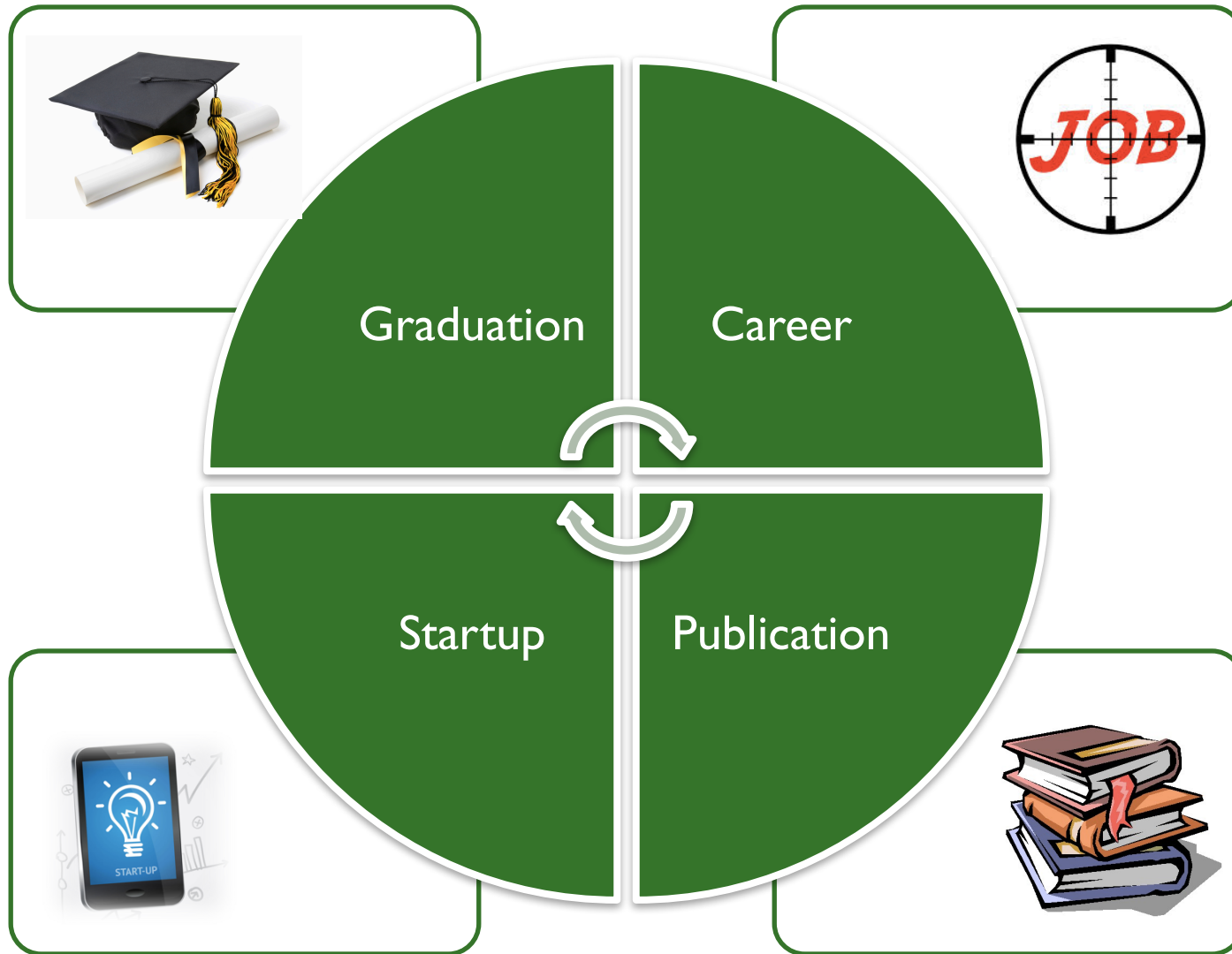


What is a Good Student Project?



Web Service Basics

CS480 Software Engineering

Yu Sun, Ph.D.

<http://yusun.io>

yusun@cpp.edu



CAL POLY POMONA

What is a Web Service?

- ◆ A **web service** is a method of **communication** between two electronic devices over a **network**. It is a software function provided at a network address over the web **with the service always on** as in the concept of utility computing.



Web Service Example

Web [Images](#) [Maps](#) [News](#) [Shopping](#) [Gmail](#) [more](#) ▾

Google [Advanced Search](#)
[Preferences](#)

Web Results 1 - 10 of about 28,300,000 for [product management software](#). (0.23 seconds)

[Product Manager Software](#)  Sponsored Links

www.accompa.com/Product-Management Requirement Management Software for PMs. S

[Telelogic - Official Site](#) 

www.Telelogic.com Trust Telelogic, the Global Leader In Product Portfolio Management.

[Product Management Tool](#) 

www.featureplan.com Product management software to develop market-driven products

[Product Management Software - Featureplan Product Management Software](#)   

Product Management Software. Featureplan Product Management Software. Product management software program is a single product management software tool that ...

www.featureplan.com/product-management-software.htm - 24k -

[Cached](#) - [Similar pages](#) - 

[FeaturePlan - Product Management Software Requirements Management ...](#)   

FeaturePlan. Product Management Software and Requirements Management Software for the Software Industry. Feature Plan Product Management Software and ...

www.featureplan.com/ - 16k - [Cached](#) - [Similar pages](#) - 

[Product Management Software Comparison](#)   

Interested in finding out what Product Management software is available to help you do your ... Their Product Management software solution is server based, ...

www.280group.com/productmanagementsoftwarecomparison.htm - 30k -

[Cached](#) - [Similar pages](#) - 

[Innovation Management Software - Accept Software](#)   

Accept Corporation - US company provides industry leading product management software, product marketing software and product planning software.

www.acceptsoftware.com/ - 13k - [Cached](#) - [Similar pages](#) - 

Sponsored Links

[Product Data Mgt Software](#) 

Free download. Full version!
Get the Software — Download Now
www.Aras.com

[Learn Product Management](#) 

Build market-driven products by listening to the market.
www.pragmaticmarketing.com

[Product Management Tool](#) 

Manage product lifecycle, software requirements, tasks, more. Free Trial.
www.qavantage.com

[Product Management Advice](#) 

Define Product Management Roles
Improve Product Manager Performance
www.lifecycl.com

[Product Data Management](#) 

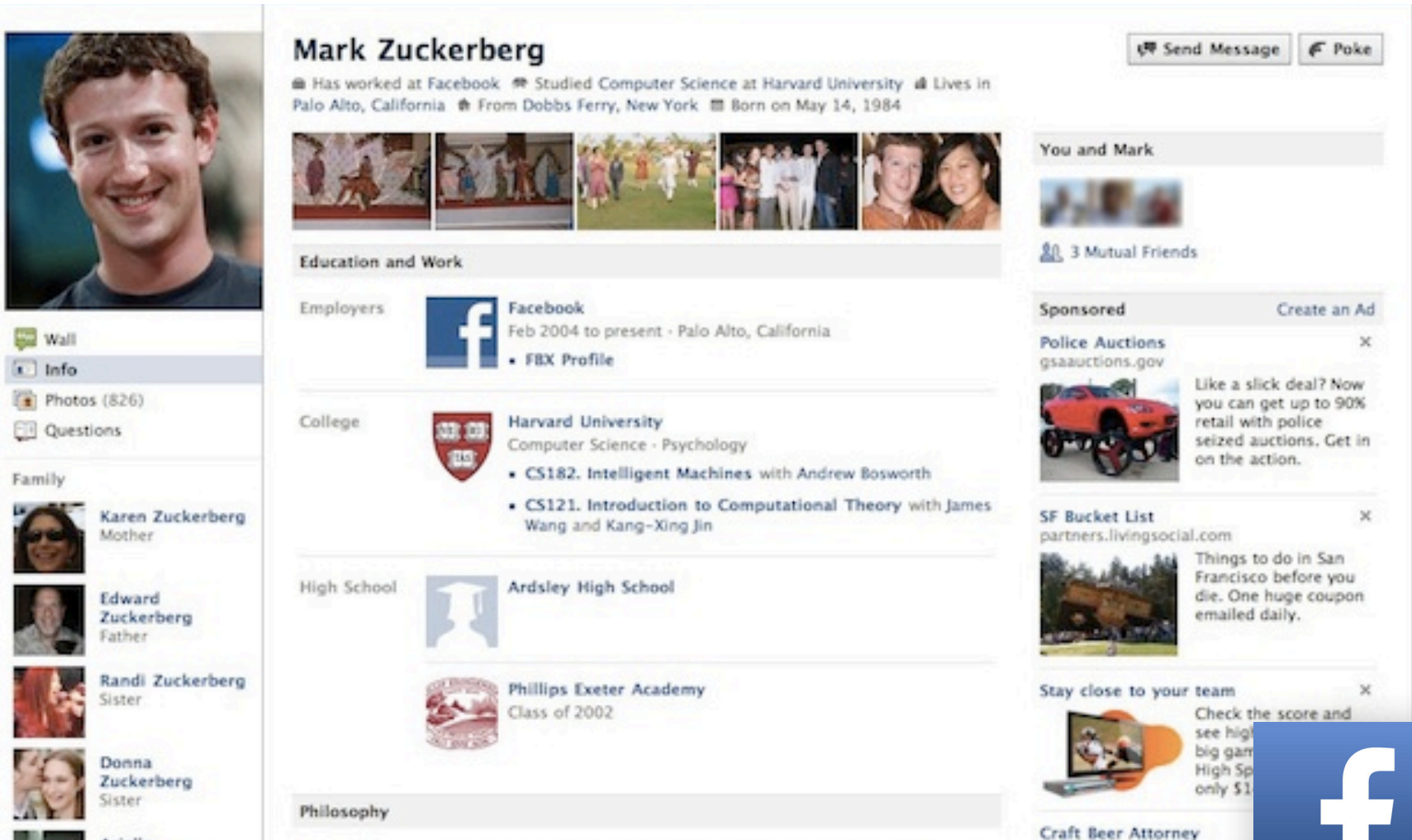
SolidWorks Enterprise PDM Software
Demos. Efficiency = Results
SolidWorks.com/OnlineTour

[Change Management Form](#) 

Change Control Management Form for FDA/ISO Environment White Paper
www.MasterControl.com

Google

Web Service Example



Mark Zuckerberg

Has worked at Facebook Studied Computer Science at Harvard University Lives in Palo Alto, California From Dobbs Ferry, New York Born on May 14, 1984

[Send Message](#) [Poke](#)

You and Mark

3 Mutual Friends

Sponsored [Create an Ad](#)

Police Auctions [gsaauctions.gov](#) [×](#)

Like a slick deal? Now you can get up to 90% retail with police seized auctions. Get in on the action.

SF Bucket List [partners.livingsocial.com](#) [×](#)

Things to do in San Francisco before you die. One huge coupon emailed daily.

Stay close to your team [×](#)

Check the score and see high big game High Sp only \$1

Craft Beer Attorney

Education and Work

Employers

Facebook
Feb 2004 to present - Palo Alto, California
• [FBX Profile](#)

College

Harvard University
Computer Science · Psychology
• CS182. Intelligent Machines with Andrew Bosworth
• CS121. Introduction to Computational Theory with James Wang and Kang-Xing Jin

High School

Ardsley High School

Phillips Exeter Academy
Class of 2002

Philosophy

Family

Karen Zuckerberg
Mother

Edward Zuckerberg
Father

Randi Zuckerberg
Sister


Donna Zuckerberg
Sister

Wall

Info

Photos (826)

Questions



Web Service Example

Weather Channel 53°F 100°F 68°F

Weather Lifestyle Social Maps Video News TV Search Zip, City or Place (Disney World) SEARCH

Local National Severe Hurricane Central

Rancho Santa Margarita, CA

31°F
Snow
Feels like 31°
Love! Ugh!

Right Now Updated: 3:25pm EST

From **20** mph
WIND

12%
HUMIDITY

9°
DEW POINT

8.0 mi
VISIBILITY

30.35 in →
PRESSURE

1 - Low
UV INDEX

Through 10pm:
Partly to mostly clear with temperatures falling into the low 70s. Winds E at 15 to 20 mph.

Stories That Affect Me Today's Forecast ▶

Your Allergies & The Weather
The weather plays a significant role when it comes to seasonal allergies. Select a ...

EAGLE MOUNTAIN LAKE, TX
From KXAS
Boaters happy about rising lake levels
After two heavy rains in the last month, North Texas ...

The Symmetrical AWD Subaru Outback
SUBARU Confidence in Motion
DETAILS

Ice Rancho Santa Margarita
Tip: "Keep up your momentum. Once you stop in deep snow or slippery ice your chances of getting going again are reduced."
- GoSwerve.com

See the Driving Difficulty Index on Interactive Maps.

Radar Updated: 3:25pm EST Change Map

The Weather Channel

Web Service Example

CAL POLY POMONA

A Legacy of W.K. Kellogg

SEARCH



ABOUT OUR UNIVERSITY

ADMISSIONS

ACADEMICS

CAMPUS LIFE

ATHLETICS

GIVING



Expand
Menu

Public Class Schedule

Home » Public Class Schedule

This schedule is intended for guests of Cal Poly Pomona, and does not contain all the information listed in the complete schedule available to students, instructors, and advisors through [BroncoDirect](#).

Note: Class information is updated nightly and may not reflect current offerings.

Class Search Criteria

Term

Class Subject example: MAT or ENG [Display Subjects](#)

Catalog Number example: 10 or 323L

Exact matches

Title

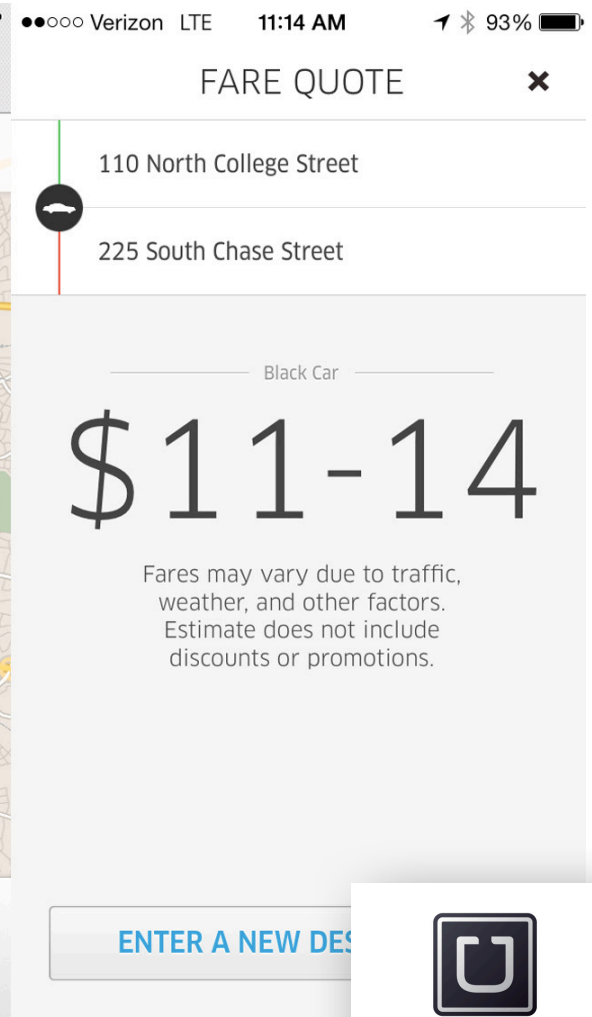
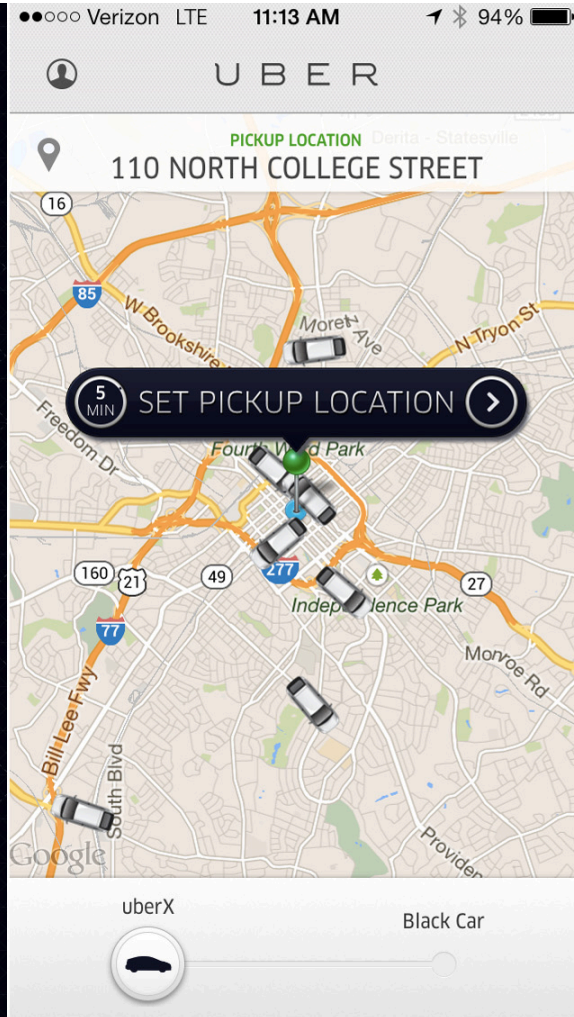
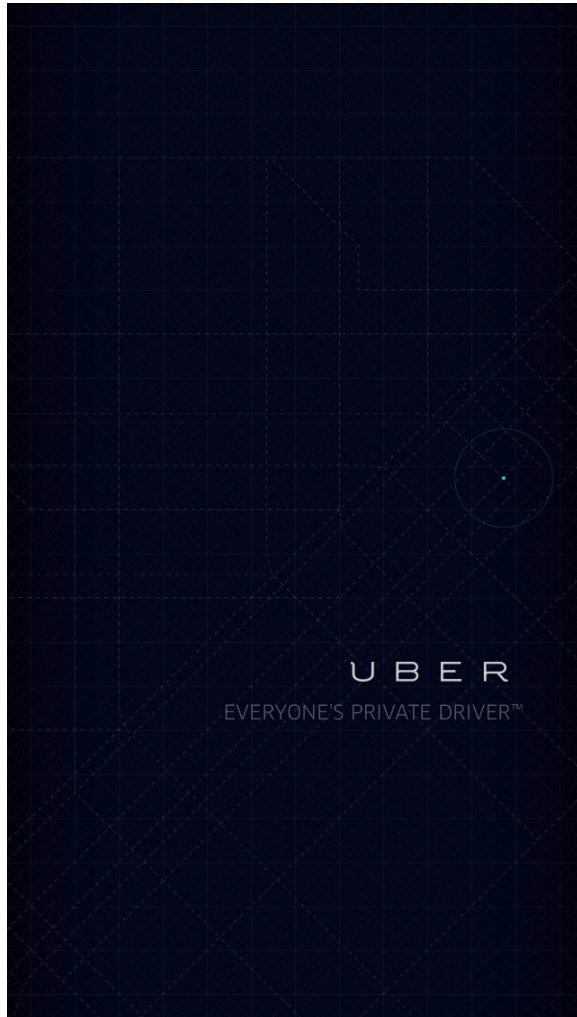
Course Component

Course Attribute

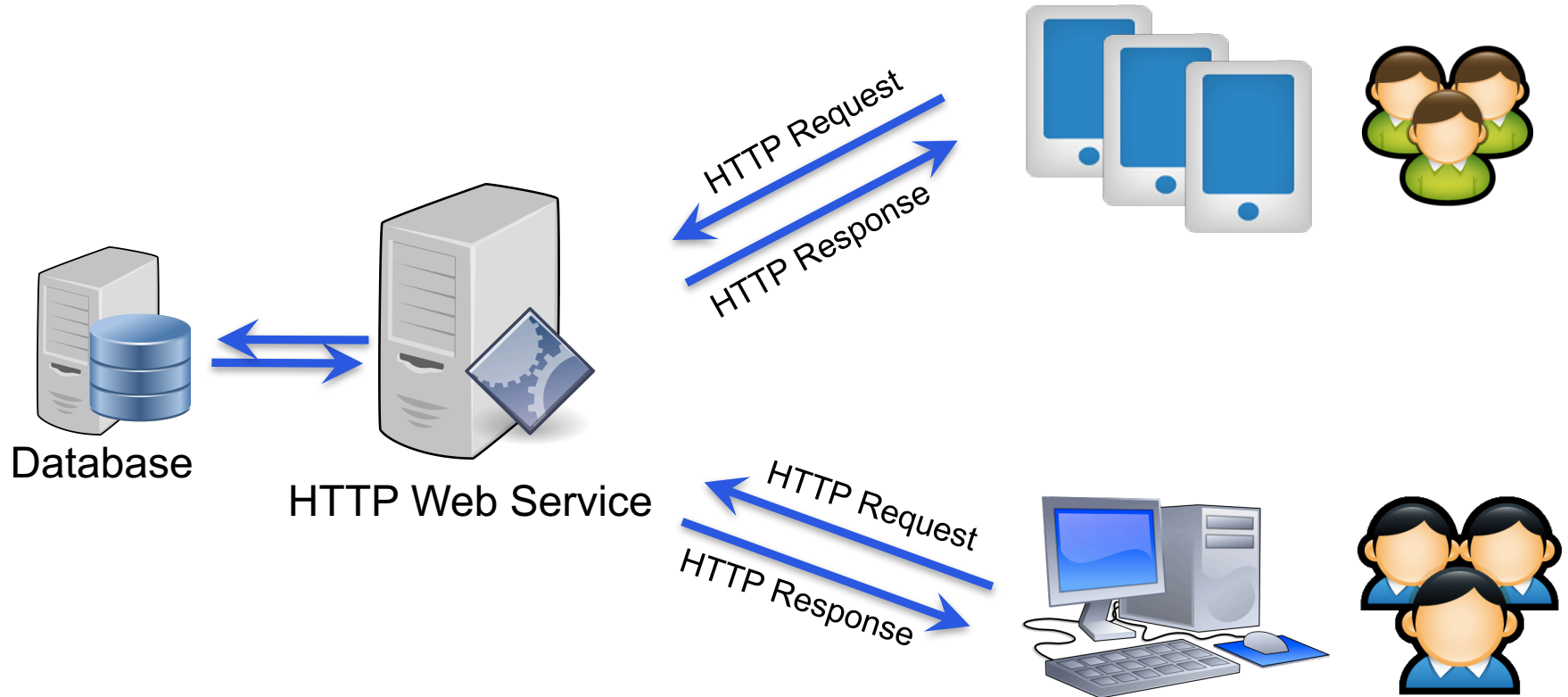


CAL POLY POMONA

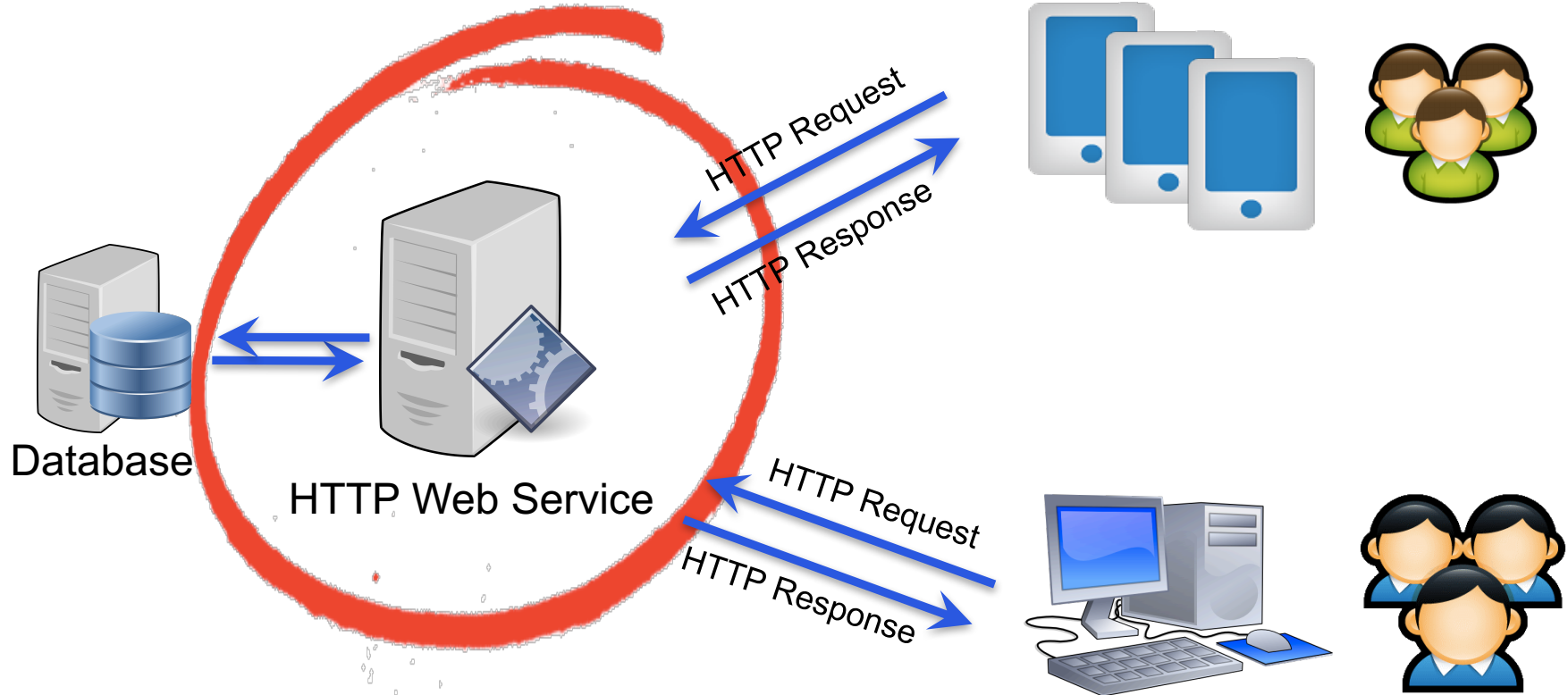
Web Service Example



The Key Components

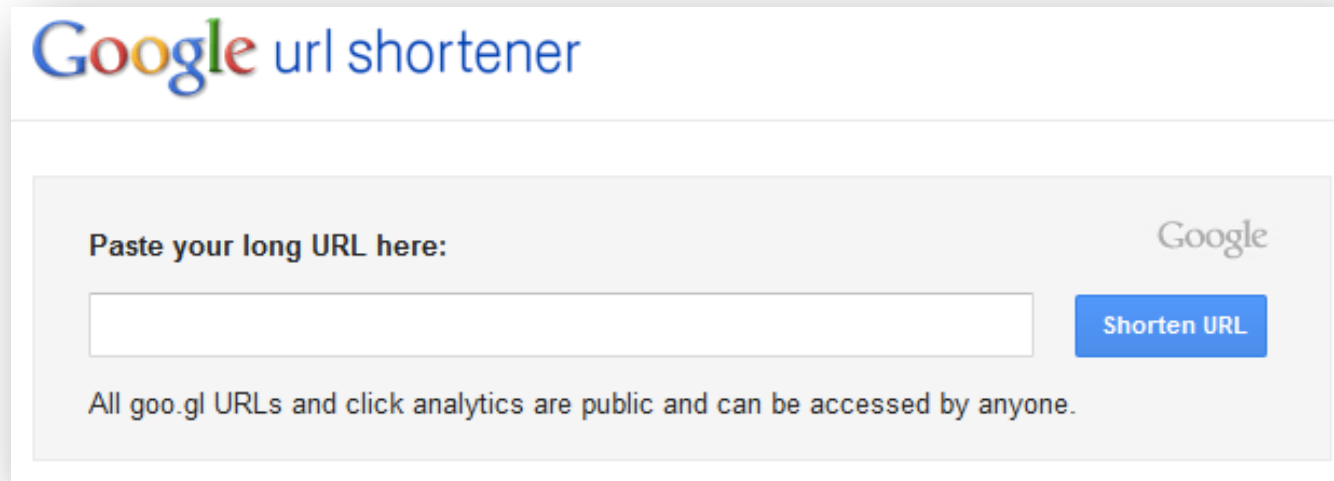


The Key Components



Web Request/Response

- ◆ Google Short URL Service

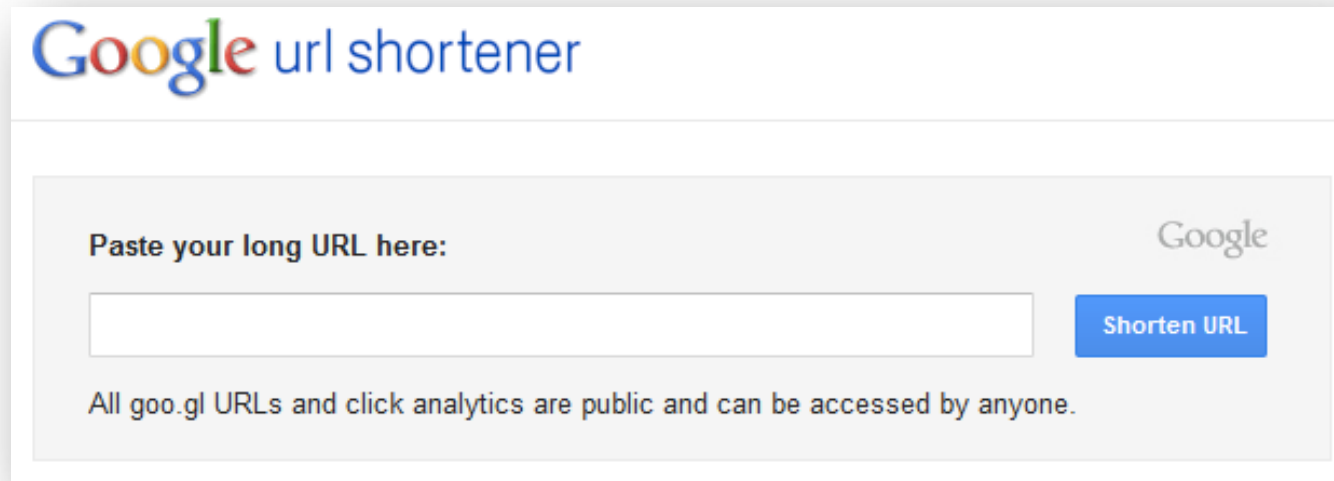


The screenshot shows the Google URL Shortener interface. At the top left is the logo "Google url shortener". Below it is a light gray box containing the text "Paste your long URL here:" followed by a white text input field. To the right of the input field is a blue button labeled "Shorten URL". In the top right corner of the gray box is the "Google" logo. Below the input field and button, there is a line of text: "All goo.gl URLs and click analytics are public and can be accessed by anyone."

For more info: https://developers.google.com/url-shortener/v1/getting_started
<https://goo.gl/>

Web Request/Response

- ◆ Google Short URL Service



The screenshot shows the Google URL Shortener interface. At the top left is the logo "Google url shortener". Below it is a form with the text "Paste your long URL here:" followed by a text input field. To the right of the input field is a blue button labeled "Shorten URL". In the top right corner of the form area is the "Google" logo. Below the input field and button, there is a disclaimer: "All goo.gl URLs and click analytics are public and can be accessed by anyone."

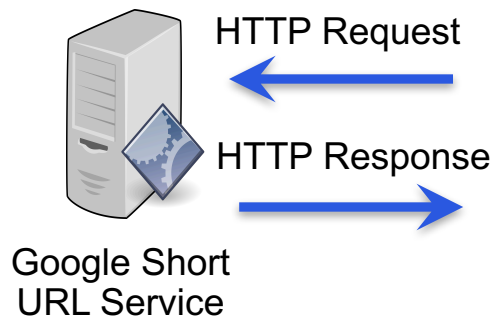


How to communicate with Google?

For more info: https://developers.google.com/url-shortener/v1/getting_started
<https://goo.gl/>

Web Request/Response

- ◆ Google Short URL Service – Under The Hood



```
POST https://www.googleapis.com/urlshortener/v1/url
Content-Type: application/json
```

```
{"longUrl": "http://www.google.com/"}
```

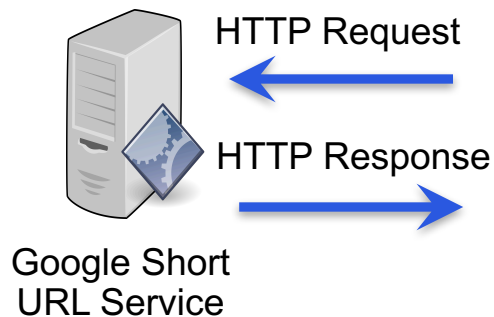
```
{
  "kind": "urlshortener#url",
  "id": "http://goo.gl/fbsS",
  "longUrl": "http://www.google.com/"
}
```

Chrome Postman HTTP Client:

<https://chrome.google.com/webstore/detail/postman-rest-client/fdmmgilgnpjigdojojpjoooidkmcomcm?hl=en>

Web Request/Response

◆ Google Short URL Service – Under The Hood



```
POST https://www.googleapis.com/urlshortener/v1/url
Content-Type: application/json
```

```
{"longUrl": "http://www.google.com/"}
```

```
{
  "kind": "urlshortener#url",
  "id": "http://goo.gl/fbsS",
  "longUrl": "http://www.google.com/"
}
```



- How to wrap/format the data?
- How to transmit the data over the web?

JavaScript Object Notation (JSON)

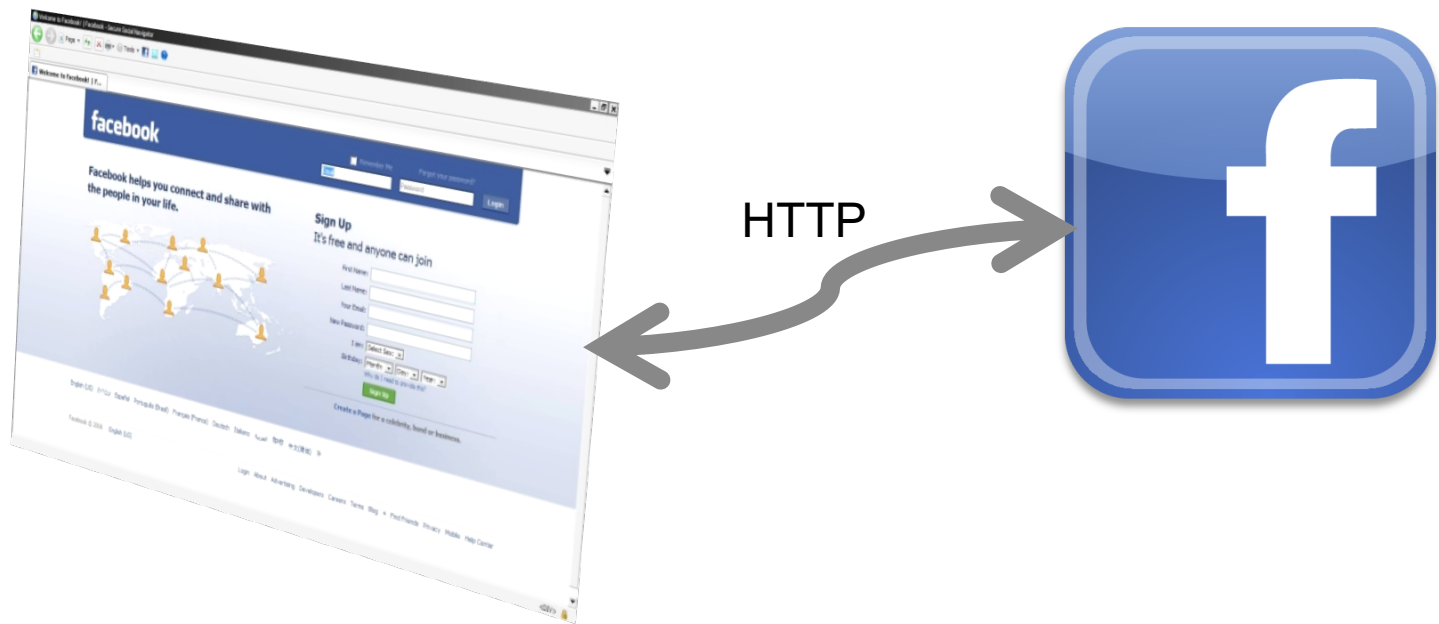
- ◆ An open standard format that uses human-readable text to transmit data objects consisting of attribute–value pairs
- ◆ JSON text can be converted to language-specific objects, such as Java, JavaScript

• <http://www.w3schools.com/json/>

```
{
  "firstName": "John",
  "lastName": "Smith",
  "isAlive": true,
  "age": 25,
  "height_cm": 167.6,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": "10021-3100"
  },
  "phoneNumbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "office",
      "number": "646 555-4567"
    }
  ],
  "children": [],
  "spouse": null
}
```

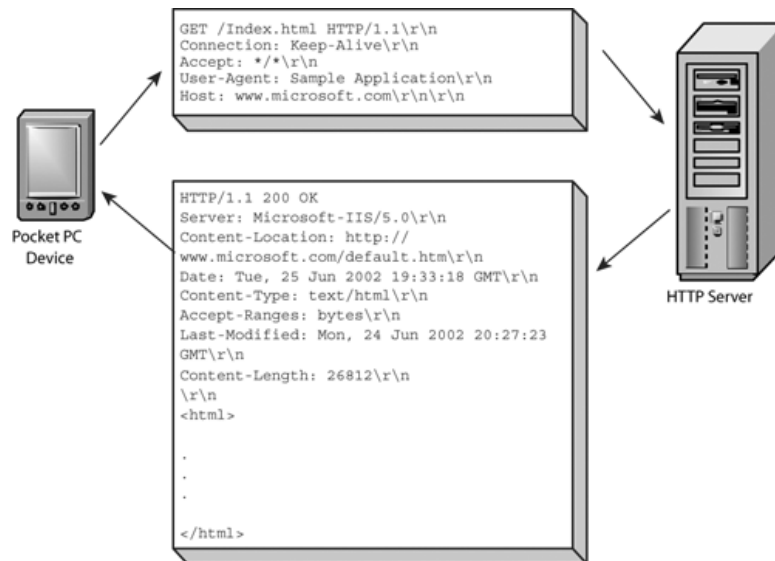
How Does a Web Page Get to Your Laptop?

- ◆ The Hypertext Transfer Protocol (HTTP) is an application-level request/response protocol for sending web content
- ◆ Every web page that you visit, including Facebook, is retrieved using HTTP

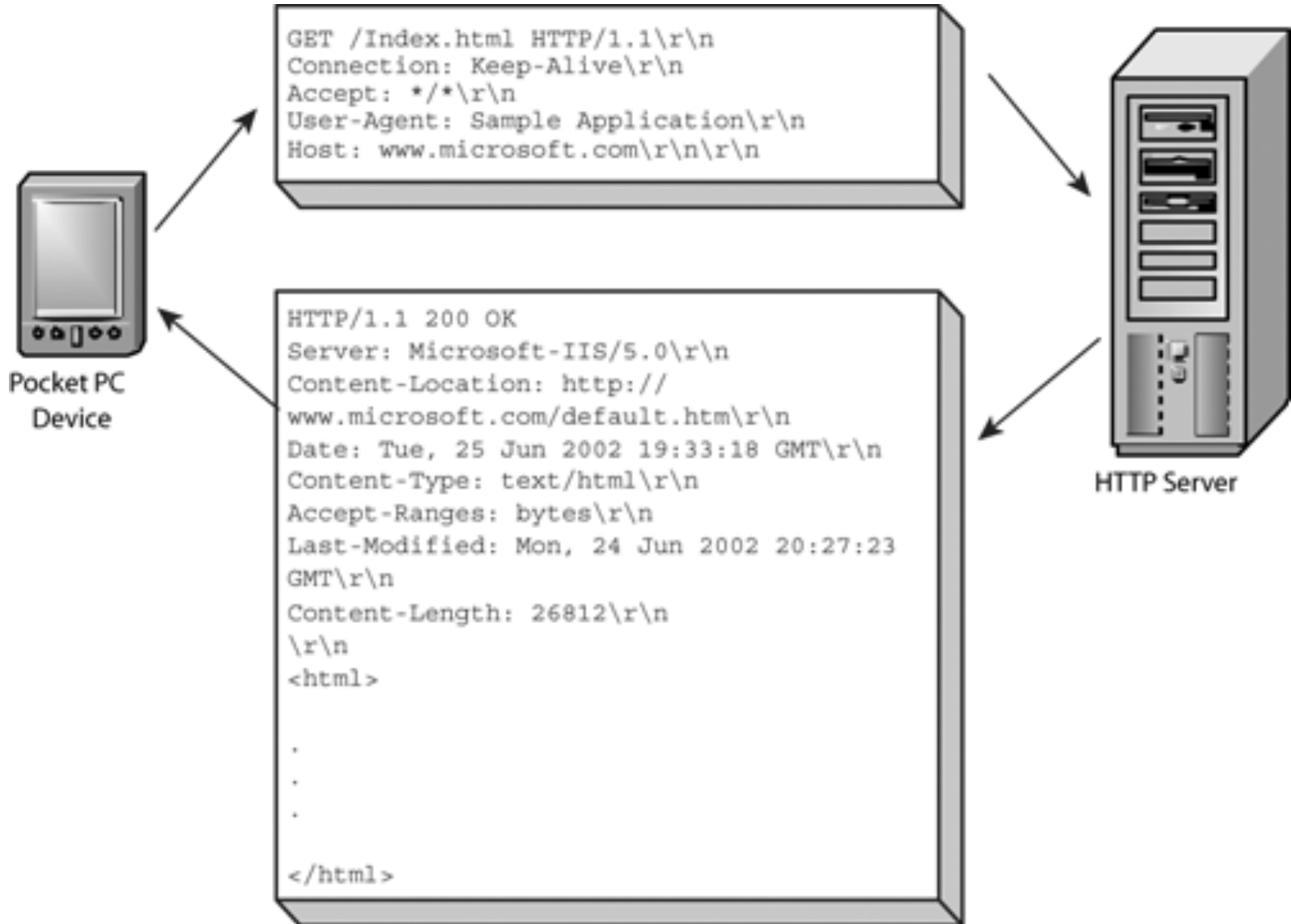


What is a Network Protocol?

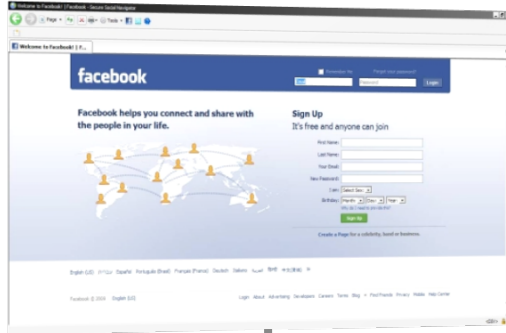
- ◆ A network protocol defines the rules and conventions for exchanging messages between two entities on a network
- ◆ A network protocol is defined by:
 - ◆ Syntax – the rules for structuring messages
 - ◆ Semantics – a definition of what each message means and what should happen when a message is received
 - ◆ Timing – a set of rules governing when messages should be sent and in what order



What is a Network Protocol?



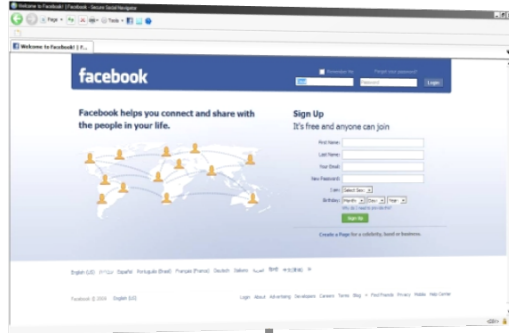
HTTP To Get Your Feed



GET /home.php

HTTP/1.1 200 OK, followed by your feed

HTTP Request Method

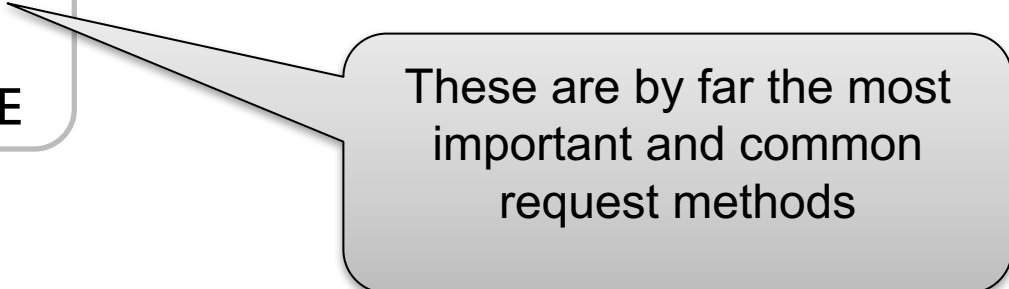


Request Method

HTTP Request Method

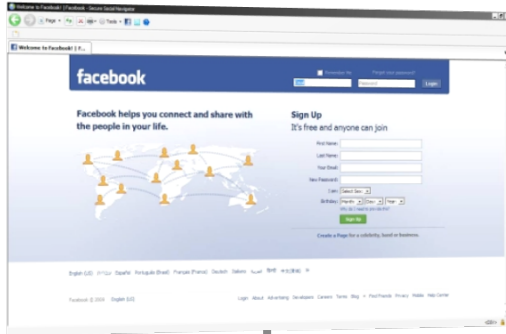
- ◆ The “request method” tells the server what action to apply to the resource that you have indicated in your request
- ◆ The most basic/common request method is to GET a resource from the server
 - ◆ GET my feed and send it to me
- ◆ There are a variety of request methods:

- ◆ GET
- ◆ POST
- ◆ DELETE
- ◆ PUT
- ◆ HEAD
- ◆ TRACE
- ◆ OPTIONS
- ◆ CONNECT
- ◆ PATCH



These are by far the most important and common request methods

HTTP Resources

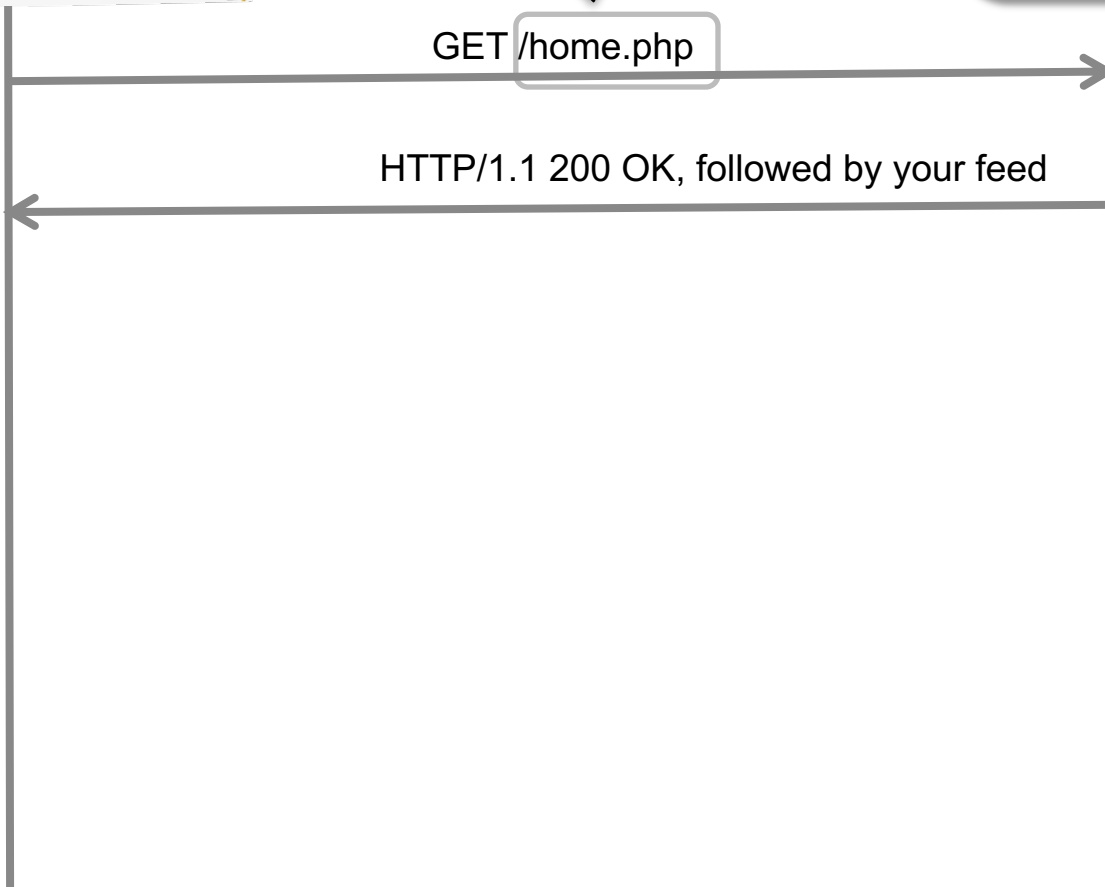


Resource



GET /home.php

HTTP/1.1 200 OK, followed by your feed



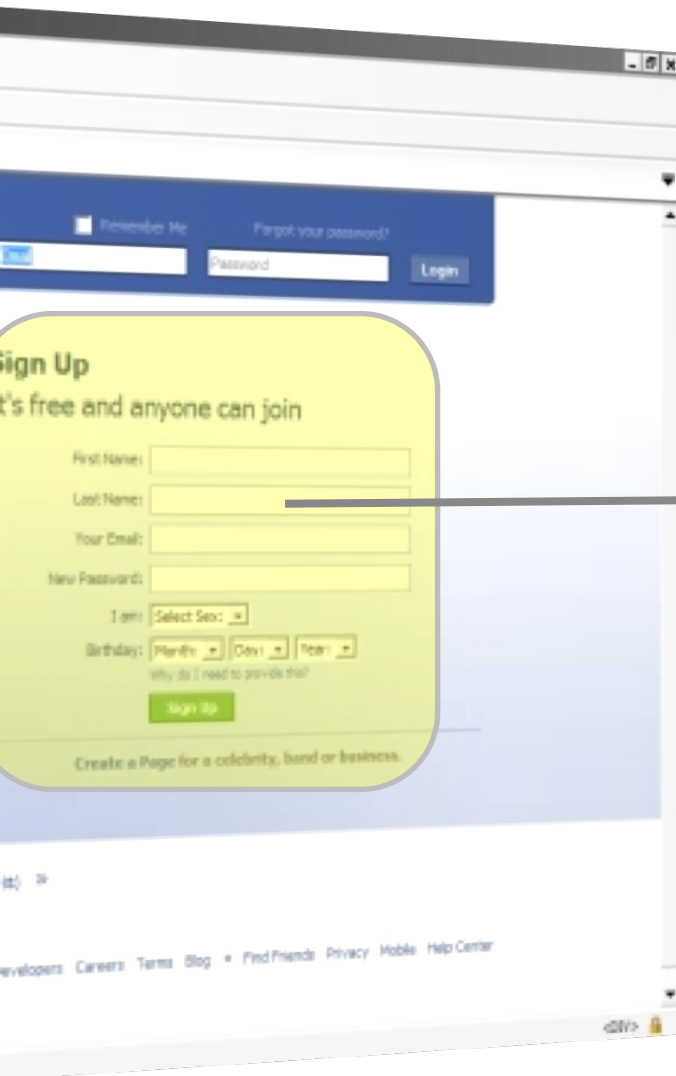
Resources / URLs

- ◆ The resource is the *thing* or data on the server that you want the action to affect
- ◆ Resources are referred to by Uniform Resource Locators
- ◆ A URL is built of multiple parts:

```
<scheme>://<server>:<port>/<resource>
```

- ◆ Example: <http://www.facebook.com/home.php>
- ◆ The **scheme** is how to access the resource, <http://> means that the resource should be accessed using HTTP
- ◆ The **server** is the network location that hosts the resource
 - ◆ Example: www.facebook.com
- ◆ The **port** is the port number running the server program
 - ◆ 80 is the default
- ◆ The **resource** is the thing that you want to act on
 - ◆ Example: [home.php](http://www.facebook.com/home.php)

Sending Data with Requests

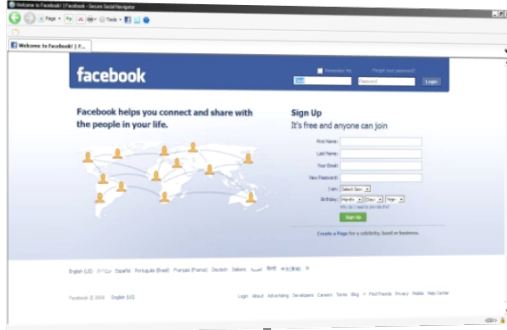


A screenshot of the Facebook sign-up form. The form is titled "Sign Up" and includes the text "It's free and anyone can join". The form fields are: First Name, Last Name, Your Email, New Password, I am (with a dropdown menu for "Select Sex"), and Birthday (with dropdown menus for "Month", "Day", and "Year"). There is a "Sign Up" button and a link that says "why do I need to provide this?". At the bottom of the form, it says "Create a Page for a celebrity, band or business." The form is highlighted with a yellow background.



When you sign up for Facebook, how does the data get sent to their server?

HTTP POST



POST allows you to send extra data with the request



POST /signup.php + DATA

HTTP/1.1 200 OK, followed by terms and conditions to sign away your privacy

HTTP POST

- ◆ A POST request can include additional parameters other than the resource to access
- ◆ These parameters are a series of Key/Value pairs that are sent to the server
- ◆ The data is sent in the body of the message
- ◆ Example:
 - ◆ FirstName=John
 - ◆ LastName=Doe
 - ◆ SignAwayPrivacy=True
- ◆ A POST request can also include a raw string in a certain format

```
POST https://www.googleapis.com/urlshortener/v1/url
Content-Type: application/json
```

```
{"longUrl": "http://www.google.com/"}
```

Example POST Request

POST /login.php?login_attempt=1 HTTP/1.1

Accept:application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,image/png,*/*;q=0.5

Content-Type:application/x-www-form-urlencoded

Origin:http://www.facebook.com

Referer:http://www.facebook.com/

User-Agent:Mozilla/5.0 (Macintosh; U; Intel Mac OS X 10_6_3; en-US) AppleWebKit/533.4 (KHTML, like Gecko) Chrome/5.0.375.53 Safari/533.4

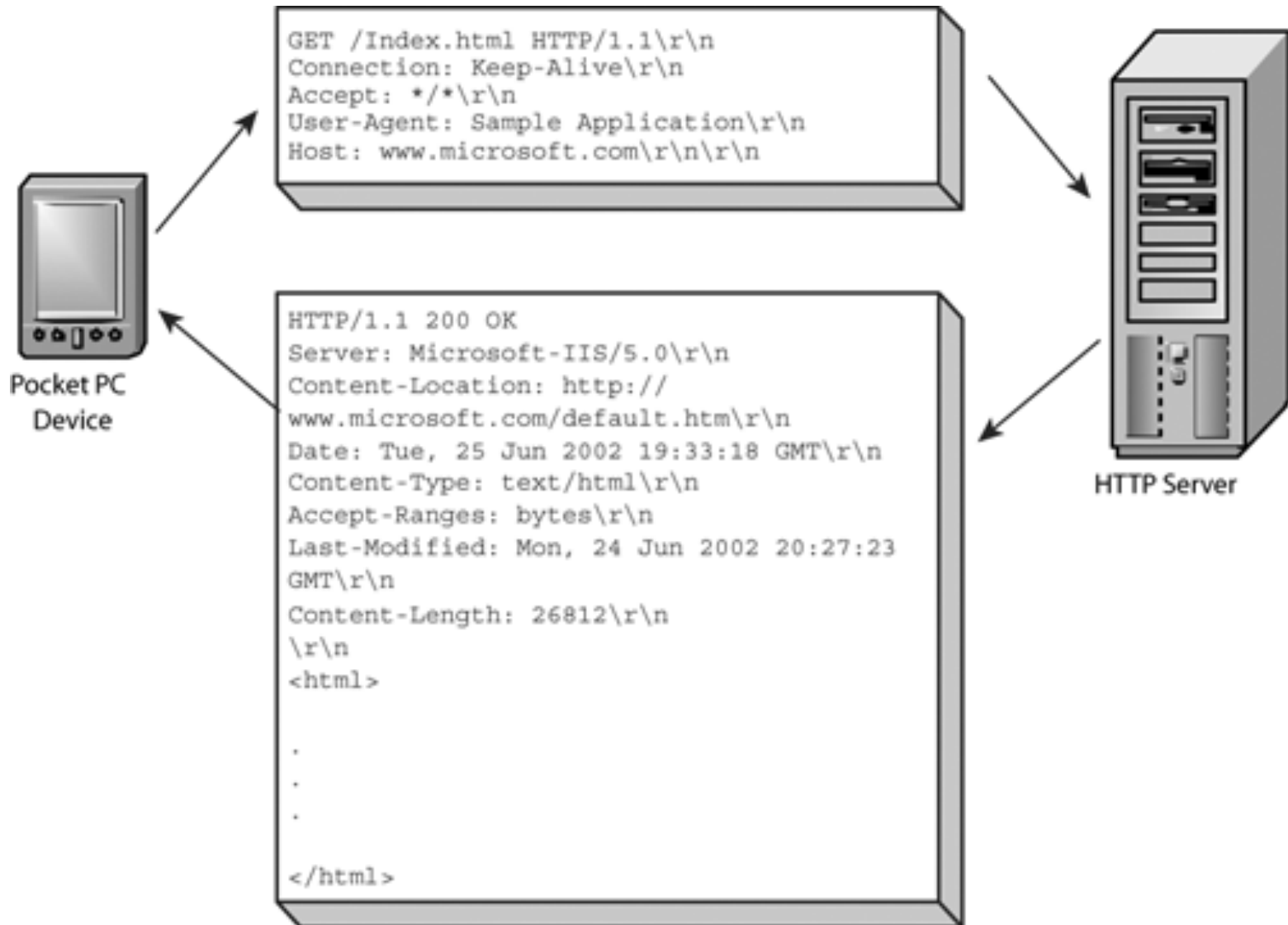
charset_test:€,´,€,´,水,Д,€

locale:en_US

email:john.doe@gmail.com

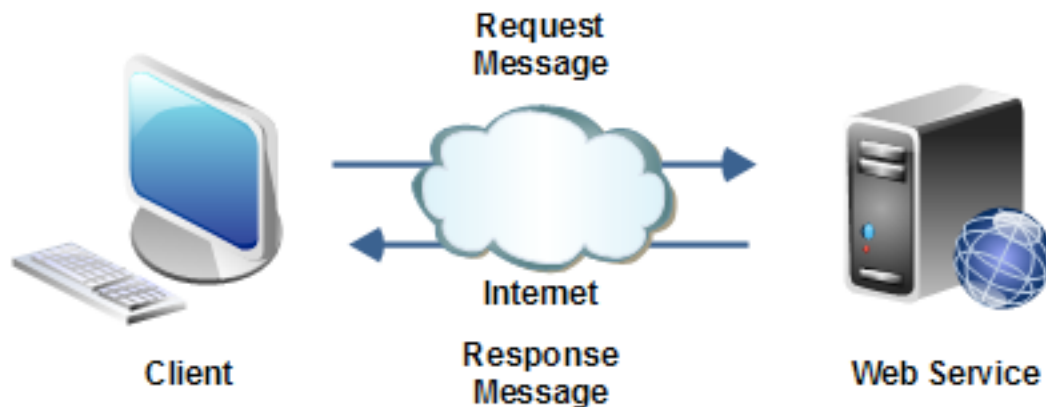
pass:somepassword

What is a Network Protocol?



What is a HTTP Web Service?

- ◆ A **running** server program
- ◆ The server program accepts a list of **HTTP requests** based on **URLs**, and sends back **HTTP responses**
- ◆ Each URL does a specific task with **data**
- ◆ Data is well **formatted** and understood by both sides



Web Service Frameworks



Spring Boot Framework

- ◆ <http://projects.spring.io/spring-boot/>

Java Spring Framework

- ◆ Java
- ◆ Web Services
 - ◆ HTTP
 - ◆ Java Servlet
 - ◆ Spring Framework
 - ◆ <http://spring.io/>
 - ◆ Spring Boot
 - ◆ <http://projects.spring.io/spring-boot/>
- ◆ MOOC Course
 - ◆ Programming Cloud Services for Android Handheld Systems
 - ◆ <https://class.coursera.org/mobilecloud-001>

@RequestMapping

- ◆ Map the URL Path to Java method
- ◆ <http://www.journaldev.com/3358/spring-mvc-requestmapping-annotation-example-with-controller-methods-headers-params-requestparam-pathvariable>

Store the Data

- ◆ Store your data in the file system is a simple option if only a small amount of data is required
- ◆ Jackson ObjectMapper
- ◆ <http://wiki.fasterxml.com/JacksonInFiveMinutes>

@Autowired

- ◆ Manage how to instantiate object instances
- ◆ http://www.tutorialspoint.com/spring/spring_automated_annotation.htm

Front-End UI: HTML/CSS

- ◆ Make nice UI for your web services



HTML & CSS

Generate Web Pages Dynamically: FreeMarker

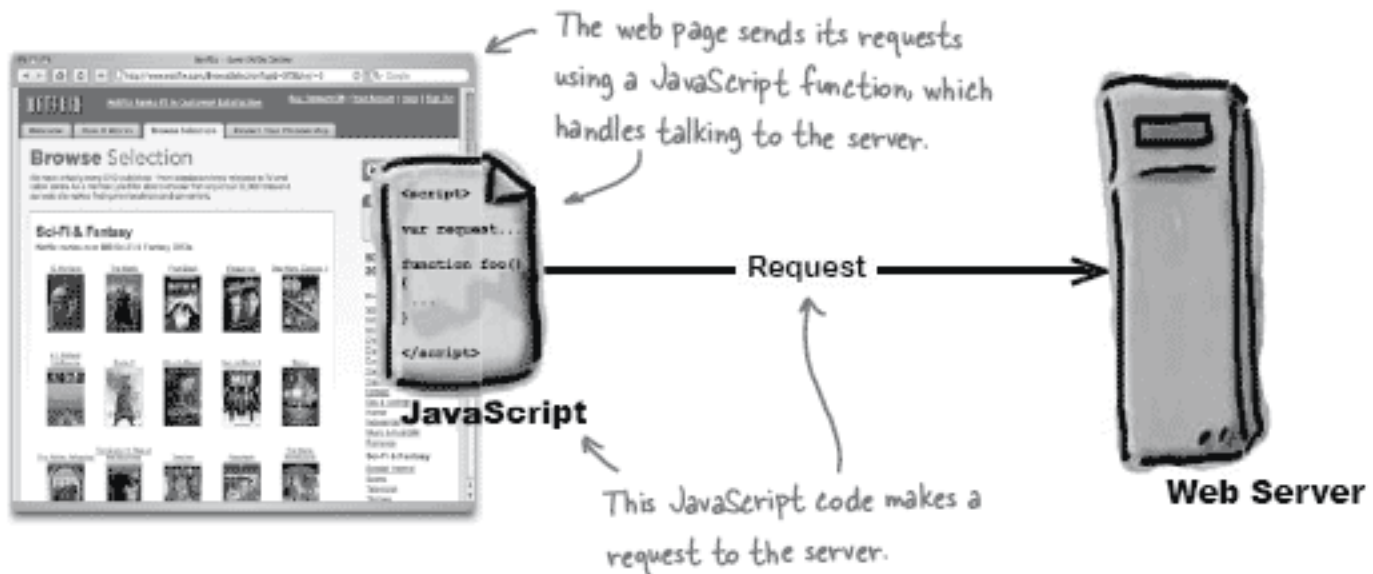
- ◆ Define a template, feed the data and generate the final HTML



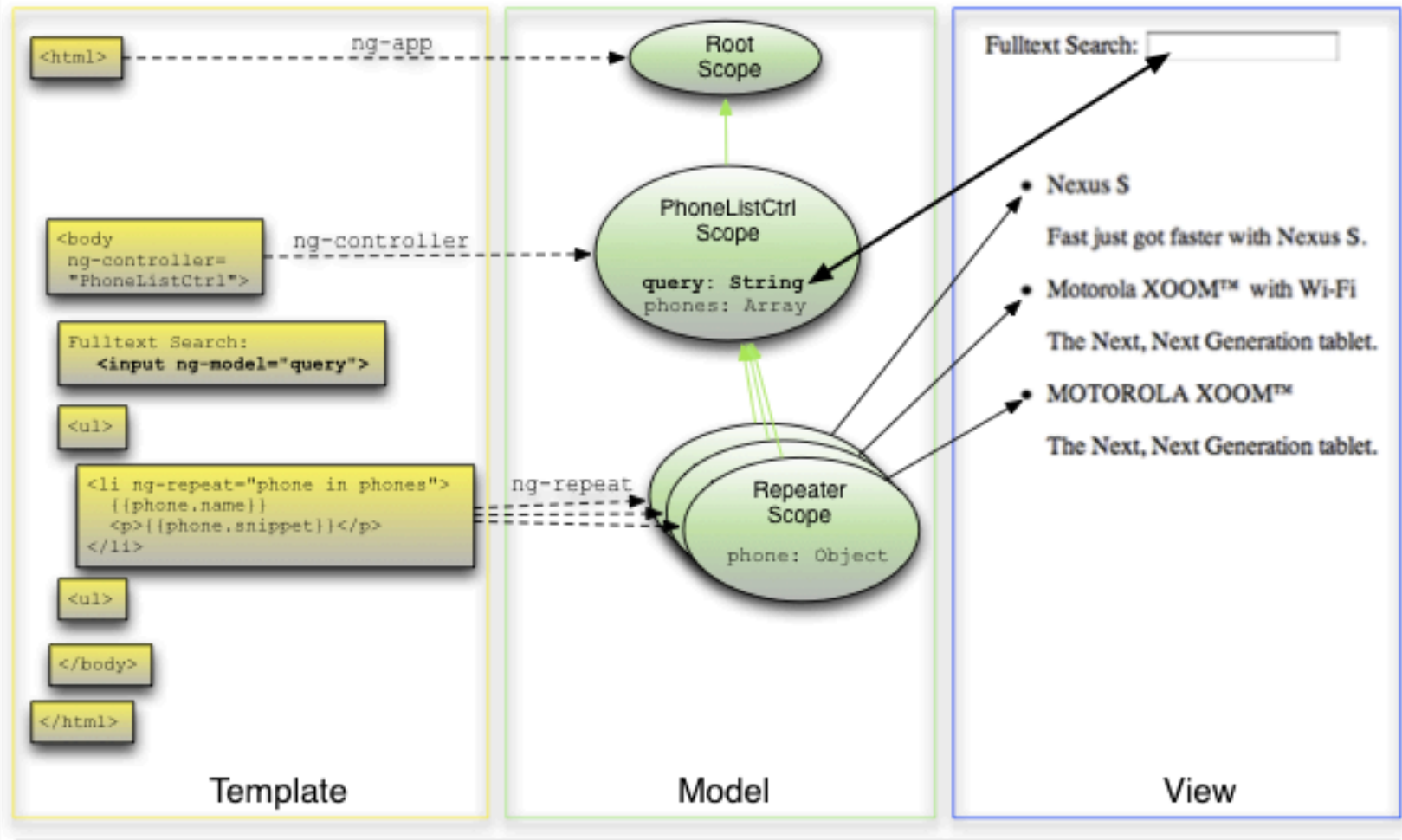
Interact with Web Service: JS/Ajax

- ◆ Asynchronous JavaScript and XML (AJAX)
- ◆ Make HTTP calls in JavaScript

No more waiting around...



The Trending Technology: AngularJS

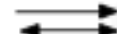


ANGULARJS
by Google

Implicit Scope Declaration



Scope Inheritance



Model / View Data-binding