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/feature/s/comppWin.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/interact/scripts.html#h-18.2.3
  - Limited but widely supported
- Standard Event Model
  - DOM Level 2 HTML Specification -
    http://www.w3.org/TR/DOM-Level-2-
    Events/events.html
- Browser specific event models

JavaScript

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

Web Server
Client-side
Core
Server-side
Browser
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 Javascript in HTML
  - `<script>
    *type="text/javascript"
    *language="JavaScript"
    *src="path_to_script_file"
  </script>`
- Run inside a browser
- `Window` is the global object

Example: Event Handling

- `j1.html`
  - Uses X Library from [http://cross-browser.com/](http://cross-browser.com/)
  - Handles events
  - Modifies the HTML document

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>`

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 ...

... Modify Elements
Create Elements

- `document`
  - `createElement()`
  - `createTextNode()`

Example: Document Manipulation

- `j2.html`
  - Read and display the text input
  - Display "Hello <name>"?!
  - Add text input to table?!

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

- `a1.html`
  - A client script sends an XMLHttpRequest
  - A servlet responds 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()

So What is Ajax?

- Asynchronous JavaScript and XML
  - JavaScript + XMLHttpRequest
- Characteristics of Ajax
  - Non-blocking – the server response is handled asynchronously with a callback function
  - Partial page update using JavaScript

More About AJAX

- XMLHttpRequest used to be an IE specific feature that received little attention
- It’s all started by Google Maps
  - Vs. Yahoo Maps (The Old Version)
  - The beginning of "Web 2.0" (or 3.0)

AJAX Frameworks and Libraries

- http://ajaxpatterns.org/Ajax_Frameworks

More Widgets, Less JavaScript

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

More Ajax Examples

- a2.html - a Taconite example
  - Simplifies request creation
  - Response generated by JSP
  - No JavaScript required to update page
- CSNS
  - Toggle file public
  - Add section
Readings

- Taconite Documentation - http://taconite.sourceforge.net/