

# Section 14.1 - Protocols

## Layer 8: Networking

### Syllabus Content Section 14: Communication and Internet Technologies

#### S14.1.1 Show understanding of why a protocol is essential for communication between computers

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**Protocol**: a set of rules for data transmission which are agreed by sender and receiver

#### S14.1.2 Show understanding of how protocol implementation can be viewed as a stack, where each layer has its own functionality

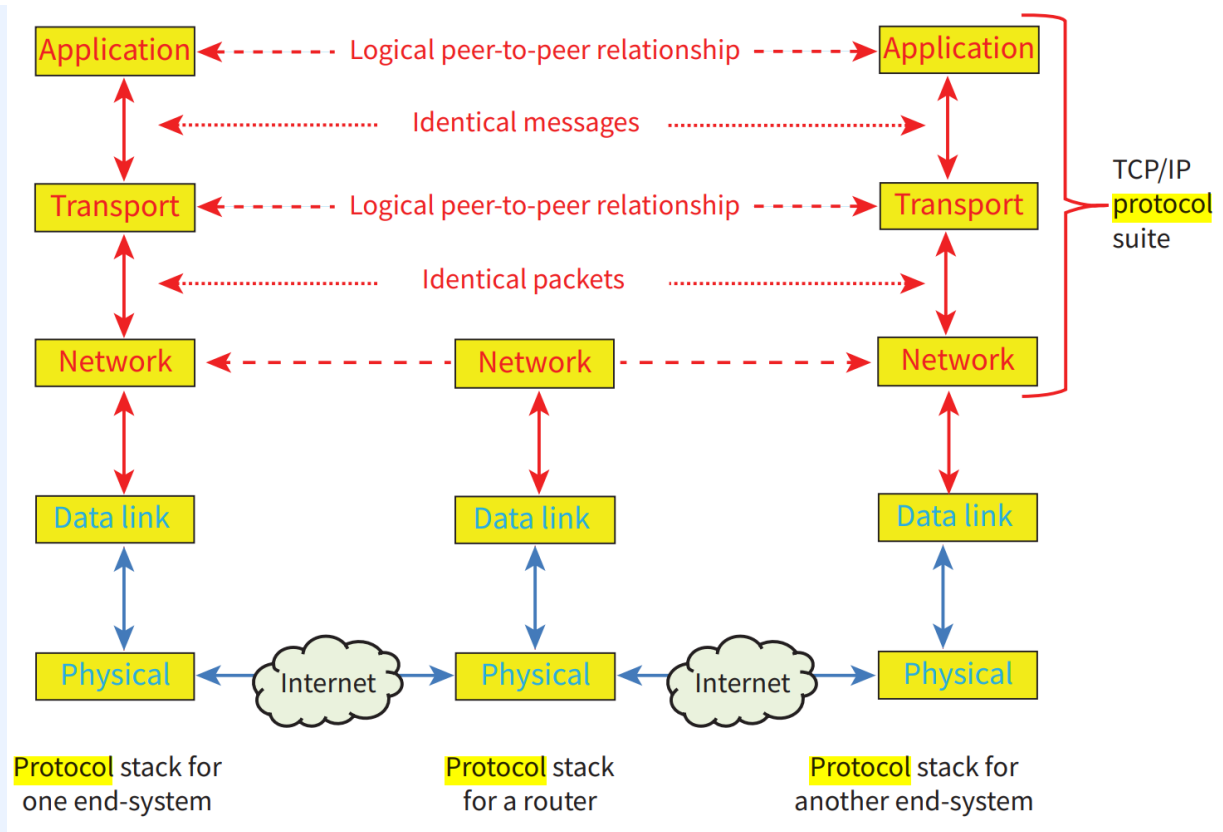
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- Each layer can only accept input from the next higher layer or the next lower layer.
- There is a defined interface between adjacent layers which constitutes the only interaction allowed between layers.
- A layer is serviced by the actions of lower layers.
- With the possible exception of the lowest layer the functioning of a layer is created by installed software.
- A layer may comprise sub-layers.
- Any user interaction will take place using protocols associated with the highest level layer in the stack.
- Any direct access to hardware is confined to the lowest layer in the stack.

#### S14.1.3 Show understanding of the TCP/IP protocol suite

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- Four Layers (Application, Transport, Internet, Link) Purpose and function of each layer
  - Application when a message is sent from one host to another on the internet
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OSI Model	TCP/IP
Application	Application
Prestation	Application
Session	Application
Transport	Transport
Network	Network
Data Link	Data Link
Physical	Physical

## Application

Only layer that interacts with the user.

Handles error handling and recovery.

Defines what protocol to use(HTTP,SMTP,TCP,POP3,DNS,FTP...)

Defines the protocol by picking a port

## Transport

Transport layer takes your data and splits it up into packets

The packets are given some extra information, they are given a header

The header includes: Port number that was used and packet number (3 out of 7)

It also adds data about error checking, the application layer does the error checking but the transport layer adds this information.

After the data is split into packets and the packets get a header. It goes to the network layer

## Internet

This is where the source IP address and destination IP address are added  
Handles packet routing. Says where and how a packet should go.

After the addresses are added and the packet routing information is done. The packet is sent to the data link layer.

#### Link

Prepares your data for transmission

Controls access to the physical layer

It makes your packet has a header and trailer, it encapsulates your data packet.

The frame header contains the information about the topology that is being used. This is because you want to send data regardless and all the previous layer information may be in a format that the network may not handle. The data link layer makes sure the information is in a format that the network can handle.

#### S14.1.4 Show understanding of protocols (HTTP, FTP, POP3, IMAP, SMTP, BitTorrent) and their purposes

- BitTorrent protocol provides peer-to-peer file sharing

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- Common TCP ports
    - 20 – FTP
    - 25 – SMTP
    - 80 – HTTP
    - 110 - POP
    - 113 – Authentication
    - 443 - HTTPS
    - 465 – Authenticated with SSL

#### HTTP(Hypertext Transfer Protocol)

Accessed using a browser uses port 80

Most common example is when you type <http://www.bing.com>

You (client) are making a request to a server

The server responds saying if its okay or not

The first line of the HTTP message is the request line.

Then the header is sent

All of that is sent using ASCII

The format is CRLF

#### FTP(File Transfer Protocol)

Just like with email (SMTP, POP, IMAP) this is becoming less common as people use web browsers and port 80

FTP lets you upload files to a web server.

You need to have special software on your client to use FTP. Its called FTP client

You can upload multiple files

There are two things you must do:

Establish a connection / Control port

Send the data / Data port

#### POP3(Post Office Protocol 3)

Pull protocol

Gets / Pulls your message from the server

Once its on your client, its removed from server

Very simple

Only useful if you use only one client

#### IMAP(Internet Message Access Protocol)

Leaves your message on the server,

If you read on client, it shows up as read on server

Can use multiple clients

Can have calendars, contact lists

#### SMTP(Simple Mail Transfer Protocol)

You (Client) sends an email.

This goes to a mail server

Then this mail server behaves like it was a client for the receiving sever

The receiving server gets the message

It's a push protocol because it pushes mail to the recipient server

#### BitTorrent

BitTorrent protocol is a P2P file transfer protocol based on TCP/IP protocol, which is in the application layer of TCP/IP structure