

# Web Services Bootcamp

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# A quick look ahead...

- An overview of the different web services protocols
- Wading through the acronym soup and major terms associated with web services
- Walkthrough of the code that makes it happen
- Code lab

# Questions?

- Ask anytime during the presentation
- This can be heady stuff

# Getting to know you

- About us
- About you
  - Who knows XML?
  - Who knows javascript and DOM?
  - Who knows PHP?
  - Goals for workshop?

# What is a mashup?

- A web application that uses and/or combines data from multiple sources within a single tool

# Why use Mashups?

- Access to content/data stores you could not otherwise provide (zip codes, news, pictures, reviews, etc.)
- Enhance site with a service that is not feasible for you to provide (maps, search, products, etc.)
- Combine these services into a seamless service you provide (mash-ups)

# Mashup Examples

- [www.housingmaps.com/](http://www.housingmaps.com/)
- [www.lib.montana.edu/beta/bookme/](http://www.lib.montana.edu/beta/bookme/)
- [www.DistancesCalculator.com](http://www DistancesCalculator.com)



City: 
 Price: 
[Show Filters](#)
[Refresh](#)
[Link](#)



pics	price	bd	description	date
	\$1600	2bd	<a href="#">2 BR/1 BA Apartment With A In-Law Unit Available For Rent</a>	10/23
	\$1950	1bd	<a href="#">Marina -1 bedroom-showing today 11-12 noon-pets ok!</a>	10/23
	\$1595	1bd	<a href="#">Sunny In-Law Unit</a>	10/23
	\$1600	1bd	<a href="#">Spotless Apt. Good Location, open Sat. &amp; Sun. 1:00-2:30</a>	10/22
	\$1900	2bd	<a href="#">Two Bedrooms &amp; Garage</a>	10/22
	\$1790	2bd	<a href="#">Bungalo Apartment, Quiet, Private</a>	10/22
	\$1750	2bd	<a href="#">Showing Sun 10/24: Charming 2bdrm/1bath Unit with Washer!</a>	10/22
	\$1550	1bd	<a href="#">Charming Jr. 1 BR In Great Location (laurel hts / presidio)</a>	10/22
	\$1845	2bd	<a href="#">2 bedrm apt. in nice area (18th ave.)</a>	10/22
	\$1895		<a href="#">massive, Huge Closets. Great Floor Plan! Call Now</a>	10/22
	\$1550	1bd	<a href="#">Spacious 1 BR: Open living room- kitchen: Hardwoods: Walk to Downtown</a>	10/22
	\$1800	2bd	<a href="#">8th/Fulton; next to Gg Park, near Usf, Parking included</a>	10/22
	\$1500	1bd	<a href="#">1 Bedroom 1 Bath</a>	10/22
	\$1800		<a href="#">2 Bed, 2 BA Ingleside near Bart</a>	10/22
	\$1950	2bd	<a href="#">Open Sat 11-1pm. New Remodeled Kitchen,</a>	10/22
	\$1800	2bd	<a href="#">2Bd/1BR, newly renovated</a>	10/22
	\$1700	1bd	<a href="#">Beautiful Total Remodel New Kitchen, bath, hardwood floors, garage.</a>	10/22
	\$1800		<a href="#">ground floor office, warehouse, art studio or ?</a>	10/22
	\$1600	1bd	<a href="#">Large Sunny 11 Win, 3 Clos Cath Hill*Open Sun 3:30-4*</a>	10/22
	\$1750	1bd	<a href="#">Stylish! New! Remodeled! View! *Excellent Location!*Near Bart*</a>	10/22
	\$2000		<a href="#">Studio, Doorman, Garage, Pool, Healthclub, Noh Hill</a>	10/22



# Distance from Redstone, MT to Coffee Creek, MT

**258.01 mi**

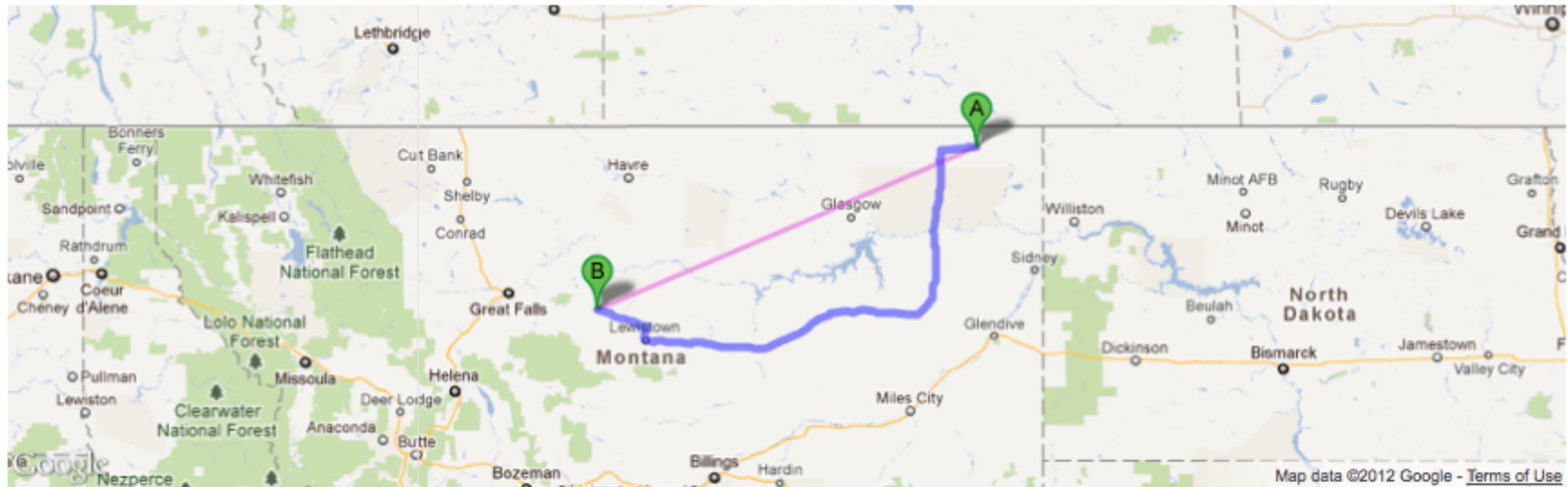
Straight Distance

**362 mi**

Driving Distance

**6 hours 44 mins**

Estimated Driving Time



The straight distance between Redstone, MT and Coffee Creek, MT is **258.01 mi**, but the driving distance is **362 mi**.

It takes **6 hours 44 mins** to go from Redstone, Montana to Coffee Creek, Montana.

## Redstone, Montana

Latitude: 48.8217 // Longitude: -104.944

## Photos of Redstone, MT



## Redstone, MT Weather



**Mon**  
25° F - 57° F  
Chance of Rain

## Coffee Creek, Montana

Latitude: 47.3478 // Longitude: -110.082

## Photos of Coffee Creek, MT



## Coffee Creek, MT Weather



**Mon**  
19° F - 36° F  
Snow

# Available Web Services

- Google
- Yahoo!
- Amazon
- eBay
- Flickr
- del.icio.us?
- AllCDCovers.com
- [ISBNdb.com](#)
- [OpenDOAR](#)
- [arXiv.org](#)
- [Freebase](#)
- [Google Book Search APIs](#)
- [LibraryThing APIs](#)
- [WorldCat Search API](#)
- [Open Library API](#)

# Possible Types Of Data


- Bibliographic Data
- Book Covers
- Digital Library metadata and objects
- Reviews
- Ratings
- Library Information
- Map Data

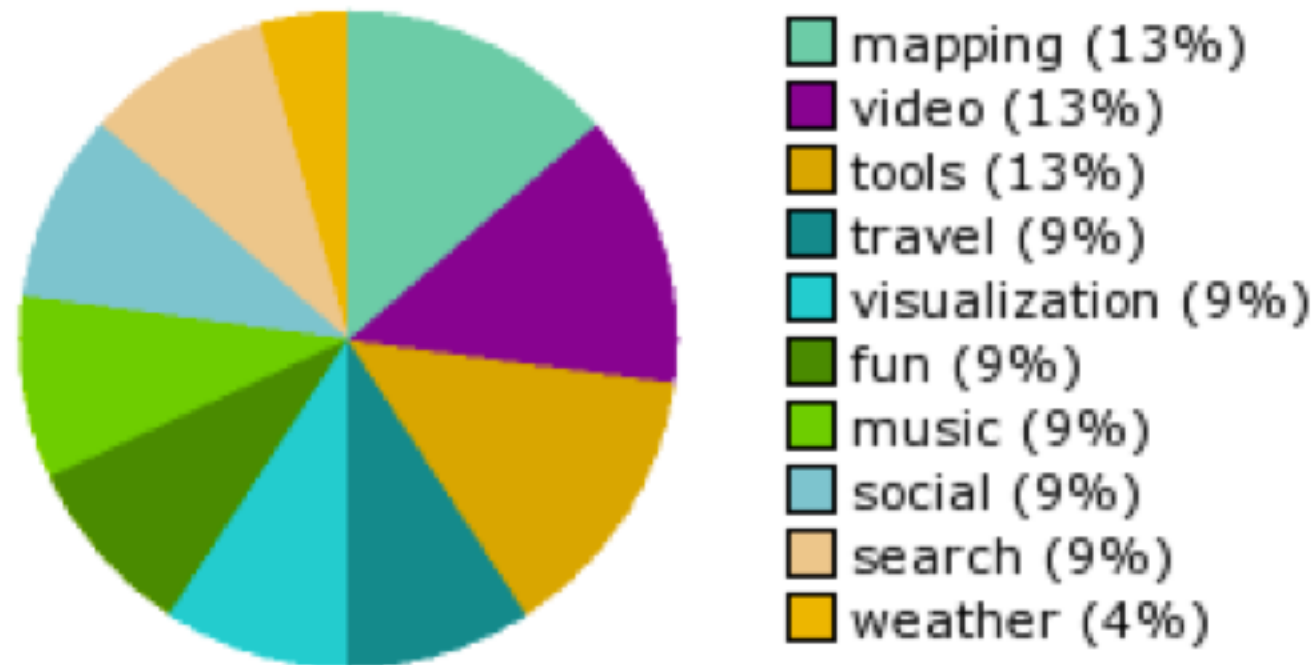
# Top Mashup Types - recent

## Top Mashup Tags

Last 14 days

See all time

Click on a slice or label to see details || Or see the whole  [Mashup Tag Cloud](#)




ProgrammableWeb.com 04/10/13

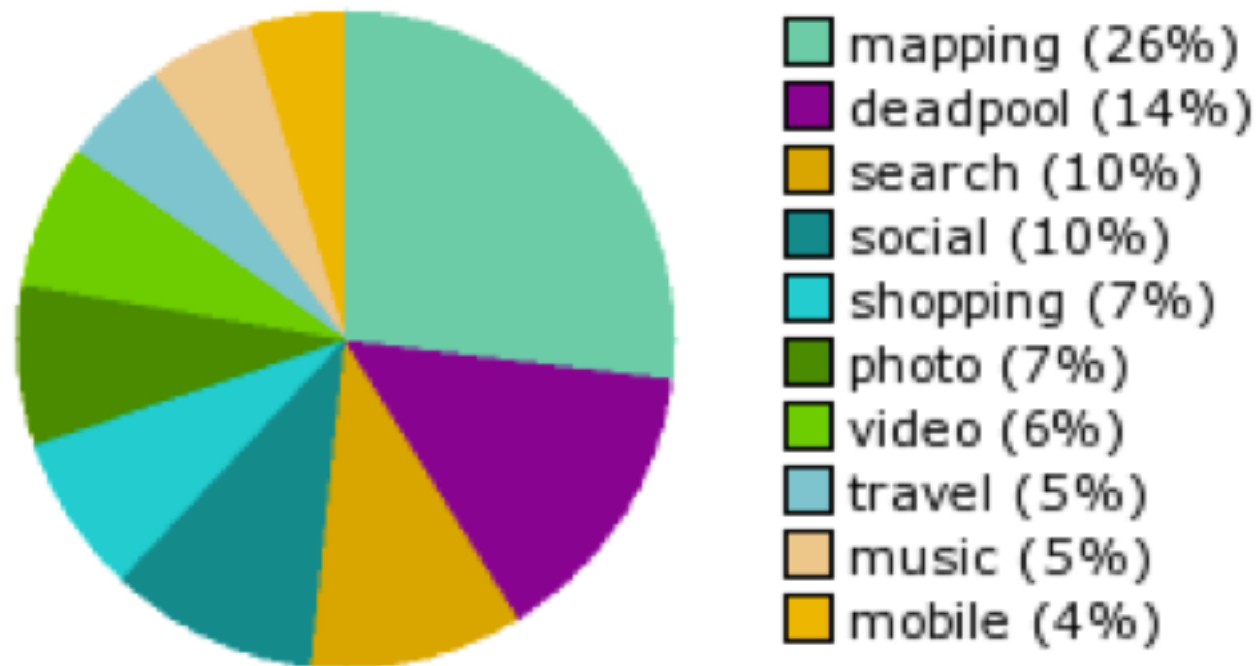
# Top Mashup Types

## Top Mashup Tags

Last 14 days

See all time

Click on a slice or label to see details || Or see the whole  [Mashup Tag Cloud](#)



ProgrammableWeb.com 04/10/13



# How Do Mashups Work?

- Retrieve data from another source(s) typically via a web service
- Mix these datasets together and integrate them into your website

# BASIC CONCEPTS

- API
- Web Service
- GET and POST
- Structured Data

# Terms: API

- An application programming interface (or API) is a way for developers to access parts of a remote web site and integrate it with their own site.

# Terms: Web Service

- Provides access to data and/or procedures (API)
- On a remote/external system (usually)
- Use structured data for data exchange (often XML)
- Come in 3 flavors : RPC, SOAP, REST

# Demo Time!

- <http://www.lib.montana.edu/~jason/files/api/lofi/>



# Terms: POST and GET

- Two primary verbs for web services actions:
  - GET data from a web service
  - POST data to a web service
  - Read and Write actions

# Terms: Structured Data

- Structured data = XML and JSON
  - Extensible Mark-up Language and Javascript Object Notation
  - Flexible mark-up languages
  - Lightweight and easy to parse
  - Allow communication between disparate systems

# Putting it all together

- Data access = Web Services (REST, SOAP, XML-RPC)
- Data typically formatted in XML or JSON
- Data display = one or more scripting languages (javascript, PHP, python, etc)

# What is REST?

- The greatest thing since sliced...
- Representational State Transfer
- Unique data resources with addresses

# Theory of REST

- Focus on diversity of resources (nouns), not actions (verbs)
- Every resource is uniquely addressable
- All resources share the same constrained interface for transfer of state (actions)
- Must be stateless, cacheable, and layered



# REST = Web Protocol

- Web As Prime Example
  - URLs uniquely address resources
  - HTTP methods (GET, POST, HEAD, etc.) and content types provide a constrained interface
  - All transactions are atomic
  - HTTP provides cache control

# REST: Final Thoughts

- Similarity to web - easy to understand
- URL is the method
- Most popular type of web service

# Basic Concepts

- Variables
- Conditions
- Loops
- Functions
- [http://docs.webplatform.org/wiki/concepts/programming/programming\\_basics](http://docs.webplatform.org/wiki/concepts/programming/programming_basics)

# Demo Time!

- Yahoo Pipes

# Yahoo Pipes

- Drag and drop UI for creating mashups
- It's a way to play with basic programming concepts
- Lots of examples - clone them!
- Variety of inputs and outputs



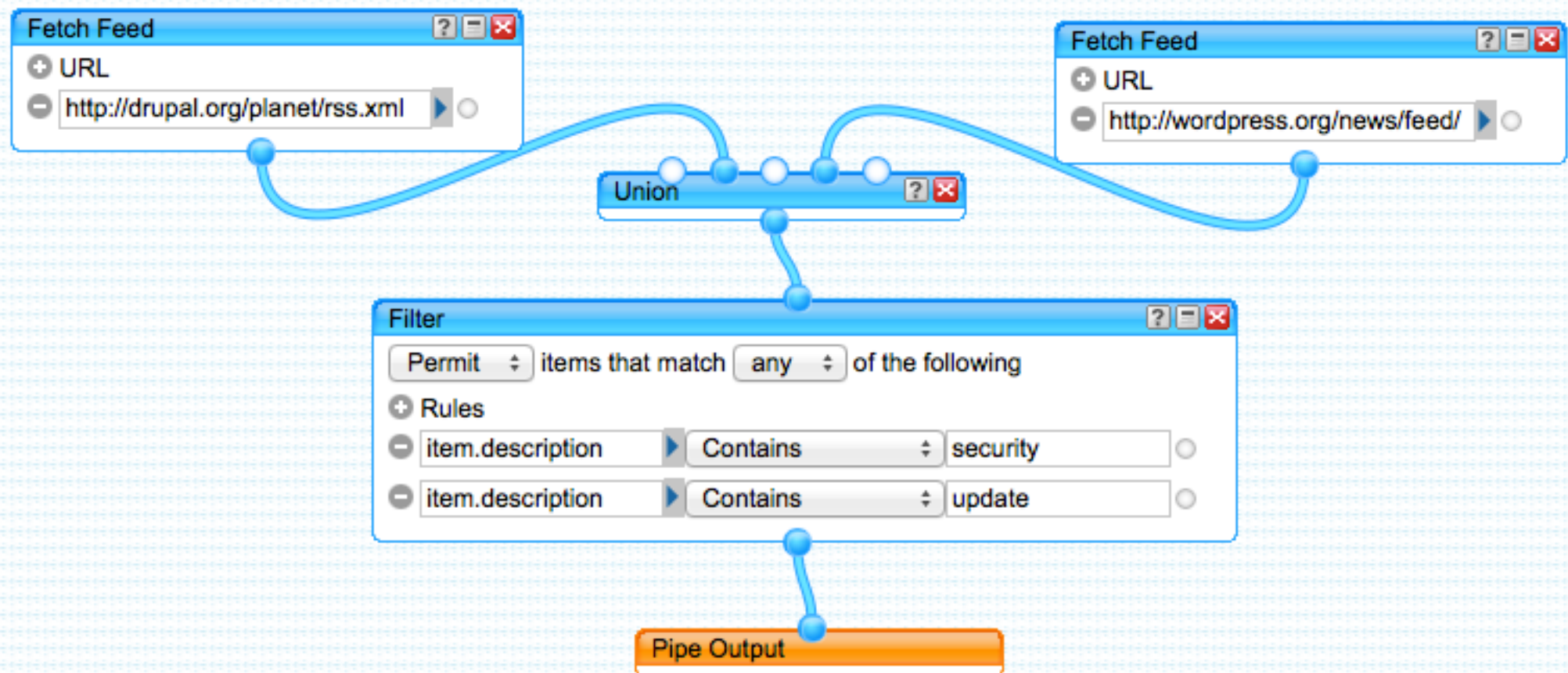
# Yahoo Pipes

- Inputs: RSS feeds, search queries, HTML pages, flickr photos, csv files (Google Spreadsheets), build your own input...
- Outputs: Javascript, RSS, JSON, PHP

# Yahoo Pipes Demo

- Use 'Fetch Feed' to fetch 2 rss feeds (drupal.org, wordpress.org)
- Use 'filter' to limit to two keywords (security, update)
- [http://pipes.yahoo.com/pipes/pipe.edit?\\_id=b49ae422dcfc463ccd414f6e16ab6152](http://pipes.yahoo.com/pipes/pipe.edit?_id=b49ae422dcfc463ccd414f6e16ab6152)

# Yahoo Pipes Demo



Debugger: Pipe Output (4 items)

Time taken: 0.549s [Refresh](#)

- ▶ **Aten Design Group: Project Review Wednesday: Cache Flush**
- ▶ **KatteKrab: Twigs and Sticks and Themes and Bones - but names will never hurt me!**
- ▶ **Freeform Solutions: An updated recipe for building newsletters in Drupal 7**
- ▶ **WordPress 3.5.1 Maintenance and Security Release**

# Debugging

- Browser Tools
  - Firebug (Firefox) or Firebug lite (chrome)
  - Advanced Rest Client (chrome)
  - Chrome Developer view

▼ http://bcc.sunyconnect.suny.edu:4620

/X

Query parameters [Add](#)








op	present	x	enc	dec
set_no	005897	x	enc	dec
set_entry	000000001-000000012	x	enc	dec
format	marc	x	enc	dec

HASH

☒ GET ☐ POST ☐ PUT ☐ PATCH ☐ DELETE ☐ HEAD ☐ OPTIONS ☐ Other

Raw Form **Headers**

Clear Send

Status	200 OK  Loading time: 1097 ms
Request headers	<b>User-Agent:</b> Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_3) AppleWebKit/537.31 (KHTML, like Gecko) Chrome/26.0.1410.63 Safari/537.31 <b>Content-Type:</b> text/plain; charset=utf-8  <b>Accept:</b> */* <b>Accept-Encoding:</b> gzip, deflate, sdch <b>Accept-Language:</b> en-US,en;q=0.8 <b>Accept-Charset:</b> ISO-8859-1,utf-8;q=0.7,*;q=0.3
Response headers	<b>Date:</b> Thu, 11 Apr 2013 01:47:15 GMT  <b>Server:</b> ALEPH/5.20  <b>Content-type:</b> text/xml <b>Pragma:</b> no-cache  <b>Cache-Control:</b> no-cache, no-store, must-revalidate  <b>Expires:</b> Sat, 01 Jan 2000 01:00:00 GMT  <b>Content-Length:</b> 83668 

Raw	XML	Response
<a href="#">Copy to clipboard</a> <a href="#">Save as file</a>		
<pre>&lt;?xml version = "1.0" encoding = "UTF-8" ?&gt; &lt;present&gt;   &lt;record&gt;     &lt;record_header&gt;       &lt;set_entry&gt;000000001&lt;/set_entry&gt;     &lt;/record_header&gt;     &lt;doc_number&gt;000189710&lt;/doc_number&gt;     &lt;metadata&gt;       &lt;oai_marc&gt;         &lt;fixfield id="FMT"&gt;BK&lt;/fixfield&gt;         &lt;fixfield id="LDR"&gt;^^^^cam^^22003254a^4500&lt;/fixfield&gt;         &lt;fixfield id="001"&gt;BCC01-000189710&lt;/fixfield&gt;         &lt;fixfield id="005"&gt;20130405142124.0&lt;/fixfield&gt;         &lt;fixfield id="008"&gt;101201s2011^^^^nyu^^^^^b^^^^001^0^eng^^&lt;/fixfield&gt;         &lt;varfield id="010" i1=" " i2=" "&gt;           &lt;subfield label="a"&gt;2010050095&lt;/subfield&gt;         &lt;/varfield&gt;         &lt;varfield id="016" i1="7" i2=" "&gt;           &lt;subfield label="a"&gt;015794674&lt;/subfield&gt;           &lt;subfield label="2"&gt;Uk&lt;/subfield&gt;         &lt;/varfield&gt;       &lt;/oai_marc&gt;     &lt;/metadata&gt;   &lt;/record&gt; &lt;/present&gt;</pre>		

# Debugging - advanced

- Turn error reporting on in php.ini
- Apache Log files



Search

Search

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: namespace error : Namespace prefix dc on identifier is not defined in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: <dc:identifier>urn:LCCN:55010341</dc:identifier> in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: ^ in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: namespace error : Namespace prefix oclterms on recordIdentifier is not defined in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: <oclterms:recordIdentifier>917314</oclterms:recordIdentifier> in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

**Warning:** simplexml\_load\_string() [[function.simplexml-load-string](#)]: ^ in **/Applications/MAMP/htdocs/mashup site/worldcat\_search\_example\_opensearch.php** on line 41

[Mathematical principles of natural philosophy](#). by Newton, Isaac, Sir, 1642-1727.

Summary:



# Things to Do

- Get data by constructing a query url
- Parse and display the raw data as html (code samples)
- Try a mashup tool

# Step1:

## Construct a url

- [New York Times API Tool](#)
- [Wikipedia API sandbox](#)

## API Request Tool

[Return to Developer Network](#)

## APIs

Article Search API ▾

[Article Search API Documentation](#)

## Requests

Query ▾

## Fields

\* required

## Search Query \*

newton

## Facets

## Begin Date [YYYYMMDD]

## End Date [YYYYMMDD]

## Fields

## Offset

## Rank

## Response Format \*

JSON ▾

Make Request

☒ Pretty Print Results

## Request URL

`http://api.nytimes.com/svc/search/v1/article?format=json&query=newton&api-key=####`

## Request Results

```
{
  "offset": "0",
  "results": [
    {
      "body": "8 P.M. (13, 49) WHAT PLANTS TALK ABOUT "Nature" follows J. C. Cahill, an experimental plant ecologist.",
      "byline": "By KATHRYN SHATTUCK",
      "date": "20130403",
      "title": "What\u2019s On Wednesday",
      "url": "http://www.nytimes.com/2013/04/03/arts/television/whats-on-wednesday.html"
    },
    {
      "body": "TAYLORSVILLE, N.C. — Sheri Farley walks with a limp. The only job she could hold would be one where she could walk.",
      "byline": "By IAN URBINA",
      "date": "20130331",
      "title": "As OSHA Emphasizes Safety, Long-Term Health Risks Fester",
      "url": "http://www.nytimes.com/2013/03/31/us/osa-emphasizes-safety-health-risks-fester.html"
    },
    {
      "body": "A guide to cultural and recreational events in New Jersey. Items for the calendar should be sent to the calendar editor.",
      "date": "20130331",
      "title": "CALENDAR; Events in New Jersey",
      "url": "http://www.nytimes.com/2013/03/31/nyregion/events-in-new-jersey.html"
    },
    {
      "body": "A guide to cultural and recreational events in New Jersey. Items for the calendar should be sent to the calendar editor."
    },
    {
      "body": "HASBROUCK HEIGHTS Bananas Comedy Club Richie Byrne. March 29 at 9 p.m.; March 30 at 7:30 and 10:15 p.m. $20. Bananas Comedy Club."
    },
    {
      "date": "20130324",
      "title": "CALENDAR; New Jersey",
      "url": "http://www.nytimes.com/2013/03/24/nyregion/events-in-new-jersey.html"
    },
    {
      "body": "Season 2 eggs with salt and cayenne pepper, whisk them, get the pan hot and add 1/2 tablespoon butter."
    },
    {
      "body": "HOW TO MAKE SCRAMBLED EGGS BY WYLIE DUFRESNE KAT WRITES: I believe that",
      "byline": "By DAVE ITZKOFF, MARK LEIBOVICH, ERIC SPITZNAGEL, JOHN HODGMAN, HOPE REEVES, SAMANTHA HENIG, MARGARET MCGEE",
      "date": "20130324",
      "title": "The One Page Magazine",
      "url": "http://query.nytimes.com/gst/fullpage.html?res=9E07EFDA153BF937A15750C0A9659D8B63"
    }
  ]
}
```

# Step 2

## Work with code samples

- Parse and display the raw data as html
- Workshop Demo Files: <http://librarydev.com/mashupdemos.zip> or usb key
- Extract the demo code

# Walk Throughs

- Flickr API example
- Lifestream
- Google spreadsheet to HTML
- Google Maps API example

# Flickr

- Code Demo: using the Flickr API

# Lifestream Demo

- Social Media Lifestream (jQuery) - <http://www.lib.montana.edu/~jason/files/web-services/lifestream-jquery-json.html>
- lifestream-jquery-json.html file in the mashup demo folder

# Google spreadsheet

Title	Author	Publisher	OCLC #	ISBN	Notes
The wilderness from Chamberlain Farm : a story of hope for the American wild	Dean B Bennett	Washington, DC : Island Press/Shearwater Books, 2001.	47221771	1559637293	
The Allagash	Lew Dietz	New York : Holt, Rinehart, Winston, 1968.	437021	30683904	Wonderful history of the Allagash. Makes me want to visit
Night train at Wiscasset Station	Lew Dietz; Kosti Ruohomaa	Garden City, N.Y. : Doubleday, 1977.	3327044	385129327	
Away from it all.	Dorothy Boone Kidney	South Brunswick [i.e. Brunswick, N.J.] A.S. Barnes [1969]	1696	498068277	Compelling autobiography of life in rural Maine
Pride and Prejudice	Jane Austen	Publisher: London ; New York : Penguin Books, 2003.	51033055	9780141439518	
Alice in Wonderland	Lewis Carroll	New York, Gregg Pub. Co. [n.d.]	49196340	9780439291491	
Through the Looking Glass	Lewis Carroll	New York : Morrow, ©1993.	26132443	9780688120498	
A Study in Scarlet	Arthur Conan Doyle	London ; New York : Penguin Books, 2001.	46650804	9780140439083	





[The wilderness from Chamberlain Farm : a story of hope for the American wild](#)  
Author: Dean B Bennett



NO IMAGE  
AVAILABLE

[The Allagash](#)  
Author: Lew Dietz  
Description: Wonderful history of the Allagash. Makes me want to visit



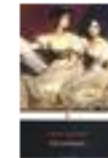
NO IMAGE  
AVAILABLE

[Night train at Wiscasset Station](#)  
Author: Lew Dietz; Kosti Ruohomaa



NO IMAGE  
AVAILABLE

[Away from it all.](#)  
Author: Dorothy Boone Kidney  
Description: Compelling autobiography of life in rural Maine



[Pride and Prejudice](#)  
Author: Jane Austen



[Alice in Wonderland](#)  
Author: Lewis Carroll



[Through the Looking Glass](#)  
Author: Lewis Carroll



[A Study in Scarlet](#)  
Author: Arthur Conan Doyle



[The Scarlet Pimpernel](#)  
Author: Emmuska Orczy  
Description: The first and most successful in the Baroness's series of books that feature Percy Blakeney



[The Karate way : discovering the spirit of practice](#)  
Author: Dave Lowry  
Description: Karate is not just a sport or a hobby - it's a lifetime study toward perfection of

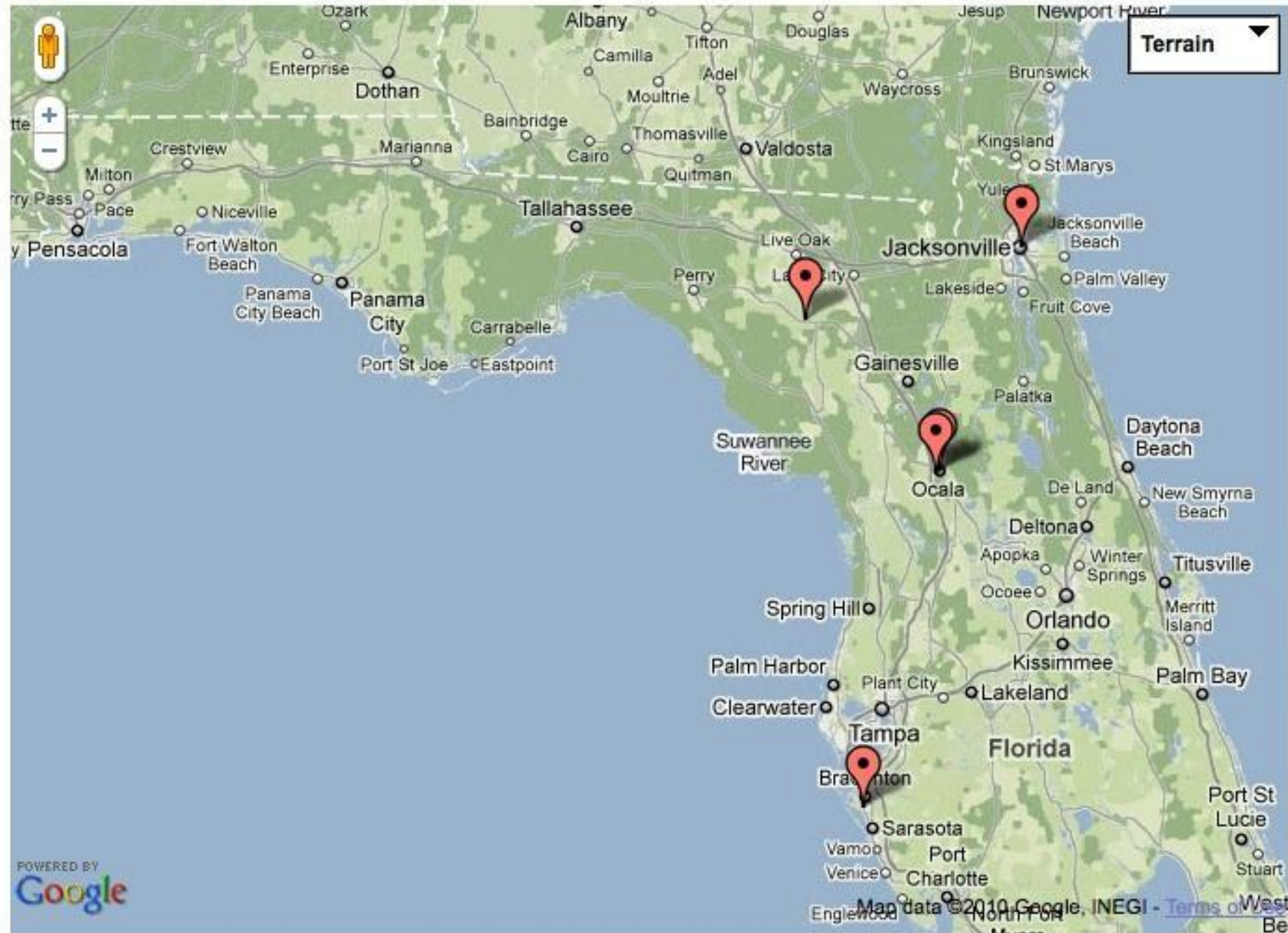
# Map Locations: Google Maps API (v3): MSU Libraries

(WORKING CODE AND PROOF OF CONCEPTS)

[Demo App](#)

[What is this?](#)

[View Code](#)



# Step 3: Try a Mashup Tool

- Yahoo Pipes
- Google Code Playground
- jsFiddle: <http://jsfiddle.net/>



# Google Code Playground

Google code Code Playground

[Tell us what you think](#) | [Sign in](#)

Pick an API

Search

+ Language

+ Blogger

+ Blog Search

+ Book Search

+ Calendar

+ Earth New Samples!

+ Feeds New Samples!

+ Friend Connect

+ Image Search

+ Javascript

+ Libraries

+ Local Search

+ Maps

+ Maps V3 New Samples!

+ News Search

+ Patent Search

+ Search

+ Video Search

+ Visualization

Edit Code

Translation » Transla

View Docs

Edit HTML

```
1  /*
2  *   How to translate text.
3  */
4
5  google.load("language", "1");
6
7  function initialize() {
8      var content = document.getElementById('content');
9      // Setting the text in the div.
10     content.innerHTML = '<div id="text">Hola, me alegro mucho de
11
12     // Grabbing the text to translate
13     var text = document.getElementById("text").innerHTML;
14
15     // Translate from Spanish to English, and have the callback
16     // put the resulting translation in the "translation" div.
17     // Note: by putting in an empty string for the source language
18     // will auto-detect the source language.
19     google.language.translate(text, 'es', 'en', function(result) {
20         var translated = document.getElementById("translation");
21         if (translated) {
22             translated.innerHTML = result;
23         }
24     });
25 }
```

Output

Debug Code

Run Code

Hola, me alegro mucho de verte.  
Hi, I'm glad to see you.

## Pick an API

- ☐ Blogger
- ☒ Blog Search
- ☒ Book Search
- ☒ Calendar
- ☒ Earth New Samples!
- ☒ Feeds
- ☒ Friend Connect
- ☒ Image Search
  - [Size Restriction](#)
  - [Color Restriction](#)
  - [Imagetype Restriction](#)
  - [Filetype Restriction](#)
  - [Color Filter](#)
  - [Rights Restrict](#)
  - [Site Restrict](#)
- ☒ Javascript
- ☒ Libraries
- ☒ Local Search
- ☒ Maps
- ☒ Maps V3
- ☒ News Search
- ☒ Patent Search

## Edit Code

Image Search » Color Restriction

[View Docs](#)
[Edit HTML](#)

```

5 google.load('search', '1');
6
7 function OnLoad() {
8     // Create a search control
9     var searchControl = new google.search.SearchControl();
10
11     // Create an ImageSearch
12     var imageSearch = new google.search.ImageSearch();
13
14     imageSearch.setRestriction(google.search.ImageSearch.RESTRICT_COLORIZAT
15                             google.search.ImageSearch.COLORIZATION_GRAYS);
16
17     // Add the searcher to the SearchControl
18     searchControl.addSearcher(imageSearch);
19
20     // tell the searcher to draw itself and tell it where to attach
21     searchControl.draw(document.getElementById("content"));
22
23     // Find me something fit for a fairytale
24     searchControl.execute('Carriage');
25

```

## Output

[Debug Code](#)
[Run Code](#)
  x

Image



Garden State... free horse an...

# jsFiddle

- Can edit javascript and jquery scripts without a web server
- Can share code examples
- <http://jsfiddle.net/libdevel/4HbhB/7/>



## Frameworks &amp; Extensions

jQuery 1.6.4

onLoad

## Fiddle Options

## External Resources

## Languages

## Ajax Requests

## Examples

## Legal, Credits and Links

```
1 <div id="booklist"> </div>
```

HTML

1

CSS

```
1 $(document).ready(function(){
2     // add List of New Books
3     $(function addBooks(){
4         $.getJSON( "https://spreadsheets.google.com
5 /feeds
6 /list/0AvwFF5rXKpNsdEh5bVN0d2xLTmV0QmdMSzFnc1ducFE
7 /od6/public/values?alt=json-in-script&callback=?",
8         function (data) {
9             $('div#booklist').append('<div
10 class="new_books"></div>');
11             $.each(data.feed.entry, function(i,item){
12                 var record = '<span
13 style="display:none">' + item.id.$t + '</span>';
14                 // if there is an ISBN, look for an
15 image
16                 if (item.gsx$isbn.$t) {
17                     var img = new Image();
18                     img.src =
19 'http://covers.openlibrary.org/b/isbn/' +
20 item.gsx$isbn.$t + '-S.jpg';
21                     if (img.width > 2) {
22                         record += '';
25                     } else {
26                         record += '<img
27 src="https://dl.dropbox.com/u/21793776
```

JavaScript

Result



[The wilderness from Chamberlain Farm : a story of hope for the American wild](#)

Author: Dean B Bennett



NO IMAGE  
AVAILABLE

[The Allagash](#)

Author: Lew Dietz

Description: Wonderful history of the Allagash.  
Makes me want to visit



NO IMAGE  
AVAILABLE

[Night train at Wiscasset Station](#)

Author: Lew Dietz; Kosti Ruohomaa



NO IMAGE  
AVAILABLE

[Away from it all.](#)



# What we've Learned

- Web services are closed source software
- Documentation and online support is vital
- Debugging can be hard
- Similarities to common protocols are important
- Practice and finding your development kit is essential



# Contact Information

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