Developing for Ajax

Ajax 101

A Look Under the Hood

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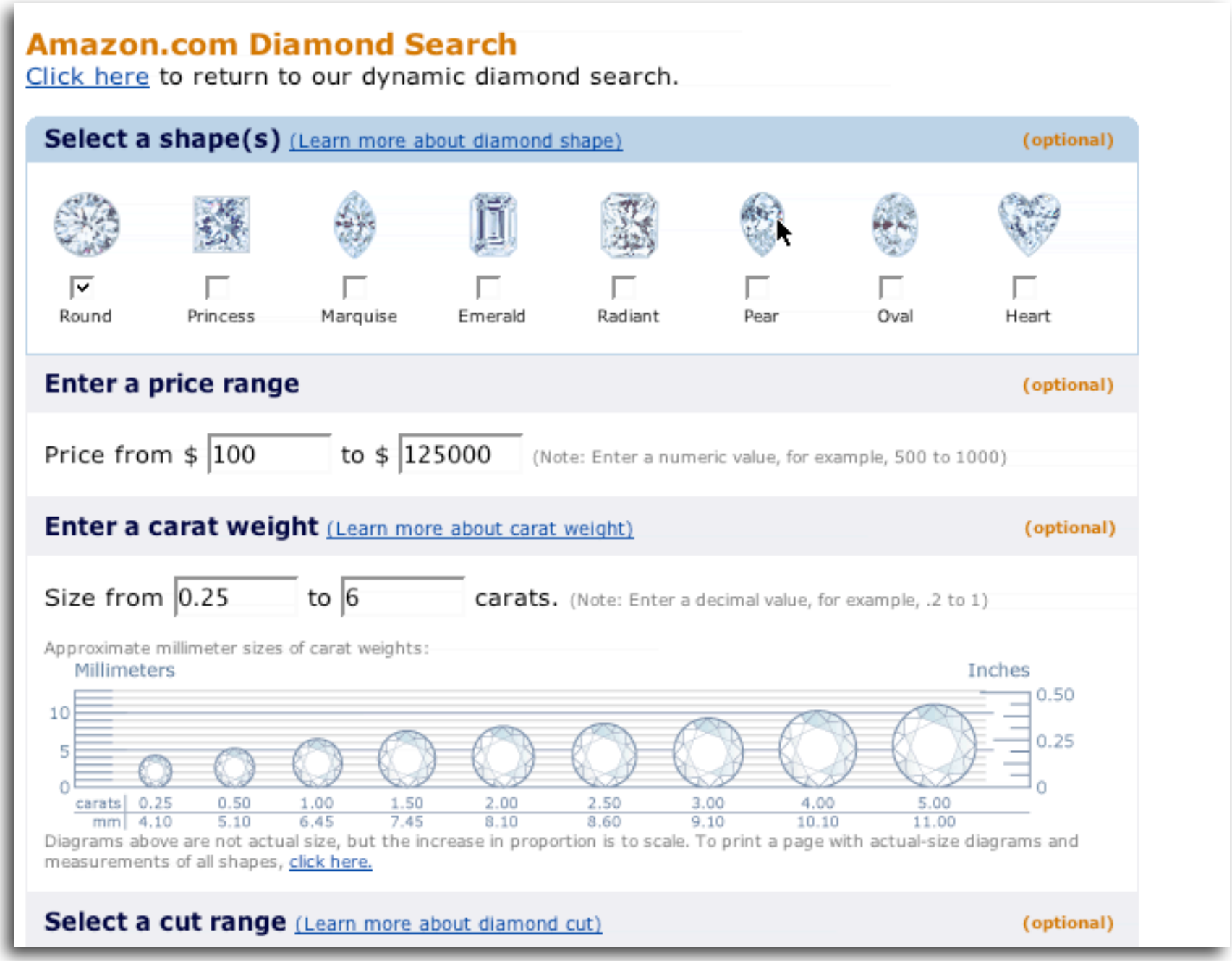
Background

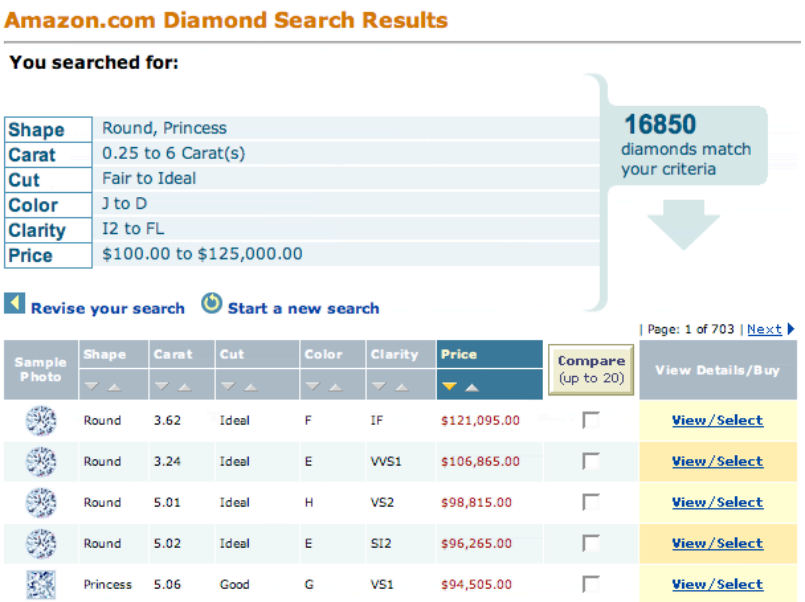

GATO
Rico
JavaScript for Rich Internet Application
Home
Features
Demos
Documentation
Downloads
About
An open-source JavaScript library for creating rich intern
applications. Rico provides full Ajax support, drag and dr
management and a cinematic effects library.
BACKGROUND
Rico is a Spanish word meaning rich. The goal of Rico is to provide a rich experience for web sites using Ajax technology.
Rico is just one small part of a larger effort at Sabre Airline Solutions to create a suite of rich internet components, behaviors and effects for the web application space.
The library is a fully object-oriented JavaScript library. Recently we refactored the library to extend the excellent prototype.js effort from the Ruby on Rails folks.
OPEN SOURCE
Rico is provide free and open-source (Apache 2.0 License) for either your personal or commercial use. Sabre Airline Solutions retains the copyright on the Rico code produced at Sabre.
BROWSER SUPPORT
Rico has been tested on IE 5.5, IE 6, Firefox 1.0x/Win, Camino/Mac, Firefox 1.0x/Mac. Currently there is no Safari or Mac IE 5.2 support. Support will be provided in a near future release for Safari.
AJAX SUPPORT
Ajax is the term that describes a set of web development techniques for creating interactive web applications. One of the key ingredients is the JavaScript object XmlHttpRequest. Rico provides a very simple interface for registering Ajax request handlers as well as HTML elements or JavaScript objects as Ajax response objects. Multiple elements and/or objects may be updated as the result of one Ajax request.
Want to get started learning? Check out our demos and then read our two Ajax tutorials on the Documentation page.
DRAG AND DROP
Desktop applications have long used drag and drop in their interfaces to simplify user interaction. Rico provides one of the simplest interfaces for enabling your web application to support drag and drop. Just register any HTML element or JavaScript object as a draggable and any other HTML element handles the rest.
CINEMATIC EFFECTS
When actions are no longer occurring just at the page level bu
required to clue the user on what has transpired. Cinematic ef
transitions can communicate change in richer ways than tradit
Rico provides several cinematic effects as well as some simple
BEHAVIORS
Take some raw HTML and sprinkle in some behaviors and what
Rico you can get an Accordion component like those found in
Laszlo. Just nest some DIVs and with one line of JavaScript tur
an accordion. And the latest behavior is the LiveGrid. LiveGrid
connect an Html table up to a stream of Ajax responses. Ajax
automatically called during table scrolling. The result is now Html tables can hold
an unlimited amount of data scrolled into view on the fly as needed! More
behaviors are planned!
See Rico in Action!
Developer Network Home
Help
Site Search
Search
YAHOO! DEVELOPER NETWORK
Design Pattern Library
Yahoo! Developer Network > Design Pattern Library
USER NEEDS TO
NAVIGATE
Breadcrumbs
Faceted Navigation
Fly-out Menus
Horizontal Bar
Hub and Spoke
Left Navigation
Tabs
Module Tabs
Navigation Tabs
EXPLORE DATA
Auto Complete
Calendar Picker
Pagination
Item Pagination
Search Pagination
ORGANIZE DATA
GIVE FEEDBACK
Ratings & Reviews
Architecture Review
Rating an Object
Writing a Review
PERFORM ACTION
CUSTOMIZE
Drag and Drop
Drag and Drop Modules
Drag and Drop Objects
In Page Editing
Sliders
APPLICATION NEEDS TO
CALL ATTENTION
IMPROVE READABILITY
Ratings & Reviews
Review Architecture
GROUP RELATED ITEMS
ORGANIZE SCREEN/PAGE
Welcome
Welcome to the Yahoo! Design Pattern Library. We are very happy to be sharing our library with the design and development community. This is our first drop of what we hope to be a monthly release cycle for the publication of patterns. In many cases we have bundled the patterns with pointers to related code from the Yahoo! User Interface Code Library. We hope this is a useful resource and look forward to your feedback.
What's a Pattern?
A pattern describes an optimal solution to a common problem within a specific context. more...
Recent Patterns
Auto-Complete
The user needs to enter an item into a text box which could ambiguous or hard to remember and therefore has the potential to be mis-typed.
Breadcrumbs
User needs to navigate potentially large quantities of information efficiently, without becoming lost.
Drag and Drop Modules
The user needs needs to re-arrange the layout of modules on a web page directly with the mouse.
Module Tabs
The user needs to navigate through one or more stacked panes of content without refreshing the page.
Navigation Tabs
The user needs to navigate through a site to locate content and features and have clear indication of their current location in the site.
Object Pagination
The user needs to view data items from a potentially large set of sorted data that will not be easy to display within a single page.
Search Pagination
The user needs to view a set of search results ranked by relevance that is too large to easily display within a single page.
Rating an Object
A user wants to quickly leave their opinion on an object, with minimal interruption to any other task flow they are involved in.
Writing a Review
User wants to share her opinion with others about an object (place, person, thing) in greater detail than a simple rating.

What is Ajax?

- AJAX = Asynchronous JavaScript and XML
  - Strict definition is using XMLHttpRequest (XHR) to retrieve XML within a web page
- Ajax = The set of technologies that allow web applications to provide rich interaction, just-in-time information and dynamic interfaces without required page refresh
- The Secret Sauce
  - Ajax = XHR + DHTML (HTML, CSS, JavaScript) + Rich design

Ajax: An Example





Amazon.com Diamond Search Results

You searched for:

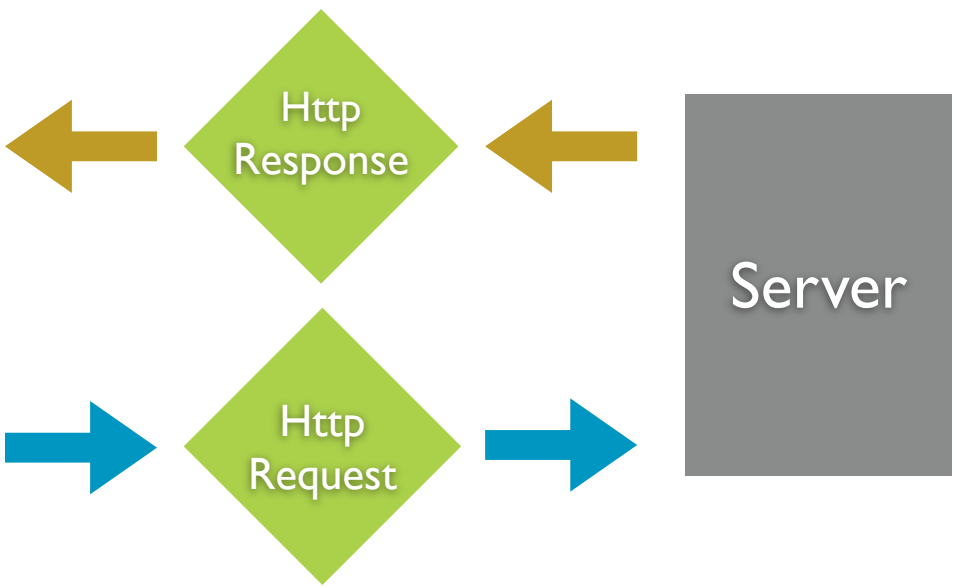
Shape	Round, Princess
Carat	0.25 to 6 Carat(s)
Cut	Fair to Ideal
Color	J to D
Clarity	I2 to FL
Price	$100.00 to $125,000.00

16850 diamonds match your criteria

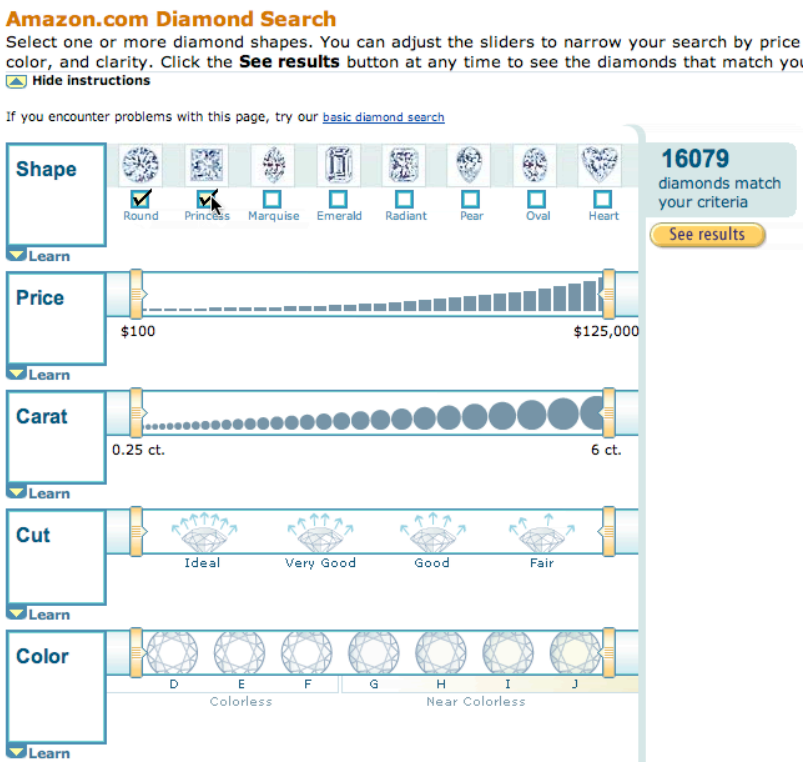
Revise your search | Start a new search

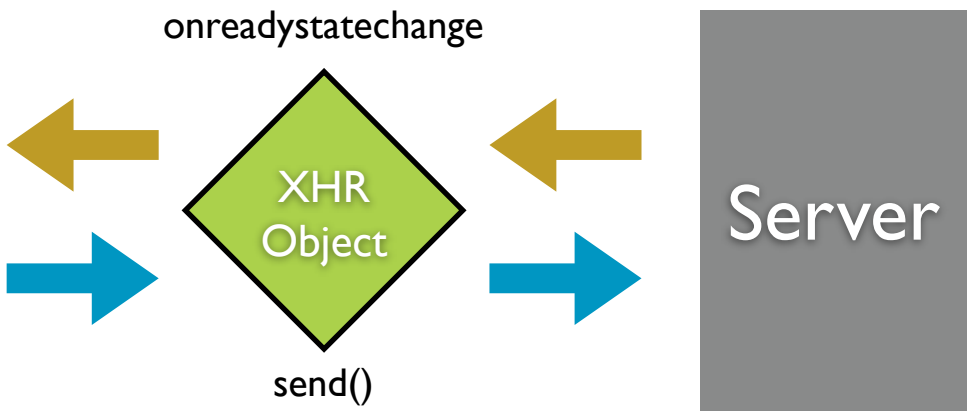
| Page: 1 of 703 | Next

Sample Photo	Shape	Carat	Cut	Color	Clarity	Price	Compare (up to 20)	View Details/Buy
	Round	3.62	Ideal	F	IF	$121,095.00		View/Select
	Round	3.24	Ideal	E	VVS1	$106,865.00		View/Select
	Round	5.01	Ideal	H	VS2	$98,815.00		View/Select
	Round	5.02	Ideal	E	SI2	$96,265.00		View/Select
	Princess	5.06	Good	G	VS1	$94,505.00		View/Select



With Ajax


Amazon.com Diamond Search
Select one or more diamond shapes. You can adjust the sliders to narrow your search by price
color, and clarity. Click the See results button at any time to see the diamonds that match yo
Hide instructions
If you encounter problems with this page, try our basic diamond search
Shape
Round
Princess
Marquise
Emerald
Radiant
Pear
Oval
Heart
Learn
16079
diamonds match
your criteria
See results
Price
$100
$125,000
Learn
Carat
0.25 ct.
6 ct.
Learn
Cut
Ideal
Very Good
Good
Fair
Learn
Color
D
E
F
G
H
I
J
Colorless
Near Colorless
Learn


onreadystatechange
XHR Object
send()
Server

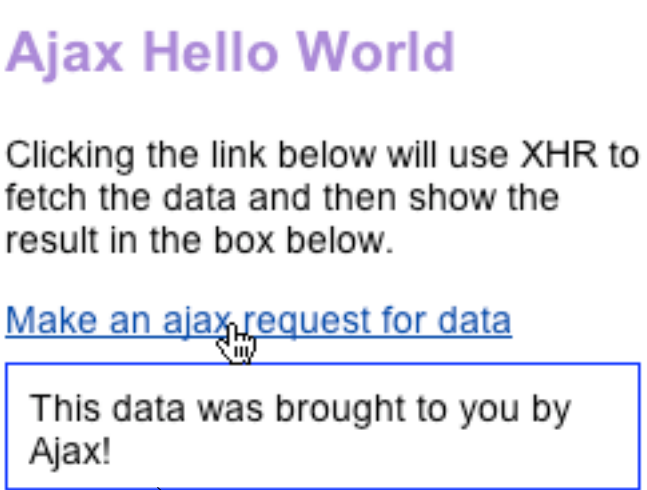
- Hidden IFrame
- <img> src
- <script> src hack
- CSS href hack
- JS to faceless Java applets
- JS to faceless Flash
- NO CONTENT Response
- Cookies

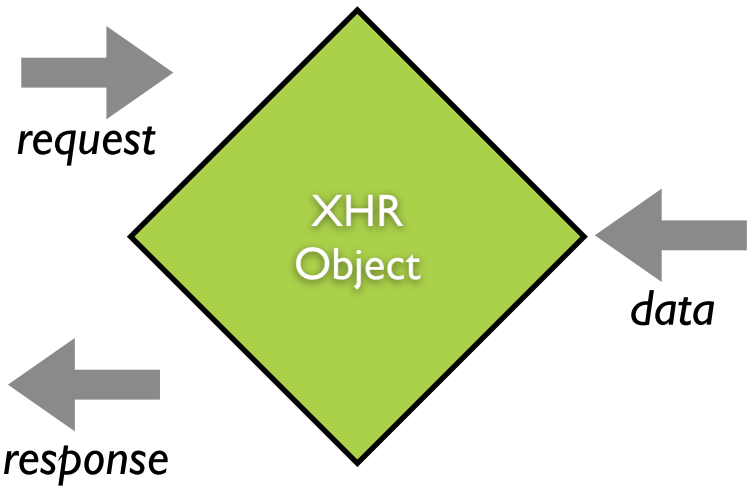
Learning Ajax

- Learning Ajax, means understanding
  - **Triggers** (event or timer)
  - **Operations** (ajax xhr)
  - **Updating** (dom)

Operation. Using XHR

Simple Ajax 'Hello World'






```
<?xml version="1.0" ?>
<root>
This data was brought
to you by Ajax!
</root>
```

/response.xml

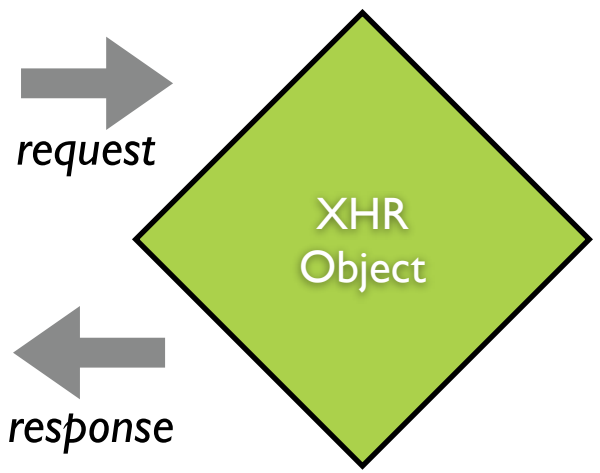
```
<h2>Ajax Hello World</h2>
<p>Clicking the link below will use XHR to fetch the data and then show the
result in the box below.</p>

<span class="ajaxlink" onclick="makeRequest('test.xml')">
Make an ajax request for data
</span>

<div id="helloArea"></div>
```

/index.html

- Clicking the link makes an XHR request
- Response is inserted into the area outlined in blue

Ajax How To

1. Create a request object
2. Make the request
3. Handle the response



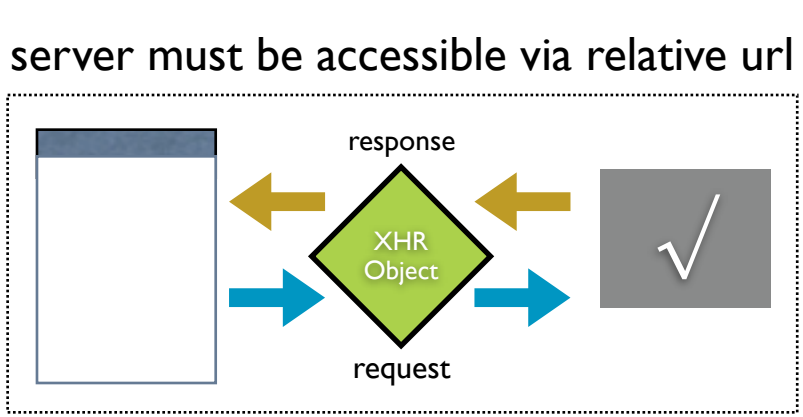
```
if browser is mozilla or safari or opera then
    create a new XMLHttpRequest

otherwise it is IE then
    create a new ActiveXObject
otherwise
    error - browser does not support XMLHttpRequest
```

- IE5, 5.5, 6 implements XHR as an ActiveX object (Msxm12.XMLHTTP/Microsoft.XMLHTTP)
- Mozilla 1.0+, Safari 1.2+, Opera 8+, IE7 provide XMLHttpRequest object natively
- All XHR objects have same methods & properties

Ajax XHR

```
set onreadystatechange to callback function - handleAjaxResponse

open a request on the xhr object

send the request through the xhr object
```

- The JavaScript function *handleAjaxResponse* will be invoked when the readystate property changes on the XHR object
- Same site rule
- 'GET' or 'POST'
- Asynchronous flag



X

X

Ajax XHR

```
var request = YAHOO.util.Connect.asyncRequest('GET',
    'response.xml', {
        success:handleAjaxResponse,
        failure:handleFailure
    }, null);
```

- Callback sets up response
  - success, failure, timeout callbacks
  - scope
  - upload
  - any user-defined parameters
  - or just pass a function

Ajax
XHR

```
function handleAjaxResponse
begin
    if response is valid then
        get responseXML
        get rootNode
        get helloArea on the page
        stuff the rootNode value into the helloArea DIV
    endif
end
```

- **readystate** values
  - 0 – Uninitialized
  - 1 – Loading
  - 2 – Loaded
  - 3 – Interactive
  - 4 – Completed

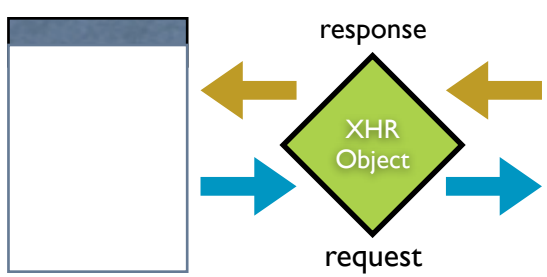
Ajax
XHR

```
function handleAjaxResponse(response, callbackObj)
{
    var doc = response.responseXML;
    var rootNode = doc.getElementsByTagName('root').item(0);
    var helloArea = document.getElementById("helloArea");
    helloArea.innerHTML=rootNode.firstChild.data;
```

- Use XHR property **responseXML** to get the response as an XML DOM (XmlDocument)
- Use standard JavaScript DOM methods
  - Mozilla, Safari, Opera & IE support a common set of methods and properties
  - Watch out for IE only stuff (e.g., **children** property)
  - Watch out for whitespace issues
- Other options
  - Use XML library for JS (e.g., XML for <script>)

Ajax XHR

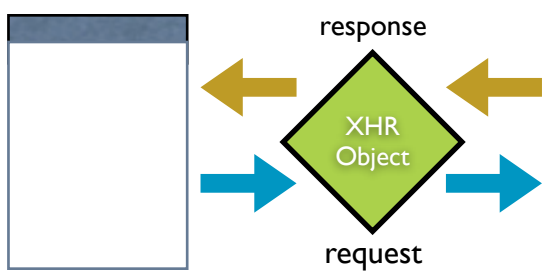
- Two types: responseText, responseXML
- Many forms: data, html, JS, JSON



text	xml
data	data
html	html
JS	JS
json	

Ajax XHR

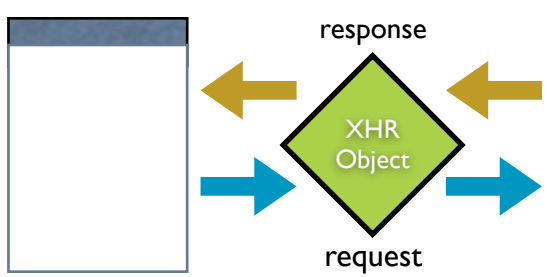
- JavaScript generated on server-side
- JavaScript is eval'ed on client side to generate GUI
- Dangerous!



text	xml	
data	data	
html	html	
JS	JS	**interface code**
json		

Ajax XHR

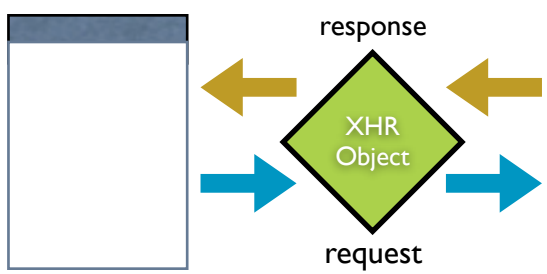
- HTML generated on server side
- Stuffed into innerHTML of DOM element

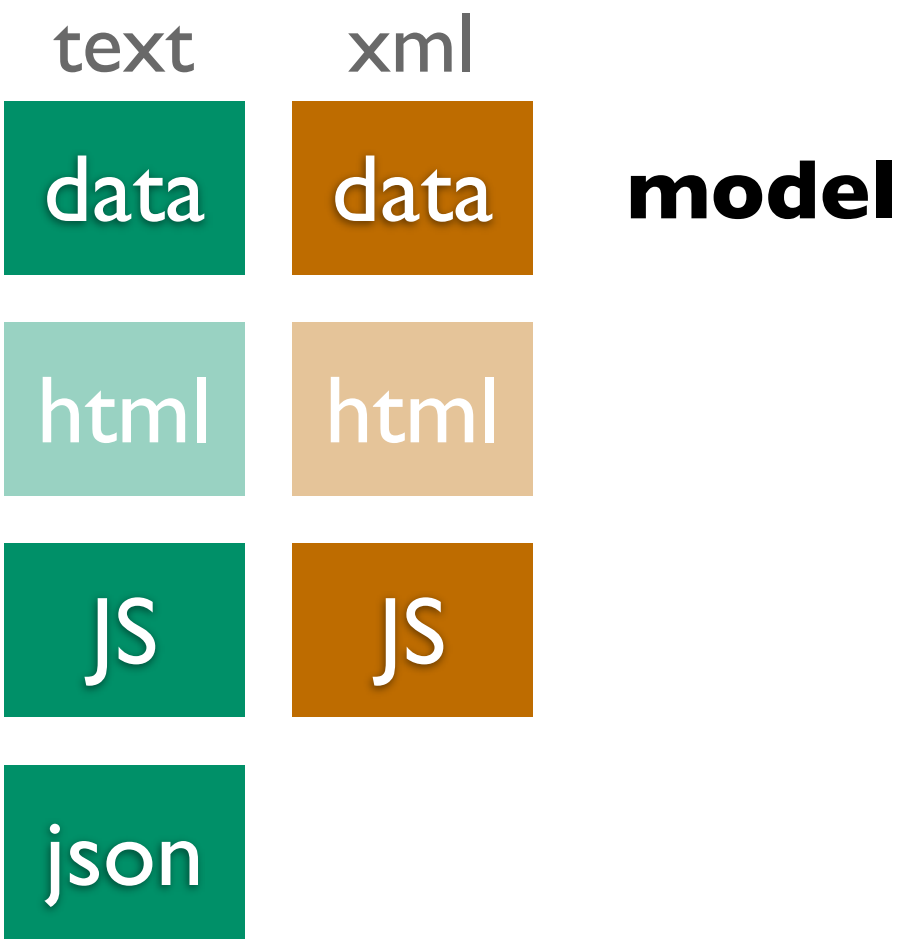


text	xml	
data	data	
html	html	**innerHTML**
JS	JS	
json		

Ajax XHR

- Model data generated on server side
  - w3c DOM elements created from model data
  - Substitute model data into HTML strings and insert via innerHTML





W3C Create Nodes


```
// var helloArea = YAHOO.util.Dom.get("hello-area");
var helloArea = document.getElementById("hello-area");
var para = document.createElement("p");
var paraText = document.createTextNode("Hello ");
var em = document.createElement("em");
var emText = document.createTextNode("World");
helloArea.appendChild(para);
para.appendChild(paraText);
para.appendChild(em);
em.appendChild(emText);
```

```
<p>A message will be inserted below:</p>
<div id="hello-area" style="height:20px;width:
220px;margin-top:8px;padding:4px;border:1px solid
```

A message will be inserted below:

A message will be inserted below:

Hello *World*

JSON

- JavaScript supports several string based notations
  - Allows the basic types to be represented as string literals
  - Strings are easy to pass over the wire
- JSON (JavaScript Object Notation - json.org)

{"**name**": "Jack B. Nimble", "at large": true, "grade": "A", "level": 3}

name	Jack B. Nimble
at large	true
grade	A
level	3

```
["Sunday", "Monday", "Tuesday", "Wednesday",
"Thursday", "Friday", "Saturday"]
```

array of 7 named days

```
[
[0, -1, 0],
[1, 0, 0],
[0, 0, 1]
]
```

3x3 array

Ajax XHR

- JSON's simple values are the same as used in JavaScript
- No restructuring is requested: JSON's structures are JavaScript!
- JSON's object is the JavaScript object
- JSON's array is the JavaScript array

- Parsing is simple, native

- Obtain responseText
- Parse the responseText

```
responseData = eval('(' + responseText + ')');
   OR
responseData = JSON.parseJSON(responseText);
```

JSON Response: Y! JSON API

Ajax XHR

- http://api.search.yahoo.com/WebSearchService/V1/webSearch?appid=YahooDemo&query=finances&start=1&results=1&output=json


```
{
 "ResultSet":
 {
    "totalResultsAvailable":"69200000",
    "totalResultsReturned":"1",
    "firstResultPosition":"1",
    "Result":
    {
       "Title":"Yahoo! Finance",
       "Summary":"manage the market and your money with Yahoo! Finance. Includes
       stock market quotes, business news, mutual funds, online bill pay, banking
       tools, loans, insurance, retirement planning, and tax tips and advice.",
       "Url":"http:\/\/finance.yahoo.com\/",
       "ClickUrl":"http:\/\/finance.yahoo.com\/",
       "ModificationDate":"1137225600",
       "MimeType":"text\/html"
    }
 }
}
```

Getting info from a JSON response

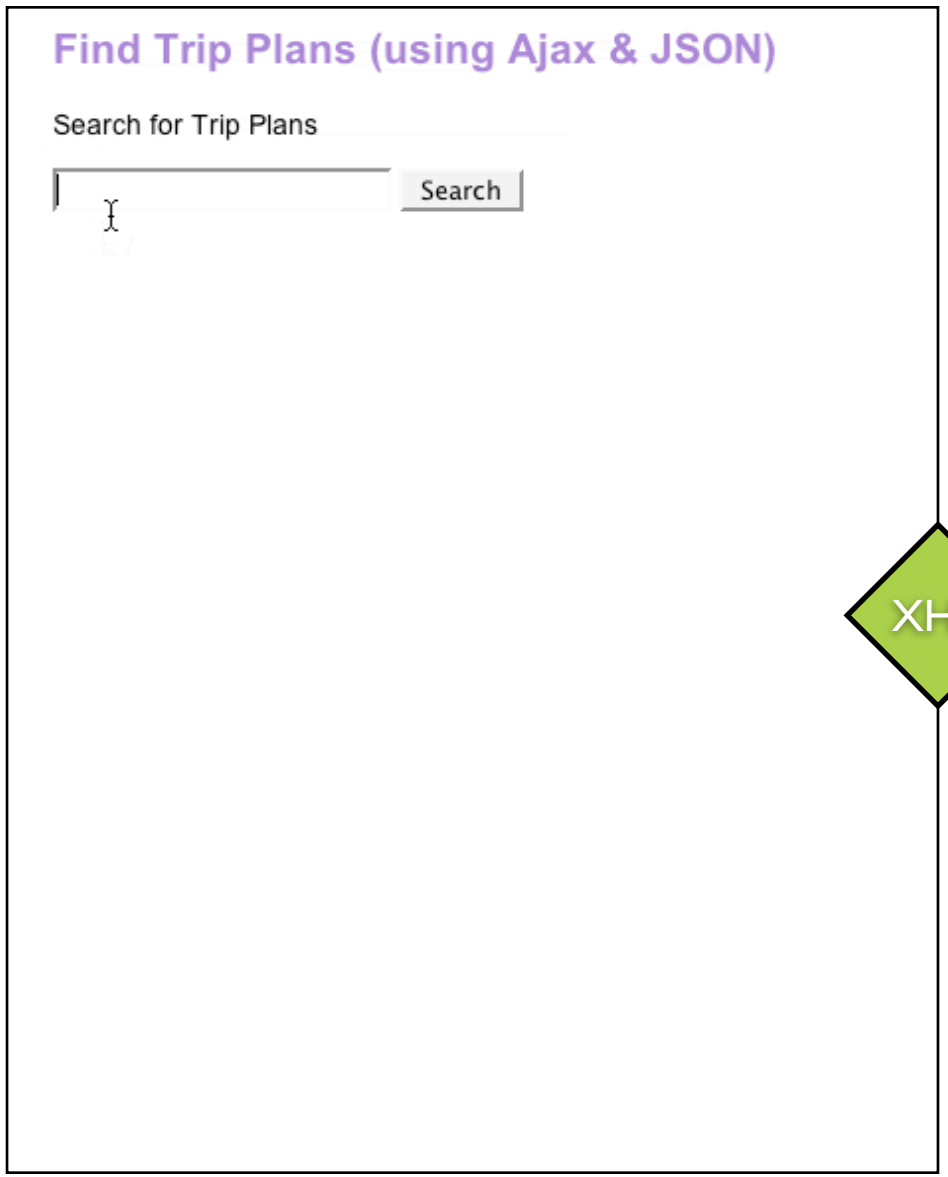
Ajax XHR

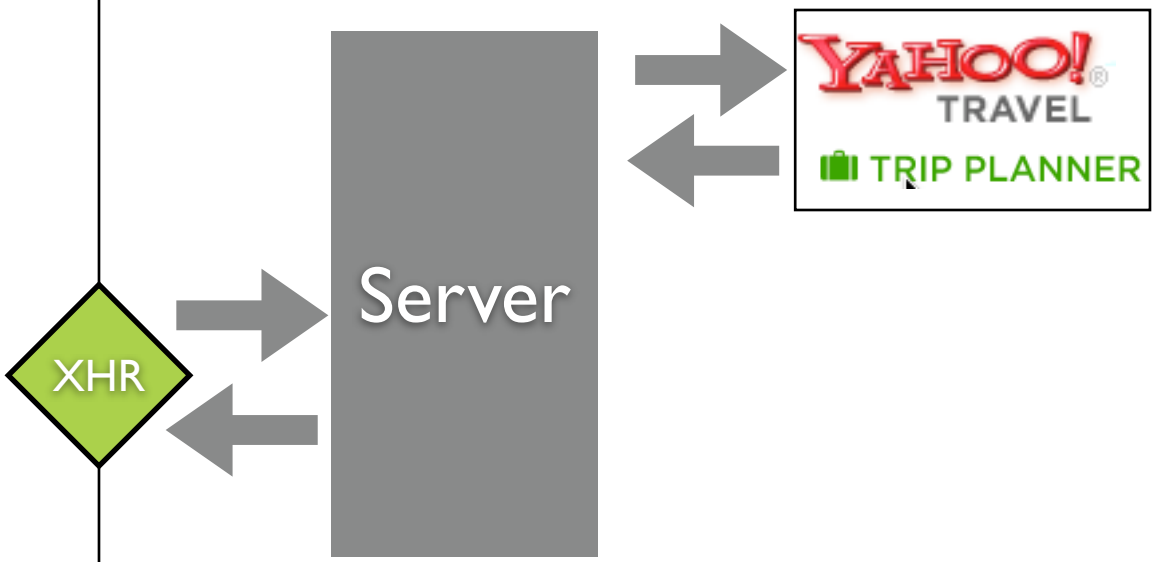
http://api.search.yahoo.com/WebSearchService/V1/webSearch?appid=YahooDemo&query=finances&start=1&results=1&output=json

```
{
    "ResultSet":
    {
        "totalResultsAvailable":"69200000",
        "totalResultsReturned":"1",
        "firstResultPosition":"1",
        "Result":
        {
            "Title":"Yahoo! Finance",
            "Summary":"manage the market and your money with Yahoo! Finance. Includes stock market quotes, business news, mutual funds, online bill pay, banking tools, loans, insurance, retirement planning, and tax tips and advice.",
            "Url":"http:\/\/finance.yahoo.com\/",
            "ClickUrl":"http:\/\/finance.yahoo.com\/",
            "ModificationDate":"1137225600",
            "MimeType":"text\/html"
        }
    }
}
```

```
responseData = JSON.parseJSON(responseText);
var resultsAvail = responseData.ResultSet.totalResultsAvailable;
var resultsReturned = responseData.ResultSet.totalResultsReturned;
var firstResultTitle = responseData.ResultSet.Result.Title;
var firstResultSummary = responseData.ResultSet.Result.Summary;
```

JSON Trip Finder

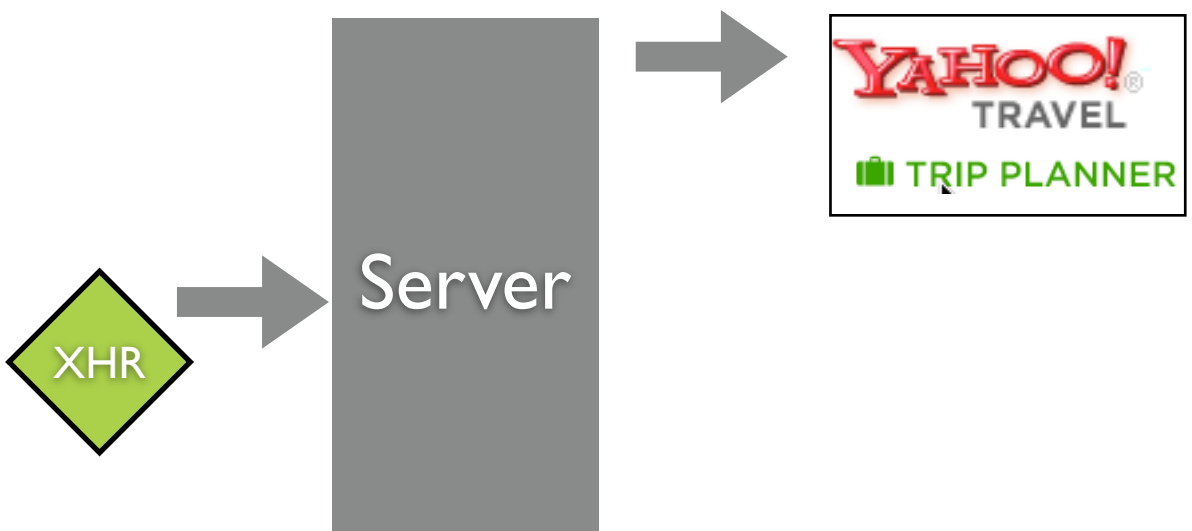




Ajax
XHR

Yahoo! Trip Planner exposes its service via an URL that requires a free partner key. Notice output=json.

```
http://api.travel.yahoo.com/TripService/V1/tripSearch?
appid=PARTNER_KEY&query=alaska&output=json
```



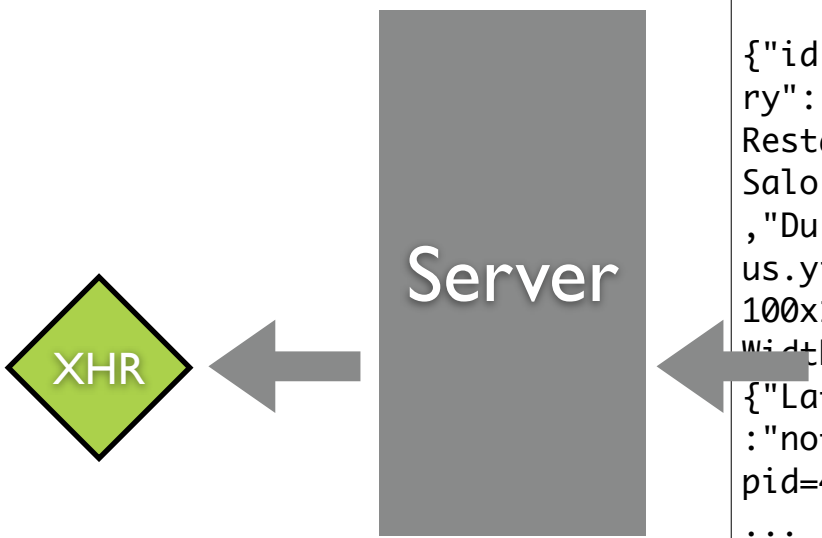
JSON Response

Ajax XHR

Each response is represented as an object in an array (list) of responses

Y! service responds with a JSON text string, valid JavaScript object notation. This is passed directly back as the XHR result


```
{"ResultSet":{"firstResultPosition":
1,"totalResultsAvailable":"16","totalResultsReturned":
10,"Result":[

{"id":"351102","YahooID":"j
from Vancouver","Summary":
Hiking,... Hotel: Hyatt R
Jho...","Destinations":"V
Vancouver, Ketchikan,
Se...","CreateDate":"113043
{"Url":"http:\/\/us.i1.yimg.c
lp\/cd\/
100x100_cde24409e413d4d6da27953f6ab0bbae.jpg","Height":"100",
"Width":"66"},"Geocode":
{"Latitude":"49.284801","Longitude":"-123.120499","precision"
:"not available"},"Url":"http:\/\/travel.yahoo.com\/trip\/?
pid=351102&action=view"},

{"id":"400333","YahooID":"brdway_grl","Title":"Alaska","Summa
ry":"Things to do: Moose's Tooth Pub and Pizzer...
Restaurant: Orso, Simon's & Seafort's
Salo...","Destinations":"Anchorage","CreateDate":"1134676973"
,"Duration":"10","Image":{"Url":"http:\/\/us.i1.yimg.com\/
us.yimg.com\/i\/travel\/tg\/poi\/ca\/
100x1                    31d3093b94afa37e.jpg","Height":"75","
Width
{"La                    "Longitude":"-149.868484","precision"
:"no                    "http:\/\/travel.yahoo.com\/trip\/?
pid=400333&action=view"},
...
```

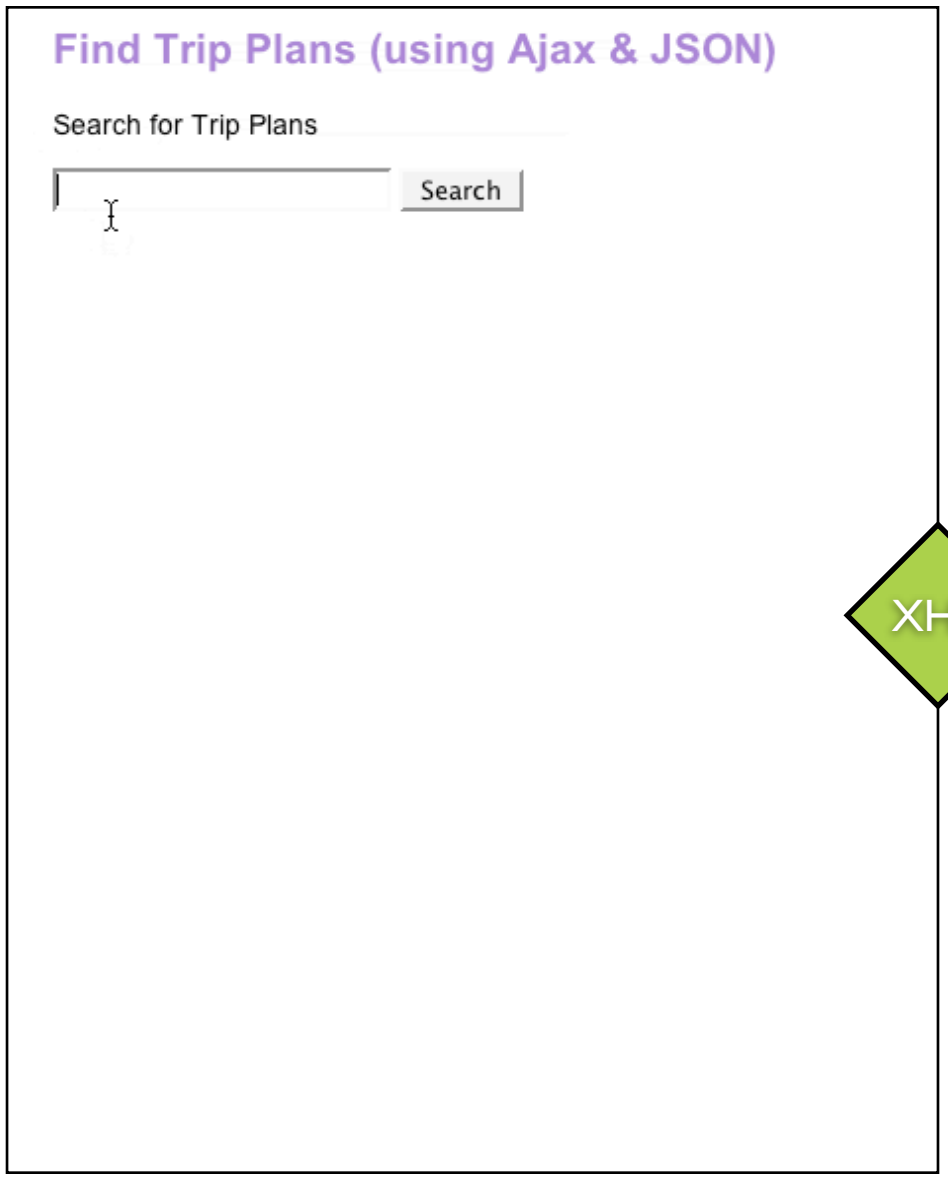



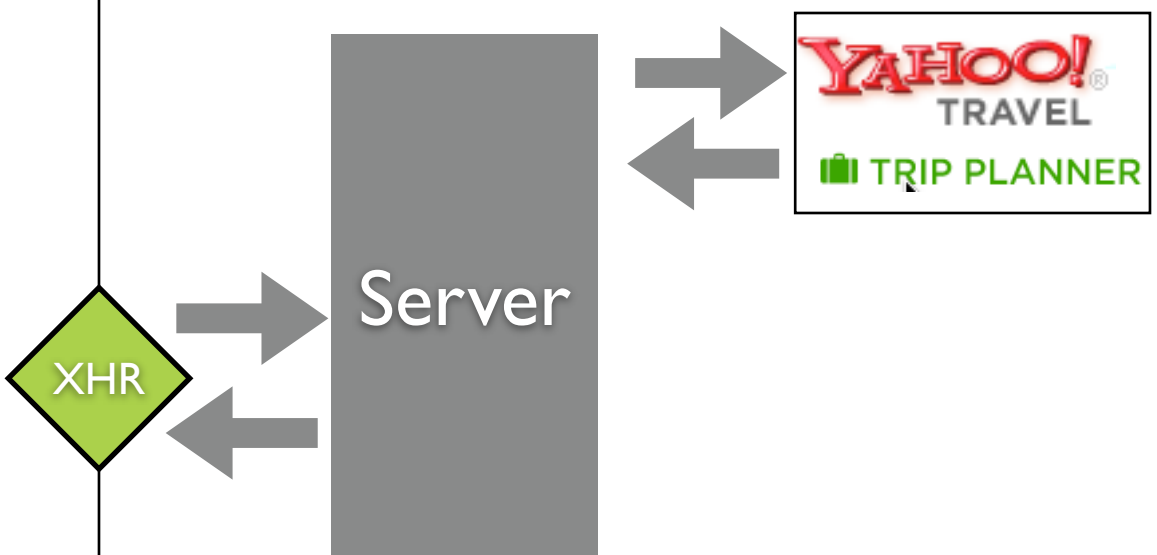
The Ajax/JSON Code

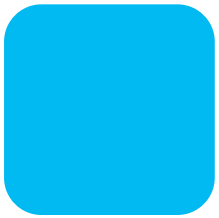
Ajax XHR

```
<script>
function showResponse() {
     if (xhr.readyState == 4) && (xhr.status == 200) {
          var helloArea = document.getElementById("helloArea");
          var theTrip = eval( '(' + xhr.responseText + ')' );
          var tripPlanHTML = "";
          for(var i=0; i<theTrip.ResultSet.totalResultsReturned; i++) {
               var result = theTrip.ResultSet.Result[i];
               tripPlanHTML = tripPlanHTML +
               '<div style="padding:4px;border:1px solid gray;width:'+
               result.Image.Width+
               ';"><img src="'+result.Image.Url+
               '" width="'+result.Image.Width+
               '" height="'+result.Image.Height+
               '"></img></div>'+
               '<div ><a href="'+result.Url+
               '"><span style="font-weight:bold;font-size:18px;">'+
               result.Title+'</span></a></div><div>'+
               result.Summary+'</div><br/>';
          }
          helloArea.innerHTML=tripPlanHTML;
     } else {
          alert('There was a problem with the request.');
     }
}
</script>
<h2>Find Trip Plans (using Ajax &amp;amp; JSON)</h2>
<p>Search for Trip Plans</p>
<input id="searchCriteria" type="text">
<input value="Search" type="button" onclick="makeRequest('response_trip_planner_mult_json.jsp',
                                                document.getElementById('searchCriteria').value)">
<div style="height:300px;width:420px;margin-top:8px;padding:8px;" id="helloArea"></div>
```

JSON Trip Finder







Trigger. JavaScript Events

Trigger. JavaScript Events

- Ajax interactions are kicked off by event & timer triggers
- There are issues with event management within the browsers
- You **do** need to understand these implications to write good Ajax applications

First, the Events

onAbort	onBlur
onChange	onClick
onDblClick	onDragDrop
onError	onFocus
onKeyDown	onKeyPress
onKeyUp	onLoad
onMouseDown	onMouseMove
onMouseOut	onMouseOver
onMouseUp	onMove
onReset	onResize
onSelect	onSubmit
onUnload	

Problem in a Nutshell

- Different event models
- Timing Issues
- Confusing madness around the **this** pointer
- Browser incompatibilities
- Memory leak issues

- Element Attributes
  - <element onclick="func()" >
- Element Properties (function reference)
  - element.onclick=func;
- Event Binding

Internet Explorer	Mozilla (FF), Safari, Opera [W3C]
attachEvent() detachEvent()	addEventListener() removeEventListener()

- Element Attributes

```
<a href="#" onclick="clickHandler(this)">
function clickHandler(anchorDOMElem) {
    // this == window --> window owns the function
    // anchorDOMElem was set to anchor DOM element
    this = anchorDOMElem; // fix this pointer
}
```

- Element Properties

```
myAnchor.onclick=clickHandler;
function clickHandler() {
    //this == anchorDOMElem --> anchorDOMElem owns the function
}
```

- Event Binding

```
function AnchorLink(anchorDOMElem) {
    this.anchorDOMElem = anchorDOMElem;
    this.anchorDOMElem.onclick = this.clickHandler;
    this.anchorDOMElem.anchorLinkObj = this;
}
AnchorLink.prototype.clickHandler = function() {
    // this == anchorDOMElem or window, not AnchorLink object
    // confusing since this normally refers to AnchorLink
    // grab our normal this
    anchorLinkObj = this.anchorLinkObj;
    anchorLinkObj.doIt();
}
AnchorLink.prototype.doIt = function() {
    // this == AnchorLink Object
}
```

JavaScript Events

- Standardizes event binding
  - Attach an event

```
var helloAreaDiv = document.getElementById("hello-area");
function handleClick(e) { alert("click"); }
YAHOO.util.Event.addListener(helloAreaDiv, "click", handleClick);
```

  - Attach multiple events

```
var ids = ["el1", "el2", "el3"]; // array can contain object references, element ids, or both
function handleClick(e) { alert(this.id); }
YAHOO.util.Event.addListener(ids, "click", handleClick);
```

- Handles automatic scope correction
  - By default "this" refers to the DOM element that the event was attached to
  - Can override scope

YUI Scope Correction

```
openItem: function () {
    // schoolId is set out here
    var oThis = this;
    YAHOO.util.Event.addListener
        // this == markerFlag
        var schoolItem = oThis.schoolList.getItem(schoolId);
        schoolItem.open();
        }/*noargs*/);
}
```

Automatic scope correction to target element

```
openItem: function () {
    // schoolId is set out here
    YAHOO.util.Event.addListener(markerFlag, 'click', function(e, oThis) {
        // this == markerFlag
        var schoolItem = oThis.schoolList.getItem(schoolId);
        schoolItem.open();
        }, this, false);
}
```

Pass in arbitrary object

```
openItem: function () {
    // schoolId is set out here
    YAHOO.util.Event.addListener(markerFlag, 'click', function(e) {
        // this == Container Object
        var schoolItem = this.schoolList.getItem(schoolId);
        schoolItem.open();
        }, this, true);
}
```

Override scope correction

- Memory Leaks
  - IE's garbage collection does simple reference counting
  - Attaching events and not removing them when finished will cause memory leaks
  - Can use an Observer style pattern to cache event handlers and at the end clean them up
- Timing
  - Attempting to attach events before the page is loaded will cause problems
  - Do it on the onload

JavaScript Events

- Automatic Listener Cleanup
- Custom Events
- getPageX, getPageY
- onAvailable. Define a function to execute as soon as an element is detected in the DOM (during load)

```
<script type="text/javascript">

function TestObj(id) { YAHOO.util.Event.onAvailable(id, this.handleOnAvailable, this); }

TestObj.prototype.handleOnAvailable = function(me) { alert(this.id + " is available"); }

var obj = new TestObj("myelementid"); </script>

<div id="myelementid">my element</div>
```

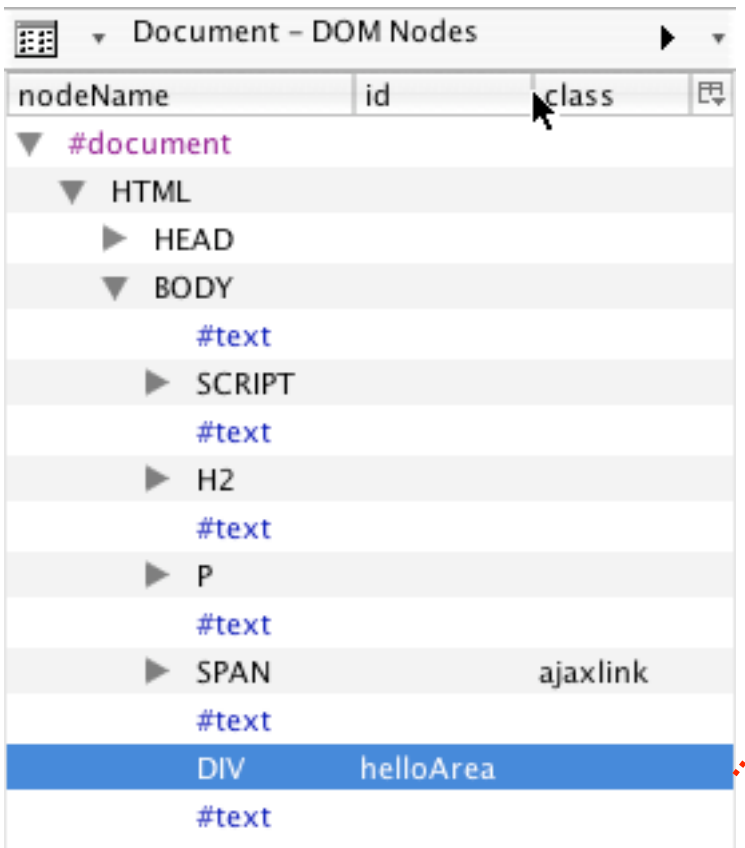
Update. The DOM

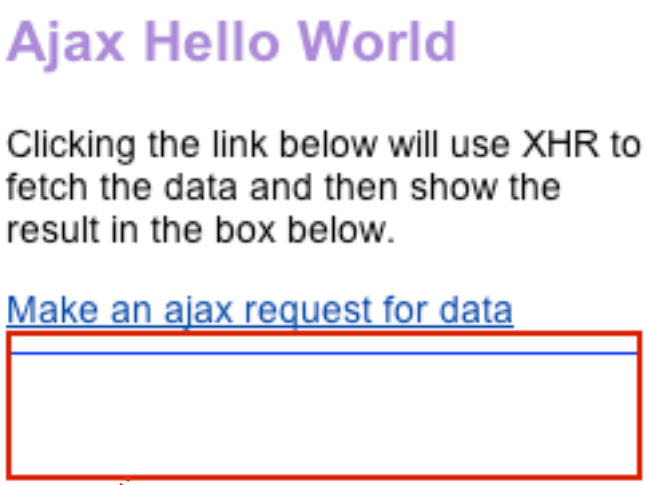
Update. The DOM

- Browsers represent the user interface as a set of objects (or elements)
- Since a page has a hierarchy of containment, each of these elements are related as parent-child or siblings
- This takes the shape of a tree
- The tree of elements is called the *document object model* or DOM. Specifically the Browser DOM.
- Any change to the DOM structure or a DOM element is reflected immediately on the web page

DOM Example

- Represented as a tree of nodes





Using the DOM

- Think of JavaScript as the DOM manipulator
- Use it to
  - Find DOM elements
  - Add new elements
  - Remove elements
  - Modify element attributes
    - Position elements
    - Style elements

Finding DOM Elements

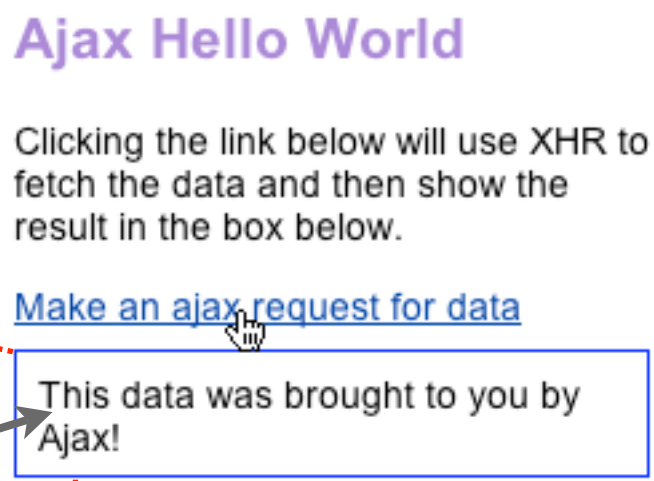
- document.getElementById
  - Prototype library shortcut: $("idName") or $(id)
  - Yahoo! library shortcuts:
    - YAHOO.util.Dom.get("idName")
    - getElementByClassName
- parentNode
- childNodes
  - Yahoo! library has ways to find ancestors

DOM Manipulation

- Creating new interface elements
  - innerHTML, createElement(), createTextNode(), appendChild()
- Changing element styles
  - Visual attributes
  - Geometry
- Y!UI positioning, region detection
- Y!UI classname & style normalization

DHTML
DOM

```
<h2>Ajax Hello World</h2>
<p>Clicking the link below will use XHR to fetch the data and
then show the result in the box below.</p>

<span class="ajaxlink" onclick="makeRequest('response.jsp')">
Make an ajax request for data
</span>

<div id="helloArea"></div>
```




```
var helloArea = document.getElementById("helloArea");
helloArea.innerHTML=rootNode.firstChild.data;
```

Advanced DOM Manipulation: Drag and Drop

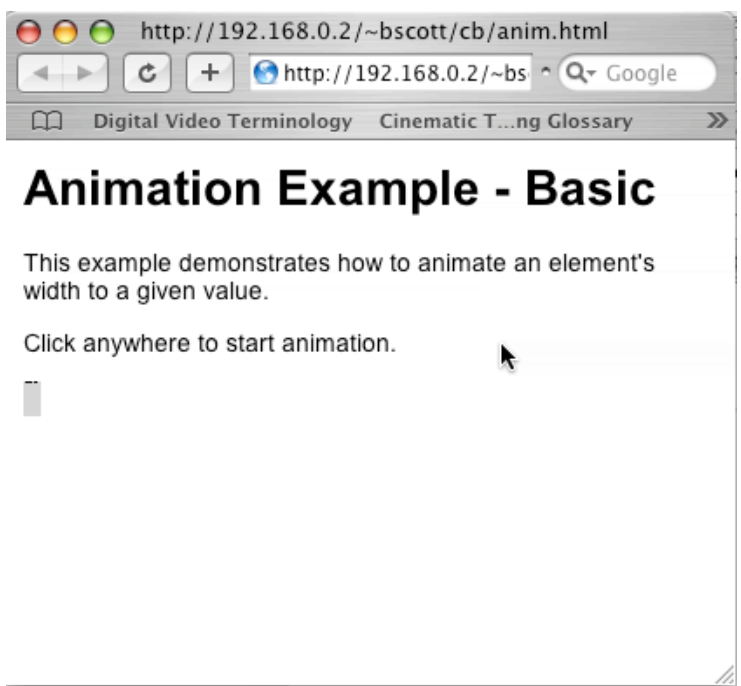
DHTML DOM

```
...
<script type="text/javascript">
YAHOO.example.DDApp = function() {
    var dd;
    return {
        init: function() {
            var dd = new YAHOO.util.DD("dragDiv");
        }
    }
} ();
YAHOO.util.Event.addListener(window, "load",
YAHOO.example.DDApp.init);
</script>

<style type="text/css">
#dragDiv {
    background:url(images/macosxlogo.gif) 0 0 no-repeat;
    height:100px;
    width:70px;
}
</style>
</head>

<body>
<h2>Drag and Drop</h2>
<p>The Mac logo is draggable</p>

<div id="dragDiv"></div>

</body>
...
```

Advanced DOM Manipulation: Animation

DHTML DOM

```
<html>
<head>
<style>
#anim { background:#ccc;width:10px;height:20px;font-size:10%;}
</style>
<script type="text/javascript">
YAHOO.namespace('example.anim');
YAHOO.example.anim.init = function() {
   var myAnim = new YAHOO.util.Anim('anim', {
                        width: {to: 200},
                        height: {to: 150},
                        fontSize: {from: 20, to: 120, unit: '%'},
                        opacity: {from: 0.25, to: 1.0 }},
                        1,
                        YAHOO.util.Easing.easeOut);
   var animate = function(e) {
      myAnim.animate();
      return false;
   }
   YAHOO.util.Event.addListener(document, 'click',
                                          animate);
}
YAHOO.util.Event.addListener(window, 'load',
                        YAHOO.example.anim.init);
</script>
</head>
<body>
<h1>Animation Example - Basic</h1>
<p>This example demonstrates how to animate
an element's width to a given value.</p>
<p>Click anywhere to start animation.</p>

<div id="anim">Lorem ipsum dolor</div>

</body>
</html>
```



Keeping it Clean

- Separate presentation style from content with CSS
  - Supports degradability
  - Supports accessibility
  - Simplifies maintenance
- http://www.mezzoblue.com/css/cribsheet/

DHTML
DOM

- Avoid these elements:
  - b, big, hr, i, small, sub, sup, tt
  - basefont, center, dir, font, isindex, menu, s, strike, u, tfoot
  - br is ok for content breaks; not layout
- Make your HTML meaningful
  - List structures as ul, li
  - Tree structures as nested ul, li
  - Containers as div
- Use css selectors (contextual)
  - Reduces the number of classes
  - Avoid inline styles
  -

Map Mashup Example

- Using Maps API to populate a search result from local search

Maps Mashup


```
<div>
     <input id="searchInput" type="text">
     <button id="searchButton" class="ygbt">Sear
</div>

<div class="gridCol4 map">
     <div id="map-container"></div>
</div>
```

```
schoolMap.ymap = new YMap(document.getElementById('map-container'));
schoolMap.ymap.drawZoomAndCenter("94117", schoolMap.zoomLevel);
// map event captures
YEvent.Capture(schoolMap.ymap, EventsList.changeZoom, schoolMap.updateMap);
YEvent.Capture(schoolMap.ymap, EventsList.endPan, schoolMap.updateMap);
YEvent.Capture(schoolMap.ymap, EventsList.endAutoPan, schoolMap.updateMap);
YEvent.Capture(schoolMap.ymap, EventsList.endMapDraw, schoolMap.updateMap);

schoolMap.ymap.disableKeyControls();
schoolMap.schoolList = new YAHOO.teacher_net.SchoolList('school-list');
YAHOO.util.Event.addListener("searchInput", 'keypress', schoolMap.searchWithEnterKey);
YAHOO.util.Event.addListener("searchButton", 'click', schoolMap.searchLocation);
```

Map created, events set up to update map, search event configured

Making Request for Local Search Via Connection Manager

```
fetchSchools: function() {
     var centerLatLon = thi                    lon();
     var unitsPerPixel = t                     xel();
     var outerRadius = this                    );

     var latitude = centerLatLon.Lat;
     var longitude = centerLatLon.Lon;
     var radius = outerRadius * unitsPerPixel.miles;

     // Run through a simple php page proxy to get the data outside yahoo domain.
     var sUrl = "ajax/ajaxProxy.php?appid="+this.appid+
                         "&query="+this.query+
                         "&category="+this.category+
                         "&latitude="+latitude+
                         "&longitude="+longitude+
                         "&radius="+radius+
                         "&results="+this.results+
                         "&sort="+this.sort+
                         "&output=json";

     // Start the ajax transaction.
     var request = YAHOO.util.Connect.asyncRequest('GET', sUrl, {
          success:this.buildMarkers,
          failure:this.handleFailure,
          scope:this
     }, null);
},
```

Called by Search, Update

Create URL for local search API. Returns JSON.

Ajax call via YUI Connection Manager. Calls buildMarkers()

JSON Returned


```
{"ResultSet":{
"totalResultsAvailable":"207","totalResultsReturned":"20","firstResultPosition":"1","ResultSetMapUrl":"ht
\/\/local.yahoo.com\/mapview?stx=school&radius=4.759164500316&ed=06LvHa131DwCvYm93rvCDpEViPaxw2YYIc_1eQb
"Result":[

{"id":"21358647","Title":"William De Avila Elementary School","Address":"1351 Haight St","City":"San
Francisco","State":"CA","Phone":"(415) 241-6325","Latitude":"37.770162","Longitude":"-122.444543","Rating
{"AverageRating":"1","TotalRatings":"1","TotalReviews":"0","LastReviewDate":"","LastReviewIntro":""},"Dis
ce":"0.12","Url":"http:\/\/local.yahoo.com\/details?id=21358647&stx=school&csz=San+Francisco
+CA&ed=pcDSr6160SztFnD2q5vz7zFoy7Vvdme2t2cipDu09HUbifjdiG8NPxnRQKJe78oS0anj0Jgp","ClickUrl":"http:\/\/
local.yahoo.com\/details?id=21358647&stx=school&csz=San+Francisco
+CA&ed=pcDSr6160SztFnD2q5vz7zFoy7Vvdme2t2cipDu09HUbifjdiG8NPxnRQKJe78oS0anj0Jgp","MapUrl":"http:\/\/
maps.yahoo.com\/maps_result?name=William+De+Avila+Elementary+School&desc=4152416325&csz=San+Francisco
+CA&qty=9&cs=9&ed=pcDSr6160SztFnD2q5vz7zFoy7Vvdme2t2cipDu09HUbifjdiG8NPxnRQKJe78oS0anj0Jgp&gid1=21358647"
usinessUrl":"http:\/\/sfusd.edu\/","BusinessClickUrl":"http:\/\/sfusd.edu\/","Categories":{"Category":
[{"id":"96928445","content":"Elementary Schools"},{"id":"96928448","content":"High Schools"},
{"id":"96928449","content":"School Districts"}]}}

MORE RESULTS FOLLOW...
```

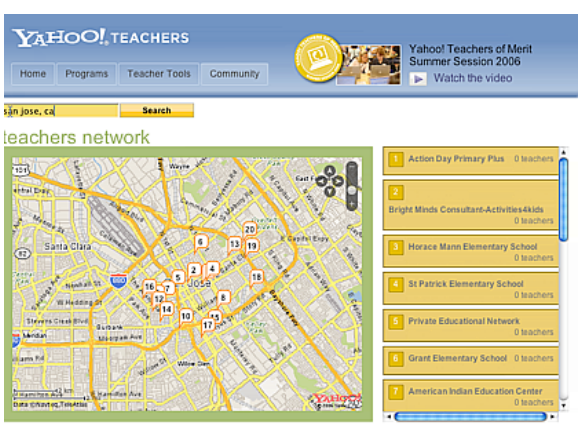

Local Search Response in JSON

Making Request for Local Search Via Connection Manager

```
buildMarkers: function(o) {
     var JSONObject = eval('(' + o.responseText + ')');
     var totalResults = JSONObject.ResultSet.totalResultsReturned;

     for (var i = 0; i < JSONObject.ResultSet.totalResultsReturned; i++
          var school = JSONObject.ResultSet.Result[i];
          var markerLoc = new YGeoPoint(school.Latitude, school.Longitude

          var myImage = new YImage();
          myImage.src = 'http://us.i1.yimg.com/us.yimg.com/i/us/map/gr/map_mrkr_orng.gif';
          myImage.size = new YSize(21,32);
          myImage.offsetSmartWindow = new YCoordPoint(0,0);
          var marker = new YMarker(markerLoc, myImage);
          marker.addLabel('<div style="padding-top:4px;">' + (i+1) + '</div>');
          addopenMarkerWinListener(marker, school.id);

          this.ymap.addOverlay(marker);

          this.markerInfo[school.id] = {marker:marker, school:sch
          addOpenMapItemListener(marker, school.id);
     }
}
```

Convert JSON response to JavaScript object

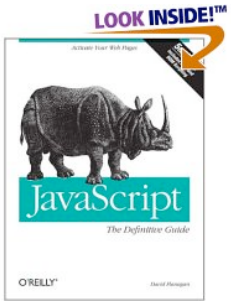
For each search result item, create map markers, etc.



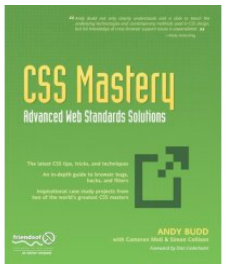
DHTML
DOM

- Jeremy Keith's Dom Scripting

- Definitive Guide JavaScript Fifth Edition



- Mastering CSS
-



Developing for Ajax
Advanced Topics

Problems and Challenges with Building Ajax Applications

Bill W. Scott, Y! Ajax Evangelist

bscott@yahoo-inc.com

How Ajax Changes Things

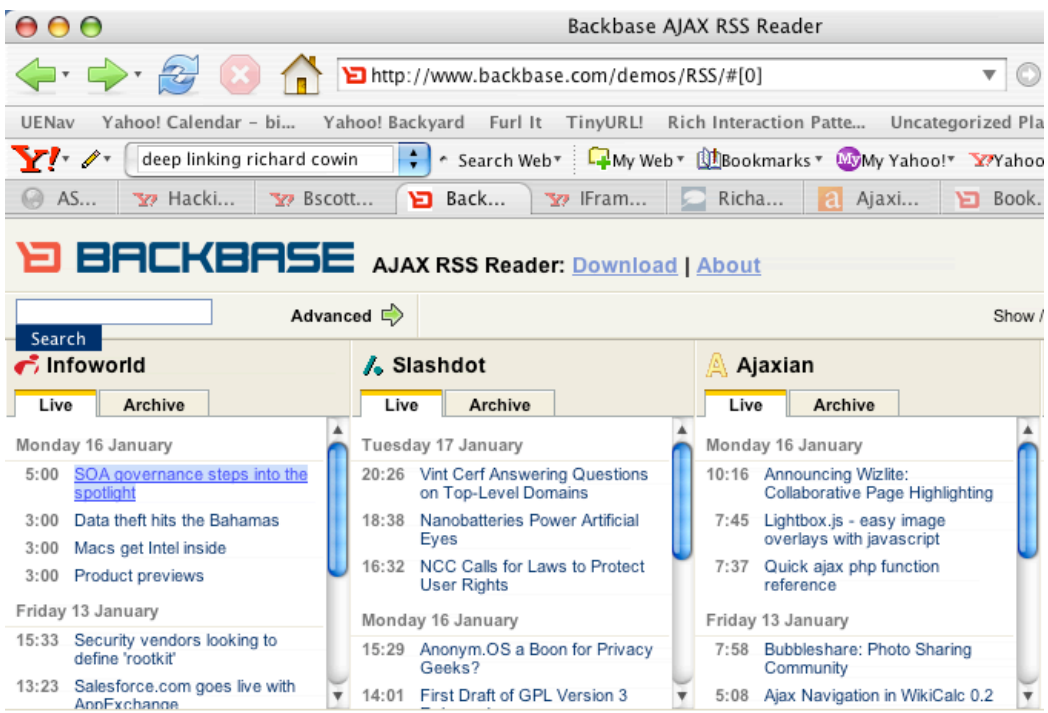
Classic Web	Ajax/Web 2.0	Problems/
Page to page navigation	Micro content	Back button, SEO, bookmarking, accessibility, security
URL/Link = User's location	Application state	Back button, SEO, bookmarking, accessibility
Browser history	Application history	Back button, bookmarking, accessibility
Back button = Undo	Is unpredictable	Back button, bookmarking, accessibility
Little JavaScript	More JavaScript	Accessibility, degradability, security, memory, performance, debug, obsfucation, error handling
Document model	Application model	Back button, SEO, bookmarking, accessibility
Static content	Dynamic content	SEO, bookmarking, accessibility
Course-grained events	Micro states	Back button
Synchronous	Asynchronous	Error handling
Browser chrome	Application controls	Back button, bookmarking, accessibility
Page Services	Web Services	Security, XML vs. JSON

Back Button

- Problem: Ajax application state changes, URL does not. No browser history of state changes/navigation
- What does the user expect?
  - Often confused with Undo
  - True context view changes should be part of history
    - Navigation tabs; but not content tabs?
    - Steps in a process
    - Tree selection when views change
  - Impact of tabbed browsers?

Back Button Solution: Fragment Identifier

- URL hash, fragment identifier (`http://a.com#loc`) does not trigger a page reload
- Fragment identifier (string after '#') can be used to record state changes in the URL



- Yahoo! Maps Beta also uses this technique
- Bottom line: tricky to implement
  - Dojo, Backbase provide direct support
  - One approach: http://www.contentwithstyle.co.uk/Articles/38/fixing-the-back-button-and-enabling-bookmarking-for-ajax-apps
    - All links have fragment
    - Clicking link changes URL, not page
    - Timer monitors window.location.href & updates
  - RSH - Really Simple History.

    http://www.onjava.com/pub/a/onjava/2005/10/26/ajax-handling-bookmarks-and-back-button.html

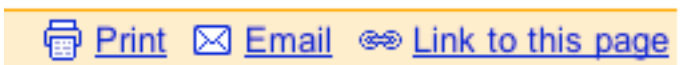
- Julien Lecomte has solution
  - Works on all A-Grade browsers except Safari 2.0.
  - However, it does work on WebKit nightly builds
  - We are working with Apple to ensure this technique will work with Safari in the future
- You can find information here:
  - http://produce.yahoo.com/~jlecomte/browser_history/test.html
  - http://produce.yahoo.com/~jlecomte/browser_history/brwhist.js
  - jlecomte@yahoo-inc.com

Bookmarking

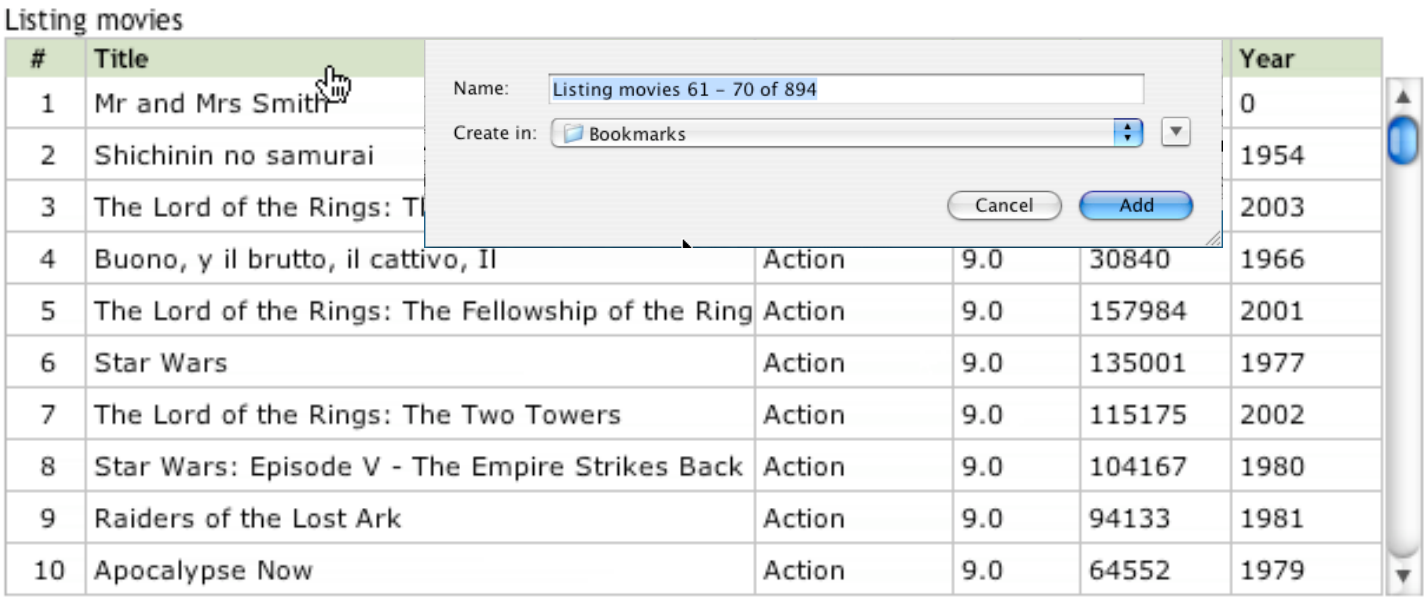
- Since we have broken the history and URL paradigm, bookmarking become problematic
- What does the user expect?
  - Do they expect to bookmark application state? content viewed?
  - Desktop apps often support bookmarking. It is always content based.

- Allow the user to save a bookmark at an interesting moment in an Ajax application
- Perhaps dynamically generate a link for bookmarking
- The URL generated for the bookmark is sufficient to restore the state

- Google Maps
  - Link is generated on each new map address
  - Link contains URL parameters to return to the page



- OpenRico LiveGrid
  http://richardcowin.typepad.com/blog/2005/07/there_has_been_.html



#	Title				Year
1	Mr and Mrs Smith				0
2	Shichinin no samurai				1954
3	The Lord of the Rings: T				2003
4	Buono, y il brutto, il cattivo, Il	Action	9.0	30840	1966
5	The Lord of the Rings: The Fellowship of the Ring	Action	9.0	157984	2001
6	Star Wars	Action	9.0	135001	1977
7	The Lord of the Rings: The Two Towers	Action	9.0	115175	2002
8	Star Wars: Episode V - The Empire Strikes Back	Action	9.0	104167	1980
9	Raiders of the Lost Ark	Action	9.0	94133	1981
10	Apocalypse Now	Action	9.0	64552	1979

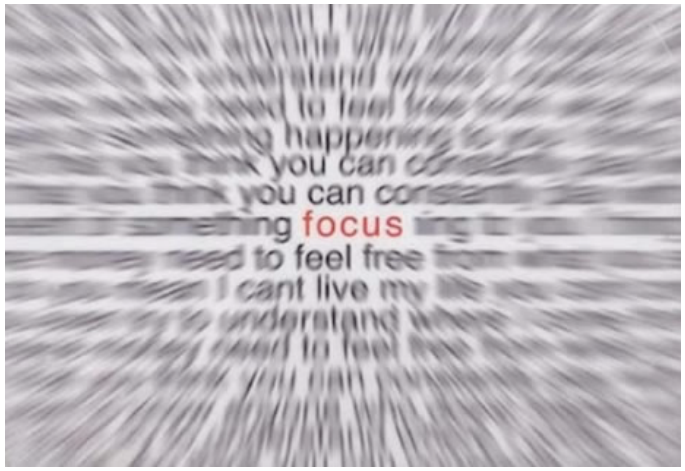
```
http://openrico.org/rico/livegrid.page?
data_grid_index=60&data_grid_sort_col=rating&data_grid_sort_dir=ASC
```

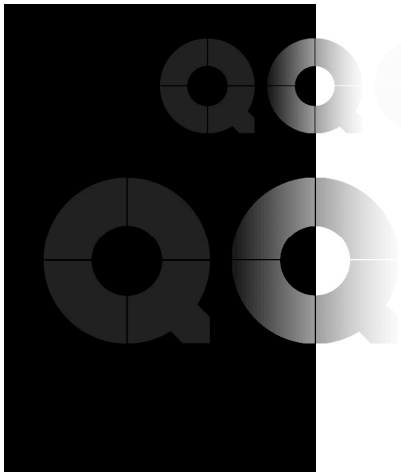
Search Engine Optimization

- With Ajax the content may not be statically available for search engine crawlers
- Provide alternate URLs (href, dynamic onclick gen)
- Strive for "addressable URLs"
- Accessibility of content & proper structure get you a long way toward SEO
- Meta Data for SEO is different than for assistive technology

source: backbase.com

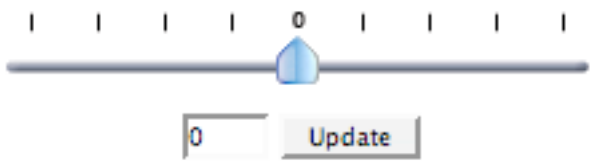
Accessibility





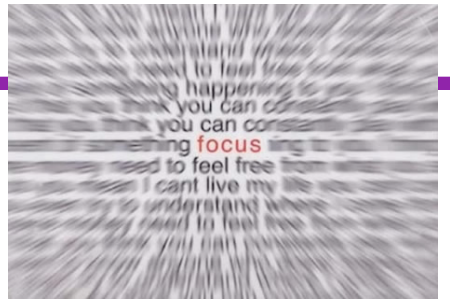
DHTML Provides	Accessibility Expects	Problem
JavaScript enabled markup, new user interface controls	Simple markup	Markup has more meaning than expected. How does the assistive technology understand this is a tree control? How does it understand the state of a control?
Dynamic pages & content	Fairly static pages	How do I announce dynamic content?
Weak support for keyboard navigation	Keyboard navigation	Sight-impaired users will not be using rich interactions; they will use the keyboard (or another device that simulates the keyboard) But how to tab key, arrow key, select items with the keyboard?

- Slider Example
  - Keyboard navigation (arrow keys)
  - Type in value



- IBM/Mozilla Accessible DHTML API/Spec
  - Direct support for keyboard traversal
    - Supports tab key to a container, arrow keys to navigate inside the container and enter key to select item
    - Setting tabindex=-1 allows focus to be set on a object without it being in the tab order
  - A way to add metadata to HTML markup for assistive technologies to understand:
    - Widget roles, properties, values and events
  - Working with assistive technology vendors to make them aware of this API (funded development)

http://www.mozilla.org/access/
http://developer.mozilla.org/en/docs/Accessible_DHTML

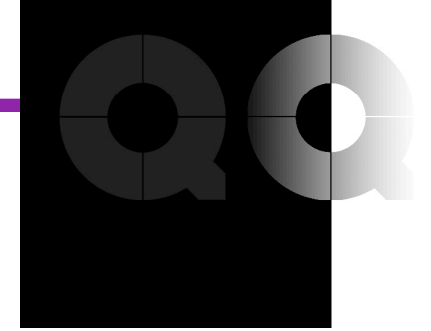


- Simple, set it!
  - Especially important for low visibility users that employ screen magnifiers
  - But important for small devices as well

- Roles

```
<span tabindex="0" xhtml2:role="wairole:checkbox"
      property:checked="true"
      onkeydown="return checkBoxEvent(event);"
      onclick="return checkBoxEvent(event);">
  Any checkbox label
</span>
```

- Provides clues to assistive technologies



- Don’t be cute, be clear

Progressive Enhancement

- Degradability - Managing the user experience as you move down in device/browser capability
- At Yahoo! we grade the browser by experience we will provide (A, B, X grade)
  - A-grade experience (majority of our users; greatest visual fidelity and richest interactions
  - B-grade experience (almost A-grade, but either they are on bleeding edge, low adoption or low economic value). Not considered in development or testing
  - X-grade experience (baseline of support; content but little style or interaction). Crawlers and old browsers get this experience.

Graded Browser Support @ Yahoo!

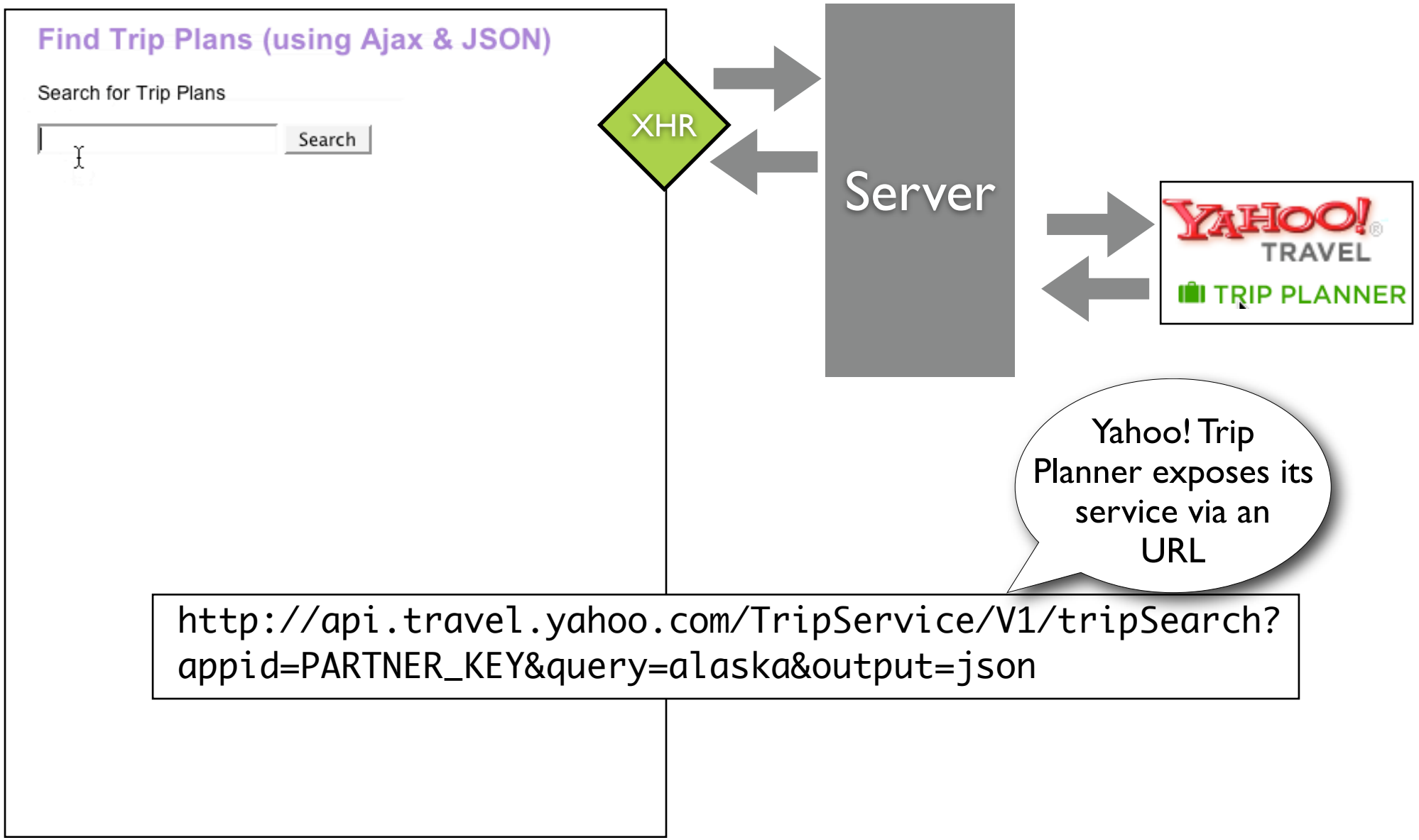
	Win 98	Win 2000	Win XP	Mac 10.0	Mac 10.2	Mac 10.3	Mac 10.3.x	Mac 10.4
IE 7.0	n/a	n/a	A-grade	n/a	n/a	n/a	n/a	n/a
IE 6.0	A-grade	A-grade	A-grade	n/a	n/a	n/a	n/a	n/a
IE 5.5	A-grade	A-grade	n/a	n/a	n/a	n/a	n/a	n/a
IE 5.0	C-grade	C-grade	n/a	C-grade	C-grade	C-grade	C-grade	C-grade
Netscape 8.0	X-grade	X-grade	A-grade	n/a	n/a	n/a	n/a	n/a
Firefox 1.5	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade
Firefox 1.0.7	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade	A-grade
Mozilla 1.7.12	X-grade	X-grade	A-grade	X-grade	X-grade	X-grade	X-grade	X-grade
Opera 8.5	X-grade	X-grade	A-grade	C-grade	C-grade	C-grade	X-grade	X-grade
Safari 1.0	n/a	n/a	n/a	X-grade	n/a	n/a	n/a	n/a
Safari 1.1	n/a	n/a	n/a	X-grade	X-grade	n/a	n/a	n/a
Safari 1.2	n/a	n/a	n/a	X-grade	X-grade	X-grade	n/a	n/a
Safari 1.3	n/a	n/a	n/a	n/a	n/a	X-grade	A-grade	n/a
Safari 2.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	A-grade

- Pre-emptive nag bar
- Semantic Markup
  - What's good for accessibility is good for degradability
- Design Issues
  - What is the experience for C-grade browsers?
  - What is the experience for non-browsers?

Web Services

- Web 2.0 - Web as a Platform. Lots of web services!
- YAHOO! DEVELOPER NETWORK
  - del.icio.us, Finance, flickr, HotJobs,
    Maps, Merchant Solutions, Music, Design Patterns, RSS Feeds, Search, Search Marketing,
    Shopping, Travel, Traffic, upcoming.org, UI library, weather, webjay,
    widgets, JS Developer Center, PHP Developer Center, etc.
- Google™ Google Web APIs (beta)
  - maps, search, desktop, sitemaps,
    adwords, finance, calendar

Web Services Example



Security: Same Site Rule

- The domain of the URL request destination must be same as one that serves up page containing script
- Why? XHR requests to a different site would carry cookies. Cookies would spoof authentication.
- Solutions
  - Proxies
  - <script> hack
  - Other remote scripting tricks
  - JSONRequest (coming)

Cross Site Scripting

- Script Hack
  - Takes advantage of most web services employ GET
  - <script> tags can be generated dynamically
  - The <script> tag can point to any domain
  - Web services can return JSON
  - JSON can be returned to a callback

- I want to access multiple services (from different domains) without setting up a separate server (scalable, simpler to implement)
- Solution: Protocol that POSTs JSON text, gets response, parses the response into JavaScript value
  - No cookies sent
  - No other file formats accepted. Must be valid JS
  - JSON is safe JavaScript (data not functions)
  - Little or no error information provided to a miscreant
  - Accumulates random delays before trying again to frustrate denial of service attacks
  - Can support duplex!

- Another approach
  - iFrames are too restrictive.
  - Sometimes you want to sandbox JS but allow communication without exposing cookies, etc.
  - <module> tag proposed by Doug Crockford
- However, in HTML5 there is a way to do this with CrossDomain Messaging
  - http://virtuelvis.com/archives/2005/12/cross-document-messaging
  - http://whatwg.org/specs/web-apps/current-work/#crossDocumentMessages
  - Currently implemented in latest version of Opera 9

- Set up Sender

```
function sendMessage(val){
  var receiver = document.getElementsByTagName("iframe")[0].contentDocument;
  receiver.postMessage(val);
}
```

- Handle event (message) in receiver

```
document.addEventListener('message',
     function(ev) {
          var output = document.getElementsByTagName("textarea")[0];
          output.value += "Message from domain "+ev.domain+" and URI "+ev.uri+":\n";
          output.value += ev.data+"\n\n";
          parent = ev.source;
          var d = new Date();
          ev.source.postMessage("The document at "+location.href+" received your message at "+d);
          setTimeout(delayedResponse,2500,ev.source);
     }, false);
```

Memory Management

- Hey, Internet Explorer is leaky!
  - Its memory garbage collector is the culprit
    - Uses reference counting; JS uses Mark & Sweep
    - Often closures are blamed
- Common problem that causes memory leaks
  - DOM <--> Application object reference each other
  - Event handlers left hanging around
- Tool for IE: Drip

JavaScript Performance

- JavaScript requires common sense
  - Cache repeatedly accessed objects
  - Always use var for local variables
  - Use numbers for number and strings for strings
  - Avoid using eval() for accessing properties
    eval("obj."+propName) --> obj[propName]
  - Look to your loops
- And a few surprises
  - Build DOM trees downward
  - Use array.join for lengthy string concatenation

source: Adam Platti

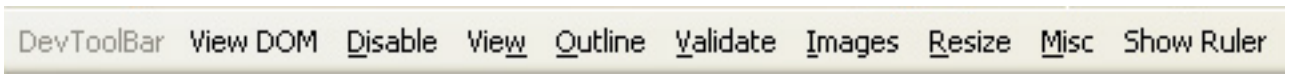
Performance

- Reduce Roundtrips
  - For YUI use the utilities.js file on akamai instead of individual js files
    - http://us.js2.yimg.com/us.js.yimg.com/lib/common/utils/2/utilities_2.1.1.js
  - Not JavaScript, but use image sprites to reduce image transfers
    - http://www.alistapart.com/articles/sprites
- Use YSlow! and Steve Souder's Performance Tips

source: Adam Platti

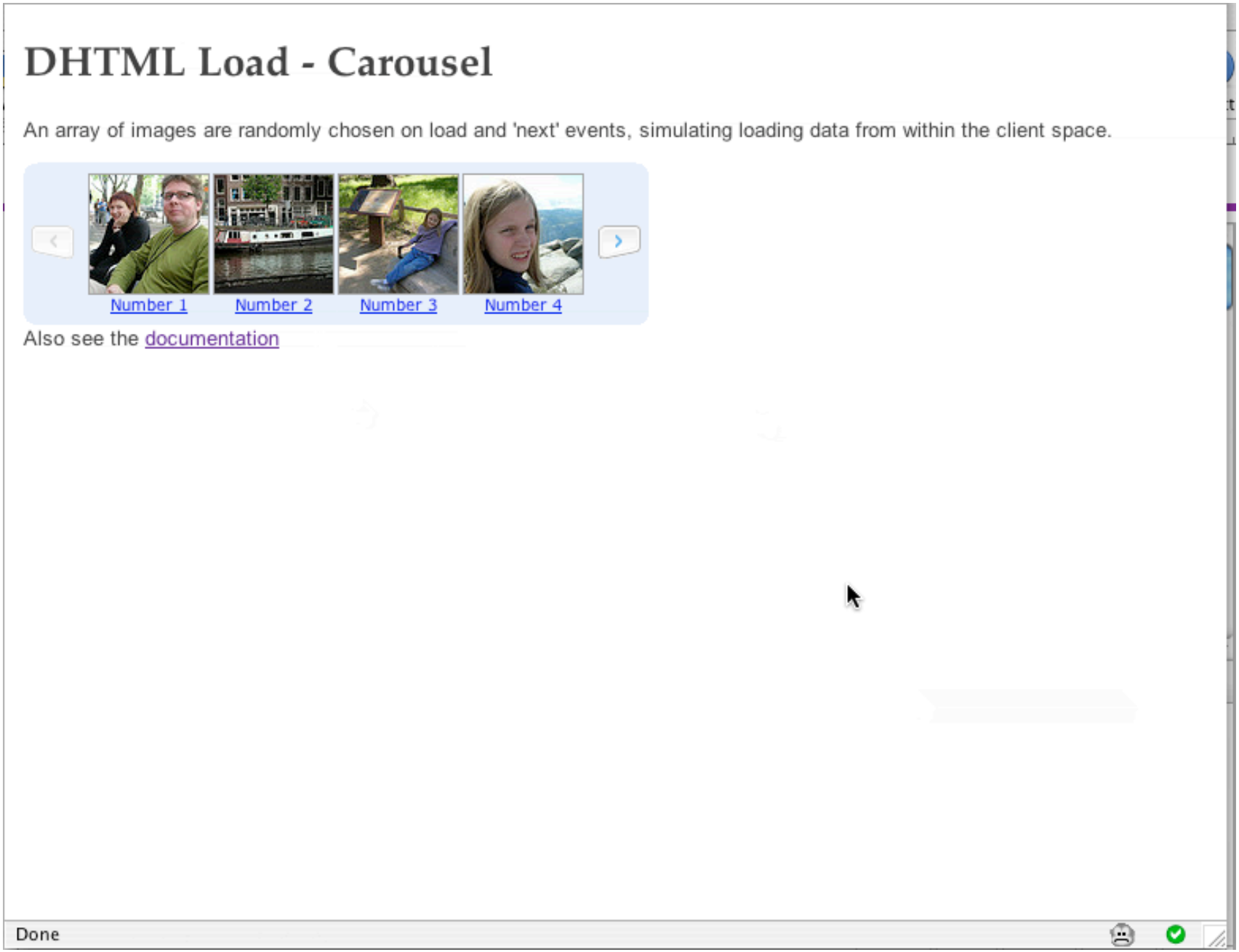
Debugging Tools

- Microsoft Script Editor
- Instant Source (IE Plugin)
- IE Dev Toolbar



- Venkman (Mozilla)
- Firebug (Mozilla)
- DOM Inspector (Mozilla)
- Web Developer Tools (Mozilla)
- Safari JavaScript Console
- JSLint

Debugging: Firebug



- Great new features
  - Profiling
  - Visualization of Box Model with direct editing
  - CSS inheritance clearly shown at runtime (strikethroughs)
  - Directly edit HTML & CSS at runtime
  - Hidden HTML is represented as slightly dimmed
  - Debug in separate window option

- Lint are syntax checkers and validators
- JavaScript needs lint
- http://www.crockford.com/jslint/lint.html
- Scans source file & looks for common syntax problems
  - Nice way to catch silly mistakes
  - Try it at: http://jslint.com

Obsfucation or Minification

- JavaScript is easy to see with a Save or a <ctrl>-U
- JavaScript can increase page size & page load
  - Obsfucators mangle the code into unreadable form
  - Minifiers strip white space & comments
- Obsfucators go too far
  - Makes development way too hard
- Minification & compression do just enough
  - JSMin (http://www.crockford.com/javascript/jsmin.html)

CSS Minification

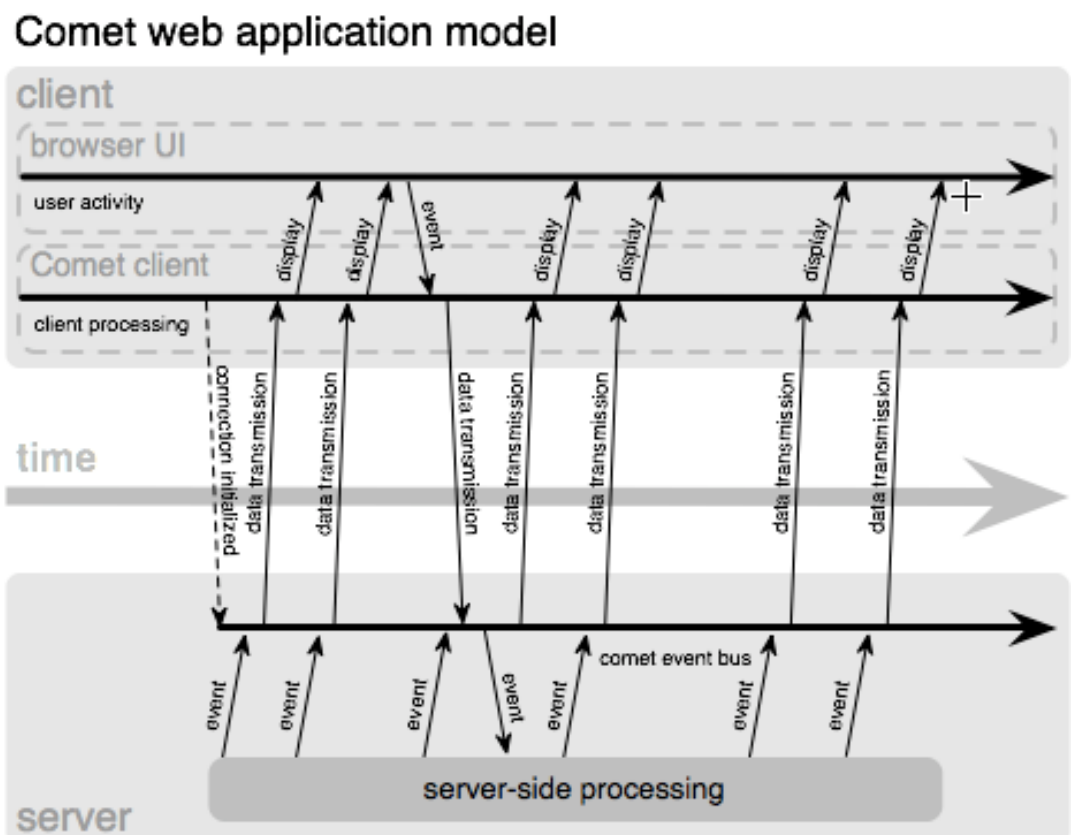
- Julien Lecomte has created a CSS minification solution that works across all browsers
  - http://rideother.corp.yahoo.com/dev/cssmin/cssmin.php
  - http://rideother.corp.yahoo.com/dev/cssmin/sample.css
  - yinst package coming (if not already available)

Error Handling

- Asynchronous error handling
  - Keep design simple (do you need multiple requests going at once?)
  - Will increase implementation issues
- Normal error handling
  - Check for error codes (!=200)
  - Roll your own HTTP status error codes
- Minimize server-side errors with intentional validation (error prevention)

Comet

- Can deliver data to client any time
  - Delivered over single, previously opened connection
- Example applications
  - gmail's GTalk integration
  - Jot Live
  - Renkoo
  - Meebo



What about Flash?

- Adobe Flash/JS Bridge (finance.google.com)
- Adobe Flex/Ajax Bridge (9.0)
- Flash sites (maps.yahoo.com/beta)
- Flex: 2.0 is serious environment (Flash 8.5; free)
- Laszlo: Generates either Flash or DHTML/Ajax
- Communication Bridge
- Storage Mechanism
- Event Extender
- Rich Media Extender (sound, video, streaming)

Questions?