Teaching Computer Science in the Cloud

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This is CS 50.
Enrollment’s Increased 150%
Female Enrollment’s Increased 48%
“You will also become addicted to useless internet-memes, but that is expected, as with great power comes even more creative ways to procrastinate.”
0: Scratch

O, hai!
2: Crypto
3: Game of Fifteen
4: Sudoku

```
8  4  6  7
  1 4  6 5
5  9  3  7
  7
4 8  2  1 3
5 2  9
3 1 9 2 5
```
5: Forensics
Teh Computer Science 50 learnz you about intertubes in teh cloudz. David J. Malan will pwn u ftw so watch out!

6: Mispellings
CS50 $120

7: C$50 Finance
8: Mashup

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1 Oxford St
Cambridge, MA 02138

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Edit now
What languages were used for the projects?

- ActionScript: 7
- C: 28
- C++: 5
- C#: 4
- CSS: 104
- Java: 27
- JavaScript: 152
- Objective-C: 12
- Perl: 1
- PHP: 206
- Python: 14
- Ruby: 7
- SQL: 156
- XHTML: 198
- LOLcode: 1
- Other: 21
Self-service, Prorated Super Computing Fun!

- “The New York Times has decided to make all the public domain articles from 1851-1922 available free of charge. These articles are all in the form of images scanned from the original paper. In fact from 1851-1980, all 11 million articles are available as images in PDF format. To generate a PDF version of the article takes quite a bit of work — each article is actually composed of numerous smaller TIFF images that need to be scaled and glued together in a coherent fashion. . . . I then began some rough calculations and determined that if I used only four machines, it could take some time to generate all 11 million article PDFs. But thanks to the swell people at Amazon, I got access to a few more machines and churned through all 11 million articles in just under 24 hours using 100 EC2 instances . . . . (In fact, it work so well that we ran it twice, since after we were done we noticed an error in the PDFs.)”
Virtualization

http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/eicaz/eicaz516.gif
Virtualization

- **Xen**
  - VMware
    - Workstation, Fusion, Server, ESXi, vSphere
- **Parallels**
  - Workstation, Server for Mac, Virtuozzo
- **Microsoft**
  - Hyper-V, Virtual PC
- **Sun**
  - VirtualBox
- **QEMU**
- **FreeVPS**
- **Virtual Iron**
- ...
Virtual Private Servers (VPSes)

- Linode
- ServInt
- TekTonic
- VPSLAND
- ...

http://www.servint.net/supervps.php
Managed Colocation

- Rackspace

Clouds

- Amazon Elastic Compute Cloud (Amazon EC2)
- Google App Engine
- Microsoft Azure Services Platform
- ...
Amazon Web Services (AWS)

- Amazon Elastic Compute Cloud (Amazon EC2)
- Amazon Simple Storage Service (Amazon S3)
- Amazon SimpleDB
- Amazon CloudFront
- Amazon Simple Queue Service (Amazon SQS)
- Amazon Elastic MapReduce
Amazon Machine Images (AMIs)

- Debian
- Fedora
- Gentoo Linux
- Red Hat Enterprise Linux
- OpenSolaris
- openSUSE Linux
- Oracle Enterprise Linux
- Ubuntu Linux
- Windows Server 2003
- ...

# On-Demand Instances

<table>
<thead>
<tr>
<th>Standard On-Demand Instances</th>
<th>Linux/UNIX Usage</th>
<th>Windows Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (Default)</td>
<td>$0.10 per hour</td>
<td>$0.125 per hour</td>
</tr>
<tr>
<td>Large</td>
<td>$0.40 per hour</td>
<td>$0.50 per hour</td>
</tr>
<tr>
<td>Extra Large</td>
<td>$0.80 per hour</td>
<td>$1.00 per hour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High CPU On-Demand Instances</th>
<th>Linux/UNIX Usage</th>
<th>Windows Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>$0.20 per hour</td>
<td>$0.30 per hour</td>
</tr>
<tr>
<td>Extra Large</td>
<td>$0.80 per hour</td>
<td>$1.20 per hour</td>
</tr>
</tbody>
</table>

cloud.cs50.net

Internet

student

Harvard Hall

cloud.cs50.net

front-end VM
192.168.1.1

back-end VM
192.168.1.10
back-end VM
192.168.1.11
back-end VM
192.168.1.12
back-end VM
192.168.1...
<table>
<thead>
<tr>
<th>Month</th>
<th>CPU</th>
<th>Disk</th>
<th>I/O Requests</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep</td>
<td>2,275 Hrs</td>
<td>125 GB</td>
<td>45,348</td>
<td>14 GB</td>
</tr>
<tr>
<td>Oct</td>
<td>3,425 Hrs</td>
<td>108 GB</td>
<td>93,257,314</td>
<td>191 GB</td>
</tr>
<tr>
<td>Nov</td>
<td>5,484 Hrs</td>
<td>199 GB</td>
<td>337,019,916</td>
<td>239 GB</td>
</tr>
<tr>
<td>Dec</td>
<td>5,206 Hrs</td>
<td>300 GB</td>
<td>427,639,962</td>
<td>52 GB</td>
</tr>
<tr>
<td>Jan</td>
<td>5,208 Hrs</td>
<td>300 GB</td>
<td>1,502,614,186</td>
<td>62 GB</td>
</tr>
</tbody>
</table>
Concerns

- Time
- No __________
- PEBKAC
- “cloud is laggy”
- “Cloud is wicked laggy”
- Bandwidth Costs
- “Lightning Strike Triggers Amazon EC2 Outage”
“Sometimes he spends a long time on broad concepts that we already understand, rather than focusing on details like return types or proper usage of functions. For example, he explained cloud computing like 17,000 times, and we don't even need to understand it for the psets.”
AWS in Education

- Educators
- Researchers
- Students
- Education IT
CS 50 in a Box
New Contestants On the Turing Test

Posted by Cmdr Taco on Wednesday October 08, @11:15AM
from the game-on dept.

vitamine73 writes

"At 9 a.m. next Sunday, six computer programs — 'artificial conversational entities' — will answer questions posed by human volunteers at the University of Reading in a bid to become the first recognized 'thinking' machine. If any program succeeds, it is likely to be hailed as the most significant breakthrough in artificial intelligence since the IBM supercomputer Deep Blue beat world chess champion Garry Kasparov in 1997. It could also raise profound questions about whether a computer has the potential to be 'conscious' — and if humans should have the 'right' to switch it off."
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