Unit 10: Web-Based Application Development

- Internet Basics,
- Introduction to Web Development,
- Node.js and Git,
- HTML, CSS, JQuery,
- JavaScript and HTTP (forms),
- Sessions and HTTP,
- Javascript & Document Object Model – DOM,
- Extensible Markup Language – XML,
- Document Type Definition - DTD Dreamweaver,
- PHP HyperText PreProcessor - PHP SQL & MySQL,
- Integrating PHP and MySQL,Database Interaction

➢ Web Development

- Web development refers to the creating, building, and maintaining of websites. It includes aspects such as web design, web publishing, web programming, and database management. It is the creation of an application that works over the internet i.e. websites.
- The word Web Development is made up of two words, that is
- Web: It refers to websites, web pages or anything that works over the internet.
- Development: It refers to building the application from scratch

- **People who create websites and web applications for a living, are called Front-End Developers.**

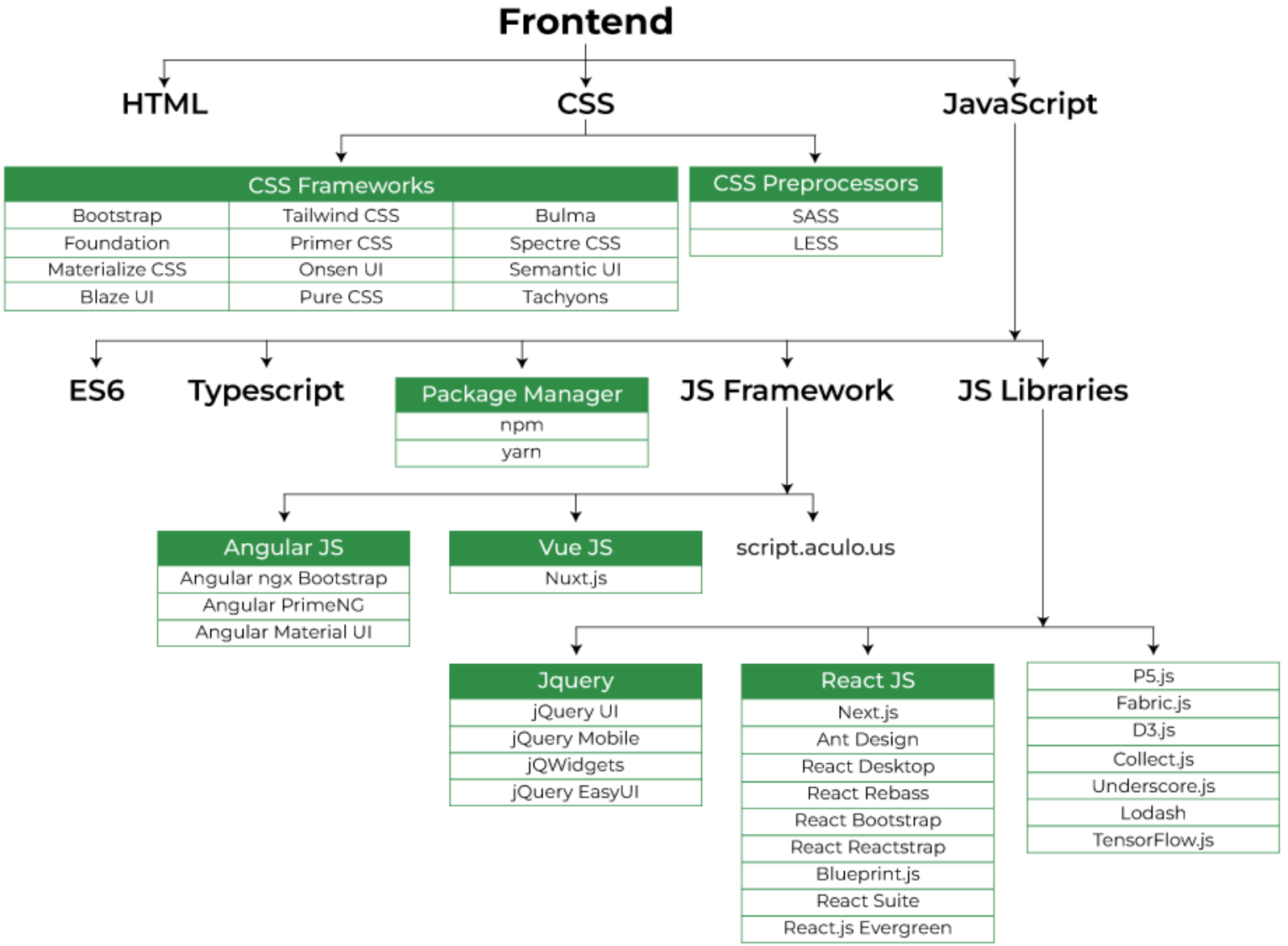
- **Many Front-End Developers also have basic knowledge of different CSS and JavaScript frameworks and libraries, like Bootstrap, SASS (CSS pre-processor), jQuery and React,and the popular version control system, Git.**

- **Front-end development refers to the client-side (how a web page looks).**

- **Back-end development refers to the server-side (how a web page works).**

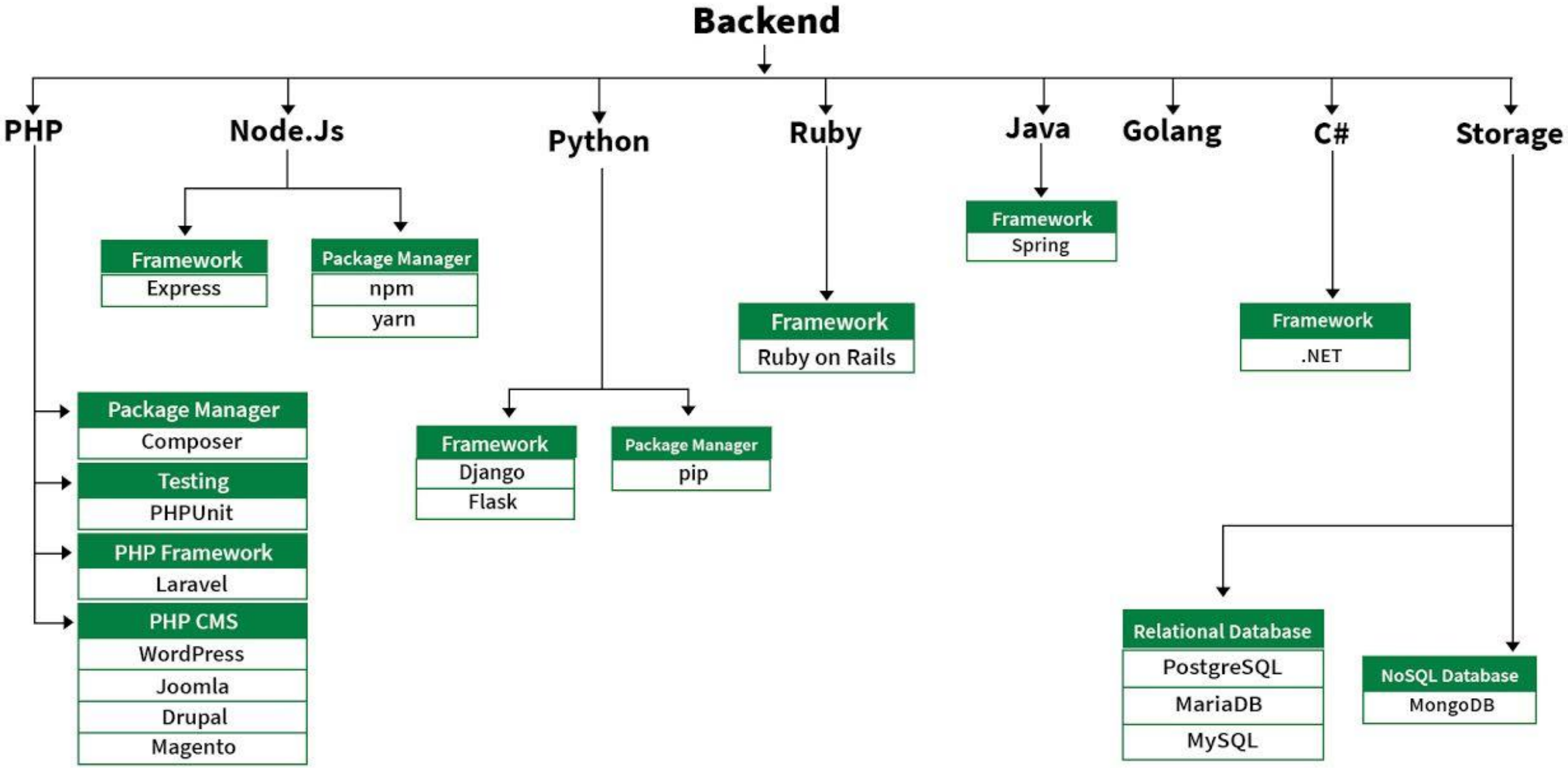
- **Front-end code is used to create static websites, where the purpose is to display the web page.**

- **However, if you want to make your website dynamic (manage files and databases, add contact forms, control user-access, etc.), you need to learn a back-end programming language, like PHP or Python, and use SQL to communicate with databases**



Popular Frontend Technologies

- HTML: HTML stands for HyperText Markup Language. It is used to design the front end portion of web pages using markup language. It acts as a skeleton for a website since it is used to make the structure of a website.
- CSS: Cascading Style Sheets fondly referred to as CSS is a simply designed language intended to simplify the process of making web pages presentable. It is used to style our website.
- JavaScript: JavaScript is a scripting language used to provide a dynamic behavior to our website.
- Bootstrap: Bootstrap is a free and open-source tool collection for creating responsive websites and web applications. It is the most popular CSS framework for developing responsive, mobile-first websites. Nowadays, the websites are perfect for all browsers (IE, Firefox, and Chrome) and for all sizes of screens (Desktop, Tablets, Phablets, and Phones).
  - Bootstrap 4
  - Bootstrap 5



Popular Backend Technologies

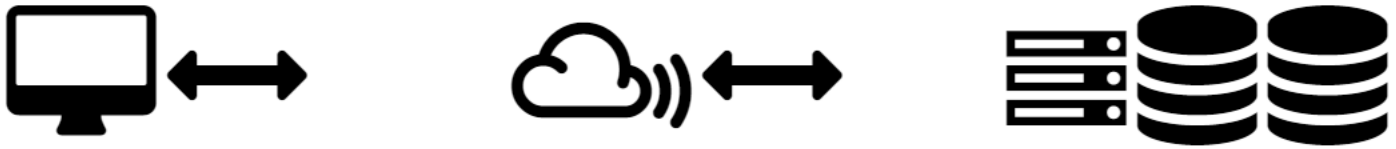
- PHP: PHP is a server-side scripting language designed specifically for web development.
- Java: Java is one of the most popular and widely used programming languages. It is highly scalable.
- Python: Python is a programming language that lets you work quickly and integrate systems more efficiently.
- Node.js: Node.js is an open source and cross-platform runtime environment for executing JavaScript code outside a browser.

What is HTTP?

- ✓ HTTP stands for Hyper Text Transfer Protocol
- ✓ 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:

- ✓ **A client (a browser) sends an HTTP request to the web**
- ✓ **A web server receives the request**
- ✓ **The server runs an application to process the request**
- ✓ **The server returns an HTTP response (output) to the browser**
- ✓ **The client (the browser) receives the response**

The HTTP Request Circle

A typical HTTP request / response circle:

- ✓ **The browser requests an HTML page. The server returns an HTML file.**
- ✓ **The browser requests a style sheet. The server returns a CSS file.**
- ✓ **The browser requests an JPG image. The server returns a JPG file.**
- ✓ **The browser requests JavaScript code. The server returns a JS file**
- ✓ **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.

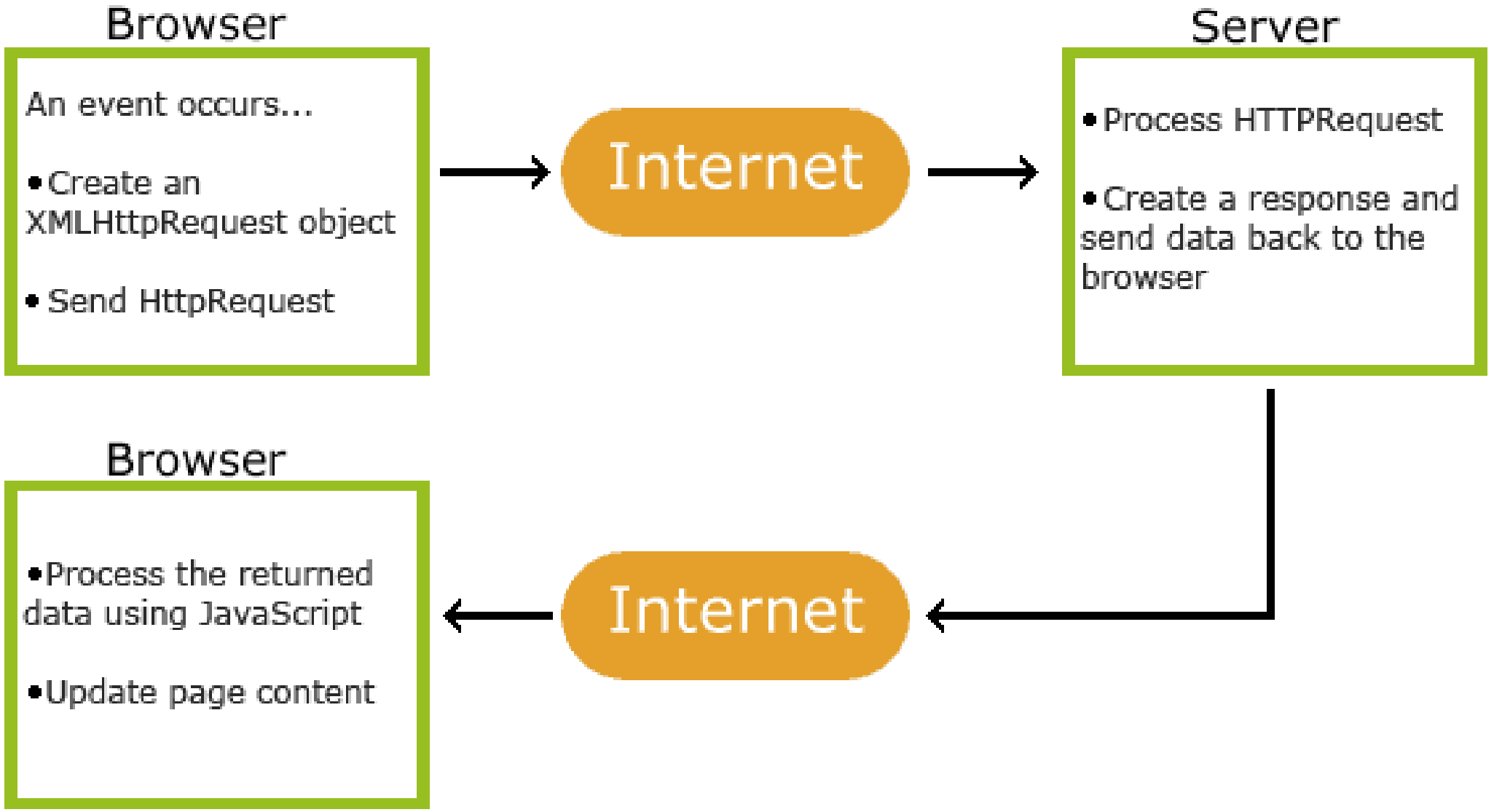
XHR is often used to request and receive data for the purpose of modifying a web page.

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.

XHR - XML Http Request

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**
- ✓ **Receive 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:**



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 Elements

A Simple HTML Document

```
<!DOCTYPE html>
<html lang="en">

<meta charset="utf-8">
<title>Page Title</title>

<body>
   <h1>This is a Heading</h1>
   <p>This is a paragraph.</p>
   <p>This is another paragraph.</p>
</body>

</html>
```

HTML Elements

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

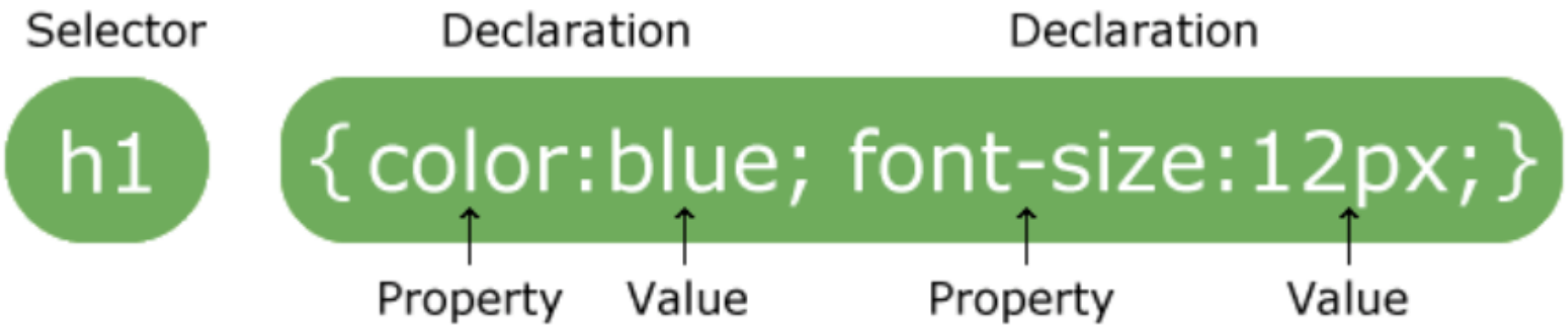
CSS stands for **C**ascading **S**tyle **S**heets

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>
```

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



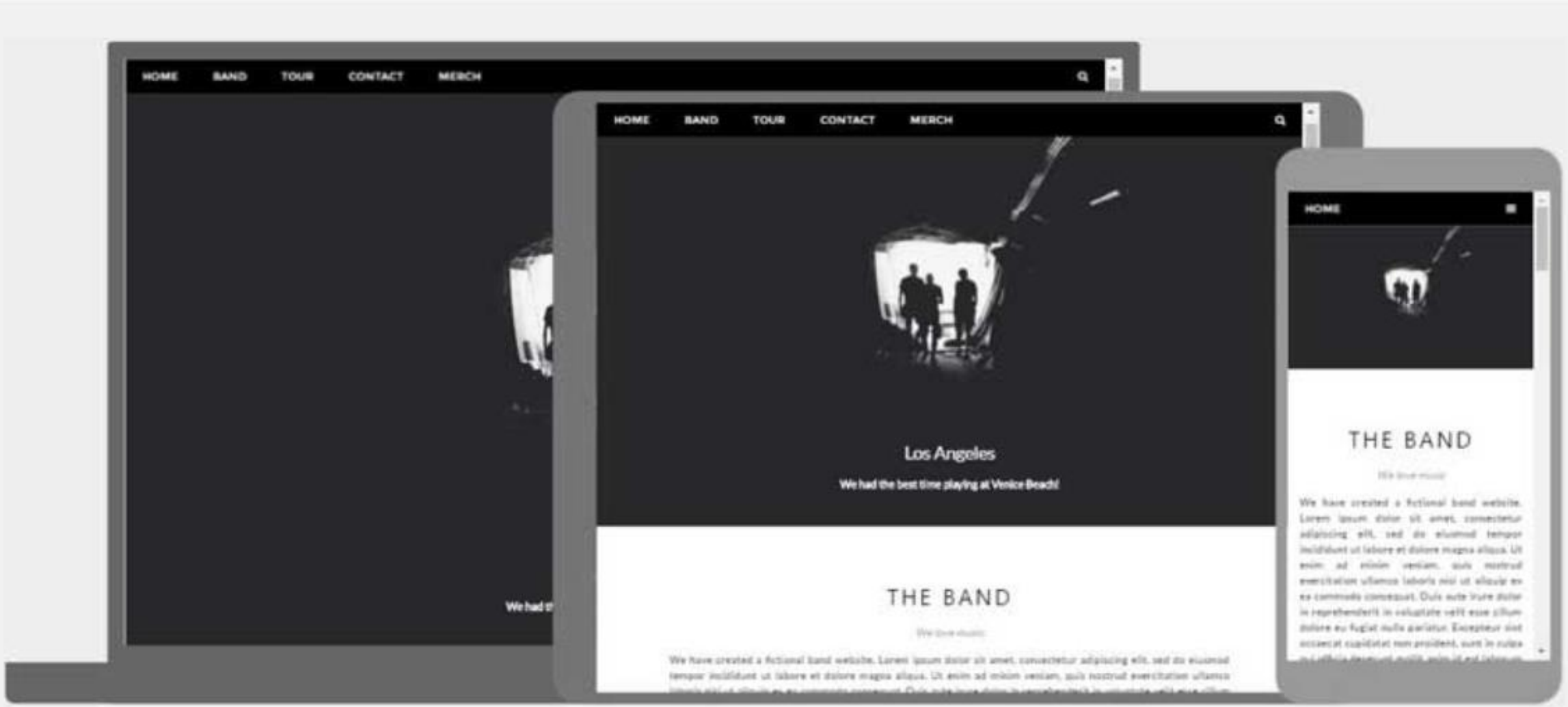
The selector points to the HTML element to style (h1).

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.

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**

Left

Main Content

Right

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**

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 variables can be:

- Numbers
- Strings
- Objects
- Arrays
- Functions

What can JavaScript Do?

This section contains some examples of what JavaScript can do:

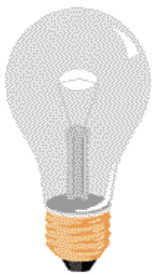
- ✓ **JavaScript Can Change HTML Content**
- ✓ **JavaScript Can Change HTML Attribute Values**
- ✓ **JavaScript Can Change HTML Styles (CSS)**
- ✓ **JavaScript Can Hide HTML Elements**
- ✓ **JavaScript Can Show HTML Elements**

```html
<!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>
```

What Can JavaScript Do?

JavaScript can change HTML attribute values.

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



Turn on the light Turn off the light

ES5 is a shortcut for **ECMAScript 5**

ECMAScript 5 is also known as **JavaScript 5**

ECMAScript 5 is also known as **ECMAScript 2009**

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

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

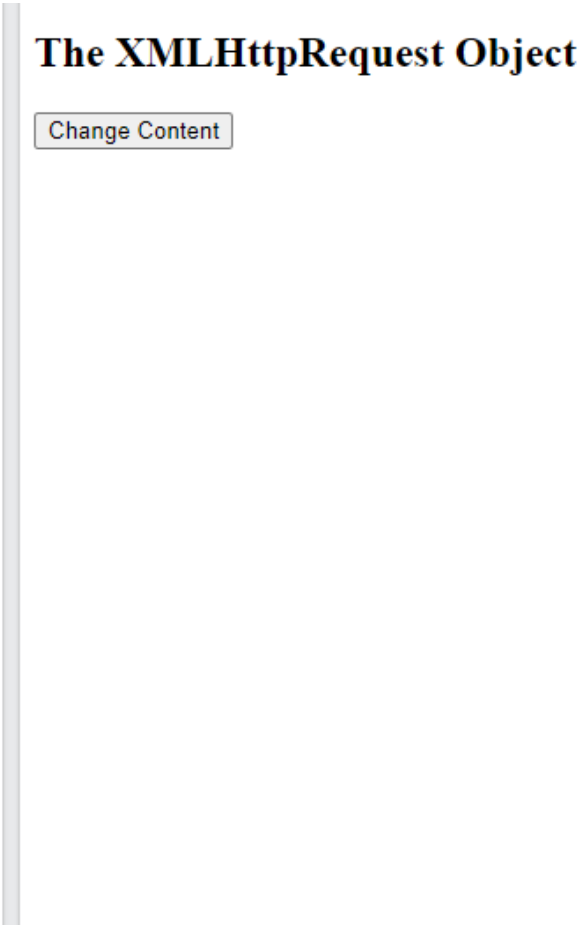
- Read data from a web server - after a web page has loaded
- Update a web page without reloading the page
- Send data to a web server - in the background

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

<div id="demo">
<h2>The XMLHttpRequest Object</h2>
<button type="button" onclick="loadDoc()">Change Content</button>
</div>

<script>
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();
}
</script>

</body>
</html>
```



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  };
  xhttp.open("GET", "ajax_info.txt", true);
  xhttp.send();
}
</script>

</body>
</html>
```

AJAX

AJAX is not a programming language.

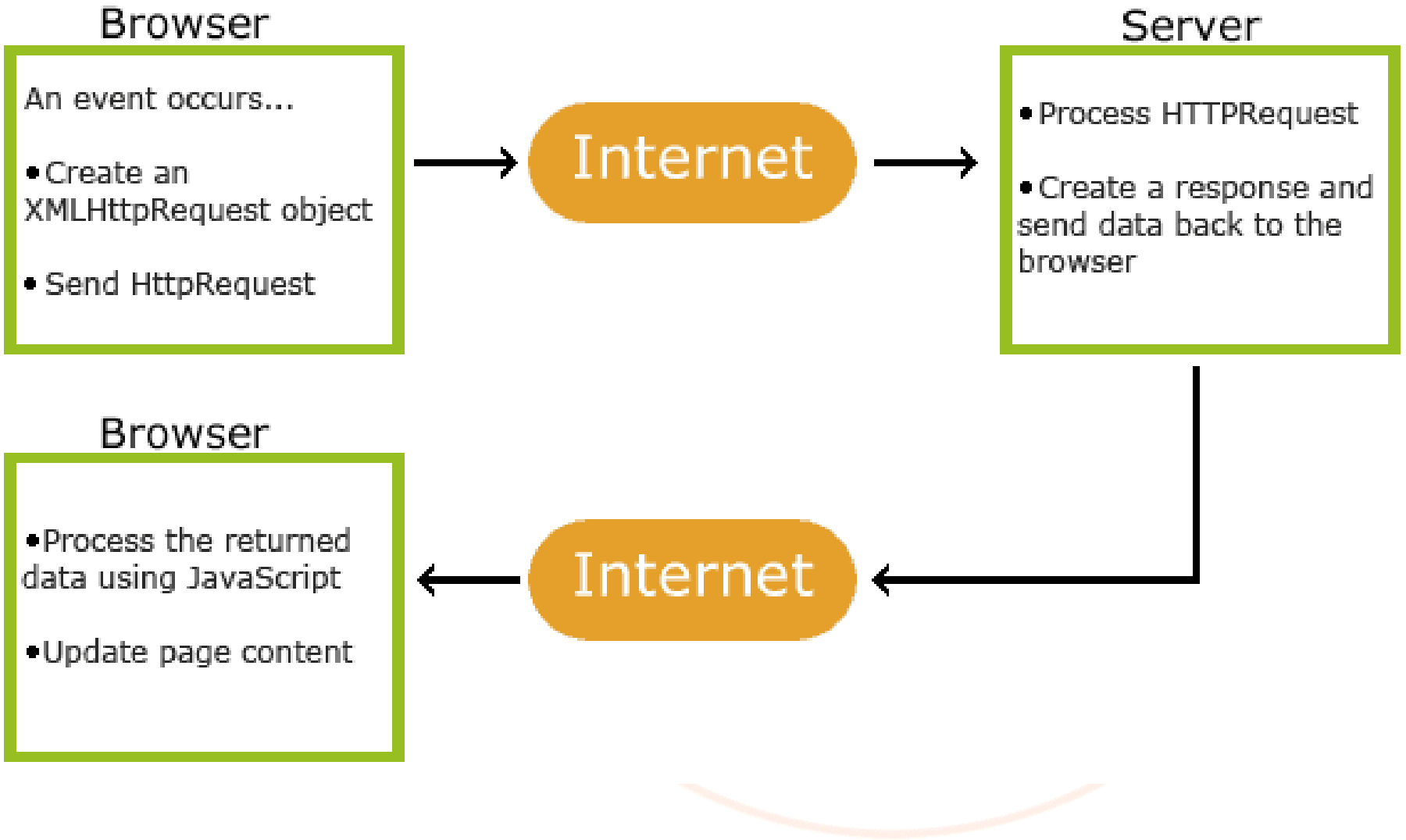
AJAX is a technique for accessing web servers from a web page.

AJAX stands for Asynchronous JavaScript And XML.

What is AJAX?

- ✓ AJAX = Asynchronous JavaScript And XML.
- ✓ 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.



Security on the web

- ✓ **Transport Layer Security (TLS), Secure Sockets Layer (SSL) and HTTPS authentication: Utilizing SSL helps to authenticate and encrypt links between networked computers. Once you have an SSL certificate for your ecommerce site, you can move from HTTP to HTTPS, which serves as a trust signal to customers that your site is secure.**

- ✓ **Multi-factor authentication (MFA), 2-factor authentication (2FA), or 2-step verification(2SV):**

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

JSON

JSON stands for **J**ava**S**cript **O**bject **N**otation

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

What is JSON?

- ✓ JSON stands for JavaScript Object Notation
- ✓ JSON is a lightweight data-interchange format
- ✓ JSON is plain text written in JavaScript object notation
- ✓ JSON is used to send data between computers
- ✓ JSON is language independent

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.

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

Bootstrap 5 is the newest version of Bootstrap

Bootstrap Quickstart

jQuery is a JavaScript library.

jQuery greatly simplifies JavaScript programming.

jQuery is easy to learn.

```html
<!DOCTYPE html>
<html>
<head>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
<script>
$(document).ready(function(){
  $("#hide").click(function(){
    $("p").hide();
  });
  $("#show").click(function(){
    $("p").show();
  });
});
</script>
</head>

<body>
<h2>jQuery Hide and Show</h2>
<p>If you click on the "Hide" button, I will disappear.</p>
<p>Then, please click the "Show" button.</p>

<button id="hide">Hide</button>
<button id="show">Show</button>

</body>
</html>
```

jQuery Hide and Show

If you click on the "Hide" button, I will disappear.

Then, please click the "Show" button.

Hide Show

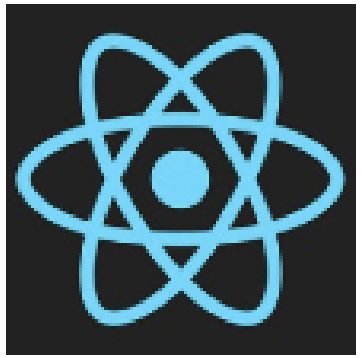
AngularJS lets you **extend** HTML with HTML attributes called **directives**

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.



React is a **JavaScript** library created by **Facebook**

React is a **User Interface** (UI) library

React is a tool for building **UI components**

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

NodeJS is an open-source, cross-platform, back-end JavaScript runtime environment that enables developers to run JavaScript code outside of a web browser. It was created by Ryan Dahl in 2009 and is based on the V8 JavaScript engine used in the Google Chrome web browser.

With Node.js, developers can build scalable network applications and server-side applications using JavaScript, which is a popular and widely used programming language. NodeJS is event-driven and supports non-blocking I/O, which means that it is highly efficient and can handle a large number of simultaneous connections without blocking the execution of other tasks.