



COMP 4021

Internet Computing

Web Services

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Web Services

- What are web services?
- The basic idea is that a web site can provide some kind of service through the Internet
- A program or another web site can use the service
- Everything uses the same 'web service' standard to communicate

Basic Idea of Web Services

- For example, here a web site is using a web service running on another system:



- Here a program is using a web service:



Example Web Service - Google

- Google.com is the most popular search engine
- The usual way to use it is by typing things into the google.com web page
- But what if you want your code to use google?
- For this reason Google has made a *web service*
- Anyone can write a program to send a web search query to the google web service and get the google search result

Google Web APIs - Home - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Address <http://www.google.com/apis/> Go

Google™

Google Web APIs (beta)

[Home](#)
[About Google](#)

Google Web APIs

- Overview
- Download
- Create Account
- Getting Help
- API Terms
- FAQs
- Reference
- Release Notes

Google Desktop API

Write handy plug-ins for Google Desktop Search.

Google AdWords API


Manage your accounts, build new tools, pull reports, and more.

Develop Your Own Applications Using Google

With the Google Web APIs service, software developers can query billions of web pages directly from their own computer programs. Google uses the SOAP and WSDL standards so a developer can program in his or her favorite environment - such as Java, Perl, or Visual Studio .NET.

To start writing programs using Google Web APIs:

- Download the developer's kit**
The Google Web APIs developer's kit provides documentation and example code for using the Google Web APIs service. The [download](#) includes Java and .NET programming examples and a WSDL file for writing programs on any platform that supports web services.
- Create a Google Account**
To access the Google Web APIs service, you must [create a Google Account](#) and obtain a license key. Your Google Account and license key entitle you to 1,000 automated queries per day.
- Write your program using your license key**
Your program must include your license key with each query you submit to the Google Web APIs service. Check out our [Getting Help](#) page or read the [FAQs](#) for more information.



With Google Web APIs, your computer can do the searching for you.

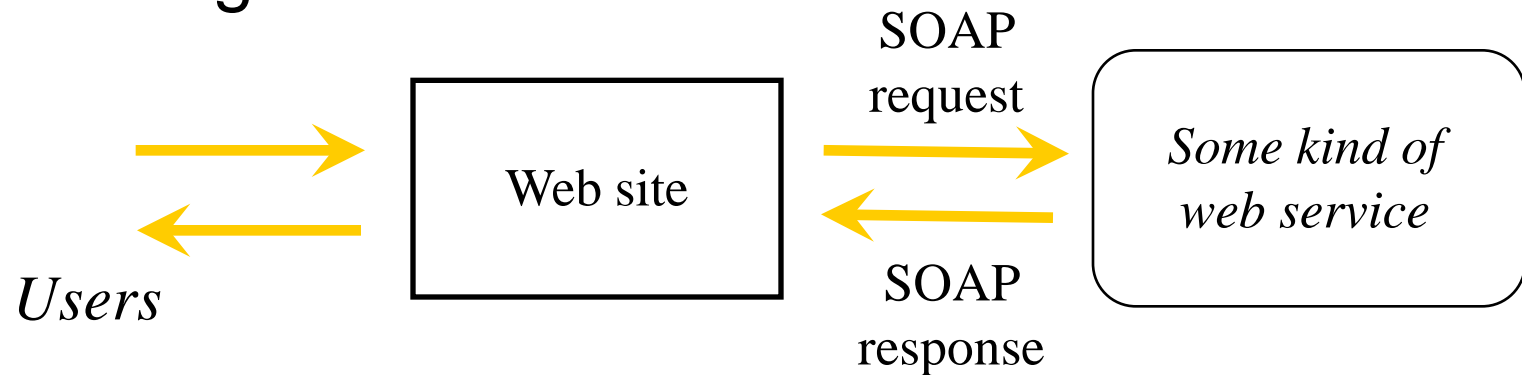
Program Ideas

- Auto-monitor the web for new information on a subject
- Glean market research insights and trends over time
- Invent a catchy online game
- Create a novel UI for searching
- Add Google's spell-checking to an application

Done Internet

SOAP

- To use a web service, you need to send a SOAP message



- The response will also be a SOAP message
- SOAP is not really a language, it is a *protocol* (method of communication) for exchanging information

The SOAP Query

- Say we want to use the google web service
- We need to create an appropriate SOAP message and then send it to Google
- An example SOAP message for this is shown on the following slide – the whole thing is put together and then sent to google

```
POST /search/beta2 HTTP/1.0
User-Agent: NuSOAP v0.6
Host: api.google.com
Content-Type: text/xml
Content-Length: 954
SOAPAction: ""
```

This section is the HTTP message header.
(‘User-agent’ means the name of the software that generates this message - in this case it is the PHP library called ‘NuSoap’)

```
<?xml version="1.0"?>
<SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:si="http://soapinterop.org/xsd"
  xmlns:galactivism="urn:GoogleSearch">
  <SOAP-ENV:Body>

    <galactivism:doGoogleSearch>
      <key xsi:type="xsd:string">your-google-license-key-xxxxxxx</key>
      <q xsi:type="xsd:string">game filetype:swf</q>
      <start xsi:type="xsd:int">0</start>
      <maxResults xsi:type="xsd:int">10</maxResults>
      . . .
    </galactivism:doGoogleSearch>

  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The license key which google requires

The google search expression. I.e., search for the word ‘game’ and return only files that end in .swf

Ask google to give 10 search results

Show the first page of results

The SOAP Result

- Google will send back a list of results
- The results will also be transmitted in a SOAP message
- An example is shown on the next slide
- (Again, there is a HTTP header at the top, but this is not shown for reasons of space)

```
<?xml version='1.0' encoding='UTF-8'?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/1999/XMLSchema">
  <SOAP-ENV:Body>
    ...
    <estimatedTotalResultsCount xsi:type="xsd:int">28400</estimatedTotalResultsCount>
    ...
    <resultElements xmlns:ns3="http://schemas.xmlsoap.org/soap/encoding/"
      xsi:type="ns3:Array"
      ns3:arrayType="ns1:ResultElement[10]">

      <item xsi:type="ns1:ResultElement">
        ...
        <URL xsi:type="xsd:string">http://www.people.fas.harvard.edu/~pyang/flash/miniputt.swf</URL>
        <title xsi:type="xsd:string"></title>
      </item>

      <item xsi:type="ns1:ResultElement">
        ...
      </item>

      ...

    </resultElements>
    ...
    <searchQuery xsi:type="xsd:string">game filetype:swf</searchQuery>
    ...
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Total number of hits
for the search string

First result

Second result

List of other results
continues (not shown here)

Companies Supporting Web Services

- Hundreds of companies now offer their service using the web service standard
- As well as google, another example is amazon.com

Amazon.com Amazon Web Services Store: Amazon Web Services - Microsoft Internet Explorer

File Edit View Favorites Tools Help

amazon.com Your Store Make Money See All 32 Product Categories Your Account Cart Your Lists Help

Program Overview Marketplace Associates Advantage Web Services Paid Placements On-Demand Publishing

Search Amazon.com GO Find Gifts Web Search GO

Welcome to Amazon Web Services

Amazon Web Services provides developers with direct access to Amazon's robust technology platform. Build on Amazon's suite of web services to enable and enhance your applications. We innovate for you, so that you can innovate for your customers. Browse our [reference applications](#) to see the possibilities!

What's New?

Announcing Amazon S3 - Simple Storage Service

(March 13, 2006)

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers. Amazon S3 provides a simple web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, fast, inexpensive data storage infrastructure that Amazon uses to run its own global network of web sites.

Announcing Amazon Mechanical Turk (Beta)

What is Artificial Intelligence?

Learn more on the [Amazon Mechanical Turk page](#).

Learn About Amazon Web Services

- [AWS Home](#)
- [Why Use AWS?](#)
- [What's New in AWS?](#)
- [Upcoming Events](#)
- [Reference Applications](#)
- [Create an Account](#)
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Browse Web Services

- [Amazon E-Commerce Service](#)
- [Amazon Historical](#)

Your Web Services Account

Amazon Mechanical Turk Promotion

Build now, Earn \$1000

Internet

Making a New Web Site

- Amazon sells many different things - books, music, toys, clothes, etc
- So you could make your own web site which appears to sell things, but in reality just uses the amazon service
- An example of this is <http://simplest-shop.com/> - shown in the next slide
- The web site takes all information from amazon, and sells everything through amazon

Simplest shop: find and buy from thousands of products in seconds - Microsoft Internet Explorer

File Edit View Favorites Tools Help



















Back Forward Stop Reload Home Search Favorites

Address <http://simplest-shop.com/> Go

Simplest-shop.com online shopping, the simple way Welcome | [Help](#)

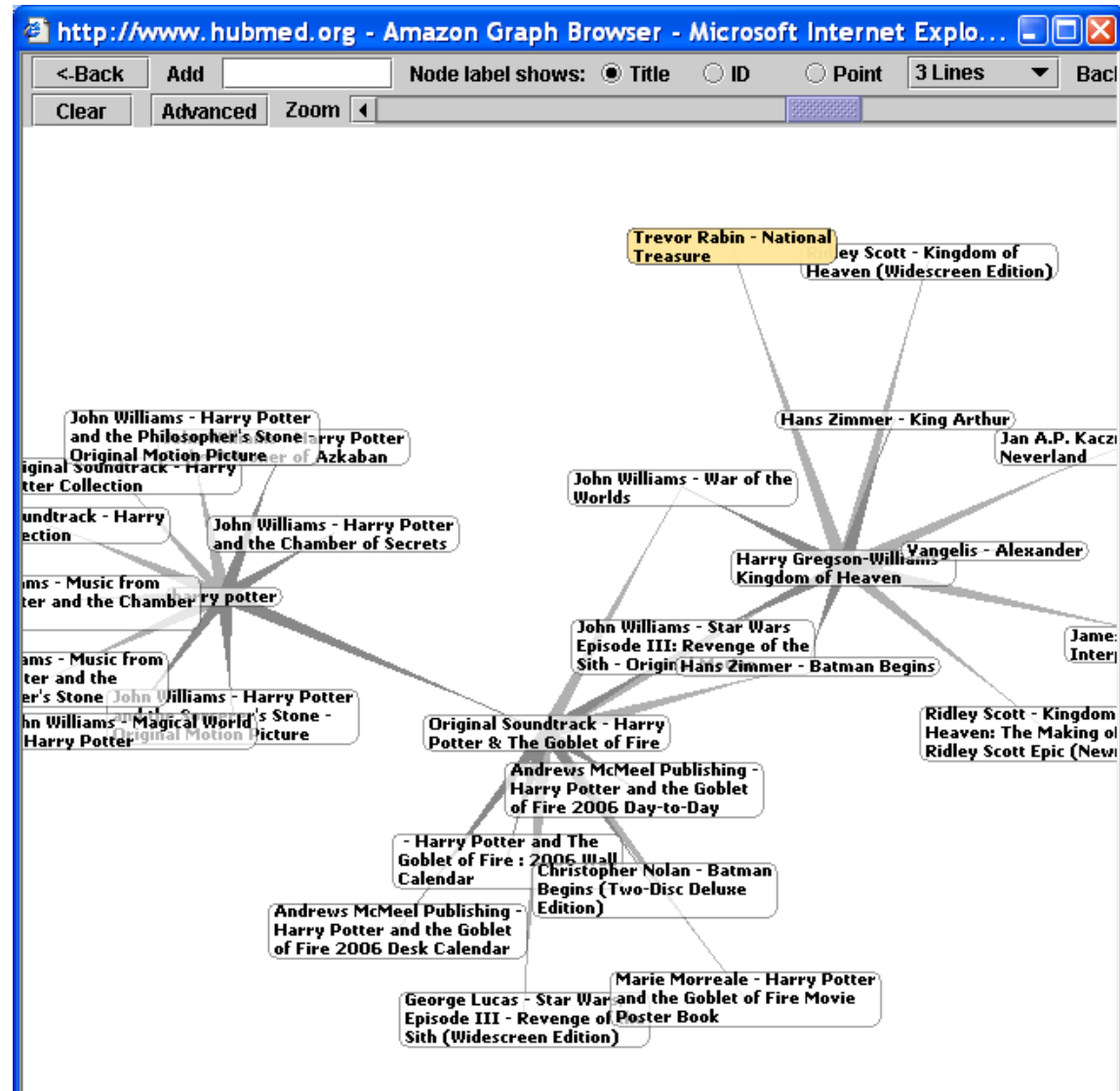
Search for Find

Browse our top categories:

 Clothes Baseball Caps , Outerwear , Snow Boots , Gift Boxes & More	 Consumer electronics Bookshelf , With Caller ID , Emerson , Socket Communications	 Music CDs France , Blues , French , Compilations , Dance & DJ , Historical Periods
 Baby products Kidline , Red Calliope , Words , Colors , Time , Nonfiction	 Jewelry Piercing Rings , September , September , Birthstone	 Cell phones Cases & Belt Clips , Special Features , Substores
 Beauty products Nail Polish , Aftershave Products , Eye Shadow	 Computer games Simulation , Sports Games , Playstation , Nintendo 64	 Software products Other , Database , Christian & Biblical Software
 Books French , All French Books , Dentistry , Travel , Games	 Garden devices Steam Cleaners , Vacuums & Floor Care , Bath Linens	 Sporting goods Pistols , Skateboarding Shoes , Airsoft , Rifles , Minnesota Vikings
 Cameras Digital Cameras , 6 Megapixels & Up , 4 to 4.9 Megapixels	 Gourmet food products French Cuisine , Candy & Chocolate , Fresh Fish	 Tools Reconditioned Tools , Heaters , Heating & Cooling
 Classical music CDs	 Health products	 Toys Costumes for Growlers

Internet

- Web services such as the one by Amazon mean that an application can concentrate on the display layer without worrying about storage



<http://www.pmbrowser.info/amazon.html>