CS520 Web Programming
Introduction to AJAX

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Browser As The New OS

- Application can be used from anywhere
- Easy application distribution and deployment
- Greatly simplifies system administration
  - No software to download, install, and update
  - Centralized data management

So why it didn't happen??

Disadvantages of Web Applications

- Usually requires high bandwidth
- Storing data remotely
  - Privacy
  - Reliability
- Limited number of GUI components
  - Compared to, e.g. http://java.sun.com/docs/books/tutorial/ui/features/compWin.html
- *Interactivity issues*

Interactivity Issues

- Conventional GUI application
  - Rich event model
  - Responsive
    - No network delay
    - Partial redraw
- Web application
  - Simple request-response model
  - Not so responsive
    - Send request, wait for response
    - Full page refresh

HTML Event Models

- HTML 4 Event Model
  - HTML 4.01 Specification - http://www.w3.org/TR/REC-html40/
  - Limited features but portable
- Standard Event Model
  - DOM Level 2 HTML Specification - http://www.w3.org/TR/2003/REC-DOM-Level-2-HTML-20030109/
  - Fully featured but less portable
- Vender specific event models

Events and Event Handler

- Events
  - onfocus, onblur, onkeypress, onkeydown, onkeyup, onclick, ondbclick, onmousedown, onmouseup, onmousemove, onmouseover …
- Specify event handler
  - <element event="code">
  - For example:

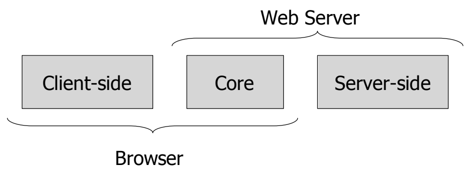
```
<button onclick="clickHandler();">click</button>
```

Example: Event Handling with JavaScript

- `j1.html`
- Disclaimer: all my JavsScript code is only tested under Firefox

JavaScript

- Interpreted language
- Originally developed by Netscape
- Syntax is similar to Java



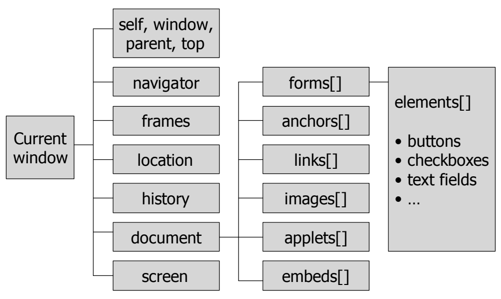
Core JavaScript

- Mainly covers language syntax, which is kind of similar to Java
- Global Object
  - Created by a JavaScript interpreter
  - *Global variables* and *global methods* are simply variables and methods of this object

Client-Side JavaScript

- Embed JavsScript in HTML
  - <script>
    - `type="text/javascript"`
    - `language="JavaScript"`
    - `src="path_to_script_file"`
- Run inside a browser
- `Window` is the global object

The Window Object



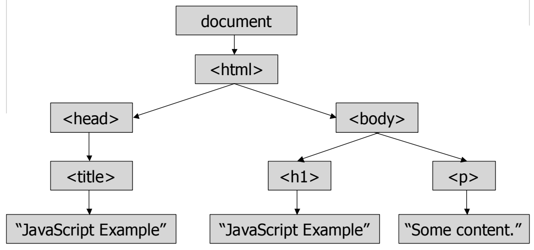
Document Object Model (DOM)

- Representing documents as objects so they can be manipulated in a programming language.

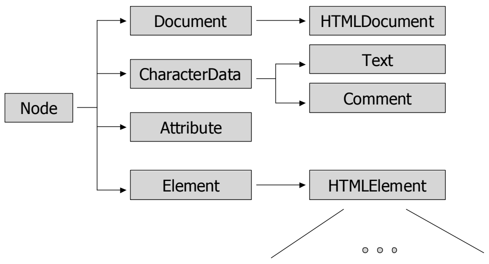
An HTML Document

```
<html>
<head><title>JavaScript Example</title></head>
<body>
    <h1>JavaScript Example</h1>
    <p>Some content.</p>
</body>
</html>
```

DOM Representation



Nodes



Manipulate a Document

- Find elements
- Modify elements
- Create elements

Find Elements

- document.getElementById()
- document.getElementsByName()
- document.getElementsByTagName()

Modify Elements

- HTMLElement properites and methods
  - IE
    - innerHTML
    - innerText
    - insertAdjacentHTML()
    - insertAdjacentText()
  - Netscape/Mozilla
    - innerHTML
  - Element-specific

Create Elements

- document
  - createElement()
  - createTextNode()
- node
  - setAttribute(), removeAttribute()
  - appendChild(), removeChild()
  - insertBefore(), replaceChild()

Communicate with Server

- The request-response model is still a limiting factor in user interactivity
- Solution: XMLHttpRequest
  - A JavaScript object
    - Send HTTP request
    - Parse XML response
  - *Response can be handled asynchronously*

XMLHttpRequest - Properties

- onreadystatechange
- readyState
  - 0 – uninitialized
  - 1 – loading
  - 2 – loaded
  - 3 – interactive
  - 4 – complete
- status
- statusText
- responseBody
- responseStream
- responseText
- responseXML

XMLHttpRequest - Methods

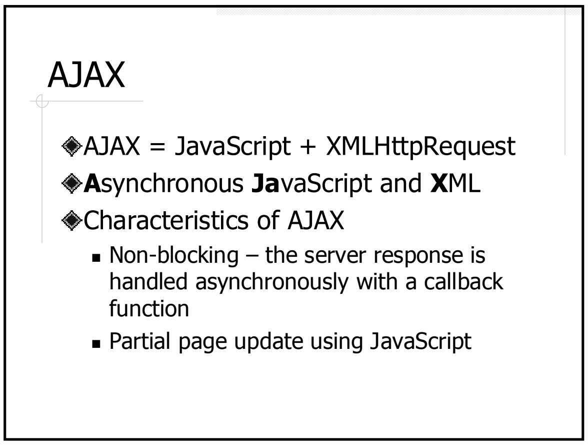
- abort()
- getAllResponseHeaders()
- getResponseHeader(header)
- open(method, url, asyncFlag, username, password)
  - asyncFlag, username, password are optional
- send(messageBody)
- setRequestHeader(name, value)

An XMLHttpRequest Example

- A client scripts sends an XMLHttpRequest
- A servlet responses with an XML message
- When the message arrives on the client, a *callback function* is invoked to update the document

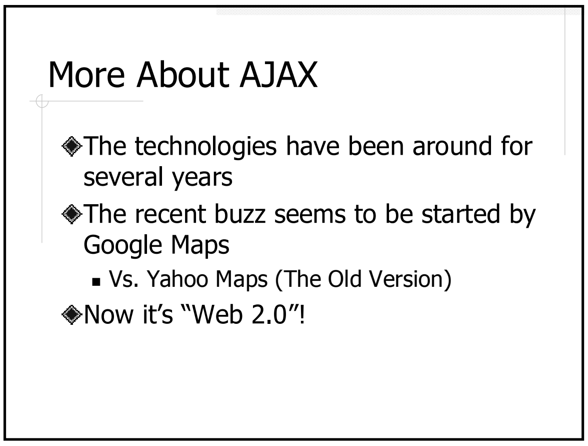
About the Example

- clickHandler()
- newXMLHttpRequest()
- updateDocument()
- getReadyStateHandler()



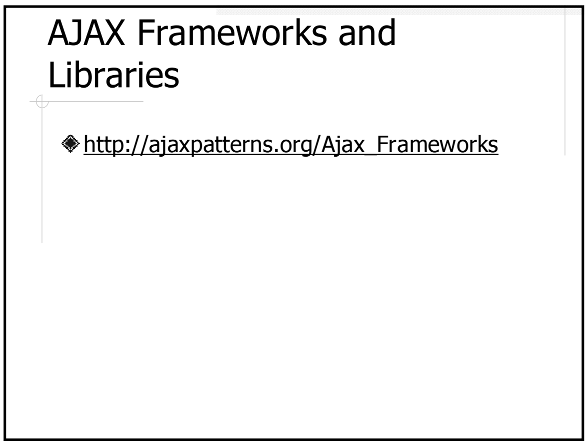
AJAX

- AJAX = JavaScript + XMLHttpRequest
- **A**synchronous **Ja**vaScript and **X**ML
- Characteristics of AJAX
  - Non-blocking – the server response is handled asynchronously with a callback function
  - Partial page update using JavaScript



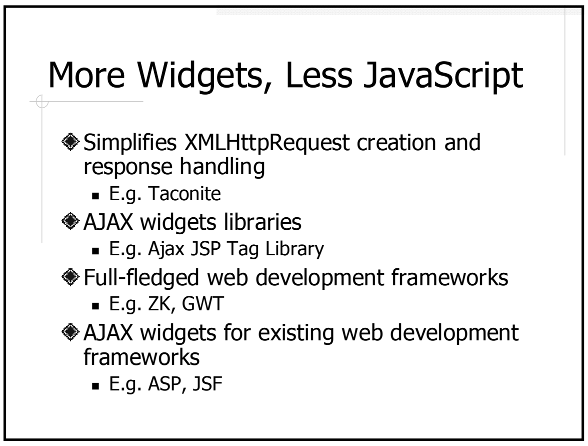
More About AJAX

- The technologies have been around for several years
- The recent buzz seems to be started by Google Maps
  - Vs. Yahoo Maps (The Old Version)
- Now it's "Web 2.0"!



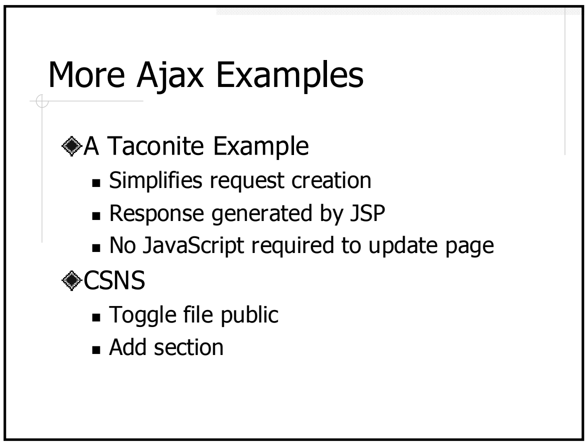
AJAX Frameworks and Libraries

- http://ajaxpatterns.org/Ajax_Frameworks



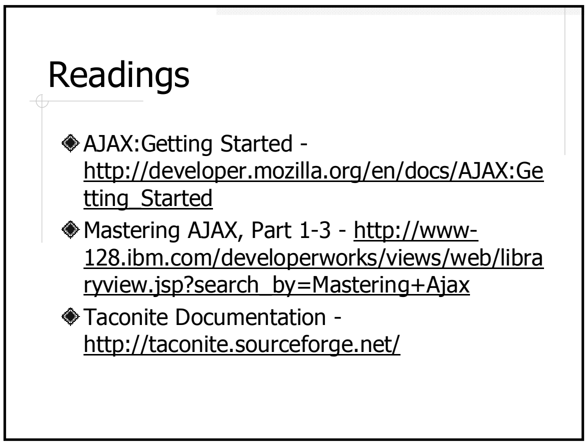
More Widgets, Less JavaScript

- Simplifies XMLHttpRequest creation and response handling
  - E.g. Taconite
- AJAX widgets libraries
  - E.g. Ajax JSP Tag Library
- Full-fledged web development frameworks
  - E.g. ZK, GWT
- AJAX widgets for existing web development frameworks
  - E.g. ASP, JSF



More Ajax Examples

- A Taconite Example
  - Simplifies request creation
  - Response generated by JSP
  - No JavaScript required to update page
- CSNS
  - Toggle file public
  - Add section



Readings

- AJAX:Getting Started - http://developer.mozilla.org/en/docs/AJAX:Getting_Started
- Mastering AJAX, Part 1-3 - http://www-128.ibm.com/developerworks/views/web/libraryview.jsp?search_by=Mastering+Ajax
- Taconite Documentation - http://taconite.sourceforge.net/