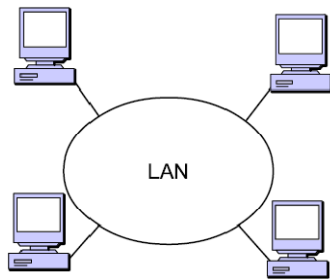


# 2

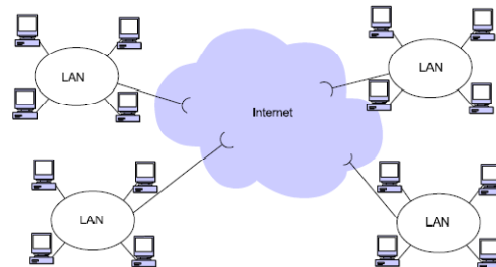
## Introduction to Web Application Technologies

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### The Internet

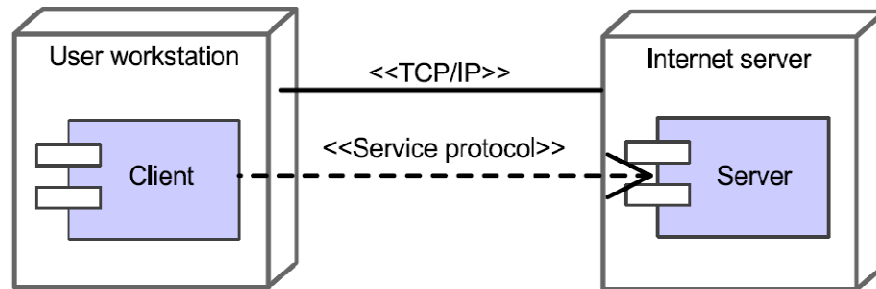


In the early days of computer networking, local area networks (LANs) were created to share resources among members of a particular institution. These networks were constrained to short distances.



The Internet is a Network of Networks

## Client-Server Architecture



## Hypertext Transfer Protocol

- ▶ The *Hypertext Transfer Protocol (HTTP)* is similar to FTP because it is a protocol to transfer files from the server to the client.
- ▶ HTTP was created in conjunction with the related *Hypertext Markup Language (HTML)* standard.
- ▶ There is one fundamental difference between FTP and HTTP: HTTP supports only one request per connection.
- ▶ This means that the client connects to the server to retrieve one file and then disconnects. This mechanism allows more users to connect to a given server over a period of time.

## HTML

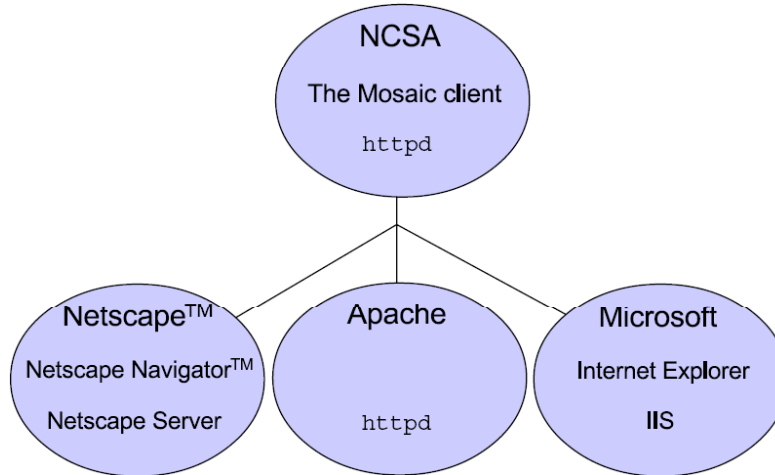
- ▶ HTML is a document display language that allows users to link from one document to another.
- ▶ HTML also permits images and other media objects to be embedded in an HTML document. The media objects are stored in files on a server.
- ▶ HTTP also retrieves these files. HTTP can therefore be used to transmit any file that conforms to the Multipurpose Internet Mail Extensions (MIME) specification.

## Web Browsers and Web Servers

- ▶ To view an HTML document with rich media content, a graphical user interface (GUI) was built on top of the client-side HTTP. This GUI is called a Web browser.
- ▶ The server-side HTTP component is called a Web server.
- ▶ Several companies have developed Web browsers and Web servers; some have developed both. The first Web server was a process called httpd; the first widely used browser was Mosaic, created by National Center for Supercomputing Applications (NCSA).

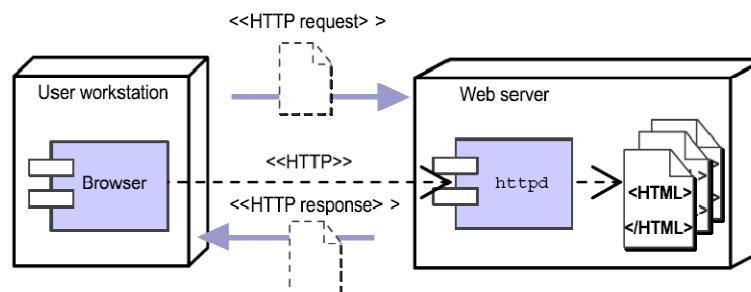
## Web Browsers and Web Servers

### ► Early web servers and browsers



## HTTP Client-Server Architecture

### ► For every exchange over the Web using HTTP, there is a request and a response.



## Uniform Resource Locator

- ▶ A URL is a canonical name that locates a specific resource on the Internet:  
protocol://host:port/path/file
- ▶ Example:  
http://www.soccer.org:80/league/Spring2001.html
- ▶ The path element includes the complete directory structure path to find the file. The port number is used to identify the TCP port that is used by the protocol on the server. If the port number is the standard port for the given protocol, then that number can be ignored in the URL.
- ▶ For example, port 80 is the default HTTP port.

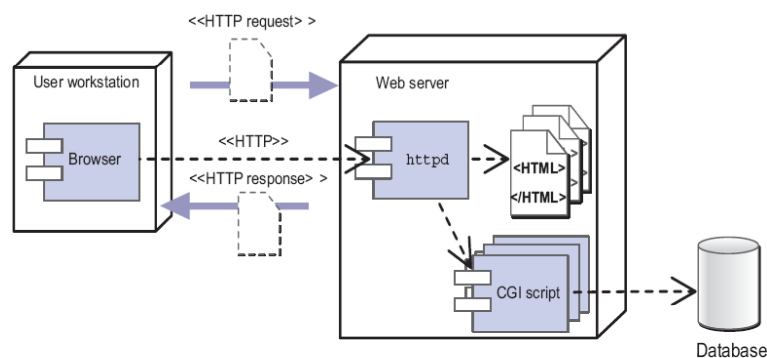
## Web Applications

- ▶ Very early in the development of HTML, the designers created a mechanism to permit a user to invoke a program on the Web server.
- ▶ This was called the *Common Gateway Interface (CGI)*. When a Web site includes CGI processing, this is called a *Web application*.

## CGI Programs on the Web Server

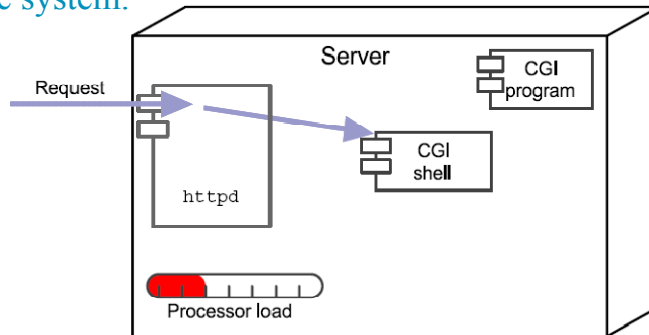
- Usually, the browser needs to send data to the CGI program on the server.
- The CGI specification defines how the data is packaged and sent in the HTTP request to the server. This data is usually typed into the Web browser in an HTML form.
- The URL determines which CGI program to execute. This might be a script or an executable file.
- The CGI program parses the CGI data in the request, processes the data, and generates a response (usually an HTML page). The CGI response is sent back to the Web server, which wraps the response in an HTTP response. The HTTP response is sent back to the Web browser.

## CGI Programs on the Web Server



## Execution of CGI Programs

- ▶ At runtime, a CGI program is launched by the Web server as a separate operating system (OS) shell.
- ▶ The shell includes an OS environment and process to execute the code of the CGI program, which resides within the server's file system.



## Execution of CGI Programs

