AJAX

IF3110 – Web-based Application Development
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What is AJAX

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

AJAX is not a programming language

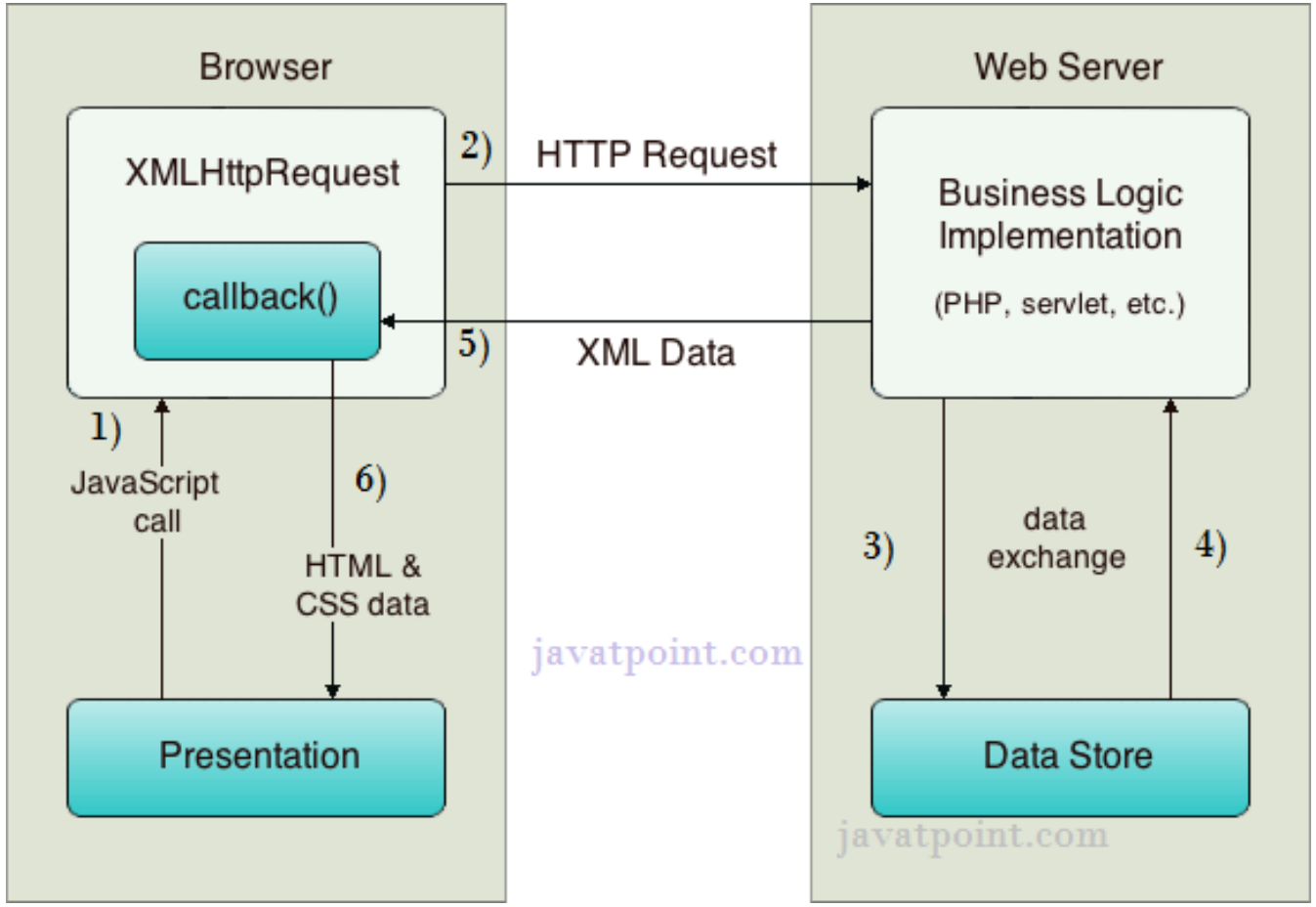
AJAX just uses a combination of:

- 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 developer's dream

- 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

AJAX Interaction

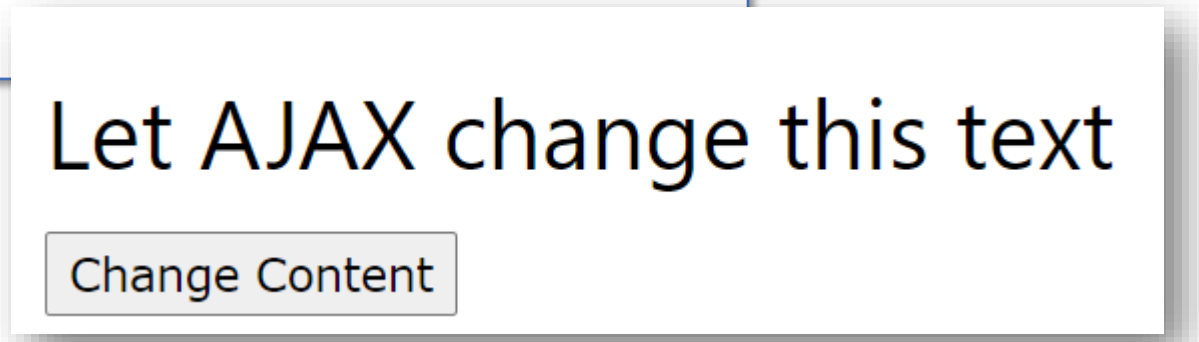


AJAX Example

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

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

</body>
</html>
```



AJAX Example

```
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();
}
```

ajax_info.txt

```
<h1>AJAX</h1>
<p>AJAX is not a programming language.</p>
<p>AJAX is a technique for accessing web servers from a web page.</p>
<p>AJAX stands for Asynchronous JavaScript And XML.</p>
```

The XMLHttpRequest Object

- All modern browsers support the **XMLHttpRequest** object.
- The **XMLHttpRequest** object can be used to exchange data with a server behind the scenes. This means that it is possible to update parts of a web page, without reloading the whole page

- Modern browser can use **Fetch API** in a simpler way

Access Across Domains

- For security reasons, modern browsers do not allow access across domains (same-origin policy)
- This means that both the web page and the XML file it tries to load, must be located on the same origin (same domain & scheme & port)
- Exception to this rule can be specified by CORS mechanism of the different origin:
  - Access-Control-Allow-Origin: https://example.com

XMLHttpRequest Object Methods

Method	Description
`new XMLHttpRequest()`	Creates a new XMLHttpRequest object
`abort()`	Cancels the current request
`getAllResponseHeaders()`	Returns header information
`getResponseHeader()`	Returns specific header information
`open(`*`method,url,async,user,psw`*`)`	Specifies the request *method*: the request type GET or POST *url*: the file location *async*: true (asynchronous) or false (synchronous) *user*: optional user name *psw*: optional password
`send()`	Sends the request to the server Used for GET requests
`send(`*`string`*`)`	Sends the request to the server. Used for POST requests
`setRequestHeader()`	Adds a label/value pair to the header to be sent

XMLHttpRequest Object Properties

Property	Description
`onreadystatechange`	Defines a function to be called when the readyState property changes
`readyState`	Holds the status of the XMLHttpRequest. 0: request not initialized 1: server connection established 2: request received 3: processing request 4: request finished and response is ready
`responseText`	Returns the response data as a string
`responseXML`	Returns the response data as XML data
`status`	Returns the status-number of a request 200: "OK" 403: "Forbidden" 404: "Not Found"
`statusText`	Returns the status-text (e.g. "OK" or "Not Found")

GET or POST?

- **GET** is simpler and faster than **POST**, and can be used in most cases.
- However, always use **POST** requests when:
  - A cached file is not an option (update a file or database on the server).
  - Sending a large amount of data to the server (**POST** has no size limitations).
  - Sending user input (which can contain unknown characters), **POST** is more robust and secure than **GET**.

Sending information with GET/POST

```
xhttp.open("GET", "demo_get2.asp?fname=Henry&lname=Ford", true);
xhttp.send();
```

```
xhttp.open("POST", "demo_post2.asp", true);
xhttp.setRequestHeader("Content-type", "application/x-www-form-urlencoded");
xhttp.send("fname=Henry&lname=Ford");
```

The onreadystatechange Property

- With the **XMLHttpRequest** object you can define a function to be executed when the request receives an answer.
- The function is defined in the **onreadystatechange** property of the **XMLHttpResponse** object:

```
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();
```

Synchronous Request

- To execute a synchronous request, change the third parameter in the **open()** method to **false**.
- Sometimes async = false are used for quick testing.
- Since the code will wait for server completion, there is no need for an **onreadystatechange** function

```
xhttp.open("GET", "ajax_info.txt", false);
xhttp.send();
document.getElementById("demo").innerHTML = xhttp.responseText;
```

- Synchronous **XMLHttpRequest** (async = false) is **not recommended** because the JavaScript will stop executing until the server response is ready

The responseXML Property

- The **XMLHttpRequest** object has an in-built XML parser.
- The **responseXML** property returns the server response as an XML DOM object.

```
xmlDoc = xhttp.responseXML;
txt = "";
x = xmlDoc.getElementsByTagName("ARTIST");
for (i = 0; i < x.length; i++) {
  txt += x[i].childNodes[0].nodeValue + "<br>";
  }
document.getElementById("demo").innerHTML = txt;
xhttp.open("GET", "cd_catalog.xml", true);
xhttp.send();
```

The responseXML Property …

```
function loadDoc() {
  var xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
      myFunction(this);
    }
  };
  xhttp.open("GET", "
  xhttp.send();
}
```

```
function myFunction(xml) {
  var i;
  var xmlDoc = xml.responseXML;
  var table="<tr><th>Title</th><th>Artist</th></tr>";
  var x = xmlDoc.getElementsByTagName("CD");
  for (i = 0; i <x.length; i++) {
    table += "<tr><td>" +
    x[i].getElementsByTagName("TITLE")[0].childNodes[0].nodeValue +
    "</td><td>" +
    x[i].getElementsByTagName("ARTIST")[0].childNodes[0].nodeValue +
    "</td></tr>";
  }
  document.getElementById("demo").innerHTML = table;
}
```

The getAllResponseHeaders() Method

The **getAllResponseHeaders()** method returns all header information from the server response

```
var xhttp = new XMLHttpRequest();
xhttp.onreadystatechange = function() {
  if (this.readyState == 4 && this.status == 200) {
    document.getElementById("demo").innerHTML =
    this.getAllResponseHeaders();
  }
};
```

Example

A simple AJAX example

- https://www.w3schools.com/xml/tryit.asp?filename=tryajax_first

An AJAX example with a callback function

- https://www.w3schools.com/xml/tryit.asp?filename=tryajax_callback

The getResponseHeader() Method

The **getResponseHeader()** method returns specific header information from the server response

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

The Fetch API

```
async function getData() {
  const url = "https://example.org/products.json";
  try {
    const response = await fetch(url);
    if (!response.ok) {
      throw new Error(`Response status: ${response.status}`);
    }

    const json = await response.json();
    console.log(json);
  } catch (error) {
    console.error(error.message);
  }
}
```

The Fetch API provides an interface for fetching resources (including across the network). It is a more powerful and flexible replacement for XMLHttpRequest.

The fetch() method takes one mandatory argument, the path to the resource you want to fetch. It returns a Promise that resolves to the Response to that request

WEB Platform APIs

The XMLHttpRequest and the Fetch API are part of the Web platform API defined by the standards bodies WHATWG and W3C.

https://fetch.spec.whatwg.org/

https://developer.mozilla.org/en-US/docs/Web/API

They are not part of ECMAScript standard.

AJAX use case

- Autocomplete
- Voting and Rating
- Dynamically updating content
- Form Submission & Validation
- Chat Rooms And Instant Messaging
- Slicker UIs
- Widgets and adds
- JIT Help system
- Tooltips
- Accordion
- Tabbed pages

AJAX Pattern

- **Multi Stage Download**
  Large pages don't load all at once, but gradually
- **Periodic Refresh** (polling mechanism)
  AJAX periodically checks if new data is available on the server
- **Predictive Fetch**
  AJAX app guesses what the user is going to do next, and retrieves the appropriate data
- **Fallback Pattern**
  If an error occurs on the server, meaning a status of something other than 200 is returned, AJAX need to decide what to do
- **Submission Throttling**
  AJAX sends large data in several stages.