Advanced Programming 2
Recitation 7 – Web Applications Part 1

Roi Yehoshua
2017

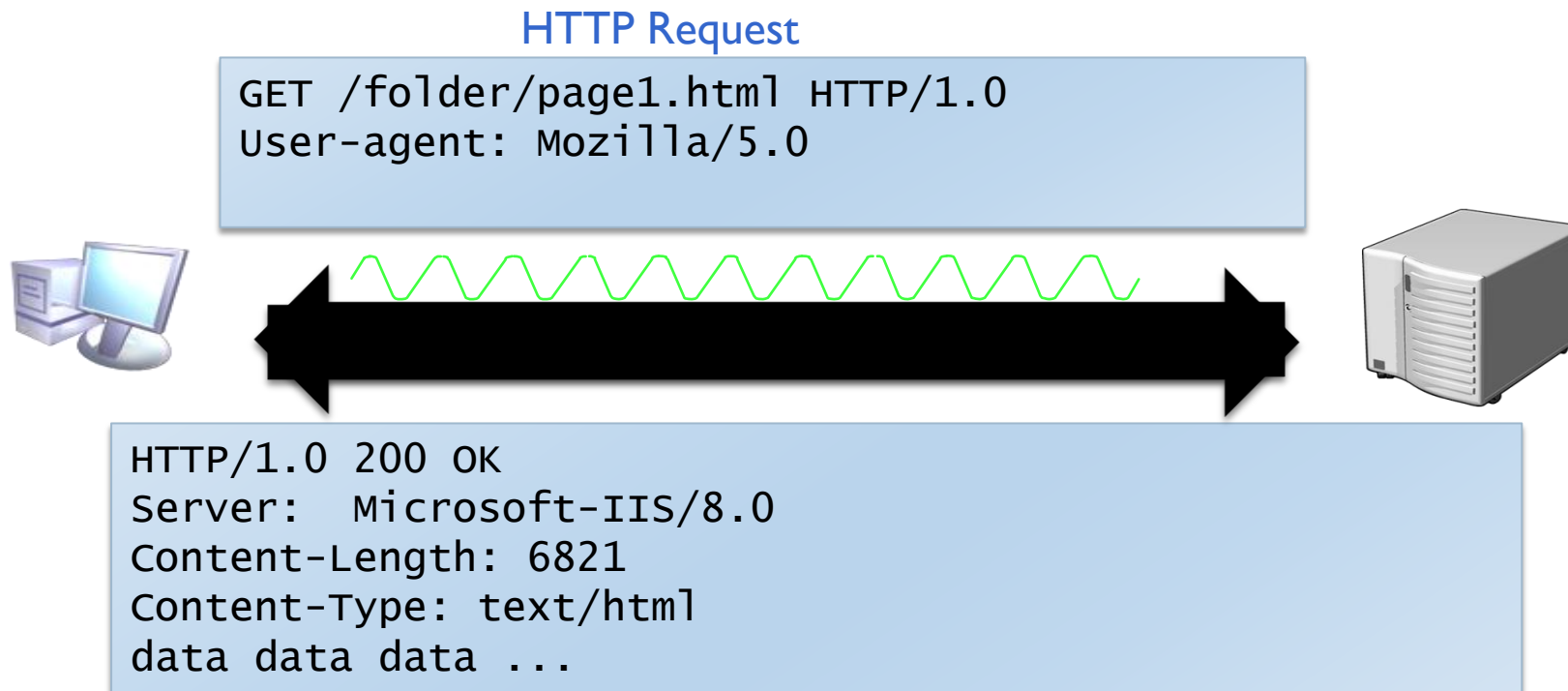# Introduction to Web Architecture

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What is the World Wide Web?

▸ A set of documents and other web resources linked together and accessed via the Internet

▸ Based on various technologies:

  ▸ HyperText Transfer Protocol (HTTP)

  ▸ Mark-up languages (HTML, SGML)

  ▸ Uniform Resource Locator (URL)

▸ Overseen by World Wide Web Consortium (W3C)

 ▸ **W3Schools** is a popular web site for learning web technologies online https://www.w3schools.com/

early milestones	Key Layers of the Internet	milestones
email@-1971 Ray Tomlinson	CONTENT	1987-HyperCard Bill Atkinson
Archie-1990 Emtage & Deutsch	SEARCH ENGINE*	1998-Google Brin & Page
DOS Houdini-1986 Neil Larson	BROWSERS	1993-Mosaic Marc Andreessen
Vannevar Bush, Ted Nelson, Douglas Engelbart	WORLD WIDE WEB	1990-http:// Tim Berners-Lee
ARPANET-1969 J.C.R. Licklider	INTERNET	1975-TCP/IP Cerf & Kahn
SAGE-1956 George Valley	NETWORKS	1973-Ethernet Robert Metcalfe
Z3-1941 Konrad Zuse	COMPUTERS	1976-Apple Jobs & Wozniak

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HyperText Transfer Protocol (HTTP)

▸ ## HTTP is an Application Level Protocol

▸ Simple — has a Request and Response (header & body)

▸ Stateless — each request is independent from the others

HTTP Request

```
GET /folder/page1.html HTTP/1.0
User-agent: Mozilla/5.0
```

```
HTTP/1.0 200 OK
Server:  Microsoft-IIS/8.0
Content-Length: 6821
Content-Type: text/html
data data data ...
```

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Web Servers

▸ The primary function of a web server is to store, process and deliver web pages to clients via the HTTP protocol

▸ Popular web servers:
  - ▸ Apache
    - ▸ Open-Source
    - ▸ Most commonly used on Linux
 - ▸ IIS (Microsoft)
    - ▸ Typically installed on Windows Servers

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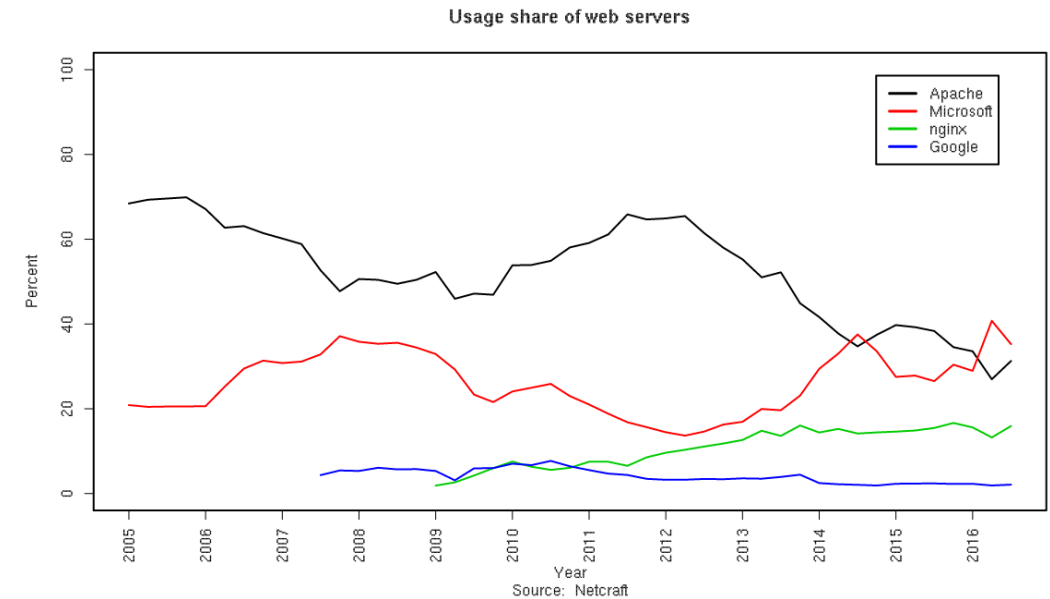
Web Browsers

- A browser is a software application for retrieving, presenting and traversing information resources on the WWW

- Each browser has a different level of support for web standards such as HTML, CSS, DOM, and ECMAScript
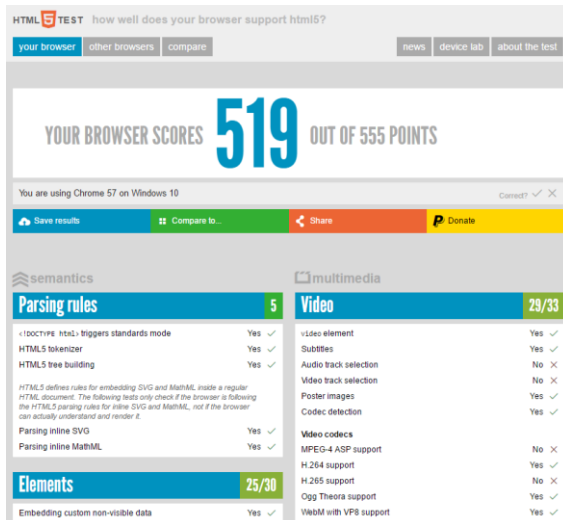

Usage share of web browsers
Source: StatCounter

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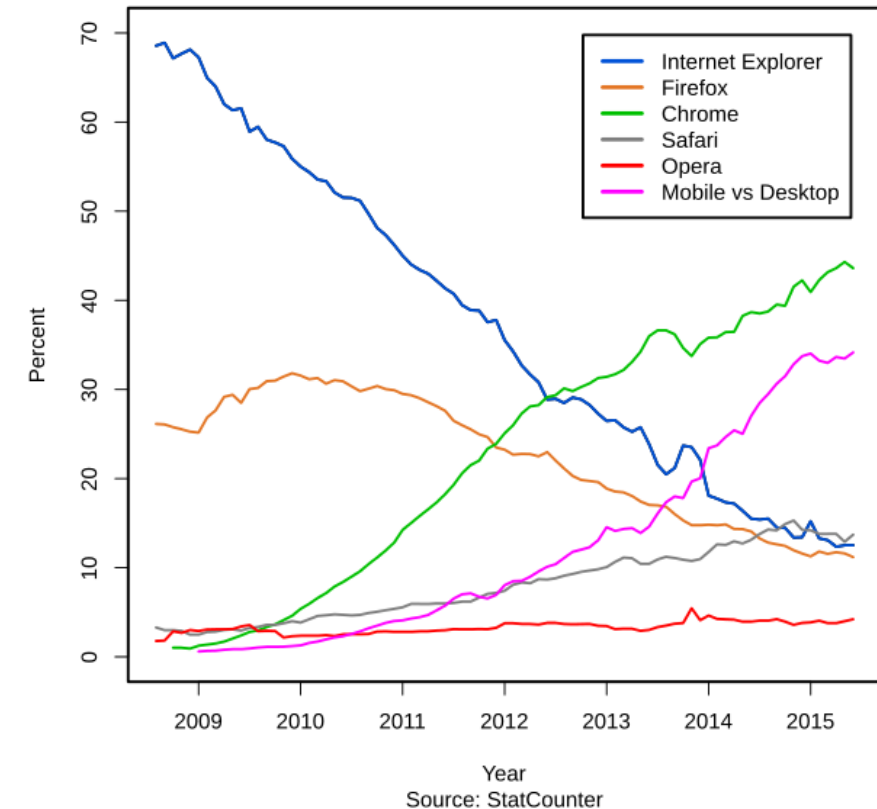
Static Web Pages

▶ A static web page is a web page that is delivered to the user exactly as stored

```html
<html>
<head>
    <title>This is a static page</title>
</head>
<body>
    <h1>Hello world</h1>
</body>
</html>
```


Local Computer
http://www.example.com/static.html

Internet

Web server

The web server is processing the request

static.html

Hard Disk static html pages

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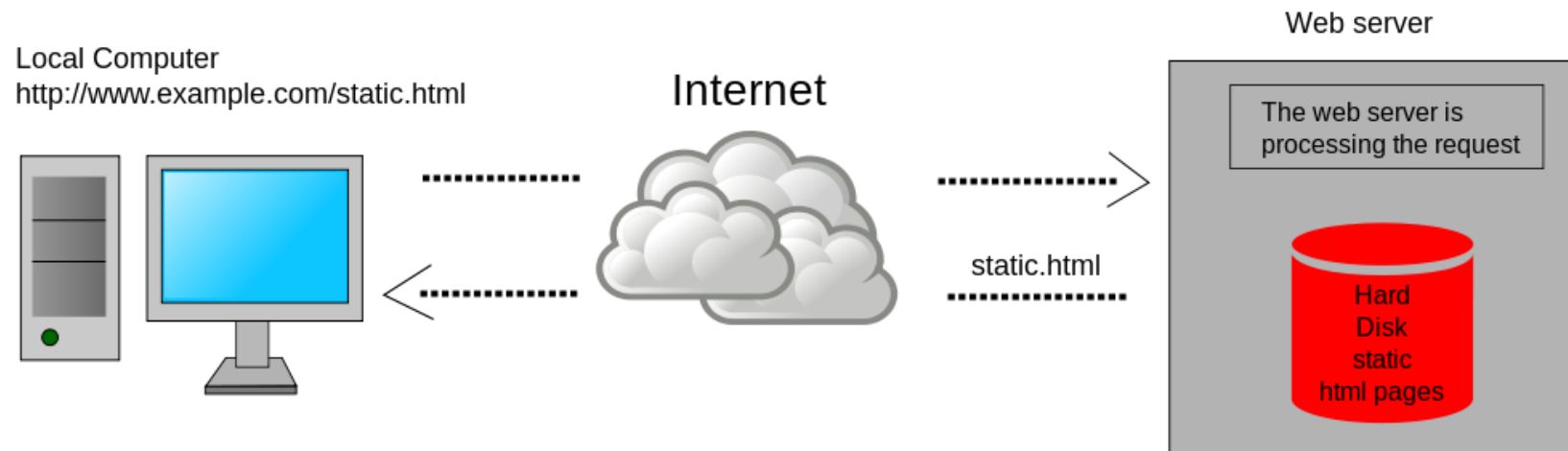
Server-Side Dynamic Web Pages

▸ Server-side processing allows dynamic page creation

▸ There are many server-side languages for creating dynamic pages, such as PHP, Perl, ASP, ASP.NET, JSP, ColdFusion and other languages.

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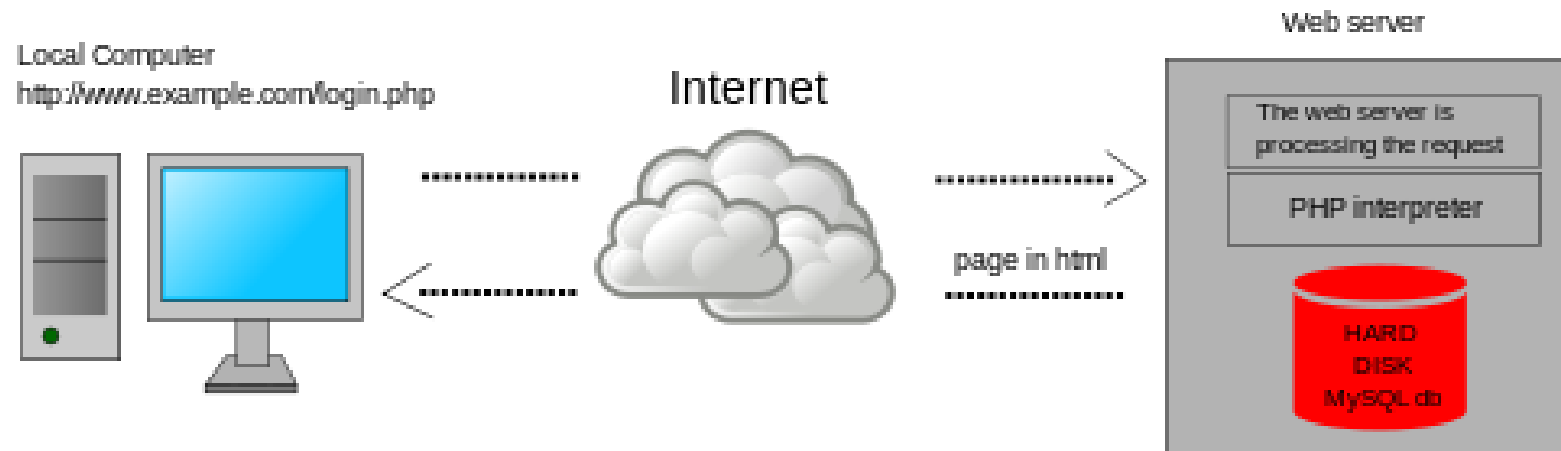
Client-Side Dynamic Web Pages

▸ Web pages that change in response to an action within that web page, such as a mouse or a keyboard action

▸ Client-side scripts can generate client-side content which is generated on the user's computer rather than the server

▸ The most popular language for client-side scripting is JavaScript

```html
<!DOCTYPE html>
<html>
<head>
    <title>This is a dynamic page</title>
<meta charset="utf-8" />
</head>
<body>
    <button id="btn1">Click me</button>
    <p id="p1"></p>
    <script>
        var btn1 = document.getElementById("btn1");
        btn1.onclick = function () {
            var p1 = document.getElementById("p1");
            p1.innerHTML = "Button was clicked";
        };
    </script>
</body>
</html>
```

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Web Development Today

- Focus is moving from server to client
- Writing web applications, not web sites
  - We want desktop-like applications
- Responsive web design
  - Supporting various types of devices
- State needs to be handled on the client
- Client side code requires design and modeling
 - Many MV* frameworks exist, e.g. AngularJS
- REST over SOAP
  - Clean URLs

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HTML

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What is HTML?

- Hyper Text Markup Language
  - The standard markup language for creating Web pages
- HTML describes the structure of Web pages using markup
- Latest version of the standard is HTML5
  - Completed and standardized on October 2014
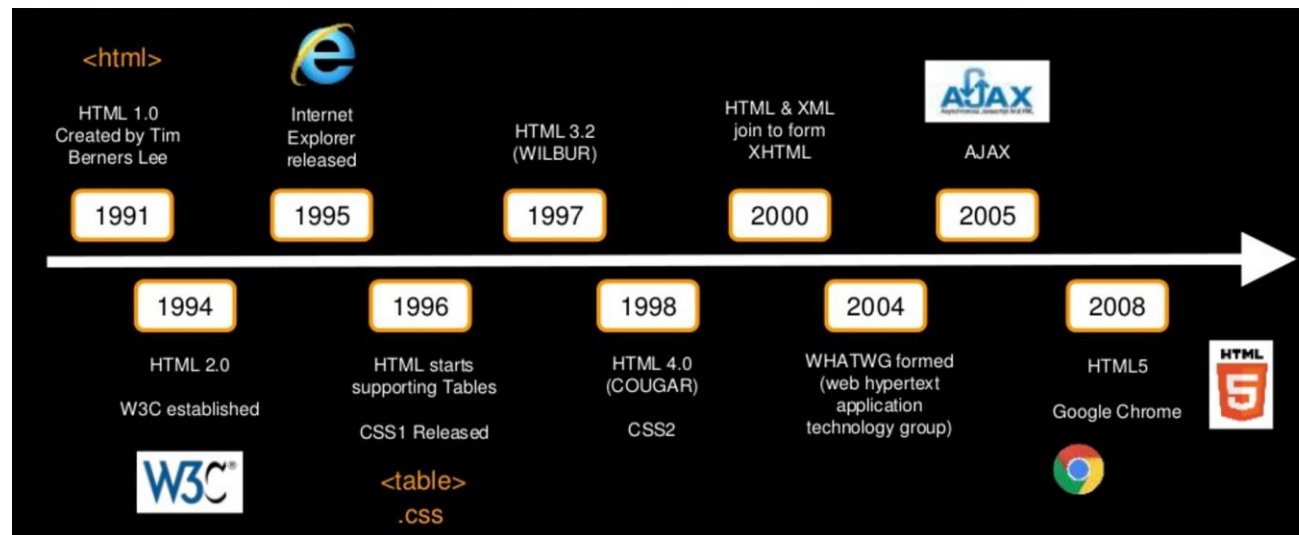
Creating an HTML Page in VS

▸ Choose File->New File

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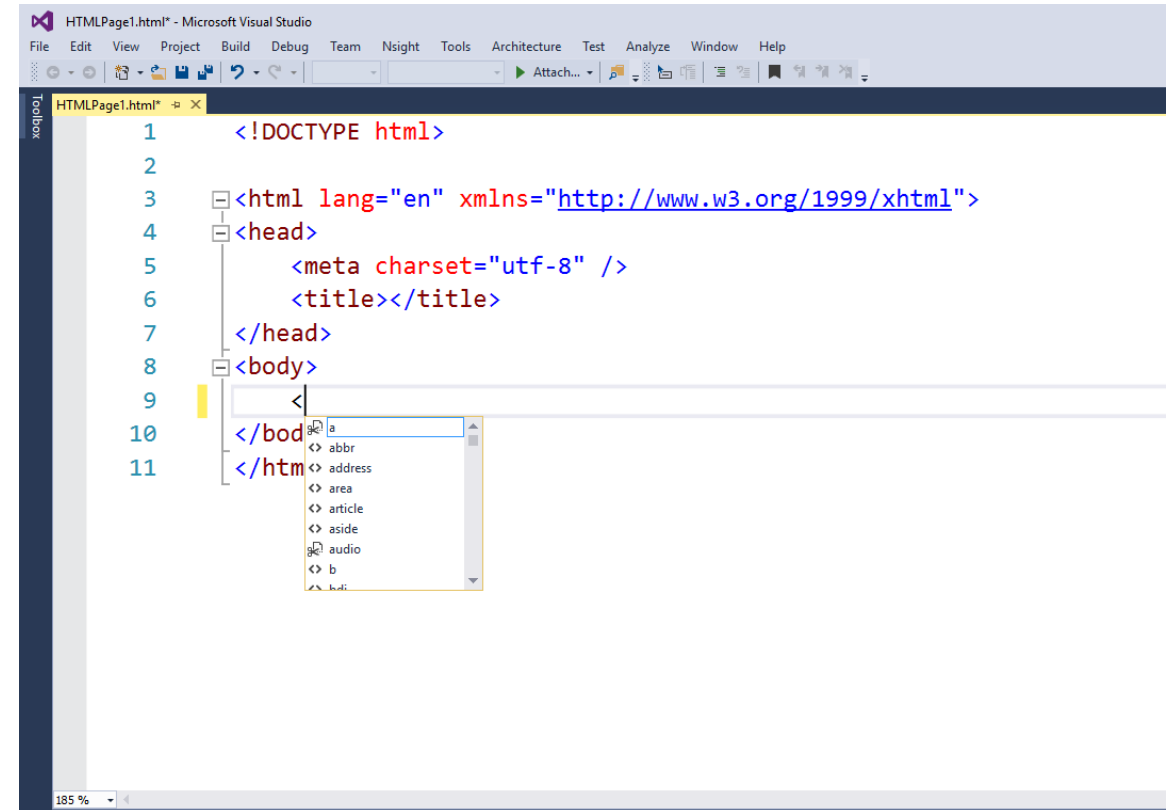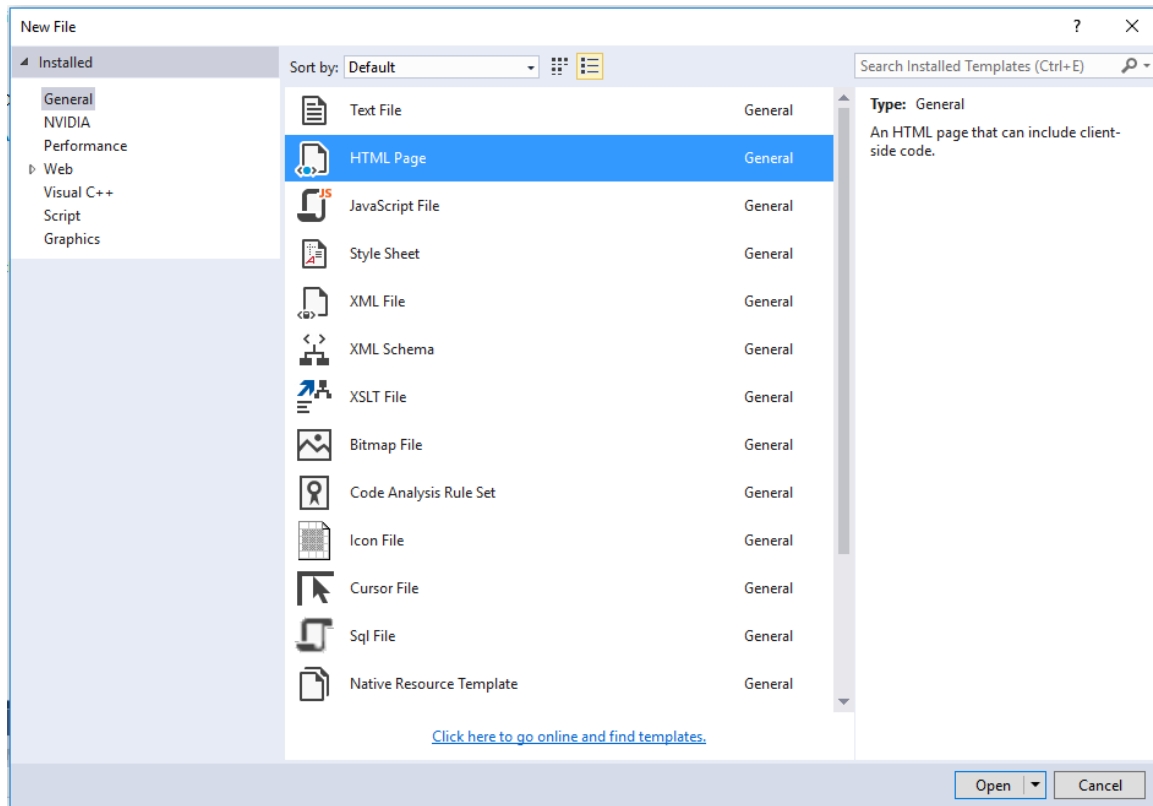
A Simple HTML Document

The <!DOCTYPE html> declaration defines this document to be HTML5

<html> is the root element of an HTML page

The <head> contains meta information about the document

<body> contains the visible page content

<h1> defines a large heading

<p> element defines a paragraph

```html
<!DOCTYPE html>

<html lang="en" xmlns="http://www.w3.org/1999/xhtml">
<head>
    <meta charset="utf-8" />
    <title>The Maze Project</title>
</head>
<body>
    <h1>Maze Game</h1>
    <p>Play the original maze game for free.</p>
    <p>Play online against your friends.</p>
</body>
</html>
```

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View the HTML Page in the Browser

▶ Right click the page and choose "View in Browser"

▶ You can change the default browser via File->Browser With...

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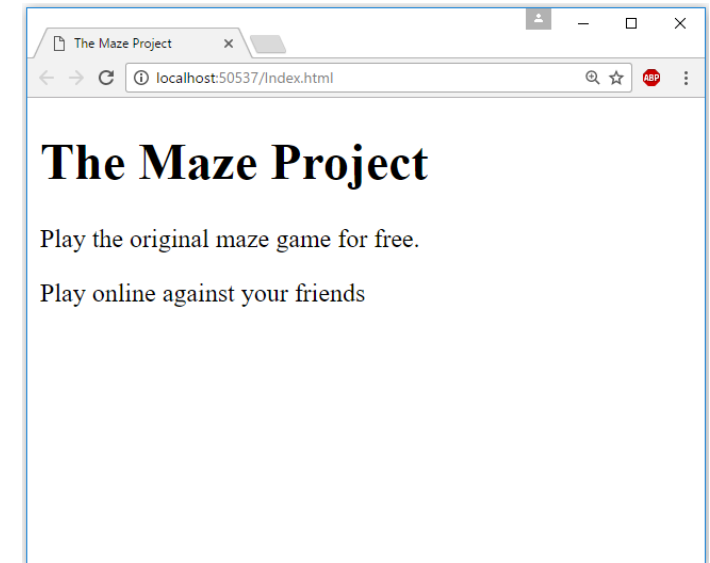
HTML tags

▸ HTML tags are element names surrounded by angle brackets:

      <tagname attribute="value">Content goes here</tagname>

▸ A complete list of HTML tags is available at https://www.w3schools.com/tags/

▸ HTML elements with no content are called empty elements.

    ▸ e.g.
 is an empty tag that defines a line break

▸ Empty elements can be "closed" in the opening tag like this:

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HTML Links

▸ HTML links are defined with the **<a>** tag:

```
<a href="https://www.w3schools.com">This is a link</a>
```

▸ The **href** attribute specifies the destination address of the link.

▸ A local link (link to the same web site) is specified with a relative URL (without http://www....)

```
<a href="Page2.html">Go to page2</a>
```

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HTML Images

▸ HTML images are defined with the **<img>** tag.

```
<img src="Maze.png" alt="Maze" style="width:200px; height: 200px" />
```

▸ The <img> tag is empty, it contains attributes only

▸ The src attribute specifies the URL (web address) of the image

▸ The alt attribute provides an alternate text for an image, if the user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader)

▸ You can use the **style** attribute to specify the width and height of an image

  ▸ The values are specified in pixels (use px after the value)

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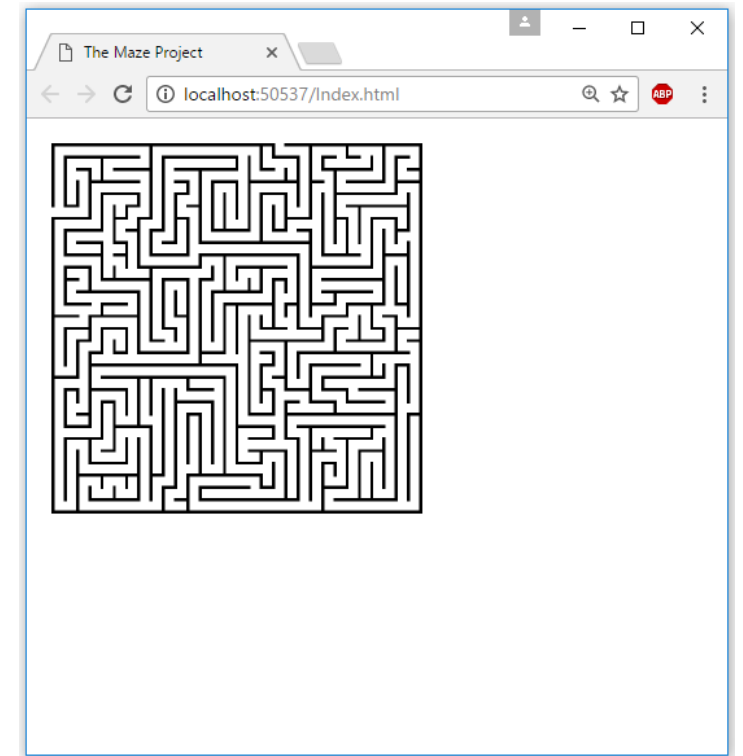
HTML Lists

▸ An unordered list starts with the **<ul>** tag

  ▸ Each list item starts with the **<li>** tag

```
<ul>
    <li>Coffee</li>
    <li>Tea</li>
    <li>Milk</li>
</ul>
```
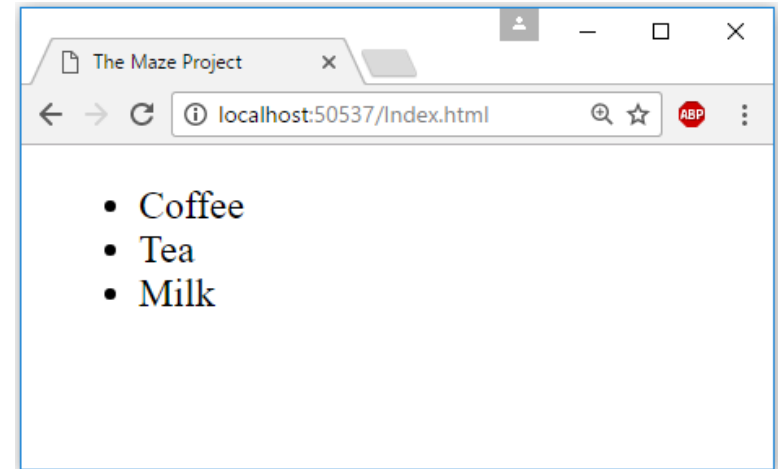
▸ An ordered list starts with the **<ol>** tag

  ▸ The list items will be marked with numbers by default

```
<ol>
    <li>Coffee</li>
    <li>Tea</li>
    <li>Milk</li>
</ol>
```

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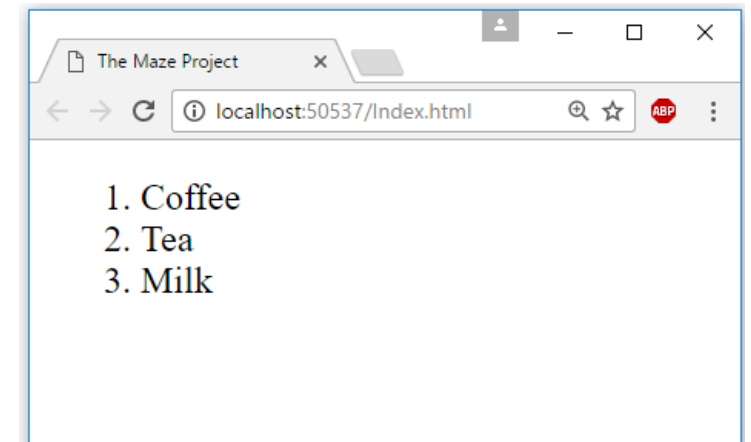
HTML Tables

- An HTML table is defined with the **<table>** tag

- Each table row is defined with the **<tr>** tag

- A table header is defined with the **<th>** tag

  - By default, table headings are bold and centered.

- A table data/cell is defined with the **<td>** tag

```html
<table border="1">
    <tr>
        <th>Firstname</th>
        <th>Lastname</th>
        <th>Age</th>
    </tr>
    <tr>
        <td>Jill</td>
        <td>Smith</td>
        <td>50</td>
    </tr>
    <tr>
        <td>Eve</td>
        <td>Jackson</td>
        <td>94</td>
    </tr>
</table>
```

Firstname	Lastname	Age
Jill	Smith	50
Eve	Jackson	94

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\<div\>

▸ The \<div\> tag defines a division or a section in the page

▸ It is very often used together with CSS, to layout a web page

```
<div style="border:1px dashed red">
    <h3>This is a heading</h3>
    <p>This is a paragraph</p>
</div>
```

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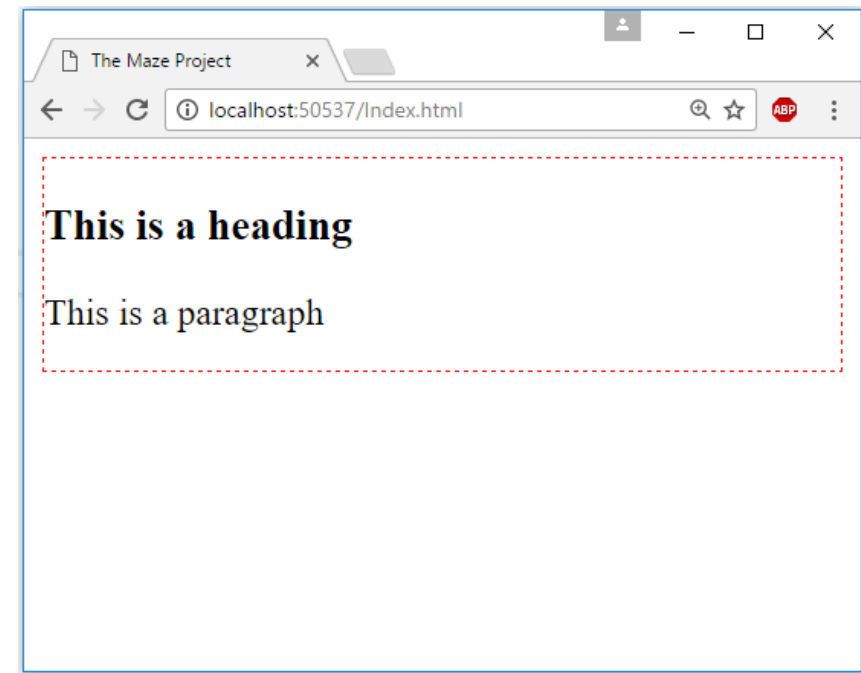
HTML Forms

▸ The HTML **<form>** element defines a form that is used to collect user input

```
<form action="/action_page.php">
```

▸ The **action** attribute defines the action to be performed when the form is submitted

▸ Normally, the form data is sent to a page on the server that contains a server-side script that handles this data

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Form Elements

▸ HTML form elements are different types of input elements, like text fields, checkboxes, radio buttons, submit buttons, and more

▸ The **\<input\>** element is the most important one

  ▸ **\<input type="text"\>** defines a one-line input field for **text input**

  ▸ **\<input type="submit"\>** defines a button for **submitting** the data to the server

```html
<form action="/action_page.php">
    First name:<br/>
    <input type="text" name="firstname" value="Mickey"><br/>
    Last name:<br/>
    <input type="text" name="lastname" value="Mouse"><br/><br/>
    <input type="submit" value="Submit">
</form>
```

First name:

| Mickey |

Last name:

| Mouse |

| Submit |

Form Methods

▸ The **method** attribute specifies the HTTP method (**GET** or **POST**) to be used when submitting the form data

```
<form action="/action_page.php" method="get">
```

  ▸ The default method is GET

▸ GET places data in the QueryString portion of the URL

```
/action_page.php?firstname=Mickey&lastname=Mouse
```

  ▸ Can be bookmarked

  ▸ Limited in length

▸ POST places data in the body of the HTTP Request

```
POST /folder/page.aspx HTTP/1.0
User-agent: Mozilla/4.0
Content-type: application/x-www-form-
urlencoded
Content-length: 25
Name=Mickey&Address=Mouse
```

  ▸ Hidden from view

  ▸ Unlimited length

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HTML5

▸ New elements with added semantics

▸ Easier for search engines to navigate

▸ Drawing graphics on screen

▸ Storing data offline

▸ Drag & Drop

▸ Video support

Page Structure in HTML5

In old versions of HTML we used **\<div\>** to contain different sections.
The new semantic tags makes it easier for search engines to figure out the page structure

```
<!doctype html>
<html>
<head>
    <title>Page title</title>
</head>
<body>
    <header>
        <h1>Page title</h1>
    </header>
    <nav>
        <!-- Navigation -->
    </nav>
    <section id="intro">
        <!-- Introduction -->
    </section>
    <section>
        <!-- Main content area -->
    </section>
    <aside>
        <!-- Sidebar -->
    </aside>
    <footer>
        <!-- Footer -->
    </footer>

</body>
</html>
```

Browser Page Title

Page title

Navigation

Introduction

Main content area

Sidebar

Footer

CSS

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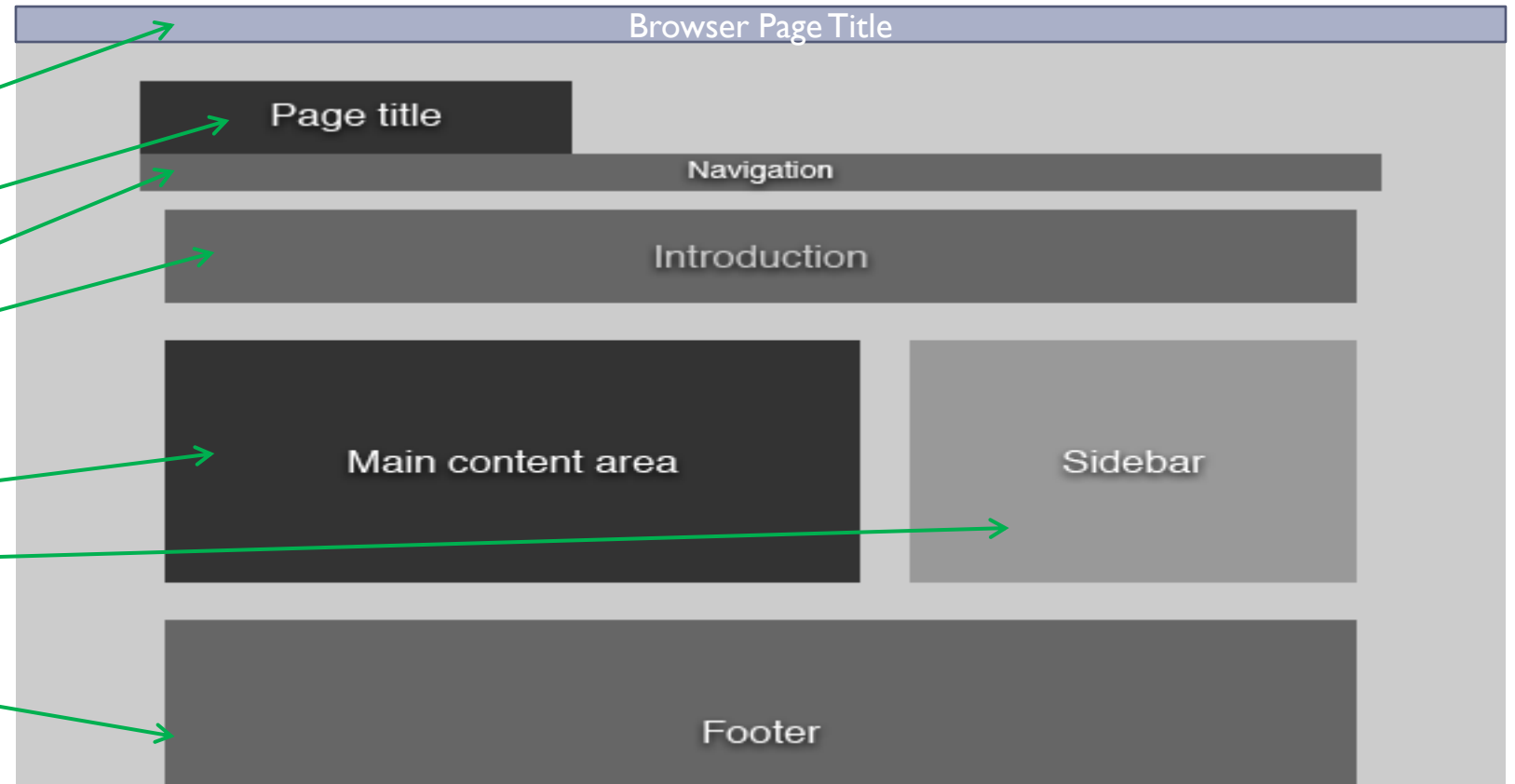
Cascading Style Sheet

▶ **CSS** is a language that describes the style of an HTML document

    ▶ CSS describes how HTML elements should be displayed

▶ Enables the separation of presentation and content

    ▶ Including aspects such as the layout, colors, and fonts

▶ Enables multiple HTML pages to share the same styles

▶ Allows to present the same HTML page in different styles

    ▶ for different rendering methods, such as on-screen, in print

    ▶ for different screen resolutions and viewing devices

▶ The style definitions are normally saved in external .css files

    ▶ Which are cached by the browser (allows faster loading times of the pages)

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Same Page – Different Styles

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CSS Syntax

▶ A style sheet consists of a list of rules

▶ Each rule consists of one or more selectors, and a declaration block

▶ A declaration block consists of a list of *declarations* in braces

▶ Each declaration itself consists of a *property*, a colon (:), and a *value*

▶ If there are multiple declarations in a block, a semi-colon (;) must be inserted to separate each declaration

SELECTOR   DECLARATION

p { color: red;}

PROPERTY   VALUE
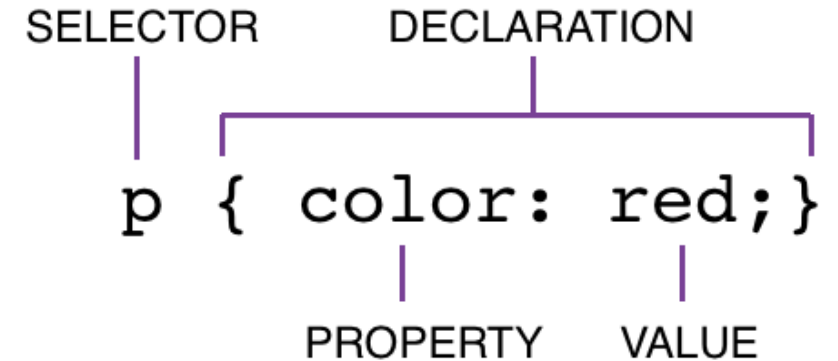
CSS - Where To Write?

- Inline

```
<h1 style="color: #7E8F7C; font-size:50px">Site
Header</h1>
```

- In <style> tag in the header of the page
    - Applies to all elements of the same type

```
<head>
    <style>
        h1 {
            color: #7E8F7C;
            font-size: 50px;
        }
    </style>
</head>
```

- In an external style sheet (.css file)
    - Can be shared among multiple HTML pages
    - Cached in the browser

```
<head>
    <link href="MyStyle.css" rel="stylesheet"/>
</head>
```

```
h1 {
    color: #7E8F7C;
    font-size: 50px;
}
```

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CSS Selectors

▶ Universal : * { margin:0; padding:0; }

▶ Type : p { font-size:2em; }

▶ Class : p.info { background:#ff0; }

  ▶ Multiple : p.info.error { color:#900; }

▶ ID : #info { background:#ff0; }

▶ Group : td, th, div { font-size:1em }

▶ Descendent : div p { color:#f00; }

▶ Child : div > strong { color:#f00; }

▶ Adj sibling : p + p { color:#f00; }

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CSS Selectors Demo

```css
*
{
    color:Red;
}

h2
{
    color:Blue;
}

li h2
{
    color:Green;
}

#myListItem1
{
    color:Lime;
}

li.myListItem
{
    color:Navy;
}

.myListItem
{
    color:Orange;
}
```

```html
<h2>Css Demo</h2>
this is a css demo
<ul>
    <li>
        <h2>header in list</h2>
        list1 item1
    </li>
</ul>
<ul>
    <li id="myListItem1">list2 item1</li>
    <li class="myListItem">list2 item2</li>
</ul>
<span class="myListItem">test</span>
```

Css Demo

this is a css demo

- **header in list**

    list1 item1

- list2 item1
- list2 item2

test

CSS Box Model

▸ All HTML elements can be considered as boxes

▸ Each box consists of:

  ▸ **Content** - The content of the box, where text and images appear

  ▸ **Padding** - Clears an area around the content. The padding is transparent

  ▸ **Border** - A border that goes around the padding and content

  ▸ **Margin** - Clears an area outside the border. The margin is transparent
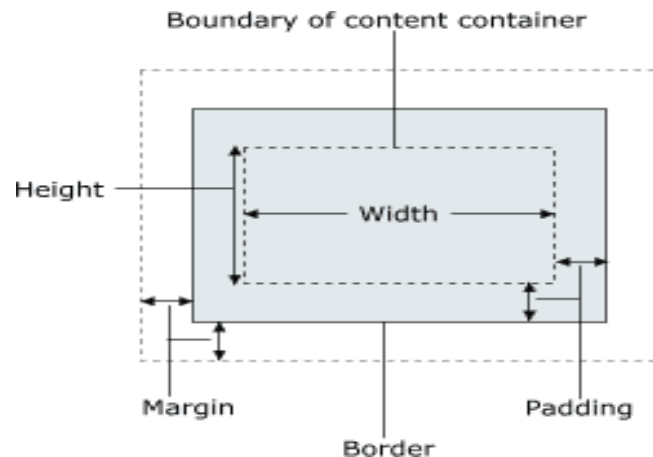


```
width:250px;
padding:10px;
border:5px solid gray;
margin:10px;
```

Let's do the math:
250px (width)
+ 20px (left and right padding)
+ 10px (left and right border)
+ 20px (left and right margin)
= 300px

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CSS Float

- With CSS float, an element can be pushed to the left or right, allowing other elements to wrap around it
- The elements **after** the floating element will flow around it
  - The **clear** property turns off the floating
- The elements before the floating element will not be affected
- Aside from the simple example of wrapping text around images, floats can be used to create **entire web layouts**

Web Layout

Float Left

Float Right

header

Float Left

side bar

main content

Float Right
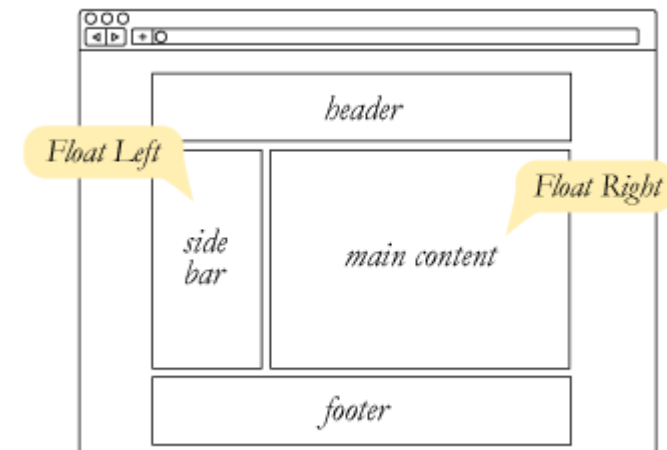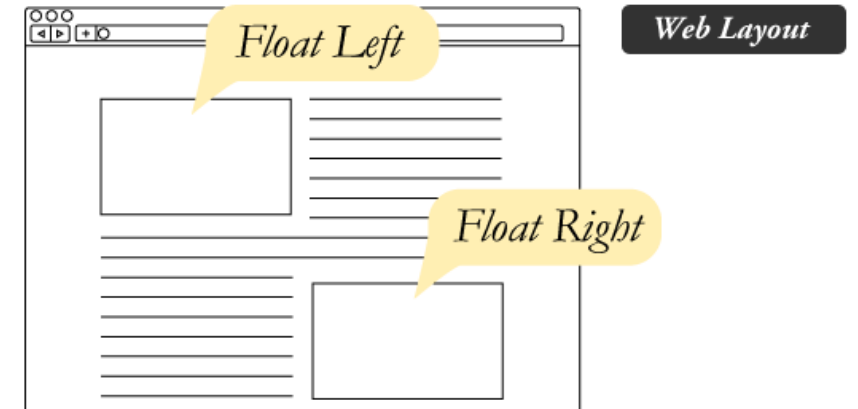
footer

Page Layout Example

```
<style>
    .header, .footer {
        background-color: grey;
        color: white;
        padding: 15px;
    }
    .column {
        float: left;
        padding: 5px;
    }
    .menu {
        width: 25%;
    }
    .content {
        width: 70%;
    }
    .menu ul {
        list-style-type: none;
        margin: 0;
        padding: 0;
    }
    .menu li {
        padding: 8px;
        margin-bottom: 8px;
        background-color: #33b5e5;
        color: #ffffff;
    }
    .footer {
        clear: both;
    }
</style>
```

Beijing

| The Flight |
| The City |
| The Culture |
| The Food |

The City

Beijing is the capital of the People's Republic of China and the world's third most populous city proper.

As a city combining both modern and traditional architecture, Beijing is an ever-changing megacity rich in history but also truly modern.

Footer Text

```
<body>
    <div class="header">
        <h1>Beijing</h1>
    </div>
    <div>
        <div class="column menu">
            <ul>
                <li>The Flight</li>
                …
            </ul>
        </div>
        <div class="column content">
            <h1>The City</h1>
            <p>Beijing is the capital of the …</p>
        </div>
    </div>
    <div class="footer">
        <p>Footer Text</p>
    </div>
</body>
```