APPLICATION LAYER TCP/IP

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TCP/IP Protocols

- TCP/IP is a large collection of different communication protocols.
- A Family of Protocols
  - TCP/IP is a large collection of different communication protocols based upon the two original protocols TCP and IP.

- TCP - Transmission Control Protocol
  - TCP is used for transmission of data from an application to the network.
  - TCP is responsible for breaking data down into IP packets before they are sent, and for assembling the packets when they arrive.
- IP - Internet Protocol
  - IP takes care of the communication with other computers.
  - IP is responsible for the sending and receiving data packets over the Internet.
- HTTP - Hyper Text Transfer Protocol
  - HTTP takes care of the communication between a web server and a web browser.
  - HTTP is used for sending requests from a web client (a browser) to a web server, returning web content (web pages) from the server back to the client.

- HTTPS - Secure HTTP
  - HTTPS takes care of secure communication between a web server and a web browser.
  - HTTPS typically handles credit card transactions and other sensitive data.
- SSL - Secure Sockets Layer
  - The SSL protocol is used for encryption of data for secure data transmission.
- SMTP - Simple Mail Transfer Protocol
  - SMTP is used for transmission of e-mails.
- MIME - Multi-purpose Internet Mail Extensions
  - The MIME protocol lets SMTP transmit multimedia files including voice, audio, and binary data across TCP/IP networks.

- IMAP - Internet Message Access Protocol
  - IMAP is used for storing and retrieving e-mails.
- POP - Post Office Protocol
  - POP is used for downloading e-mails from an e-mail server to a personal computer.
- FTP - File Transfer Protocol
  - FTP takes care of transmission of files between computers.
- NTP - Network Time Protocol
  - NTP is used to synchronize the time (the clock) between computers.

- DHCP - Dynamic Host Configuration Protocol
  - DHCP is used for allocation of dynamic IP addresses to computers in a network.
- SNMP - Simple Network Management Protocol
  - SNMP is used for administration of computer networks.
- LDAP - Lightweight Directory Access Protocol
  - LDAP is used for collecting information about users and e-mail addresses from the internet.
- ICMP - Internet Control Message Protocol
  - ICMP takes care of error-handling in the network.

- ARP - Address Resolution Protocol
  - ARP is used by IP to find the hardware address of a computer network card based on the IP address.
- RARP - Reverse Address Resolution Protocol
  - RARP is used by IP to find the IP address based on the hardware address of a computer network card.
- BOOTP - Boot Protocol
  - BOOTP is used for booting (starting) computers from the network.
- PPTP - Point to Point Tunneling Protocol
  - PPTP is used for setting up a connection (tunnel) between private networks.

Example: TCP/IP Email

Email is one of the most important uses of TCP/IP.

You Don't

When you write an email, you don't use TCP/IP.

When you write an email, you use an email program like Lotus Notes, Microsoft Outlook or Netscape Communicator.

Your Email Program Does

Your email program uses different TCP/IP protocols:

It sends your emails using SMTP

It can download your emails from an email server using POP

It can connect to an email server using IMAP

- SMTP - Simple Mail Transfer Protocol
  - The SMTP protocol is used for the transmission of e-mails. SMTP takes care of sending your email to another computer.
  - Normally your email is sent to an email server (SMTP server), and then to another server or servers, and finally to its destination.
  - SMTP can only transmit pure text. It cannot transmit binary data like pictures, sounds or movies.
  - SMTP uses the MIME protocol to send binary data across TCP/IP networks. The MIME protocol converts binary data to pure text.

- POP - Post Office Protocol
  - The POP protocol is used by email programs (like Microsoft Outlook) to retrieve emails from an email server.
  - If your email program uses POP, all your emails are downloaded to your email program (also called email client), each time it connects to your email server.

- IMAP - Internet Message Access Protocol
  - The IMAP protocol is used by email programs (like Microsoft Outlook) just like the POP protocol.
  - The main difference between the IMAP protocol and the POP protocol is that the IMAP protocol will not automatically download all your emails each time your email program connects to your email server.
  - The IMAP protocol allows you to look through your email messages at the email server before you download them. With IMAP you can choose to download your messages or just delete them. This way IMAP is perfect if you need to connect to your email server from different locations, but only want to download your messages when you are back in your office.