



# WEB ENGINEERING & DEVELOPMENT

## SWE 363



Spring Semester 2008-2009 (082)

### Module 2-1-1: Markup Languages & HTML

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## Objectives/Outline

### Objectives

- Identify the role of markup languages in Web Development
- Learn the basic structure and components of an HTML document
- Format and stylize your web page font, add images, hyperlinks, lists, image maps, tables

### Outline

- Introduction to Markup Languages
- Introduction to HTML
- HTML Document Structure
- HTML Elements
  - Basic Tags, Special Characters, Text Formatting, Lists
  - Hyperlinks, Images, Image Maps, Tables

## Markup Languages

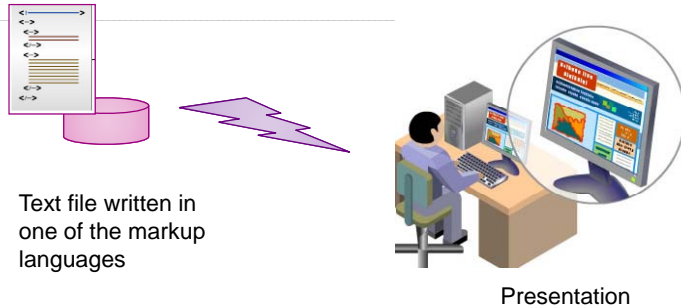
- Markup languages have been in use for centuries
- In recent years, they have also been used in computer *typesetting* and *word-processing* systems, e.g.
  - Tex was introduced in late 1970s by Donald Knuth and became a de facto standard to typeset scientific articles in professional quality
- With the advent of the Web, Tim Berners-Lee created HTML (based on SGML) as the core language for publishing online documents
  - Since then, several other markup languages and extensions have been proposed
  - Interoperability**: platform-independent & browser-independent documents lead to reduced publishing cost

## Markup Languages

- A markup language is an artificial language that uses a set of annotations (*tags*) or instructions to specify the content structure and how it should be displayed
- A markup language defines the *syntax* and *semantic* for the valid set of tags to be used
  - Tags are names enclosed in pairs of angle brackets, e.g. <html>
  - Each tag has a purpose
  - Most tags come in pairs: an opening tag and a closing tag, e.g.  
`<html> ..... </html>`
- An opening tag and a closing tag with information between them is called an *element*
  - Start tag: the element name in angle brackets (e.g., <html>)
  - End tag: the element name preceded by a forward slash (/) in angle brackets (e.g., </html>)
- Many start tags may contain *attributes* that provide additional information about an element
  - Each attribute has a name and a value separated by an equal sign (=), e.g.  
`<a href="http://www.kfupm.edu.sa"> ...`

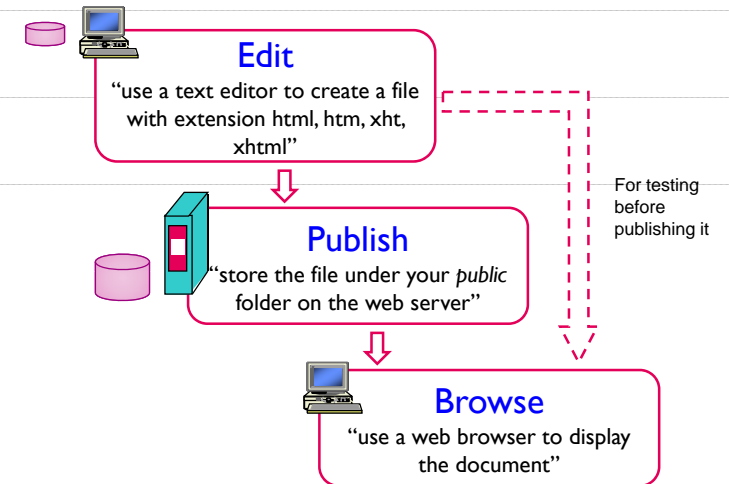
## Markup Languages (cont.)

- A *web page* is a text file that contains text marked up with elements that are delimited by tags; other media objects and applications are embedded
- Web pages are stored on *Web Servers* and are requested and displayed by *Web Browsers*
- When a page is viewed by a web browser, it shows text, images, lists, headings, tables, forms, hyperlinks to other online documents, etc.



## Markup Languages (cont.)

### ➤ Development steps



## Examples of Markup Languages

- **SGML: Standard Generalized Markup Language**
  - An ISO standard meta-language for specifying a markup language for documents (ISO 8879:1986 SGML)
- **HTML: Hypertext Markup Language**
  - A simple markup language that is widely used to create and distribute web documents that are portable from one platform to another
  - Created by Berners-Lee as an application of SGML
  - First public release in 1993
  - Legacy technology of the W3C
    - [HTML 3.2 Reference Specification](#) 14 January 1997
    - [HTML 4.01 Specification](#) 24 December 1999
    - [HTML Design Principles](#) 26 November 2007
    - [HTML 5](#) 10 June 2008
    - [HTML 5 differences from HTML 4](#) 10 June 2008

## Examples of Markup Languages (cont.)

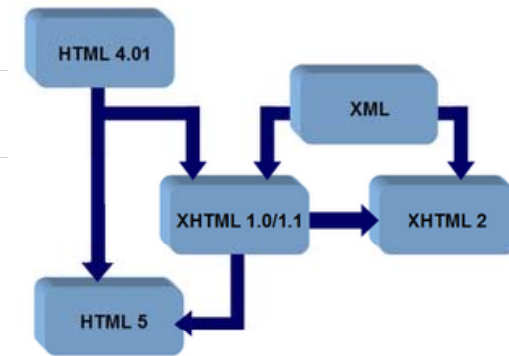
- **XML: eXtensible Markup Language**
  - Meta markup language (like SGML) that allows document authors to create custom tags (hence "extensible") that describe any type of data
  - Not intended to replace HTML, but to extend its power by separating data from presentation
  - First developed in 1996 by W3C
  - [Extensible Markup Language \(XML\) 1.0 \(Fourth Edition\)](#), September 2006.

## Examples of Markup Languages (cont.)

- XHTML: eXtensible Hypertext Markup Language
  - Developed by W3C as a reformulation of HTML 4.01 to combine the formatting strengths of HTML 4.01 and the data structure and extensibility strengths of XML
  - A valid XHTML document contains only content and structure but not formatting (need to be specified with Cascading Style Sheets (CSS))
    - CSS: A language used to define the appearance (style) of a document written in a markup language such as HTML and XHTML
  - Some W3C Resources
    - [XHTML™ 1.0 The Extensible HyperText Markup Language \(Second Edition\)](#) First published 26 January 2000, revised 1 August 2002,
    - [XHTML™ Basic 1.1](#) First published 19 December 2000, revised 29 July 2008,
    - [XHTML™ 1.1 - Module-based XHTML - Second Edition](#) 16 February 2007
    - [XHTML™ 2.0](#) 26 July 2006

## Examples of Markup Languages (cont.)

- The relationship between the markup languages



[Source: Web Development & Design Foundations with XHTML, 4E]

## HTML

- Stands for HyperText Markup Language
- Not a computer programming language
  - It is simply a set of markup codes that structure and style text and graphics
  - Learning HTML requires learning these markup tags
  - An HTML file is a text file with filename extension: htm or html
- An HTML file can be created using
  - Simple text editors like notepad, TextPad, etc
  - WYSIWYG editors like MS FrontPage, Macromedia HomeSite, Adobe PageMill, DreamWeaver, CoffeeCup, etc
    - Make the process of creating web page much easier
    - To be a skillful Web developer, use a plain text editor

## Example

- An HTML document consists of a head section (has a title to be shown in the title bar of the browser window; other information is not displayed) and a body section (to be displayed in the browser window)

```
<html>
  <head>
    <title>Title of page</title>
  </head>

  <body>
    This is my first homepage.
    <b>This text is bold</b>
  </body>
</html>
```

## HTML Tags

- Are *not case sensitive*, e.g. `<b>` and `<B>` are equivalent
  - W3C recommends *lowercase* tags in their HTML 4 Recommendation, and XHTML demands lowercase tags
- There are two types of tags
  - Container tags: come in pairs: a beginning tag like `<title>` and a closing tag like `</title >`
    - Used to mark-up HTML elements
    - The text between the start and end tags is the element content
  - Empty tags: do not contain any text and are not permitted to have end tags
    - Examples: `img`, `hr`, `br`, `input`

## HTML Tags (cont.)

- Can have attributes to provide additional information about the HTML elements on your page, e.g.

```
<body bgcolor="red">
```

- Attributes always come in name/value pairs like this: `name="value"`; e.g. `bgcolor="red"`
- Attribute values should always be enclosed in quotes

## Basic HTML Tags

- Headings
  - Headings are defined with the `<h1>` to `<h6>` tags
- Paragraphs
  - Paragraphs are defined with the `<p>` tag
  - HTML automatically adds an extra blank line before and after a paragraph
- Line Breaks
  - The `<br>` tag is used when you want to end a line, but don't want to start a new paragraph
- Horizontal Rule: the `<hr>` tag
- Comments in HTML
  - `<!-- This is a comment -->`
- HTML will truncate the spaces in your text.
  - Any number of spaces count as one

## Headings

- There are six headings with different font sizes to specify the relative importance of information
  - Heading element `<h1> ...</h1>` is displayed in the *largest* font and is considered to be the most significant
  - Other headings `h2`, `h3`, ..., `h6` are rendered in a progressively smaller font
  - The actual font size used to display each heading element can vary significantly between browsers
  - There is another approach to control the font size (to be discussed later)
- Use larger headings to emphasize more important parts of a web page
- Having a heading at the top of each page helps viewers understand the purpose of each page

## Headings (cont.)

`<h1>Heading Level 1</h1>`

`<h2>Heading Level 2</h2>`

`<h3>Heading Level 3</h3>`

`<h4>Heading Level 4</h4>`

`<h5>Heading Level 5</h5>`

`<h6>Heading Level 6</h6>`

**Heading Level 1**

**Heading Level 2**

**Heading Level 3**

**Heading Level 4**

**Heading Level 5**

**Heading Level 6**

## Paragraph Element

`<p> ...paragraph goes here... </p>`

- All text placed between the `<p>` and `</p>` tags forms one paragraph
  - Groups sentences and sections of text together
- Configures a blank line above and below the paragraph

## Line Break Element

- Stand-alone tag

`...text goes here <br />`

This starts on a new line...

- Causes the next element or text to display on a new line

## Text Formatting Tags

Tag	Description
<code>&lt;b&gt;</code>	Defines bold text
<code>&lt;big&gt;</code>	Defines big text
<code>&lt;em&gt;</code>	Defines emphasized text
<code>&lt;i&gt;</code>	Defines italic text
<code>&lt;small&gt;</code>	Defines small text
<code>&lt;strong&gt;</code>	Defines strong text
<code>&lt;sub&gt;</code>	Defines subscripted text
<code>&lt;sup&gt;</code>	Defines superscripted text
<code>&lt;ins&gt;</code>	Defines inserted text
<code>&lt;del&gt;</code>	Defines deleted text
<code>&lt;blockquote&gt;</code>	Defines a long quotation
<code>&lt;code&gt;</code>	Defines computer code text
<code>&lt;pre&gt;</code>	Defines preformatted text

### Examples

`<b>Bold</b>`

`<u>Underline</u>`

`<i><b>Italic Bold</b></i>`

`<pre>show as  
it is </pre>`

## Special Characters

Result	Description	Entity Name	Entity Number
	non-breaking space	&nbsp;	&#160;
<	less than	&lt;	&#60;
>	greater than	&gt;	&#62;
&	ampersand	&amp;	&#38;
"	quotation mark	&quot;	&#34;
'	apostrophe		&#39;
©	copyright	&copy;	&#169;
®	registered trademark	&reg;	&#174;
×	multiplication	&times;	&#215;
÷	division	&divide;	&#247;

## HTML Fonts

- The <font> tag can be used to change the font color and size
- Example

```
<font color="red">
This text is shown in red
</font>
```
- This tag is deprecated in recent versions of HTML
- Even if a lot of people are using it, you should try to avoid it, and use styles instead

## Lists

- Used to organize information on the web page
- Types of lists:

### Ordered List

1. Apply to school
2. Register for course
3. Pay tuition
4. Attend course

### Unordered List

- TCP
- IP
- HTTP
- FTP

### Definition List

- IP  
Internet Protocol
- TCP  
Transmission Control Protocol

## Ordered List

- The ordered list element ol creates a list in which each item begins with a number
- Conveys information in an ordered fashion
  - <ol>  
Contains the ordered list
    - type attribute determines numbering scheme of list, default is numerals
  - <li>  
Contains an item in the list

## Example

```
<ol>
  <li>Apply to school</li>
  <li>Register for course</li>
  <li>Pay tuition</li>
  <li>Attend course</li>
</ol>
```

1. Apply to school
2. Register for course
3. Pay tuition
4. Attend course

## Unordered List

- Unordered list element ul
  - creates a list in which each item in the list begins with a bullet symbol (called a disc)
  - Each entry is an li (list item) element. Most web browsers render these elements with a line break and a bullet symbol at the beginning of the line
- Displays information with bullet points
  - <ul>  
Contains the unordered list
    - type attribute determines the type of bullet point
    - default type is disc (but depends on the browser used)
  - <li>  
Contains an item in the list

## Example

```
<ul>
  <li>TCP</li>
  <li>IP</li>
  <li>HTTP</li>
  <li>FTP</li>
</ul>
```

- TCP
- IP
- HTTP
- FTP

## Definition List

- Useful to display a list of terms and definitions or a list of FAQ and answers
  - <dl> tag  
Contains the definition list
  - <dt> tag  
Contains a defined term  
Configures a line break above and below the text
  - <dd> tag  
Contains a data definition or description  
Indents the text

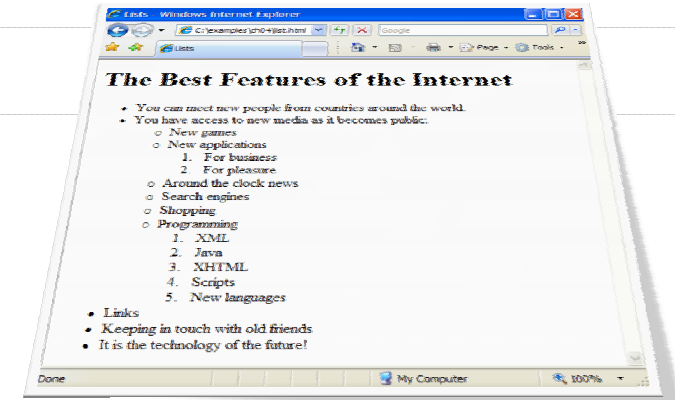
## Example

```
<dl>
  <dt>IP</dt>
  <dd>Internet Protocol</dd>
  <dt>TCP</dt>
  <dd>Transmission Control Protocol</dd>
</dl>
```

IP  
Internet Protocol  
TCP  
Transmission Control Protocol

## Nested Lists

- Lists may be nested to represent hierarchical data relationships



## Activity:

- Create an html file for the previous example of nested lists

## Hyperlinks

- A hyperlink references or links to other resources, such as other documents or images
- Web browsers typically underline text hyperlinks and color them blue by default
- Users can insert links using the anchor element
  - The href attribute specifies the resource (e.g., page, file, e-mail address) being linked
  - Example  

```
<a href="http://www.w3schools.com/">Visit W3Schools!</a>
```
- Anchors can link to an e-mail address using a mailto: URL
  - When a user clicks this type of anchored link, most browsers launch the default e-mail program (e.g., Outlook Express) to initiate an e-mail message addressed to the linked address



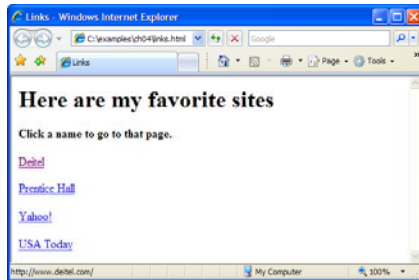
## Example 1

```
<body>
<h1>Here are my favorite sites</h1>
<p><strong>Click a name to go to that page.</strong></p>

<!-- Create four text hyperlinks -->
<p><a href = "http://www.deitel.com">Deitel</a></p>
<p><a href = "http://www.prenticehall.com">Prentice Hall</a></p>
<p><a href = "http://www.yahoo.com">Yahoo!</a></p>
<p><a href = "http://www.usatoday.com">Today</a></p>
</body>
```

Creates anchor elements that link to the URL specified in the href attribute

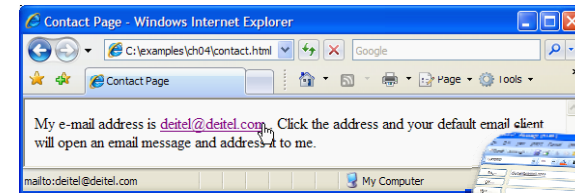
How it is shown on the browser



## Example 2

```
12 <body>
13 <p>
14 My email address is
15 <a href = "mailto:deitel@deitel.com">deitel@deitel.com</a>
16 deitel@deitel.com
17 </a>
18 . Click the address and your default email client
19 will open an e-mail message and address it to me.
20 </p>
21 </body>
```

Hyperlink that creates a message to the address deitel@deitel.com with the computer's default e-mail program



## Example 3

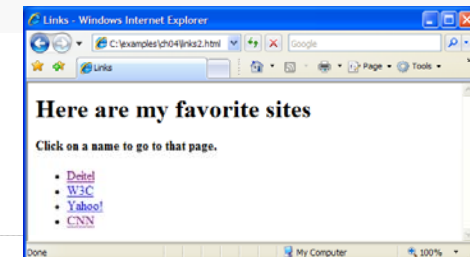
```
<p>
This is another mailto link:
<a
href="mailto:someone@microsoft.com?cc=someoneelse@microsoft.com&bcc=andsomeoneelse2@microsoft.com&subject=Summer%20Party&body=You%20are%20invited%20to%20a%20big%20summer%20party!">Send mail!</a>
</p>
```

- Spaces between words should be replaced by %20 to ensure that the browser will display your text properly.

## Example 4

```
12 <body>
13 <h1>Here are my favorite sites</h1>
14 <p><strong>Click on a name to go to that page.</strong></p>
15
16 <!-- create an unordered list -->
17 <ul>
18 <!-- add four list items -->
19 <li><a href = "http://www.deitel.com">Deitel</a></li>
20 <li><a href = "http://www.w3.org">W3C</a></li>
21 <li><a href = "http://www.yahoo.com">Yahoo!</a></li>
22 <li><a href = "http://www.cnn.com">CNN</a></li>
23 </ul>
24 </body>
```

Unordered list containing hyperlinks



## Internal Linking (Bookmark)

- Internal links to different parts of the page make it easier for users to navigate the page
  - No need to scroll to find the section they want
  - Useful in documents that contain large amounts of information
- You can use `<a ... >` tag to link to another section of the same document
  - Set the element *name* attribute
  - Use the name given to the element id as the link href

## Example I

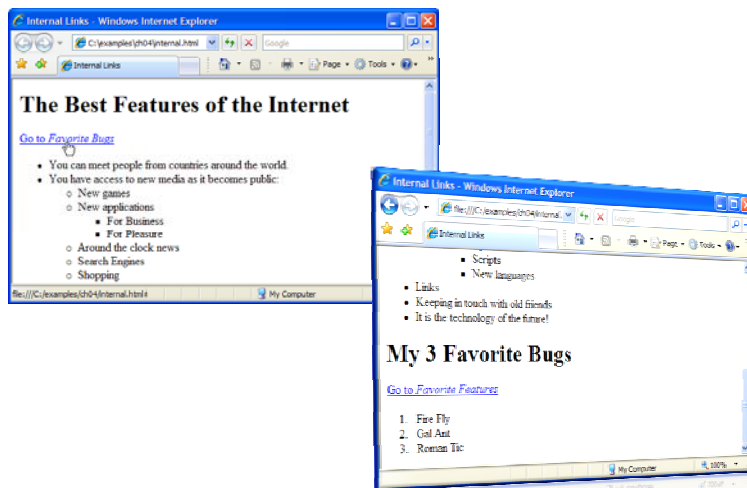
```
<p>  
<a href="#C4">See also Chapter 4</a>  
</p>  
.  
.  
<h2><a name="C4">Chapter 4</a></h2>  
<p>This chapter explains ba bla bla</p>
```

[See also Chapter 4](#)

### Chapter 4

This chapter explains ba bla bla

## Example 2: Activity



## Images

- Most web pages contain both text and images when viewed by a browser
- Images can be obtained from various websites, taken by a camera, created using specialized software, e.g. [Adobe Photoshop Elements](#), [G.I.M.P](#), and [Inkscape](#)
- Images are stored on the server in separate files and their URLs are incorporated in the HTML document using the `img` element
- The most popular image formats used by web developers are:
  - GIF (Graphics Interchange Format)
  - JPEG (Joint Photographic Experts Group)
  - PNG (Portable Network Graphics)

## Images (cont.)

- The img element has no closing tag and the src attribute specifies the location of the image

``

- The document requested initially by the browser is called a base document
- The browser issue a separate HTTP request for each image to get it
  - Using the same HTTP session
  - Using separate HTTP sessions in sequence
  - Using separate HTTP sessions but in parallel

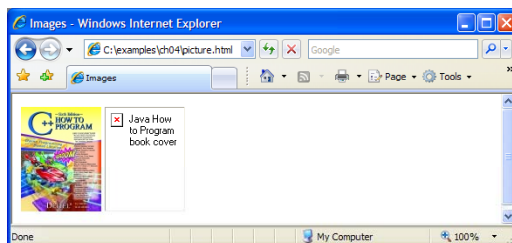
## Images (cont.)

- Other attributes

align	top bottom middle left right	Specifies how to align the image according to surrounding text. Deprecated. Use styles instead
border	pixels	Defines a border around an image. Deprecated. Use styles instead
height	pixels %	Defines the height of an image
hspace	pixels	Defines white space on the left and right side of the image. Deprecated. Use styles instead
ismap	URL	Defines the image as a server-side image map
longdesc	URL	A URL to a document that contains a long description of the image
usemap	URL	Defines the image as a client-side image map. Look at the <map> and <area> tags to figure out how it works
vspace	pixels	Defines white space on the top and bottom of the image. Deprecated. Use styles instead
width	pixels %	Sets the width of an image

## Examples

```
12 <body>
13 <p>
14 <img src = "/images/1p5.jpg" width = "92" height = "100"
15 alt = "C++ How to Program book cover" />
16 <img src = "/img1.jpg" width = "92" height = "100"
17 alt = "Java how to Program book cover" />
18 </p>
19 </body>
```



## Examples (cont.)

### Examples

```
<p>
<img src = "/images/xhtml1.gif"
align = "left" width="100" height="50">
A paragraph with an image. The align attribute of the image
is set to "left". The image will float to the left of this
text.
</p>
```

An image with a paragraph

```
<p>
You can also use an image as a link:
<a href = "lastpage.htm">
<img border="0" src = "buttonnext.gif" width="65" height="38">
</a>
</p>
```

Used a link

## Image Maps

- An image map allows linking different parts of an image to different URLs according to where you click on the image
  - Useful for creating links on maps, diagrams, fancy buttons, etc.
- The map element defines the areas of the image and the URLs that associate to different areas
- There are two types of image maps:
  - Client-side image map:
    - When a user activates a region of the map with a mouse, the pixel coordinates are interpreted by the client and the client selects a link that was specified for the activated region and follows it
  - Server-side image map:
    - When a user activates a region of the map with a mouse, the pixel coordinates are sent to the server-side agent specified by the href attribute of the anchor element which interprets the coordinates and performs some action

## Example

```
<p>Click on one of the planets to watch it closer:</p>

<map id="planetmap" name="planetmap">
  <area shape="rect"
  coords="0,0,82,126"
  alt="Sun"
  href="sun.htm">
  <area shape="circle"
  coords="90,58,3"
  alt="Mercury"
  href="mercur.htm">
  <area shape="circle"
  coords="124,58,8"
  alt="Venus"
  href="venus.htm">
</map>
```

## Backgrounds

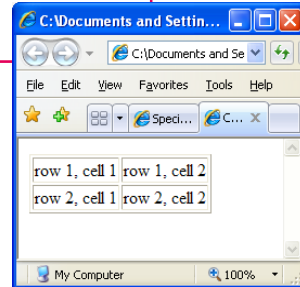
- The background can be a color or an image
- Examples
  - `<body bgcolor="#000000">`
  - `<body bgcolor="rgb(0,0,0)">`
  - `<body bgcolor="black">`
  - `<body background="clouds.gif">`
  - `<body background="http://www.w3schools.com/clouds.gif">`
- The background image will increase the loading time
- The bgcolor, background, and the text attributes in the <body> tag are deprecated in the latest versions of HTML (HTML 4 and XHTML)
- In future versions of HTML, style sheets (CSS) will be used to define the layout and display properties of HTML elements

## Tables

- Used to organize information into rows and columns
  - A common practice is to use tables to format the layout of an HTML page or to display tabulated information
- Tables are defined with the <table> tag
  - To control the table border, use border attribute
- <caption> defines the table caption (title)
  - The default position of the title is centered at the top of the table
  - To change the caption position to be below the table, use align=bottom attribute
- A table is divided into rows using the <tr> tag
  - You may define default attributes for the entire row: align (left, center, right) and/or valign (top, middle, bottom)
- To define a table header cell, use <th> tag
  - By default the text in the text cell is bold and centered.
  - Table header cells may contain other attributes to determine the characteristics of the cell and/or its contents.
- A row is divided into data cells with <td> tag
  - By default the text in this cell is aligned left and centered vertically.
  - Table data cells may contain other attributes to determine the characteristics of the cell and/or its contents.
  - A data cell can contain text, images, lists, paragraphs, forms, horizontal rules, tables, etc

## Example

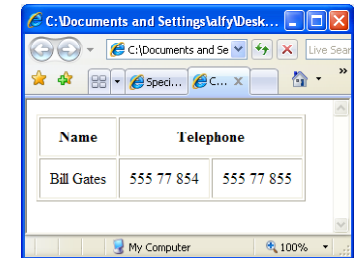
```
<table border="1">
  <tr>
    <td>row 1, cell 1</td>
    <td>row 1, cell 2</td>
  </tr>
  <tr>
    <td>row 2, cell 1</td>
    <td>row 2, cell 2</td>
  </tr>
</table>
```



## Table Tags

Tag	Description
<table>	Defines a table
<thead>	Defines a table header
<tr>	Defines a table row
<td>	Defines a table cell
<caption>	Defines a table caption
<colgroup>	Defines groups of table columns
<col>	Defines the attribute values for one or more columns in a table
<thead>	Defines a table head
<tbody>	Defines a table body
<tfoot>	Defines a table footer

```
<table border="1" cellpadding="10">
  <tr>
    <th>Name</th>
    <th colspan="2">Telephone</th>
  </tr>
  <tr>
    <td>Bill Gates</td>
    <td>555 77 854</td>
    <td>555 77 855</td>
  </tr>
</table>
```



## The <table> tag attributes

Attribute	Value	Description
align	left center right	Aligns the table. Deprecated. Use styles instead.
bgcolor	rgb(x,x,x) #xxxxxx colorname	Specifies the background color of the table. Deprecated. Use styles instead.
border	pixels	Specifies the border width.  <b>Tip:</b> Set border="0" to display tables with no borders!
cellpadding	pixels %	Specifies the space between the cell walls and contents
cellspacing	pixels %	Specifies the space between cells
frame	void above below hsides lhs rhs vsides box border	Specifies how the outer borders should be displayed.  <b>Note:</b> Must be used in conjunction with the "border" attribute!
rules	none groups rows cols all	Specifies the horizontal/vertical divider lines.  <b>Note:</b> Must be used in conjunction with the "border" attribute!
width	% pixels	Specifies the width of the table

For more examples: [http://www.w3schools.com/TAGS/tag\\_table.asp](http://www.w3schools.com/TAGS/tag_table.asp)

## The <td> tag attributes

Attribute	Value	Description
abbr	abbr_text	Specifies an abbreviated version of the content in a cell
align	left right center justify char	Specifies the horizontal alignment of cell content
bgcolor	rgb(x,x,x) #xxxxxx colorname	Specifies the background color of the table cell. Deprecated. Use styles instead.
colspan	number	Indicates the number of columns this cell should span
height	pixels	Specifies the height of the table cell. Deprecated. Use styles instead.
nowrap	nowrap	Whether to disable or enable automatic text wrapping in this cell. Deprecated. Use styles instead.
rowspan	number	Indicates the number of rows this cell should span
valign	top middle bottom baseline	Specifies the vertical alignment of cell content
width	pixels %	Specifies the width of the table cell. Deprecated. Use styles instead.

For more examples: [http://www.w3schools.com/TAGS/tag\\_table.asp](http://www.w3schools.com/TAGS/tag_table.asp)

## Q & A



## References

➤ Some useful links with examples and other resources:

- *Internet and World Wide Web How to Program*, 4/e, H. M. Deitel, P. J. Deitel, and A. B. Goldberg, Pearson Education Inc., 2008. Chapter 4.
- *Web Development and Design Foundations with XHTML*, 4/e, Pearson Education Inc. 2009. Chapter 2.
- [http://en.wikipedia.org/wiki/List\\_of\\_document\\_markup\\_languages](http://en.wikipedia.org/wiki/List_of_document_markup_languages)
- W3C at <http://www.w3.org/html/>
- W3Schools at <http://www.w3schools.com/>
  - <http://www.w3schools.com/html/>
- <http://www.boutell.com/mapedit>
- HTML Tutorial  
<http://www.davesite.com/webstation/html/index.shtml>