

INTERNET PROGRAMMING & WEB OPTIMIZATION

WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

WEB ESSENTIALS: CLIENTS, SERVERS AND COMMUNICATION

HTML :

- HTML (Hyper Text Markup Language) document (with the extension .html or .htm) describes to a web browser the document's content and structure.
- HTML documents normally contain hyperlinks, which, when clicked, load a specified web document. Both images and text may be hyperlinked.
- When the mouse pointer hovers over a hyperlink, the default arrow pointer changes into a hand with the index finger pointing upward.
- Often hyperlinked text appears underlined and in a different color from regular text in a web page.

Clients, Servers and Communication :

- When the user clicks a hyperlink, a web server locates the requested web page and sends it to the user's web browser.
- Similarly, the user can type the address of a web page into the browser's address field and press Enter to view the specified page.
- Hyperlinks can reference other web pages, e-mail addresses, files and more.

URIs and URLs :

- URIs (Uniform Resource Identifiers) identify resources on the Internet.
- URIs that start with http:// are called URLs (Uniform Resource Locators).
- Common URLs refer to files, directories or server-side code that performs tasks such as database lookups, Internet searches and business-application processing.

Parts of a URL :

- A URL contains information that directs a browser to the resource that the user wishes to access. Web servers make such resources available to web clients
Popular web servers include ,Apache's HTTP Server and Microsoft's Internet Information Services (IIS).
- Let's examine the components of the URL
<http://www.deitel.com/books/downloads.html>
- The text http:// indicates that the Hyper Text Transfer Protocol (HTTP) should be used to obtain the resource. Next in the URL is the server's fully qualified hostname (for example,

www.deitel.com)—the name of the web-server computer on which the resource resides.

- This computer is referred to as the host, because it houses and maintains resources.
- The hostname www.deitel.com is translated into an IP (Internet Protocol) address—a numerical value that uniquely identifies the server on the Internet.

Domain Name System (DNS) Server :

- An Internet Domain Name System (DNS) server maintains a database of hostnames and their corresponding IP addresses and performs the translations automatically.
- The remainder of the URL (/books/downloads.html) specifies the resource's location (/books) and name (downloads.html) on the web server.
- The location could represent an actual directory on the web server's file system. For security reasons, however, the location is typically a virtual directory. The web server translates the virtual directory into a real location on the server, thus hiding the resource's true location.

Making a Request and Receiving a Response :

- When given a web page URL, a web browser uses HTTP to request the web page found at that address.

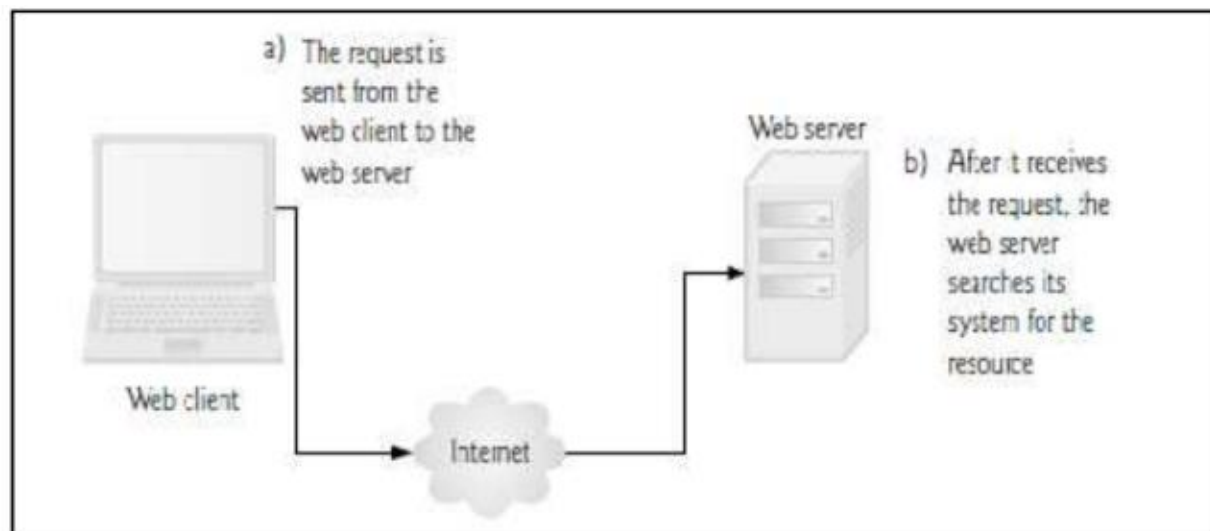


Figure: Client requesting a resource from a web server.

In Figure, the web browser sends an HTTP request to the server. The request (in its simplest form) is

GET /books/downloads.html HTTP/1.1

- The word GET is an HTTP method indicating that the client wishes to obtain a resource from the server.
- The remainder of the request provides the path name of the resource (e.g., an HTML5 document) and the protocol's name and version number (HTTP/1.1).
- The client's request also contains some required and optional headers. Any server that understands HTTP (version 1.1) can translate this request and respond appropriately.

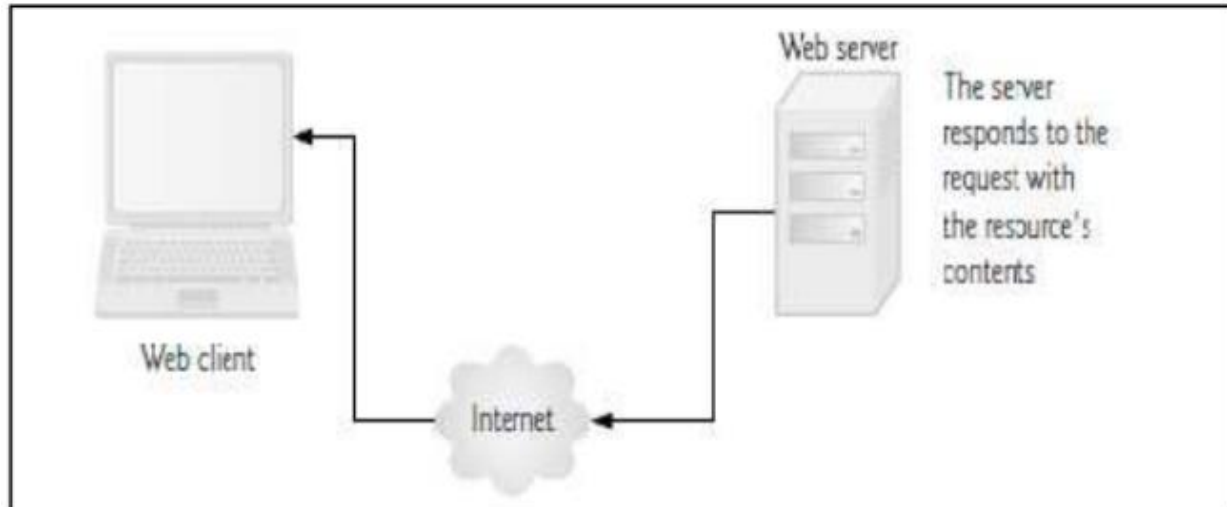


Figure : Client receiving a response from the web server.

What does the response look like?

The server first sends a line of text that indicates the HTTP version, followed by a numeric code and a phrase describing the status of the transaction.

For example,

HTTP/1.1 200 OK

◇ indicates success, whereas

HTTP/1.1 404 Not found

◇ informs the client that the web server could not locate the requested resource.

THE INTERNET

- The Internet is the collection of computers that can communicate with one another using TCP/IP over an open, global communications network.
- The Internet traces its roots to a project of the U.S. Department of Defense's then-named Advanced Research Projects Agency, or ARPA. The ARPANET project was intended to support DoD research on computer networking.
- The purpose of ARPANET was to create a larger network, to electronically connect DoD-sponsored researchers and develop tools for computer networking.
- The ARPANET computer network was launched in 1969 and by year's end consisted of four computers at four sites running four different operating systems.
- By 1983, when many ARPANET nodes were split off to form a separate network called MILNET, there were only 113 nodes in the entire network, and these were primarily at universities and other organizations involved in DoD-sponsored research.
- E-mail was available on ARPANET beginning in 1972, and it soon became an extremely popular.
- It wasn't long before other networks were being built, both internationally and regionally within the United States like , SURAnet (Southeastern University Research Association Network) and CSNET (Computer Science Network), was partially funded by the U.S. National Science Foundation (NSF) to aid scientists at universities without ARPANET access.
- Several of the most widely used Internet protocols— including the File Transfer Protocol (FTP) and Simple Mail Transfer Protocol (SMTP), which underlie many of the Internet's file transfer and e-mail operations.

- The TCP/IP (Transmission Control Protocol / Internet Protocol) communication protocol was designed to be used for host-to-host communication both within local area networks and between networks. ARPANET switched from using an earlier protocol to TCP/IP during 1982. At around the same time, an ARPA Internet was created, allowing computers on some outside networks such as CSNET to communicate via TCP/IP with computers on the ARPANET.
- At first, many institutions connected through the so-called PhoneNet (modem) approach for passing e-mail messages. This generally involved long distance calls, and the expense of these calls could be a problem.
- Beginning in 1985, the NSF began work on a new network based on TCP/IP, called NSFNET.
- The NSFNET would provide a backbone through which other networks could interconnect synchronously.
- The original backbone operated at only 56 kbit/s, the maximum speed of a home dial-up line today. This was a reasonable starting point.
- The backbone rate was upgraded to 1.5 Mbit/s (T1) in 1988 and then to 45 Mbit/s (T3) in 1991.
- The backbone was expanded to directly include several research networks in addition to the supercomputer centers, making it that much easier for sites near these research networks to connect to the NSFNET.
- In 1988, networks in Canada and France were connected to NSFNET.
- In 1990, NSFNET was at the center of the Internet, that is, the collection of computer networks connected via the public backbone and communicating across networks using TCP/IP. This same year, commercial Internet dial-up access was first offered.
- There could be significant benefits to allowing commercial traffic on the Internet.
- The restriction on commercial traffic was in 1991.
- This also led fairly quickly to the NSF being able to leave its role as the operator of the Internet backbone in the United States. Those responsibilities were assumed by private telecommunication firms in 1995.
- These firms are paid by other firms, such as some of the larger Internet service providers (ISPs), who connect directly with the Internet backbone. These ISPs are paid by their users, which may include small ISPs as well as end users.

~~These are actually two~~ BASIC INTERNET PROTOCOLS

- A computer communication protocol is a detailed specification of how communication between two computers will be carried out in order to serve some purpose.

TCP/IP :

TCP and IP are actually two different protocols. The reason that they are often treated as one is that the bulk of the services associated with the Internet—e-mail, Web browsing, file downloads, accessing remote databases—are built on top of both the TCP and IP protocols.

- A key element of IP is the IP address, which is simply a 32-bit number.
- At any given moment, each device on the Internet has one or more IP addresses associated with it .
- IP addresses are normally written as a sequence of four decimal numbers separated by periods (called “dots”), as in 192.0.34.166.
- Each decimal number represents one byte of the IP address.
- The function of IP software is to transfer data from one computer (the source) to another computer (the destination).

IP :

- When an application on the source computer wants to send information to a destination, the application calls IP software on the source machine and provides it with data to be transferred along with an IP address for each of the source and destination computers.
- The IP software running on the source creates a packet, which is a sequence of bits representing the data to be transferred along with the source and destination IP addresses and some other header information, such as the length of the data.
- If the destination computer is on the same local network as the source, then the IP software will send the packet to the destination directly via this network.
- If the destination is on another network, the IP software will send the packet to a gateway.
- The gateway will select a computer on one of the other networks to which it is attached and send the packet on to that computer. This process will continue, with the packet until the packet reaches the destination computer.
- The sequence of computers that a packet travels through from source to destination is known as its route.
- A separate protocol (the current standard is BGP-4, the Border Gateway Protocol) is used to pass network connectivity information between gateways .
- IP software also adds some error detection information (a checksum) to each packet it creates, so that if a packet is corrupted during transmission, this can usually be detected by the recipient.
- The IP standard calls for IP software to simply discard any corrupted packets.

TCP :

- TCP, the Transmission Control Protocol, is a higher-level protocol that extends IP to provide additional functionality, including reliable communication based on the concept of a connection. A connection is established between TCP software running on two machines by one of the machines (let's call it A) sending a connection-request message via IP to the other (B).
- If the connection is accepted by B, then B returns a message to A requesting a connection in the other direction.
- If A responds affirmatively, then the connection is established.
- This means that A and B can both send messages to one another at the same time; this is known as full duplex communication.
- Once a connection has been established, TCP provides reliable data transmission by demanding an acknowledgment for each packet it sends via IP.
- The software sets a timer after sending each packet.
- The TCP software on the receiving side sends a packet containing an acknowledgment for every TCP-based packet it receives that passes the checksum test.
- If the TCP software sending a packet does not receive an acknowledgment packet before its timer expires, then it resends the packet and restarts the timer.
- Another important feature that TCP adds to IP is the concept of a port. The port concept allows TCP to be used to communicate with many different applications on a machine.
- TCP and IP provide many other functions, such as splitting long messages into shorter ones for transport over the Internet and transparently reassembling them on the receiving side.

UDP, DNS, and Domain Names :

- UDP (User Datagram Protocol) is an alternative protocol to TCP that also builds on IP. The main feature that UDP adds to IP is the port concept.
- It does not provide the two-way connection or guaranteed delivery of TCP. Its advantage over

TCP is speed for simple tasks.

- One Internet application that is often run using UDP rather than TCP is the Domain Name Service (DNS).
- DNS provides a mechanism for mapping back and forth between IP addresses and host names.
- Internet host names consist of a sequence of labels separated by dots. The final label in a host name is a top-level domain.
- There are two standard types of top-level domain: generic (such as .com, .edu, .org, and .biz) and country-code (such as .de, .il, and .mx).
- The top-level domain names are assigned by the Internet Corporation for Assigned Names and Numbers (ICANN), a private nonprofit organization formed to take over technical Internet functions that were originally funded by the U.S. government.
- Each top-level domain is divided into sub domains (second-level domains), which may in turn be further divided, and so on.
- The assignment of second-level domains within each top-level domain is performed (for a fee) by a registry operator selected by ICANN.

Higher-Level Protocols :

- A variety of higher-level protocols are used to communicate once a TCP connection has been established.
- SMTP and FTP, are two examples of widely used higher-level protocols that are used to communicate over TCP connections. SMTP supports transfer of e-mail between different e-mail servers, while FTP is used for transferring files between machines.
- Another higher-level TCP protocol, Telnet, is used to execute commands typed into one computer on a remote computer.
- The primary TCP-based protocol used for communication between web servers and browsers is called the Hypertext Transport Protocol (HTTP).

WORLD WIDE WEB

- Public sharing of information has been a part of the Internet.
- Large files were (and still are) often shared by running an FTP server application that allowed any user to transfer the files from their origin machine to the user's machine.
- The first Internet chat software in widespread use, Internet Relay Chat (IRC), provided both public and private chat facilities.
- As the amount of information publicly available on the Internet grew, the need to locate information also grew.
- Some of the more popular information management technologies in the early 1990s were
- Gopher information servers, which provided a simple hierarchical view of documents
- The Wide Area Information System (WAIS) system for indexing and retrieving information
- The World Wide Web also was developed in the early 1990s .

Server and Client :

Server :An Internet-connected computer that wishes to provide information to other Internet systems must run server software.

Client :A system that wishes to access the information provided by servers must run client software .

- The server and client applications communicate over the Internet by following a communication protocol built on top of TCP/IP.

Protocol :

- The protocol used by the Web is the Hypertext Transport Protocol, HTTP.
- The generic nature of HTTP gives it the advantage of somewhat more flexibility than is present in the protocols used by WAIS and Gopher.
- A bigger advantage for the Web is the type of information communicated. Most web pages are written using the Hypertext Markup Language, HTML. HTML pages can contain the familiar web links (technically called hyperlinks) to other documents on the Web.
- In addition to hyperlinks, modern versions of HTML also provide extensive page layout facilities, including support for inline graphics, which has added significantly to the commercial appeal of the Web.
- The World Wide Web can be informally defined as the collection of machines (web servers) on the Internet that provide information via HTTP, and particularly those that provide HTML documents.

Hypertext Transport Protocol :

- HTTP is a form of communication protocol, in particular a detailed specification of how web clients and servers should communicate.
- The basic structure of HTTP communication follows what is known as a request–response model.
- The protocol dictates that an HTTP interaction is initiated by a client sending a request message to the server; the server is then expected to generate a response message.
- HTTP does expect that the request and response are both sent within a TCP-style connection between the client and the server.
- Most HTTP implementations send these messages using TCP.
- Figure shows a browser window in which I typed `http://www.example.org` in the Location bar.
- When pressed the Enter key after typing this address, the browser created a message conforming to the HTTP protocol, used DNS to obtain an IP address for `www.example.org`, created a TCP connection with the machine at the IP address obtained, sent the HTTP message over this TCP connection, and received back a message containing the information that is shown displayed in the client area of the browser.

HTTP REQUEST MESSAGE

Overall Structure :

- Every HTTP request message has the same basic structure:

Start line
Header field(s) (one or more)
Blank line
Message body (optional)

- Every start line consists of three parts, with a single space used to separate adjacent parts:

1.Request method
2.Request-URI portion of web address
3.HTTP version

Request-URI :

- The second part of the start line is known as the Request-URI.
- The concatenation of the string http://, the value of the Host header field (www.example.org, in this example), and the Request-URI (/ in this example) forms a string known as a Uniform Resource Identifier (URI).
- A URI is an identifier that is intended to be associated with a particular resource (such as a web page or graphics image) on the World Wide Web.
- Every URI consists of two parts:
 - } The scheme, which appears before the colon (:),
 - } Another part that depends on the scheme.
- In this scheme, the URI represents the location of a resource on the Web.
- A URI of this type is said to be a Uniform Resource Locator (URL). Therefore, URIs using the http scheme are both URIs and URLs.
- In addition to the URL type of URI, there is other type, called a Uniform Resource Name (URN). URNs are sometimes used in web development .

Request Method:

- The method part of the start line of an HTTP request must be written entirely in uppercase letters.
- The HTTP/1.1 standard defines a CONNECT method, which can be used to create certain types of secure connections.
- The primary HTTP method is GET. This is the method used when we type a URL into the Location bar of the browser.
- It is also the method that is used by default when we click on a link in a document displayed in the browser and when the browser downloads images for display within an HTML document.
- The POST method is used to send information collected from a form displayed within a browser, such as an order-entry form, back to the web server.

Method	Requests server to . . .
GET	return the resource specified by the Request-URI as the body of a response message.
POST	pass the body of this request message on as data to be processed by the resource specified by the Request-URI.
HEAD	return the same HTTP header fields that would be returned if a GET method were used, but not return the message body that would be returned to a GET (this provides information about a resource without the communication overhead of transmitting the body of the response, which may be quite large).
OPTIONS	return (in Allow header field) a list of HTTP methods that may be used to access the resource specified by the Request-URI.
PUT	store the body of this message on the server and assign the specified Request-URI to the data stored so that future GET request messages containing this Request-URI will receive this data in their response messages.
DELETE	respond to future HTTP request messages that contain the specified Request-URI with a response indicating that there is no resource associated with this Request-URI.
TRACE	return a copy of the complete HTTP request message, including start line, header fields, and body, received by the server. Used primarily for test purposes.

TABLE : Standard HTTP/1.1 Methods

Header Fields and MIME Types :

- Each header field begins with a field name, such as Host, followed by a colon and then a field value. White space is allowed to precede or follow the field value, but such white space is not considered part of the value itself.
- Header names are not case sensitive.
- A header field value may wrap onto several lines by preceding each continuation line with one or more spaces or tabs.
- MIME is an acronym standing for Multipurpose Internet Mail Extensions, and refers to a standard that can be used to pass a variety of types of information, including graphics and applications, through e-mail as well as through other Internet message protocols.
- The content of a MIME message is specified using a two-part, case-insensitive string which, in web applications, is known as the content type of the message. Two examples of standard MIME content-type strings are text/html and image/jpeg.
- The substring preceding the slash in these strings is the top-level type.
- The substring following the slash, called the subtype, specifies the particular type of content relative to the top-level type.

MIME Type	Description
text/html	HTML document
image/gif	Image represented using Graphics Interchange Format (GIF)
image/jpeg	Image represented using Joint Picture Expert Group (JPEG) format
text/plain	Human-readable text with no embedded formatting information
application/octet-stream	Arbitrary binary data (may be executable)
application/x-www-form-urlencoded	Data sent from a web form to a web server for processing

TABLE :Some Common MIME Content Types

HTTP RESPONSE MESSAGE :

- An HTTP response message consists of a status line, header fields, and the body of the response, in the following format:

Status line
Header field(s) (one or more)
Blank line
Message body (optional)

Response Header Fields

- Some of the header fields used in HTTP request messages, including Connection, Content-Type, and Content-Length, are also valid in response messages

Status Code	Recommended Reason Phrase	Usual Meaning
200	OK	Request processed normally.
301	Moved Permanently	URI for the requested resource has changed. All future requests should be made to URI contained in the Location header field of the response. Most browsers will automatically send a second request to the new URI and display the second response.
307	Temporary Redirect	URI for the requested resource has changed at least temporarily. This request should be fulfilled by making a second request to URI contained in the Location header field of the response. Most browsers will automatically send a second request to the new URI and display the second response.
401	Unauthorized	The resource is password protected, and the user has not yet supplied a valid password.
403	Forbidden	The resource is present on the server but is read protected (often an error on the part of the server administrator, but may be intentional).
404	Not Found	No resource corresponding to the given Request-URI was found at this server.
500	Internal Server Error	Server software detected an internal failure.

TABLE :Some Common HTTP/1.1 Status Codes

WEB CLIENTS

- A web client is software that accesses a web server by sending an HTTP request message and processing the resulting HTTP response.
- Web browsers running on desktop or laptop computers are the most common form of web client software, but there are many other forms of client software, including text-only browsers, browsers running on cell phones, and browsers that speak a page (over the phone, for example) rather than displaying the page.

WEB SERVERS

- The primary feature of every web server is to accept HTTP requests from web clients and return an appropriate resource (if available) in the HTTP response

HTML –refer to practical exercises

CASCADING STYLE SHEET

What is CSS?

CSS stands for Cascading Style Sheets

- CSS defines how HTML elements are to be displayed
- Styles were added to HTML 4.0 to solve a problem
- CSS saves a lot of work
- External Style Sheets are stored in CSS files
- HTML was NEVER intended to contain tags for formatting a document.
- HTML was intended to define the content of a document, like:
 - <h1>This is a heading</h1>
 - <p>This is a paragraph.</p>

CSS Syntax :

A CSS rule set consists of a selector and a declaration block:



The selector points to the HTML element you want to style. The declaration block contains one or more declarations separated by semicolons. Each declaration includes a property name and a value, separated by a colon. A CSS declaration always ends with a semicolon, and declaration groups are surrounded by curly braces:

`p {color:red;text-align:center;}`

CSS Selectors :

CSS selectors allow you to select and manipulate HTML elements.

CSS selectors are used to "find" (or select) HTML elements based on their id, class, type, attribute, and more.

The element Selector :

The element selector selects elements based on the element name.

You can select all <p> elements on a page like this: (all <p> elements will be center-aligned, with a red text color)

Example:

```
p {  
  text-align: center;  
  color: red;  
}
```

The id Selector :

The id selector uses the id attribute of an HTML element to select a specific element.

An id should be unique within a page, so the id selector is used if you want to select a single, unique element.

To select an element with a specific id, write a hash character, followed by the id of the element.

The style rule below will be applied to the HTML element with id="para1":

Eg:

```
t.css
#para1 {
text-align: center;
color: red;
}
t.html
<head>
<link rel="stylesheet" type="text/css" href="t.css">
</head>
<body>
<p id="para1">testing</p>
</body>
```

The class Selector :

The class selector selects elements with a specific class attribute.

To select elements with a specific class, write a period character, followed by the name of the class:

In the example below, all HTML elements with class="center" will be center-aligned:

Eg:

```
t.css
.center {
text-align: center;
color: red;
}
t.html
<head>
<link rel="stylesheet" type="text/css" href="t.css">
</head>
<body>
<p class="center">testing</p>
</body>
```

Three Ways to Insert CSS:

There are three ways of inserting a style sheet:

- Inline style
- Internal style sheet(or)Embedded Style Sheet
- External style sheet

a)Inline style :

An inline style may be used to apply a unique style for a single element. An inline style loses many of the advantages of a style sheet (by mixing content with presentation).

Eg: <h1 style="color:blue;margin-left:30px;">This is a heading.</h1>

b) Internal Style Sheet :

An internal style sheet may be used if one single page has a unique style. Internal styles are defined within the <style> element

Eg:

```
<html>
<head>
<style>
body
{
background-color: linen;
}
h1
{
color: maroon;
margin-left: 40px;
}
</style>
</head>
<body>
<h1 style="color:blue;margin-left:30px;">This is a heading.</h1>
</body>
</html>
```

c) External Style Sheet :

With an external style sheet, you can change the look of an entire website by changing just one file. Each page must include a reference to the external style sheet file inside the <link> element. The <link> element goes inside the head section:

Eg: t1.html:

```
<html>
<head>
<link rel="stylesheet" type="text/css" href="mystyle.css">
</head>
<body>
</body>
</html>
```

An external style sheet can be written in any text editor. The file should not contain any html tags. The style sheet file must be saved with a .css extension. An example of a style sheet file called "myStyle.css"

mystyle.css

```
body
{
background-color: lightblue;
}
h1
{
color: navy;
margin-left: 20px;
}
```

a)Background Color

body

```
{  
background-color: #b0c4de;  
}
```

b) Background Image

The background-image property specifies an image to use as the background of an element.

body

```
{  
background-image: url("paper.gif");  
}
```

Background Image - Repeat Horizontally or Vertically

By default, the background-image property repeats an image both horizontally and vertically.

Some images should be repeated only horizontally or vertically,

body

```
{  
background-image: url("gradient_bg.png");  
background-repeat: repeat-x;  
}
```

Font Family

The font family of a text is set with the font-family property. The font-family property should hold several font names as a "fallback" system. If the browser does not support the first font, it tries the next font.

p

```
{  
font-family: "Times New Roman", Times, serif;  
}
```

Font-style

The font-style property is mostly used to specify italic text. This property has three values:

- normal - The text is shown normally
- italic - The text is shown in italics
- oblique - The text is "leaning"

p.normal

```
{  
font-style: normal;  
}
```

Font Size

The font-size property sets the size of the text. Being able to manage the text size is important in web design. However, you should not use font size adjustments to make paragraphs look like headings,

h1

```
{  
font-size: 40px;  
}
```