Web Development Roadmaps

Front-End Roadmap

STEP 1
Learn the Basics

Every **Web Developer** must have a basic understanding of **HTML**, **CSS**, and **JavaScript**.

Responsive Web Design is used in all types of modern web development.

ECMAScript 5 (JavaScript 5) is supported in all modern browsers. Take a good look at it, especially the new array functions.

STEP 2
Dig Deeper

When you feel comfortable with **HTML** and **CSS**, it is time to dig deeper.

You should learn how to use **Maps**, **Fonts** and **Icons** in HTML.

On the **JavaScript** side, you should learn how to access the **HTML DOM**.

You should also learn how to use **AJAX** and **JSON** for making server requests.

STEP 3
Choose Frameworks

Now it is time to look at some **Frameworks**.

On the **CSS** side you should choose a framework for reponsive web design:
Bootstrap / **Material Design** / **W3.CSS**

On the **JavaScript** side you should learn at least one modern framework:
React.js / **Angular.js** / **Vue.js** / **W3.JS**

Maybe the popularity of **jQuery** has passed the top, but it is still the most used JavaScript framework.

STEP 4
Back-End Roadmaps

Fullstack

Fullstack JS

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What is HTTP?

HTTP stands for **H**yper **T**ext **T**ransfer **P**rotocol

WWW is about communication between web **clients** and **servers**

Communication between client computers and web servers is done by sending **HTTP Requests** and receiving **HTTP Responses**

World Wide Web Communication

The World Wide Web is about communication between web **clients** and web **servers**.

Clients are often browsers (Chrome, Edge, Safari), but they can be any type of program or device.

Servers are most often computers in the cloud.

HTTP Request / Response

Communication between clients and servers is done by **requests** and **responses**:

1. A client (a browser) sends an **HTTP request** to the web
2. A web server receives the request
3. The server runs an application to process the request
4. The server returns an **HTTP response** (output) to the browser
5. The client (the browser) receives the response

The HTTP Request Circle

A typical HTTP request / response circle:

1. The browser requests an HTML page. The server returns an HTML file.
2. The browser requests a style sheet. The server returns a CSS file.
3. The browser requests an JPG image. The server returns a JPG file.
4. The browser requests JavaScript code. The server returns a JS file
5. The browser requests data. The server returns data (in XML or JSON).

XHR - XML Http Request

All browsers have a built-in XMLHttpRequest Object (XHR).

XHR is a JavaScript object that is used to transfer data between a web browser and a web server.

XHR is often used to request and receive data for the purpose of modifying a web page.

Despite the XML and Http in the name, XHR is used with other protocols than HTTP, and the data can be of many different types like HTML, CSS, XML, JSON, and plain text.

The XHR Object is a Web Developers Dream, because you can:

Update a web page without reloading the page

Request data from a server - after the page has loaded

Send data to a server - in the background

The XHR Object is the underlying concept of AJAX and JSON:

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What is HTML?

HTML stands for **H**yper **T**ext **M**arkup **L**anguage

HTML is the **standard markup** language for Web pages

HTML **elements** are the building blocks of HTML pages

HTML elements are represented by **<> tags**

HTML Elements

An HTML element is a **start** tag and an **end** tag with content in between:

<h1>This is a Heading</h1>

Start tag Element content End tag

<h1> This is a Heading </h1>

  This is paragraph.

HTML Attributes

- HTML elements can have **attributes**
- Attributes provide **additional information** about the element
- Attributes come in name/value pairs like **charset="utf-8"**

Example Explained

HTML elements are the building blocks of HTML pages.

- The `<!DOCTYPE html>` declaration defines this document to be HTML5
- The `<html>` element is the root element of an HTML page
- The `lang` attribute defines the language of the document
- The `<meta>` element contains meta information about the document
- The `charset` attribute defines the character set used in the document
- The `<title>` element specifies a title for the document
- The `<body>` element contains the visible page content
- The `<h1>` element defines a large heading
- The `<p>` element defines a paragraph
-

HTML Documents

All HTML documents must start with a document type declaration: `<!DOCTYPE html>`.

The HTML document itself begins with `<html>` and ends with `</html>`.

The visible part of the HTML document is between `<body>` and `</body>`.

HTML Document Structure

Below is a visualization of an HTML document (an HTML Page):

```
<html>

<head>

<title>Page title</title>

</head>

<body>

<h1>This is a heading</h1>
```

```
<p>This is a paragraph.</p>

<p>This is another paragraph.</p>

</body>

</html>
```

Note: Only the content inside the <body> section (the white area above) is displayed in a browser.

HTML Headings

HTML headings are defined with <h1> to <h6> tags.

<h1> defines the most important heading.

<h6> defines the least important heading:

Example

```
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
```

HTML Paragraphs

HTML paragraphs are defined with <p> tags:

Example

```
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
```

HTML Links

HTML links are defined with <a> tags:

Example

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

The link's destination is specified in the href attribute.

HTML Images

HTML images are defined with <img> tags.

The source file (src), alternative text (alt), width, and height are provided as attributes:

Example

```
<img src="img_w3schools.jpg" alt="W3Schools"
style="width:120px;height:150px"
```

HTML Buttons

HTML buttons are defined with <button> tags:

Example

```
<button>Click me</button>
```

HTML Lists

HTML lists are defined with <ul> (unordered/bullet list) or <ol> (ordered/numbered list) tags, followed by <li> tags (list items):

Example

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

HTML Tables

An HTML table is defined with a <table> tag.

Table rows are defined with <tr> tags.

Table headers are defined with <th> tags. (bold and centered by default).

Table cells (data) are defined with <td> tags.

Example

```
<table>
  <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>
```

Programming HTML

Every HTML element can have attributes.

For web development and programming, the most important attributes are id and class. These attributes are often used to address program based web page manipulations.

Attribute Example

id	<table **id**="table01">
class	<p **class**="normal">
style	<p **style**="font-size:16px">
data-	<div **data-**id="500">
onclick	<input **onclick**="myFunction()">
onmouseover	<a **onmouseover**="this.setAttribute('style','color:red')">

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What is CSS?

CSS stands for Cascading Style Sheets

CSS describes how HTML elements are to be displayed

CSS Example

```
<style>

body {background-color:lightblue; text-align:center;}
h1 {color:blue; font-size:40px;}
p {font-family:verdana; font-size:20px;}

</style>
```

CSS Syntax

A CSS rule consists of a selector and a declaration block

The selector points to the HTML element to style (h1).

The declaration block (in curly braces) contains one or more declarations separated by semicolons.

Each declaration includes a CSS property name and a value, separated by a colon.

In the following example all <p> elements will be center-aligned, red and have a font size of 32 pixels:

Example

```
<style>
p {font-size:32px; color:red; text-align:center;}
</style>
```

Same example can also be written like this:

```
<style>
p {
   font-size: 32px;
   color: red;
   text-align: center;
}
</style>
```

External Style Sheet

A CSS style sheet can be stored in an external file:

mystyle.css

```
body {background-color: orange; font-family:verdana}
h1 {color: white;}
p {font-size: 20px;}
```

External style sheets are linked to HTML pages with **<link>** tags:

Example

```
<!DOCTYPE html>
<html>
<link rel="stylesheet" href="mystyle.css">
<body>

<h1>My First CSS Example</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

Inline Style

Example

```
<!DOCTYPE html>
<html>
<link rel="stylesheet" href="mystyle.css">
<body>

<h1>My First CSS Example</h1>
<p>This is a paragraph.</p>
<p style="font-size:25px">This is a paragraph.</p>
<p style="font-size:30px">This is a paragraph.</p>

</body>
</html>
```

Cascading Order

If different styles are specified for HTML elements, the styles will **cascade** into new styles with the following priority:

- Priority 1: Inline styles
- Priority 2: External and internal style sheets
- Priority 3: Browser default
- If different styles are defined on the same priority level, the last one has the highest priority.

Example

```
<!DOCTYPE html>
<html>
<link rel="stylesheet" href="mystyle.css">

<style>
body {background-color: lightblue;}
</style>

<body style="background-color: olivedrab">
<h1>Multiple Styles Cascades into One</h1>
<p>Try experimenting by removing styles to see how the cascading stylesheets work.</p>
<p>Try removing the inline first, then the internal, then the external.</p>
</body>
</html>
```

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What is Responsive Web Design?

Responsive Web Design is about using HTML and CSS to automatically resize a website.

Responsive Web Design is about making a website look good on all devices (desktops, tablets, and phones):

Setting The Viewport

When making responsive web pages, add the following <meta> element to all your web pages:

Example

```
<meta name="viewport" content="width=device-width, initial-scale=1.0">
```

Media Queries

Media Queries plays an important role in responsive web pages.

With media queries you can define different styles for different browser sizes.

Example:
Resize the browser window to see that the three elements below will display horizontally on large screens and vertically on small screens:

Example

```
<style>
.left, .right {
  float: left;
  width: 20%; /* The width is 20%, by default */
}

.main {
  float: left;
  width: 60%; /* The width is 60%, by default */
}

/* Use Media Query to add a breakpoint at 800px: */
@media screen and (max-width:800px) {
  .left , .main, .right {width:100%;}
}
</style>
```

Responsive Images

Responsive images are images that scale nicely to fit any browser size.

When the CSS width property is set to a percentage value, an image will scale up and down when resizing the browser window.

Example

```
<img src="img_girl.jpg" style="width:80%;height:auto;">
```

If the max-width property is set to 100%, the image will scale down if it has to, but never scale up to be larger than its original size:

Example

```
<img src="img_girl.jpg" style="max-width:100%;height:auto;">
```

Image Depending on Browser Size

The HTML <picture> element allows you to define different images for different browser window sizes.

Example

```
<picture>
  <source srcset="img_smallflower.jpg" media="(max-width: 600px)">
  <source srcset="img_flowers.jpg" media="(max-width: 1500px)">
  <source srcset="flowers.jpg">
  <img src="img_smallflower.jpg" alt="Flowers">
</picture>
```

Responsive W3.CSS

W3.CSS is a free CSS Framework that offers Responsive Design by default.

W3.CSS makes it easy to develop sites that look nice on any device; desktop, laptop, tablet, or phone:

Example

```
<!DOCTYPE html>
<html>
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href="https://www.w3schools.com/w3css/4/w3.css">
<body>

<div class="w3-center w3-padding-64 w3-light-grey">
  <h1>My W3.CSS Page</h1>
  <p>Resize this page to see the responsive effect!</p>
</div>

<div class="w3-row-padding">
  <div class="w3-third">
    <h2>London</h2>
    <p>London is the capital city of England.</p>
    <p>It is the most populous city in the United Kingdom,
    with a metropolitan area of over 13 million inhabitants.</p>
  </div>

  <div class="w3-third">
    <h2>Paris</h2>
    <p>Paris is the capital of France.</p>
    <p>The Paris area is one of the largest population centers in Europe,
    with more than 12 million inhabitants.</p>
  </div>

  <div class="w3-third">
    <h2>Tokyo</h2>
    <p>Tokyo is the capital of Japan.</p>
    <p>It is the center of the Greater Tokyo Area,
    and the most populous metropolitan area in the world.</p>
  </div>
```

```
</div>

</body>
</html>
```

Bootstrap

Bootstrap is a very popular framework that uses HTML, CSS and jQuery to make responsive web pages.

Example

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Bootstrap Example</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.1.3/css/bootstrap.min.css"
>
<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
<script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.14.3/umd/popper.min.js"
></script>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.1.3/js/bootstrap.min.js"></s
cript>
</head>
<body>

<div class="jumbotron text-center">
  <h1>My First Bootstrap Page</h1>
```

```
  <p>Resize this responsive page to see the effect!</p>
</div>

<div class="container-fluid">
  <div class="row">
    <div class="col-sm-4">
      <h2>London</h2>
      <p>London is the capital city of England.</p>
      <p>It is the most populous city in the United Kingdom,
      with a metropolitan area of over 13 million inhabitants.</p>
    </div>
    <div class="col-sm-4">
      <h2>Paris</h2>
      <p>Paris is the capital of France.</p>
     <p>The Paris area is one of the largest population centers in Europe,
      with more than 12 million inhabitants.</p>
    </div>
    <div class="col-sm-4">
      <h2>Tokyo</h2>
      <p>Tokyo is the capital of Japan.</p>
      <p>It is the center of the Greater Tokyo Area,
      and the most populous metropolitan area in the world.</p>
    </div>
  </div>
</div>

</body>
</html>
```

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What is JavaScript?

JavaScript is the **Programming Language** for the Web.

JavaScript can update and change both **HTML** and **CSS.**

JavaScript can **calculate**, **manipulate** and **validate** data.

JavaScript Quickstart Tutorial

This tutorial will take a quick look at the most important JavaScript data types.

JavaScript variables can be:

- Numbers
- Strings
- Objects
- Arrays
- Functions

JavaScript Variables

- JavaScript variables are containers for storing data values.
- In this example, x, y, and z, are variables:
- Example
- var x = 5;
  var y = 6;
  var z = x + y;
- From the example above, you can expect:
- x stores the value 5
- y stores the value 6
- z stores the value 11

JavaScript Numbers

JavaScript has only one type of number. Numbers can be written with or without decimals.

Example

```
var x = 3.14;    // A number with decimals
var y = 3;       // A number without decimals
```

All numbers are stored as double precision floating point numbers.

The maximum number of decimals is 17, but floating point is not always 100% accurate:

Example

```
var x = 0.2 + 0.1;         // x will be 0.30000000000000004
```

JavaScript Strings

Strings store text. Strings are written inside quotes. You can use single or double quotes:

Example

```
var carname = "Volvo XC60";  // Double quotes
var carname = 'Volvo XC60';  // Single quotes
```

The length of a string is found in the built in property length:

Example

```
var txt = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
var sln = txt.length;
```

JavaScript Objects

You have already learned that JavaScript variables are containers for data values.

This code assigns a **simple value** (Fiat) to a **variable** named car:

var car = "Fiat";

Objects are variables too. But objects can contain many values.

This code assigns many values (Fiat, 500, white) to a variable named car:

var car = {type:"Fiat", model:"500", color:"white"};

JavaScript Arrays

JavaScript arrays are used to store multiple values in a single variable.

Example
var cars = ["Saab", "Volvo", "BMW"];

JavaScript Functions

A JavaScript function is a block of code designed to perform a particular task.

A JavaScript function is executed when "something" invokes it (calls it).

Example

```
function myFunction(p1, p2) {
  return p1 * p2;          // The function returns the product of p1 and p2
}
```

What can JavaScript Do?

This section contains some examples of what JavaScript can do:

- JavaScript Can Change HTML Content
- JavaScript Can Change HTML Attribute Values
- JavaScript Can Change HTML Styles (CSS)
- JavaScript Can Hide HTML Elements

- JavaScript Can Show HTML Elements

JavaScript Can Change HTML Content

One of many JavaScript HTML methods is getElementById().

This example uses the method to "find" an HTML element (with id="demo") and changes the element content (innerHTML) to "Hello JavaScript":

Example

```
document.getElementById("demo").innerHTML = "Hello JavaScript";
```

JavaScript Can Change HTML Attribute Values

In this example JavaScript changes the value of the src (source) attribute of an <img> tag:

```
<!DOCTYPE html>

<html>

<body>

<h2>What Can JavaScript Do?</h2>

<p>JavaScript can change HTML attribute values.</p>

<p>In this case JavaScript changes the value of the src (source) attribute of an image.</p>

<button
onclick="document.getElementById('myImage').src='img_bulbon.gif'">Turn on the light</button>

<img id="myImage" src="img_bulboff.gif" style="width:100px">
```

<button
onclick="document.getElementById('myImage').src='img_bulboff.gif'">Turn off the light</button>

</body>

</html>

JavaScript Can Change HTML Styles (CSS)

Changing the style of an HTML element, is a variant of changing an HTML attribute:

Example

```
document.getElementById("demo").style.fontSize = "35px";
or
document.getElementById('demo').style.fontSize = '35px';
```

JavaScript Can Hide HTML Elements

Hiding HTML elements can be done by changing the display style:

Example

```
document.getElementById("demo").style.display = "none";
or
document.getElementById('demo').style.display = 'none';
```

JavaScript Can Show HTML Elements

Showing hidden HTML elements can also be done by changing the display style:

Example

```
document.getElementById("demo").style.display = "block";
or
document.getElementById('demo').style.display = 'block';
```

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What is ES5?

ES5 is a shortcut for ECMAScript 5

ECMAScript 5 is also known as JavaScript 5

ECMAScript 5 is also known as ECMAScript 2009

ECMAScript 5

ECMAScript 5 was released in 2009.

ECMAScript 5 Features

These were the new features released in 2009:

- The "use strict" Directive
- String.trim()
- Array.isArray()
- Array.forEach()
- Array.map()
- Array.filter()
- Array.reduce()
- Array.reduceRight()
- Array.every()
- Array.some()
- Array.indexOf()
- Array.lastIndexOf()
- JSON.parse()
- JSON.stringify()
- Date.now()
- Property Getters and Setters

- New Object Property Methods

ECMAScript 5 Syntactical Changes

Property access [ ] on strings

Trailing commas in array and object literals

Multiline string literals

Reserved words as property names

Browser Support for ES5 (2009)

Chrome 23, IE 10, and Safari 6 were the first browsers to fully support ECMAScript 5:

Chrome 23	IE10 / Edge	Firefox 21	Safari 6	Opera 15
Sep 2012	Sep 2012	Apr 2013	Jul 2012	Jul 2013

Internet Explorer 9 (March 2011) supports ES 5 except for "use strict".

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What is the HTML DOM?

The HTML DOM is an Object Model for HTML. It defines:

HTML elements as objects

Properties for all HTML elements

Methods for all HTML elements

Events for all HTML elements

The HTML DOM is an API (Programming Interface) for JavaScript:

- JavaScript can add/change/remove HTML elements
- JavaScript can add/change/remove HTML attributes
- JavaScript can add/change/remove CSS styles
- JavaScript can react to HTML events
- JavaScript can add/change/remove HTML events

The HTML DOM (Document Object Model)

- When a web page is loaded, the browser creates a **D**ocument **O**bject **M**odel of the page.
- The **HTML DOM** model is constructed as a tree of **Objects**:

Finding HTML Elements

When you want to access HTML elements with JavaScript, you have to find the elements first.

There are a couple of ways to do this:

- Finding HTML elements by id
- Finding HTML elements by tag name
- Finding HTML elements by class name
- Finding HTML elements by CSS selectors
- Finding HTML elements by HTML object collections

Finding HTML Element by Id

The easiest way to find an HTML element in the DOM, is by using the element id.

- This example finds the element with id="intro":

Example

```
var myElement = document.getElementById("intro");
```

If the element is found, the method will return the element as an object (in myElement).

If the element is not found, myElement will contain null.

Finding HTML Elements by Tag Name

This example finds all <p> elements:

Example

```
var x = document.getElementsByTagName("p");
```

This example finds the element with id="main", and then finds all <p> elements inside "main":

Example

```
var x = document.getElementById("main");
var y = x.getElementsByTagName("p");
```

Finding HTML Elements by Class Name

If you want to find all HTML elements with the same class name, use getElementsByClassName().

This example returns a list of all elements with class="intro".

Example

```
var x = document.getElementsByClassName("intro");
```

Finding elements by class name does not work in Internet Explorer 8 and earlier versions.

Finding HTML Elements by CSS Selectors

If you want to find all HTML elements that matches a specified CSS selector (id, class names, types, attributes, values of attributes, etc), use the querySelectorAll() method.

This example returns a list of all <p> elements with class="intro".

Example

```
var x = document.querySelectorAll("p.intro");
```

The querySelectorAll() method does not work in Internet Explorer 8 and earlier versions. Finding HTML Elements by HTML Object Collections

HTML object collections are also accessible:

- document.anchors
- document.forms
- document.images
- document.links
- document.scripts

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What is Google Maps?

Google Maps is a Google API

Google Fonts is a Google API

Google Charts is a Google API

My First Google Map

Start with a simple web page.

Add a element where you want the map to display, and set the size of the map:

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Google Map</h1>

<div id="map" style="width:100%;height:400px;">My map will go here</div>

</body>
<html>
```

Add a JavaScript function to display the map:

Example

```
function myMap() {
  var mapCanvas = document.getElementById("map");
  var mapOptions = {
    center: new google.maps.LatLng(51.5, -0.2),
    zoom: 10
  };
  var map = new google.maps.Map(mapCanvas, mapOptions);
}
```

The **mapCanvas** variable is the map's HTML element.

The **mapOptions** variable defines the properties for the map.

The **center** property specifies where to center the map (using latitude and longitude coordinates).

The **zoom** property specifies the zoom level for the map (try to experiment with the zoom level).

The **google.maps.Map** object is created with mapCanvas and mapOptions as parameters.

Finally Add the Google API

The functionality of the map is provided by a JavaScript library located at Google:

Example

<scriptsrc="https://maps.googleapis.com/maps/api/js?key=YOUR_KEY&callback=myMap"></script>

What is Google Fonts?

Google Maps is a Google API

Google Fonts is a Google API

Google Charts is a Google API

Currently there are 1043 fonts available from Google:

What is Google Charts?

Google Maps is a Google API

Google Fonts is a Google API

Google Charts is a Google API

Google Pie Chart

Start with a simple basic web page.

Add a element with the id "piechart":

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My Web Page</h1>

<div id="piechart"></div>

</body>
<html>
```

Add a reference to the Chart API at google.com:

Example

```
<script type="text/javascript"
src="https://www.gstatic.com/charts/loader.js"></script>
```

And add a JavaScript function:

Example

```
<script type="text/javascript">
// Load google charts
google.charts.load('current', {'packages':['corechart']});
google.charts.setOnLoadCallback(drawChart);

// Draw the chart and set the chart values
function drawChart() {
  var data = google.visualization.arrayToDataTable([
  ['Task', 'Hours per Day'],
  ['Work', 8],
  ['Friends', 2],
  ['Eat', 2],
```

```
  ['TV', 2],
  ['Gym', 2],
 ['Sleep', 8]
]);

  // Optional; add a title and set the width and height of the chart
  var options = {'title':'My Average Day', 'width':550, 'height':400};

  // Display the chart inside the <div> element with id="piechart"
  var chart = new
google.visualization.PieChart(document.getElementById('piechart'));
  chart.draw(data, options);
}
</script>
```

****

What is XML?

XML stands for eXtensible Markup Language

XML plays an important role in many different IT systems

XML is often used for distributing data over the Internet

It is important for all web developers to have a good understanding of XML

XML Example 1

```
<?xml version="1.0" encoding="UTF-8"?>
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

XML Example 2

```
<?xml version="1.0" encoding="UTF-8"?>
<breakfast_menu>
<food>
   <name>Belgian Waffles</name>
   <price>$5.95</price>
   <description>
  Two of our famous Belgian Waffles with plenty of real maple syrup
  </description>
   <calories>650</calories>
</food>
<food>
   <name>Strawberry Belgian Waffles</name>
   <price>$7.95</price>
   <description>
   Light Belgian waffles covered with strawberries and whipped cream
   </description>
   <calories>900</calories>
</food>
<food>
   <name>Berry-Berry Belgian Waffles</name>
   <price>$8.95</price>
   <description>
   Belgian waffles covered with assorted fresh berries and whipped cream
   </description>
   <calories>900</calories>
</food>
<food>
   <name>French Toast</name>
   <price>$4.50</price>
   <description>
   Thick slices made from our homemade sourdough bread
   </description>
```

```
  <calories>600</calories>
</food>
<food>
  <name>Homestyle Breakfast</name>
  <price>$6.95</price>
  <description>
  Two eggs, bacon or sausage, toast, and our ever-popular hash browns
  </description>
  <calories>950</calories>
</food>
</breakfast_menu>
```

****

What is AJAX?

AJAX is a developer's dream, because you can:

- Read data from a web server - after a web page has loaded
- Update a web page without reloading the page
- Send data to a web server - in the background

AJAX Example Explained

HTML Page

- ```
  <!DOCTYPE html>
  <html>
  <body>

    <h2>Let AJAX change this text</h2>
    <button type="button" onclick="loadDoc()">Change Content</button>

  </body>
  </html>
  ```
  ```

The HTML page contains a section and a <button>.

The section is used to display information from a server.

The <button> calls a function (if it is clicked).

The function requests data from a web server and displays it:

Function loadDoc()

```
function loadDoc() {
  var xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
     document.getElementById("demo").innerHTML = this.responseText;
    }
  };
  xhttp.open("GET", "ajax_info.txt", true);
  xhttp.send();
}
```

What is AJAX?

AJAX = **A**synchronous **J**avaScript **A**nd **X**ML.

AJAX is not a programming language.

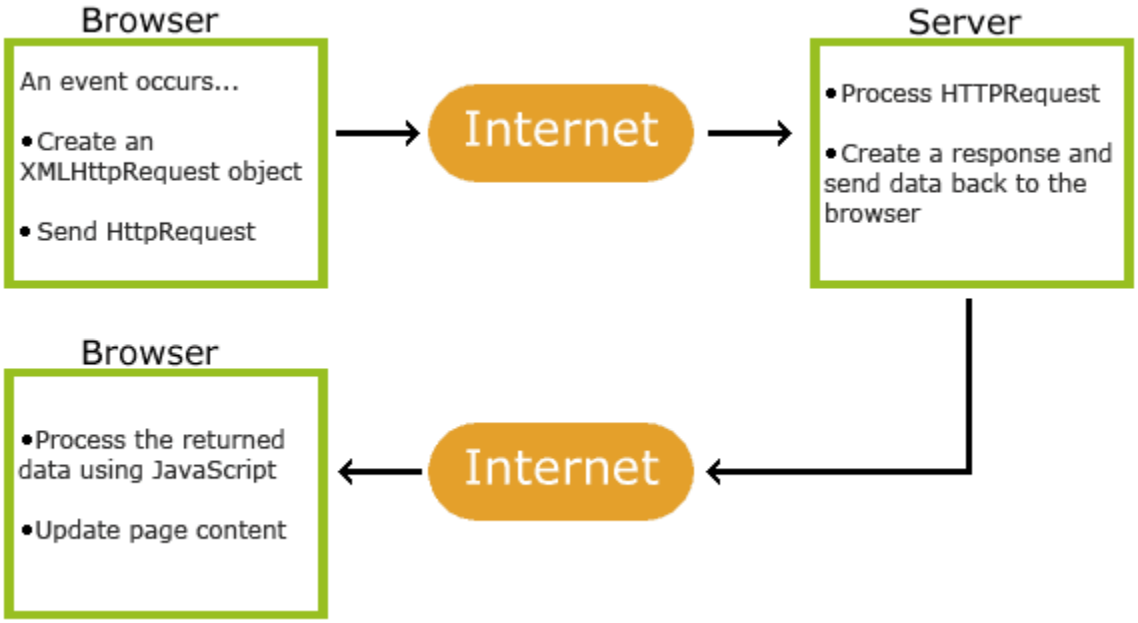
AJAX just uses a combination of:

- A browser built-in XMLHttpRequest object (to request data from a web server)
- JavaScript and HTML DOM (to display or use the data)

AJAX is a misleading name. AJAX applications might use XML to transport data, but it is equally common to transport data as plain text or JSON text.

AJAX allows web pages to be updated asynchronously by exchanging data with a web server behind the scenes. This means that it is possible to update parts of a web page, without reloading the whole page.

How AJAX Works



- 1. An event occurs in a web page (the page is loaded, a button is clicked)
- 2. An XMLHttpRequest object is created by JavaScript
- 3. The XMLHttpRequest object sends a request to a web server
- 4. The server processes the request
- 5. The server sends a response back to the web page
- 6. The response is read by JavaScript
- 7. Proper action (like page update) is performed by JavaScript

****

What is JSON?

JSON stands for JavaScript Object Notation

JSON is a lightweight format for storing and transporting data

JSON is often used when data is sent from a server to a web page

JSON is "self-describing" and easy to understand

JSON Example

- This example defines an employees object: an array of 3 employee records (objects):
- {
"employees":[
{"firstName":"John", "lastName":"Doe"},
{"firstName":"Anna", "lastName":"Smith"},
{"firstName":"Peter", "lastName":"Jones"}
]
}

JSON Syntax Rules

- Data is in name/value pairs
- Data is separated by commas
- Curly braces hold objects
- Square brackets hold arrays

JavaScript Object Notation

The JSON format is syntactically identical to the code for creating JavaScript objects.

Because of this similarity, a JavaScript program can easily convert JSON data into native JavaScript objects.

The JSON syntax is derived from JavaScript object notation syntax, but the JSON format is text only. Code for reading and generating JSON data can be written in any programming language.

JSON Data - A Name and a Value

JSON data is written as name/value pairs, just like JavaScript object properties.

A name/value pair consists of a field name (in double quotes), followed by a colon, followed by a value:

"firstName":"John"

JSON names require double quotes. JavaScript names do not.

JSON Objects

JSON objects are written inside curly braces.

Just like in JavaScript, objects can contain multiple name/value pairs:

{"firstName":"John", "lastName":"Doe"}

JSON Arrays

JSON arrays are written inside square brackets.

Just like in JavaScript, an array can contain objects:

```
"employees":[
   {"firstName":"John", "lastName":"Doe"},
   {"firstName":"Anna", "lastName":"Smith"},
   {"firstName":"Peter", "lastName":"Jones"}
]
```

In the example above, the object "employees" is an array. It contains three objects.

Each object is a record of a person (with a first name and a last name).

Converting a JSON Text to a JavaScript Object

A common use of JSON is to read data from a web server, and display the data in a web page.

For simplicity, this can be demonstrated using a string as input.

First, create a JavaScript string containing JSON syntax:

```
var text = '{ "employees" : [' +
'{ "firstName":"John" , "lastName":"Doe" },' +
'{ "firstName":"Anna" , "lastName":"Smith" },' +
'{ "firstName":"Peter" , "lastName":"Jones" } ]}';
```

Then, use the JavaScript built-in function JSON.parse() to convert the string into a JavaScript object:

```
var obj = JSON.parse(text);
```

Finally, use the new JavaScript object in your page:

Example

```
<p id="demo"></p>

<script>
document.getElementById("demo").innerHTML =
obj.employees[1].firstName + " " + obj.employees[1].lastName;
</script>
```

****

What is CSS Icons?

Icons come in scalable vector libraries that can be customized with CSS

Common libraries are:

- Font Awesome Icons
- Bootstrap Icons
- Google Icons

How To?

To use icons, just add a link to the icon library the <head> section of your HTML page:

No downloads or installations required!

To insert an icon, add the name of the icon class to any inline HTML element like <i> or .

Font Awesome Example

```
<!DOCTYPE html>
<html>
<head>
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">
</head>
<body>

<i class="fa fa-cloud"></i>
<i class="fa fa-heart"></i>
<i class="fa fa-car"></i>
<i class="fa fa-file"></i>
<i class="fa fa-bars"></i>
```

```
</body>
</html>
```

Bootstrap Example

```
<!DOCTYPE html>
<html>
<head>
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/css/bootstrap.min.css">
</head>
<body>

<i class="glyphicon glyphicon-cloud"></i>
<i class="glyphicon glyphicon-remove"></i>
<i class="glyphicon glyphicon-user"></i>
<i class="glyphicon glyphicon-envelope"></i>
<i class="glyphicon glyphicon-thumbs-up"></i>

</body>
</html>
```

Google Example

```
<!DOCTYPE html>
<html>
<head>
<link rel="stylesheet"
href="https://fonts.googleapis.com/icon?family=Material+Icons">
</head>
<body>

<i class="material-icons">cloud</i>
<i class="material-icons">favorite</i>
<i class="material-icons">attachment</i>
<i class="material-icons">computer</i>
<i class="material-icons">traffic</i>
```

```
</body>
</html>
```

****

What is Bootstrap?

Bootstrap is the most popular CSS Framework for developing responsive and mobile-first websites.

Bootstrap 4 is the newest version of Bootstrap

Example

```
<div class="jumbotron text-center">
  <h1>My First Bootstrap Page</h1>
  <p>Resize this page to see the responsive effect!</p>
</div>

<div class="container-fluid">
  <div class="row">
    <div class="col-sm-4">
      <h2>London</h2>
      <p>London is the capital city of England.</p>
      <p>It is the most populous city in the United Kingdom,
      with a metropolitan area of over 13 million inhabitants.</p>
    </div>
    <div class="col-sm-4">
      <h2>Paris</h2>
      <p>Paris is the capital of France.</p>
      <p>The Paris area is one of the largest population centers in Europe,
      with more than 12 million inhabitants.</p>
    </div>
    <div class="col-sm-4">
```

```
      <h2>Tokyo</h2>
      <p>Tokyo is the capital of Japan.</p>
      <p>It is the center of the Greater Tokyo Area,
      and the most populous metropolitan area in the world.</p>
    </div>
  </div>
</div>
```

Browser Support

Bootstrap 4 is the newest version of Bootstrap.

Bootstrap 4 supports all major browsers except Internet Explorer 9.

If you require support for IE9 or IE8, you must use Bootstrap 3.

Bootstrap Containers

The container class is one of the most important Bootstrap classes.

It provides margins, padding, alignments, and more, to HTML elements.

Example

```
<div class="container">
   <h1>This is a paragraph</h1>
   <p>This is a paragraph</p>
   <p>This is a paragraph</p>
   <p>This is a paragraph</p>
   <p>This is a paragraph</p>
</div>
```

Bootstrap Colors

Example

```
<div class="container bg-primary text-white py-4">
<p>London is the most populous city in the United Kingdom, with a metropolitan area of over 9 million inhabitants.</p>
```

```
</div>

<div class="container bg-success text-white py-4">
<p>London is the most populous city in the United Kingdom, with a metropolitan area of over 9 million inhabitants.</p>
</div>
```

Bootstrap Text Colors

```
<div class="container">
  <p class="text-muted">This text is muted.</p>
  <p class="text-primary">This text is important.</p>
  <p class="text-success">This text indicates success.</p>
  <p class="text-info">This text represents some information.</p>
  <p class="text-warning">This text represents a warning.</p>
  <p class="text-danger">This text represents danger.</p>
</div>
```

Bootstrap Columns

Three equal-width columns, on all devices and screen widths:

Example

```
<div class="row">
  <div class="col">.col</div>
  <div class="col">.col</div>
  <div class="col">.col</div>
</div>
```

Responsive Columns

Three equal-width columns scaling to stack on top of each other on small screens:

Example

```
<div class="row">
  <div class="col-sm-4">.col-sm-4</div>
```

```
  <div class="col-sm-4">.col-sm-4</div>
  <div class="col-sm-4">.col-sm-4</div>
</div>
```

Bootstrap Tables

A boredered zebra-striped table:

Firstname	Lastname	Email
John	Doe	john@example.com
Mary	Moe	mary@example.com
July	Dooley	july@example.com

Example

```
 <table class="table table-striped table-bordered">
  <thead>
    <tr>
      <th>Firstname</th>
      <th>Lastname</th>
      <th>Email</th>
    </tr>
  </thead>
  <tbody>
    <tr>
      <td>John</td>
      <td>Doe</td>
      <td>john@example.com</td>
    </tr>
    <tr>
      <td>Mary</td>
      <td>Moe</td>
      <td>mary@example.com</td>
    </tr>
```

```
    <tr>
      <td>July</td>
      <td>Dooley</td>
      <td>july@example.com</td>
    </tr>
  </tbody>
</table>
```

Bootstrap Alerts

Bootstrap provides an easy way to create predefined alert messages:

Success! This alert box indicates a successful or positive action.

Warning! This alert box indicates a warning that might need attention.

Danger! This alert box indicates a dangerous or potentially negative action.

Primary! This alert box indicates an important action.

Example

```
<div class="alert alert-success">
  <strong>Success!</strong> Indicates a successful or positive action.
</div>
```

Bootstrap Buttons

Bootstrap provides different styles of buttons:

Example

```
<button type="button" class="btn">Basic</button>
<button type="button" class="btn btn-primary">Primary</button>
<button type="button" class="btn btn-secondary">Secondary</button>
<button type="button" class="btn btn-success">Success</button>
<button type="button" class="btn btn-info">Info</button>
<button type="button" class="btn btn-warning">Warning</button>
```

```
<button type="button" class="btn btn-danger">Danger</button>
<button type="button" class="btn btn-dark">Dark</button>
```

Bootstrap Cards

Example

```
<div class="card" style="width:400px">
  <img src="img_avatar1.png" alt="Card image">
  <div class="card-body">


    <h4 class="card-title">John Doe</h4>
    <p class="card-text">Some example text.</p>
    <a href="#" class="btn btn-primary">See Profile</a>
    </div>
    </div>
```

****

What is Command Line Interface (CLI)?

C:\>npm install mysoftware

CLI stands for:

- Command Line Interface
- Command Line Interpreter
- Command Line Input

Command Line Input

- CLI is a command line program that accepts text input to execute operating system functions.
- In the 1960s, using only computer terminals, this was the only way to interact with computers.

- In the 1970s an 1980s, command line input was commonly used by Unix systems and PC systems like MS-DOS and Apple DOS.
- Today, with graphical user interfaces (GUI), most users never use command-line interfaces (CLI).
- However, CLI is still used by software developers and system administrators to configure computers, install software, and access features that are not available in the graphical interface.

Examples

The software package manager npm uses command line input to install software:

Windows Example

C:\>npm install mysoftware

Mac OS Example

>npm install mysoftware

You can navigate your folders (directories) with command line commands:

Windows Example

C:\Users\myuser>cd ..

C:\Users\>cd ..

C:\>

> Use CLI commands with great attention!!!
>
> Wrong use can easily delete files or destroy your computer system completely.

Basic Linux CLI Commands

Command	Description
ls	List the directory (folder) system.
cd *pathname*	Change directory (folder) in the file system.
cd ..	Move one level up (one folder) in the file system.

cp	Copy a file to another folder.
mv	Move a file to another folder.
mkdir	Creates a new directory (folder).
rmdir	Remove a directory (folder).
clear	Clears the CLI window.
exit	Closes the CLI window.
man *command*	Shows the manual for a given command.

Basic Windows CLI Commands

Command	Description
dir	List the directory (folder) system.
cd *pathname*	Change directory (folder) in the file system.
cd \	Move to the root folder of the file system.
cd ..	Move one level up (one folder) in the file system.
copy	Copy a file to another folder.
move	Move a file to another folder.
type *filename*	Type a file.
mkdir or md	Creates a new directory (folder).
rmdir or rd	Removes a directory (folder).
cls	Clears the CLI window.
exit	Closes the CLI window.

help *command* Shows the manual for a given command.

DOS Commands Help

You can display all available commands with the help command:

Example

C:\Users\myuser>help

ASSOC	Displays or modifies file extension associations.
ATTRIB	Displays or changes file attributes.
BREAK	Sets or clears extended CTRL+C checking.
BCDEDIT	Sets properties in boot database to control boot loading.
CACLS	Displays or modifies access control lists (ACLs) of files.
CALL	Calls one batch program from another.
CD	Displays the name of or changes the current directory.
CHCP	Displays or sets the active code page number.
CHDIR	Displays the name of or changes the current directory.
CHKDSK	Checks a disk and displays a status report.
CHKNTFS	Displays or modifies the checking of disk at boot time.
CLS	Clears the screen.
CMD	Starts a new instance of the Windows command interpreter.
COLOR	Sets the default console foreground and background colors.
COMP	Compares the contents of two files or sets of files.

COMPACT	Displays or alters the compression of files on NTFS partitions.
CONVERT	Converts FAT volumes to NTFS. You cannot convert the current drive.
COPY	Copies one or more files to another location.
DATE	Displays or sets the date.
DEL	Deletes one or more files.
DIR	Displays a list of files and subdirectories in a directory.
DISKPART	Displays or configures Disk Partition properties.
DOSKEY	Edits command lines, recalls Windows commands, and creates macros.
DRIVERQUERY	Displays current device driver status and properties.
ECHO	Displays messages, or turns command echoing on or off.
ENDLOCAL	Ends localization of environment changes in a batch file.
ERASE	Deletes one or more files.
EXIT	Quits the CMD.EXE program (command interpreter).
FC	Compares two files or sets of files, and displays the differences between them.
FIND	Searches for a text string in a file or files.
FINDSTR	Searches for strings in files.
FOR	Runs a specified command for each file in a set of files.
FORMAT	Formats a disk for use with Windows.

FSUTIL	Displays or configures the file system properties.
FTYPE	Displays or modifies file types used in file extension associations.
GOTO	Directs the Windows command interpreter to a labeled line in a batch program.
GPRESULT	Displays Group Policy information for machine or user.
GRAFTABL	Enables Windows to display an extended character set in graphics mode.
HELP	Provides Help information for Windows commands.
ICACLS	Display, modify, backup, or restore ACLs for files and directories.
IF	Performs conditional processing in batch programs.
LABEL	Creates, changes, or deletes the volume label of a disk.
MD	Creates a directory.
MKDIR	Creates a directory.
MKLINK	Creates Symbolic Links and Hard Links.
MODE	Configures a system device.
MORE	Displays output one screen at a time.
MOVE	Moves one or more files from one directory to another directory.
OPENFILES	Displays files opened by remote users for a file share.
PATH	Displays or sets a search path for executable files.
PAUSE	Suspends processing of a batch file and displays a message.

POPD	Restores the previous value of the current directory saved by PUSHD.
PRINT	Prints a text file.
PROMPT	Changes the Windows command prompt.
PUSHD	Saves the current directory then changes it.
RD	Removes a directory.
RECOVER	Recovers readable information from a bad or defective disk.
REM	Records comments (remarks) in batch files or CONFIG.SYS.
REN	Renames a file or files.
RENAME	Renames a file or files.
REPLACE	Replaces files.
RMDIR	Removes a directory.
ROBOCOPY	Advanced utility to copy files and directory trees.
SET	Displays, sets, or removes Windows environment variables.
SETLOCAL	Begins localization of environment changes in a batch file.
SC	Displays or configures services (background processes).
SCHTASKS	Schedules commands and programs to run on a computer.
SHIFT	Shifts the position of replaceable parameters in batch files.
SHUTDOWN	Allows proper local or remote shutdown of machine.
SORT	Sorts input.

START	Starts a separate window to run a specified program or command.
SUBST	Associates a path with a drive letter.
SYSTEMINFO	Displays machine specific properties and configuration.
TASKLIST	Displays all currently running tasks including services.
TASKKILL	Kill or stop a running process or application.
TIME	Displays or sets the system time.
TITLE	Sets the window title for a CMD.EXE session.
TREE	Graphically displays the directory structure of a drive or path.
TYPE	Displays the contents of a text file.
VER	Displays the Windows version.
VERIFY	Tells Windows whether to verify that your files are written correctly to a disk.
VOL	Displays a disk volume label and serial number.
XCOPY	Copies files and directory trees.
WMIC	Displays WMI information inside interactive command shell.

Command Help

For more information on a specific command, type help + command-name

Example

C:\Users\myuser>help date

Displays or sets the date.

DATE [/T | date]

Type DATE without parameters to display the current date setting and
a prompt for a new one. Press ENTER to keep the same date.

If Command Extensions are enabled the DATE command supports
the /T switch which tells the command to just output the
current date, without prompting for a new date.

****

What is npm?

npm is the world's largest Software Library (Registry)

npm is also a software Package Manager and Installer

The World's Largest Software Registry (Library)

npm is the world's largest Software Registry.

The registry contains over 800,000 code packages.

Open-source developers use npm to share software.

Many organizations also use npm to manage private development.

Using npm is Free

npm is free to use.

You can download all npm public software packages without any registration or logon.

Command Line Client

npm includes a CLI (Command Line Client) that can be used to download and install software:

Windows Example

C:\>npm install <package>

Mac OS Example

>npm install <package>

Installing npm

npm is installed with Node.js

This means that you have to install Node.js to get npm installed on your computer.

Download Node.js from the official Node.js web site: https://nodejs.org

Software Package Manager

The name npm (Node Package Manager) stems from when npm first was created as a package manager for Node.js.

All npm packages are defined in files called package.json.

The content of package.json must be written in JSON.

At least two fields must be present in the definition file: name and version.

Example

```
{
"name" : "foo",
"version" : "1.2.3",
"description" : "A package for fooing things",
"main" : "foo.js",
"keywords" : ["foo", "fool", "foolish"],
"author" : "John Doe",
```

"licence" : "ISC"
}

Managing Dependencies

npm can manage dependencies.

npm can (in one command line) install all the dependencies of a project.

Dependencies are also defined in package.json.

Sharing Your Software

If you want to share your own software in the npm registry, you can sign in at:

https://www.npmjs.com

Publishing a Package

You can publish any directory from your computer as long as the directory has a package.json file.

Check if npm is installed:

C:\>npm

Check if you are logged in:

C:\>npm whoami

If not, log in:

C:\>npm login
Username: <your username>
Password: <your password>

Navigate to your project and publish your project:

C:\Users\myuser>cd myproject
C:\Users\myuser\myproject>npm publish

****

What is GitHub?

GitHub is a code hosting platform for collaboration and version control.

GitHub lets you (and others) work together on projects.

GitHub essentials are:

- Repositories
- Branches
- Commits
- Pull Requests
- Git (the version control software GitHub is built on)

Example

$ git push origin heroku
$ cd /etc/
$ ls

Repository

A GitHub repository can be used to store a development project.

It can contain folders and any type of **files** (HTML, CSS, JavaScript, Documents, Data, Images).

A GitHub repository should also include a **licence** file and a **README** file about the project.

A GitHub repository can also be used to store ideas, or any resources that you want to share.

Branch

A GitHub branch is used to work with different **versions** of a repository at the same time.

By default a repository has a **master** branch (a production branch).

Any other branch is a **copy** of the master branch (as it was at a point in time).

New Branches are for bug fixes and feature work separate from the master branch. When changes are ready, they can be merged into the master branch. If you make changes to the master branch while working on a new branch, these updates can be pulled in.

Commits

At GitHub, changes are called commits.

Each commit (change) has a description explaining why a change was made.

Pull Requests

Pull Requests are the heart of GitHub **collaboration**.

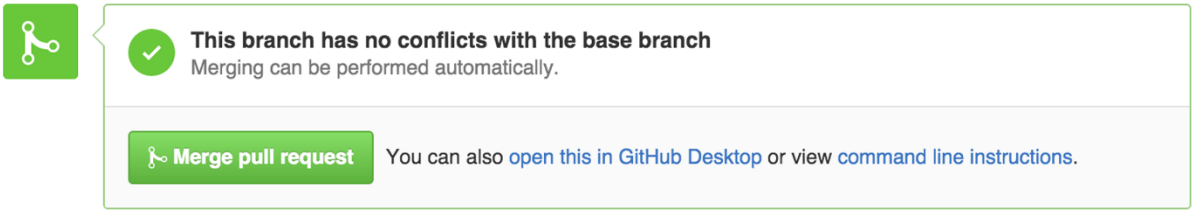
With a pull request you are **proposing** that your changes should be **merged** (pulled in) with the master.

Pull requests show content **differences**, changes, additions, and subtractions in **colors** (green and red).

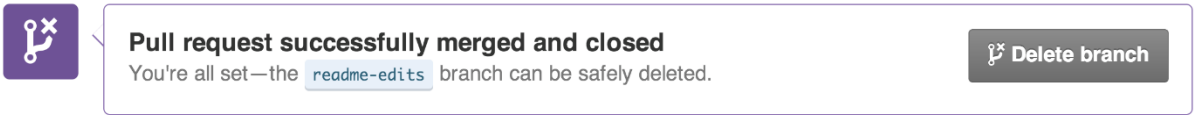
As soon as you have a commit, you can open a pull request and start a discussion, even before the code is finished.

A a great way to learn GitHub, before working on larger projects, is to open pull requests in your own repository and merge them yourself.

You merge any changes into the master by clicking a "Merge pull request" button.



After merging you can delete the branch by clicking a "Delete branch button".



****

What is jQuery?

jQuery is a JavaScript library.

jQuery greatly simplifies JavaScript programming.

jQuery is easy to learn.

jQuery Hide and Show

With jQuery, you can hide and show HTML elements with the hide() and show() methods:

Example

```
$("#hide").click(function(){
  $("p").hide();
});

$("#show").click(function(){
  $("p").show();
});
```

jQuery Sliding

With jQuery you can create sliding effects on HTML elements:

- slideDown()
- slideUp()
- slideToggle()

Example

```
$("#flip").click(function(){
  $("#panel").slideDown();
});
```

jQuery Animation

Example

```
$("button").click(function(){
  $("div").animate({
    left: '250px',
    height: '+=150px',
    width: '+=150px'
```

```
  });
});
```

jQuery Manipulating CSS

Example

```
$("button").click(function(){
  $("h1, h2, p").toggleClass("blue");
});
```

****

What is AngularJS?

AngularJS lets you **extend** HTML with HTML attributes called **directives**

AngularJS directives offers **functionality** to HTML applications

AngularJS provides **built-in** directives and **user defined** directives

AngularJS Directives

AngularJS uses double braces {{ }} as place holders for data.

AngularJS directives are HTML attributes with the prefix ng-

The ng-app directive initializes an AngularJS application.

The ng-init directive initializes application data.

Example

```
<div ng-app="" ng-init="message='Hello AngularJS!'">
  <h1>{{ message }}</h1>
</div>
```

The ng-model Directive

The ng-model directive binds the value of HTML elements to application data.

Example

```
<div ng-app="" ng-init="firstName='John'">

<p>Name: <input type="text" ng-model="firstName"></p>
<p>You wrote: <b>{{firstName}}</b></p>

</div>
```

The ng-bind Directive

The ng-bind directive binds data to a model.

Example

```
<div ng-app="" ng-init="firstName='John'">

<p>Name: <input type="text" ng-model="firstName"></p>
<p>You wrote <b ng-bind="firstName"></b></p>

</div>
```

****

What is React?

React is a JavaScript library created by Facebook

React is a User Interface (UI) library

React is a tool for building UI components

React Quickstart Tutorial

This is a quickstart tutorial.

Before you start, you should have a basic understanding of:

- What is HTML
- What is CSS
- What is DOM
- What is ES6
- What is Node.js
- What is npm

Adding React to an HTML Page

This quickstart tutorial will add React to a page like this:

Example

```
<!DOCTYPE html>
<html lang="en">
<title>Test React</title>

<!-- Load React API -->
<script src= "https://unpkg.com/react@16/umd/react.production.min.js"></script>
<!-- Load React DOM-->
<script src= "https://unpkg.com/react-dom@16/umd/react-
dom.production.min.js"></script>
<!-- Load Babel Compiler -->
<script src="https://unpkg.com/babel-standalone@6.15.0/babel.min.js"></script>

<body>

<script type="text/babel">
   //  JSX Babel code goes here
</script>
```

</body>
</html>

What is Babel?

Babel is a JavaScript compiler that can translate markup or programming languages into JavaScript.

With Babel, you can use the newest features of JavaScript (ES6 - ECMAScript 2015).

Babel is available for different conversions. React uses Babel to convert JSX into JavaScript.

Please note that <script type="text/babel"> is needed for using Babel.

What is JSX?

JSX stands for JavaScript XML.

JSX is an XML/HTML like extension to JavaScript.

Example

```
const element = <h1>Hello World!</h1>
```

As you can see above, JSX is not JavaScript nor HTML.

JSX is a XML syntax extension to JavaScript that also comes with the full power of ES6 (ECMAScript 2015).

Just like HTML, JSX tags can have a tag names, attributes, and children. If an attribute is wrapped in curly braces, the value is a JavaScript expression.

Note that JSX does not use quotes around the HTML text string.

React DOM Render

The method ReactDom.render() is used to render (display) HTML elements:

Example

```
<div id="id01">Hello World!</div>

<script type="text/babel">
ReactDOM.render(
   <h1>Hello React!</h1>,
   document.getElementById('id01'));
</script>
```

JSX Expressions

Expressions can be used in JSX by wrapping them in curly {} braces.

Example

```
<div id="id01">Hello World!</div>

<script type="text/babel">
const name = 'John Doe';
ReactDOM.render(
   <h1>Hello {name}!</h1>,
   document.getElementById('id01'));
</script>
```

React Elements

React applications are usually built around a single HTML element.

React developers often call this the root node (root element):

```
<div id="root"></div>
```

React elements look like this:

```
const element = <h1>Hello React!</h1>
```

Elements are rendered (displayed) with the ReactDOM.render() method:

ReactDOM.render(element, document.getElementById('root'));

React elements are immutable. They cannot be changed.

The only way to change a React element is to render a new element every time:

Example

```
function tick() {
   const element = (<h1>{new Date().toLocaleTimeString()}</h1>);
   ReactDOM.render(element, document.getElementById('root'));
}
setInterval(tick, 1000);
```

React Components

React components are JavaScript functions.

This example creates a React **component** named "Welcome":

Example

```
function Welcome() {
   return <h1>Hello React!</h1>;
}
ReactDOM.render(<Welcome />, document.getElementById('root'));
```

React can also use ES6 classes to create components.

This example creates a React component named Welcome with a render **method**:

Example

```
class Welcome extends React.Component {
   render() { return(<h1>Hello React!</h1>); }
}
ReactDOM.render(<Welcome />, document.getElementById('root'));
```

React Component Properties

This example creates a React **component** named "Welcome" with property arguments:

Example

```
function Welcome(props) {
  return <h1>Hello {props.name}!</h1>;
}
ReactDOM.render(<Welcome name="John Doe"/>,
document.getElementById('root'));
```

React can also use ES6 classes to create components.

This example also creates a React component named "Welcome" with property arguments:

Example

```
class Welcome extends React.Component {
  render() { return(<h1>Hello {this.props.name}</h1>); }
}
ReactDOM.render(<Welcome name="John Doe"/>,
document.getElementById('root'));
```

JSX Compiler

The examples on this page compiles JSX in the browser.

For production code, the compilation should be done separately.

Create React Application

Facebook has created a Create React Application with everything you need to build a React app.

It is a a development server that uses Webpack to compile React, JSX, and ES6, auto-prefix CSS files.

The Create React App uses ESLint to test and warn about mistakes in the code.

To create a Create React App run the following code on your terminal:

Example

npx create-react-app react-tutorial

Make sure you have Node.js 5.2 or higher. Otherwise you must install npx:

Example

npm i npx

Start one folder up from where you want your application to stay:

Example

C:\Users\myUser>npx create-react-app react-tutorial

Success Result:

npx: installed 63 in 10.359s
Creating a new React app in C:\Users\myUser\react-tutorial.
Installing packages. This might take a couple of minutes.
Installing react, react-dom, and react-scripts...
+ react-dom@16.5.2
+ react@16.5.2
+ react-scripts@2.0.4
added 1732 packages from 664 contributors and audited 31900 packages in 355.501s
found 0 vulnerabilities+ react@16.5.2

Success! Created react-tutorial at C:\Users\myUser\react-tutorial
Inside that directory, you can run several commands:

npm start
Starts the development server.

npm run build

Bundles the app into static files for production.

npm test
Starts the test runner.

npm run eject
Removes this tool and copies build dependencies, configuration files
and scripts into the app directory. If you do this, you can't go back!

We suggest that you begin by typing:

cd react-tutorial
npm start

****

What is Vue.js?

Vue.js lets you extend HTML with HTML attributes called directives

Vue.js directives offers functionality to HTML applications

Vue.js provides built-in directives and user defined directives

Vue.js Directives

Vue.js uses double braces {{ }} as place-holders for data.

Vue.js directives are HTML attributes with the prefix v-

Vue Example

In the example below, a new Vue object is created with new Vue().

The property el: binds the new Vue object to the HTML element with **id="app"**.

Example

```
<div id="app">
<h1>{{ message }}</h1>
</div>

<script>

var myObject = new Vue({
   el: '#app',
   data: {message: 'Hello Vue!'}
})

</script>
```

Vue.js Binding

When a Vue object is bound to an HTML element, the HTML element will change when the Vue object changes:

Example

```
<div id="app">
{{ message }}
</div>

<script>

var myObject = new Vue({
   el: '#app',
   data: {message: 'Hello Vue!'}
})

function myFunction() {
   myObject.message = "John Doe";
}
```

</script>

Vue.js Two-Way Binding

The v-model directive binds the value of HTML elements to application data.

This is called two-way binding:

Example

```
<div id="app">
  <p>{{ message }}</p>
  <p><input v-model="message"></p>
</div>


<script>

var myObject = new Vue({
    el: '#app',
    data: {message: 'Hello Vue!'}
})

</script>
```

Vue.js Loop Binding

Using the v-for directive to bind an array of Vue objects to an "array" of HTML element:

Example

```
<div id="app">
 <ul>
   <li v-for="x in todos">
   {{ x.text }}
   </li>
  </ul>
</div>
```

```
<script>

myObject = new Vue({
   el: '#app',
   data: {
   todos: [
      { text: 'Learn JavaScript' },
      { text: 'Learn Vue.js' },
      { text: 'Build Something Awesome' }
      ]
   }
})
</script>
```

****

What is Full Stack?

Full Stack Web Developer

A full stack web developer is a person who can develop both client and server software.

In addition to mastering HTML and CSS, he/she also knows how to:

- Program a browser (like using JavaScript, jQuery, Angular, or Vue)
- Program a server (like using PHP, ASP, Python, or Node)
- Program a database (like using SQL, SQLite, or MongoDB)

Client Software
(Front End)

- HTML

- CSS
- Bootstrap
- W3.CSS
- JavaScript
- ES5
- HTML DOM
- JSON
- XML
- jQuery
- Angular
- React
- Backbone.js
- Ember.js
- Redux
- Storybook
- GraphQL
- Meteor.js
- Grunt
- Gulp

Server Software (Back End)

- PHP
- ASP
- C++
- C#
- Java
- Python
- Node.js
- Express.js
- Ruby
- REST
- GO
- SQL
- MongoDB
- Firebase.com
- Sass

- Less
- Parse.com
- PaaS (Azure and Heroku)

Popular Stacks

- LAMP stack: JavaScript - Linux - Apache - MySQL - PHP
- LEMP stack: JavaScript - Linux - Nginx - MySQL - PHP
- MEAN stack: JavaScript - MongoDB - Express - AngularJS - Node.js
- Django stack: JavaScript - Python - Django - MySQL
- Ruby on Rails: JavaScript - Ruby - SQLite - Rails

Advantages

The advantage of being a full stack web developer is:

- You can master all the techniques involved in a development project
- You can make a prototype very rapidly
- You can provide help to all the team members
- You can reduce the cost of the project
- You can reduce the time used for team communication
- You can switch between front and back end development based on requirements
- You can better understand all aspects of new and upcoming technologies

Disadvantages

- The solution chosen can be wrong for the project
- The solution chosen can be dependent on developer skills
- The solution can generate a key person risk

- Being a full stack developer is increasingly complex

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What is SQL?

SQL stands for Structured Query Language

SQL is a standard language for accessing databases

SQL has been an international standard (ISO) since 1987

SQL Statements

To access a database, you use SQL statements.

The following SQL statement selects all records in a database table called "Customers":

Example

```
SELECT * FROM Customers;
```

Database Tables

A database most often contains one or more tables.

Each table is identified by a name like "Customers" or "Orders".

Below is a selection from a "Customers" table:

ID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

The table above contains five records (one for each customer) and seven columns:

1. CustomerID (ID)
2. CustomerName
3. ContactName
4. Address
5. City
6. PostalCode
7. Country

The Most Important SQL Statements:

- **SELECT** - extracts data from a database
- **UPDATE** - updates data in a database
- **DELETE** - deletes data from a database
- **INSERT INTO** - inserts new data into a database
- **CREATE DATABASE** - creates a new database
- **ALTER DATABASE** - modifies a database
- **CREATE TABLE** - creates a new table
- **ALTER TABLE** - modifies a table
- **DROP TABLE** - deletes a table
- **CREATE INDEX** - creates an index (search key)
- **DROP INDEX** - deletes an index

SQL keywords are NOT case sensitive: select is the same as SELECT

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