Algorithms and Programming IV
Introducing Web Application Development (22-1)

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Our topics today

Web Application Architecture
• HTML
• CSS
• JS

Frontend Web Application Frameworks
Client-Server Architectures

Alternative Client-Server Architectures

Example of Web Application Architecture

Example taken from https://engineering.videoblocks.com/web-architecture-101-a3224e126947
Basic Architecture

User

Frontend
(Browser, Smartphone, Wearable...)

Internet

Web Application

Web Server

Application Logic
PHP/Python/JavaScript

Database
MySQL/MongoDB/PostgreSQL

Backend

Web Application
Frontend: Overview

- User-facing part of the Web Application
- Interpreted by the Browser
- Separation of concerns:
  - Content
  - Presentation
  - Behaviour

Frontend

Content/Structure: HTML
Presentation: CSS
Behaviour: Javascript
Frontend Overview: Example

### Content

```html
<!doctype html>
<html lang="en">
<head>
  <title>Display Date</title>
  <link rel="stylesheet" href="css/styles.css?v=1.0"/>
</head>
<body>
  <script src="js/scripts.js"></script>
  <button onclick="displayDate()">The date is?</button>
  <p id="date"></p>
</body>
</html>
```

### Behavior

```javascript
function displayDate() {
    document.getElementById("date").innerHTML = Date();
}
```

### Presentation

```css
body {
    font-family: Consolas;
}

p {
    color: blue;
}

button {
    background-color: #888888;
    border-color: black;
}
```
Web Application Development I

HyperText Markup Language (HTML)
Basics of HTML

• HTML is not a programming language, it is a markup language
• It is a language for specifying the static content of Web pages (based on SGML, the Standard Generalized Markup Language)

• Hypertext: more than just text; links for jumping within the same document & to other documents; contain multimedia
• Markup: augmenting text with special symbols (tags) that identify the document structure and content type
Tags and Elements

HTML specifies a set of tags that are enclosed in < > which identify structure of the document and the content type
<img src="image.gif" /> specifies an image

Most tags come in pairs
<title>My Home Page</title> is a TITLE element
<a href="/">Home</a> this is a LINK

<p>Part of this text is <b>bold</b>. </p>
is a PARAGRAPH element that contains a BOLD element (nesting)

An HTML document is a collection of elements (text/media with context).
**Structure of an HTML Document**

**Doctype declaration**
- defines the type of the document
- ‘html’ means it is an HTML5 document
  (for older versions the tag was more complicated)

Main Container: <html></html>
- encloses the document
- defines start and end

```html
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>Basic HTML Document</title>
  <meta name="description" content="This is an example">
  <meta name="author" content="John Doe">
  <link rel="stylesheet" href="css/styles.css?v=1.0">
</head>
<body>
  <script src="js/scripts.js"></script>
</body>
</html>
```
**<head> element**

The `<head>` element can contain:

- Metadata (e.g. Author, Encoding, Title, Description)
- JavaScript code
- CSS code
- links to external resources (e.g. external stylesheet)

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<link rel="stylesheet" href="css/styles.css?v=1.0">
</head>
<body>
<script src="js/scripts.js"></script>
</body>
</html>
```
**<body> element**

The **<body>** element contains:

- main content displayed on the webpage
- Paragraphs, tables and lists
- multimedia (images, videos, SVG...)
- structural elements (Buttons, Menus...)

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</head>
<body>
  <script src="js/scripts.js"></script>
</body>
</html>
```
Text Appearance

You can specify styles for fonts

- `<b>...</b>` specify bold
- `<i>...</i>` specify italics
- `<tt>...</tt>` specify typewriter-like (fixed-width) font

- `<big>...</big>` increase the size of the font
- `<small>...</small>` decrease the size of the font
- `<em>...</em>` put emphasis
- `<strong>...</strong>` put even more emphasis
Structure

Websites can be structured with specific Tags

<div>... </div> Container
<p>... </p> Paragraph
<h1>... </h1> - <h5>... </h5> Headlines
<ul>... </ul> unordered List
<li>... </li> list element
<section>... </section> Section

<nav>
<ul>
<li><a href="/">Home</a></li>
<li><a href="/news">News</a></li>
<li><a href="/examples">Examples</a></li>
<li><a href="/legal">Legal</a></li>
</ul>
</nav>

Basic Navigation
Media

Different tags exist to include media

<img> Image
<svg>...</svg> Scalable vector graphics
<video>...</video> video
<canvas>...</canvas> canvas (raster graphics)
HTML - Attributes

• All HTML elements can have attributes
• Attributes provide additional information about elements
• Attributes are always specified in the start tag
• Attributes usually come in name/value pairs like: name="value"

Examples:

<a href="www.example.com">example link </a> Path
<div id="example1">example link </div> unique identifier
<div class="examples">example link </div> class identifier

HTML Tutorial: http://www.w3schools.com/html/default.asp
HTML specification: https://www.w3.org/TR/html52/
Content vs. Presentation

Most HTML tags define content type, independent of presentation.

**Cascading Style Sheets (CSS)** allow us to maintain this separation, which allows for easier maintenance of webpages, and for a consistent look across a collection of webpages.

Style definitions are normally saved in external .css files.

With an external stylesheet file, the look of an entire website can be changed by updating just one file.