



CSC424 System Administration

Instructor: Dr. Hao Wu

Week 1 Introduction

How we see ourselves



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



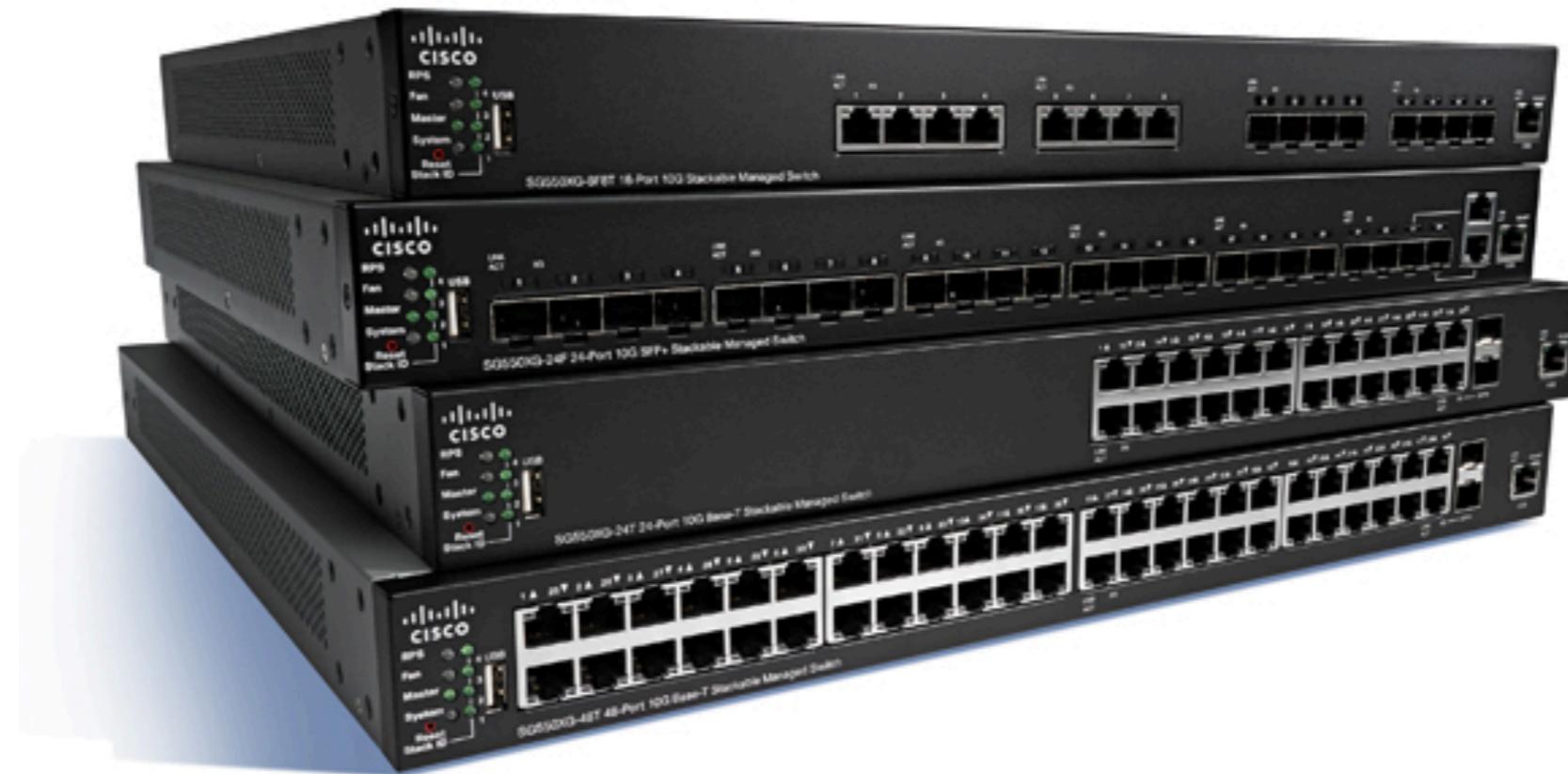
The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



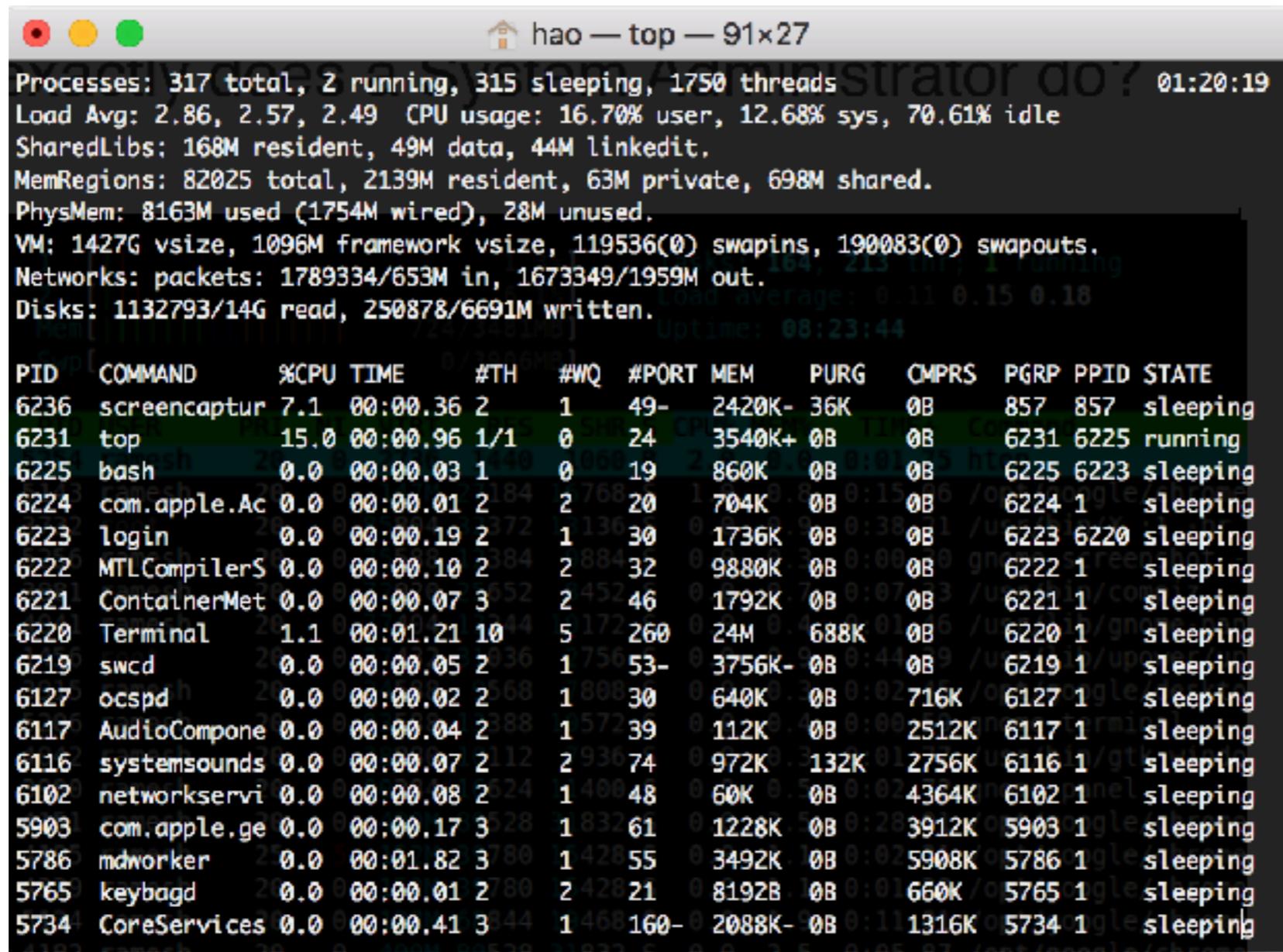
The Job of a System Administrator

- What exactly does a System Administrator do?



The Job of a System Administrator

- What exactly does a System Administrator do?



A screenshot of a terminal window titled "hao — top — 91x27". The window displays system statistics and a list of running processes. The statistics include:

- Processes: 317 total, 2 running, 315 sleeping, 1750 threads
- Load Avg: 2.86, 2.57, 2.49
- CPU usage: 16.70% user, 12.68% sys, 70.61% idle
- SharedLibs: 168M resident, 49M data, 44M linkedit.
- MemRegions: 82025 total, 2139M resident, 63M private, 698M shared.
- PhysMem: 8163M used (1754M wired), 28M unused.
- VM: 1427G vsize, 1096M framework vsize, 119536(0) swapins, 190083(0) swapouts.
- Networks: packets: 1789334/653M in, 1673349/1959M out.
- Disks: 1132793/14G read, 250878/6691M written.

The process list shows the following columns: PID, COMMAND, %CPU, TIME, #TH, #WQ, #PORT, MEM, PURG, CMPRS, PGRP, PPID, and STATE. The processes listed include screencaptur, top, bash, com.apple.Ac, login, MTLCompilerS, ContainerMet, Terminal, swcd, ocsprd, AudioCompone, systemsounds, networkservi, com.apple.ge, mdworker, keybagd, and CoreServices.

The Job of a System Administrator

- What exactly does a System Administrator do?
 - no precise job description
 - often learned by experience
 - "make things run"
 - work behind the scenes
 - often known as Operator, Network Administrator, System Programmer, System Manager, Service Engineer, Site Reliability Engineer etc.

Essential Duties of a System Administrator

- Controlling access
- Adding hardware
- Automating tasks
- Overseeing backups
- Installing and upgrading software
- Monitoring
- Troubleshooting
- Maintaining local documentation
- Vigilantly monitoring security
- Tuning performance
- Developing site policies
- Working with vendors
- Fire fighting

What is a System?

- "A group of interacting, interrelated, or interdependent elements that together form a complex whole."
- In the context of this class, we generally consider computer systems consisting of
 - the computers
 - the network
 - the users
 - the organization's goal and policies

Learning System Administration

- System Administration is a profession with no fixed career path
 - 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

- Breadth of knowledge:
 - operating system concepts
 - TCP/IP networking
 - programming
 - security
 - ...
- Depth of knowledge:
 - certain OS flavor
 - specific service (DNS, E-Mail, Database, ...)
 - specific implementation/vendor (Oracle, Hadoop, Apache, Cisco, MS, AWS, ...)
 - specific area of expertise (security, storage, network, data center, ...)
 - ...

People think the internet looks like this



System Administrators know it looks like this



Content covered in this class

- We can only cover some of the system administration aspects:
 - Linux OS
 - Shell Script
 - Cloud

UNIX history

http://www.unix.org/what_is_unix/history_timeline.html

- Originally developed in 1969 at Bell Labs by Ken Thompson and Dennis Ritchie.
- 1973, Rewritten in C. This made it portable and changed the history of OS
- 1974: Thompson, Joy, Haley and students at Berkeley develop the Berkeley Software Distribution (BSD) of UNIX
- two main directions emerge: BSD and what was to become “System V”

Notable dates in UNIX history

- 1984 4.2BSD released (TCP/IP), 1986 4.3BSD released (NFS)
- 1991 Linus Torvalds starts working on the Linux kernel
- 1993 Settlement of USL vs. BSDi; NetBSD, then FreeBSD are created
- 1994 Single UNIX Specification introduced
- 1995 4.4BSD-Lite Release 2 (last CSRG release); OpenBSD forked off NetBSD
- 2000 Darwin created (derived from NeXT, FreeBSD, NetBSD)
- 2003 Xen; SELinux
- 2005 Hadoop; DTrace; ZFS; Solaris Containers
- 2006 AWS ("Cloud Computing" comes full circle)
- 2007 iOS; KVM appears in Linux
- 2008 Android; Solaris open sourced as OpenSolaris

Some UNIX versions

More UNIX (some generic, some trademark, some just unix-like):

1BSD	2BSD	3BSD	4BSD	4.4BSD Lite 1
4.4BSD Lite 2	386 BSD	A/UX	Acorn RISC iX	AIX
AIX PS/2	AIX/370	AIX/6000	AIX/ESA	AIX/RT
AMiX	AOS Lite	AOS Reno	ArchBSD	ASV
Atari Unix	BOS	BRL Unix	BSD Net/1	BSD Net/2
BSD/386	BSD/OS	CB Unix	Chorus	Chorus/MiX
Coherent	CTIX	Darwin	Debian GNU/Hurd	DEC OSF/1 ACP
Digital Unix	DragonFly BSD	Dynix	Dynix/ptx	ekkoBSD
FreeBSD	GNU	GNU-Darwin	HPBSD	HP-UX
HP-UX BLS	IBM AOS	IBM IX/370	Interactive 386/ix	Interactive IS
IRIX	Linux	Lites	LSX	Mac OS X
Mac OS X Server	Mach	MERT	MicroBSD	Mini Unix
Minix	Minix-VMD	MIPS OS	MirBSD	Mk Linux
Monterey	more/BSD	mt Xinu	MVS/ESA OpenEdition	NetBSD
NeXTSTEP	NonStop-UX	Open Desktop	Open UNIX	OpenBSD
OpenServer	OPENSTEP	OS/390 OpenEdition	OS/390 Unix	OSF/1
PC/IX	Plan 9	PWB	PWB/UNIX	QNX
QNX RTOS	QNX/Neutrino	QUNIX	ReliantUnix	Rhapsody
RISC iX	RT	SCO UNIX	SCO UnixWare	SCO Xenix
SCO Xenix System V/386	Security-Enhanced Linux	Sinix	Sinix ReliantUnix	Solaris
SPIX	SunOS	Tru64 Unix	Trusted IRIX/B	Trusted Solaris
Trusted Xenix	TS	UCLA Locus	UCLA Secure Unix	Ultrix
Ultrix 32M	Ultrix-11	Unicos	Unicos/mk	Unicox-max
UNICS	UNIX 32V	UNIX Interactive	UNIX System III	UNIX System IV
UNIX System V	UNIX System V Release 2	UNIX System V Release 3	UNIX System V Release 4	UNIX System V/286
UNIX System V/386	UNIX Time-Sharing System	UnixWare	UNSW	USG
Venix	Wollongong	Xenix OS	Xinu	xMach

Popular general purpose Linux distributions

Distribution	Web site	Comments
Arch	archlinux.org	For those who fear not the command line
CentOS	centos.org	Free analog of Red Hat Enterprise
CoreOS	coreos.com	Containers, containers everywhere
Debian	debian.org	Free as in freedom, most GNUish distro
Fedora	fedoraproject.org	Test bed for Red Hat Linux
Kali	kali.org	For penetration testers
Linux Mint	linuxmint.com	Ubuntu-based, desktop-friendly
openSUSE	opensuse.org	Free analog of SUSE Linux Enterprise
openWRT	openwrt.org	Linux for routers and embedded devices
Oracle Linux	oracle.com	Oracle-supported version of RHEL
RancherOS	rancher.com	20MiB, everything in containers
Red Hat Enterprise	redhat.com	Reliable, slow-changing, commercial
Slackware	slackware.com	Grizzled, long-surviving distro
SUSE Linux Enterprise	suse.com	Strong in Europe, multilingual
Ubuntu	ubuntu.com	Cleaned-up version of Debian

UNIX Everywhere

- Today, your desktop, server, cloud, TV, phone, watch, stereo, car navigation system, thermostat, door lock, etc. all run a Unix-like OS...
... with all the risks that entails.

Setup your Linux environment

- We will use VirtualBox to install Linux systems on your machine:

<https://www.virtualbox.org/wiki/Downloads>

- We will use CentOS as our Linux OS:

<https://www.centos.org/download/>