AJAX and ASP.NET

AJAX?

Asynchronous Javascript + XML

- Could also be
  - Asynchronous Java + XML
  - Asynchronous ActionScript + SWF
  - Etc.

AJAX Concepts

Rich Internet application (*RIA*): Displayed in a web browser, but has some of the features of a desktop application
- Enhanced user interface
- Quick response time.

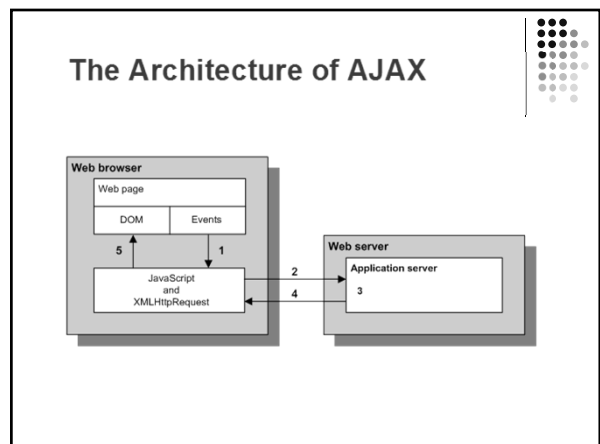*Asynchronous JavaScript and XML* (*AJAX*) is one way to build a RIA

- A standard HTTP request and response cycle returns the entire page is from the server and loads it into the browser

- In an AJAX HTTP request and response cycle, the browser can request just the information it needs to update the page. The server returns just the updated information which can be used to update the page without having to reload it.

User Interaction Paradigms

- Click-wait-refresh: Static HTML
- Synchronous request/response: Browser always initiates requests and the server responds to the requests
- The AJAX Model:
  - Partial page update: Only UI elements that have new information are updated
  - Asynchronous communication: User can continue to use the application while the client program requests information from the server in the background

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AJAX Architecture

- Use of a client-side engine as an intermediate between the user interface and the server
- User activity leads to program calls to the client-side engine instead of a page request to the server
- XML data transfer between server and the client-side engine

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The Architecture of AJAX

How AJAX Works

- The web page that is downloaded from the web server contains HTML, CSS, and *JavaScript*
- The web browser uses the HTML and CSS to build the *Document Object Model* (*DOM*), which is an object-oriented representation of the content in the page
- JavaScript is used to run code when events occur in the web page. JavaScript also has access to the DOM to determine the state of controls on the page and to make changes to the DOM that will be shown to the user.
- The XMLHttpRequest object that's built into the web browser is used to communicate with the web server. JavaScript is used to access the functionality of the XMLHttpRequest object.
- For most requests, *JavaScript Object Notation* (*JSON*) is now used to send data back to the web browser rather than XML
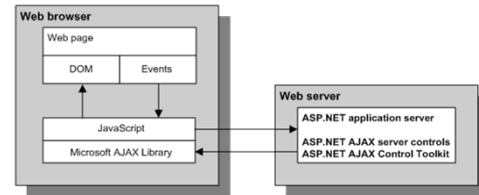
How AJAX updates the contents of a web page

1. An event happens on the web page (moving the mouse, clicking a button, changing a field or a timer going off), triggering JavaScript code.
2. JavaScript prepares a request containing information about the event and the current state of the controls on the web page and sends it to the web server.
3. The server receives the data and processes it. Although processing can take place on the client, some actions, such as database access, must happen on the server.
4. The server prepares a response containing the updated state of the controls and sends it back to the browser.
5. JavaScript parses the response and uses the data it contains to update the contents of the web page by modifying objects in the DOM. The browser then updates the user's screen.

ASP.NET AJAX Components

- Microsoft AJAX Library
- ASP.NET AJAX server controls
- ASP.NET AJAX Control Toolkit
  (Download from www.codeplex.com)

The architecture of ASP.NET AJAX

How ASP.NET AJAX works

- Microsoft developed a set of extensions to ASP.NET that provided AJAX support.
- ASP.NET uses an *asynchronous postback* to perform a partial-page update. During an asynchronous postback, the view state of the web page is sent to the server, which processes the request and sends back the new view state of the controls being updated.
- The ASP.NET AJAX server controls enclose other ASP.NET server controls to make them AJAX-enabled. These controls can then be updated using an asynchronous postback.
- A single page can have one or more groups of AJAX-enabled controls that can be updated independently or simultaneously.
- Server controls that are not AJAX-enabled will still trigger a full postback that causes the entire page to be reloaded.

ASP.NET AJAX server controls

- ScriptManager
- ScriptManagerProxy
- UpdatePanel
- UpdateProgress
- Timer

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The ScriptManager Control

- Only one ScriptManager control per page
  - If there is more than one ScriptManager control on a page, an Invalid Operation exception will be generated
- The ScriptManager control can also be used to load and manage additional JavaScript files and to register web services so they can be accessed by JavaScript code on the client through a web service proxy.

The UpdatePanel Control

- The UpdatePanel control is a container control that holds other server controls that will be updated during an asynchronous postback
- All controls inside an UpdatePanel control will be updated at the same time
- A page can contain multiple UpdatePanel controls, each with a different set of controls

The UpdateProgress and Timer Controls

- Use an UpdateProgress control to visually indicate that an asynchronous postback is in progress and that the user should wait until it's completed
- Useful when an asynchronous postback will take a few seconds or more to complete
- When one or more UpdatePanel controls need to be updated automatically, use the Timer control to trigger partial-page updates at a set time interval

Common ASP.NET AJAX Control Toolkit Controls

- Accordion
- Animation
- Calendar
- CollapsiblePanel
- DragPanel
- DropShadow
- HoverMenu
- ModalPopup
- NumericUpDown
- PagingBulletedList
- PopupControl
- RoundedCorners
- Slider
- SlideShow
- TabContainer
- TextBoxWatermark
- ToggleButton

AJAX Control Toolkit

- A collection of open source AJAX enabled controls from CodePlex
- Download from www.codeplex.com and extract the files
- Add a new tab to the Visual Studio Toolbox
- Choose items for the new tab by browsing to the AjaxControlToolkit.dll