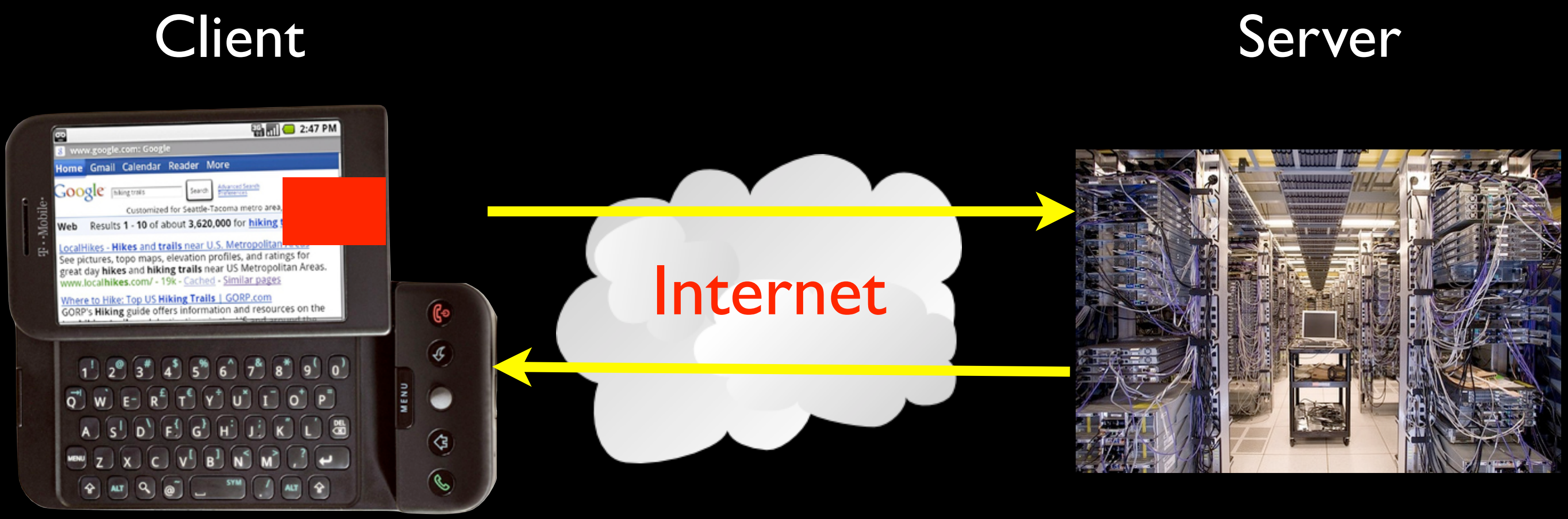
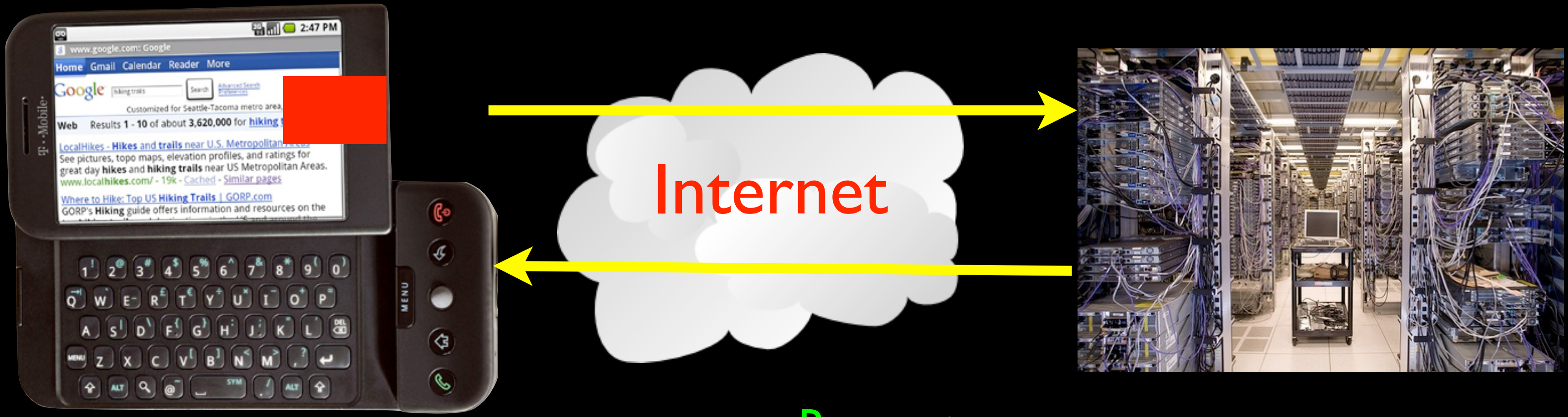
Networked Programs

Chapter 12

Python for Informatics: Exploring Information
www.py4inf.com



Wikipedia



HTML JavaScript

AJAX CSS

HTTP Request

Response GET

socket POST

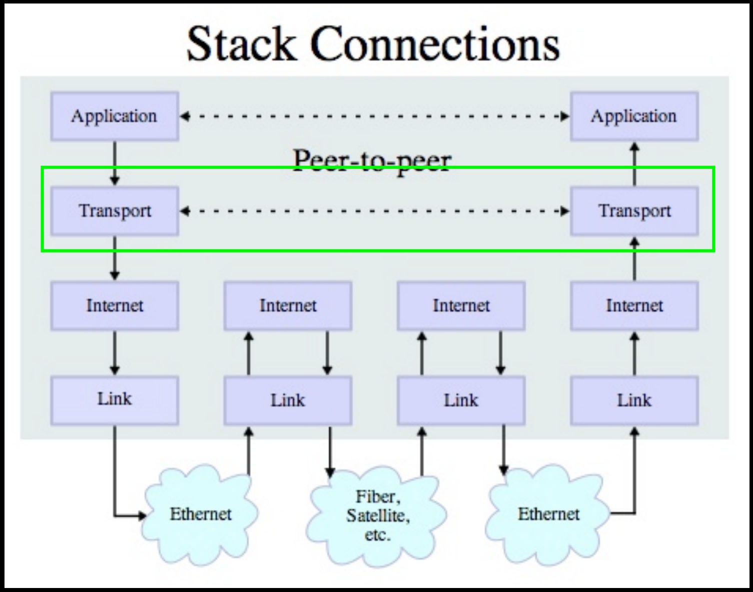
Python Data Store

Templates memcache

Network Architecture....

Transport Control Protocol (TCP)

- Built on top of IP (Internet Protocol)
- Assumes IP might lose some data - stores and retransmits data if it seems to be lost
- Handles "flow control" using a transmit window
- Provides a nice reliable pipe



Source: http://en.wikipedia.org/wiki/Internet_Protocol_Suite

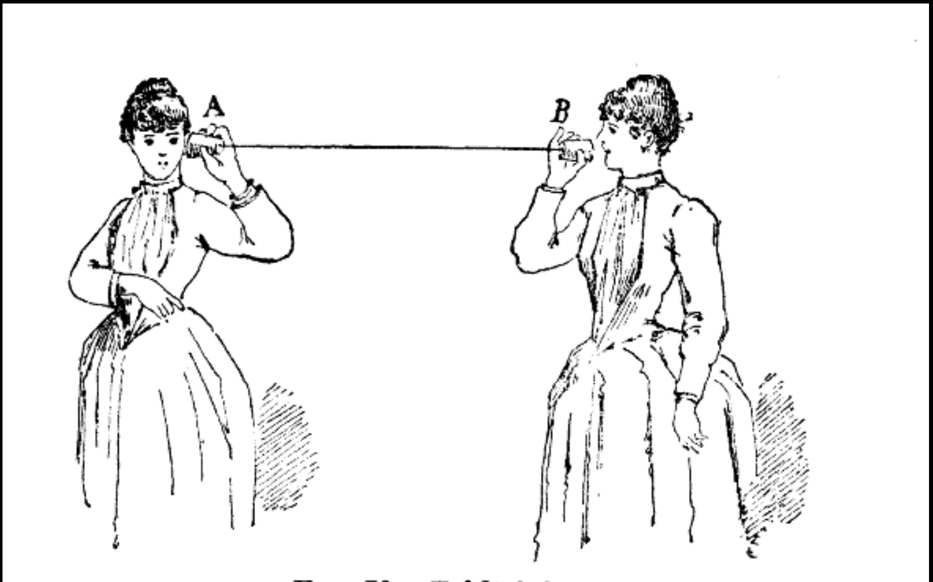


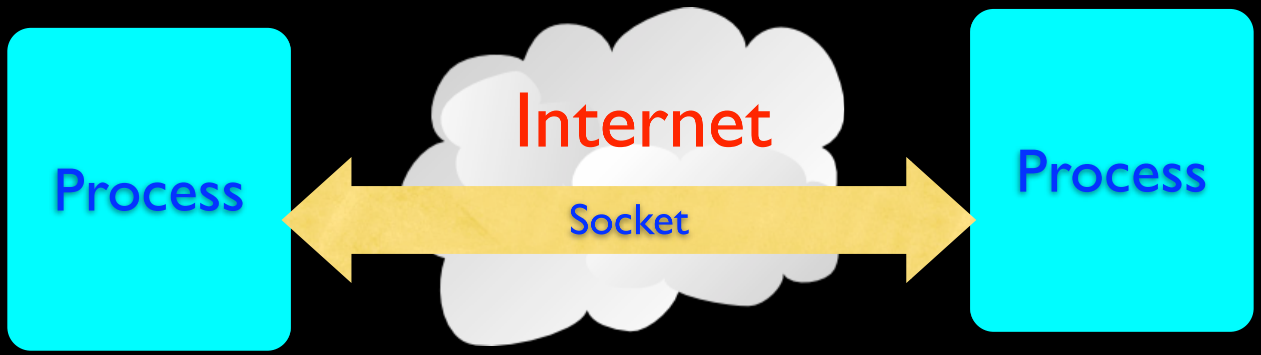
FIG. 76. Trådtelefon.

http://en.wikipedia.org/wiki/Tin_can_telephone

http://www.flickr.com/photos/kitcowan/2103850699/

TCP Connections / Sockets

"In computer networking, an Internet socket or network socket is an endpoint of a bidirectional inter-process communication flow across an Internet Protocol-based computer network, such as the Internet."

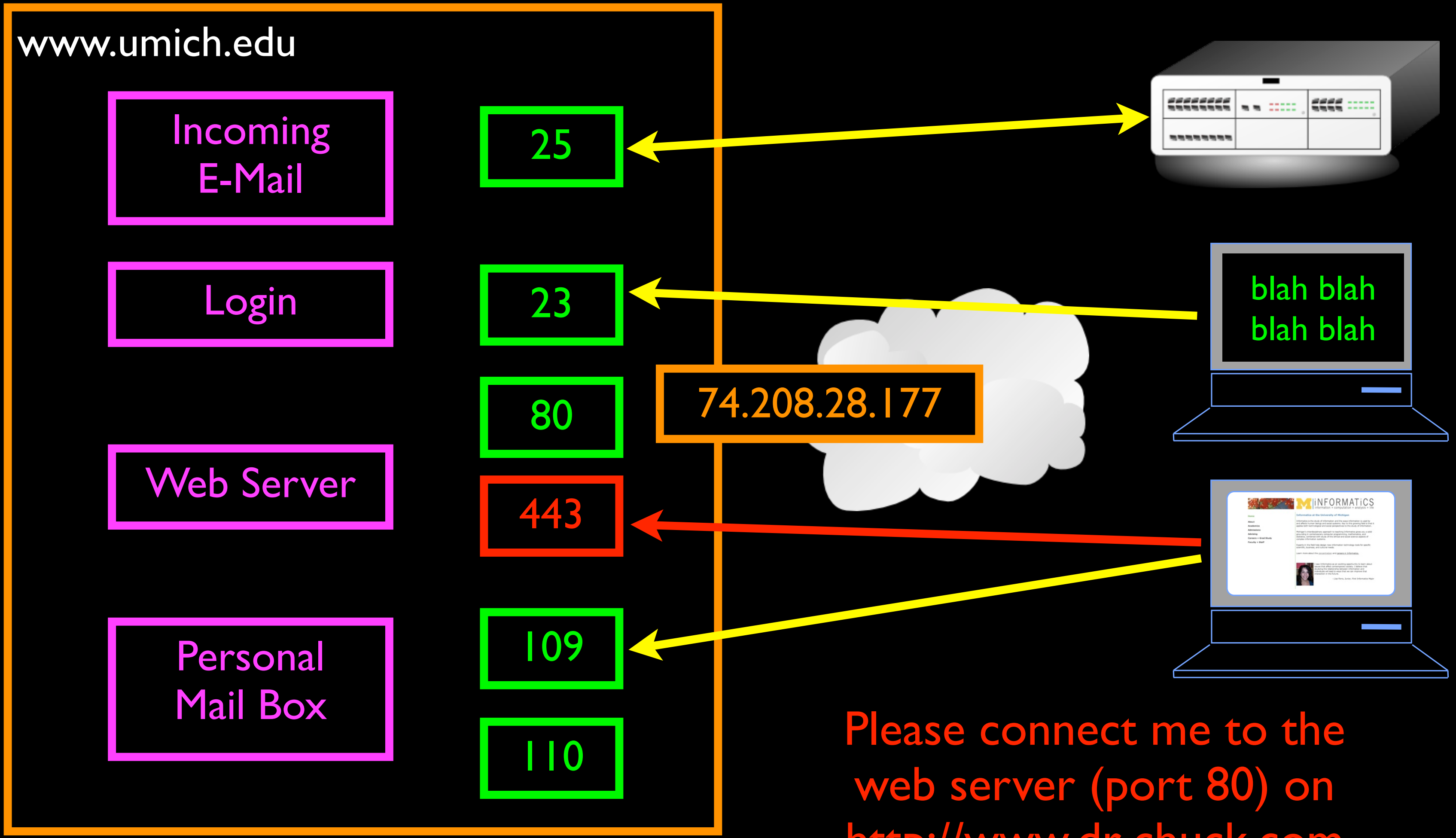


http://en.wikipedia.org/wiki/Internet_socket

TCP Port Numbers

- A port is an application-specific or process-specific software communications endpoint
- It allows multiple networked applications to coexist on the same server.
- There is a list of well-known TCP port numbers

http://en.wikipedia.org/wiki/TCP_and_UDP_port



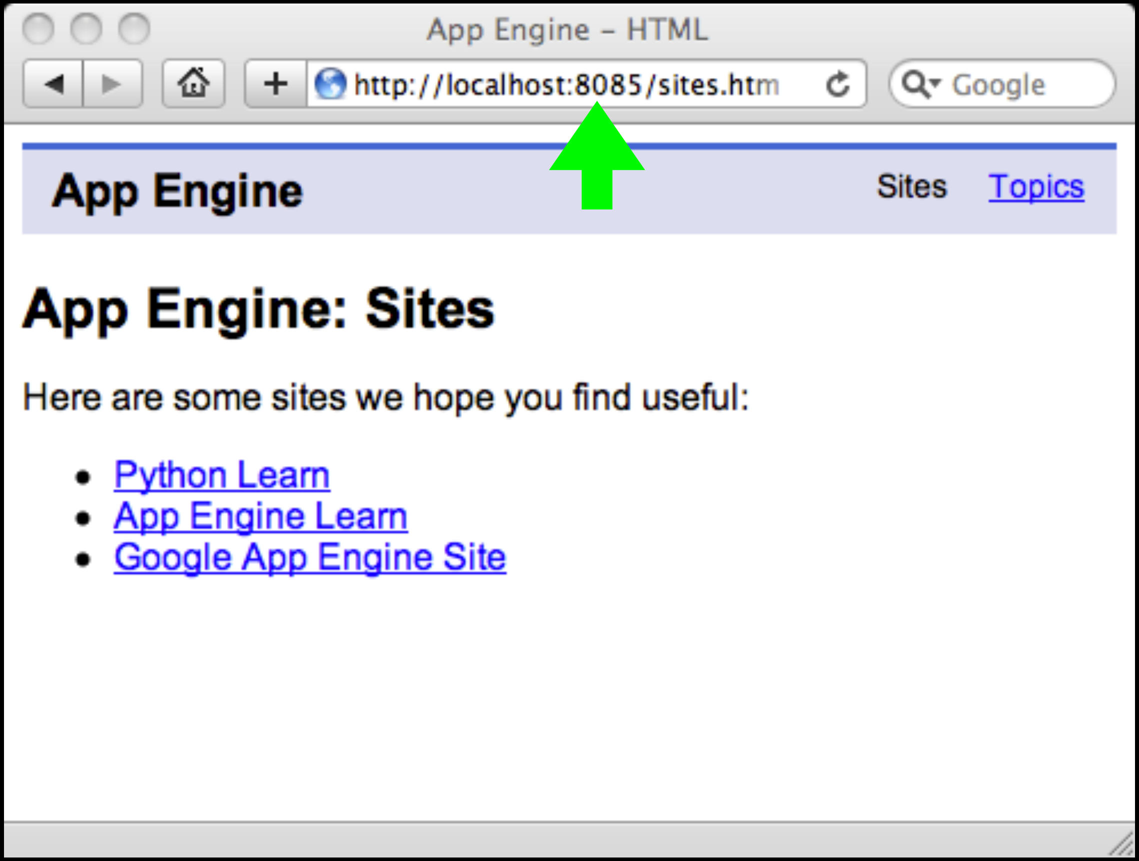
Please connect me to the web server (port 80) on http://www.dr-chuck.com

Clipart: http://www.clker.com/search/networksym/1

Common TCP Ports

- Telnet (23) - Login
- SSH (22) - Secure Login
- HTTP (80)
- HTTPS (443) - Secure
- SMTP (25) (Mail)
- IMAP (143/220/993) - Mail Retrieval
- POP (109/110) - Mail Retrieval
- DNS (53) - Domain Name
- FTP (21) - File Transfer

http://en.wikipedia.org/wiki/List_of_TCP_and_UDP_port_numbers



App Engine

Sites Topics

App Engine: Sites

Here are some sites we hope you find useful:

- Python Learn
- App Engine Learn
- Google App Engine Site

Sometimes we see the port number in the URL if the web server is running on a "non-standard" port.

Sockets in Python

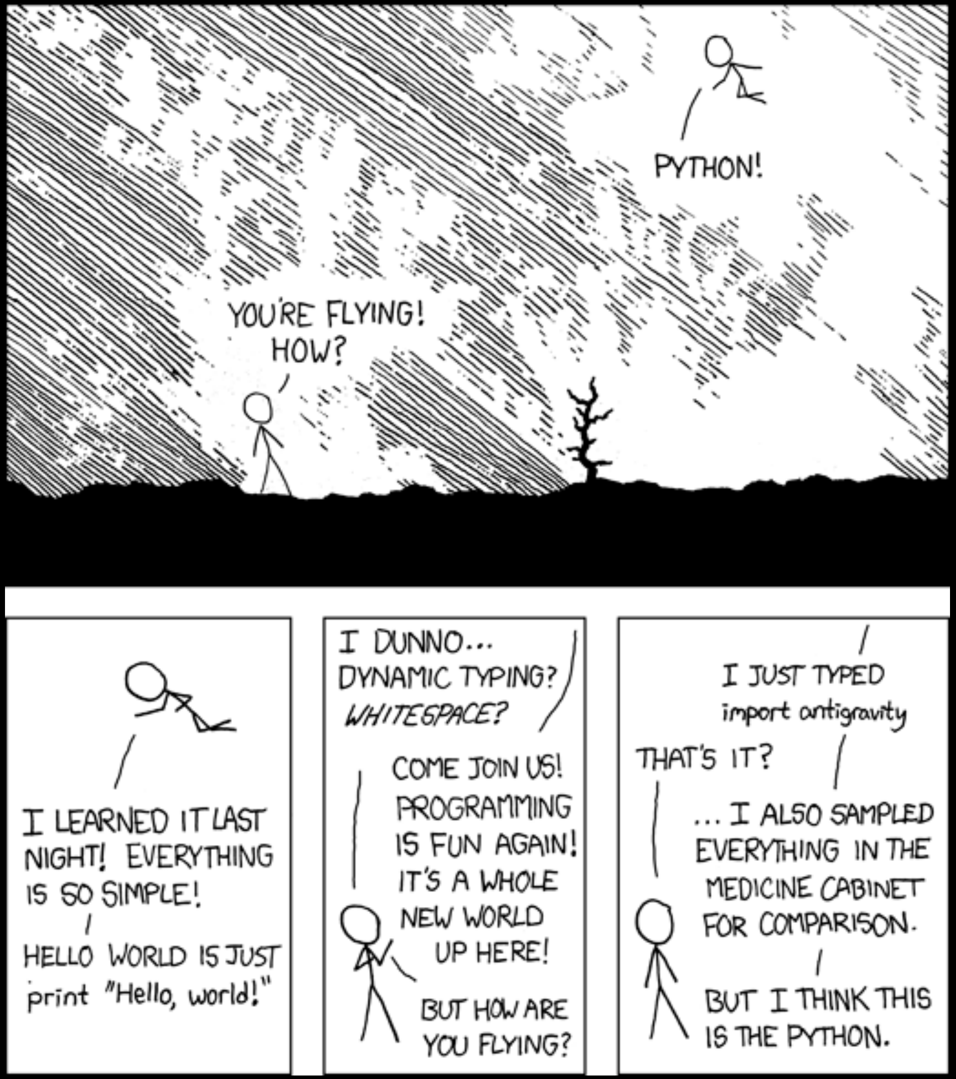
- Python has built-in support for TCP Sockets

```
import socket

mysock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
mysock.connect( ('www.py4inf.com', 80) )
```

Host

Port

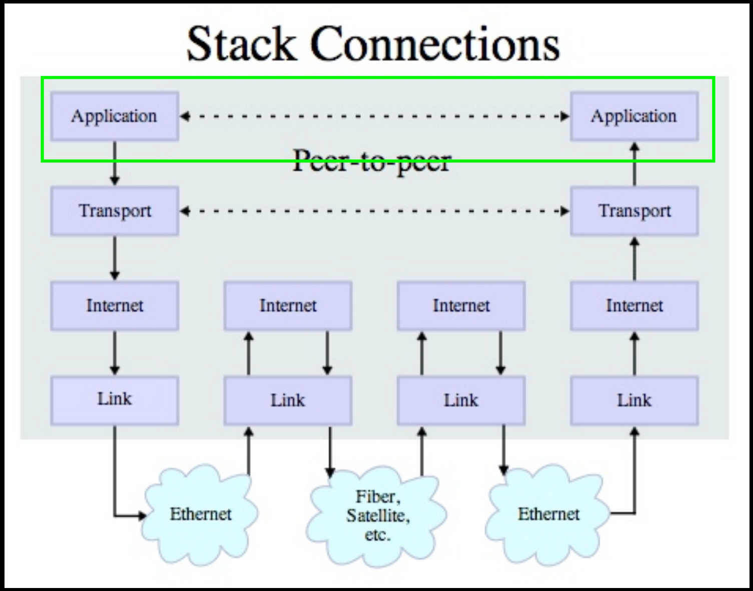
http://docs.python.org/library/socket.html


PYTHON!
YOU'RE FLYING! HOW?
I LEARNED IT LAST NIGHT! EVERYTHING IS SO SIMPLE!
HELLO WORLD IS JUST print "Hello, world!"
I DUNNO... DYNAMIC TYPING? WHITESPACE?
COME JOIN US! PROGRAMMING IS FUN AGAIN! IT'S A WHOLE NEW WORLD UP HERE!
BUT HOW ARE YOU FLYING?
I JUST TYPED import antigravity
THAT'S IT?
... I ALSO SAMPLED EVERYTHING IN THE MEDICINE CABINET FOR COMPARISON.
BUT I THINK THIS IS THE PYTHON.

http://xkcd.com/353/

Application Protocol

- Since TCP (and Python) gives us a reliable socket, what to we want to do with the socket? What problem do we want to solve?
- Application Protocols
  - Mail
  - World Wide Web



Source: http://en.wikipedia.org/wiki/Internet_Protocol_Suite

HTTP - Hypertext Transport Protocol

- The dominant Application Layer Protocol on the Internet
- Invented for the Web - to Retrieve HTML, Images, Documents etc
- Extended to be data in addition to documents - RSS, Web Services, etc..
- Basic Concept - Make a Connection - Request a document - Retrieve the Document - Close the Connection

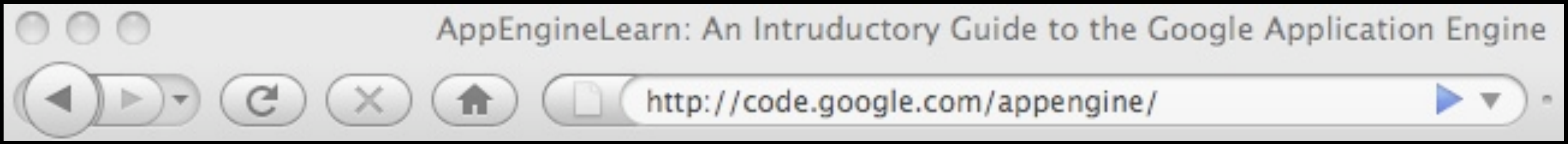
http://en.wikipedia.org/wiki/Http

HTTP

- The HyperText Transport Protocol is the set of rules to allow browsers to retrieve web documents from servers over the Internet

What is a Protocol?

- A set of rules that all parties follow for so we can predict each other's behavior
- And not bump into each other
  - On two-way roads in USA, drive on the right hand side of the road
  - On two-way roads in the UK drive on the left hand side of the road


AppEngineLearn: An Intruductory Guide to the Google Application Engine
http://code.google.com/appengine/

http://www.dr-chuck.com/page1.htm

protocol | host | document

http://www.youtube.com/watch?v=x2GylLq59rI

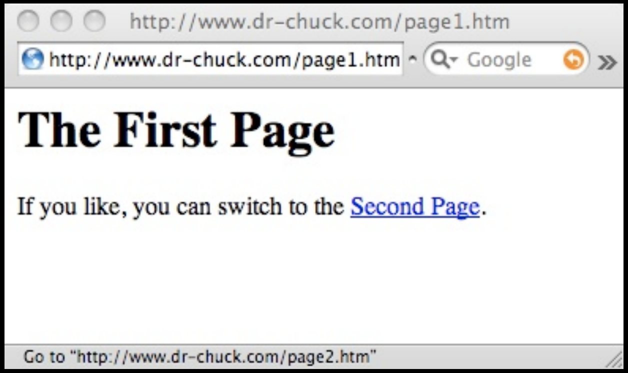
1:17 - 2:19

Getting Data From The Server

- Each the user clicks on an anchor tag with an href= value to switch to a new page, the browser makes a connection to the web server and issues a "GET" request - to GET the content of the page at the specified URL
- The server returns the HTML document to the Browser which formats and displays the document to the user.

Making an HTTP request

- Connect to the server like www.dr-chuck.com
    - a "hand shake"
- Request a document (or the default document)
    - GET http://www.dr-chuck.com/page1.htm
    - GET http://www.mlive.com/ann-arbor/
    - GET http://www.facebook.com

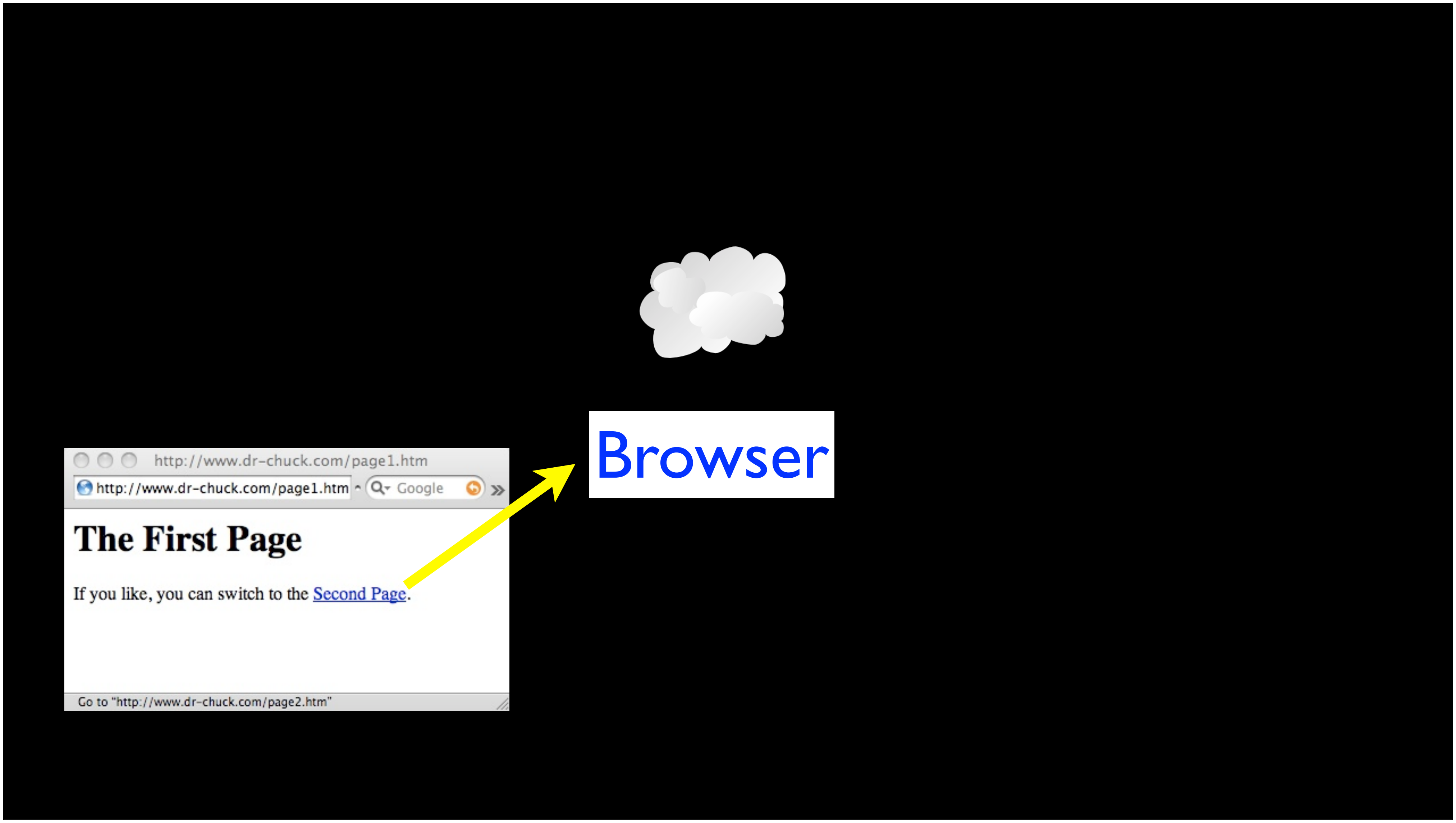

http://www.dr-chuck.com/page1.htm

http://www.dr-chuck.com/page1.htm

The First Page

If you like, you can switch to the Second Page.

Go to "http://www.dr-chuck.com/page2.htm"

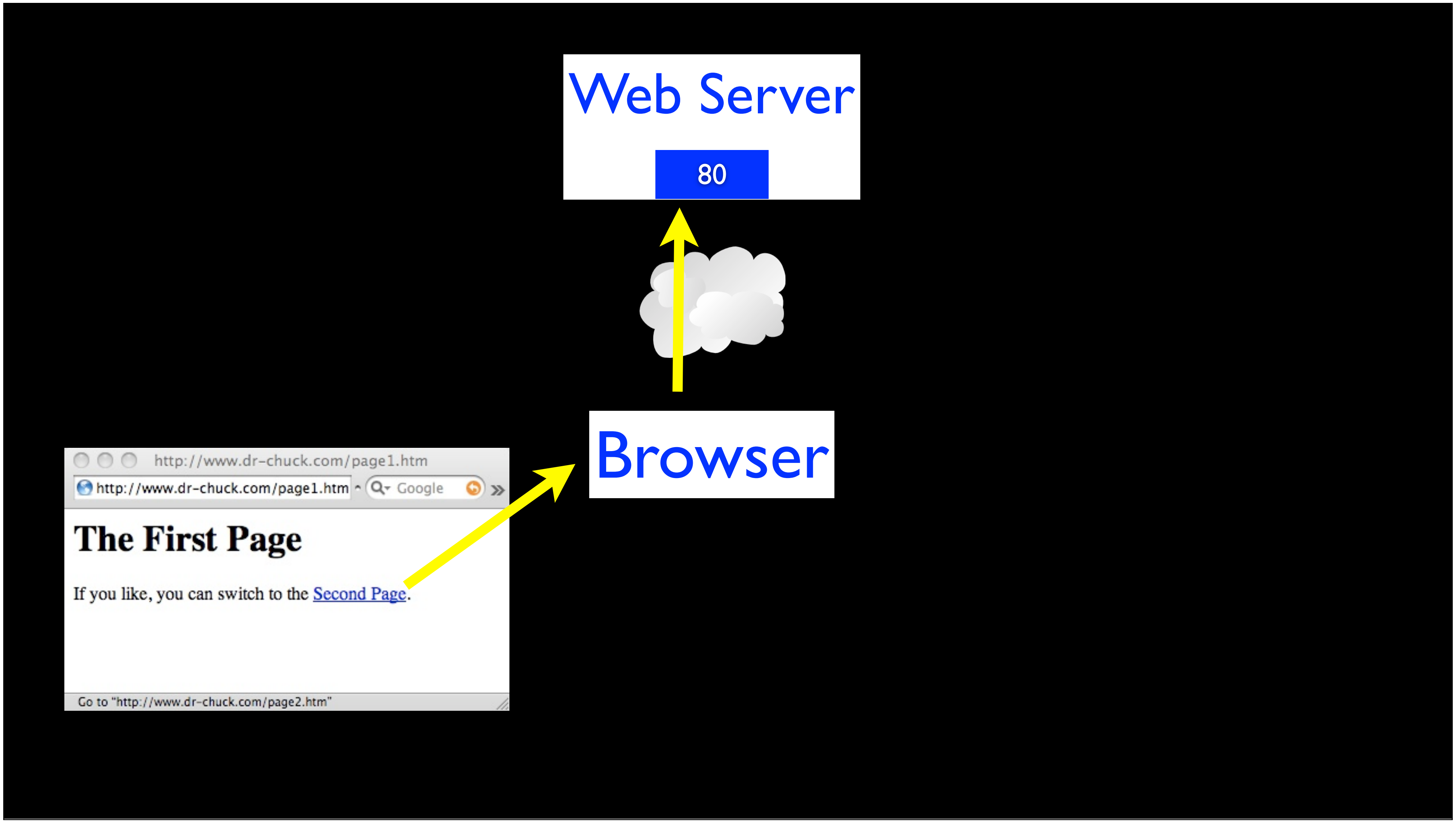


http://www.dr-chuck.com/page1.htm

The First Page

If you like, you can switch to the Second Page.

Go to "http://www.dr-chuck.com/page2.htm"

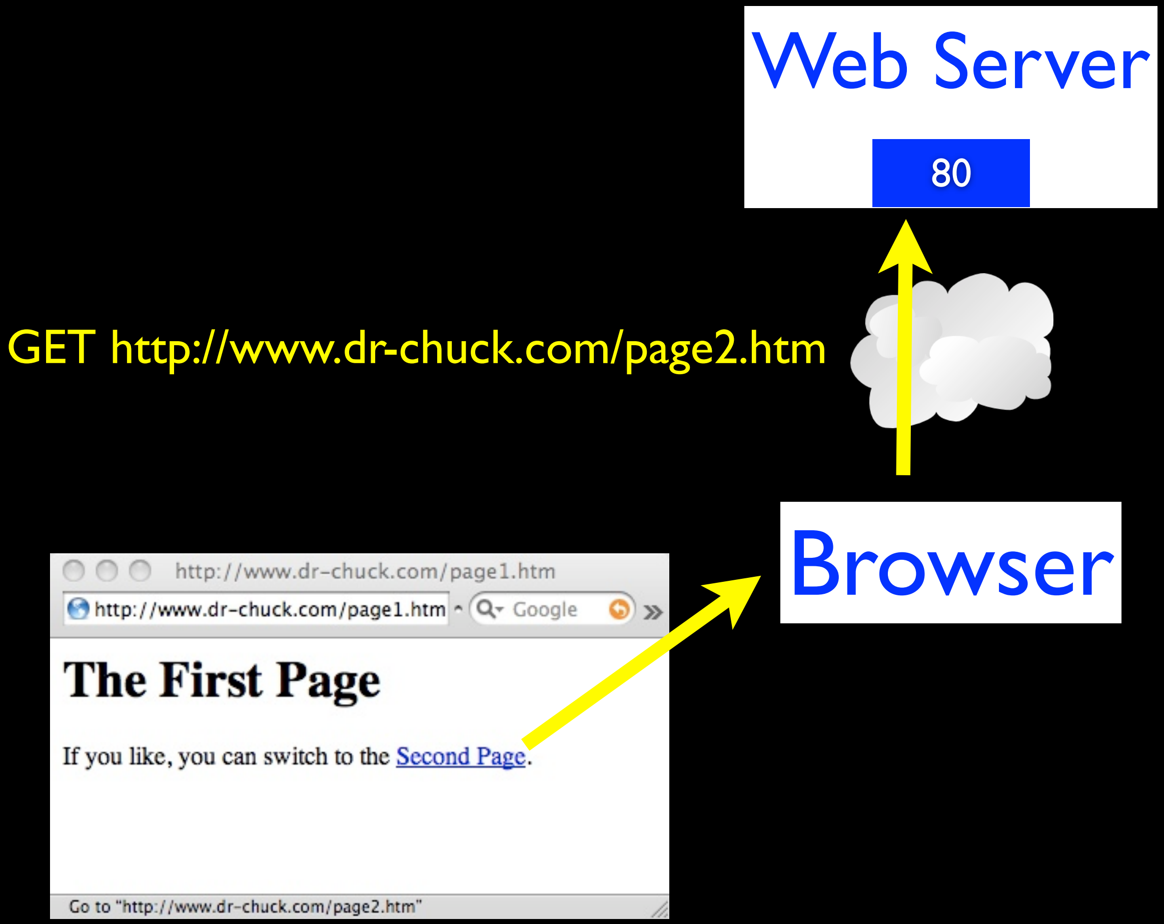


http://www.dr-chuck.com/page1.htm

The First Page

If you like, you can switch to the Second Page.

Go to "http://www.dr-chuck.com/page2.htm"



http://www.dr-chuck.com/page1.htm

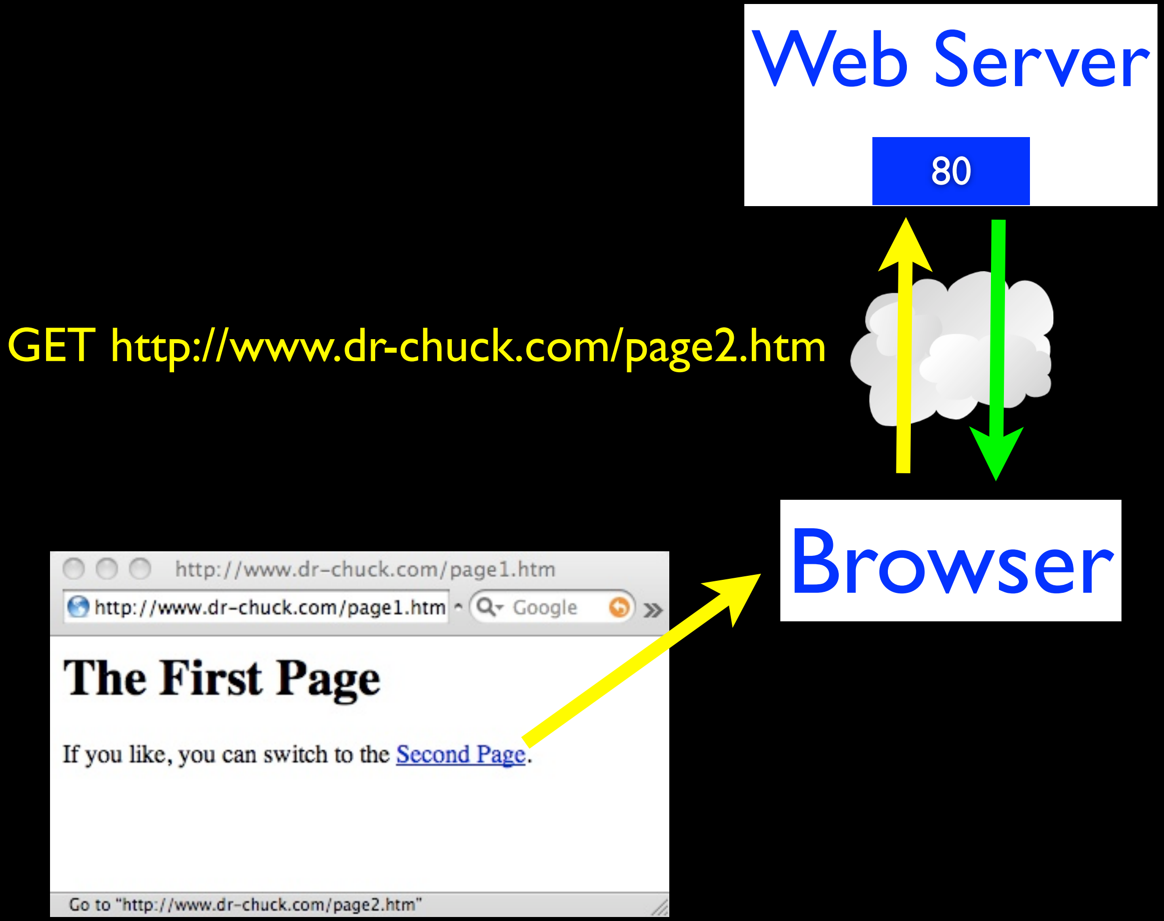
http://www.dr-chuck.com/page1.htm

Google

The First Page

If you like, you can switch to the Second Page.

Go to "http://www.dr-chuck.com/page2.htm"



http://www.dr-chuck.com/page1.htm

http://www.dr-chuck.com/page1.htm

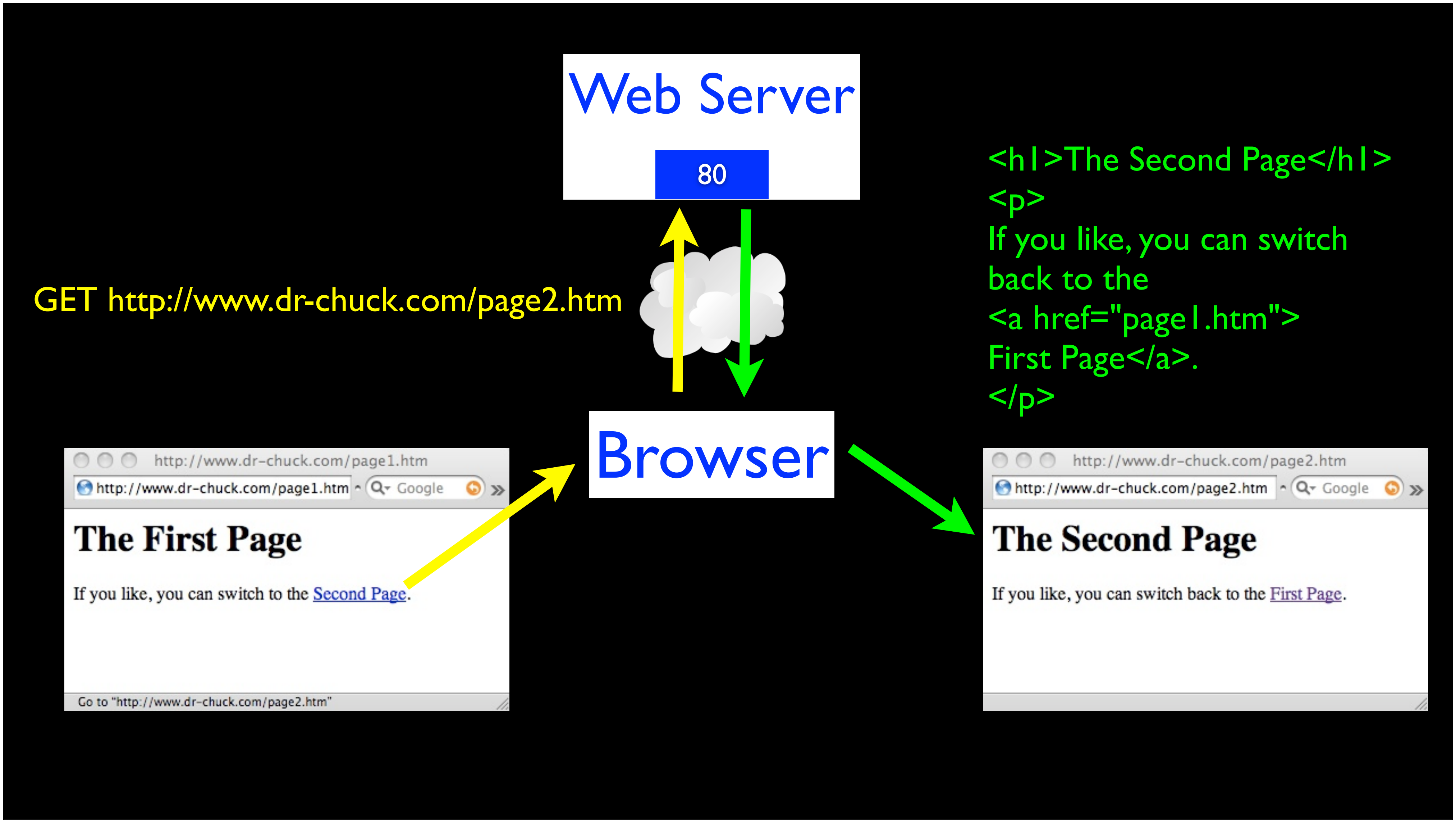
Google

The First Page

If you like, you can switch to the Second Page.

Go to "http://www.dr-chuck.com/page2.htm"

```
<h1>The Second Page</h1>
<p>
If you like, you can switch
back to the
<a href="page1.htm">
First Page</a>.
</p>
```



```
<h1>The Second Page</h1>
<p>
If you like, you can switch
back to the
<a href="page1.htm">
First Page</a>.
</p>
```

http://www.dr-chuck.com/page1.htm

The First Page

If you like, you can switch to the Second Page.

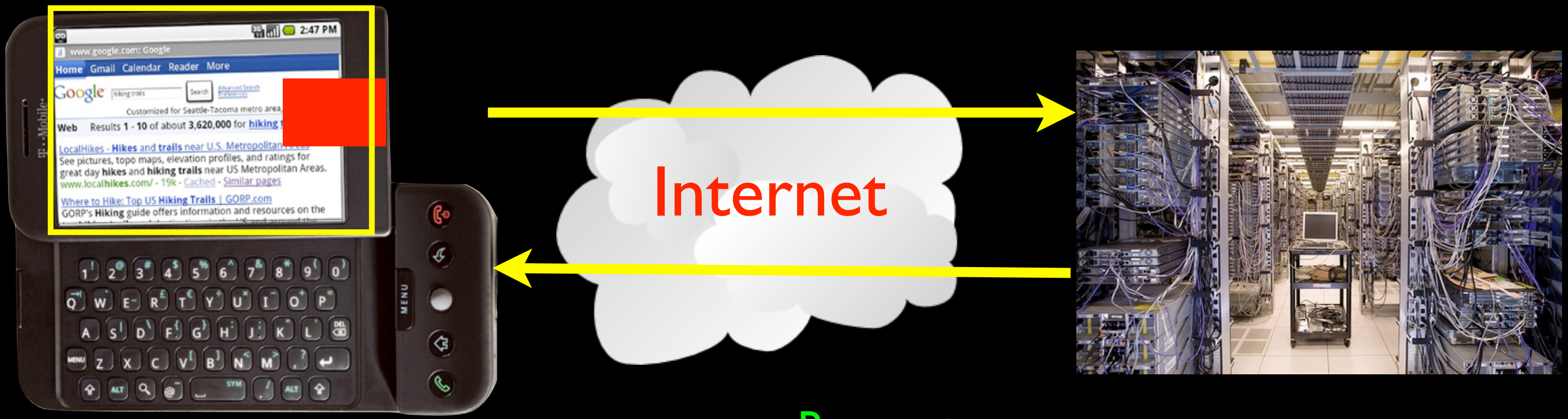
Go to "http://www.dr-chuck.com/page2.htm"

http://www.dr-chuck.com/page2.htm

The Second Page

If you like, you can switch back to the First Page.

Lets Write a Web Browser!



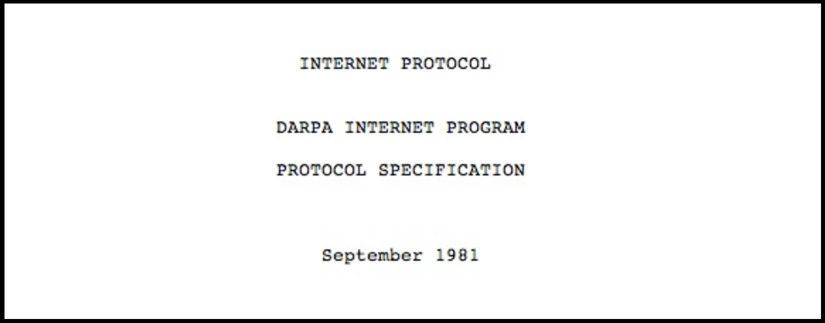
HTML JavaScript AJAX CSS

HTTP Request Response GET socket POST

Python Data Store Templates memcache

Internet Standards

- The standards for all of the Internet protocols (inner workings) are developed by an organization
- Internet Engineering Task Force (IETF)
- www.ietf.org
- Standards are called "RFCs" - "Request for Comments"

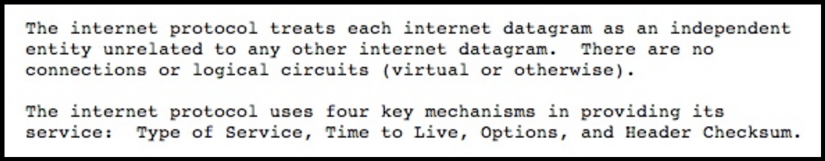


INTERNET PROTOCOL

DARPA INTERNET PROGRAM

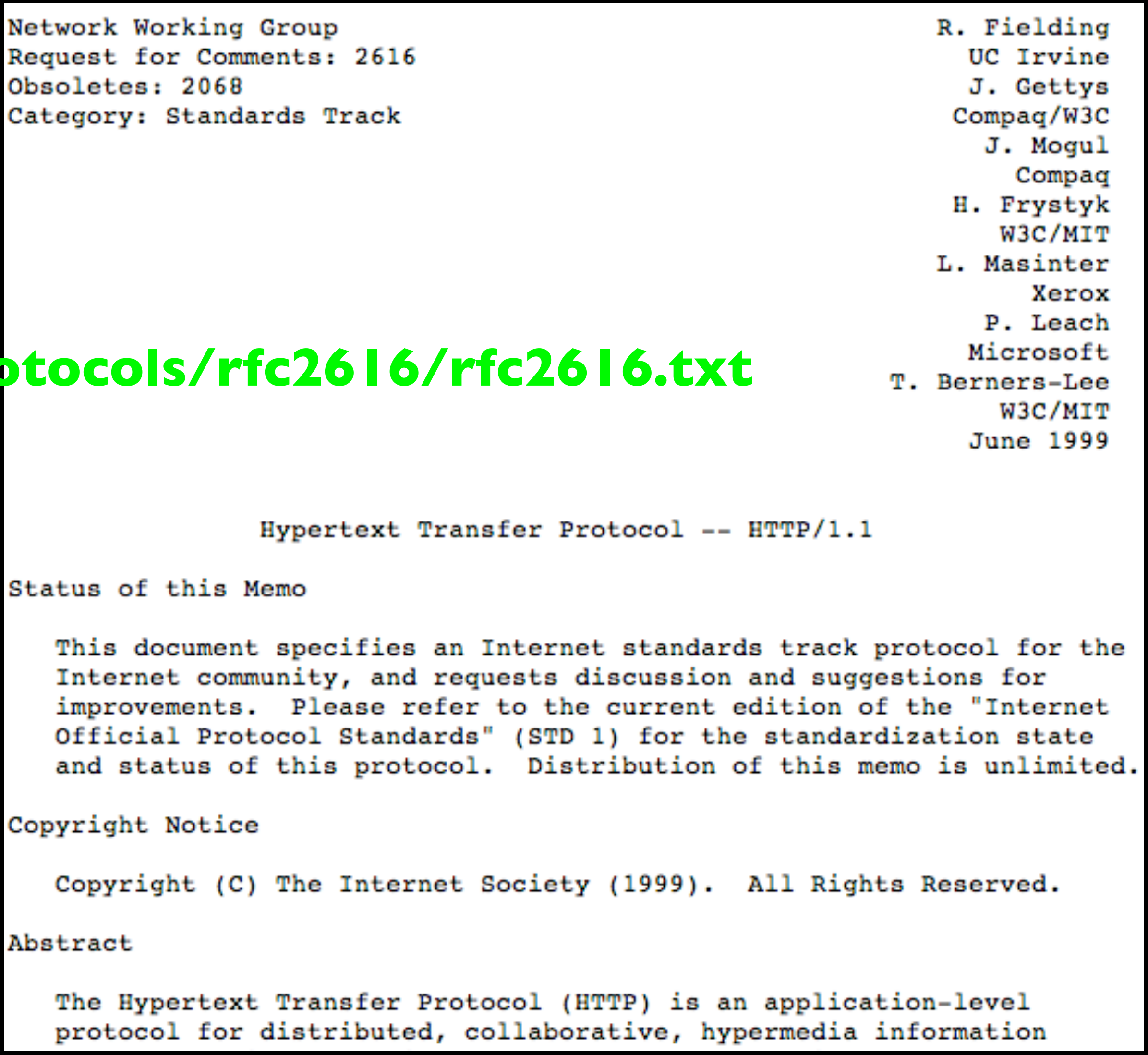
PROTOCOL SPECIFICATION

September 1981



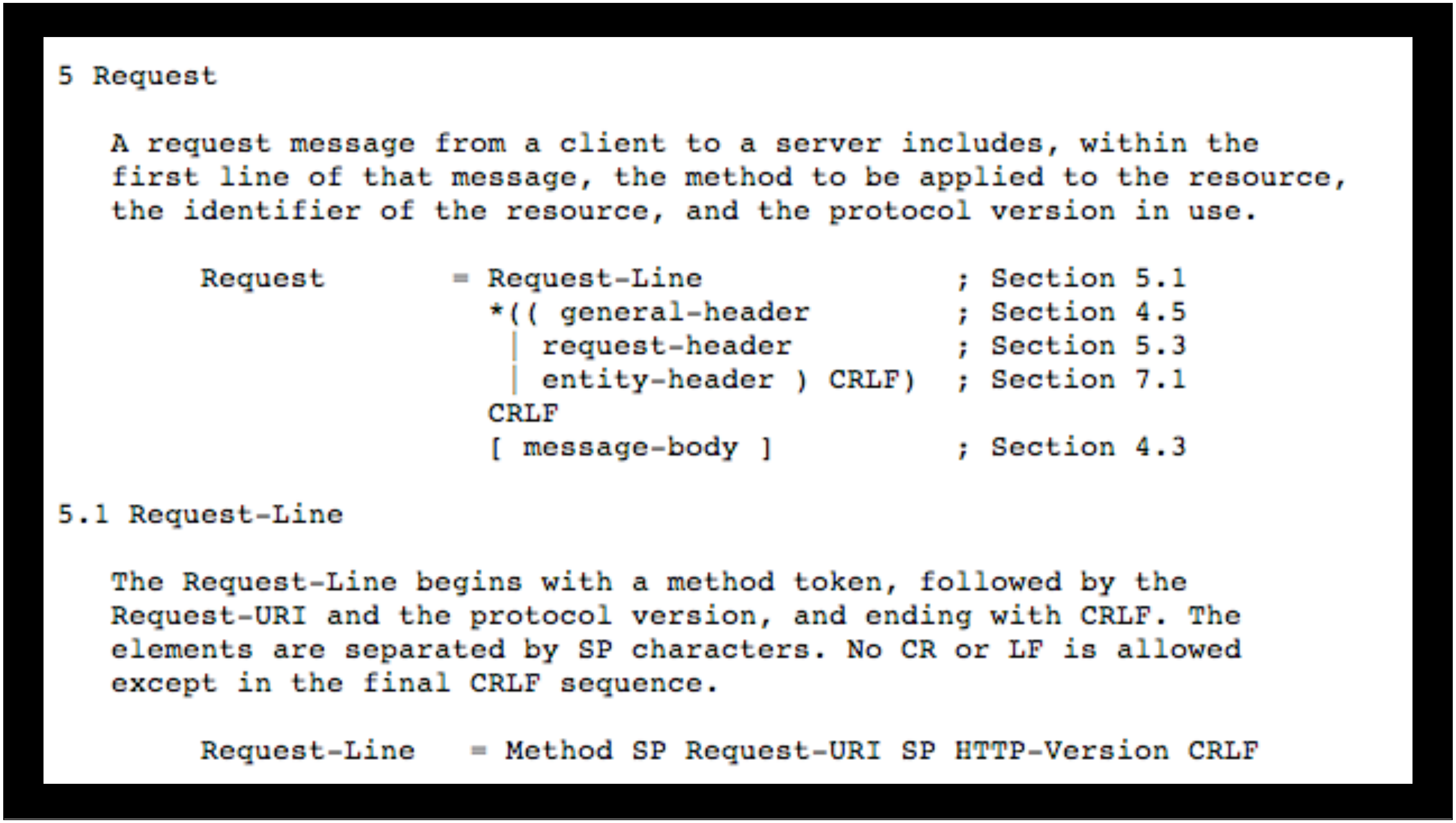
```
The internet protocol treats each internet datagram as an independent
entity unrelated to any other internet datagram.  There are no
connections or logical circuits (virtual or otherwise).

The internet protocol uses four key mechanisms in providing its
service:  Type of Service, Time to Live, Options, and Header Checksum.
```

Source: http://tools.ietf.org/html/rfc791



http://www.w3.org/Protocols/rfc2616/rfc2616.txt

```
Network Working Group                                      R. Fielding
Request for Comments: 2616                                   UC Irvine
Obsoletes: 2068                                              J. Gettys
Category: Standards Track                                   Compaq/W3C
                                                              J. Mogul
                                                                Compaq
                                                            H. Frystyk
                                                               W3C/MIT
                                                           L. Masinter
                                                                 Xerox
                                                              P. Leach
                                                             Microsoft
                                                        T. Berners-Lee
                                                               W3C/MIT
                                                             June 1999


                Hypertext Transfer Protocol -- HTTP/1.1

Status of this Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements.  Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol.  Distribution of this memo is unlimited.

Copyright Notice

   Copyright (C) The Internet Society (1999).  All Rights Reserved.

Abstract

   The Hypertext Transfer Protocol (HTTP) is an application-level
   protocol for distributed, collaborative, hypermedia information
```



5 Request

A request message from a client to a server includes, within the first line of that message, the method to be applied to the resource, the identifier of the resource, and the protocol version in use.

```
     Request       = Request-Line              ; Section 5.1
                     *(( general-header        ; Section 4.5
                      | request-header         ; Section 5.3
                      | entity-header ) CRLF)  ; Section 7.1
                     CRLF
                     [ message-body ]          ; Section 4.3
```

5.1 Request-Line

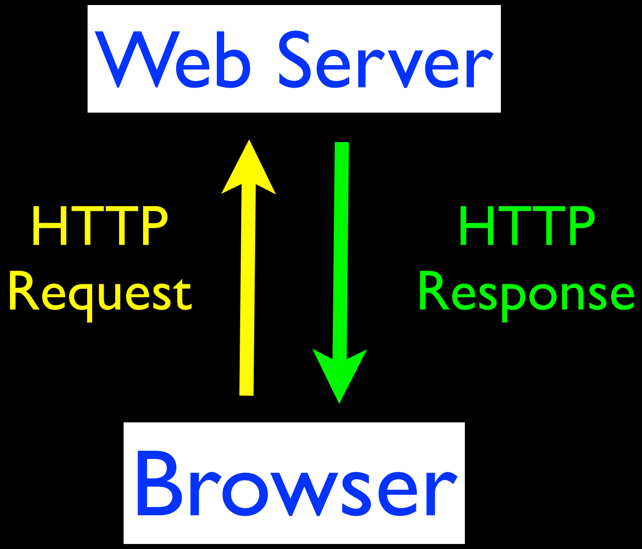
The Request-Line begins with a method token, followed by the Request-URI and the protocol version, and ending with CRLF. The elements are separated by SP characters. No CR or LF is allowed except in the final CRLF sequence.

```
     Request-Line   = Method SP Request-URI SP HTTP-Version CRLF
```

Making an HTTP request

- Connect to the server like www.dr-chuck.com
    - a "hand shake"
- Request a document (or the default document)
    - GET http://www.dr-chuck.com/page1.htm
    - GET http://www.mlive.com/ann-arbor/
    - GET http://www.facebook.com

“Hacking” HTTP



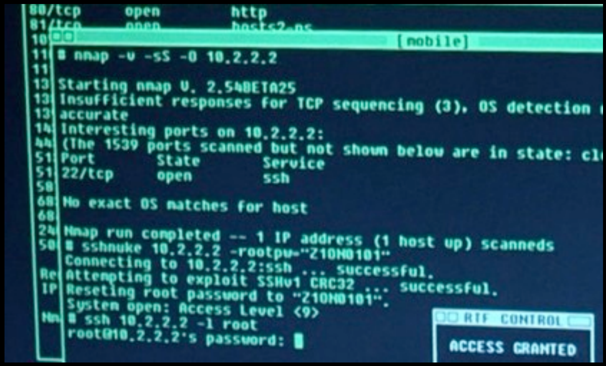
```
$ telnet www.dr-chuck.com 80
Trying 74.208.28.177...
Connected to www.dr-chuck.com.
Escape character is '^]'.
GET http://www.dr-chuck.com/page1.htm
<h1>The First Page</h1>
<p>
If you like, you can switch to the
<a href="http://www.dr-chuck.com/page2.htm">
Second Page</a>.
</p>
```

Port 80 is the non-encrypted HTTP port

Accurate Hacking in the Movies

- Matrix Reloaded
- Bourne Ultimatum
- Die Hard 4
- ...

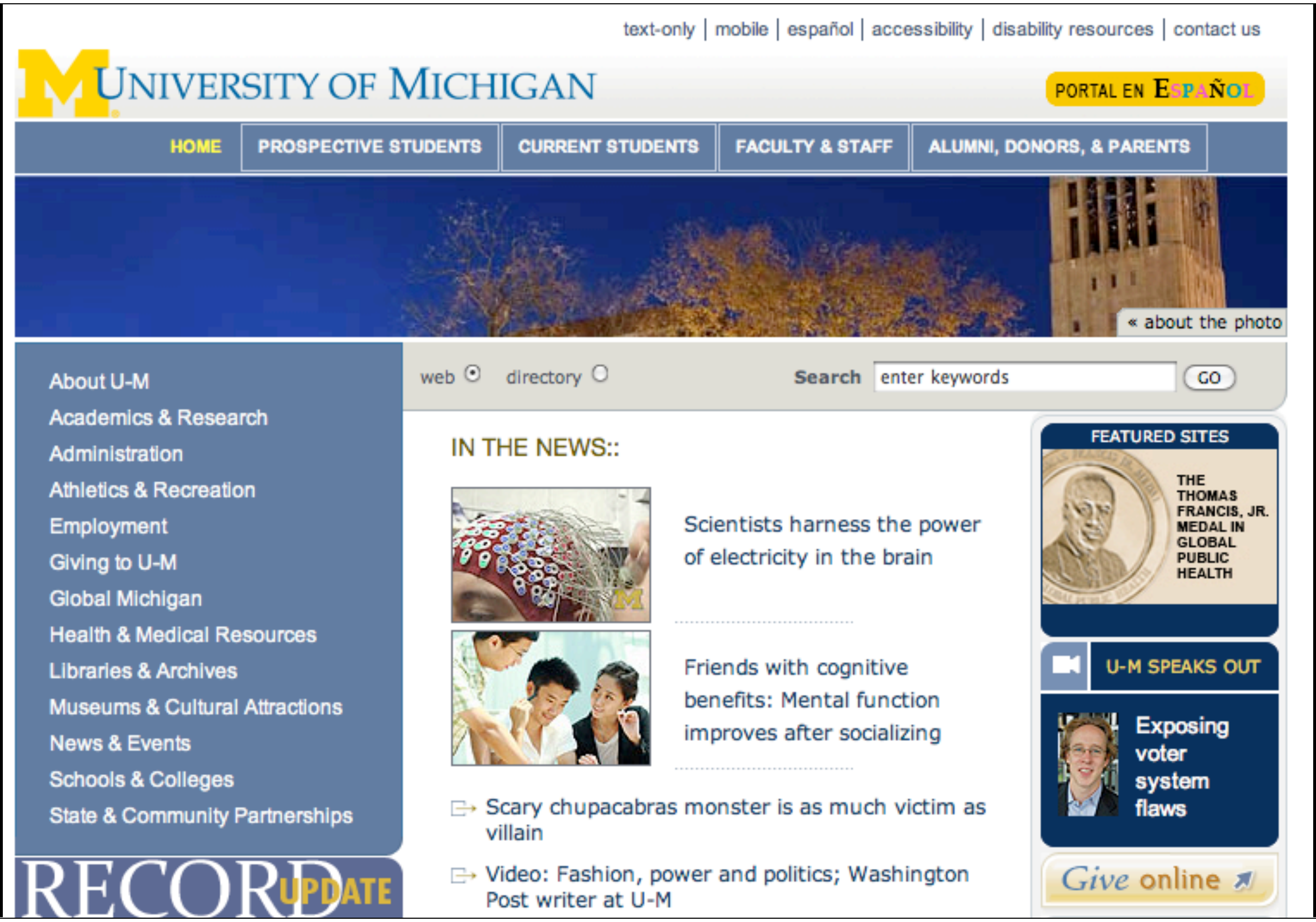
http://nmap.org/movies.html
http://www.youtube.com/watch?v=Zy5_gYu_isg



```
80/tcp      open        http
81/tcp      open        hosts2-ns
```

```
# nmap -v -sS -O 10.2.2.2

Starting nmap V. 2.54BETA25
Insufficient responses for TCP sequencing (3), OS detection
accurate
Interesting ports on 10.2.2.2:
(The 1539 ports scanned but not shown below are in state: cl
Port       State       Service
22/tcp     open        ssh

No exact OS matches for host

Nmap run completed -- 1 IP address (1 host up) scanneds
# sshnuke 10.2.2.2 -rootpw="Z10N0101"
Connecting to 10.2.2.2:ssh ... successful.
Attempting to exploit SSHv1 CRC32 ... successful.
Reseting root password to "Z10N0101".
System open: Access Level <9>
# ssh 10.2.2.2 -l root
root@10.2.2.2's password:
```

```
$ telnet www.dr-chuck.com 80
Trying 74.208.28.177...
Connected to www.dr-chuck.com.
Escape character is '^]'.
GET http://www.dr-chuck.com/page1.htm
<h1>The First Page</h1>
<p>
If you like, you can switch to the
<a href="http://www.dr-chuck.com/page2.htm">
Second Page</a>.
</p>
Connection closed by foreign host.
```



text-only | mobile | español | accessibility | disability resources | contact us

UNIVERSITY OF MICHIGAN

PORTAL EN ESPAÑOL

HOME | PROSPECTIVE STUDENTS | CURRENT STUDENTS | FACULTY & STAFF | ALUMNI, DONORS, & PARENTS

« about the photo

- About U-M
- Academics & Research
- Administration
- Athletics & Recreation
- Employment
- Giving to U-M
- Global Michigan
- Health & Medical Resources
- Libraries & Archives
- Museums & Cultural Attractions
- News & Events
- Schools & Colleges
- State & Community Partnerships

RECORD UPDATE

web ● directory ○ Search enter keywords GO

IN THE NEWS::

Scientists harness the power of electricity in the brain

Friends with cognitive benefits: Mental function improves after socializing

Scary chupacabras monster is as much victim as villain

Video: Fashion, power and politics; Washington Post writer at U-M

FEATURED SITES

THE THOMAS FRANCIS, JR. MEDAL IN GLOBAL PUBLIC HEALTH

U-M SPEAKS OUT

Exposing voter system flaws

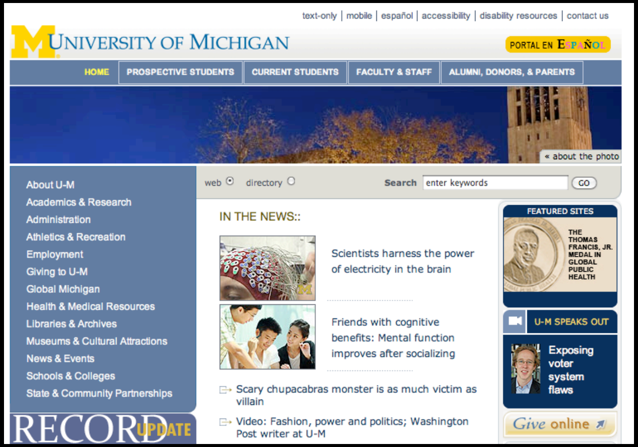
Give online

```
si-csev-mbp:tex csev$ telnet www.umich.edu 80
Trying 141.211.144.190...
Connected to www.umich.edu.
Escape character is '^]'.
GET /
<!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" xml:lang="en" lang="en">
<head>
<title>University of Michigan</title>
<meta name="description" content="University of Michigan is one of the top
universities of the world, a diverse public institution of higher learning,
fostering excellence in research. U-M provides outstanding undergraduate,
graduate and professional education, serving the local, regional, national and
international communities." />
```

```
...
<link rel="alternate stylesheet" type="text/css" href="/CSS/accessible.css"
media="screen" title="accessible" />
<link rel="stylesheet" href="/CSS/print.css" media="print,projection" />
<link rel="stylesheet" href="/CSS/other.css"
media="handheld,tty,tv,braille,embossed,speech,aural" />
...
<dl>
<dt><a href="http://ns.umich.edu/htdocs/releases/story.php?id=8077">
<img src="/Images/electric-brain.jpg" width="114" height="77" alt="Top News
Story" /></a><span class="verbose">:</span></dt>
<dd><a href="http://ns.umich.edu/htdocs/releases/story.php?
id=8077">Scientists harness the power of electricity in the brain</a></dd>
</dl>
```

As the browser reads the document, it finds other URLs that must be retreived to produce the document.

The big picture...

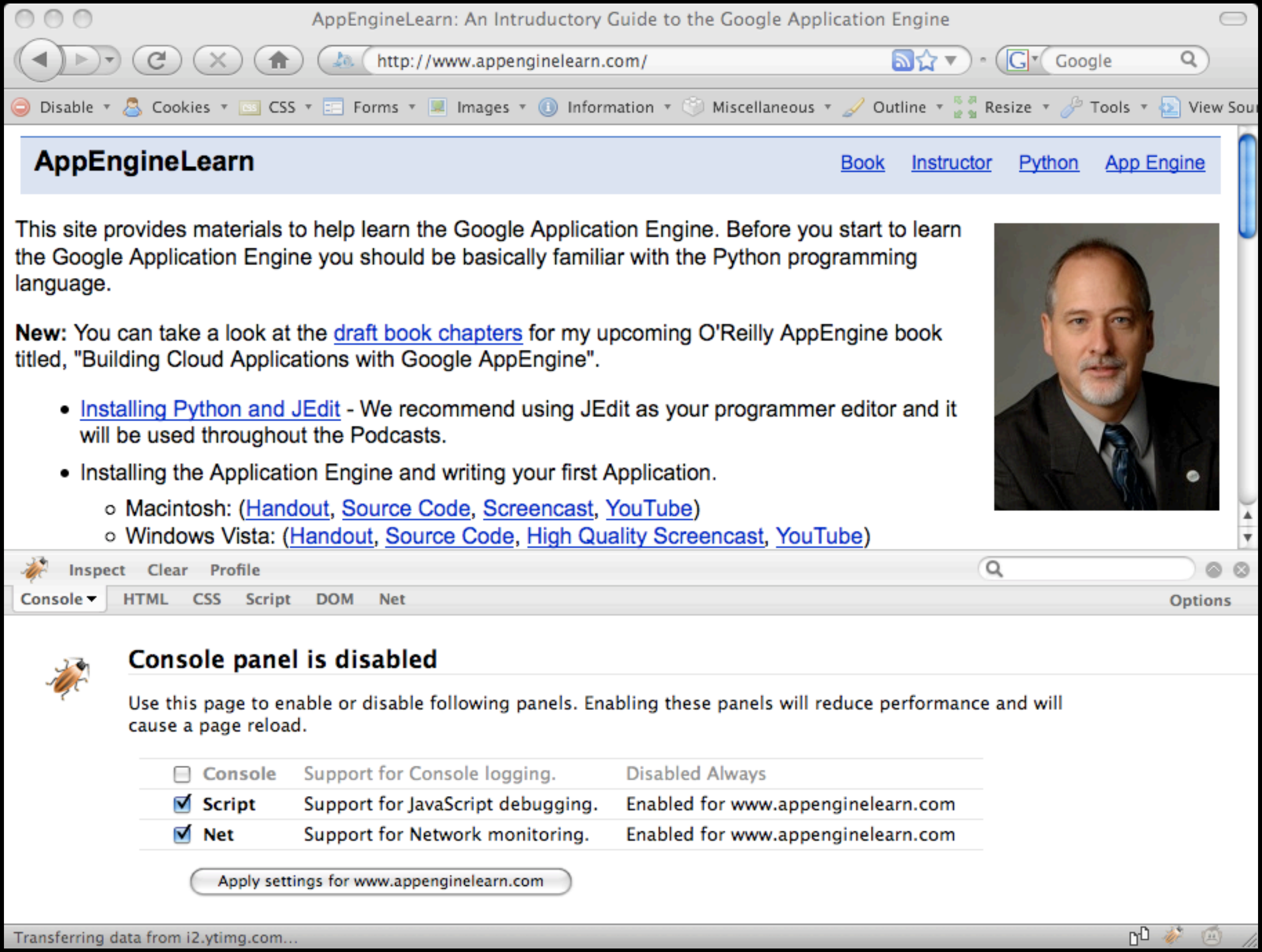

text-only | mobile | español | accessibility | disability resources | contact us
UNIVERSITY OF MICHIGAN
PORTAL EN ESPAÑOL
HOME
PROSPECTIVE STUDENTS
CURRENT STUDENTS
FACULTY & STAFF
ALUMNI, DONORS, & PARENTS
« about the photo
About U-M
Academics & Research
Administration
Athletics & Recreation
Employment
Giving to U-M
Global Michigan
Health & Medical Resources
Libraries & Archives
Museums & Cultural Attractions
News & Events
Schools & Colleges
State & Community Partnerships
RECORD UPDATE
web
directory
Search
enter keywords
GO
IN THE NEWS::
Scientists harness the power of electricity in the brain
Friends with cognitive benefits: Mental function improves after socializing
Scary chupacabras monster is as much victim as villain
Video: Fashion, power and politics; Washington Post writer at U-M
FEATURED SITES
THE THOMAS FRANCIS, JR. MEDAL IN GLOBAL PUBLIC HEALTH
U-M SPEAKS OUT
Exposing voter system flaws
Give online

```
<!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" xml:lang="en">
<head>
<title>University of Michigan</title>
....
```

```
@import "/CSS/graphical.css"/**/;
p.text strong, .verbose, .verbose p, .verbose h2{text-indent:-876em;position:absolute}
p.text strong a{text-decoration:none}
p.text em{font-weight:bold;font-style:normal}
div.alert{background:#eee;border:1px solid red;padding:.5em;margin:0 25%}
a img{border:none}
.hot br, .quick br, dl.feature2 img{display:none}
div#main label, legend{font-weight:bold}
```

Firebug reveals the detail...

- If you haven't already installed the Firebug FireFox extenstion you need it now
- It can help explore the HTTP request-response cycle
- Some simple-looking pages involve lots of requests:
    - HTML page(s)
    - Image files
    - CSS Style Sheets
    - Javascript files


AppEngineLearn: An Intruductory Guide to the Google Application Engine
http://www.appenginelearn.com/
Google
Disable Cookies CSS Forms Images Information Miscellaneous Outline Resize Tools View Sou
Inspect Clear Profile
Console HTML CSS Script DOM Net Options
Transferring data from i2.ytimg.com...

AppEngineLearn

Book Instructor Python App Engine

This site provides materials to help learn the Google Application Engine. Before you start to learn the Google Application Engine you should be basically familiar with the Python programming language.

New: You can take a look at the draft book chapters for my upcoming O'Reilly AppEngine book titled, "Building Cloud Applications with Google AppEngine".

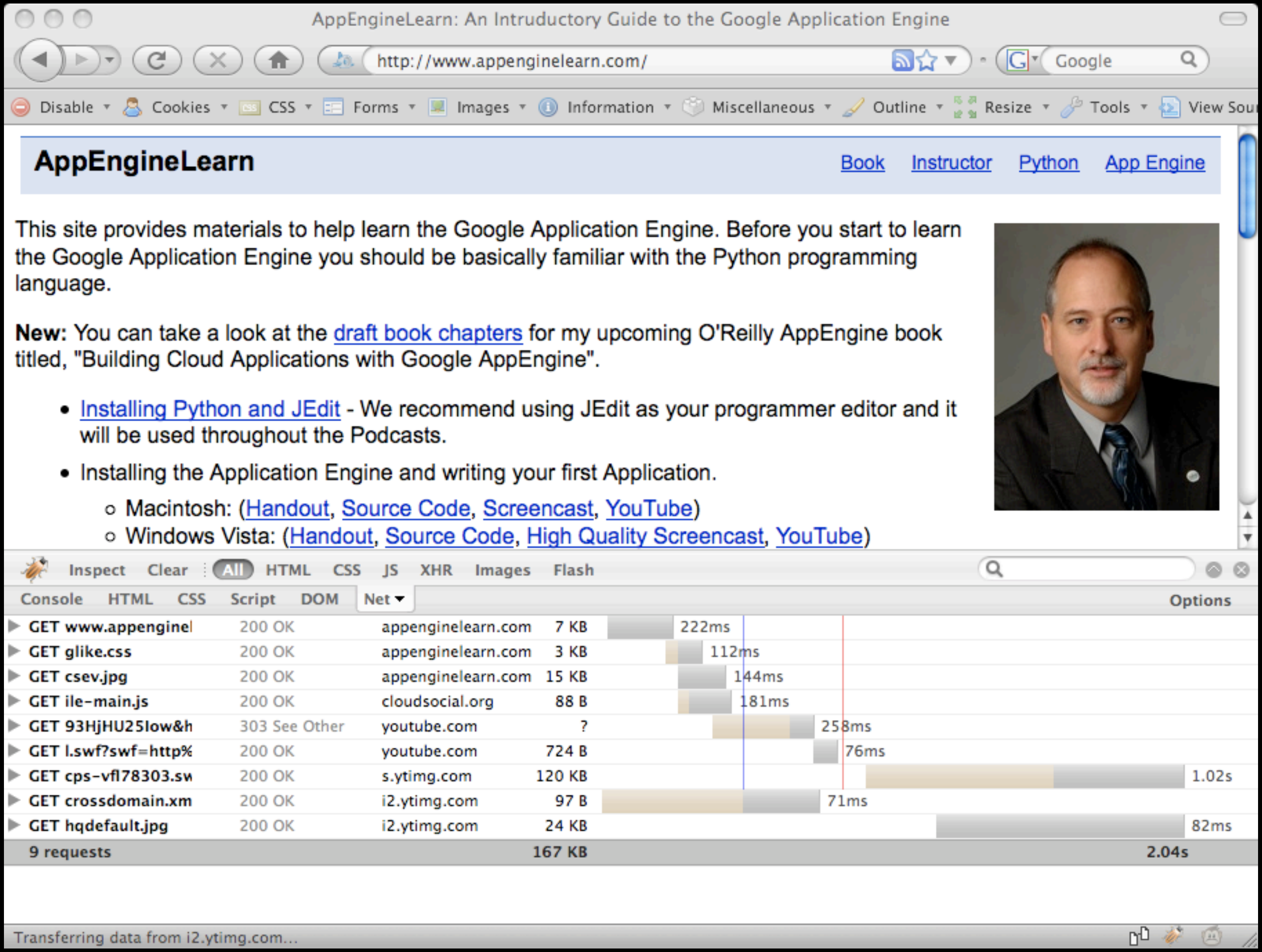
- Installing Python and JEdit - We recommend using JEdit as your programmer editor and it will be used throughout the Podcasts.
- Installing the Application Engine and writing your first Application.
  - Macintosh: (Handout, Source Code, Screencast, YouTube)
  - Windows Vista: (Handout, Source Code, High Quality Screencast, YouTube)

Console panel is disabled

Use this page to enable or disable following panels. Enabling these panels will reduce performance and will cause a page reload.

☐	Console	Support for Console logging.	Disabled Always
✓	Script	Support for JavaScript debugging.	Enabled for www.appenginelearn.com
✓	Net	Support for Network monitoring.	Enabled for www.appenginelearn.com

Apply settings for www.appenginelearn.com



AppEngineLearn: An Intruductory Guide to the Google Application Engine

http://www.appenginelearn.com/

AppEngineLearn — Book · Instructor · Python · App Engine

This site provides materials to help learn the Google Application Engine. Before you start to learn the Google Application Engine you should be basically familiar with the Python programming language.

New: You can take a look at the draft book chapters for my upcoming O'Reilly AppEngine book titled, "Building Cloud Applications with Google AppEngine".

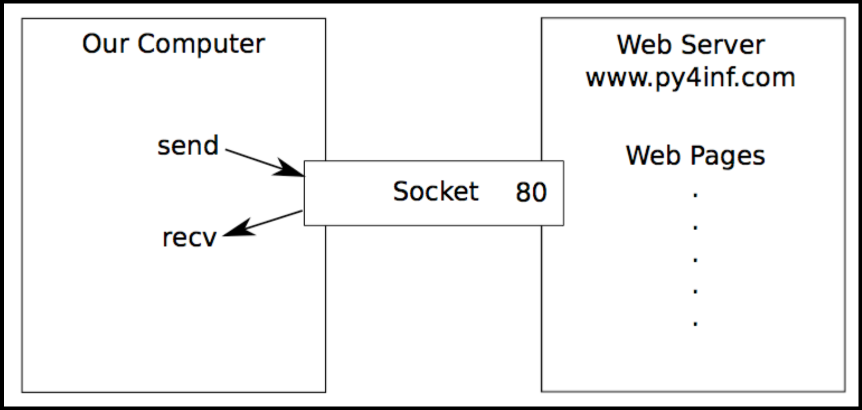
- Installing Python and JEdit - We recommend using JEdit as your programmer editor and it will be used throughout the Podcasts.
- Installing the Application Engine and writing your first Application.
  - Macintosh: (Handout, Source Code, Screencast, YouTube)
  - Windows Vista: (Handout, Source Code, High Quality Screencast, YouTube)

```
GET www.appenginel       200 OK          appenginelearn.com   7 KB    222ms
GET glike.css            200 OK          appenginelearn.com   3 KB    112ms
GET csev.jpg             200 OK          appenginelearn.com  15 KB    144ms
GET ile-main.js          200 OK          cloudsocial.org      88 B    181ms
GET 93HjHU25low&h        303 See Other   youtube.com           ?      258ms
GET l.swf?swf=http%      200 OK          youtube.com         724 B     76ms
GET cps-vfl78303.sw      200 OK          s.ytimg.com         120 KB    1.02s
GET crossdomain.xm       200 OK          i2.ytimg.com         97 B     71ms
GET hqdefault.jpg        200 OK          i2.ytimg.com         24 KB    82ms
9 requests                                                   167 KB    2.04s
```

Transferring data from i2.ytimg.com...

An HTTP Request in Python

```
import socket

mysock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
mysock.connect(('www.py4inf.com', 80))
mysock.send('GET http://www.py4inf.com/code/romeo.txt HTTP/1.0\n\n')

while True:
    data = mysock.recv(512)
    if ( len(data) < 1 ) :
        break
    print data

mysock.close()
```



```
HTTP/1.1 200 OK
Date: Sun, 14 Mar 2010 23:52:41 GMT
Server: Apache
Last-Modified: Tue, 29 Dec 2009 01:31:22 GMT
ETag: "143c1b33-a7-4b395bea"
Accept-Ranges: bytes
Content-Length: 167
Connection: close
Content-Type: text/plain

But soft what light through yonder window breaks
It is the east and Juliet is the sun
Arise fair sun and kill the envious moon
Who is already sick and pale with grief
```

HTTP Header

```
while True:
    data = mysock.recv(512)
    if ( len(data) < 1 ) :
        break
    print data
```

HTTP Body

Making HTTP Easier With urllib

Using urllib in Python

- Since HTTP is so common, we have a library that does all the socket work for us and makes web pages look like a file

```
import urllib

fhand = urllib.urlopen('http://www.py4inf.com/code/romeo.txt')

for line in fhand:
    print line.strip()
```

http://docs.python.org/library/urllib.html

urllib1.py

```
import urllib

fhand = urllib.urlopen('http://www.py4inf.com/code/romeo.txt')

for line in fhand:
    print line.strip()
```

```
But soft what light through yonder window breaks
It is the east and Juliet is the sun
Arise fair sun and kill the envious moon
Who is already sick and pale with grief
```

http://docs.python.org/library/urllib.html

urllib1.py

Like a file...

```
import urllib

fhand = urllib.urlopen('http://www.py4inf.com/code/romeo.txt')

counts = dict()
for line in fhand:
    words = line.split()
    for word in words:
        counts[word] = counts.get(word,0) + 1
print counts
```

urlwords.py

Reading Web Pages

```
import urllib

fhand = urllib.urlopen('http://www.dr-chuck.com/page1.htm')
for line in fhand:
    print line.strip()
```

```
<h1>The First Page</h1>
<p>
If you like, you can switch to the
<a href="http://www.dr-chuck.com/page2.htm">
Second Page</a>.
</p>
```

urllib1.py

Going from one page to another...

```
import urllib

fhand = urllib.urlopen('http://www.dr-chuck.com/page1.htm')
for line in fhand:
    print line.strip()
```

```
<h1>The First Page</h1>
<p>
If you like, you can switch to the
<a href="http://www.dr-chuck.com/page2.htm">
Second Page</a>.
</p>
```

Google

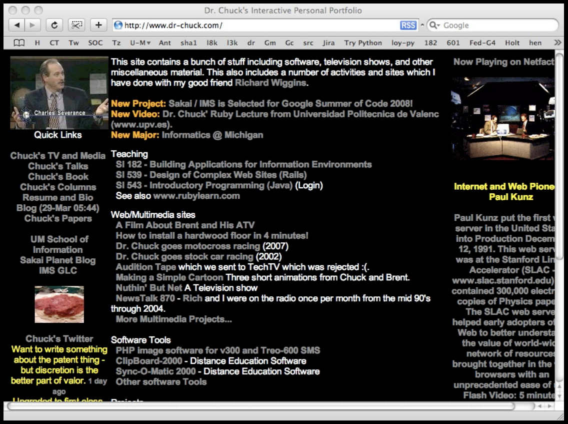
```
import urllib

fhand = urllib.urlopen('http://www.dr-chuck.com/page1.htm')
for line in fhand:
    print line.strip()
```

Parsing HTML
(a.k.a Web Scraping)

What is Web Scraping?

- When a program or script pretends to be a browser and retrieves web pages, looks at those web pages, extracts information and then looks at more web pages.
- Search engines scrape web pages - we call this "spidering the web" or "web crawling"

http://en.wikipedia.org/wiki/Web_scraping
http://en.wikipedia.org/wiki/Web_crawler



Dr. Chuck's Interactive Personal Portfolio

http://www.dr-chuck.com/

H CT Tw SOC Tz U-M Ant sha1 I8k I3k dr Gm Gc src Jira Try Python loy-py 182 601 Fed-G4 Holt hen

Quick Links

Chuck's TV and Media
Chuck's Talks
Chuck's Book
Chuck's Columns
Resume and Bio
Blog (29-Mar 05:44)
Chuck's Papers

UM School of Information
Sakai Planet Blog
IMS GLC

Chuck's Twitter
Want to write something about the patent thing - but discretion is the better part of valor. 1 day ago

This site contains a bunch of stuff including software, television shows, and other miscellaneous material. This also includes a number of activities and sites which I have done with my good friend Richard Wiggins.

New Project: Sakai / IMS is Selected for Google Summer of Code 2008!
New Video: Dr. Chuck' Ruby Lecture from Universidad Politecnica de Valenc (www.upv.es).
New Major: Informatics @ Michigan

Teaching
SI 182 - Building Applications for Information Environments
SI 539 - Design of Complex Web Sites (Rails)
SI 543 - Introductory Programming (Java) (Login)
See also www.rubylearn.com

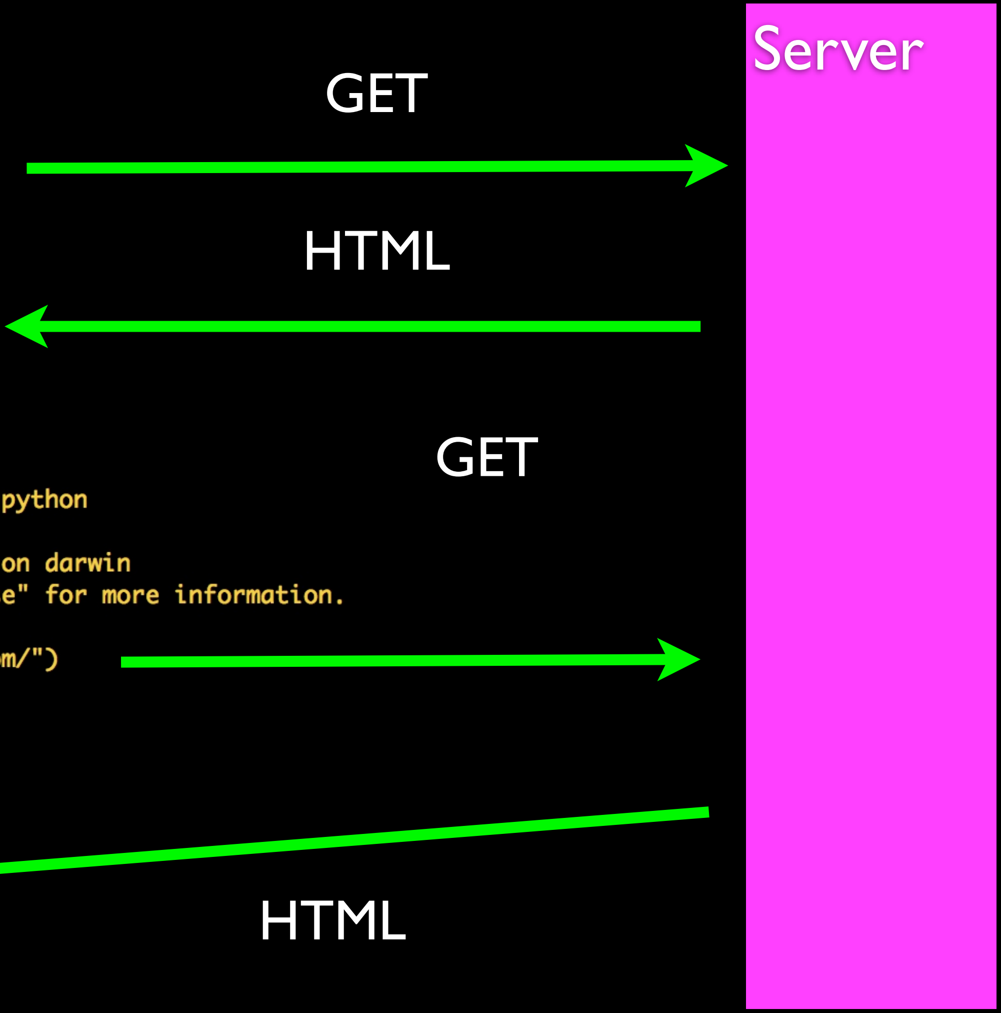
Web/Multimedia sites
A Film About Brent and His ATV
How to install a hardwood floor in 4 minutes!
Dr. Chuck goes motocross racing (2007)
Dr. Chuck goes stock car racing (2002)
Audition Tape which we sent to TechTV which was rejected :(.
Making a Simple Cartoon Three short animations from Chuck and Brent.
Nuthin' But Net A Television show
NewsTalk 870 - Rich and I were on the radio once per month from the mid 90's through 2004.
More Multimedia Projects...

Software Tools
PHP image software for v300 and Treo-600 SMS
ClipBoard-2000 - Distance Education Software
Sync-O-Matic 2000 - Distance Education Software
Other software Tools

Now Playing on Netfact

Internet and Web Pione
Paul Kunz

Paul Kunz put the first
server in the United Sta
into Production Decem
12, 1991. This web serv
was at the Stanford Lin
Accelerator (SLAC -
www.slac.stanford.edu)
contained 300,000 electr
copies of Physics pape
The SLAC web serve
helped early adopters of
Web to better understa
the value of world-wid
network of resources
brought together in the
browsers with an
unprecedented ease of
Flash Video: 5 minute



```
charles-severances-macbook-air:Scraping csev$ python
Python 2.5 (r25:51918, Sep 19 2006, 08:49:13)
[GCC 4.0.1 (Apple Computer, Inc. build 5341)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> import urllib
>>> f = urllib.urlopen("http://www.dr-chuck.com/")
>>> contents = f.read()
>>> f.close()
>>> print len(contents)
95328
>>> print contents[0:30]
<html>
<head>
  <title>Dr. C
>>> 
```

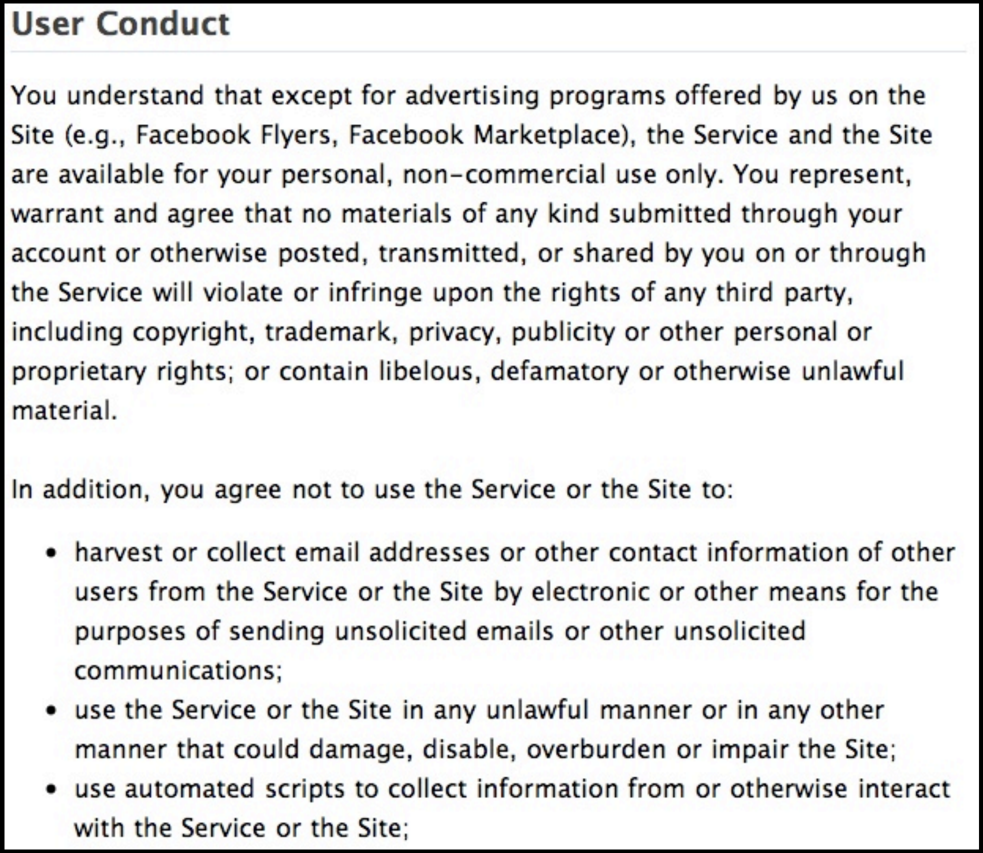
Why Scrape?

- Pull data - particularly social data - who links to who?
- Get your own data back out of some system that has no “export capability”
- Monitor a site for new information
- Spider the web to make a database for a search engine

Scraping Web Pages

- There is some controversy about web page scraping and some sites are a bit snippy about it.
  - Google: facebook scraping block
- Republishing copyrighted information is not allowed
- Violating terms of service is not allowed

http://www.facebook.com/terms.php



User Conduct

You understand that except for advertising programs offered by us on the Site (e.g., Facebook Flyers, Facebook Marketplace), the Service and the Site are available for your personal, non-commercial use only. You represent, warrant and agree that no materials of any kind submitted through your account or otherwise posted, transmitted, or shared by you on or through the Service will violate or infringe upon the rights of any third party, including copyright, trademark, privacy, publicity or other personal or proprietary rights; or contain libelous, defamatory or otherwise unlawful material.

In addition, you agree not to use the Service or the Site to:

- harvest or collect email addresses or other contact information of other users from the Service or the Site by electronic or other means for the purposes of sending unsolicited emails or other unsolicited communications;
- use the Service or the Site in any unlawful manner or in any other manner that could damage, disable, overburden or impair the Site;
- use automated scripts to collect information from or otherwise interact with the Service or the Site;

The Easy Way - Beautiful Soup

- You could do string searches the hard way
- Or use the free software called BeautifulSoup from www.crummy.com

http://www.crummy.com/software/BeautifulSoup/

Place the BeautifulSoup.py file in the same folder as your Python code...

```python
import urllib
from BeautifulSoup import *

url = raw_input('Enter - ')
html = urllib.urlopen(url).read()
soup = BeautifulSoup(html)

# Retrieve a list of the anchor tags
# Each tag is like a dictionary of HTML attributes

tags = soup('a')

for tag in tags:
   print tag.get('href', None)
```

urllinks.py

```
<h1>The First Page</h1>
<p>
If you like, you can switch to the
<a href="http://www.dr-chuck.com/page2.htm">
Second Page</a>.
</p>
```

```
html = urllib.urlopen(url).read()
soup = BeautifulSoup(html)
tags = soup('a')
for tag in tags:
   print tag.get('href', None)
```

```
python urllinks.py
Enter - http://www.dr-chuck.com/page1.htm
http://www.dr-chuck.com/page2.htm
```

Summary

- The TCP/IP gives us pipes / sockets between applications
- We designed application protocols to make use of these pipes
- HyperText Transport Protocol (HTTP) is a simple yet powerful protocol
- Python has good support for sockets, HTTP, and HTML parsing