JACOBS UNIVERSITY

WEB SERVICES

Overview

- What we will learn:
  - HTTP : the machinery that drives the Web
  - Web Services: on the way to solve complex tasks

Uniform Resource Identifiers

- = naming schema to identify any resource on the Internet
- Syntax: scheme ":" [authority] [path] ["?" query]
  - Naming scheme (http)
  - Name of host computer
    + optionally port#
    - *//www.cs.wisc.edu:80*
    - *80 is default, can be left out*
  - Name of resource

http://www.cs.wisc.edu/~dbbook/index.html

- More URIs:
  - mailto:webmaster@bookstore.com
  - telnet:127.0.0.1

Hypertext Transfer Protocol

- What is a communication protocol?
  - Set of rules that defines the structure of messages & communication process
  - Examples: TCP, IP, HTTP
- What happens if you click on www.cs.wisc.edu/~dbbook/index.html?
  - Client connects to server, transmits HTTP request to server
  - Server generates response, transmits to client
  - Both disconnect
- HTTP header describes content/action (text = ISO-8859-1), content for data
  - RFC 2616

HTTP Request Structure

GET /index.html HTTP/1.1

- Request line
  - Http method field (GET and POST, more later)
  - local resource field
  - HTTP version field

User-agent: Mozilla/4.0

- Type of client

- What types of files (MIME types) the client will accept

Accept: text/*, image/gif, image/jpeg

  - MIME = Multipurpose Internet Mail (!) Extensions = file type naming system
  - MIME types other than text/*, image/jpeg, image/gif, image/png
    need browser plug-in or helper application

HTTP Sample Request & Response

- Client sends:

```
GET ~dbbook/index.html HTTP/1.1
User-agent: Mozilla/4.0
Accept: text/*, image/gif, image/jpeg
```

- Server responds:

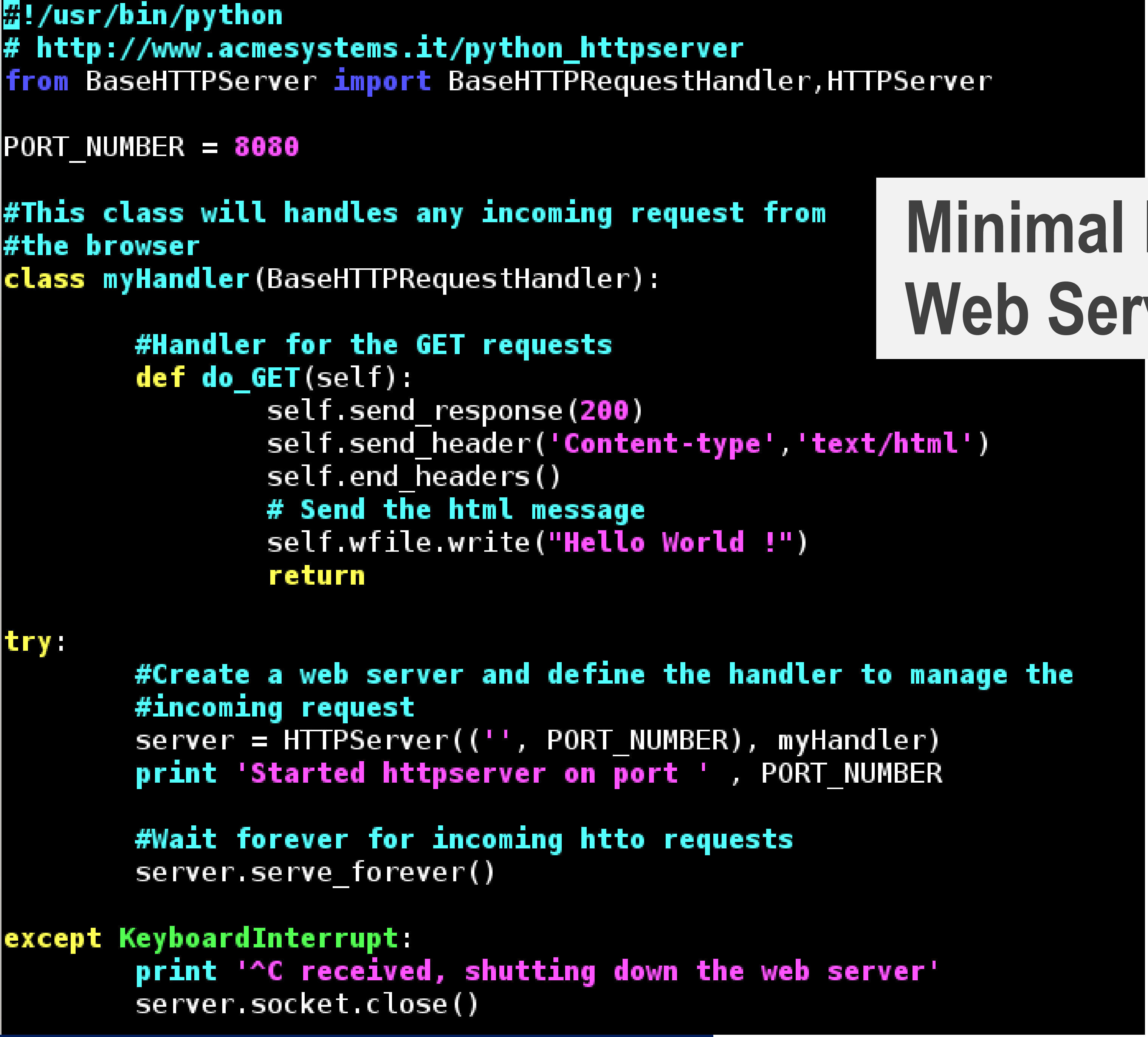
```
HTTP/1.1 200 OK
Date: Mon, 04 Mar 2002 12:00:00 GMT
Server: Apache/1.3.0 (Linux)
Last-Modified: Mon, 01 Mar 2002 09:23:24 GMT
Content-Length: 1024
Content-Type: text/html

<html> <head></head>
<body>
<h1>Barns and Nobble Internet Bookstore</h1>
Our inventory:
<h3>Science</h3>
<b>The Character of Physical Law</b>
...
</body></html>
```

Try this:
telnet www.leo.org 80
GET index.html HTTP/1.0
<3x newline>

Looking into the Server

- Listen for request at port assigned
- Receive HTTP request
- Serve request
- Deliver result (or error)
- loop

Minimal Python Web Server



```
#!/usr/bin/python
# http://www.acmesystems.it/python_httpserver
from BaseHTTPServer import BaseHTTPRequestHandler,HTTPServer

PORT_NUMBER = 8080

#This class will handles any incoming request from
#the browser
class myHandler(BaseHTTPRequestHandler):

        #Handler for the GET requests
        def do_GET(self):
                self.send_response(200)
                self.send_header('Content-type','text/html')
                self.end_headers()
                # Send the html message
                self.wfile.write("Hello World !")
                return

try:
        #Create a web server and define the handler to manage the
        #incoming request
        server = HTTPServer(('', PORT_NUMBER), myHandler)
        print 'Started httpserver on port ' , PORT_NUMBER

        #Wait forever for incoming htto requests
        server.serve_forever()

except KeyboardInterrupt:
        print '^C received, shutting down the web server'
        server.socket.close()
```

What‘s Next: The Semantic Web

- Today (*): typically, humans ask servers
- In future:
  Add machine-understandable meanings to the current Web
  so that:
- Computers can understand Web documents
  → can automatically accomplish tasks
  that have been otherwise conducted manually,
  on a large scale

* Until 2012

Semantic Web: The Approach

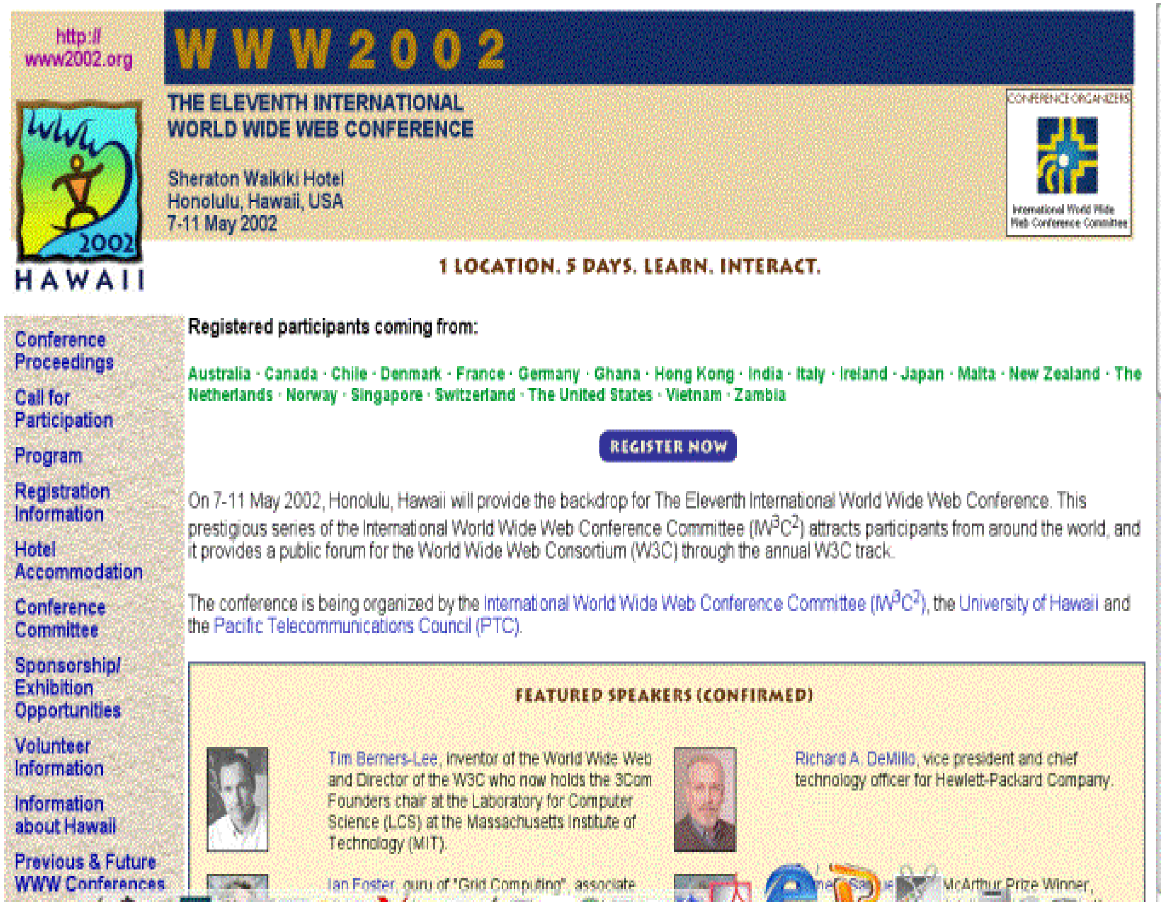
- Step 1: adding structure to contents
  → machine-machine communication
  - ex: XML

A: „B, give me that piece!

- Step 2: describe meaning, allow reasoning
  → automated orchestration across The Web
  - ex: ontologies, OWL
  - See http://en.wikipedia.org/wiki/Web_Ontology_Language

A: „who can help me? Guys, let‘s solve this jointly!“

Step 1: What is the Problem?



http://www2002.org

WWW2002

THE ELEVENTH INTERNATIONAL WORLD WIDE WEB CONFERENCE

Sheraton Waikiki Hotel
Honolulu, Hawaii, USA
7-11 May 2002

1 LOCATION. 5 DAYS. LEARN. INTERACT.

- Conference Proceedings
- Call for Participation
- Program
- Registration Information
- Hotel Accommodation
- Conference Committee
- Sponsorship/ Exhibition Opportunities
- Volunteer Information
- Information about Hawaii
- Previous & Future WWW Conferences

Registered participants coming from:

Australia · Canada · Chile · Denmark · France · Germany · Ghana · Hong Kong · India · Italy · Ireland · Japan · Malta · New Zealand · The Netherlands · Norway · Singapore · Switzerland · The United States · Vietnam · Zambia

REGISTER NOW

On 7-11 May 2002, Honolulu, Hawaii will provide the backdrop for The Eleventh International World Wide Web Conference. This prestigious series of the International World Wide Web Conference Committee (W^3C^2) attracts participants from around the world, and it provides a public forum for the World Wide Web Consortium (W3C) through the annual W3C track.

The conference is being organized by the International World Wide Web Conference Committee (W^3C^2), the University of Hawaii and the Pacific Telecommunications Council (PTC).

FEATURED SPEAKERS (CONFIRMED)

Tim Berners-Lee, inventor of the World Wide Web and Director of the W3C who now holds the 3Com Founders chair at the Laboratory for Computer Science (LCS) at the Massachusetts Institute of Technology (MIT).

Richard A. DeMillo, vice president and chief technology officer for Hewlett-Packard Company.

Ian Foster, guru of "Grid Computing", associate

McArthur Prize Winner,

- Markup consists of:
  - rendering information
    - *font size, colour, …*
  - Hyper-links
- accessible to humans, not to computers

What We See

WWW2002

The eleventh international world wide web conference

Sheraton waikiki hotel, Honolulu, hawaii, USA

7-11 may 2002, 1 location 5 days learn interact

Registered participants coming from

australia, canada, chile denmark, france, germany, ghana, hong kong,, norway, singapore, switzerland, the united kingdom, the united states, vietnam, zaire

Register now

On the 7th May Honolulu will provide the backdrop of the eleventh international world wide web conference. This prestigious event..

Speakers confirmed

Tim berners-lee

Tim is the well known inventor of the Web, …

Ian Foster

Ian is the pioneer of the Grid, the next generation internet …

What a machine Sees

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What a Machine Sees…with XML

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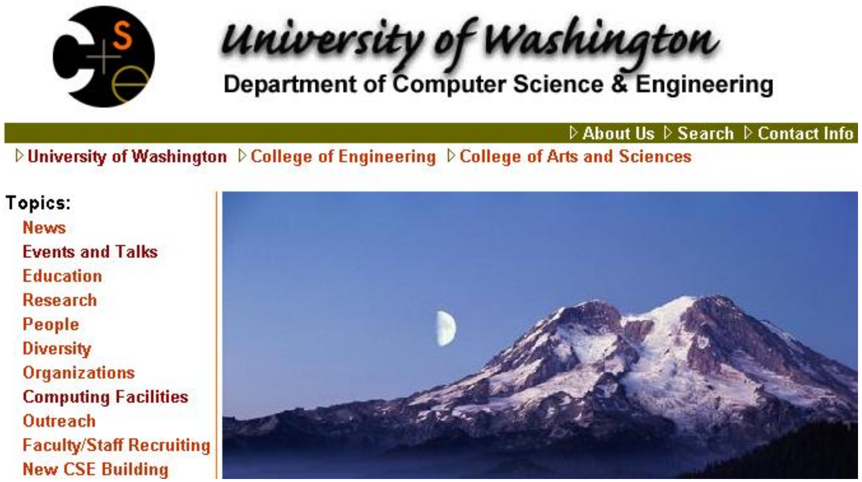
Now machine can answer questions:
- Name of conference?
- How many countries?

Step 2: Understand the Unknown

“Find Prof. Cook, a professor in U Washington,
earlier an assoc. professor at his alma mater in Australia”



University of Washington
Department of Computer Science & Engineering

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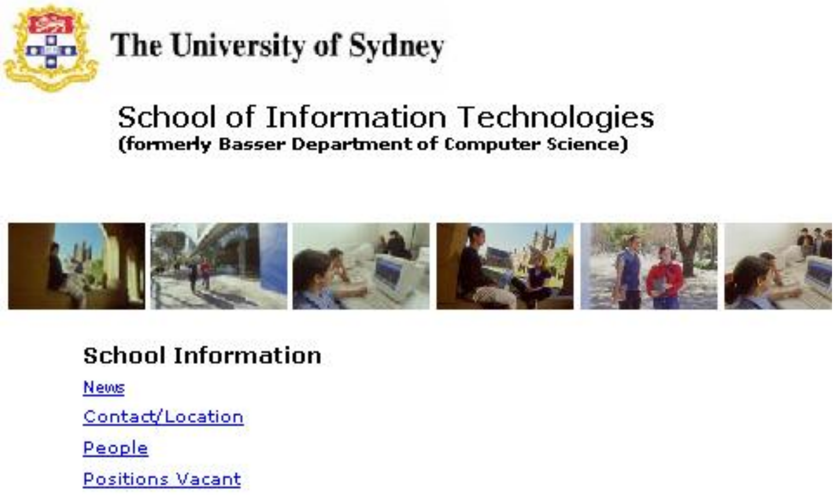
- Diversity
- Organizations
- Computing Facilities
- Outreach
- Faculty/Staff Recruiting
- New CSE Building



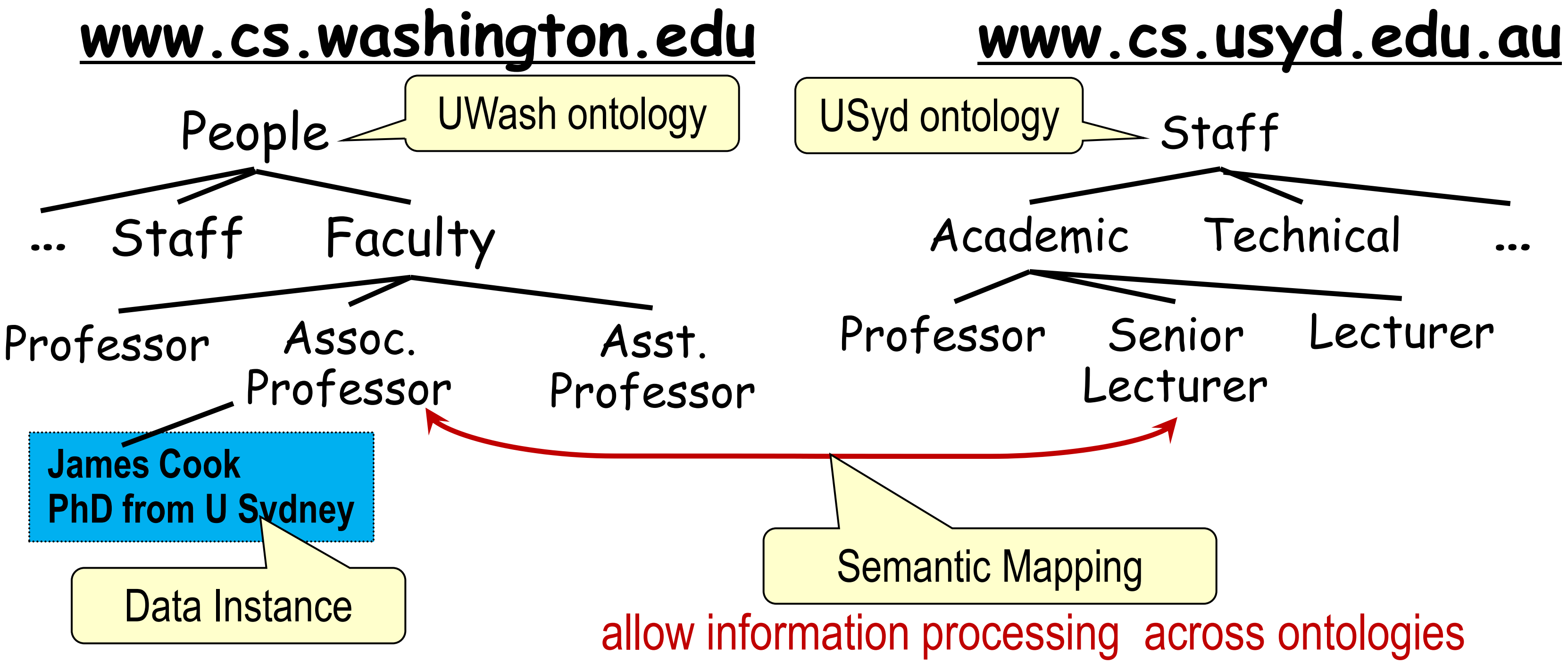
The University of Sydney

School of Information Technologies
(formerly Basser Department of Computer Science)

School Information
- News
- Contact/Location
- People
- Positions Vacant

Step 2: Understand the Unknown

"Find Prof. Cook, a professor in U Washington,
earlier an assoc. professor at his alma mater in Australia"



www.cs.washington.edu

www.cs.usyd.edu.au

UWash ontology

USyd ontology

People

... Staff Faculty

Professor Assoc. Professor Asst. Professor

Staff

Academic Technical ...

Professor Senior Lecturer Lecturer

James Cook
PhD from U Sydney

Data Instance

Semantic Mapping

allow information processing across ontologies

Web Services: Where Do We Stand?

- Practice: Broad spectrum of services available
  - Information systems, electronic commerce, financial transactions, sensors, ...
- Progressing on interoperability
  - Data can be understood independently from their originating system
  - Two technically heterogeneous systems can exchange such data
- Working hard on automation
  - Service can discover another service it needs
  - Service can „orchestrate“ other services to perform more complex tasks

Summary

- World Wide Web: an Internet service linking zillions of computers
  - HTTP for communication
  - URIs for linking
- Challenge 1: Interoperability → machine2machine exchange
- Challenge 2: Automation → Web for answering complex questions