AJAX

Internet Technology

ITECH

HYPE, MECHANICS, DEMOS

The Hype

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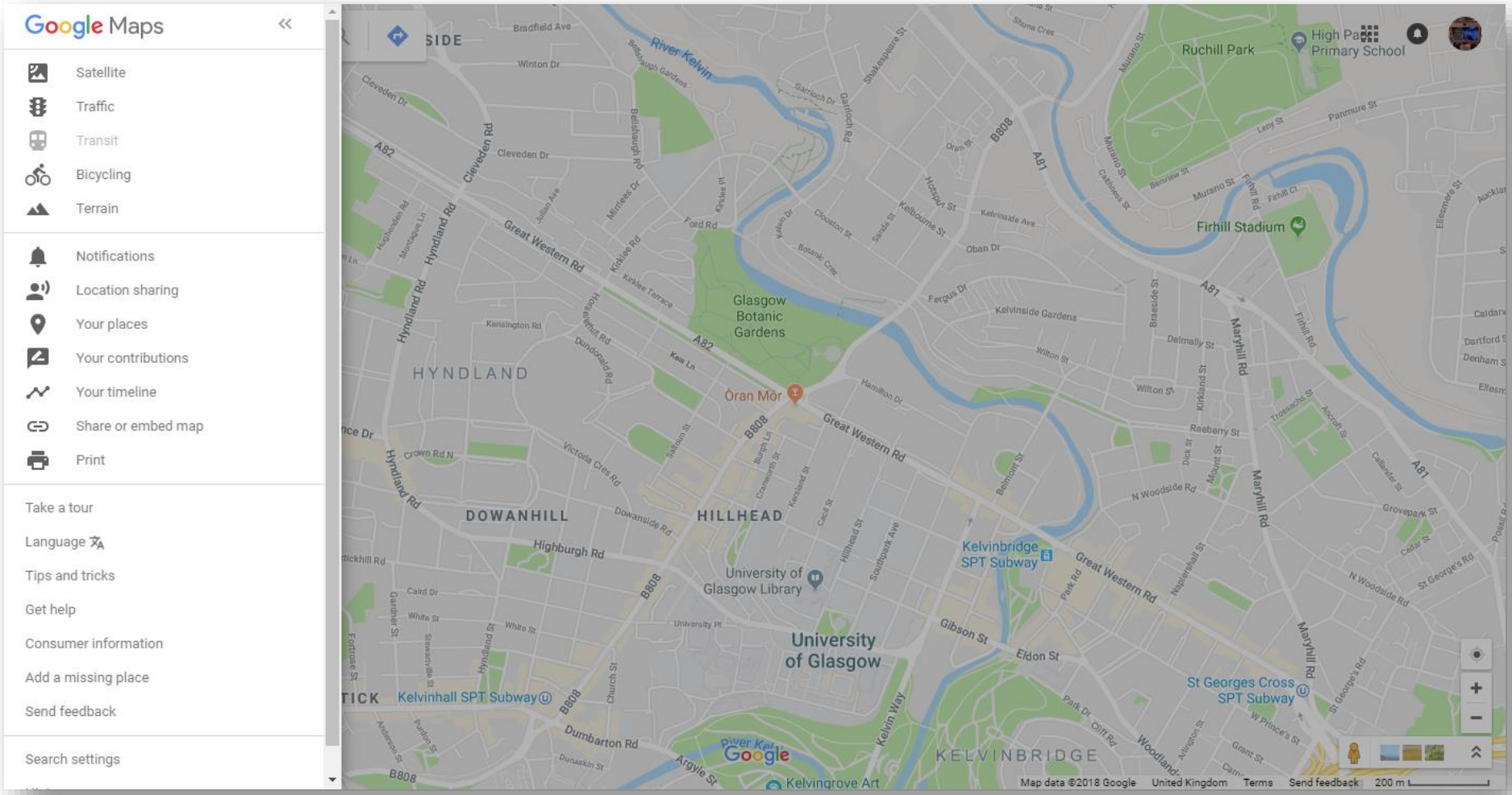
Ajax

- A key technology underlying web apps
  - **Asynchronous JavaScript** and **XML**

- Critically, all of the components have existed in some form since the late 1990's
  - An example of where browsers introducing non-standard features has been a positive thing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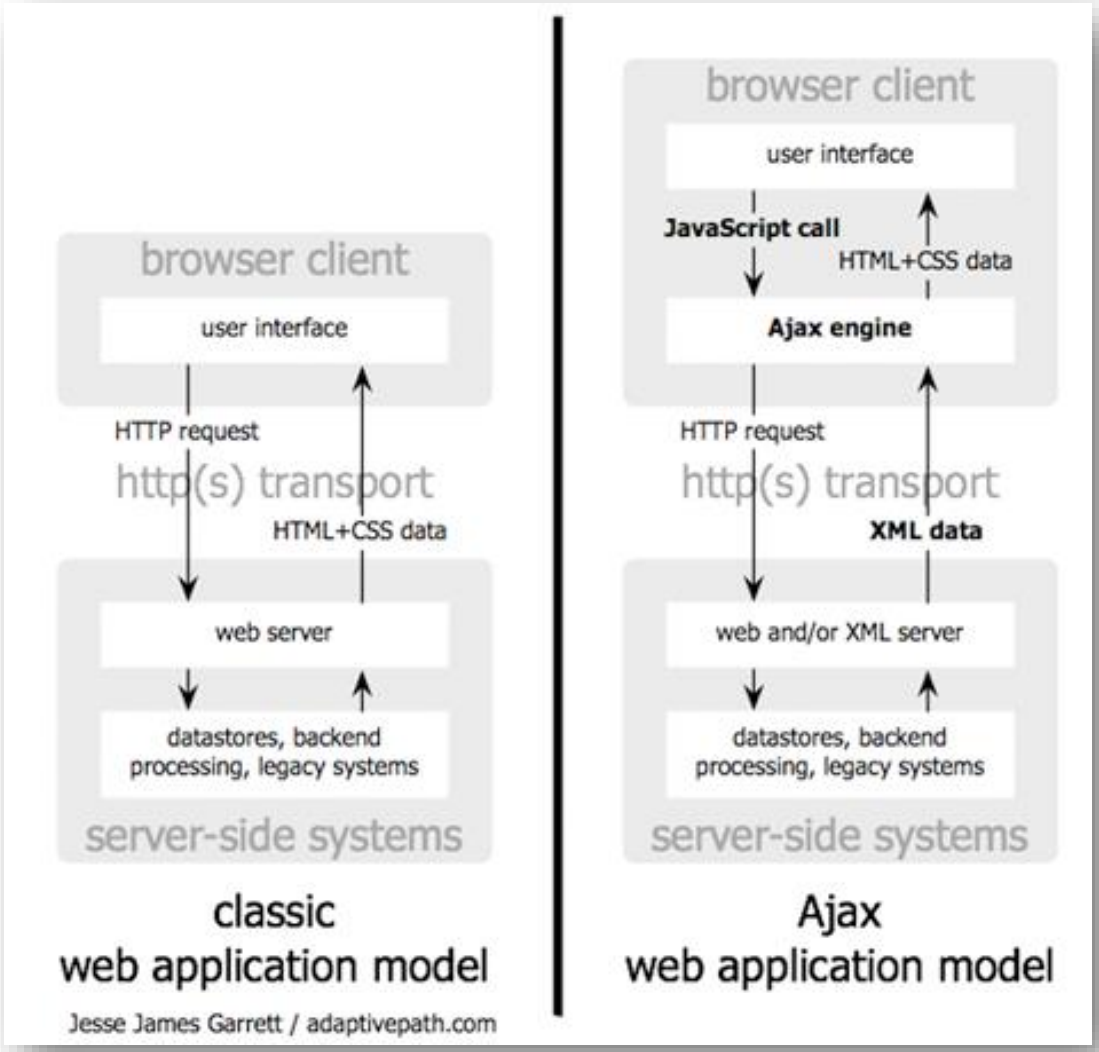
Ajax – Origins

- Jesse James Garret coined the term in his 2005 essay:
  - "*Ajax: A New Approach to Web Applications*"
  - http://adaptivepath.org/ideas/ajax-new-approach-web-applications/
- Generated an enormous amount of hype and energy in web development ever since

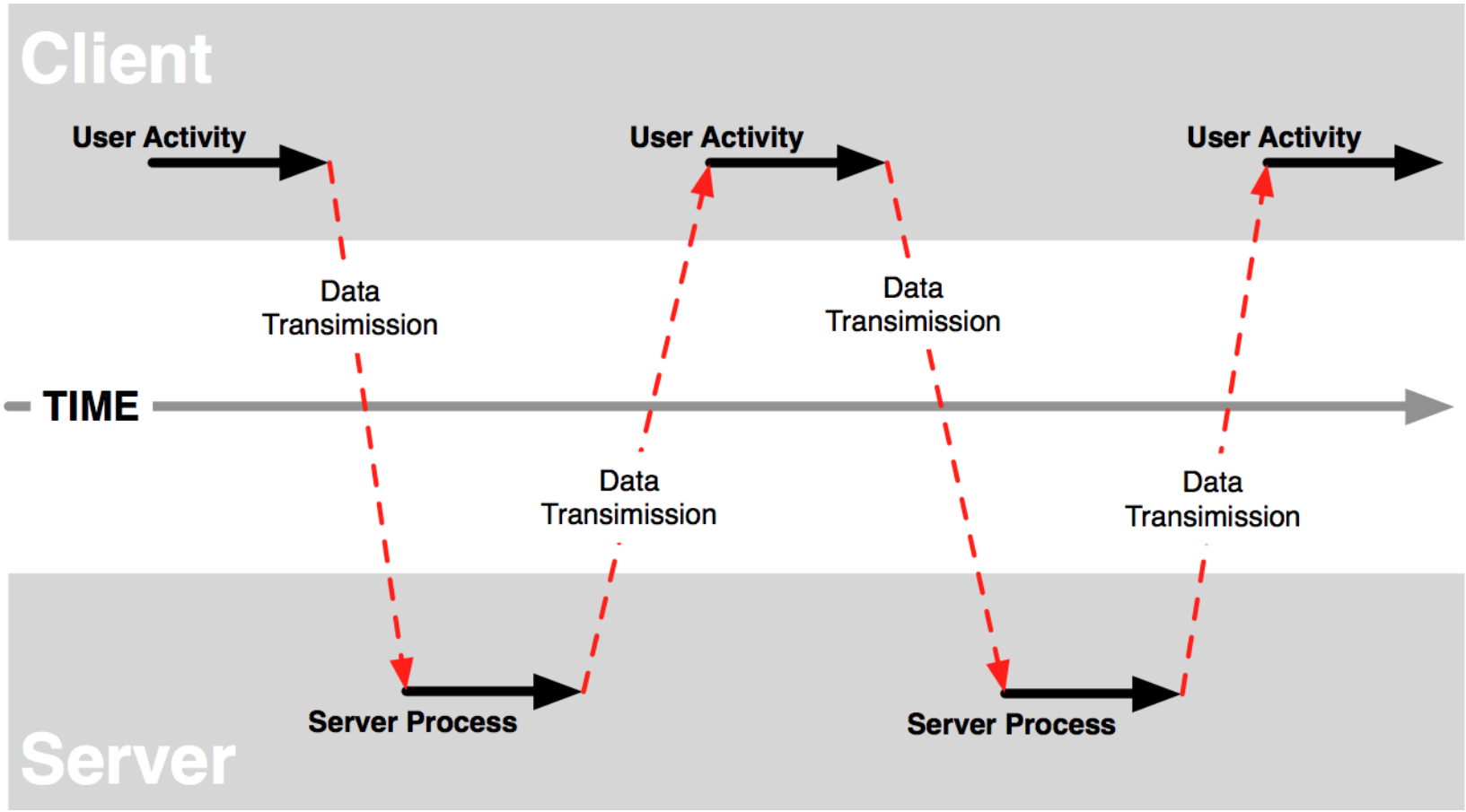
Ajax – Origins



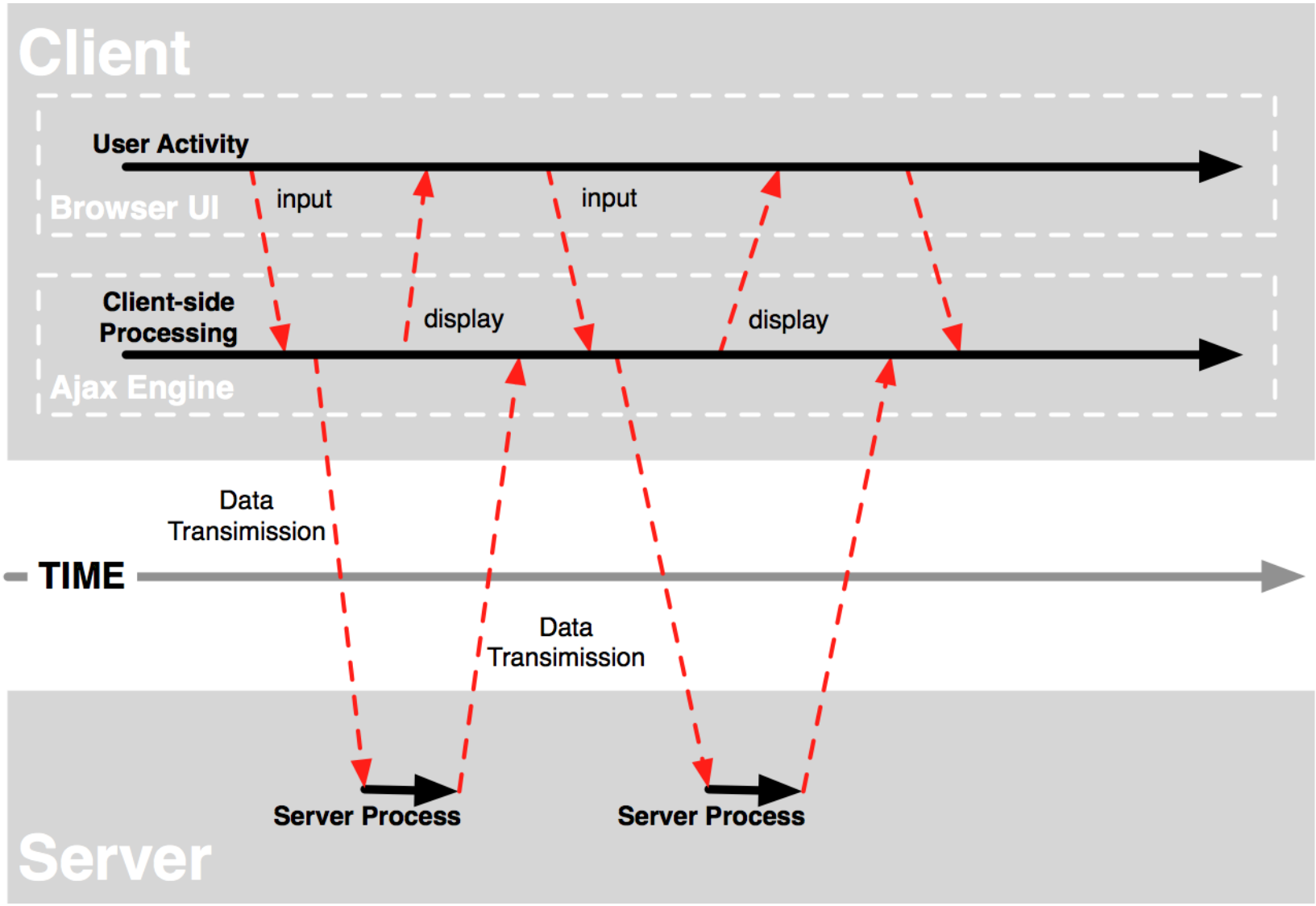
What does Ajax do?

- Ajax **eliminates the need to reload** a web page in order to get new content from the server
- This removes the **start-stop interaction** where a user has to wait for new pages to load.
- An intermediate layer (**Ajax Engine**) is introduced into the communication chain between client and server


The
Mechanics



Traditional Client/Server Synchronous Communication Model



AJAX Client/Server Asynchronous Communication Model

AJAX Components

- JavaScript can manipulate the DOM of a webpage to **create, modify and remove content and style**
- JavaScript event handlers can be attached to **events generated by the user** and browser
- XML can **model data** and we can access it using DOM
- So how does AJAX achieve asynchronous interaction and communication with the server?

XmlHttpRequest Object

- The keystone of AJAX
- Introduced by Microsoft in Internet Explorer 5
- The XHR is an object that is part of the DOM and is built into most modern browsers
- It can communicate with the server by sending HTTP requests (much like normal client/server communication)

XmlHttpRequestObject

- Independent of <form> or <a> elements for generating HTTP GET/POST requests
- It does not block script execution after sending an HTTP request
- As with **content** and **style**, JavaScript can now programmatically manage **HTTP communication**

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

https://adaptivepath.org/ideas/ajax-new-approach-web-applications/

XmlHttpRequest Properties

- **readyState** property
  - cycles through several states as it sends an HTTP request to the server, waits whilst the request is processed, and when it receives a response from the server (values 0-4)
- **onreadystatechange** property
  - accepts an EventListener value, specifying the method that the object will invoke whenever the readyState value changes
- **status** property
  - The status property represents the HTTP status code and is of type short (e.g. 200 = OK, 404 = Not Found)

XmlHttpRequest Properties

- **responseXML** property
  - represents the XML response data when the complete HTTP response has been received (when readyState is 4), and when the Content-Type header specifies the MIME (media) type as text/xml, application/xml, or ends in +xml
- **responseText** property
  - contains the text of the HTTP response received by the client
  - XML is not the only method to model data in Ajax applications. A popular alternative is JSON (JavaScript Object Notation)

responseXML

- Simple XML to model an address book entry

```
<Person>
    <firstName>John</firstName>
    <lastName>Smith</lastName>
    <age>25</age>
    <address>
        <streetAddress>21 2nd Street</streetAddress>
        <city>New York</city>
        <state>NY</state>
        <postalCode>10021</postalCode>
    </address>
    <phoneNumber type="home">212 555-1234</phoneNumber>
    <phoneNumber type="fax">646 555-4567</phoneNumber>
    <companyName />
</Person>
```

responseText (JSON)

- Same data as before, but uses fewer characters:

```
{
    "firstName": "John",
    "lastName": "Smith",
    "age": 25,
    "address": {                                        // address object
        "streetAddress": "21 2nd Street",
        "city": "New York",
        "state": "NY",
        "postalCode": "10021"
    },
    "phoneNumbers": [                                   // array of objects
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ],
    "companyName": null
}
```

XmlHttpRequest Methods

- **abort()**
  - Cancels the current request
- **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

XmlHttpRequest Methods (cont)

- **getAllResponseHeaders()**
  - Returns all header information of a resource such as length, server-type, content-type, last-modified
- **getResponseHeader()**
  - Returns specific header information such as “Last-Modified”
- **setRequestHeader()**
  - Adds a name/value pair to the header to be sent
  - Can be used with POST data to specify the type of data you want to send with the send() method

AJAX IN ACTION

AJAX Example – HTML header

```
<!DOCTYPE html>
<html>
  <head>
    <title>AJAX example</title>
        <script type="text/javascript">
            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>
    </head>
```

AJAX Example – HTML Body

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

- Contents of ajax-info.txt:

```
<h1>AJAX</h1>

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

Sending a Request

- 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();
```

- 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 a Request (cont)

- If you want to send information with the GET method, add the information to the URL

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

- A simple POST request:

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

- To POST data like an HTML form, add an HTTP header with setRequestHeader(). Specify the data you want to send in the send() method:

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

Responses from the server

- **responseText**: get the response data as a string

```
document.getElementById("demo").innerHTML = xhttp.responseText;
```

- **responseXML**: get the response data as XML data

```
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();
```

Callback functions

- A callback function is a function passed as a parameter to another function
- If you have more than one AJAX task in a website, you should create one function for executing the XMLHttpRequest object, and one callback function for each AJAX task
- The function call should contain the URL and what function to call when the response is ready

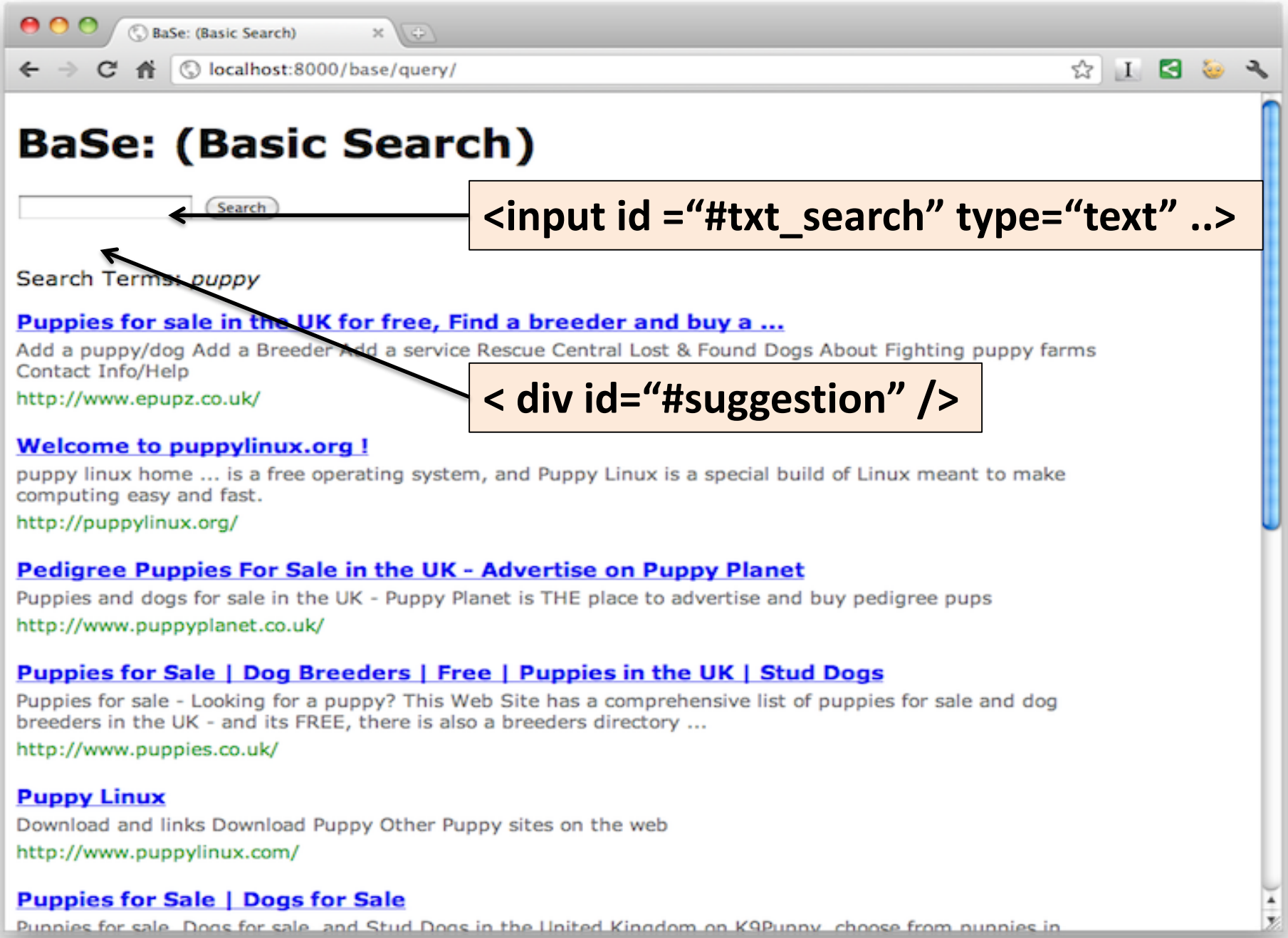
```
loadDoc("url-1", myFunction1);
loadDoc("url-2", myFunction2);

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

function myFunction1(xhttp) {
  // action goes here
}
function myFunction2(xhttp) {
  // action goes here
}
```

jQuery AJAX

- Simplifying AJAX in web applications

```
$.ajax({type: ”GET",
        url: ”greeting.php",
        data: ”name=" + name,
        success: function(message) {
          // do something
        }
});
```

SEARCH SUGGESTION EXAMPLE


BaSe: (Basic Search)
localhost:8000/base/query/
BaSe: (Basic Search)
Search
<input id =“#txt_search” type=“text” ..>
Search Terms: puppy
< div id=“#suggestion” />
Puppies for sale in the UK for free, Find a breeder and buy a ...
Add a puppy/dog Add a Breeder Add a service Rescue Central Lost & Found Dogs About Fighting puppy farms Contact Info/Help
http://www.epupz.co.uk/
Welcome to puppylinux.org !
puppy linux home ... is a free operating system, and Puppy Linux is a special build of Linux meant to make computing easy and fast.
http://puppylinux.org/
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Puppies and dogs for sale in the UK - Puppy Planet is THE place to advertise and buy pedigree pups
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Views.py

```
def suggest(request):
    """generate search suggestions"""
    # get suggestion so far from post
    search = request.POST['search']
    # search for pattern from list
    suggestion = ""
    suggestion_list = ["puppy dog", "cats hate
dogs", "raining cats and dogs"]
    for s in suggestion_list:
      if s.startswith(search):
        suggestion = s
    # return suggestion
    response = HttpResponse(suggestion)
    return response
```

Jquery Code

```
$(document).ready(function() {
     $("#txt_search").keyup(function() {
          var search = $("#txt_search").val();
          if (search.length > 0) {
               $.ajax({type: "POST",
                    url: "suggest/",
                    data: "search=" + search,
                    success: function(message) {
                      $("#suggest").empty();
                      if (message.length > 0) {
                        message = "Do you mean: " + message + "?";
                        $("#suggest").append(message);
                      }
                    }
            });
          } else {
            // Empty suggestion list
            $("#suggest").empty();
          }
        });
      });
```