Welcome to CSE 330/503
Creative Programming and Rapid Prototyping

Course Information

- **Instructor**
  - Todd Sproull
  - todd@wustl.edu
  - Jolley 536
  - Office Hours by Appointment
- **Classroom**
  - Lecture free format, we will meet in lab for every class
  - Video lectures are posted on the course website calendar
  - Watch video before attempting lab
- **Time**
  - Monday and Wednesday 10 – 11:20 AM
- **Course Website**
  - http://research.engineering.wustl.edu/~todd/cse330/
- **Labs**
- Urbauer Rooms 214, 216, 218, and 222

- **Head TA**
  - Connor Stevens
Grading

• 6 modules and a Creative Project to complete during the semester
• Most modules contain individual and group assignments
• Modules are due by the end of class on the due date
• You must “commit” the module by the end of class to receive credit
  • Otherwise it is a 0
• CSE 503S students will also complete a performance evaluation study

What is this class all about?

• A tour of Web 2.0 technologies
  – Cloud Computing
    • Amazon EC2
  – LAMP
    • Linux
    • Apache
    • MySQL
    • PHP
  – Python
  – Javascript
Cloud computing is using the Internet to access someone else's software running on someone else's hardware in someone else's data center.

- Lewis Cunningham
Types of Cloud Computing

- **SaaS**
  - Software as a Service
  - Cloud based delivery of complete software applications that run on infrastructure the SaaS vendor manages
  - Accessed over the Internet and typically charged on a subscription
  - Examples
    - Gmail and Yahoo Mail
    - Google Docs
    - Box.net

- **PaaS**
  - Platform as a Service

- **IaaS**
  - Infrastructure as a Service

Software as a Service (SaaS)
Platform as a Service – (PaaS)

• Features
  – Storage
  – Databases
  – Cloud Middleware
  – Scalability

• Examples
  – Google App Engine
  – Amazon Web Services S3
  – Heroku

Infrastructure as a Service – (IaaS)

• Features
  – Virtualization
  – Nearly instant scalability
  – Everything is a service
  – Utility style (pay for what you use)
  – Hardware, OS, Software, Storage & Network

• Examples
  – Amazon Web Services (AWS)
  – EMC Fortress (Storage Cloud)
  – HP Adaptive IaaS
Amazon Elastic Cloud Computing (EC2)

- This semester we are using Amazon Web Services (AWS) to run the Linux Operating System in a virtual machine
  - We avoid purchasing 100 PCs for the course
    - Instead we have virtual machines (VM)s to use
  - These machines our hosted in the cloud
  - You connect to an instance of a particular configuration of Linux

Amazon EC2 Costs

- You are only billed for the computing resources you use
- When you are done using an instance you can “stop” it from running so you do not continue to be billed
- Free Tier available for limited use
  - Sufficient for this course
  - No need to stop a Free Tier instance for the entire semester
Free Tier

As part of AWS’s Free Usage Tier, new AWS customers can get started with Amazon EC2 for free. Upon sign-up, new AWS customers receive the following EC2 services each month for one year:

- 750 hours of EC2 running Linux, RHEL, or SLES t2.micro instance usage
- 750 hours of EC2 running Microsoft Windows Server t2.micro instance usage
- 750 hours of Elastic Load Balancing plus 15 GB data processing
- 30 GB of Amazon Elastic Block Storage in any combination of General Purpose (SSD) or Magnetic, plus 2 million I/Os (with Magnetic) and 1 GB of snapshot storage
- 15 GB of bandwidth out aggregated across all AWS services
- 1 GB of Regional Data Transfer

How much does this cost?

<table>
<thead>
<tr>
<th>Region</th>
<th>EC2 Size</th>
<th>vCPU</th>
<th>Memory (GB)</th>
<th>Instance Storage (GB)</th>
<th>Linux/UNIX Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>US East (N. Virginia)</td>
<td>t2.micro</td>
<td>1</td>
<td>1</td>
<td>EBS Only</td>
<td>$0.015 / hour</td>
</tr>
<tr>
<td></td>
<td>t2.medium</td>
<td>2</td>
<td>4</td>
<td>EBS Only</td>
<td>$0.020 / hour</td>
</tr>
<tr>
<td></td>
<td>m3.medium</td>
<td>1</td>
<td>3.75</td>
<td>1 x 4 SSD</td>
<td>$0.070 / hour</td>
</tr>
<tr>
<td></td>
<td>m3.large</td>
<td>2</td>
<td>7.5</td>
<td>1 x 32 SSD</td>
<td>$0.140 / hour</td>
</tr>
<tr>
<td></td>
<td>m3.xlarge</td>
<td>4</td>
<td>15</td>
<td>2 x 40 SSD</td>
<td>$0.290 / hour</td>
</tr>
<tr>
<td></td>
<td>m3.2xlarge</td>
<td>8</td>
<td>30</td>
<td>3 x 80 SSD</td>
<td>$0.550 / hour</td>
</tr>
<tr>
<td>US West (Oregon)</td>
<td>t2.micro</td>
<td>1</td>
<td>1</td>
<td>EBS Only</td>
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GPU Instances – Current Generation

<table>
<thead>
<tr>
<th>GPU Instance</th>
<th>vCPU</th>
<th>Memory (GB)</th>
<th>Instance Storage (GB)</th>
<th>Linux/UNIX Usage</th>
</tr>
</thead>
<tbody>
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<td>29</td>
<td>15</td>
<td>$0.160 / hour</td>
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</table>
Module 1 – HTML and CSS

- **HyperText Markup Language (HTML)**
  - Main “markup language” for displaying web pages in a web browser

- **Cascading Style Sheets (CSS)**
  - Language for describing the “look and feel” of a markup language (such as HTML)
HTML History

- In 1989 Tim Berners-Lee introduced three technologies that allowed documents to be distributed and read
  - HTML (HyperText Markup Language)
    - A simple language to layout documents
  - HTTP (Hypertext transfer protocol)
    - Technology that transfers a page from one computer to another
  - Browser Technology
    - Software that reads the HTML pages

What is HTML?

- Initially just a text file with a few special codes (called tags)
- Clear text, case insensitive
- Ignores white space
- Comprised of tags `<tag> </tag>`
  - eg `<p>` This is some cool content inside a paragraph tag. `</p>`
    - The tag and contents is called an element
    - Stuff between the tags is the elements contents
- Elements have attributes
  - Allow you to create a particular class of an element
  - You can also create a unique id for an element
HTML Version Timeline

- 1992: HTML 1.0 original proposal
- 1994: HTML 2.0
- 1996: HTML 3.2, end of browser wars
- 1997: HTML 4.0, stylesheets introduced
- 1999: HTML 4.01, everyone is happy
- 2000: XHTML 1.0, an XML version of HTML
- 2001: XHTML 1.1
- 2002: XHTML 2.0
- 2008: HTML 5.0 published as working draft
- 2011: HTML 5 “Last Call” from HTML Working Group

HTML – Fundamentals

- Document Structure

```html
< HTML >

Header

Body

</ HTML>
```
### HTML – Fundamentals

```html
<html>
  <head>
    <title>The title of your html page</title>
  </head>
  <body>
    <!-- your web page content and markup -->
  </body>
</html>
```
HTML – Fundamentals - Example

<header>
<body>

Todd Sproull
Here is my contact info:

</body>
</header>
<html>
  <head>
  <title>My Contact Information</title>
  </head>
  <body>
    Todd Sproull<br><br>
    Here is my contact info:<br>
    <ol>
      <li>Office: Jolley Hall, Room 536</li>
      <li>Email: todd@wustl.edu</li>
      <li>Phone: 314-935-7140</li>
    </ol>
  </body>
</html>
<header></header>
<body>
  Todd Sproull
  Here is my contact info:
  <li>Office: Jolley Hall, Room 536</li>
  <li>Email: todd@wustl.edu</li>
  <li>Phone: 314-935-7140</li>
  <img src='http://www.myserver.com/images/me.jpg'/>
<a href='cse436.html'>Read about my iPhone class</a>
</body>
**HTML Compliance**

- We want to follow best practices and adhere to standards when possible in this course.

- W3C provides an online Markup Validation Service for us to test out our web pages
  - [http://validator.w3.org/](http://validator.w3.org/)

- All web pages developed in this course must pass this validation.

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**HTML and CSS Tutorials**

- Plenty of really good examples available online
  - [http://webplatform.org](http://webplatform.org)

- A basic understanding of HTML is necessary for this course.

- The goal of this course is not to teach all of the amazing aspects of web design
  - But you MUST create W3C compliant web pages.

- The header `<!DOCTYPE HTML>` declares an HTML 5 webpage
  - Which is what we will use in this course.
Cascading Style Sheets

• A powerful way to specify styles and formatting across all documents in a web site

• Style sheets can be specified inline or as a separate document

• Helps to keep a common look and feel

Cascading Style Sheets (CSS)

• Styles enable you to define a consistent 'look' for your documents by describing once how headings, paragraphs, quotes, etc. should be displayed.

• Style sheet syntax is made up of three parts:

  selector {property: value}

  selector = element.class
CSS

• General form:

selector {property: value} or

selector {property 1: value 1;
   property 2: value 2;
   ...
   property n: value n }

CSS Examples

H1 {text-align: center;
   color: blue;
   font: Arial, Times New Roman}

P {text-align: left;
   color: red;
   font-family: Tahoma, Arial Narrow;
   font-style: italics}
Using CSS - Example Page

```html
<html>
<head>
  <title> CSS Example </title>
  <style>
    h1 { color:blue; }
  </style>
</head>
<body>
  <h1> Hello </h1>
</body>
</html>
```
Using CSS - Example Page

```html
<html>
<head>
  <title> CSS Example </title>
  <link rel="stylesheet" href="mystyle.css" >
</head>
<body>
  <h1> Hello </h1>
</body>
</html>
```

CSS Examples

```css
h1 {text-align: center; color: blue}
a {color:green; font-family:arial,courier; font-weight:bold;}
td { align:center; background-color:grey; border-color:red;}
div {position:absolute; visibility:hidden; margin:10px }
font {color:navy; font-size:2pt; font-face:trebuchet; }
```
More CSS Examples - Classes

element.class {property:value; }

h1 {color: blue}
h1.widget {color: green; }

a {color:green; font-family:arial,courier; font-weight:bold;}
a.menu {color:cyan; font-family:arial,courier; font-style:italics;}

<h1> Hello </h1>
<h1 class="widget"> Hello again </h1>

Using CSS Classes - Example Page

<html>
<head>
<title> CSS Example </title>
<style>
  h1 { color:blue; }
  h1.widget { color:green; }
</style>
</head>
<body>
  <h1>Hello</h1>
  <h1 class="widget">Hello again</h1>
</body>
</html>
HTML Forms

• `<form>` is just another kind of HTML tag

• HTML forms are used to create (rather primitive) GUIs on Web pages
  – Usually the purpose is to ask the user for information
  – The information is then sent back to the server

• A form is an area that can contain form elements
  – Forms can be used for other things, such as a GUI for simple programs

The `<form>` tag

• The `<form arguments>` ... `</form>` tag encloses form elements (and probably other HTML as well)
• The arguments to `form` tell what to do with the user input
  - `action`="url" (required)
    • Specifies where to send the data when the Submit button is clicked
  - `method`="get" (default)
    • Form data is sent as a URL with `?form_data` info appended to the end
    • Can be used only if data is all ASCII and not more than 100 characters
  - `method`="post"
    • Form data is sent in the body of the URL request
    • Cannot be bookmarked by most browsers
  - `target`="target"
    • Tells where to open the page sent as a result of the request
      • `target`=_blank means open in a new window
      • `target`=_top means use the same window
**HTML Form Example**

fileExampleGet.html

```html
<!DOCTYPE HTML>
<head>
  <title> My HTML Form </title>
</head>
<body>
<form name="input" action="http://someWebsite.com/" method="get">
  Username: <input type="text" name="user" />
  
  <input type="submit" value="Submit" />
</form>
</body>
```

**HTML Forms**

**DEMO**
Get vs Post

- Mantra
  - you "must not use GET requests to make changes"

- GET should never change data on the server

- Differences:
  - http://stackoverflow.com/questions/198462/is-either-get-or-post-more-secure-than-the-other
  - http://www.diffen.com/difference/Get_vs_Post

Course Wiki
Piazza

Git
Git: A Fast Version Control System

- **Git**
  - Is distributed
  - Has no master copy
  - Has fast merges
  - Scales up
  - Convenient tools still being built
  - Safeguards against corruption

What is version control?

- **Basic functionality:**
  - keep track of changes made to files (allows roll-backs)
  - merge the contributions of multiple developers

- **Benefits:**
  - facilitates backups
  - increased productivity (vs manual version control)
  - encourages experimentation
  - helps to identify/fix conflicts
  - makes source readily available – less duplicated effort
Our First Git Repository

- `mkdir first-git-repo`
- `cd first-git-repo`
- `git init`
  - Creates the basic artifacts in the .git directory
- `echo "Hello World" > hello.txt`
- `git add .`
  - Adds content to the index
  - Index reflects the working version
  - Must be run prior to a commit
- `git commit -a -m 'Check in number one'`

We will cover Git in more detail in later modules

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Demo of Git