

COMP 4021
Internet Computing

AJAX

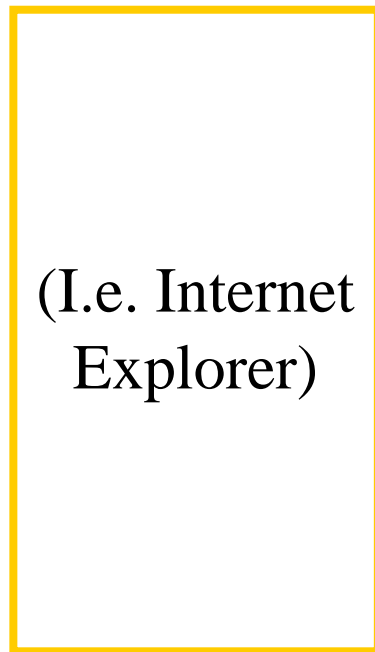
David Rossiter

‘Traditional’ Communication

- ❑ You already know that the most common way to give information to a server is by using a form
- ❑ In response to the form request, the server sends back a **complete web page** to the browser
- ❑ With this method, the transaction (request – respond) happens ‘once only’
- ❑ This is the ‘traditional’ style of “updating” a web page in **Web 1.0**

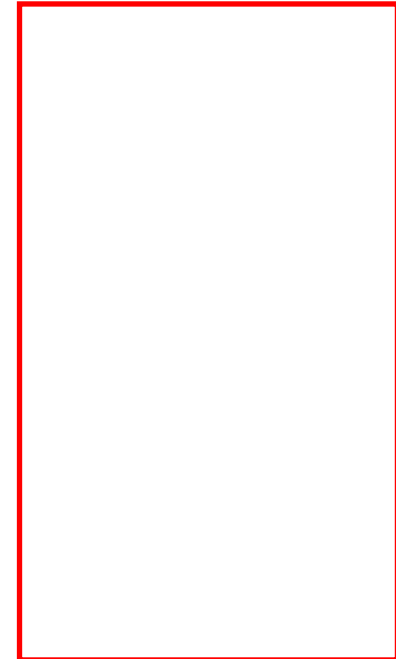
'Traditional' Operation

Client



(I.e. Internet Explorer)

Server



*1. Client sends request i.e.
GET index.html*



2. Server sends new web page



or maybe redirects the browser to a web page

3. New web page is shown in the browser

Updating an Entire Web Page

- ❑ To periodically update information on a web page automatically, you can do either of these:
 - Method 1: **Refresh** the web page (or go to another web page) using an html 'meta' tag
 - Method 2: Use **JavaScript** to tell the browser to reload the web page (or go to another web page)
- ❑ With both methods, even if only small parts of the page need to be updated, the whole thing must be updated

Method 1 – Using a Meta Tag

- ❑ The HTML **refresh** meta tag can be used to redirect a web page after a certain time interval

`<META http-equiv="refresh" content="<time>;URL=<url>" />`

- ❑ For example the following tag **redirects** the browser to the 303 main page 10 seconds after loading

`<META http-equiv="refresh"
content="10;URL=http://course.cse.ust.hk/comp303" />`

- ❑ If the URL field is empty the page will refresh itself after the specified time value, e.g.

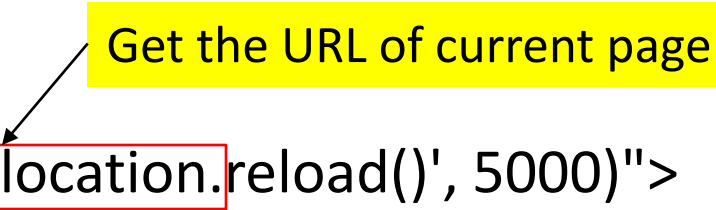
`<META http-equiv="refresh" content="5" />`

Refresh the same page after 5 seconds

Method 2 – Using JavaScript

- ❑ You can use JavaScript to refresh the page content
- ❑ The following example refreshes a web page after 5 seconds

```
<html>  
<body onload=  
  "setTimeout('window.location.reload()', 5000)">  
  Hello, I will be reloaded in 5 seconds.  
</body>  
</html>
```



Get the URL of current page

AJAX

- ❑ Ajax uses a different style of communication to the 'load a complete page' style
- ❑ Ajax = **A**ynchronous **J**avaScript **a**nd **X**ML
- ❑ It is a method for code in a web page to send a request to the server any time it wants to, without 'leaving' the current web page
- ❑ This is called 'asynchronous communication'
- ❑ Typically a small message is sent back from the server to the browser (not a complete web page)

Example Use of Ajax - Google

- ❑ Example - interactive entering of search terms:
<http://www.google.com>
- ❑ As soon as you enter a letter in the google search field, all the letters entered by the user so far are sent to the Google server
- ❑ Google immediately responds with a list of the most popular search terms that start with those letters (user can then use arrow keys to select one)

| | |
|------------|------------------------|
| a | |
| amazon | 11,510,000,000 results |
| argos | 16,500,000 results |
| amazon.com | 641,000,000 results |
| aol | 1,280,000,000 results |
| ask jeeves | 575,000,000 results |
| aol.com | 300,000,000 results |
| apple | 1,780,000,000 results |
| ask.com | 1,140,000,000 results |
| ask | 5,700,000,000 results |
| autotrader | 148,000,000 results |

| | |
|---------------|---------------------|
| aj | |
| ajax | 147,000,000 results |
| ajc | 114,000,000 results |
| ajc.com | 1,600,000 results |
| aj wright | 63,100,000 results |
| ajax tutorial | 25,800,000 results |
| ajilon | 2,780,000 results |
| aj.com | 73,300,000 results |
| ajit | 5,050,000 results |
| ajb | 4,530,000 results |
| aja | 297,000,000 results |

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| ajax | |
| ajax tutorial | 25,800,000 results |
| ajax tutorials | 51,400,000 results |
| ajax examples | 3,790,000 results |
| ajaxian | 2,230,000 results |
| ajax framework | 33,900,000 results |
| ajax php | 138,000,000 results |
| ajax example | 17,800,000 results |
| ajax4jsf | 199,000 results |
| ajax asp.net | 9,170,000 results |
| ajax amsterdam | 3,530,000 results |

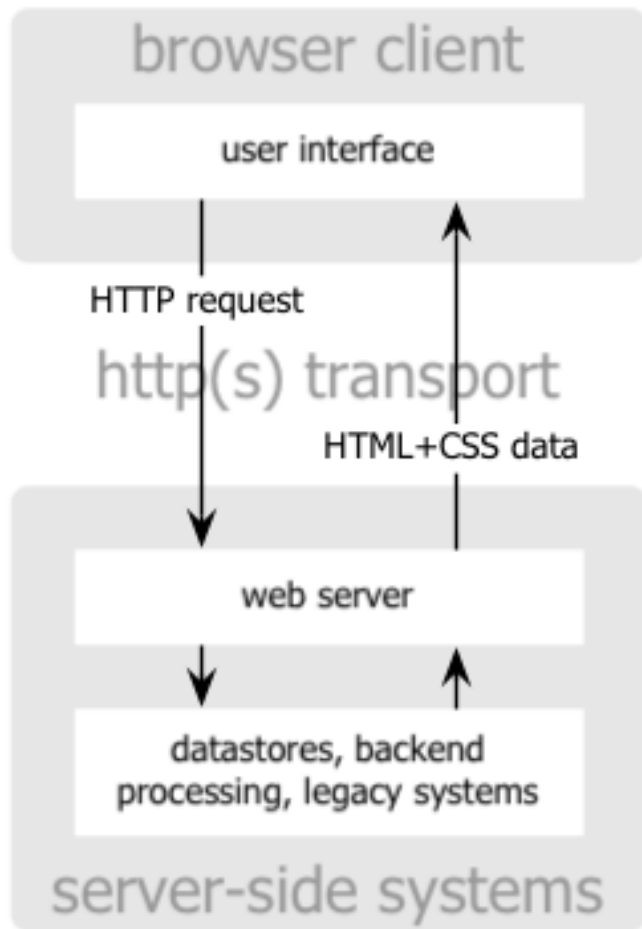
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| ajay devgan | 776,000 results |
| ajax tutorials | 51,400,000 results |
| ajax examples | 3,790,000 results |
| ajay | 124,000,000 results |
| ajaxian | 2,230,000 results |
| ajanta | 898,000 results |
| ajax framework | 33,900,000 results |
| ajax php | 138,000,000 results |

Speed Advantages of AJAX

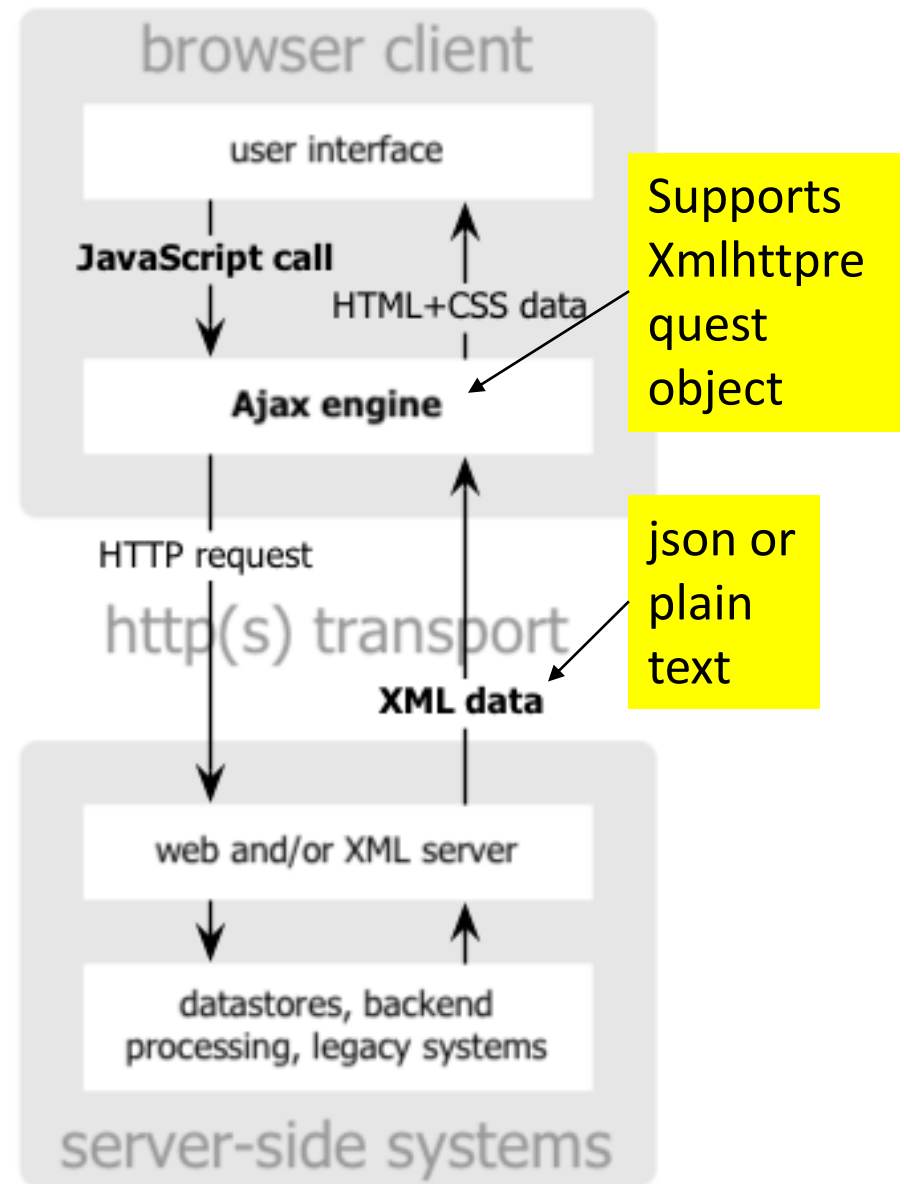
- ❑ The request sent to the server is small (i.e. <150 bytes) and the response from the server is small (maybe <200 bytes)
 - Only data for the updated parts of a page (e.g., DIVs) need to be fetched from server
- ❑ So these small sizes mean quick communication
- ❑ Another point is that usually when the data is received the JavaScript code only updates a small part of the web page, not the entire display
- ❑ This is much quicker than updating the entire web page display, which is the 'traditional' style

Ajax/Traditional Comparison

- ❑ The next slide shows a comparison between the 'traditional' method (left) and the Ajax method (right)
- ❑ Some things in the figure are slightly misleading i.e.
 - Both methods don't *have* to use a CSS file
 - Don't *have* to send XML data for the Ajax method, even simple text could be sent
 - Anything could be on the server, i.e. server may or may not have a database



classic
web application model



Ajax
web application model

Client Side Programming for Ajax

- ❑ Create an **XMLHttpRequest** object
- ❑ Send the request to the server
 - **open()** to initialize connection to the server
 - **send()** to send the data
- ❑ A **client side event listener** knows when the XMLHttpRequest object has finished retrieving data, and runs a **callback function**
- ❑ The callback function
 - Checks whether the data is successfully retrieved
 - Does something appropriate with the data

Why a callback function is needed?

Ajax: Set up and Send Request

```
function getUpdate() {
```

```
    request = new XMLHttpRequest();
```

Here the request sent to the server doesn't pass any parameter

```
    request.onreadystatechange = stateChange; // Define callback function
```

```
    request.open("POST", "server.php", true);
```

```
    request.send( null );
```

```
}
```

No parameters are passed to the server program

Server program to receive Ajax requests

Specifies the type of request; last parameter is: async (true) or sync (false)

- ❑ The AJAX request goes through several stages (see later slide)
- ❑ Whenever the state changes, the callback function will be executed

Ajax: Callback Function

```
function stateChange() { // Callback function
    // This function is run when the server responds
    if (request.readyState == 4 && request.status == 200
        && request.responseText) {
        // suppose myDiv has been defined in html body
        document.getElementById("myDiv").innerHTML=
            request.responseText;
    }
}
```

- ❑ '4' means a reply has been received from the server
- ❑ '200' means the reply was normal
- ❑ The third test is to check some actual data was returned by the server.

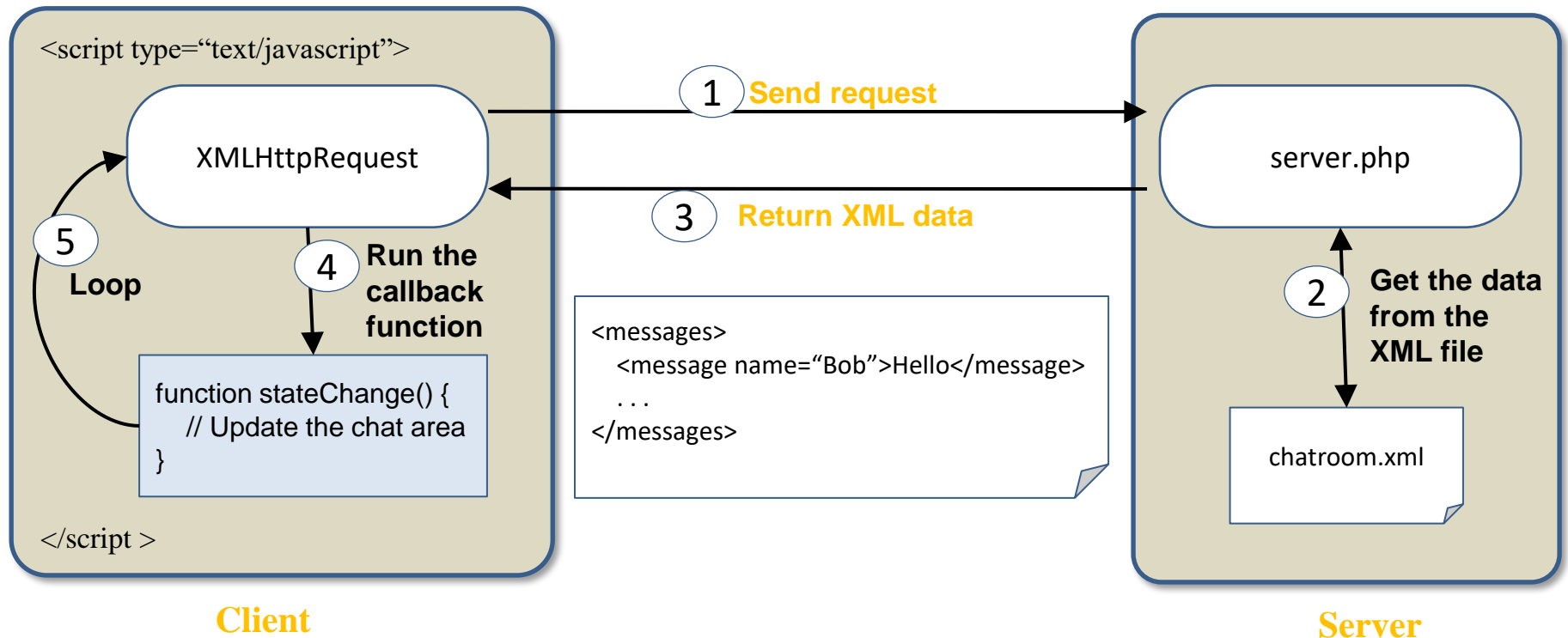
Ajax: Callback Function Status

- ❑ **onreadystatechange** property defines a **call-back** function to be executed when the **readyState** changes
- ❑ **readyState** property holds the status of XMLHttpRequest:
 - 0: request not initialized
 - 1: server connection established
 - 2: request received
 - 3: processing request
 - 4: request finished and response is ready
- ❑ **status** property holds the HTTP return code (200, 404, etc) of the **XMLHttpRequest** object

[Run Display Time Demo](#)

Getting XML Data from Server

- ❑ In PHP project, the client uses AJAX to get XML data from the server
- ❑ A request is sent to the server; XML data is sent back
- ❑ When we send the request, we send the last known size of the XML data, so the server can compare it to the current size, and send all the XML chat room data if the size is not the same



PHP Project Code

- ❑ In the previous example code, we only needed to send the request once (in `getUpdate()`)
- ❑ After that, whenever a response is received from `server.php`, `stateChange()` will be automatically executed
- ❑ For the PHP project, the situation is a bit different, because each time we need to tell the server **the size** of the chat room XML in the client
- ❑ So that means we have to repeatedly send the request

```
var datasize = 0;
```

The size of the XML data in the client is 0 when the chat room client side code starts

```
function getUpdate() {  
    request = new XMLHttpRequest();  
    request.onreadystatechange = stateChange;  
    request.open("POST", "server.php", true);  
    request.setRequestHeader("Content-type",  
        "application/x-www-form-urlencoded");  
    request.send("datasize=" + datasize); } }
```

POST data in HTML form

Send the size of the XML file in the client to the server
server.php compares this value with the size of the current XML file to check if the client has the latest XML data, and send it if required

```
function stateChange() { // Callback function  
    // This function is run when data is returned  
    if (request.readyState == 4 && request.status == 200  
        && request.responseText) {
```

```
        document.getElementById("myDiv").innerHTML=  
            request.responseText;  
        datasize = request.responseText.length;  
        ... // XML received, update the chat display
```

Update the current size of the XML data for sending later

```
        getUpdate();  
    } }
```

Repeat the whole procedure again

Take Home Message

- ❑ Ajax has become a standard technology for modern websites
- ❑ Web 2.0 enables instantaneous interaction between user/system and user/user
- ❑ Data transfer from the server does not have to be XML; any format that the client can interpret is fine