THE UNIVERSITY of EDINBURGH
informatics

Semantic Web Systems

The Programmable Web

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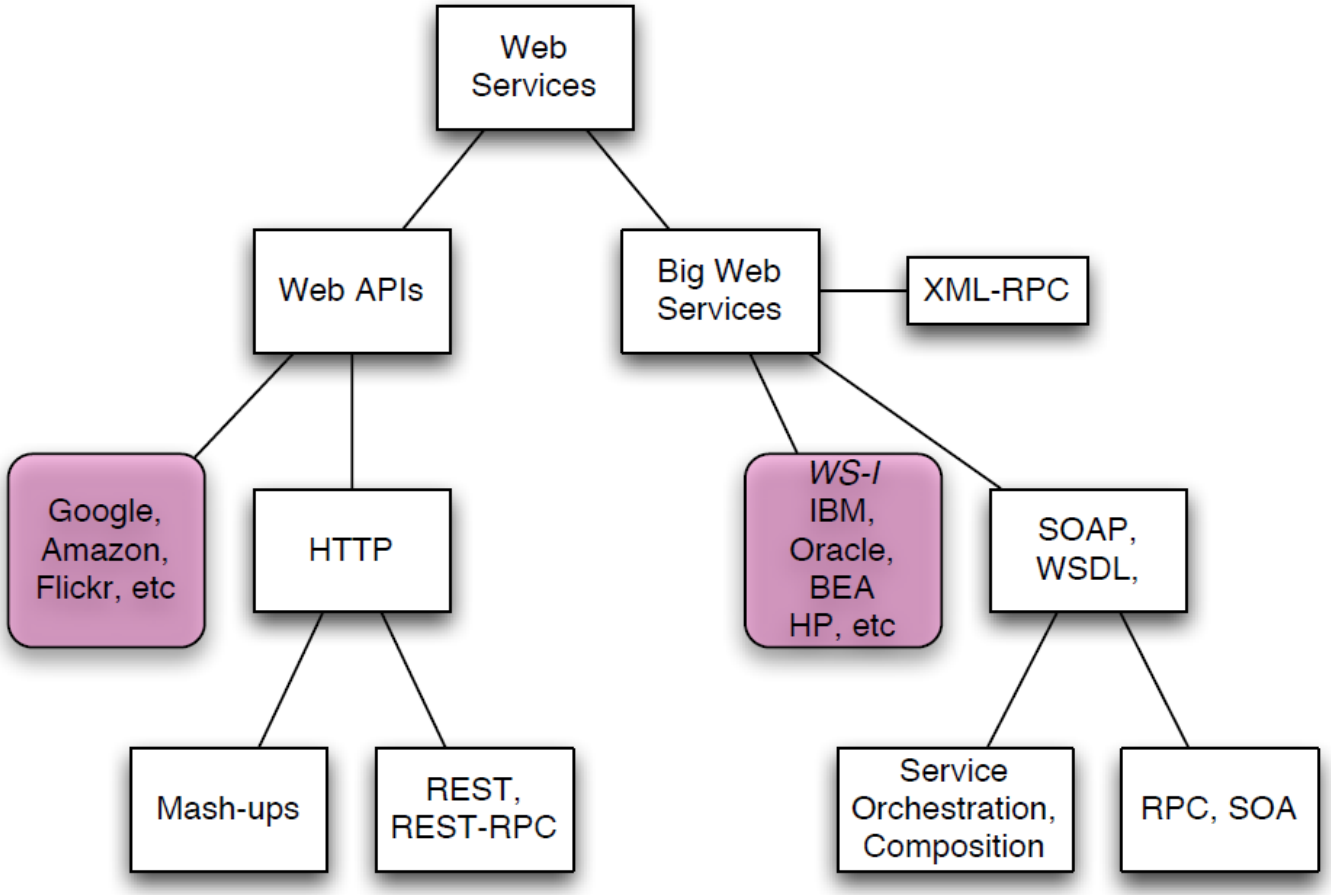
WS: High-level view



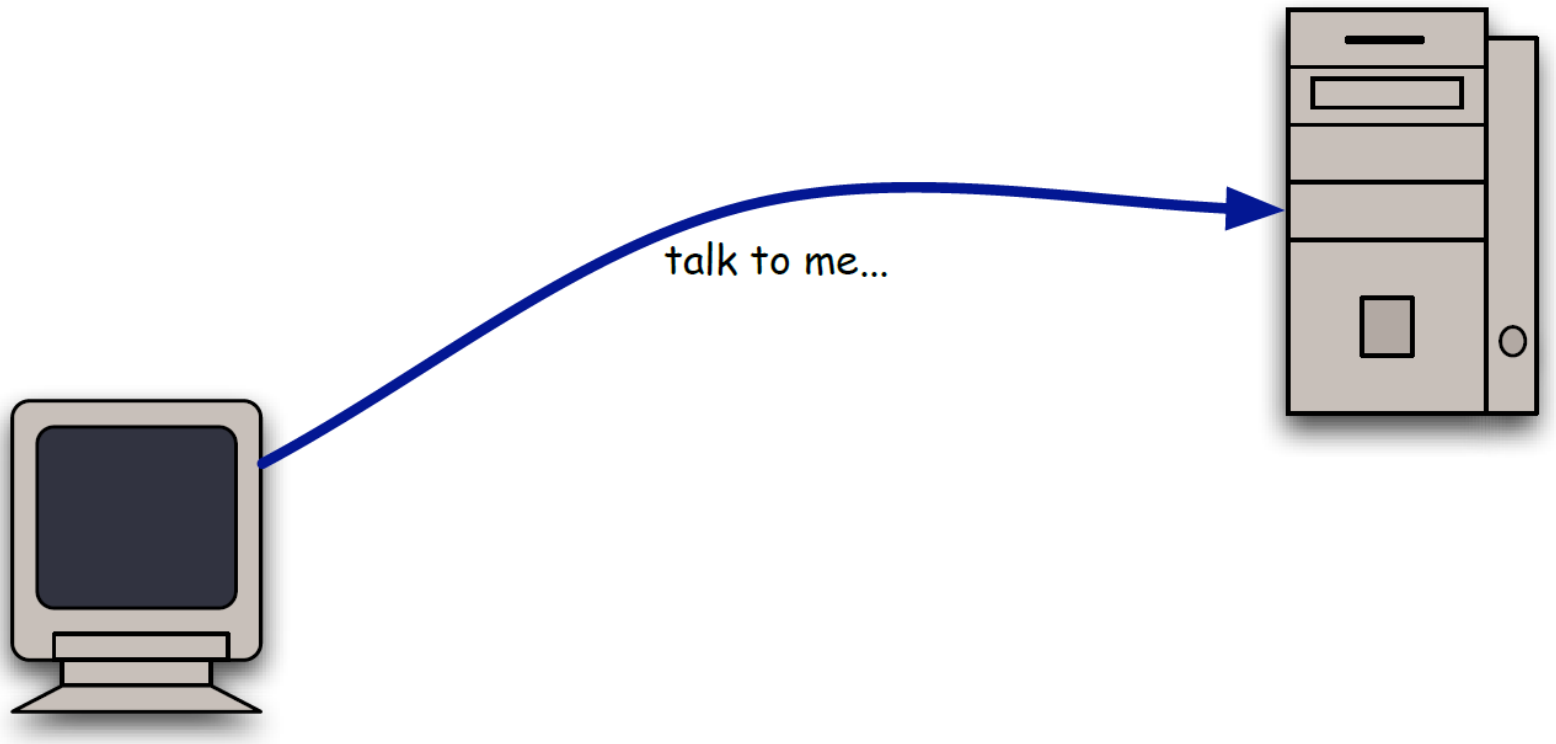
Two perspectives

- Web APIs
  - Same technology that supports existing WWW also supports web services.
  - If it's on the Web, it's a web service – Richardson and Ruby (2007), RESTful Web Services, O'Reilly.
- Big Web Services:
  - WS interfaces are specified in WSDL
  - WS exchange data in SOAP messages

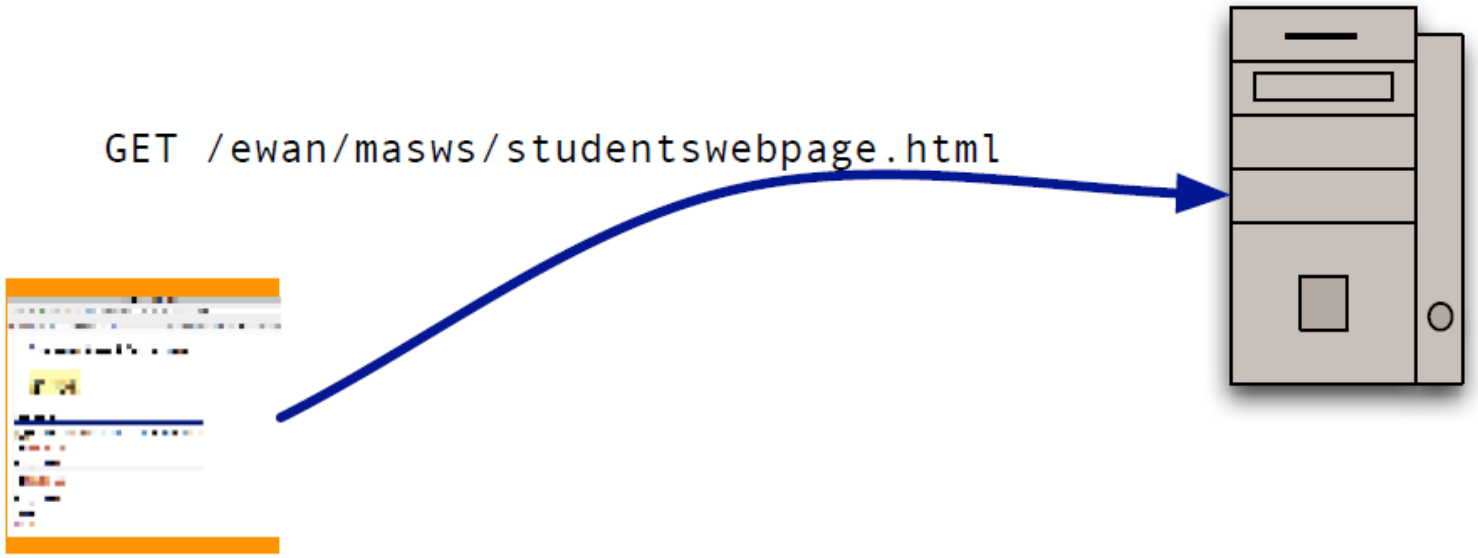
WS: Computational Styles / Architecture

- Representational State Transfer (REST) – only uses HTTP methods and resources (i.e. URIs)
- Remote procedure call (RPC) – distributed programming paradigm
- Service Orient Architecture (SOA) – emphasis on messages and metadata for service functionality

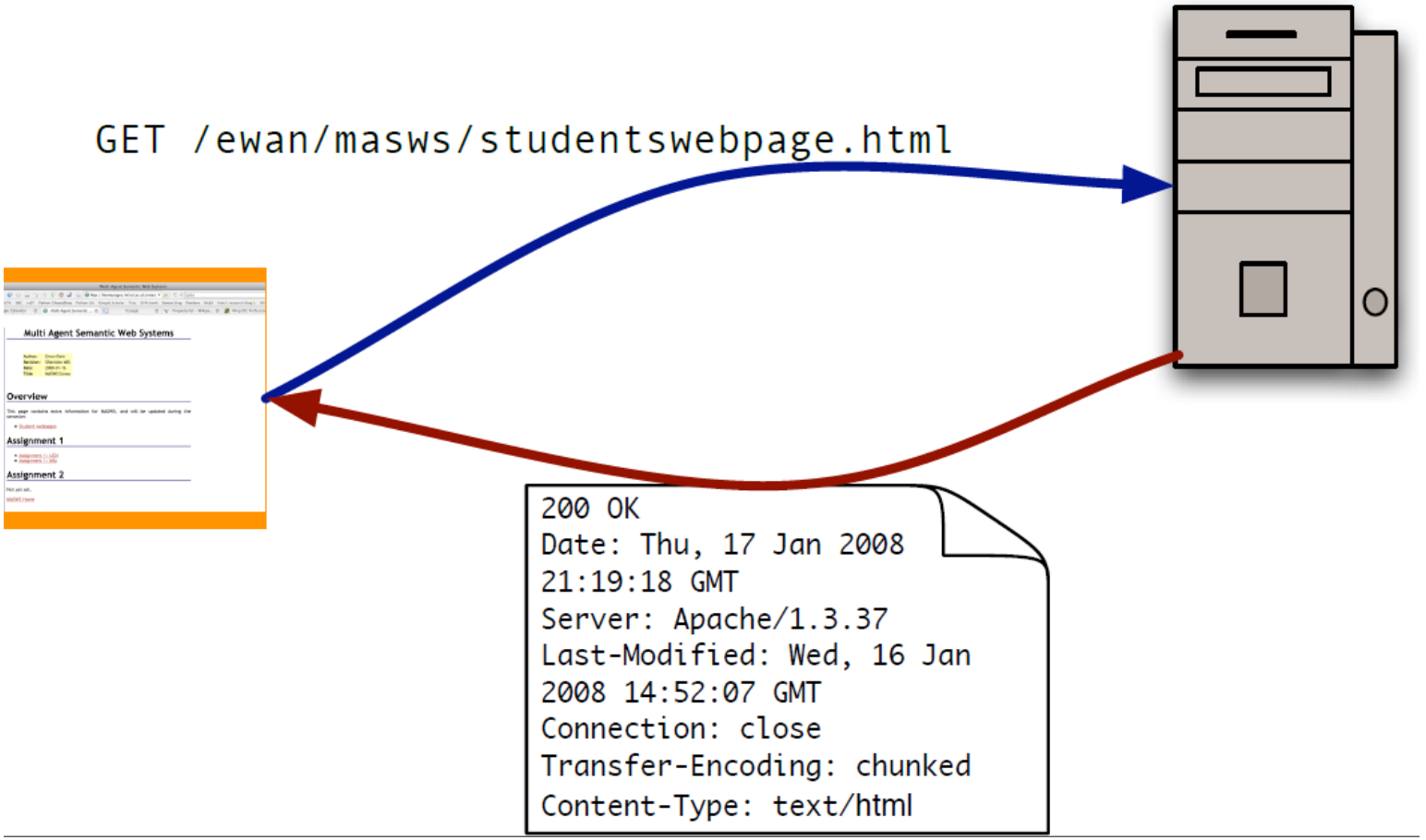
HTTP Client-Server



HTTP Browser-Servers



HTTP Browser-Servers



HTTP Client-Server Interaction, 1

- Client opens TCP/IP socket connection on port 80 to host.
- Client sends an HTTP request consisting of a method and request URL.
- Server sends back a message consisting of a status code and some header information, followed by a blank line.
- If the client's request method is a GET, and the server's status code is 2OO OK, then server also returns a representation of the requested resource.

HTTP Client-Server Interaction, 2

HTTP Request

HOST: homepages.inf.ed.ac.uk
GET /ewan/masws/studentswebpage.html

METHOD + argument

HTTP Client-Server Interaction, 3

Response Status Code
200 OK

HTTP Client-Server Interaction, 4

Server Headers

Date: Thu, 17 Jan 2008 21:19:18 GMT
Server: Apache/1.3.37
Last-Modified: Wed, 16 Jan 2008 14:52:07 GMT
Connection: close
Transfer-Encoding: chunked
Content-Type: text/html

HTTP Client-Server Interaction, 5

Response Document

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
<head>
 <title>MASWS Student Webpages</title>
 <link href="delpost.css" rel="stylesheet" type="text/css">
</head>
<body>
 <h1>MASWS Student Webpages</h1>
 ...
```

What's in the document?

- HTML – for rendering by browser.
- XML – anything that can deal with structured data.
- JSON – 'lightweight' alternative to XML for data serialization audio, graphics, etc.
- MIME types (e.g. text/html).

JSON

Javascript Object Notation

- http://www.json.org
- Language-independent scheme for exchanging data between applications.
  - lightweight format (i.e. compared to XML).
  - easy for humans to read and write.
  - easy for machines to parse and generate.
- Two basic structures:
  1. unordered key/value pairs.
  2. ordered list of values.
- A similar non-XML data format language: YAML http://www.yaml.org

JSON Example

Dictionary and List

```
{"HOST": "homepages.inf.ed.ac.uk",
"PATH": "/jdf/index.php"}
["homepages.inf.ed.ac.uk", "del.icio.us"]
```

Dictionary with list values

```
{"HOSTS": ["inf.ed.ac.uk", "del.icio.us"],
"PATHS": []}
```

List of dictionaries

```
[{"HOST": "inf.ed.ac.uk"}, {"HOST": "del.icio.us"}]
```

A GET request in Python

Parsing a URL

```
>>> import httplib
>>> h= httplib.HTTPConnection('homepages.inf.ed.ac.uk')
>>> h.request('GET', '/jdf/index.php')
>>> r=h.getresponse()
>>> print r.status, r.reason
302 Found
>>> for m in r.msg.headers: print m,
....
Date: Wed, 25 Nov 2015 17:02:41 GMT
Server: Apache/2.2
Location: http://homepages.inf.ed.ac.uk/jdf/index.php
Content-Length: 227
Content-Type: text/html; charset=iso-8859-1
```

HTTP Methods

- GET: Requests a representation of the specified resource.
- HEAD: Asks for the response identical to the one that would correspond to a GET request, but without the response body.
- POST: Submits data to be processed (e.g. from an HTML form) to the identified resource.
- PUT: Uploads a representation of the specified resource.
- DELETE: Deletes the specified resource.

HTTP Status Codes

1xx Informational

2xx Success:

- e.g. 200 OK

3xx Redirection:

- e.g. 303 See Other

4xx Client Error:

- e.g. 404 Not Found

5xx Server Error

Web API Summary

- Opening a browser and typing in a URL initiates a kind of client-server interaction.
- Client program sends a request to a host, server sends a response. HTTP provides a kind of envelope for messages.
- Server response depends in part on the HTTP method; may also be encoded in the URL.
- Issues about RPC approach will be looked at later in course.
- Returned document can be in a variety of formats.
- XML and JSON: both examples of data-exchange formats.
- http://www.programmableweb.com/ for APIs and mashups.