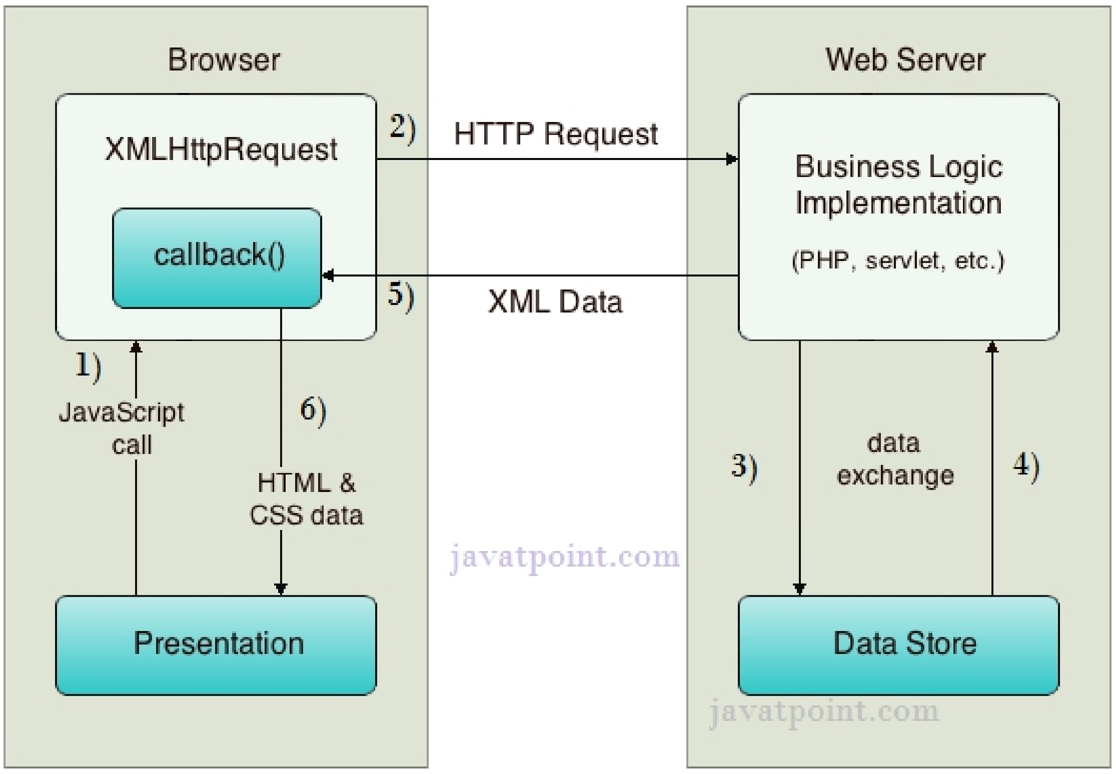
AJAX

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.
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

AJAX - The XMLHttpRequest Object

The keystone of AJAX is the XMLHttpRequest object.

The XMLHttpRequest Object

All modern browsers support the XMLHttpRequest object.
The XMLHttpRequest object can be used to exchange 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.

Create an XMLHttpRequest Object

All modern browsers (Chrome, Firefox, IE7+, Edge, Safari, Opera) have a built-in XMLHttpRequest object.

Syntax for creating an XMLHttpRequest object:

```
variable = new XMLHttpRequest();
```

Example

```
var xhttp = new XMLHttpRequest();
```

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

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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" For a complete list go to the Http Messages Reference
statusText	Returns the status-text (e.g. "OK" or "Not Found")

Send a Request To a Server

To send a request to a server, we use the open() and send() methods of the XMLHttpRequest object:
xhttp.open("GET", "ajax_info.txt", true);
xhttp.send();

Method	Description
open(method, url, async)	Specifies the type of request method: the type of request: GET or POST url: the server (file) location async: true (asynchronous) or false (synchronous)

send()	Sends the request to the server (used for GET)
send(string)	Sends the request to the server (used for POST)

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.

GET Requests
A simple GET request:
Example

```
xhttp.open("GET", "demo_get.asp", true);
xhttp.send();
```

POST Requests

A simple POST request:
Example

```
xhttp.open("POST", "demo_post.asp", true);
xhttp.send();
```

Asynchronous - True or False?

Server requests should be sent asynchronously.
The async parameter of the open() method should be set to true:

```
xhttp.open("GET", "ajax_test.asp", true);
```

By sending asynchronously, the JavaScript does not have to wait for the server response, but can instead:
execute other scripts while waiting for server response
deal with the response after the response is ready

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 XMLHttpRequest object:
Example

```
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:

```
xhttp.open("GET", "ajax_info.txt", false);
```

Sometimes async = false are used for quick testing. You will also find synchronous requests in older JavaScript code.

Since the code will wait for server completion, there is no need for an onreadystatechange function:

Example

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

AJAX - Server Response

The onreadystatechange Property

The readyState property holds the status of the XMLHttpRequest.

The onreadystatechange property defines a function to be executed when the readyState changes.

The status property and the statusText property holds the status of the XMLHttpRequest object.

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
status	200: "OK" 403: "Forbidden" 404: "Page not found" For a complete list go to the Http Messages Reference
statusText	Returns the status-text (e.g. "OK" or "Not Found")

The onreadystatechange function is called every time the readyState changes.

When readyState is 4 and status is 200, the response is ready:

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();
}
```

The onreadystatechange event is triggered four times (1-4), one time for each change in the readyState.

XML file:

AJAX can be used for interactive communication with an XML file.

AJAX XML Example
The following example will demonstrate how a web page can fetch information from an XML file with

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Example Explained
When a user clicks on the "Get CD info" button above, the loadDoc() function is executed.
The loadDoc() function creates an XMLHttpRequest object, adds the function to be executed when the server response is ready, and sends the request off to the server.
When the server response is ready, an HTML table is built, nodes (elements) are extracted from the XML file, and it finally updates the element "demo" with the HTML table filled with XML data:

```
function loadDoc() {
  var xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
    myFunction(this);
    }
  };
  xhttp.open("GET", "cd_catalog.xml", true);
  xhttp.send();
}
function myFunction(xml) {
  var i;
  var xmlDoc = xml.responseXML;
  var table="<tr><th>Artist</th><th>Title</th></tr>";
  var x = xmlDoc.getElementsByTagName("CD");
  for (i = 0; i <x.length; i++) {
    table += "<tr><td>" +
    x[i].getElementsByTagName("ARTIST")[0].childNodes[0].nodeValue +
    "</td><td>" +
    x[i].getElementsByTagName("TITLE")[0].childNodes[0].nodeValue +
    "</td></tr>";
  }
  document.getElementById("demo").innerHTML = table;
}
```

The XML File
The XML file used in the example above looks like this: "cd_catalog.xml".

PHP

AJAX is used to create more interactive applications.

AJAX PHP Example
The following example demonstrates how a web page can communicate with a web server while a user types characters in an input field:

Example Explained
In the example above, when a user types a character in the input field, a function called showHint() is executed.
The function is triggered by the onkeyup event.
Here is the HTML code:
Example

```
<html>
<body>

<p><b>Start typing a name in the input field below:</b></p>

<p>Suggestions: <span id="txtHint"></span></p>

<form>
First name: <input type="text" onkeyup="showHint(this.value)">
</form>

<script>
function showHint(str) {
  if (str.length == 0) {
    document.getElementById("txtHint").innerHTML = "";
    return;
   } else {
     var xmlhttp = new XMLHttpRequest();
     xmlhttp.onreadystatechange = function() {
      if (this.readyState == 4 && this.status == 200) {
        document.getElementById("txtHint").innerHTML = this.responseText;
        }
    };
     xmlhttp.open("GET", "gethint.php?q=" + str, true);
     xmlhttp.send();
  }
}
</script>

</body>
</html>
```

Code explanation:
First, check if the input field is empty (str.length == 0). If it is, clear the content of the txtHint placeholder and exit the function.
However, if the input field is not empty, do the following:
Create an XMLHttpRequest object
Create the function to be executed when the server response is ready

Send the request off to a PHP file (gethint.php) on the server
Notice that q parameter is added gethint.php?q="+str
The str variable holds the content of the input field

The PHP File - "gethint.php"
The PHP file checks an array of names, and returns the corresponding name(s) to the browser:

```
<?php
// Array with names
$a[] = "Anna";
$a[] = "Brittany";
$a[] = "Cinderella";
$a[] = "Diana";
$a[] = "Eva";
$a[] = "Fiona";
$a[] = "Gunda";
$a[] = "Hege";
$a[] = "Inga";
$a[] = "Johanna";
$a[] = "Kitty";
$a[] = "Linda";
$a[] = "Nina";
$a[] = "Ophelia";
$a[] = "Petunia";
$a[] = "Amanda";
$a[] = "Raquel";
$a[] = "Cindy";
$a[] = "Doris";
$a[] = "Eve";
$a[] = "Evita";
$a[] = "Sunniva";
$a[] = "Tove";
$a[] = "Unni";
$a[] = "Violet";
$a[] = "Liza";
$a[] = "Elizabeth";
$a[] = "Ellen";
$a[] = "Wenche";
$a[] = "Vicky";

// get the q parameter from URL
$q = $_REQUEST["q"];

$hint = "";

// lookup all hints from array if $q is different from ""
if ($q !== "") {
  $q = strtolower($q);
   $len=strlen($q);
  foreach($a as $name) {
     if (stristr($q, substr($name, 0, $len))) {
      if ($hint === "") {
        $hint = $name;
       } else {
         $hint .= ", $name";
      }
    }
  }
}

// Output "no suggestion" if no hint was found or output correct values
echo $hint === "" ? "no suggestion" : $hint;
?>
```

ASP

AJAX is used to create more interactive applications.

AJAX ASP Example
The following example will demonstrate how a web page can communicate with a web server while a user type characters in an input field:

Example Explained
In the example above, when a user types a character in the input field, a function called showHint() is executed.
The function is triggered by the onkeyup event.
Here is the HTML code:
Example

```
<html>
<head>
<script>
function showHint(str) {
   if (str.length == 0) {
    document.getElementById("txtHint").innerHTML = "";
    return;
  } else {
     var xmlhttp = new XMLHttpRequest();
     xmlhttp.onreadystatechange = function() {
       if (this.readyState == 4 && this.status == 200) {
        document.getElementById("txtHint").innerHTML = this.responseText;
       }
    };
     xmlhttp.open("GET", "gethint.asp?q=" + str, true);
    xmlhttp.send();
  }
}
</script>
</head>
<body>

<p><b>Start typing a name in the input field below:</b></p>
<form>
First name: <input type="text" onkeyup="showHint(this.value)">
</form>
<p>Suggestions: <span id="txtHint"></span></p>
</body>
</html>
```

Code explanation:
First, check if the input field is empty (str.length == 0). If it is, clear the content of the txtHint placeholder and exit the function.
However, if the input field is not empty, do the following:
Create an XMLHttpRequest object
Create the function to be executed when the server response is ready
Send the request off to an ASP file (gethint.asp) on the server
Notice that q parameter is added gethint.asp?q="+str
The str variable holds the content of the input field

The ASP File - "gethint.asp"
The ASP file checks an array of names, and returns the corresponding name(s) to the browser:

```
<%
response.expires=-1
dim a(30)
'Fill up array with names
a(1)="Anna"
a(2)="Brittany"
a(3)="Cinderella"
a(4)="Diana"
a(5)="Eva"
a(6)="Fiona"
a(7)="Gunda"
a(8)="Hege"
a(9)="Inga"
a(10)="Johanna"
a(11)="Kitty"
a(12)="Linda"
a(13)="Nina"
a(14)="Ophelia"
a(15)="Petunia"
a(16)="Amanda"
a(17)="Raquel"
a(18)="Cindy"
a(19)="Doris"
a(20)="Eve"
a(21)="Evita"
a(22)="Sunniva"
a(23)="Tove"
a(24)="Unni"
a(25)="Violet"
a(26)="Liza"
a(27)="Elizabeth"
a(28)="Ellen"
a(29)="Wenche"
a(30)="Vicky"

'get the q parameter from URL
q=ucase(request.querystring("q"))

'lookup all hints from array if length of q>0
if len(q)>0 then
  hint=""
  for i=1 to 30
    if q=ucase(mid(a(i),1,len(q))) then
      if hint="" then
```

```
        hint=a(i)
      else
        hint=hint & " , " & a(i)
      end if
    end if
  next
end if

'Output "no suggestion" if no hint were found
'or output the correct values
if hint="" then
  response.write("no suggestion")
else
  response.write(hint)
end if
%>
```

DATABASE:

AJAX can be used for interactive communication with a database.

AJAX Database Example
The following example will demonstrate how a web page can fetch information from a database with AJAX:
Example Explained - The showCustomer() Function
When a user selects a customer in the dropdown list above, a function called showCustomer() is executed. The function is triggered by the onchange event:
showCustomer

```
function showCustomer(str) {
  var xhttp;
  if (str == "") {
    document.getElementById("txtHint").innerHTML = "";
    return;
  }
  xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
    document.getElementById("txtHint").innerHTML = this.responseText;
    }
  };
  xhttp.open("GET", "getcustomer.php?q="+str, true);
  xhttp.send();
}
```

The showCustomer() function does the following:
Check if a customer is selected
Create an XMLHttpRequest object
Create the function to be executed when the server response is ready
Send the request off to a file on the server
Notice that a parameter (q) is added to the URL (with the content of the dropdown list)

The AJAX Server Page

The page on the server called by the JavaScript above is a PHP file called "getcustomer.php".
The source code in "getcustomer.php" runs a query against a database, and returns the result in an HTML table:

```
<?php
$mysqli = new mysqli("servername", "username", "password", "dbname");
if($mysqli->connect_error) {
  exit('Could not connect');
}

$sql = "SELECT customerid, companyname, contactname, address, city, postalcode, country
FROM customers WHERE customerid = ?";

$stmt = $mysqli->prepare($sql);
$stmt->bind_param("s", $_GET['q']);
$stmt->execute();
$stmt->store_result();
$stmt->bind_result($cid, $cname, $name, $adr, $city, $pcode, $country);
$stmt->fetch();
$stmt->close();

echo "<table>";
echo "<tr>";
echo "<th>CustomerID</th>";
echo "<td>" . $cid . "</td>";
echo "<th>CompanyName</th>";
echo "<td>" . $cname . "</td>";
echo "<th>ContactName</th>";
echo "<td>" . $name . "</td>";
echo "<th>Address</th>";
echo "<td>" . $adr . "</td>";
echo "<th>City</th>";
echo "<td>" . $city . "</td>";
echo "<th>PostalCode</th>";
echo "<td>" . $pcode . "</td>";
echo "<th>Country</th>";
echo "<td>" . $country . "</td>";
echo "</tr>";
echo "</table>";
?>
```