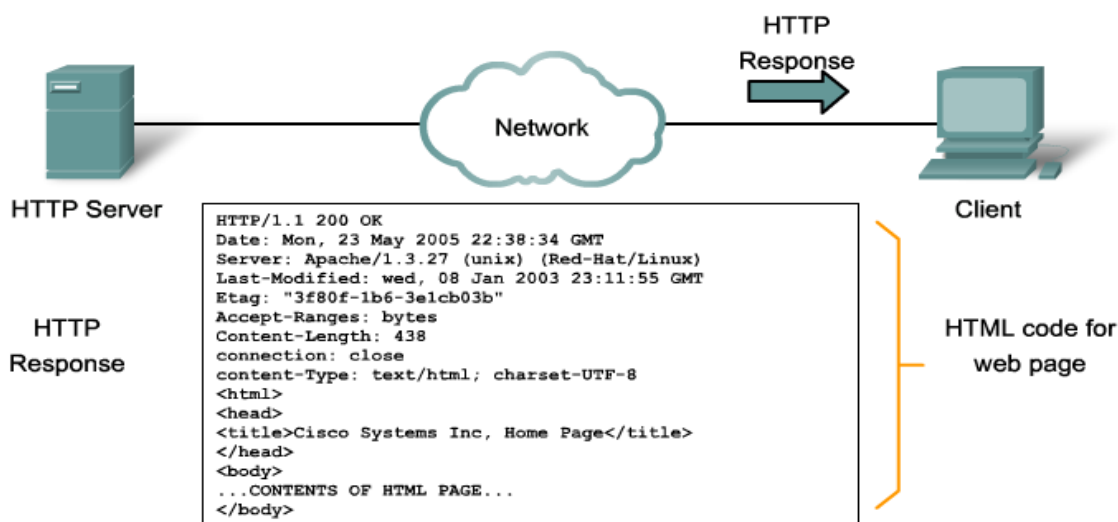
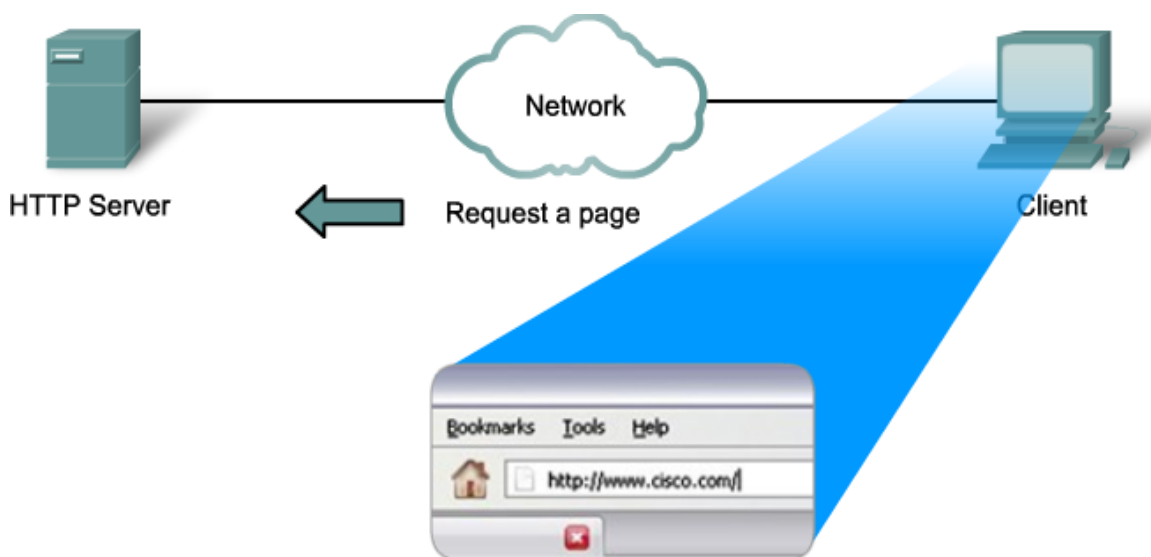


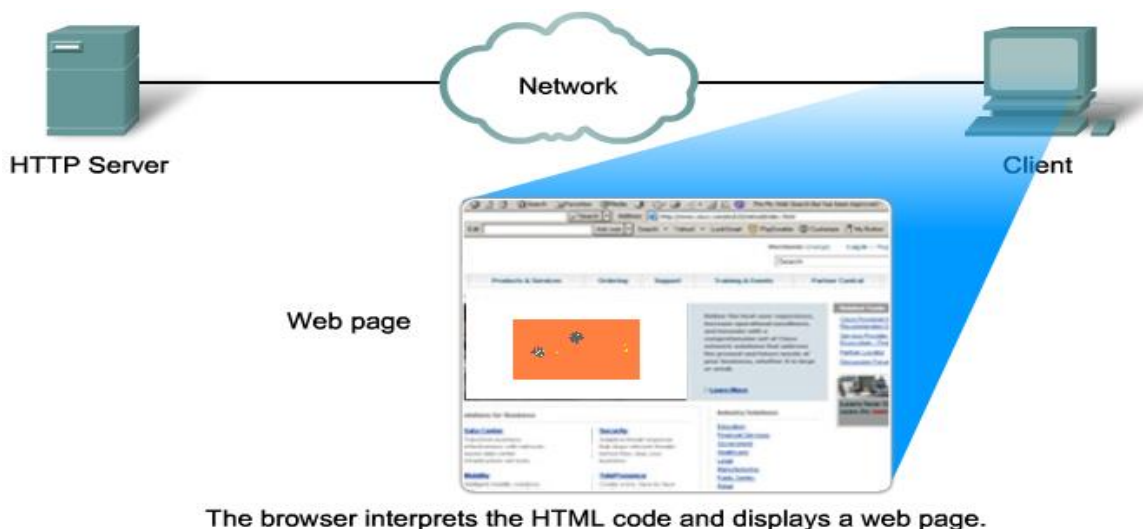
## WWW Services and HTTP:

When a web address (or **URL**-**U**niform **R**esource **L**ocator (e.g. [www.cisco.com](http://www.cisco.com))) is typed into a web browser, the web browser establishes a connection to the web service running on the server using the HTTP protocol.

*The following figures depict these services and protocols.*



In response to the request, the HTTP server returns code for a web page.



\*\*\*Web browsers are the client applications our computers use to connect to the World Wide Web and access resources stored on a web server

For example, we'll use the URL: **http://www.cisco.com/web-server.htm**.

First, the browser interprets the three parts of the URL:

1. **Http** (the protocol or scheme)
  2. **www.cisco.com** (the server name)
  3. **web-server.htm** (the specific file name requested).
- The browser then checks with a name server (DNS) to convert **www.cisco.com** into a numeric address, which it uses to connect to the server.
  - Using the HTTP protocol requirements, the browser sends a **GET** request to the server and asks for the file **web-server.htm**.
  - The server in turn sends the Hyper Text Markup Language (**HTML**) code for this web page to the browser.
  - Finally, the browser deciphers the HTML code and formats the page for the browser window.

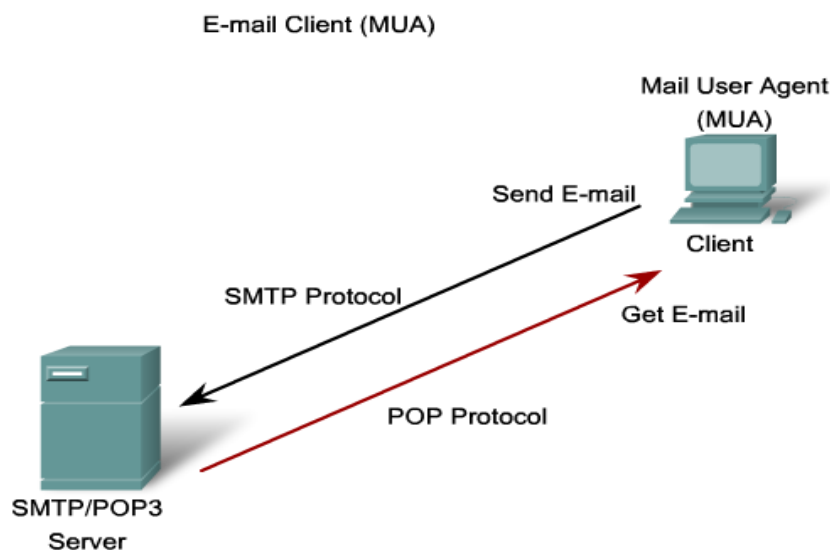
**\*\*When a client sends a request message to a server, the HTTP protocol defines the message types the client uses to request the web page and also the message types the server uses to respond. The three common message types are GET, POST, and PUT.**

- **GET** is a client request for data.
- **POST** and **PUT** are used to send messages that upload data to the web server.

### **SMTP and POP:**

Simple Mail Transfer Protocol (SMTP) and Post Office Protocol (POP). As with HTTP, these protocols define client/server processes.

When people compose e-mail messages, they typically use an application called a Mail User Agent (MUA), or e-mail client. The MUA allows messages to be sent and places received messages into the client's mailbox, both of which are distinct processes. See the following figure.



Clients send e-mails to a server using SMTP and receive e-mails using POP.

### **E-mail Server Processes:**

The e-mail server operates two separate processes:

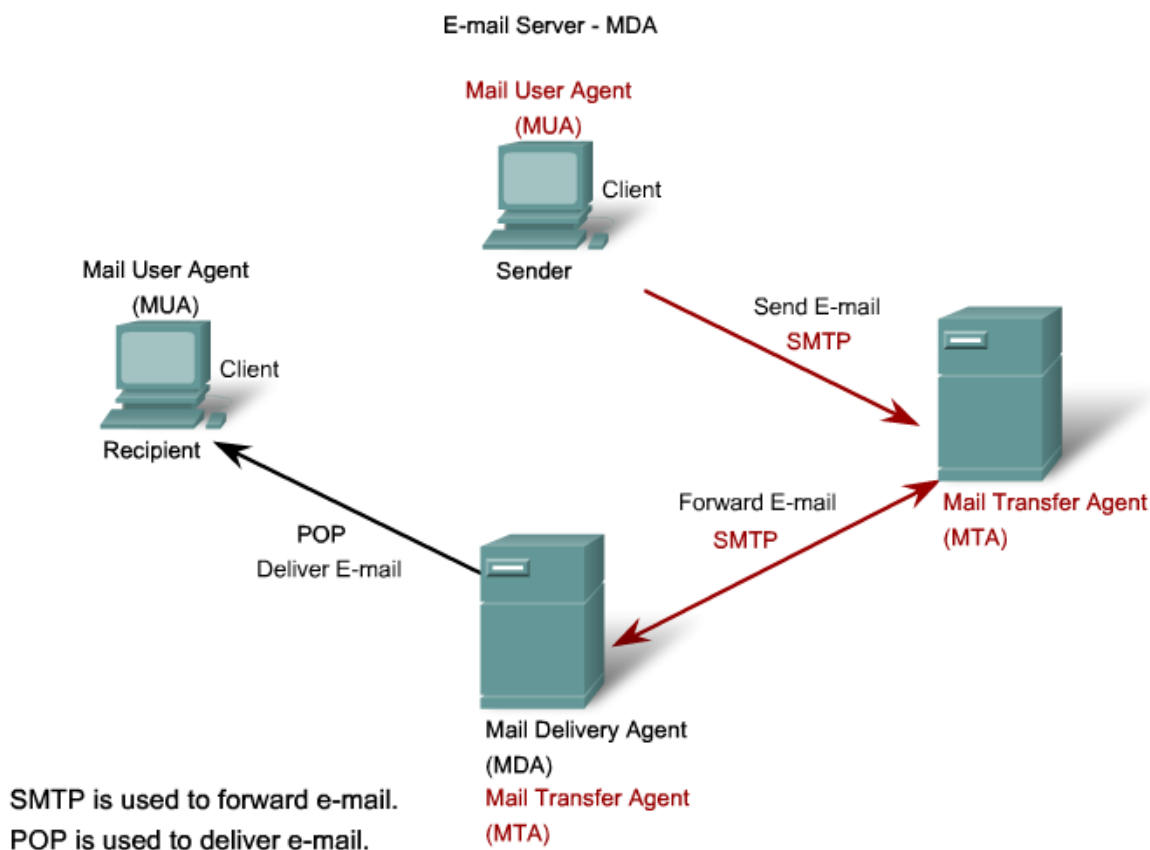
**Mail Transfer Agent (MTA):** a process that is used to **forward** e-mail

**Mail Delivery Agent (MDA):** a process that performs the actual delivery.

The **MDA** receives all the inbound mail from the MTA and places it into the appropriate users' mailboxes.

**POP** and **POP3** (POP version 3) are **inbound** mail delivery protocols and are typical client/server protocols. They deliver e-mail from the e-mail server to the client (MUA).

The Simple Mail Transfer Protocol (**SMTP**), on the other hand, governs the transfer of **outbound** e-mail from the sending client to the e-mail server (MDA), as well as the transport of e-mail between e-mail servers (MTA). See the following figure.



### File Transfer Protocol:

The File Transfer Protocol (FTP) is another commonly used Application layer protocol. FTP was developed to allow for file transfers between a client and a server.

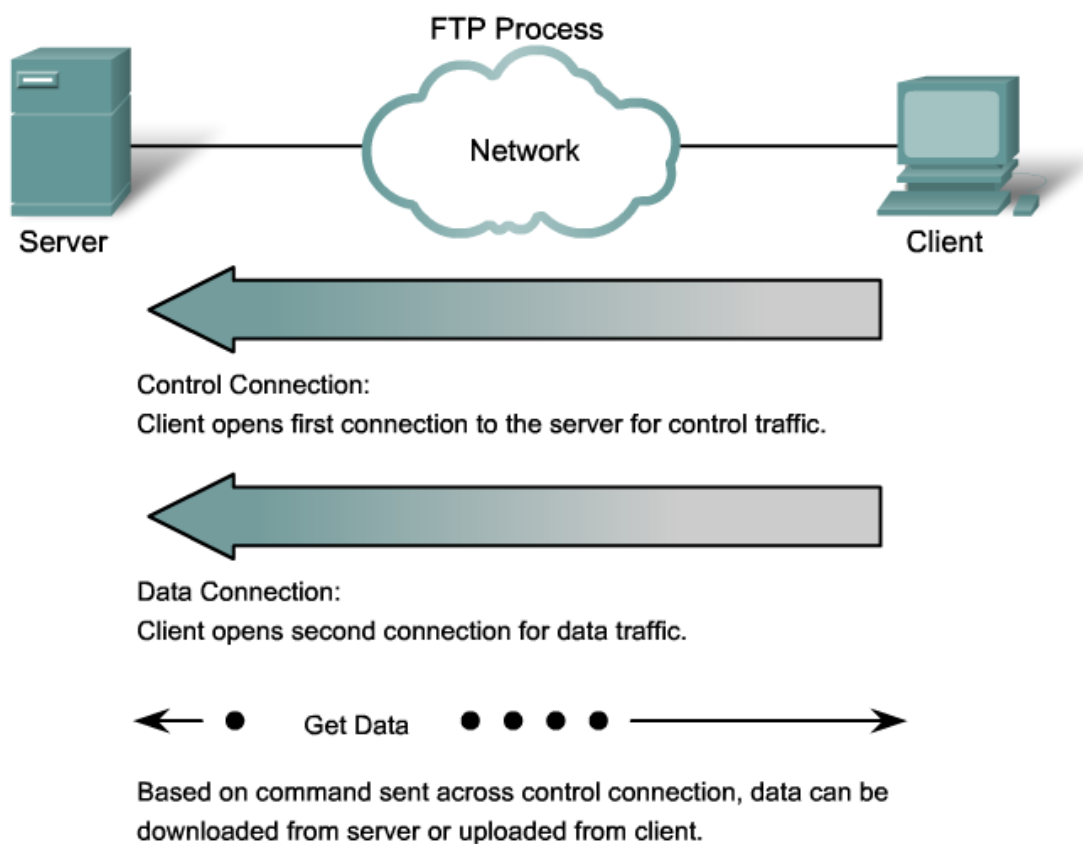
To successfully transfer files, FTP requires two connections between the client and the server: one for commands and replies, the other for the actual file transfer.

The client establishes the first connection to the server on TCP port 21. This connection is used for control traffic, consisting of client commands and server replies.

The client establishes the second connection to the server over TCP port 20. This connection is for the actual file transfer and is created every time there is a file transferred.

The file transfer can happen in either direction. The client can download (pull) a file from the server or, the client can upload (push) a file to the server.

*The following figure shows the process of file transformation.*

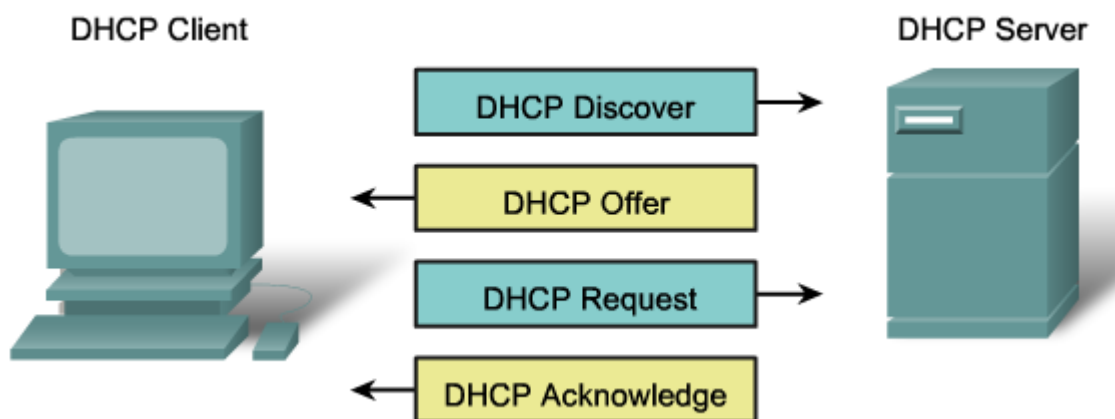


## Dynamic Host Configuration Protocol (DHCP):

The DHCP service enables devices on a network to obtain IP addresses and other information from a DHCP server. This service automates the assignment of IP addresses, subnet masks, gateway and other IP networking parameters.

DHCP allows a host to obtain an IP address dynamically when it connects to the network. The DHCP server is contacted and an address requested. The DHCP server chooses an address from a configured range of addresses called a pool and assigns ("leases") it to the host for a set period.

*The following next figure shows the process of **leasing** an address from a server.*



On larger local networks, or where the user population changes frequently, DHCP is preferred. New users may arrive with laptops and need a connection. Others have new workstations that need to be connected. Rather than have the network administrator assign IP addresses for each workstation, it is more efficient to have IP addresses assigned automatically using DHCP.

Dynamic and static addressing both has their places in network designs. Many networks use both DHCP and static addressing. DHCP is used for general purpose hosts such as end user devices, and fixed addresses are used for network devices such as gateways, switches, servers and printers. As the *following figure* shows, various types of devices can be DHCP servers when running DHCP service software. The DHCP server in most medium to large networks is usually a local dedicated PC-based server.

