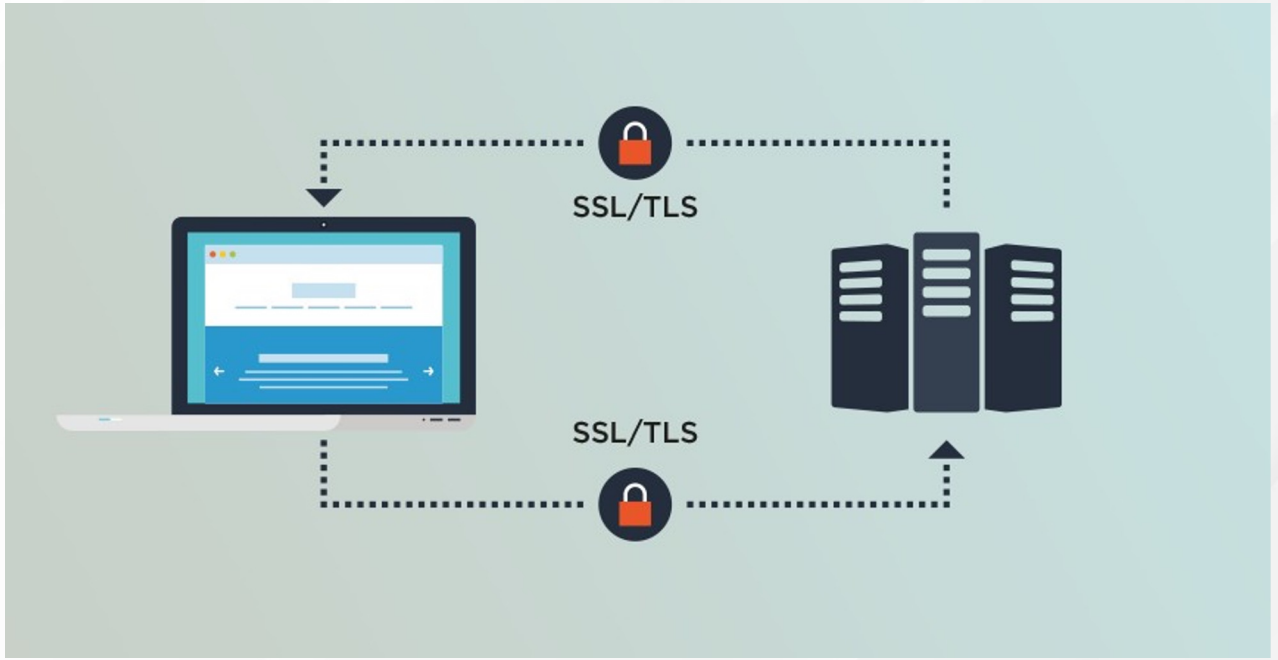
6.IMAPv4: Internet Message Access Protocol (IMAP) gives us more security while allowing users to retrieve mail from a mail server to a host. Uses port 143.

The Process/Application Layer Protocols



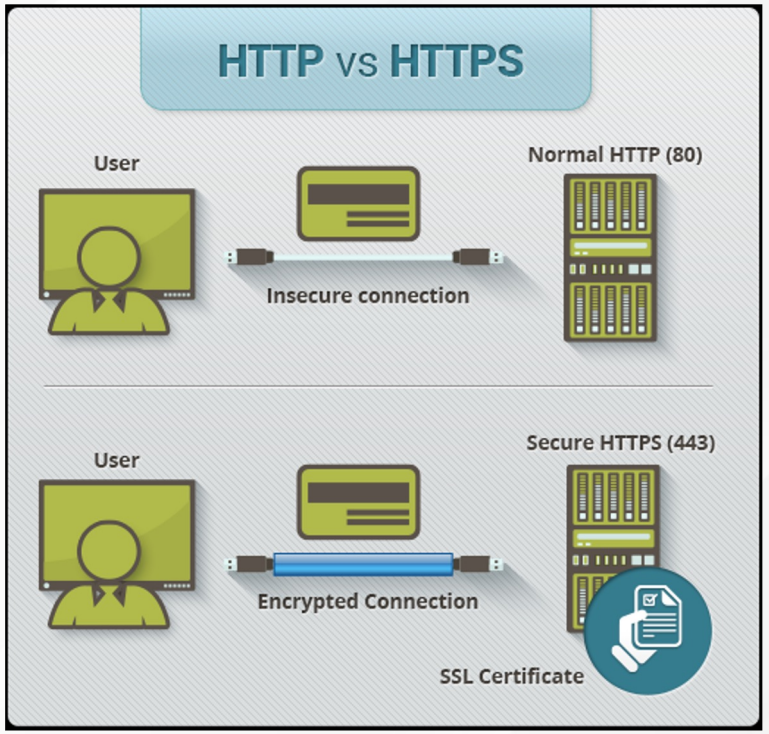
The Process/Application Layer Protocols

7. TLS and SSL: Transport Layer Security (TLS) and Secure Socket Layer (SSL) are cryptographic protocols or securing the online data transmission.



The Process/Application Layer Protocols

8.HTTP and HTTPS: Used to manage communications between browsers and servers. HTTPS uses SSL.

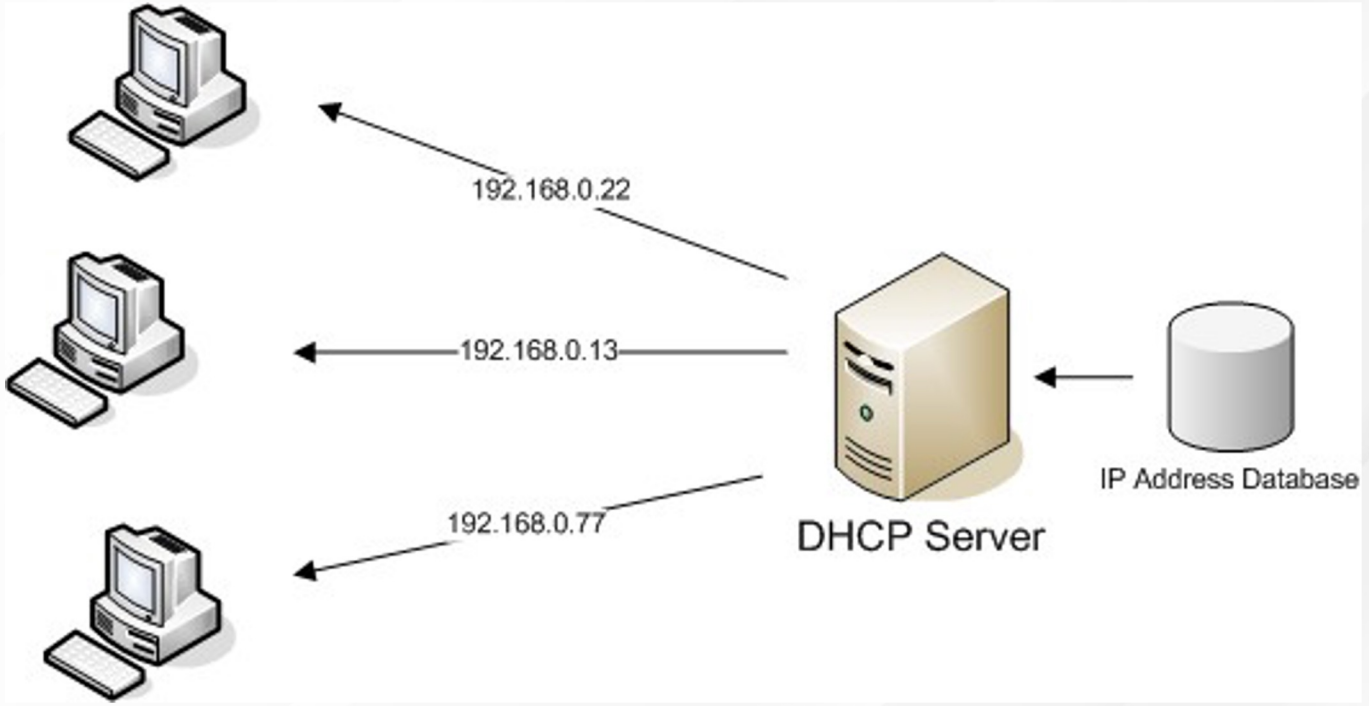


The Process/Application Layer Protocols

9. DNS: Domain name server (DNS) resolves hostnames.

The Process/Application Layer Protocols

10. DHCP: Used to dynamically assign IP addresses to hosts.



Host-to-Host Layer Protocols

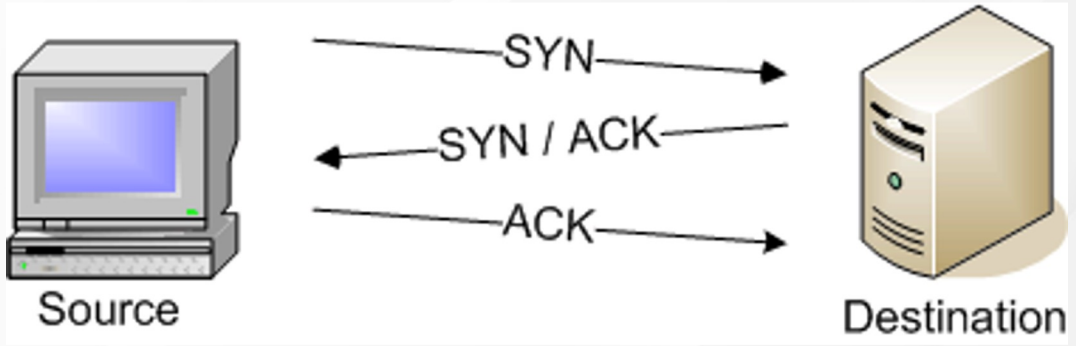
- There are *two* sets of protocols in this layer which helps to manage end to end communication between the communicating hosts.

- **TCP** or Transmission Control Protocol is a Connection-Oriented protocol.

- **UDP** or User Datagram Protocol is a Connection-Less Protocol.

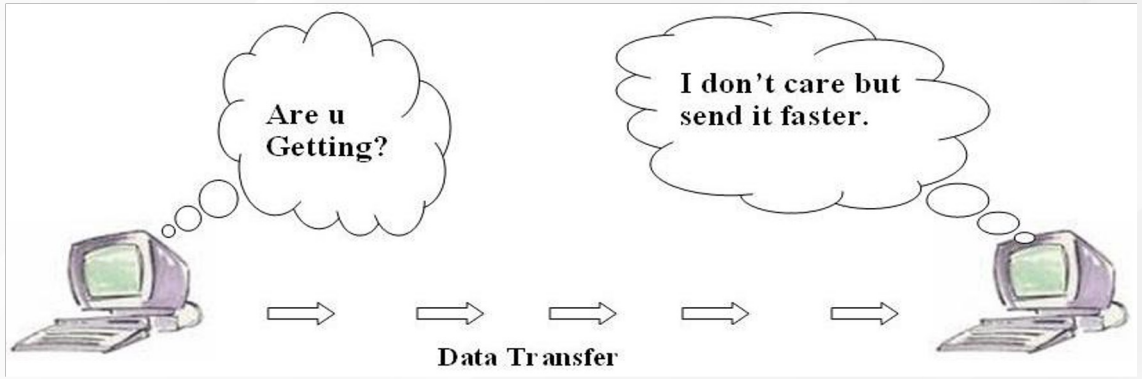
Host-to-Host Layer Protocols

- **TCP** takes data from the top layer and then breaks it into segments.
- Uses virtual circuits.
- It sequences and numbers each segments and thus is called connection oriented protocol.
- Uses Three-way-Handshake for reliability and is known as Reliable protocol.



Host-to-Host Layer Protocols

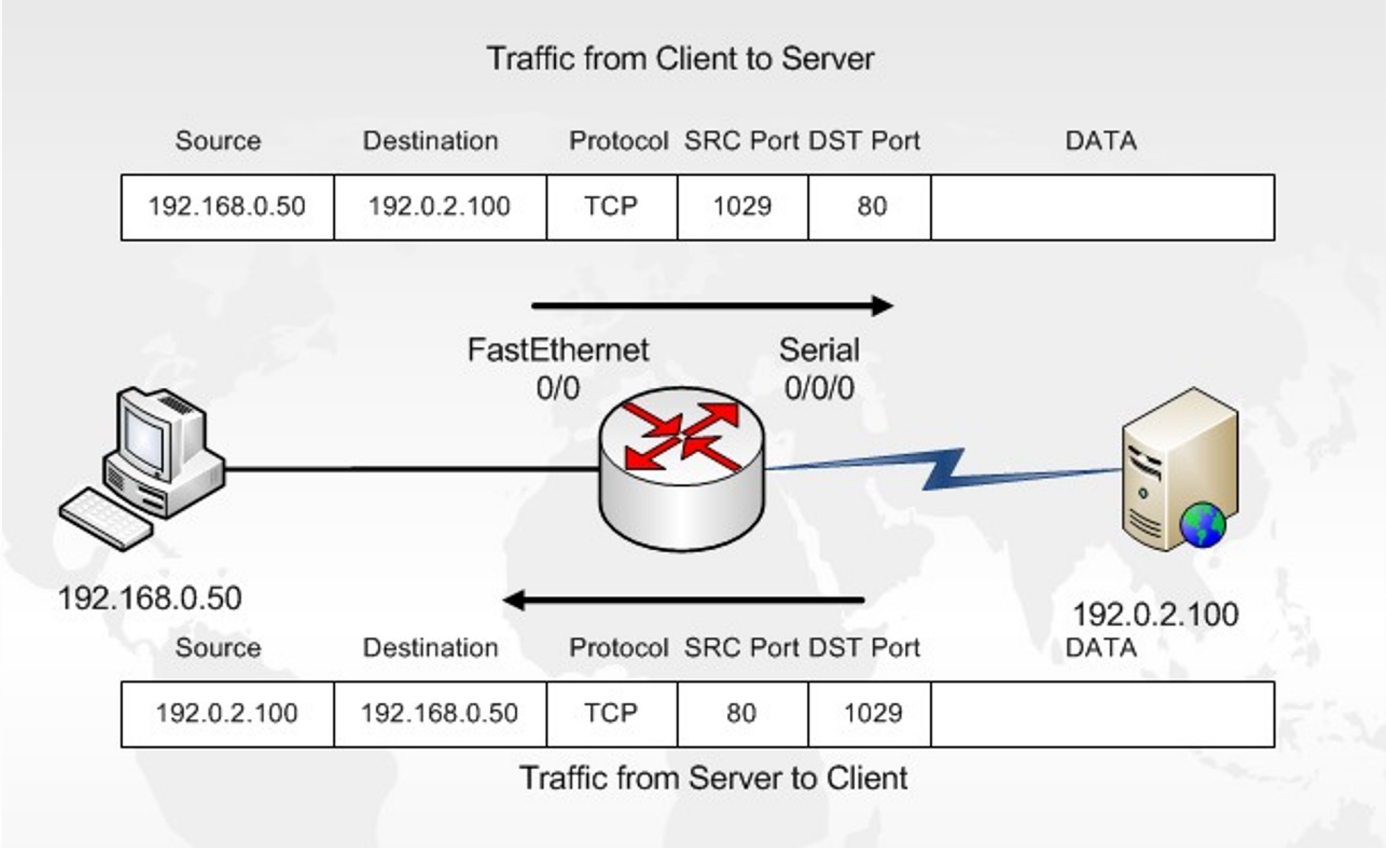
- **UDP** is a scaled down protocol and is also referred to as the thin protocol.
- This protocol is used when the reliability of the transmitted data is not a priority.
- The segments created using UDP are not segmented, nor numbered, hence known as Connectionless protocol.
- There are no acknowledgements and thus the protocol is known as Unreliable protocol.



Port Numbers

- Port numbers are used for establishing communication sessions and for communication with the upper layers to that of Host-to-Host layer.
- There are source ports and then there are destination ports.
- Numbers below 1024 are reserved as ports used by well known protocol and services.
- 1024 to 65535 can be used to make up source ports or destination ports.

Port Numbers



Common Port Numbers

Port Number	Protocol	Application
20	TCP	FTP data
21	TCP	FTP control
22	TCP	SSH
23	TCP	Telnet
25	TCP	SMTP
53	UDP, TCP	DNS
67, 68	UDP	DHCP
69	UDP	TFTP
80	TCP	HTTP (WWW)
110	TCP	POP3
161	UDP	SNMP
443	TCP	SSL

End of Lecture 19