Moving CS50 into the Cloud

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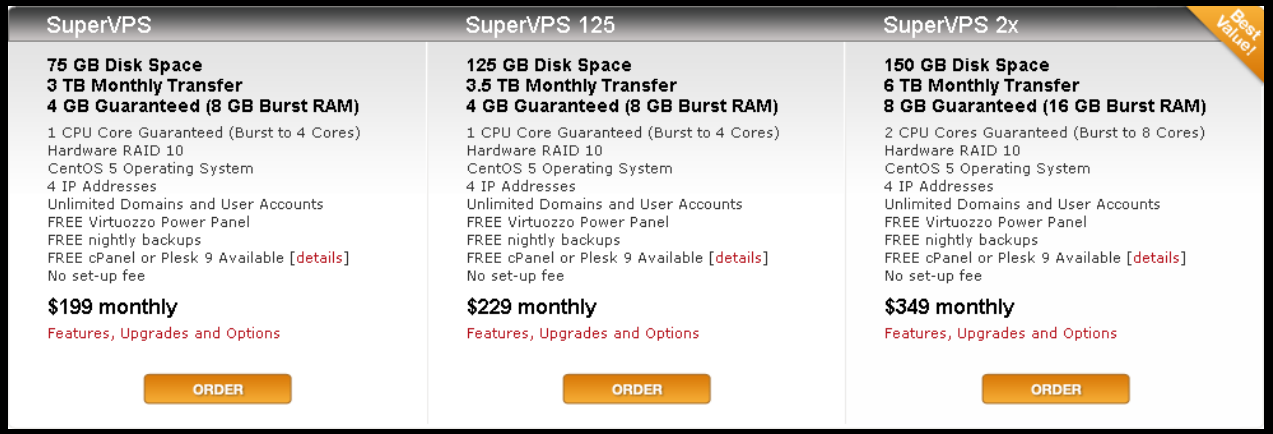
Virtual Private Servers (VPSes)

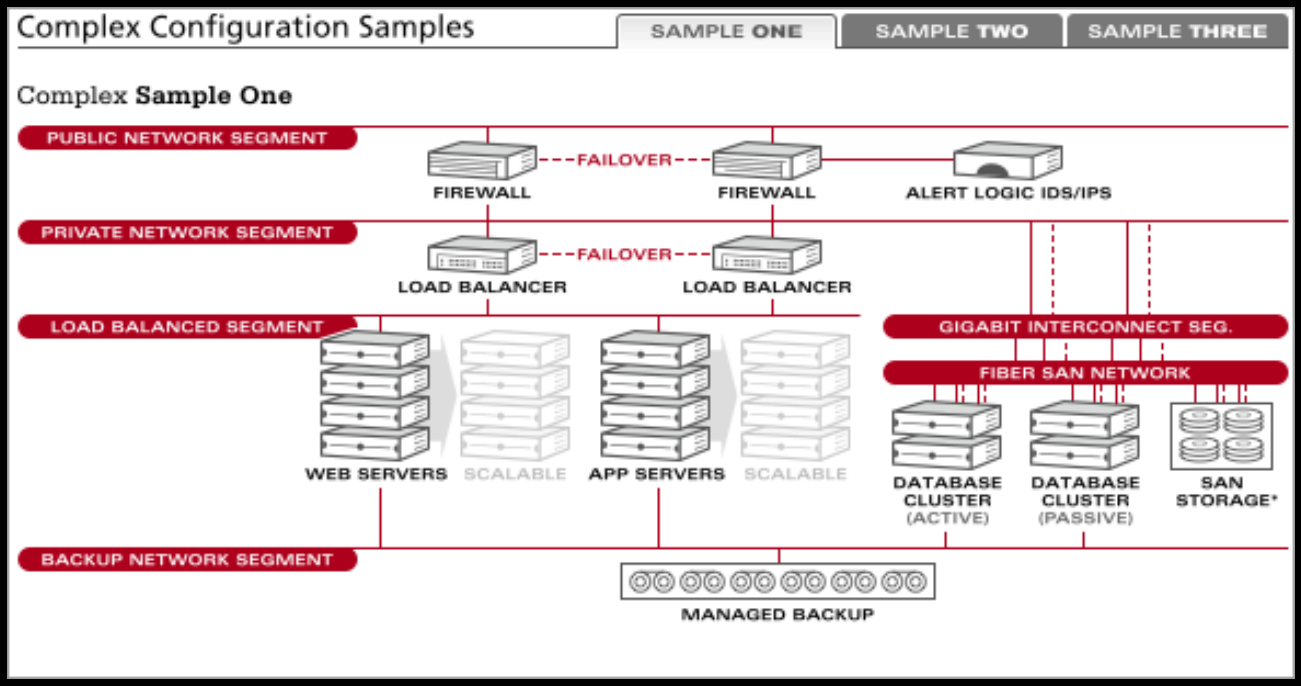
- Linode
- ServInt
- TekTonic
- VPSLAND
- . . .



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

Managed Colocation

- Rackspace
- . . .



http://www.rackspace.com/solutions/managed_hosting/configurations/index.php

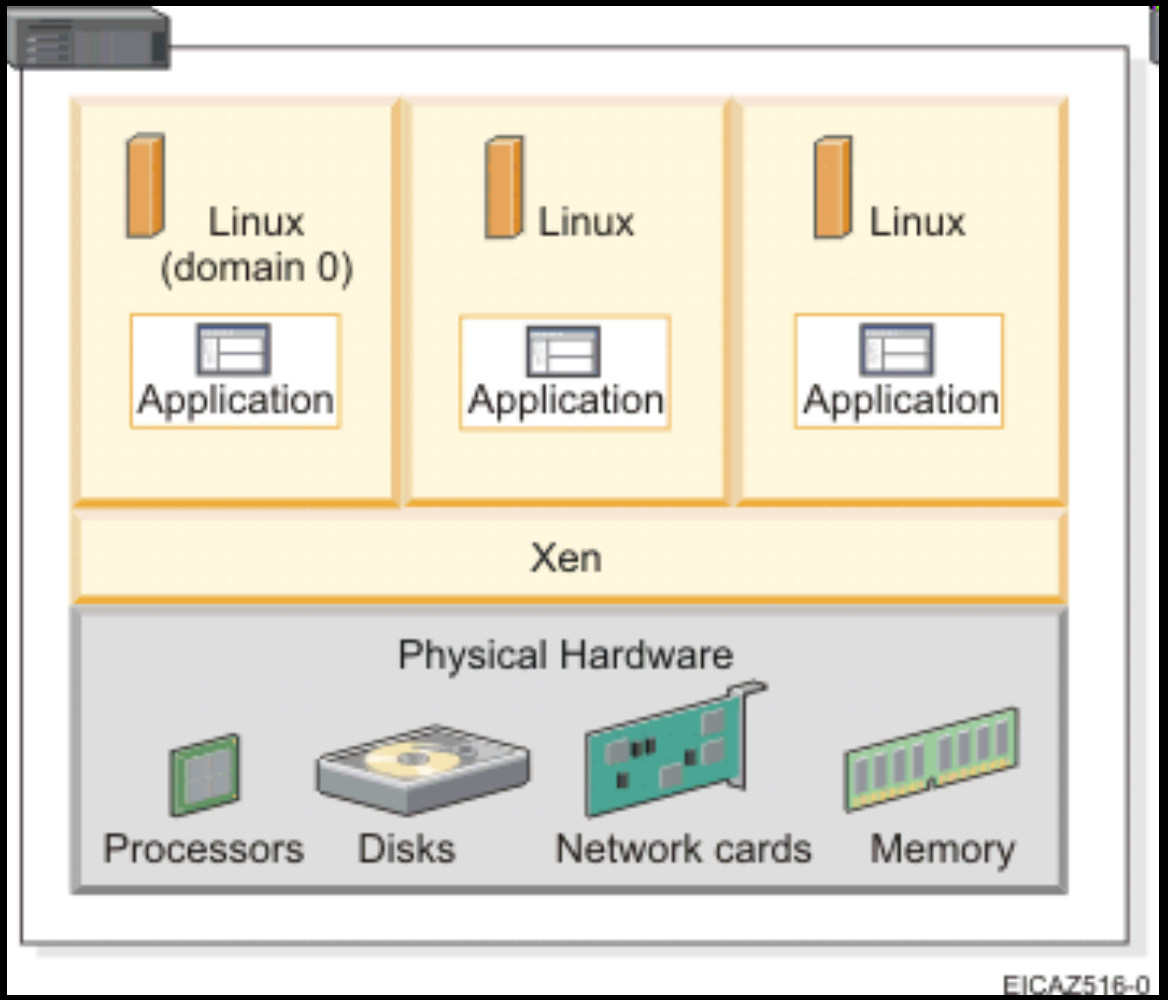
Self-service, Prorated Super Computing Fun!

- "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.)"

Clouds

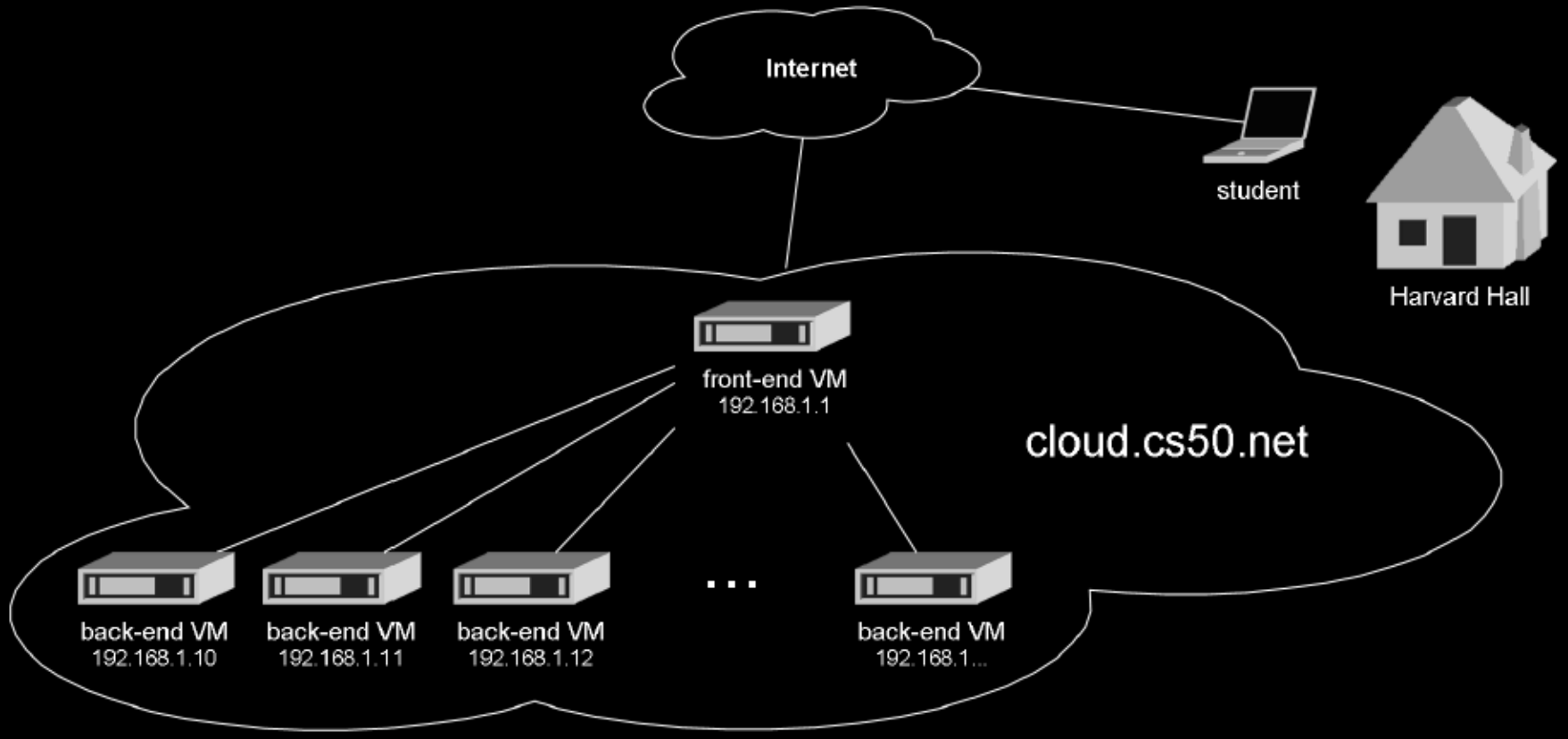
- Amazon Elastic Compute Cloud (Amazon EC2)
- Google App Engine
- Microsoft Azure Services Platform
- . . .

Xen



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

cloud.cs50.net



On-Demand Instances

US – N. Virginia | US – N. California | EU – Ireland

Standard On-Demand Instances	Linux/UNIX Usage	Windows Usage
Small (Default)	$0.085 per hour	$0.12 per hour
Large	$0.34 per hour	$0.48 per hour
Extra Large	$0.68 per hour	$0.96 per hour
High-Memory On-Demand Instances	**Linux/UNIX Usage**	**Windows Usage**
Extra Large	$0.50 per hour	$0.62 per hour
Double Extra Large	$1.20 per hour	$1.44 per hour
Quadruple Extra Large	$2.40 per hour	$2.88 per hour
High-CPU On-Demand Instances	**Linux/UNIX Usage**	**Windows Usage**
Medium	$0.17 per hour	$0.29 per hour
Extra Large	$0.68 per hour	$1.16 per hour

http://aws.amazon.com/ec2/

Cost Us Less than $15 per Student

	CPU	Disk	I/O Requests	Bandwidth
Sep	2,275 Hrs	125 GB	45,348	14 GB
Oct	3,425 Hrs	108 GB	93,257,314	191 GB
Nov	5,484 Hrs	199 GB	337,019,916	239 GB
Dec	5,206 Hrs	300 GB	427,639,962	52 GB
Jan	5,208 Hrs	300 GB	1,502,614,186	62 GB

Concerns

- Time
- PEBKAC
- “Cloud is wicked laggy”
- Bandwidth Costs
- “Lightning Strike Triggers Amazon EC2 Outage”
- …

Virtualization

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

CS50 Appliance

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