

# CS615 - Aspects of System Administration

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Stevens Institute of Technology  
Jan Schaumann

`jschauma@stevens.edu`

`http://www.cs.stevens.edu/~jschauma/615/`

## Why are you here?

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`https://www.cs.stevens.edu/~jschauma/cgi-bin/615.cgi`

# The Job of a System Administrator

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What exactly does a *System Administrator* do?

# The Job of a System Administrator

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# The Job of a System Administrator

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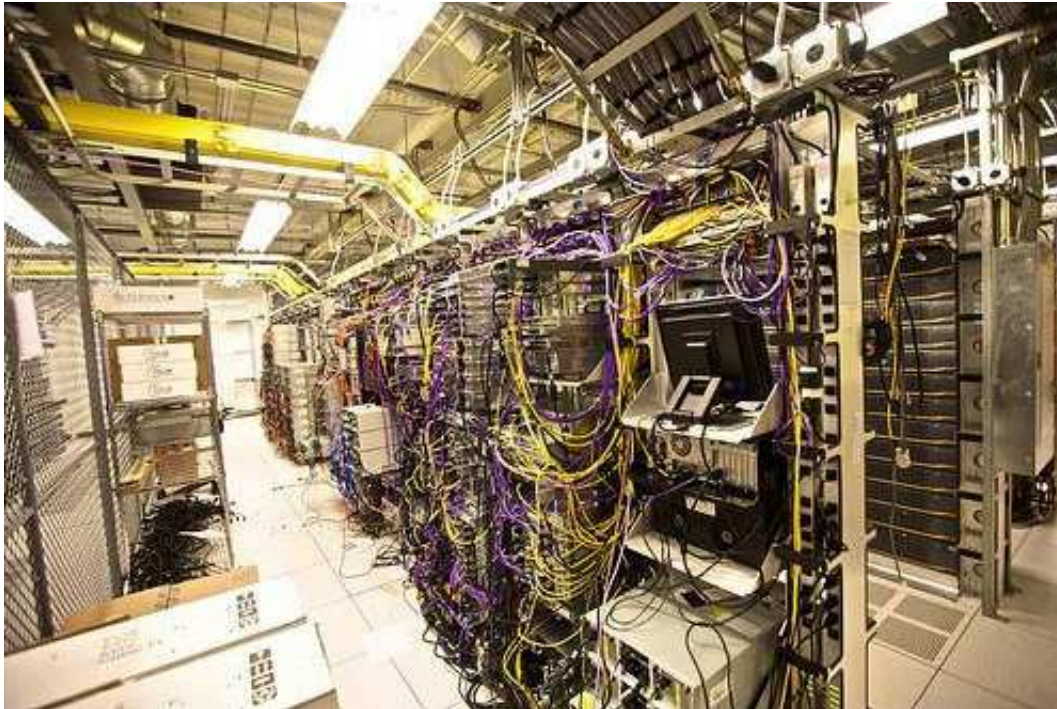
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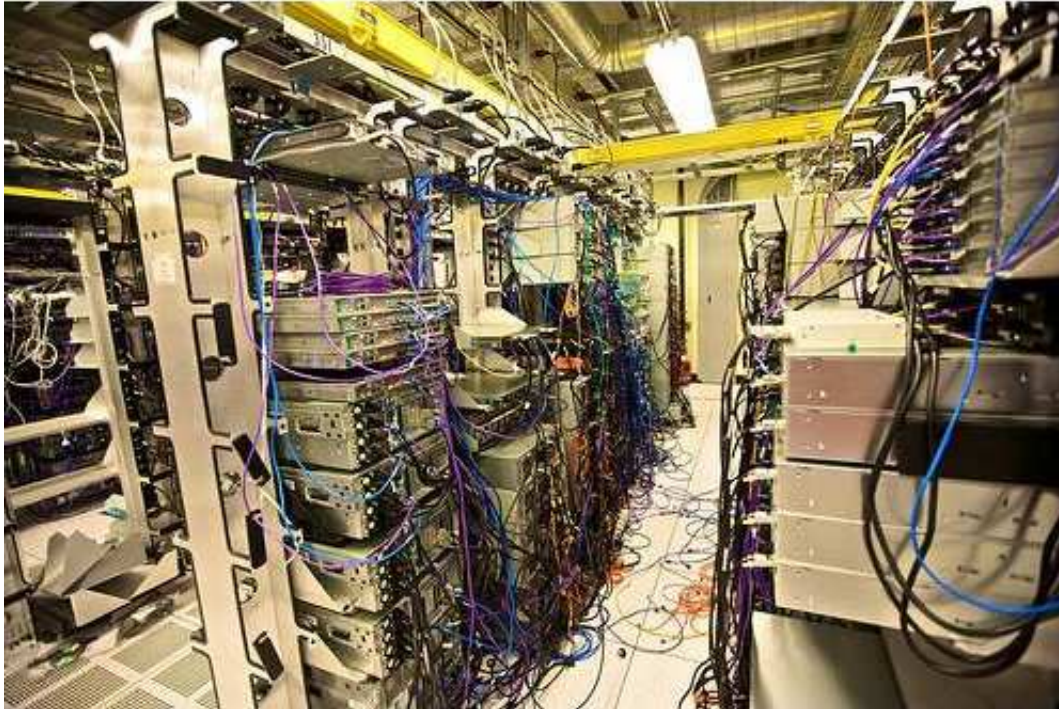
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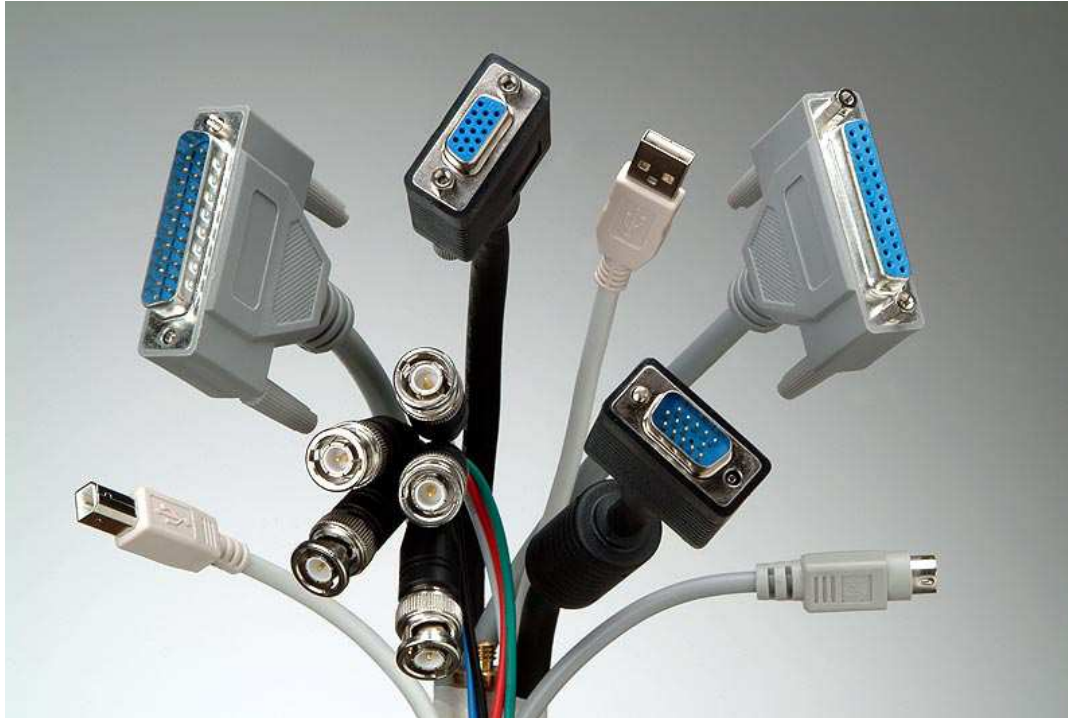
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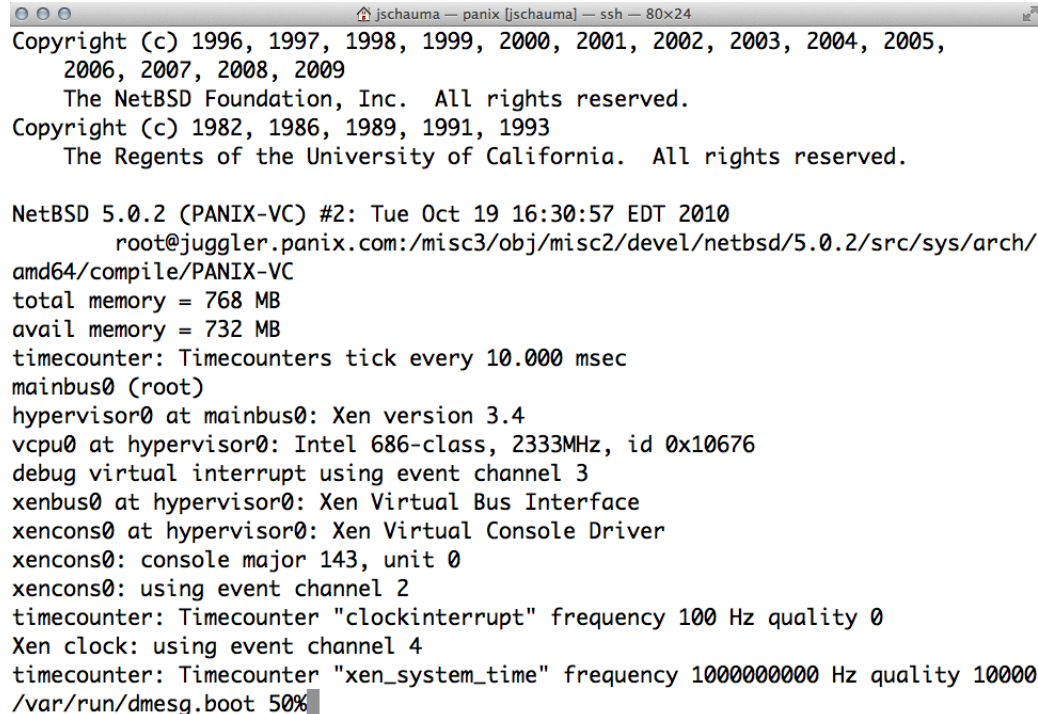
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A terminal window titled 'jschauma — panix [jschauma] — ssh — 80x24' displays the output of a NetBSD 5.0.2 (PANIX-VC) boot. The output includes copyright notices for 1996-2009 and 1982-1993, followed by system information such as total and available memory (768 MB and 732 MB respectively), timecounter tick rate (10.000 msec), and Xen hypervisor details (version 3.4, 2333MHz, id 0x10676). It also shows Xen virtual bus and console interface details, and the boot progress at 50%.

```
jschauma — panix [jschauma] — ssh — 80x24
Copyright (c) 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005,
2006, 2007, 2008, 2009
The NetBSD Foundation, Inc.  All rights reserved.
Copyright (c) 1982, 1986, 1989, 1991, 1993
The Regents of the University of California.  All rights reserved.

NetBSD 5.0.2 (PANIX-VC) #2: Tue Oct 19 16:30:57 EDT 2010
root@juggler.panix.com:/misc3/obj/misc2/devel/netbsd/5.0.2/src/sys/arch/
amd64/compile/PANIX-VC
total memory = 768 MB
avail memory = 732 MB
timecounter: Timecounters tick every 10.000 msec
mainbus0 (root)
hypervisor0 at mainbus0: Xen version 3.4
vcpu0 at hypervisor0: Intel 686-class, 2333MHz, id 0x10676
debug virtual interrupt using event channel 3
xenbus0 at hypervisor0: Xen Virtual Bus Interface
xencons0 at hypervisor0: Xen Virtual Console Driver
xencons0: console major 143, unit 0
xencons0: using event channel 2
timecounter: Timecounter "clockinterrupt" frequency 100 Hz quality 0
Xen clock: using event channel 4
timecounter: Timecounter "xen_system_time" frequency 1000000000 Hz quality 10000
/var/run/dmesg.boot 50%
```

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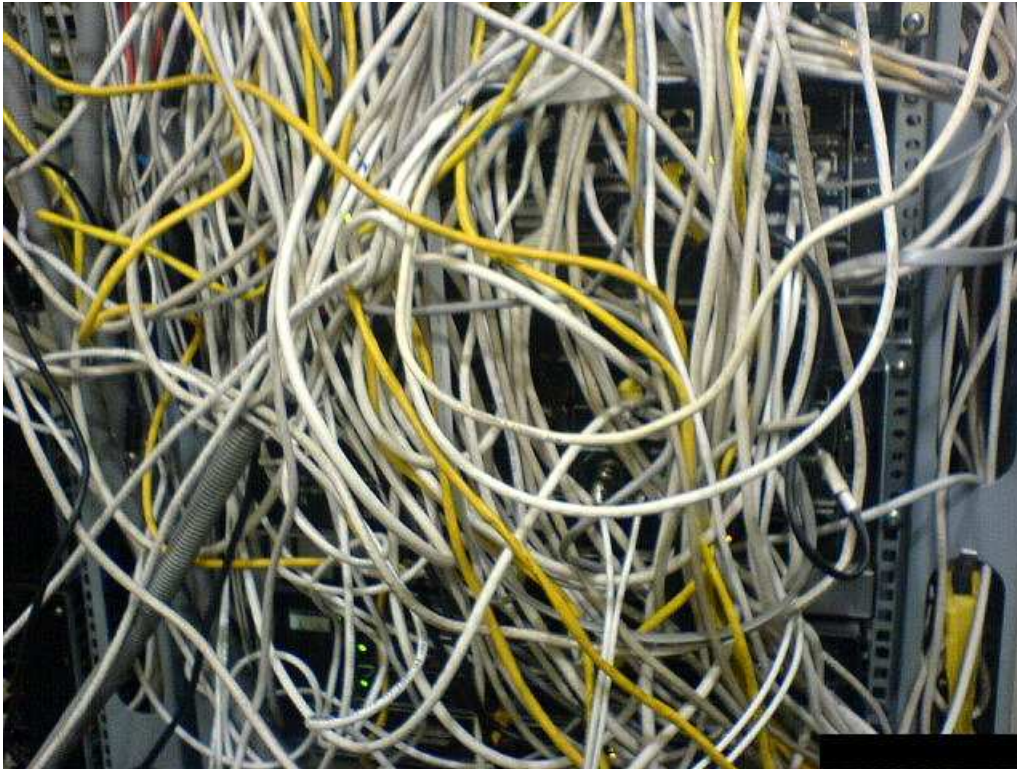
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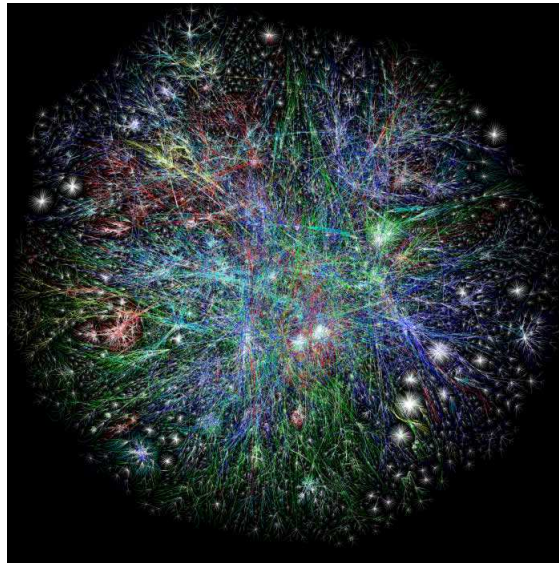
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<http://www.opte.org/maps/>

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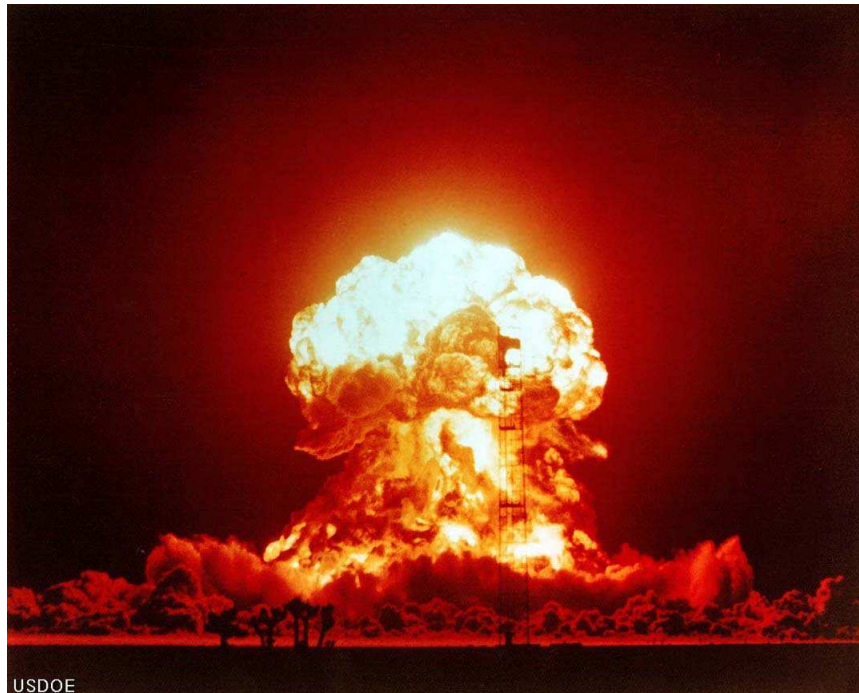
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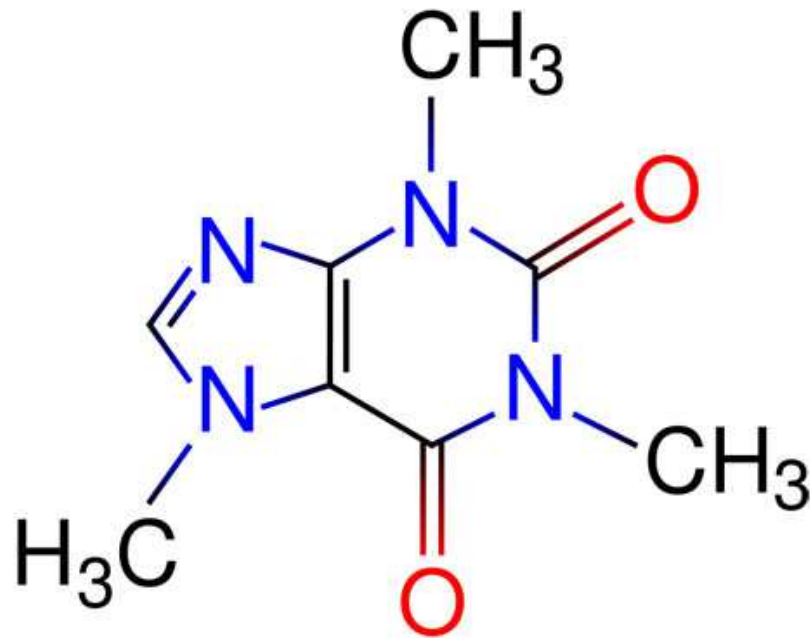
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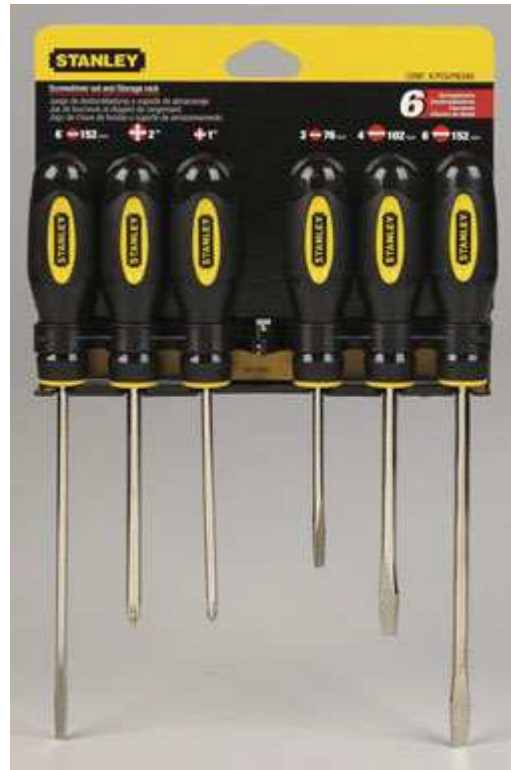
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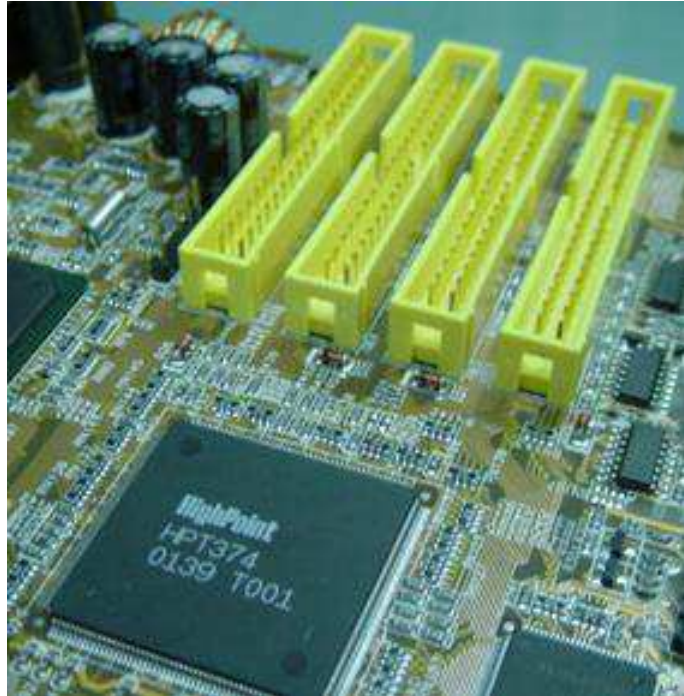
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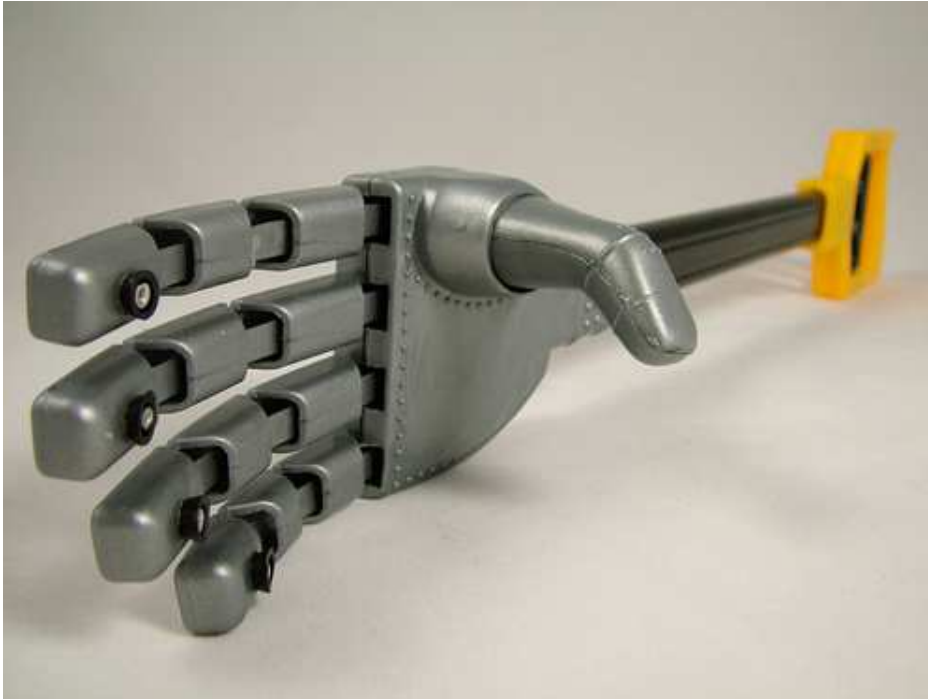
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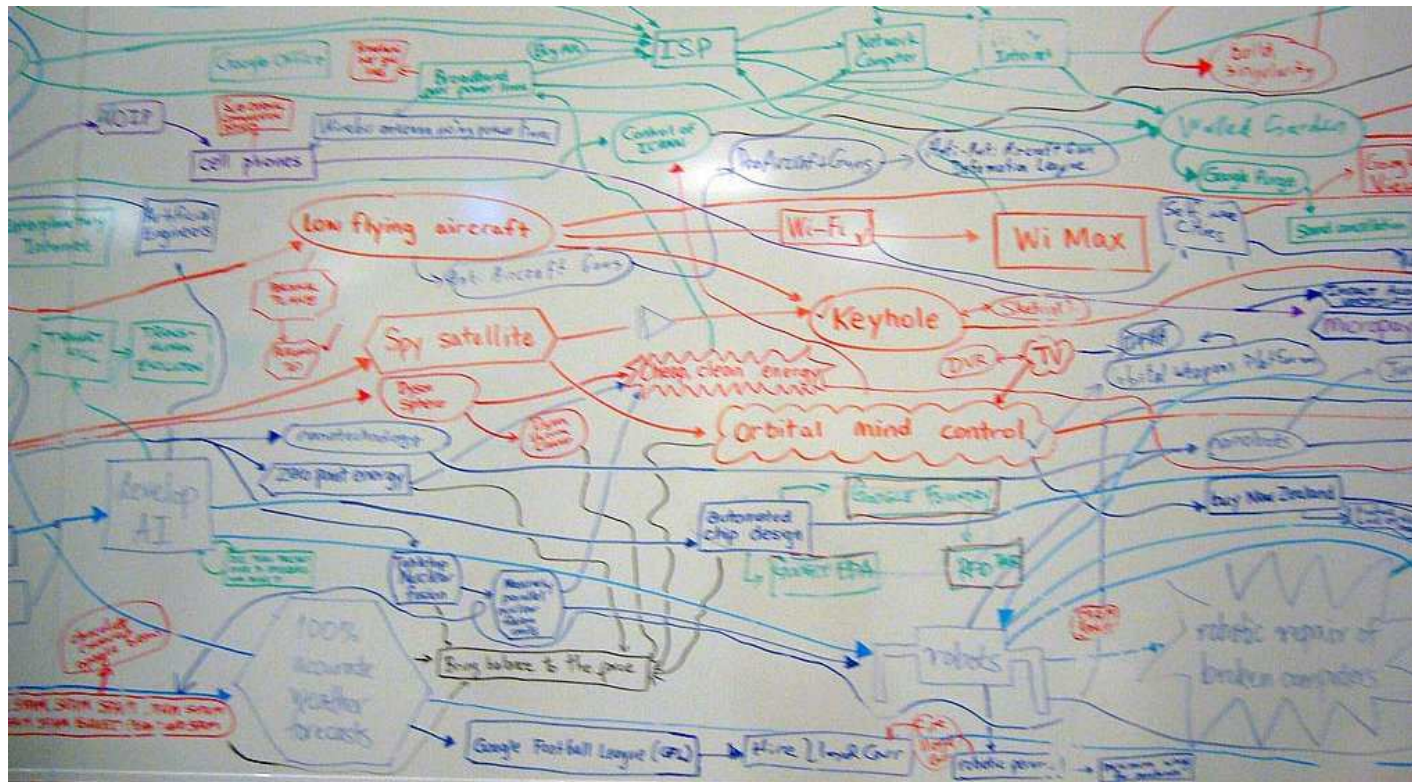
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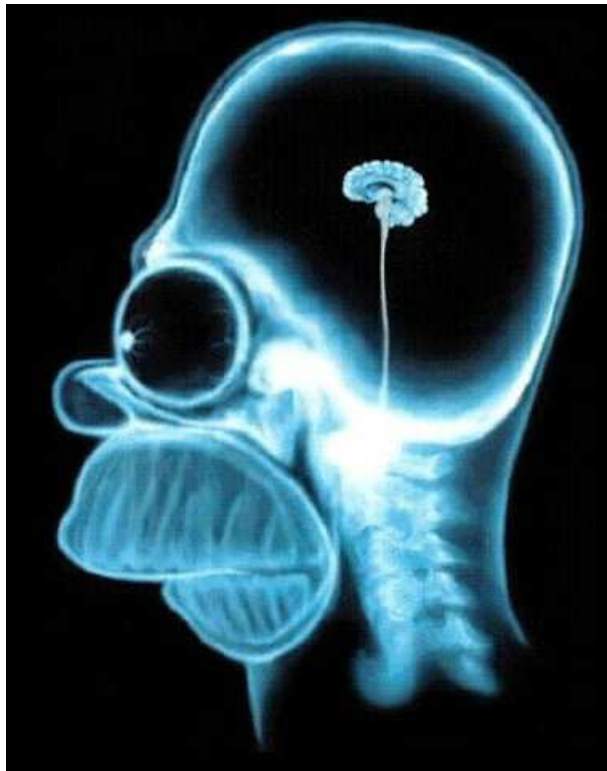
See also: <http://is.gd/WUezLL>

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## The Job of a System Administrator

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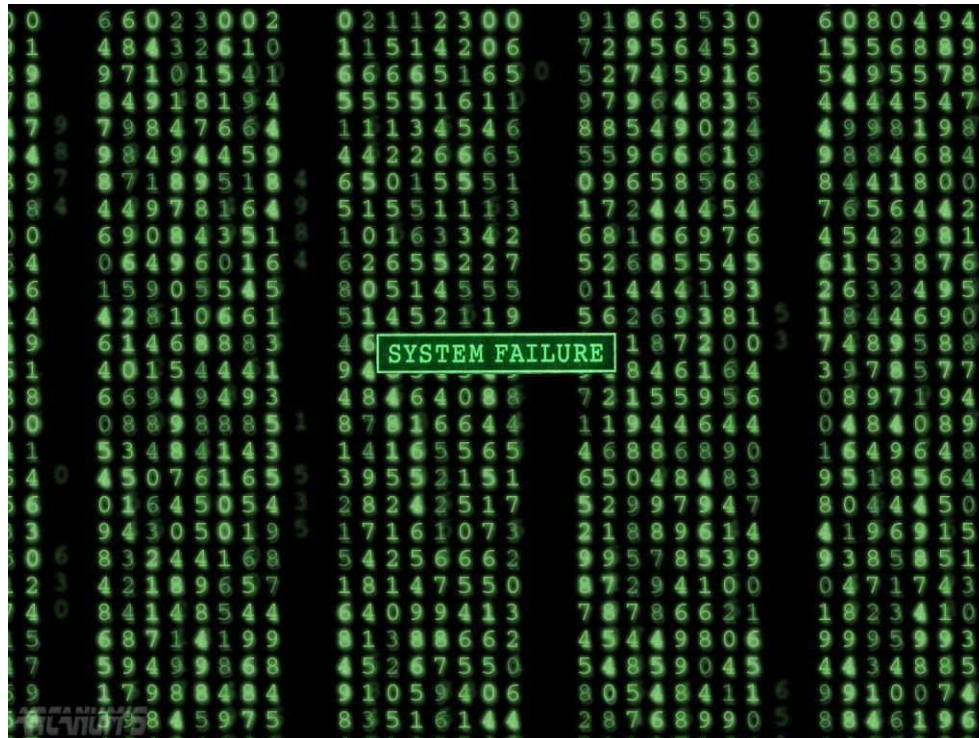


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- often learned by experience
- “makes things run”
- work behind the scenes
- often known as Operator, Network Administrator, System Programmer, System Manager, Service Engineer, Site Reliability Engineer etc.

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## So what is a *System*?

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“A group of interacting, interrelated, or interdependent elements that together form a complex whole.”

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In the context of this class, we generally consider *computer-human systems* consisting of

- the computer(s)
- the network
- the user(s)
- the organization's goals and policies

## ... and *Administration*?

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...all of which may involve a fair amount of *software development, programming and scripting*.

## Learning System Administration

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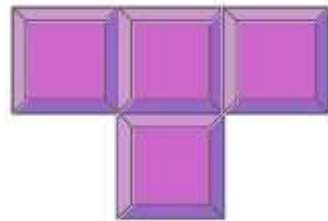
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- few degree granting programs
- heavy reliance on practical experience
- specializations in many different areas possible
- breadth of expertise as necessary as depth in some areas
- background knowledge and requirements vary

# Learning System Administration

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# Learning System Administration

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Breadth of knowledge:

- operating system concepts
- TCP/IP networking
- programming
- ...

Depth of knowledge:

- certain OS flavor
- specific service (DNS, E-Mail, Databases, Content-Delivery, ...)
- specific implementation/vendor (Oracle, Hadoop, Apache, Cisco, ...)
- specific area of expertise (security, storage, network, data center, ...)
- ...

## SysAdmins' favorite Laws

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*"Of two equivalent theories or explanations, all other things being equal, the simpler one is to be preferred."*

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Throw in some philosophy for good measure:

*Causality: For every effect, there must be a cause.*

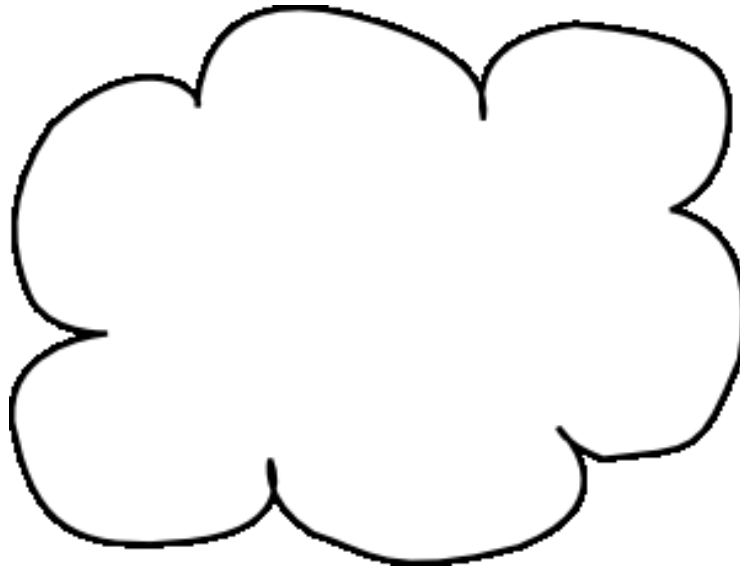
## SysAdmins' favorite tool

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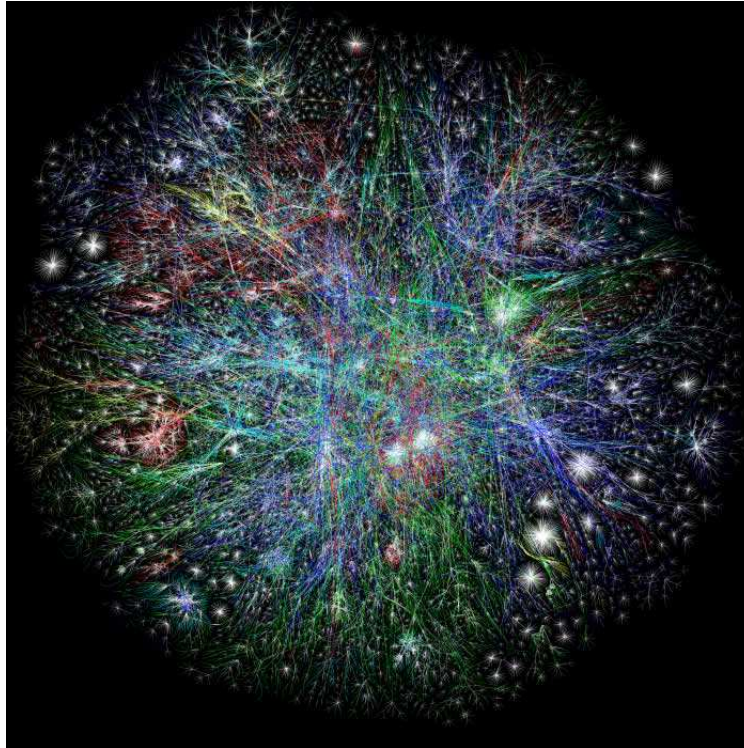
People think the internet looks like this.

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Or like this.

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SysAdmins know it looks like this.

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Hooray!

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5 Minute Break



In reality...

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## About this class

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We can only cover *some* of the aspects of System Administration.



## Three Pillars of Exceptional System Design

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We will give particular attention to these three core features:

- Scalability
- Security
- Simplicity

## Three Pillars of Exceptional System Design: Scalability

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System Overload

## Three Pillars of Exceptional System Design: Scalability

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Scaling Vertically



## Three Pillars of Exceptional System Design: Scalability

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Scaling Horizontally

## Three Pillars of Exceptional System Design: Scalability

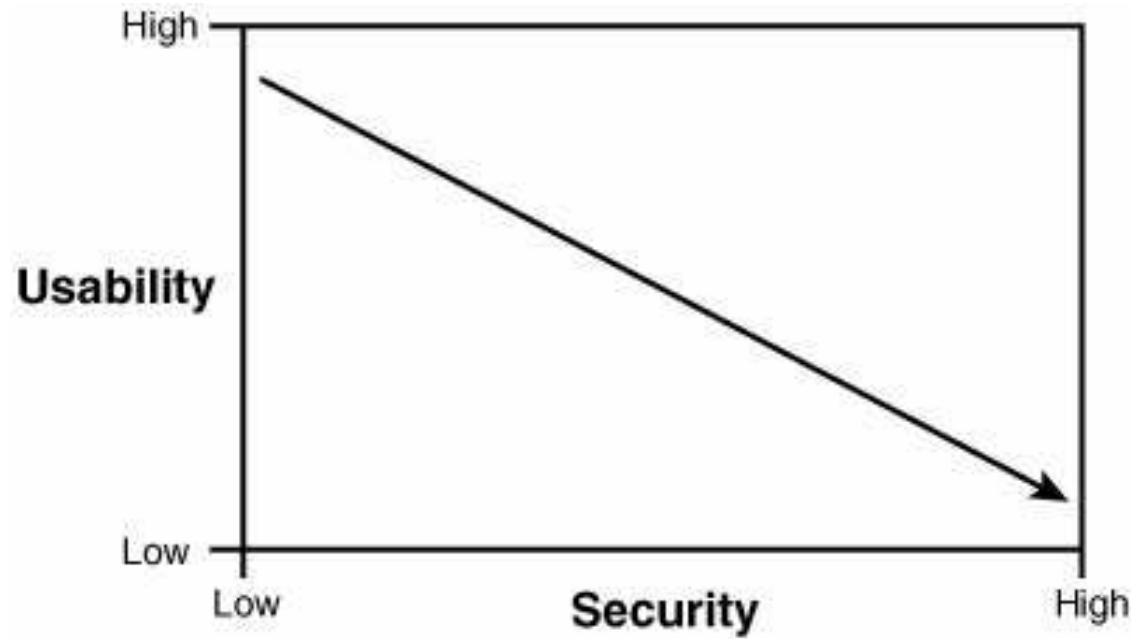
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Scaling Down

## Three Pillars of Exceptional System Design: Security

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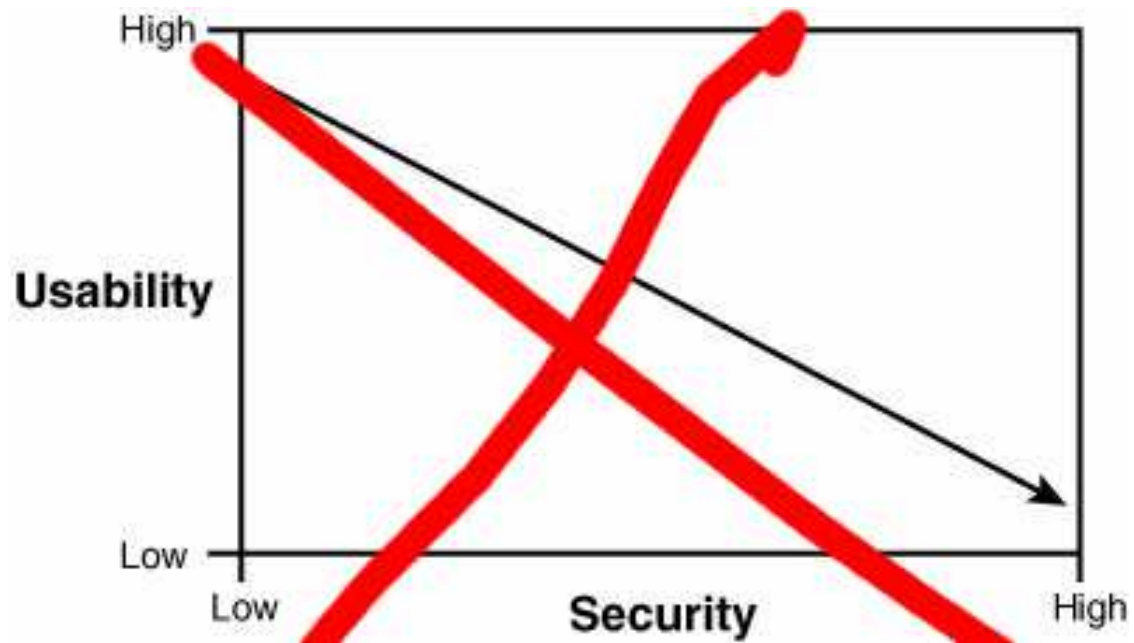
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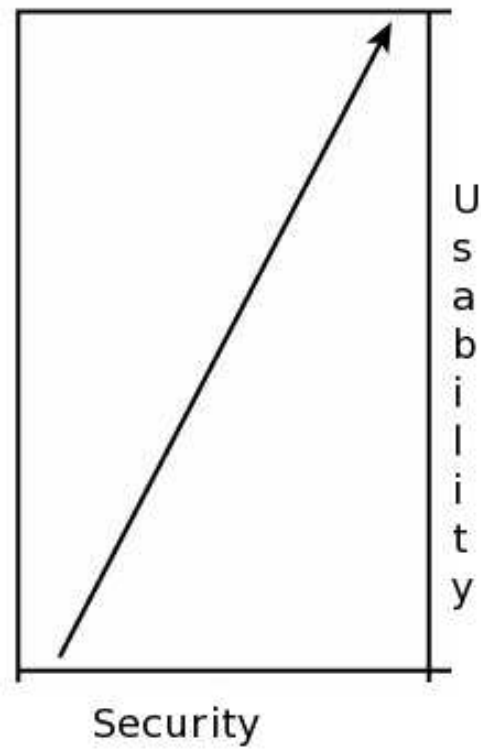
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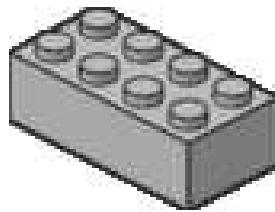
## Three Pillars of Exceptional System Design: Simplicity

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## Three Pillars of Exceptional System Design: Simplicity

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## Three Pillars of Exceptional System Design: Simplicity

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## About this class

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### Suggested Reading:

- “Essential System Administration”, 3rd Edition, by Eelen Frisch
- “Unix System Administration Handbook”, 3rd Edition, by Evi Nemeth
- “Principles of Network and System Administration”, by Mark Burgess
- “Analytical Network and System Administration”, by Mark Burgess
- “The Practice of System and Network Administration”, by Thomas A. Limoncelli & Christine Hogan

### Grading:

- class participation / lightning talks
- a number of homework assignments of varying weight
- a group project towards the end of the semester
- no curve

# Syllabus

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- 2014-01-22: Introduction, Overview, course basics
- 2014-01-27: UNIX history and basics / Filesystems and Disks
- 2014-02-03: Software Installation Concepts
- 2014-02-10: User Management, multi-user basics
- 2014-02-18: Automating Administrative Tasks
- 2014-02-24: Backup and Disaster Recovery
- 2014-03-03: Networking
- 2014-03-17: Popular services (DNS, SMTP)
- 2014-03-24: Configuration Management (Guest Lecturer)
- 2014-03-31: Popular services (HTTP, SNMP, SSH)
- 2014-04-07: System Security
- 2014-04-14 – 2011-04-28: AMA / Misc. topics / presentations / TBD



# Syllabus

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Miscellaneous topics and presentations may include:

- large scale logging
- heterogenous networks / multiple OS
- automated installation
- configuration management
- server room basics, cooling issues, racking etc.
- clustering
- spam
- ...

## Questions, Answers, Chatter...

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- 10 minutes of Ask Me Anything / current events / lightning talks at the beginning of the class

that does *not* mean you can come 10 minutes late

- course website, syllabus, assignments, course material:

<https://www.cs.stevens.edu/~jschauma/615/>

- discussions and announcements:

<https://lists.stevens.edu/cgi-bin/mailman/listinfo/cs615asa>

- who knows what: <https://twitter.com/cs615asa>

## Let's do some homework!

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`https://webchat.freenode.net/ -- #cs615asa`

`http://www.cs.stevens.edu/~jschauma/615/s14-hw1.html`

- ensure you have access to `linux-lab.cs.stevens.edu`
- create your website (if you don't already have it)
- create an AWS account
- create an EC2 instance
- access EC2 instance, run commands

## Reading

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### Miscellaneous:

- <http://www.opsschool.org/>
- <http://nixsrv.com/llthw>
- [http://linuxcommand.org/lc3\\_learning\\_the\\_shell.php](http://linuxcommand.org/lc3_learning_the_shell.php)
- [http://www.sage.org/pubs/22\\_jobs/](http://www.sage.org/pubs/22_jobs/)

### UNIX history:

- <http://www.bell-labs.com/history/unix/>
- <http://www.futuretech.blinkenlights.nl/admin/day1a.html>
- <http://www.levenez.com/unix/>
- [https://en.wikipedia.org/wiki/Operating\\_system](https://en.wikipedia.org/wiki/Operating_system)

## Reading

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UNIX basics:

- `chmod(1)`, `chown(1)`, `ls(1)`
- `intro(1)`, `login(1)`, `passwd(5)`
- `su(1)`, `sudo(8)`