Web Engineering @ UCL


Ian Sillitoe (Darwin 627)

i.sillitoe@ucl.ac.uk
About me

• Bashing my head against various web technologies for > 20 years

• What I’ve learned so far:
  • There is no single, correct way to do things
  • There are lots of bad ways to do things
An expert is someone who knows some of the worst mistakes that can be made in his subject and how to avoid them.

— Werner Heisenberg —
“Don’t believe everything you read on the Internet just because there’s a picture with a quote next to it.”

—Abraham Lincoln
Orengo Group

- Prof Christine Orengo
  - Room 627, Darwin
  - 6 Post docs, 6 PhD students
Linux Services

- **Version Control**: SVN, Git
- **Web Tools**: Apache, Varnish, FCGI, Solr, Tomcat
- **Databases**: PostgreSQL, Oracle, MySQL
- **Software Dev**: Perl, Python, Java, C++, Javascript
- **Sys Dev**: VM, Puppet, CentOS, Ubuntu

- **20** Desktops / Laptops
- **6** General Servers
- **3** Big VM Servers
- **50** Local HPC nodes
Background

• Technology
  • HTML / CSS / Javascript

• Concepts
  • MVC
  • Web application
  • Virtualisation
HTML (HyperText Markup Language)

• Provides semantic meaning (markup) to documents
  • `<h1>Title</h1>`
  • `<p>Paragraph</p>`
  • `<table>...</table>`

• HTML5 provides a rich, standardised vocabulary
  • `<footer>...</footer>`
  • `<section>...</section>`
  • `<audio>...</audio>`
  • `<video>...</video>`

“MDN HTML”

HTML (HyperText Markup Language)

<h1>Title</h1>
<p>Some text and a link</p>

Title

Some text and a link
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>Title</title>
  <link rel="stylesheet" href="style.css">
  <script src="script.js"></script>
</head>
<body>
  <!-- page content -->
  <p>Some text and a
      <a href="http://www.ucl.ac.uk">link</a>
  </p>
</body>
</html>
CSS (Cascading Style Sheets)

- Language to specify presentation of the document
- Separates data from presentation
- Consistency across many pages

“MDN CSS”
CSS (Cascading Style Sheets)

<h1>Title</h1>
<p>Some <span class="example">text</span> and a <a href="http://www.ucl.ac.uk">link</a></p>
**CSS** (Cascading Style Sheets)

```html
<h1>Title</h1>
<p>Some <span class="example">text</span> and a <a href="http://www.ucl.ac.uk">link</a></p>
```

```css
p .example {
    color: red;
}
```

Title

Some text and a link
Javascript

• Dynamic language
• Commonly used to negotiate interaction between user and HTML
• Standard is supported by all modern browsers
• JS Frameworks make it easier to use
  • jQuery, Underscore, Prototype, ...

“MDN Javascript”

Background

• Technology
  • HTML / CSS / Javascript

• Concepts
  • MVC
  • Web application
  • Virtualisation
MVC

Controller
Glue

Model
Database, Filesystem, ...

View
HTML, Excel, PDF, ...
MVC

Controller

Model
Database, Filesystem, ...

View
HTML, Excel, PDF, ...

Glue
Crowd Computing

• Web Service
  
  http://api.ucl.ac.uk/RandomNumberAndColour/2

• Models
  • RandomNumber
  • RandomColour

• Views
  • to_json
  • to_html
  • to_html( language => ‘Spanish’ )
MVC

Controller

Model

View

Colours: ["red", "green"]
Numbers: [42, 15]
Crowd Computing

• Web Service

http://api.ucl.ac.uk/RandomNumberColour/2

• Returns

```
[
  { colour: "red", number: 42},
  { colour: "green", number: 15}
]
```
Crowd Computing

• Web Service

http://api.ucl.ac.uk/RandomNumberColour/2

• Returns
Crowd Computing

• Web Service

http://api.ucl.ac.uk/RandomNumberColour/2

• Returns
Challenge 1

• Provide web application that is:
  • Efficient
  • Robust
  • Flexible
  • Scalable
  • Maintainable
Efficient

• Use MVC web application (not CGI.pl)

• e.g.
  • Perl  Catalyst, Dancer, Mojolicious, ...
  • Python Django, CherryPy, ...
  • Ruby Rails, ...
Robust

• Continuous Integration (CI)
  • Everything gets put into group code repository
    • code, crontabs, tests, etc
  • All code has its own tests
  • Tests run automatically all the time
  • If tests PASS - shared code gets updated
  • If tests FAIL - we get an email

• e.g. Jenkins CI, Travis CI, ...
Flexible

• Lots of (good) tests gives you...
  • Confidence to make changes
  • Confidence to accept changes from others

• Continuous Integration lets you...
  • See your own changes in “beta” sites

• MVC web applications make it easy to...
  • Create powerful, interactive web pages
Scalable

• Move web code to Virtual Machine (VM)
  • SVN all common code in central repo
  • Puppet maintains machine requirements
  • Varnish web cache, load balance, failover
Develop, Build / Test, Deploy

DEVELOP

User 1

User 2

BUILD / TEST

Code Repo (SVN)

VM server

orengobuild64

orengocatalyst01

orengocatalyst02

orengocatalyst03

DEPLOY
Cache, Load Balance, MVC

- Web server
  - Varnish
  - Cache, Load Balance, MVC
    - Data Source A
    - Data Source B
    - Data Source C
- VM server
  - orengobuild64
  - orengocatalyst01
  - orengocatalyst02
  - orengocatalyst03
Challenge 2

- Monitor SGE jobs (qstat without the typing)

- [https://github.com/sillitoe/sge-monitor](https://github.com/sillitoe/sge-monitor)