

# UNIX: Working the Command Line in OS X

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# Using the Command Line



```
$ mkdir /Users/Shared/new_docs  
$ mv hde*.txt /Users/Shared/new_docs  
$ chown warren /Users/Shared/new_docs
```

# Advantages of the Command Line

- **Advanced configuration and features**
- **Running a command as a different user**
- **Efficiency**
- **Remote administration and troubleshooting**

# Command Line Interface



## Getting to it

- >console
- SSH
- Single-user mode
- Terminal application

```
russell.poucher — bash — 73x23
reboot ~ Tue Aug 30 12:01
reboot ~ Tue Aug 30 12:00
root console Tue Aug 30 12:00 - crash (00:00)
cradmin console Tue Aug 30 09:23 - 12:00 (02:36)
reboot ~ Tue Aug 30 09:22
shutdown ~ Mon Aug 29 12:06
cradmin console Mon Aug 29 12:05 - 12:06 (00:01)
reboot ~ Mon Aug 29 12:01
shutdown ~ Mon Aug 29 11:32
cradmin console Mon Aug 29 11:31 - 11:32 (00:00)
reboot ~ Mon Aug 29 11:30
shutdown ~ Mon Aug 29 11:30
cradmin console Mon Aug 29 11:14 - 11:30 (00:16)
reboot ~ Mon Aug 29 11:11
reboot ~ Mon Aug 29 11:11
root console Mon Aug 29 11:08 - crash (00:02)
cradmin ttys000 Mon Aug 29 10:21 - 10:21 (00:00)
cradmin console Mon Aug 29 09:47 - 11:08 (01:21)
root console Mon Aug 29 09:44 - 09:47 (00:02)
reboot ~ Mon Aug 29 09:43

wtmp begins Mon Aug 29 09:43
RLP-MacPro:~ russell.poucher$
```



# Available Shells in OS X

 <b>bash</b>	<b>"Bourne-again" shell (default)</b>
 <b>sh</b>	<b>Bourne shell is present but physical copy of bash</b>
 <b>csch</b>	<b>C shell</b>
 <b>tcsh</b>	<b>Tenex C Shell (enhanced csch)</b>
 <b>ksh</b>	<b>Korn shell</b>
 <b>zsh</b>	<b>Close to ksh (includes features from csch, tcsh)</b>

- ▶ **All shells are located in /bin except tc1sh /usr/bin/tc1sh**

# Shell Resource Files—/bin/bash

## Systemwide:

-  /etc/profile—Systemwide initialization for login shell

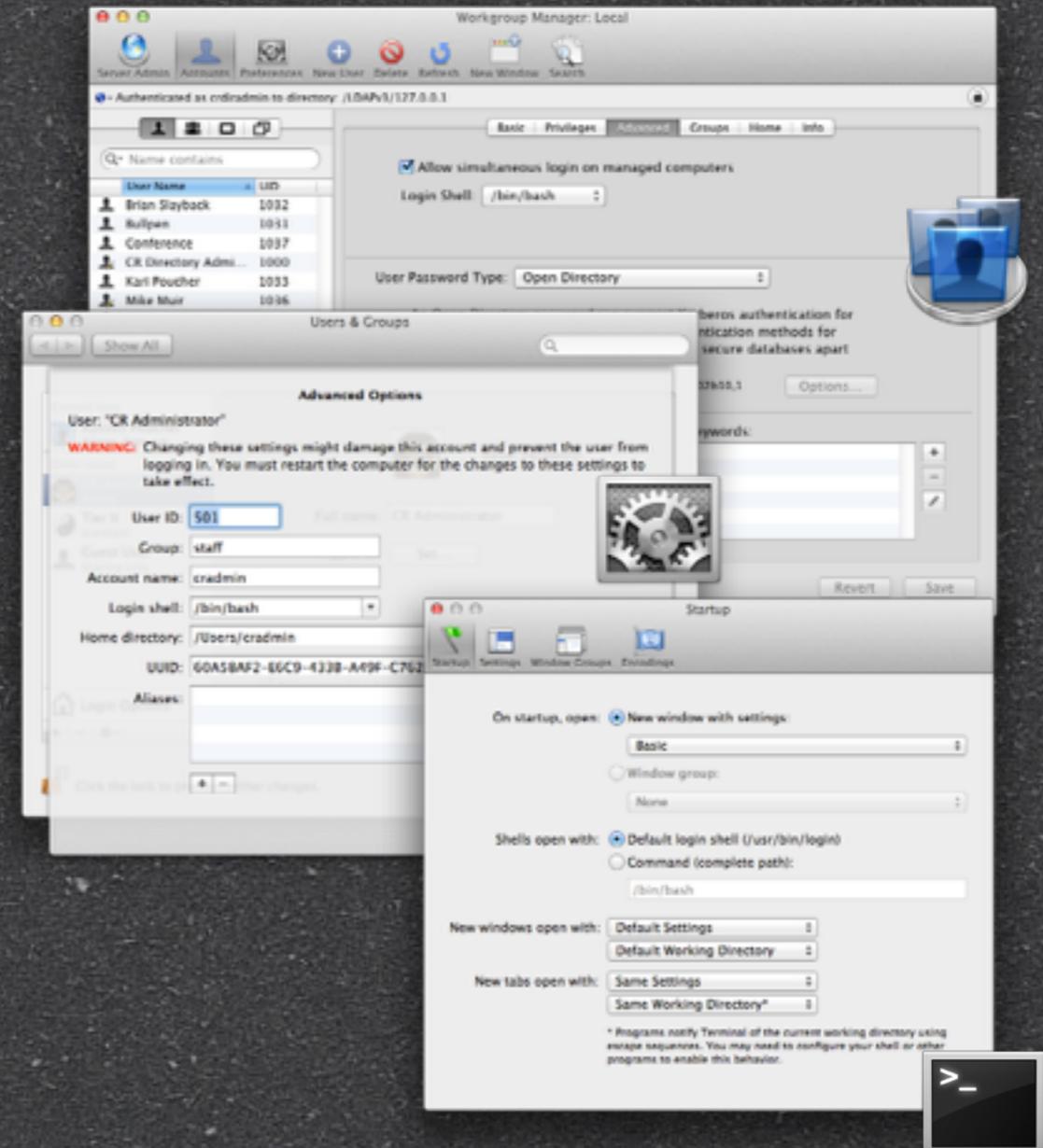
## User:

-  ~/.bash\_profile—Personal initialization file for login shells
-  ~/.bashrc—Individual per-interactive-shell startup file
-  ~/.bash\_logout—Individual login shell cleanup file, executed when a login shell exits
-  ~/.inputrc—Individual readline initialization file
-  ~/.bash\_history—Command history file

## See man pages for the other shells

# Change Default Shell

-  `dscl`
-  **Workgroup Manager**
-  **Server.app**
-  **System Preferences**
-  **Terminal.app**
-  `$ chsh -s shell`

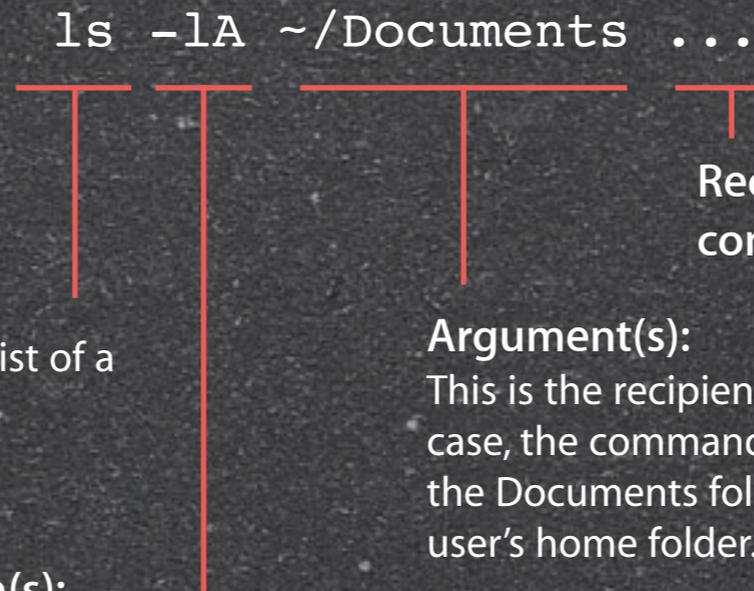


# Automation with Shell Scripting

- 🎲 **Everything you can use in the shell you can use in a shell script.**
- 🎲 **This enables building workflows with scripts.**
- 🎲 **A lot is automated with shell scripts**
  - 🎲 `/private/etc/periodic/`
  - 🎲 `/System/Library/ServerSetup/`
  - 🎲 ...
- 🎲 **Anatomy of a script covered later**

# Example Commands

ls



## BSD command:

"ls" is the command to display a list of a folder's contents.

## Option(s):

Options add conditions, limits, or other modifiers to the BSD command. The "l" option requests a "long" listing, and the "A" option omits the . and .. entries from the list. Note the spaces between the different components of the command.

## Argument(s):

This is the recipient of the action. In this case, the command will provide a list of the Documents folder within the current user's home folder.

Redirected output, or other commands, as needed

man ls

mount -uw /

# Get Info About Commands



## Manual

- All UNIX systems come with an extensive set of manuals
- Organized into different sections
- Use them to look up arguments and usage



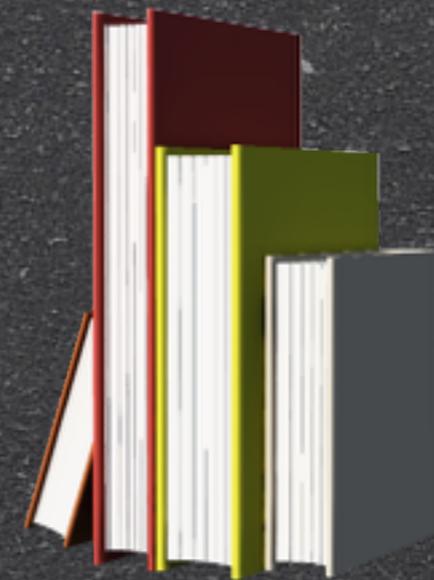
`man ssh`



`man -k secure`



`man 2 open`



# Shell Filename Wildcard

- **The \* wildcard helps you to specify multiple files.**
- **List all of the user folders:**
- **`ls -ld /Users/ *`**
- **List all of the pdf files in your Documents folder:**
- **`ls -l ~/Documents/ *.pdf`**

# Command Line Interface

## Using sudo to gain root permissions

 root disabled by default

 sudo -s

 sudo passwd root

## Change in prompt

## Be careful with root!

```
russell.poucher — bash — 73x23
reboot ~ Tue Aug 30 12:01
reboot ~ Tue Aug 30 12:00
root console Tue Aug 30 12:00 - crash (00:00)
cradmin console Tue Aug 30 09:23 - 12:00 (02:36)
reboot ~ Tue Aug 30 09:22
shutdown ~ Mon Aug 29 12:06
cradmin console Mon Aug 29 12:05 - 12:06 (00:01)
reboot ~ Mon Aug 29 12:01
shutdown ~ Mon Aug 29 11:32
cradmin console Mon Aug 29 11:31 - 11:32 (00:00)
reboot ~ Mon Aug 29 11:30
shutdown ~ Mon Aug 29 11:30
cradmin console Mon Aug 29 11:14 - 11:30 (00:16)
reboot ~ Mon Aug 29 11:11
reboot ~ Mon Aug 29 11:11
root console Mon Aug 29 11:08 - crash (00:02)
cradmin ttys000 Mon Aug 29 10:21 - 10:21 (00:00)
cradmin console Mon Aug 29 09:47 - 11:08 (01:21)
root console Mon Aug 29 09:44 - 09:47 (00:02)
reboot ~ Mon Aug 29 09:43

wtmp begins Mon Aug 29 09:43
RLP-MacPro:~ russell.poucher$
```

# Playing with Files

## **touch**

 **Creates a new, empty file**

## **.DS\_Store**

## **.Trash**

## **mv**

## **rm**

## **cp**

 **Unix command do not recognize a resource fork**

# Directories



**push**



**remembers where you were**



**popd - puts you back**



**pwd - where you are**



**mkdir**



**cpdir**



**rmdir**

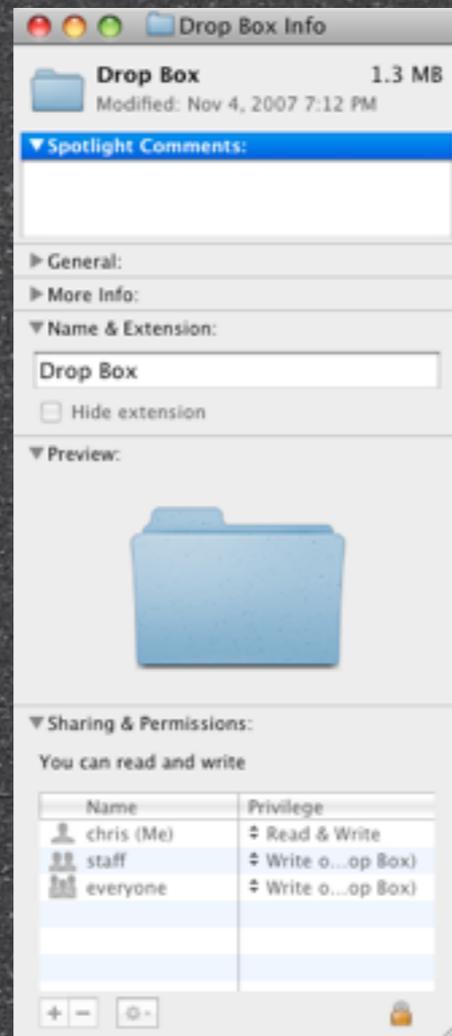


**Using wildcards - (? , [], \***

```
Terminal — top — 80x32
Processes: 110 total, 4 running, 106 sleeping... 379 threads 10:18:50
Load Avg: 3.51, 1.86, 1.31 CPU usage: 61.0% user, 39.0% sys, 0.0% idle
SharedLibs: num = 114, resident = 29.4M code, 2.99M data, 6.37M LinkEdit
MemRegions: num = 8221, resident = 155M + 15.8M private, 96.9M shared
PhysMem: 76.0M wired, 148M active, 379M inactive, 604M used, 35.9M free
VM: 4.59G + 80.6M 37760(1) pageins, 2006(0) pageouts

  PID COMMAND   %CPU   TIME   #TH  #PRTS  #MREGS  RPRVT  RSHRD  RSIZE  VSIZE
25553 screencapt 50.7%  0:06.85  1    31     45   3.42M+ 2.20M  5.47M+ 64.3M+
25507 java          0.6%  0:30.34 59   793    495   66.6M  3.91M  58.4M  322M
25502 sh           0.0%  0:00.02  1    12     15   124K   772K   628K  18.2M
25490 AppleFileS  0.0%  0:00.11 42    95    115   1.34M  1.93M  2.02M  74.6M
25489 AppleFileS  0.0%  0:00.00  1     9     22    32K   1.92M   72K  28.6M
25036 bootpd      0.0%  0:00.06  1    14     26   216K   864K   848K  27.3M
24480 servermgrd  0.0%  0:01.32  1    10     37   264K   2.06M  996K  28.2M
24343 servermgrd  0.0%  0:01.57  1    10     37   268K   2.06M  1.01M  28.2M
13193 bash         0.0%  0:00.02  1    12     18   176K   872K   768K  18.2M
13192 login        0.0%  0:00.03  1    13     38   128K   432K   504K  26.9M
13186 top          13.1% 2:38:41  1    26     27   352K   432K   716K  27.1M
13185 bash         0.0%  0:00.02  1    12     16   136K   888K   744K  18.2M
13184 login        0.0%  0:00.04  1    13     38   128K   432K   504K  26.9M
13182 Safari       0.0%  0:05.16  5   103    162   3.85M  13.7M  12.6M  124M
13092 ssh           0.0%  0:26.16  1    14     27   600K   932K   1.39M  27.4M
13091 bash         0.0%  0:00.02  1    12     16   136K   888K   744K  18.2M
13090 login        0.0%  0:00.04  1    13     38   128K   432K   504K  26.9M
13058 top          12.5% 2:41:19  1    14     26   328K   432K   500K  27.0M
13057 bash         0.0%  0:00.02  1    12     16   136K   888K   744K  18.2M
13056 login        0.0%  0:00.05  1    13     38   128K   432K   504K  26.9M
13045 Server Adm  0.0% 13:32.36  4   101    334   9.88M  16.0M  21.3M  147M
13044 Workgroup   0.0%  0:05.14  2    86    178   3.16M  12.7M  10.7M  116M
 8653 httpd       0.0%  0:10.48  1    10     99   176K   1.84M  1.03M  27.9M
 8572 httpd         0.0%  0:11.66  1    10     99   176K   1.84M  1.03M  27.9M
```

# File/Folder Permissions



Type of file:  
d for directory  
- for file  
l for symbolic link

drwx-wx-wx



Owner permissions:  
rwx=read, write and execute

Group permissions:  
-wx=write and execute

Others' permissions:  
-wx=write and execute

# Working at the Command Line

```
Terminal — bash — 80x24
Last login: Wed Nov  7 11:10:27 on ttys000
client17:~ chris$
client17:~ chris$ ls -lA
total 56
-rw-----  1 chris  staff    3 Oct 13 11:14 .CFUserTextEncoding
-rw-r--r--@  1 chris  staff 12292 Nov  7 01:09 .DS_Store
drwx----- 14 chris  staff  476 Nov  7 00:52 .Trash
-rw-----  1 chris  staff 1371 Nov  7 11:11 .bash_history
drwx-----  3 chris  staff  102 Oct 30 13:56 .cups
-rw-----  1 chris  staff   35 Nov  6 18:49 .lessht
drwx----- 21 chris  staff  714 Nov  7 11:10 Desktop
drwx-----  5 chris  staff  170 Nov  4 22:49 Documents
drwx-----  7 chris  staff  238 Nov  4 22:12 Downloads
drwx----- 35 chris  staff 1190 Oct 30 15:52 Library
drwx-----  3 chris  staff  102 Oct 13 11:14 Movies
drwx-----  3 chris  staff  102 Oct 13 11:14 Music
drwx-----  5 chris  staff  170 Oct 16 09:49 Pictures
drwxr-xr-x   9 chris  staff  306 Nov  6 11:56 Public
drwxr-xr-x   5 chris  staff  170 Oct 13 11:14 Sites
drwxr-xr-x   2 chris  staff   68 Nov  7 00:59 untitled folder
client17:~ chris$
```

command prompt

command entry

command results

computer name

logged-in user's name



# Command Line Entry

Shortcut	Action
Tab	Completes word being typed
Drag folder to Terminal	Enters pathname
Up and Down Arrow keys	Accesses prior commands
Control-A	Moves cursor to the beginning of the line
Control-E	Moves cursor to the end of the line
Control-F	Moves forward one character
Control-B	Moves backward one character
Esc F	Moves forward one word
Esc B	Moves backward one word
Control-C	Terminates command in progress
Control-L or "clear"	Clears screen

# Command Line Issues

- ❏ **Easy to make serious mistakes and there is no trash or undo**
- ❏ **Exact syntax required and some characters are easy to confuse:**
  - ❏ **0 and O (uppercase letter O and the numeral zero)**
  - ❏ **- and ~**
  - ❏ **l and 1 (lowercase letter l and the numeral one)**
- ❏ **Exact pathnames are important—spaces in filenames and paths can have unexpected results**



# Changing File/Folder Permissions

```
chown apple:staff /Users/Shared/ReadMe.rtf
```

```
chown owner[:group] file ...
```

```
chmod g+w /Users/Shared/ReadMe.rtf
```

```
chmod mode file ...
```

The options for chmod specify three things: who is affected, the change, and the permissions being applied to the folder or file.

who	action	permissions
u (user/owner)	+, -, =	r (read)
g (group)		w (write)
o (others/everyone else)		x (execute)
a (all=ugo)		t (sticky bit)



# Text Editors on OS X

-  **Text Edit (GUI)**
-  **TextWrangler**
-  **vi**
-  **nano (pico)**
-  **emacs**

# Processes & Daemons

- Activity Monitor (GUI)
- top Command
- kill
  - for processes
  - for daemons
- sudo kill
  - processes or daemons you don't own



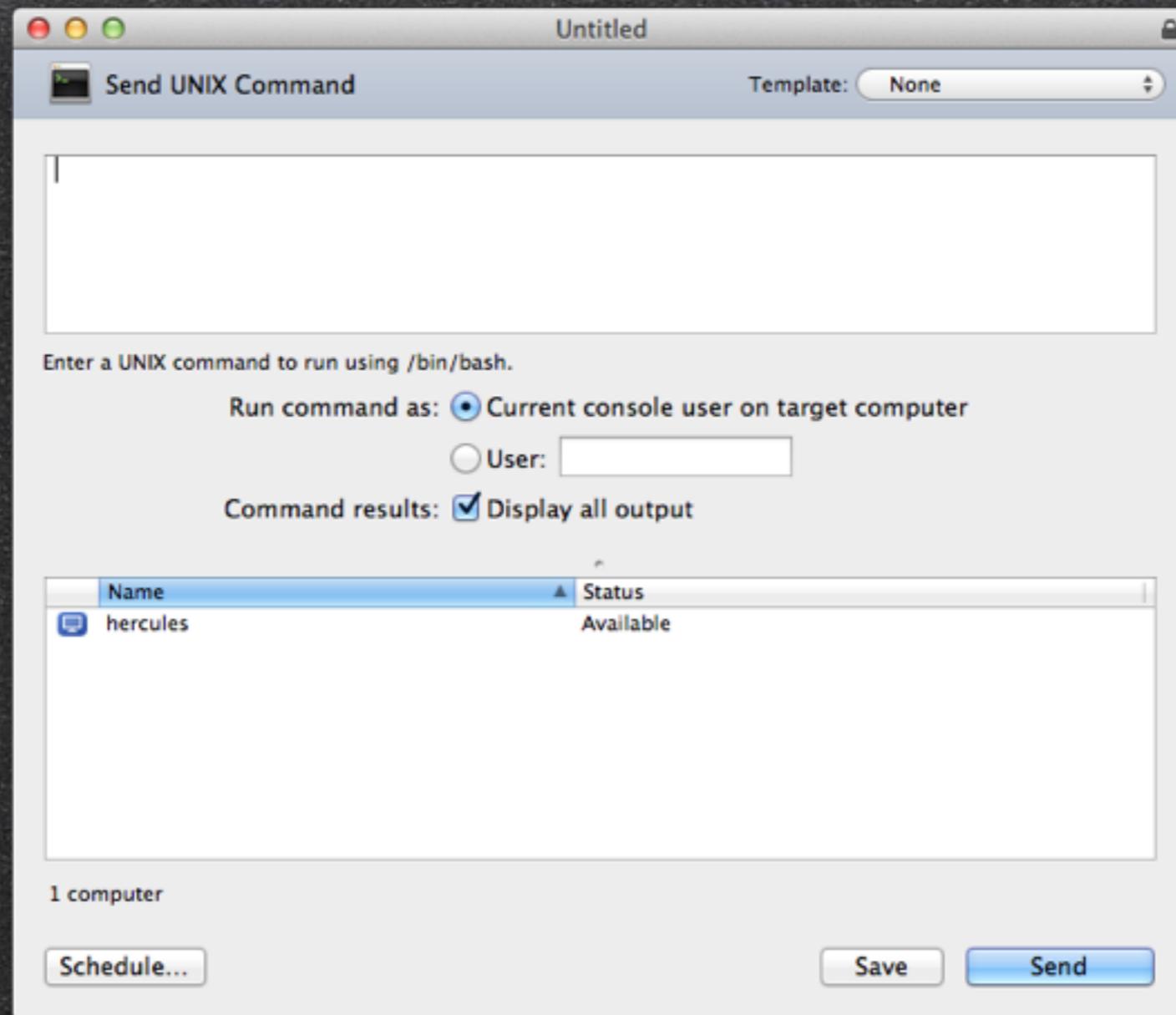
# Managing Processes from the Command Line

- ps
- top
- kill
- killall

```
russell.poucher — top — 73x23
Processes: 95 total, 4 running, 2 stuck, 89 sleeping, 596 threads
14:41:08 Load Avg: 0.83, 0.77, 0.75
CPU usage: 2.96% user, 1.89% sys, 95.14% idle
SharedLibs: 11M resident, 0B data, 0B linkedit.
MemRegions: 24552 total, 1904M resident, 59M private, 858M shared.
PhysMem: 1150M wired, 3636M active, 436M inactive, 5221M used, 8084M free
VM: 245G vsize, 1101M framework vsize, 150043(0) pageins, 0(0) pageouts.
Networks: packets: 19421353/13G in, 18286146/12G out.
Disks: 394664/4086M read, 194592/3338M written.

PID  COMMAND  %CPU  TIME    #TH   #WQ  #POR  #MREG  RPRVT  RSHRD
2770  screencaptur 0.0   00:00.02  4     3    50+   91+   1000K+ 21M+
2769  top         4.9   00:00.27  1/1   0     29+   29    1116K  216K
2762  automountd  0.0   00:00.01  6     0     49    50    608K   216K
2760  mdworker    0.0   00:00.17  3     1     50    104   4928K  21M
2743  writeconfig 0.0   00:00.01  2     1     41    49    828K   216K
2733  System Prefe 0.0   00:02.92  2     1    260   436   39M    57M
2710  bash        0.0   00:00.00  1     0     20    24    396K   216K
2709  login       0.0   00:00.01  2     1     34    71    1056K  216K
2707  Terminal    0.4   00:00.68  6/1   2    125   197   12M    57M
2687  distnoted   0.0   00:00.00  2     1    39-   65-   792K-  240K
2686  mdworker    0.0   00:00.13  3     1     50    88    2204K  26M
2684  launchd     0.0   00:00.00  2     0     53    50    472K   416K
```

# Using Apple Remote Desktop to Send Commands



# Terminology

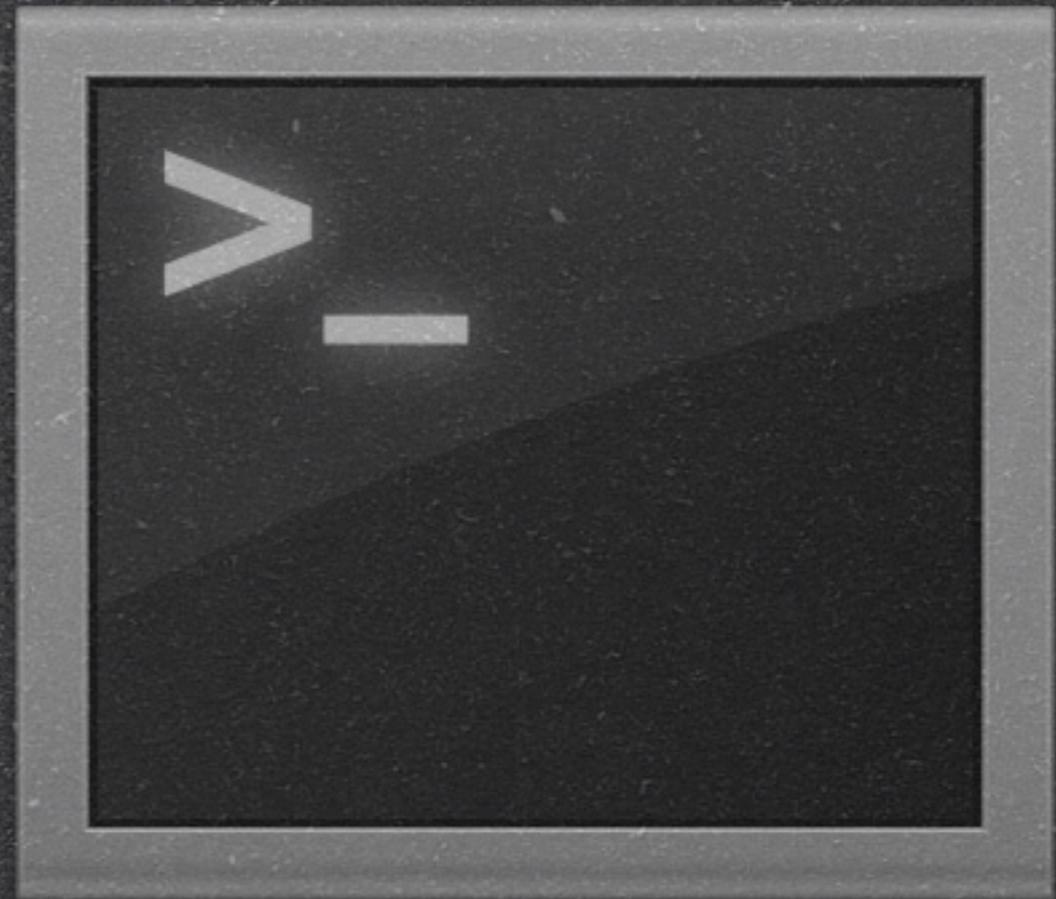
- **The life of an administrator is about automating repetitive tasks.**
- **automation |,ô'tə'mā sh ən|**
  - **The use of largely automatic equipment in a system of manufacturing or other production process**

# Automation

- ❏ **Why automate?**
  - ❏ **Eliminate repetitive tasks**
  - ❏ **Help with time-consuming tasks**
  - ❏ **Quality by avoiding mistakes**
  - ❏ **Ensure task execution**
  - ❏ **More efficient**

# Scripting

- Mac OS X's **UNIX** heritage provides a huge range of open source scripting languages.
- Out-of-the-box support for:
  - Perl
  - Python
  - PHP
  - Tcl
  - Ruby
  - Shells
    - bash, ksh, zsh, and csh



# Apple Technologies

## **AppleScript**

-  **System and applications scripting**
-  **Can be recorded**
-  **English-like syntax**



## **Automator**

-  **Script and workflow creation**
-  **Drag-and-drop creation process**
-  **The action itself is an Xcode project**
  -  **Written in AppleScript, Cocoa, Shell Script, ...**



# Schedule/Automate Tasks

- ❏ **Part of automation is scheduling your tasks.**
- ❏ **UNIX has a variety of tools dedicated to scheduling.**
  - ❏ `cron(8)`
  - ❏ `at(1)`
  - ❏ `periodic(8)`
- ❏ **Apple-specific**
  - ❏ **Startup Items**
  - ❏ `launchd(8)`

# Scheduling

- ❏ **Run always**
- ❏ **Run on demand**
- ❏ **Run at (1) a specific time**
- ❏ **Run periodic (8) at a specific time**

# cron

- ❏ **Executes periodic scheduled commands**
- ❏ **Only starts when it sees files in:**
  - ❏ **/etc/crontab**
  - ❏ **/usr/lib/cron/tabs**
- ❏ **Crontab folder changed location**
  - ❏ **/var/cron/tabs (10.4)**
  - ❏ **/usr/lib/cron/tabs (10.5)**
- ❏ **Functionality replaced by launchd (8)**

# at—Queue for Later Execution

- ❏ **at(1)**

- ❏ **Executes commands at a specified time**

- ❏ **atq(1)**

- ❏ **Lists the pending jobs**

- ❏ **atrm(1)**

- ❏ **Deletes jobs**

- ❏ **batch(1)**

- ❏ **Executes commands when system load levels permit**

- ❏ **Disabled by default (as of 10.5.2)**

```
$ launchctl load -w /System/Library/LaunchDaemons/com.apple.atrun.plist
```

# periodic—Run Periodic Commands

## **daily**

-  **Runs at 3:15 a.m.**

-  **Executes scripts in `/etc/periodic/daily/`**

## **weekly**

-  **Runs every Saturday at 3:15 a.m.**

-  **Executes scripts in `/etc/periodic/weekly/`**

## **monthly**

-  **Runs every first day of the month at 5:30 a.m.**

-  **Executes scripts in `/etc/periodic/monthly/`**

```
$ ls -cl /etc/periodic/
daily/
100.clean-logs
110.clean-tmps
130.clean-msgs
430.status-rwho
500.daily
600.daily.server
601.daily.server.krb5kdc
700.daily.server.cyrus
```

# Add Your Own Periodic Scripts

- Take advantage of the existing process

- Move your script into the right folder

- `/etc/periodic/daily/`, `/etc/periodic/weekly/`, or `/etc/periodic/monthly/`

- Add a number in front to set the execution order

- Make executable and readable for owner/group

- Change owner to *root* and the group to *wheel*

- ```
$ sudo mv pretendCoBAK.sh /etc/periodic/weekly/850.pretendCoBAK.sh
$ sudo chmod 550 /etc/periodic/weekly/850.pretendCoBAK.sh
$ sudo chown root:wheel /etc/periodic/weekly/850.pretendCoBAK.sh
```

# Startup Items

- ❏ **Deprecated in favor of launchd ( 8 )**
- ❏ **Located in**
  - ❏ **/System/Library/StartupItems**
  - ❏ **/Library/StartupItems**
- ❏ **Perform basic system initialization tasks**
- ❏ **Prepare the system for normal operation**
- ❏ **Used via SystemStarter**

# launchd(8)

- ❏ **launchd debuted in Mac OS X v10.4 as a replacement for a long list of different UNIX components.**
- ❏ **In a nutshell, launchd has two main areas**
  - ❏ **Interprocess communication**
  - ❏ **Starting and monitoring processes**

# Purpose

- ❏ **launchd is designed to replace:**
  - ❏ `init`
  - ❏ `SystemStarter`
  - ❏ `mach_init`
  - ❏ `/etc/rc`
  - ❏ `at`
  - ❏ `cron`
  - ❏ `watchdog`
  - ❏ `xinetd`

# Key Features

- 🎲 **Fully asynchronous bootstrap**
- 🎲 **Fault isolation and error recovery**
- 🎲 **Pay as you go (start on demand)**
- 🎲 **Security (privilege separation)**

# launchctl

## 🎮 Talking to launchd from the shell

### 🎮 Some useful subcommands

- 🎮 `list`
- 🎮 `load <plist>`
- 🎮 `unload <plist>`
- 🎮 `log level debug`
- 🎮 `start <job label>`
- 🎮 `stop <job label>`
- 🎮 `help`

```
PID      Status  Label
...
-        0      edu.mit.Kerberos.KerberosAgent
-        0      com.apple.CoreMIDIServer
571      -      com.apple.UserEventAgent-Aqua
-        0      com.apple.syncservices.uihandler
-        0      com.apple.syncservices.SyncServer
570      -      com.apple.Spotlight
-        0      com.apple.ServerScanner
-        0      com.apple.scrod
-        0      com.apple.ScreenSharing.server
-        0      com.apple.ReportPanic
-        0      com.apple.ReportCrash.SafetyNet
-        0      com.apple.ReportCrash
-        0      com.apple.RemoteUI
71329   -      com.apple.RemoteDesktop.agent
-        0      com.apple.quicklook
-        0      com.apple.qtkitserver
-        0      com.apple.PubSub.Agent
-        0      com.apple.ProblemReporter
-        0      com.apple.PreferenceSyncAgent
-        0      com.apple.pictd
-        0      com.apple.PCIESlotCheck
-        0      com.apple.pbs
578     -      com.apple.pboard
-
...
```

# launchd Instances

## 🎲 One launchd for each user

```
🎲 $ launchctl list | wc -l  
🎲     79
```

```
🎲 $ sudo launchctl list | wc -l  
🎲    161
```

```
🎲 $ ps -o user -o command -ax | grep /sbin/launchd  
🎲 root      /sbin/launchd  
🎲 localadmin /sbin/launchd
```

# CPU

## `cpuwalk.d`

-  **Measure which CPUs a process runs on**

## `top -u`

-  **List processes by CPU usage**

```
PID: 26      CMD: httpd
```

```
value  ----- Distribution ----- cour
  < 0  |
    0  | @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@ 28
    1  | @@@@@@@@@@ 8
    2  | 0
```

```
PID: 399     CMD: iCal
```

```
value  ----- Distribution ----- cour
    0  | 0
    1  | @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@ 10
    2  | 0
```

```
Processes: 103 total, 3 running, 5 stuck, 95 sleeping...
16:14:36
```

```
Load Avg: 1.35, 0.91, 0.65  CPU usage: 87.30% user, 1
SharedLibs: num = 3, resident = 52M code, 3864K data,
MemRegions: num = 28034, resident = 700M + 22M private,
PhysMem: 280M wired, 1162M active, 583M inactive, 2025M
VM: 16G + 373M 889379(0) pageins, 572776(0) pageouts
```

| PID   | COMMAND    | %CPU   | TIME     | #TH | #PRTS | #MREGS | RPRVT  | P |
|-------|------------|--------|----------|-----|-------|--------|--------|---|
| 15044 | Vue 6 Infi | 172.5% | 1:35.82  | 8   | 167   | 591    | 37M+   |   |
| 15060 | top        | 12.9%  | 0:04.60  | 1   | 18    | 31     | 1652K  |   |
| 0     | kernel_tas | 6.7%   | 13:41:48 | 63  | 2     | 698    | 13M    |   |
| 578   | Terminal   | 4.5%   | 5:46.92  | 10  | 170   | 372    | 2820K- |   |
| 71    | WindowServ | 3.3%   | 2:59:43  | 5   | 573   | 5003   | 27M-   |   |

# Memory

 `vm_stat(1)`

 `top(1)`

```
$ vm_stat
Mach Virtual Memory Statistics: (page
size of 4096 bytes)
Pages free: 17409.
Pages active: 284415.
Pages inactive: 146856.
Pages wired down: 73583.
"Translation faults": 432342007.
Pages copy-on-write: 5581205.
Pages zero filled: 247414912.
Pages reactivated: 1059381.
Pageins: 918500.
Pageouts: 611593.
Object cache: 503460 hits of 3926331
lookups (12% hit rate)
```

```
Processes: 104 total, 3 running, 5 stuck, 96 sleeping... 444 threads
16:03:57
```

```
Load Avg: 0.45, 0.41, 0.38 CPU usage: 11.21% user, 12.07% sys, 76.72% idle
```

```
SharedLibs: num = 3, resident = 53M code, 3980K data, 3944K linkedit.
```

```
MemRegions: num = 27350, resident = 658M + 21M private, 595M shared.
```

```
PhysMem: 276M wired, 1112M active, 512M inactive, 1900M used, 141M free.
```

```
VM: 15G + 373M 883401(0) pageins, 572217(0) pageouts
```

| PID   | COMMAND    | %CPU  | TIME     | #TH | #PRTS | #MREGS | RPRVT | RSHRD | RSIZE | VSIZE |
|-------|------------|-------|----------|-----|-------|--------|-------|-------|-------|-------|
| 15018 | top        | 12.6% | 0:02.26  | 1   | 20    | 31     | 1632K | 188K  | 2224K | 18M   |
| 0     | kernel_tas | 8.1%  | 13:40:54 | 63  | 2     | 727    | 13M   | 0     | 175M  | 270M  |
| 195   | Finder     | 7.5%  | 34:07.71 | 20  | 496   | 1024   | 24M   | 36M   | 49M   | 534M  |
| 71    | WindowServ | 7.1%  | 2:58:59  | 5   | 523   | 4875   | 25M+  | 217M- | 241M  | 648M  |
| 194   | SystemUISe | 3.3%  | 64:34.54 | 13  | 572   | 513    | 5792K | 73M   | 12M   | 475M  |

# Memory

The screenshot displays the macOS Activity Monitor application. The main window shows a list of processes with columns for PID, Process Name, User, % CPU, Threads, Real Mem, and Kind. Below the list, the 'System Memory' tab is selected, showing memory usage statistics. A small inset window shows a detailed view of a process's memory usage, and another inset shows a desktop background image of a forest path.

| PID  | Process Name                           | User            | % CPU | Threads | Real Mem | Kind           |
|------|----------------------------------------|-----------------|-------|---------|----------|----------------|
| 1990 | Mail                                   | russell.poucher | 10.8  | 25      | 154.3 MB | Intel (64 bit) |
| 0    | kernel_task                            | root            | 4.4   | 92      | 989.1 MB | Intel (64 bit) |
| 2769 | top                                    | root            | 2.9   | 1       | 2.0 MB   | Intel (64 bit) |
| 220  | WindowServer                           | _windowserver   | 2.5   | 11      | 210.5 MB | Intel (64 bit) |
| 453  | Keynote                                | russell.poucher | 2.4   | 11      | 739.8 MB | Intel          |
| 306  | Safari Web Content                     | russell.poucher | 2.0   | 9       | 541.1 MB | Intel (64 bit) |
| 2302 | Flash Player (Safari Internet plug-in) | russell.poucher | 1.8   | 20      | 71.0 MB  | Intel (64 bit) |
| 2083 | AccountEdge NE                         | russell.poucher | 1.4   | 10      | 41.5 MB  | Intel          |
| 2775 | Activity Monitor                       | russell.pouch   |       |         |          |                |
| 2778 | activitymonitord                       | root            |       |         |          |                |
| 100  | hidd                                   | root            |       |         |          |                |
| 1882 | Virtual TimeClock Pro Client           | russell.pouch   |       |         |          |                |
| 138  | _coreaudiod                            | _coreaudiod     |       |         |          |                |
| 2707 | Terminal                               | russell.pouch   |       |         |          |                |
| 2669 | Quick Look Helper                      | russell.pouch   |       |         |          |                |
| 282  | SystemUIServer                         | russell.pouch   |       |         |          |                |
| 111  | java                                   | root            |       |         |          |                |
| 280  | Dock                                   | russell.pouch   |       |         |          |                |

**System Memory**

- Free: 7.83 GB
- Wired: 1.13 GB
- Active: 3.61 GB
- Inactive: 438.6 MB
- Used: 5.17 GB

VM size: 253.17 GB  
Page ins: 586.7 MB (0 bytes/sec)  
Page outs: 0 bytes (0 bytes/sec)  
Swap used: 0 bytes

# Disk

## **df (1)**

 **Display free disk space**

## **iostat (1)**

 **Report I/O statistics**

## **lsof (8)**

 **List open files**

## **fs\_usage (1)**

 **Report system calls**

```
$ df -h -t hfs
Filesystem      Size  Used Avail Capacity  Mounted on
/dev/disk0s3    74Gi  51Gi   23Gi    69%      /
/dev/disk1s2    465Gi 347Gi  118Gi    75%     /Volumes/MediaFWStore

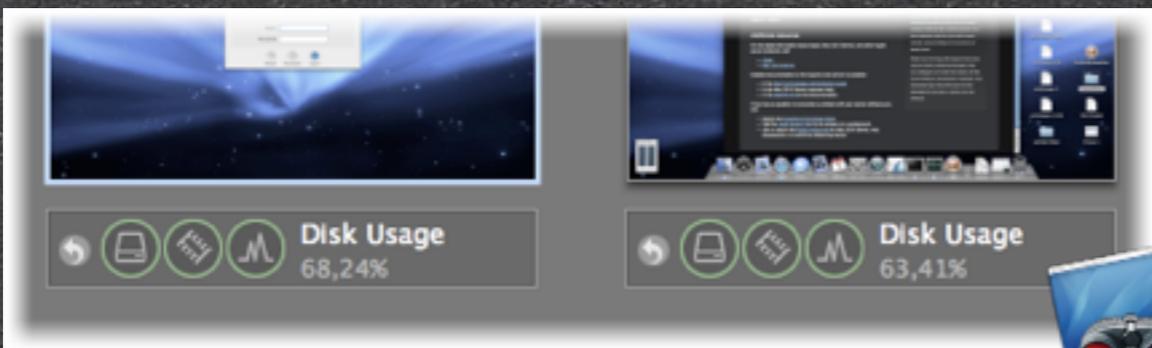
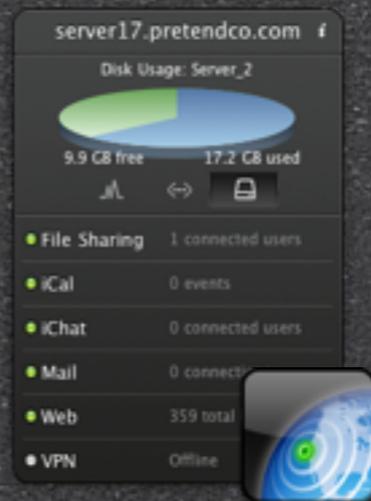
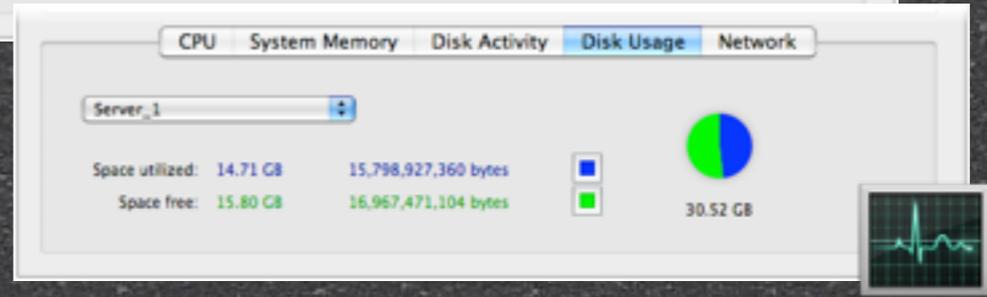
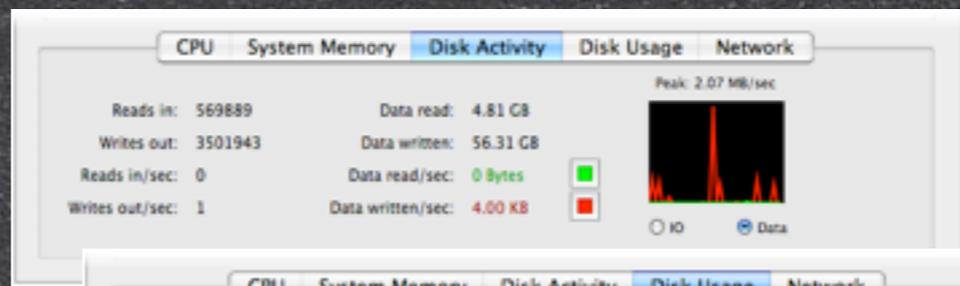
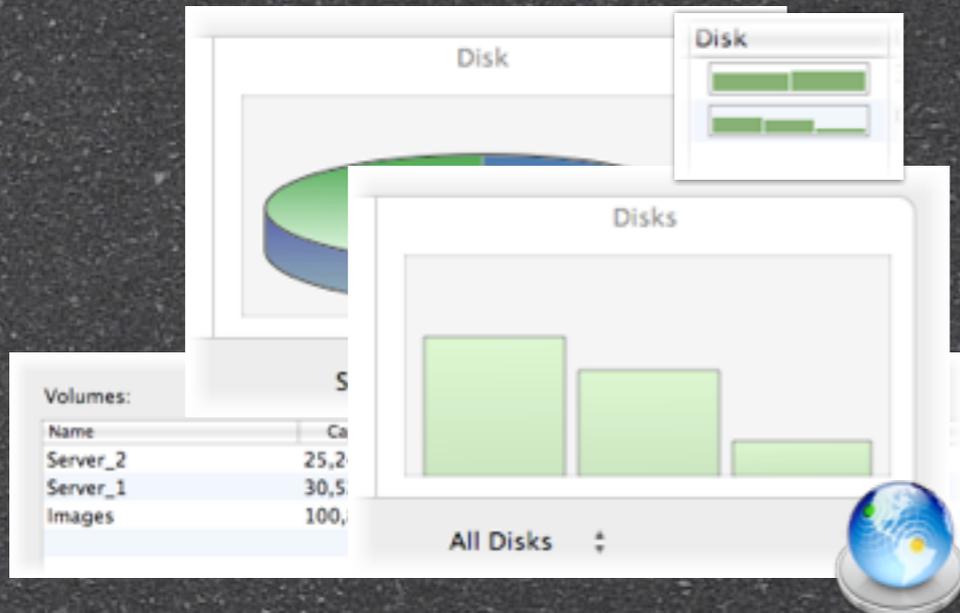
$ iostat -w 1 -d disk0 disk1
          disk0          disk1
  KB/t tps  MB/s   KB/t tps  MB/s
    4.00   1  0.00     0.00  0  0.00
  420.00  10  4.09   41.71  7  0.28
1024.00   1  1.00     0.00  0  0.00
  768.00   3  2.24     0.00  0  0.00
1024.00   4  3.99     0.00  0  0.00

# lsof /Volumes/MediaFWStore/
COMMAND  PID  USER  FD   TYPE DEVICE SIZE/OFF NODE NAME
bash     63817 media  cwd   DIR  14,5   680    2 /Volumes/MediaFWStore/

# lsof -u _teamsserver
COMMAND PID          USER  FD   TYPE    DEVICE  SIZE/OFF      NODE NAME
Python  55  _teamsserver  cwd   DIR    14,2    1258         2 /
Python  55  _teamsserver  txt   REG    14,2   38144   365614 /System
Library/Frameworks/Python.framework/Versions/2.5/Resources/Python.app/
Contents/MacOS/Python
Python  55  _teamsserver  txt   REG    14,2    92900   364097 /System
Library/Frameworks/Python.framework/Versions/2.5/lib/python2.5/lib-dyn
time.so
...

# fs_usage -w -f fileSYS Python
10:54:40.359 getdirentries      F=14  B=0x0
0.000047  Python
```

# Disk



# Network

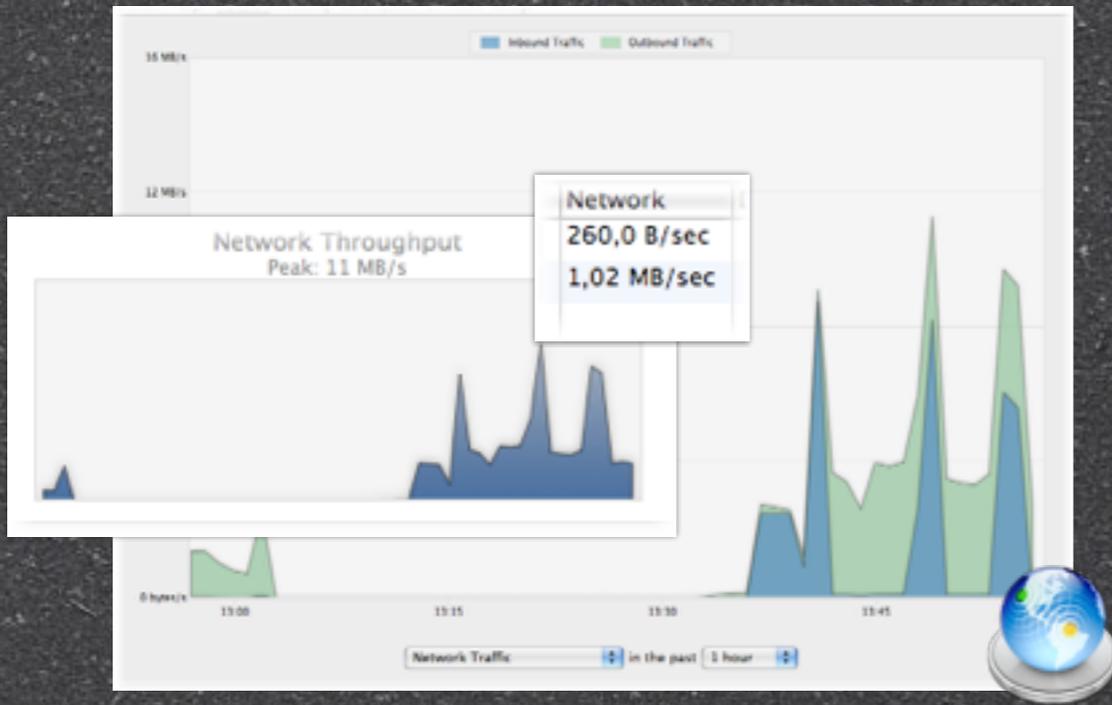
📄 netstat (1)

📄 tcpdump (1)

```
$ netstat -b -I en0
Name Mtu Network Address Ipkts Ierrs Ibytes Opkts Oerrs Obytes Coll
en0 1500 <Link#4> 00:11:24:6f:1d:6a 1810076 0 2027413615 1276472 0 245011138 0
en0 1500 10.0.1/24 miniserver.extr 1810076 - 2027413615 1276472 - 245011138 -
en0 1500 10.1/16 mainserver.pret 1810076 - 2027413615 1276472 - 245011138 -

# tcpdump -s0 -v -i en0
tcpdump: listening on en0, link-type EN10MB (Ethernet), capture size 65535 bytes
13:13:08.164723 IP (tos 0x10, ttl 64, id 29534, offset 0, flags [DF], proto TCP (6), length 180)
mainserver.pretendco.com.ssh > 10.1.17.5.58276: P, cksum 0xa459 (correct), 1929289080:1929289208(128) ack
4201395484 win 65535 <nop,nop,timestamp 88298191 952884239>
13:13:08.165815 IP (tos 0x10, ttl 64, id 17992, offset 0, flags [DF], proto TCP (6), length 52) 10.1.17.5.58276
> mainserver.pretendco.com.ssh: ., cksum 0xc03c (correct), ack 128 win 65535 <nop,nop,timestamp 952884320
88298191>
```

# Network



Network Utility

Info Netstat AppleTalk Ping Lookup Traceroute Whois Finger Port Scan

Please select a network interface for information

Network Interface (en0)

Interface Information

- Hardware Address: 00:16:cb:8a:9b:93
- IP Address(es): 10.1.17.5
- Link Speed: 1 Gbit/s
- Link Status: Active
- Vendor: Marvell
- Model: Yukon Gigabit Adapter 88E8053 Singleport Copper SA

Transfer Statistics

- Sent Packets: 11409456
- Send Errors: 0
- Recv Packets: 15470755
- Recv Errors: 0
- Collisions: 0

A small globe icon is located at the bottom right of the window.

Info Memory Drives Power Network Temperature Blowers Security

Interface: Interface 1

- IP Address: 172.20.0.200
- Subnet Mask: 255.255.0.0
- Ethernet Address: 00:19:e3:e7:1d:83
- Link Status: Up
- Speed: 1000baseT
- Duplex: full-duplex
- Physical Location: Ethernet Bond (bond0) (bond0)

Graph: kbit/sec In

29,183

4

A warning icon (triangle with exclamation mark) is located at the bottom right of the window.

CPU System Memory Disk Activity Disk Usage Network

Packets in: 424164 Data received: 49.14 MB

Packets out: 459433 Data sent: 239.08 MB

Packets in/sec: 12 Data received/sec: 17.74 KB

Packets out/sec: 7 Data sent/sec: 460 Bytes

Peak: 185.66 KB/sec

Graph: Packets Data

A small graph icon is located at the bottom right of the window.

# SSH

- **Secure replacement for telnet (1) and more**
  - `ssh(1)`
  - `scp(1)`
  - `sftp(1)`
  - **port forwarding (tunneling)**
- **OpenSSH implementation**



# SSH Authentication

## Password

-  `ssh(1)` client sends user name
-  `sshd(8)` requests password

## Key Pair

-  Generate key pairs, public part needs to be installed in the user's `~/.ssh` directory on the server
-  SSH client sends user name
-  `sshd` sends challenge based on public part of key pair
-  SSH client creates response using private part of key pair

# Helpful Built-In GUI Tools

## GUI Tools for Assessment and Utilization

-  **Server Admin**
-  **Server Status widget**
-  **Disk Utility**
-  **Activity Monitor**
-  **System Profiler**
-  **Web browser**
-  **Network browser**



# Helpful Built-In CLI Tools

uptime(1)

top(1)

ps(1)

diskutil(8)

df(1)

du(1)

iostat(8)

networksetup(8)

netstat(1)

systemsetup(8)

scutil(8)

serveradmin(8)

serversetup(8)

system\_profiler(8)

launchctl(1)

sysctl(8)

...

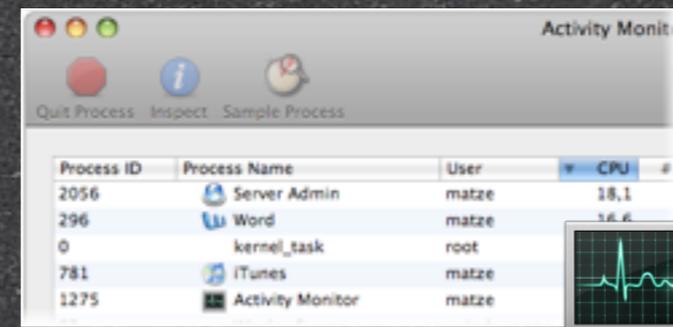


# Assess Service/Process Utilization

Activity Monitor

ps (1)

top (1)



The screenshot shows the Activity Monitor application window. At the top, there are three buttons: 'Quit Process', 'Inspect', and 'Sample Process'. Below these is a table with the following columns: Process ID, Process Name, User, CPU, and a small graph icon. The table contains the following data:

| Process ID | Process Name     | User  | CPU  |
|------------|------------------|-------|------|
| 2056       | Server Admin     | matze | 18.1 |
| 296        | Word             | matze | 16.6 |
| 0          | kernel_task      | root  |      |
| 781        | iTunes           | matze |      |
| 1275       | Activity Monitor | matze |      |

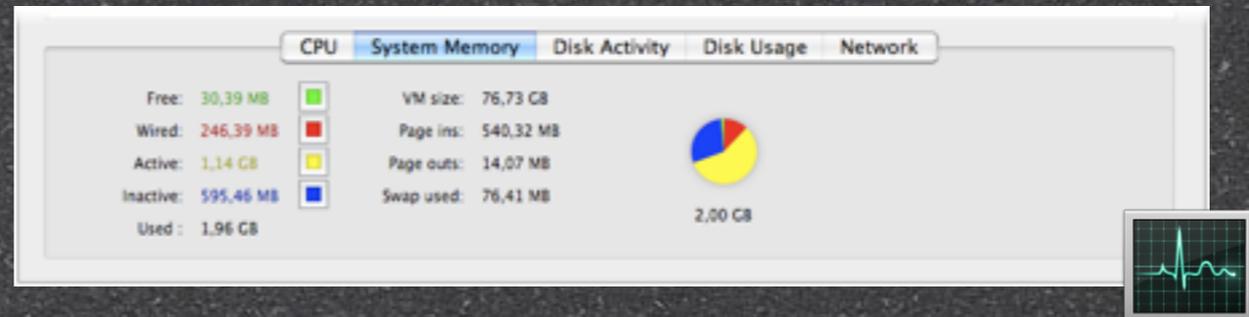
Processes: 113 total, 2 running, 4 stuck, 107 sleeping... 425 threads

...

| PID | COMMAND    | %CPU  | TIME     | #TH | #PRTS | #MREGS | RPRVT | RSHRD | RSIZE | VSIZE |
|-----|------------|-------|----------|-----|-------|--------|-------|-------|-------|-------|
| 296 | LaunchCFMA | 16.1% | 53:48.99 | 3   | 124   | 699    | 80M   | 33M   | 117M  | 862M  |

# Assess Hardware Utilization

## Activity Monitor



## `vm_stat(1)`

```
server17:~ admin$ vm_stat
Mach Virtual Memory Statistics: (page size of 4096 bytes)
Pages free:                        8725.
Pages active:                       293357.
Pages inactive:                     152717.
...
```

## `sysctl(8)`

```
Pageins:                            138306.
Pageouts:                            3603.
Object cache: 53134 hits of 191862 lookups (27% hit rate)

server17:~ admin$ sysctl vm.loadavg
vm.loadavg: { 0.28 0.33 0.38 }
```

```
server17:~ admin$ sysctl vm.swapusage
vm.swapusage: total = 128.00M  used = 76.41M  free = 51.59M
(encrypted)
```

## `top(1)`

# Assess Storage Utilization

- Server.app
- Disk Utility
- System Profiler

The image displays three overlapping screenshots from macOS illustrating storage assessment tools:

- Server.app:** Shows a table of storage volumes.
- Disk Utility:** Shows a graphical view of storage volumes with progress bars.
- System Profiler:** Shows detailed hardware information for a specific disk.

| Name         | Capacity  | Available                   | % Free |
|--------------|-----------|-----------------------------|--------|
| Server       | 74.41 GB  | 22.06 GB (23,690,928,128)   | 29.65% |
| MediaFWStore | 465.44 GB | 118.14 GB (126,853,464,064) | 25.38% |

| Name       | Available | Total     | Used |
|------------|-----------|-----------|------|
| Server_1   | 15,61 GB  | 30,52 GB  | ~50% |
| Untitled 2 | 84,21 GB  | 100,84 GB | ~15% |

**System Profiler Details (WDC WD1600BEVS-22RST0):**

- Capacity: 149.05 GB
- Model: WDC WD1600BEVS-22RST0
- Revision: 04.01G04
- Serial Number: WD-WXE107E29983
- Native Command Queuing: Yes
- Queue Depth: 32
- Removable Media: No
- Detachable Drive: No
- BSD Name: disk0
- Mac OS 9 Drivers: No
- Partition Map Type: GPT (GUID Partition Table)
- S.M.A.R.T. status: Verified
- Volumes:
  - Leopard:
    - Capacity: 148,61 GB
    - Available: 5,37 GB
    - Writable: Yes
    - File System: Journaled HFS+
    - BSD Name: disk0s2
    - Mount Point: /

# Assess Storage Utilization

🎲 `system_profiler(8)`

🎲 `diskutil(8)`

🎲 `df(1)`

🎲 `du(1)`

🎲 `iostat(8)`

```
server17:~ localadmin$ system_profiler SPSerialATADataType
```

```
...
```

```
Server_1:
```

```
Capacity: 30.52 GB
```

```
Available: 15.61 GB
```

```
Writable: Yes
```

```
File System: Journaled HFS+
```

```
BSD Name: disk0s2
```

```
Mount Point: /
```

```
Untitled 2:
```

```
Capacity: 100.84 GB
```

```
Available: 84.21 GB
```

```
Writable: Yes
```

```
File System: Journaled HFS+
```

```
BSD Name: disk0s3
```

```
Mount Point: /Volumes/Untitled 2
```

```
...
```

```
server17:~ localadmin$ df -h
```

| Filesystem    | Size  | Used  | Avail | Capacity | Mounted on    |
|---------------|-------|-------|-------|----------|---------------|
| /dev/disk0s2  | 31Gi  | 15Gi  | 16Gi  | 49%      | /             |
| devfs         | 108Ki | 108Ki | 0Bi   | 100%     | /dev          |
| fdesc         | 1.0Ki | 1.0Ki | 0Bi   | 100%     | /dev          |
| map -hosts    | 0Bi   | 0Bi   | 0Bi   | 100%     | /net          |
| map auto_home | 0Bi   | 0Bi   | 0Bi   | 100%     | /home         |
| map -fstab    | 0Bi   | 0Bi   | 0Bi   | 100%     | /Network/Serv |
| /dev/disk0s3  | 101Gi | 17Gi  | 84Gi  | 17%      | /Volumes/Unti |

```
server17:Users localadmin$ sudo du -sh *
```

```
0B Shared
```

```
6.2M diradmin
```

# Finishing up

## **logout**

-  **Terminates an SSH session**

## **exit**

-  **gets you out of a root shell**

## **reboot**

## **halt**

-  **Properly shuts down all processes**

# Backup Tools

 `rsync(1)`

 `ditto(1)`

 `asr(8)`

 **Other UNIX tools**

 `server.app(8)`

 **Time Machine**

 **Third-Party Solutions**



# rsync(1)

- `/usr/bin/rsync`
  - Keeps backup data in sync with the original
  - One-way sync
  - Only copies files or blocks of files that have changed
  - Can copy extended attributes, including resource forks
  - Can back up via network using ssh
- ```
$ rsync -auvE ~/Documents/ServerConfig/  
localadmin@server17.local:/Backup
```



# ditto(1)

## **/usr/bin/ditto**

-  **Performs a complete copy of specified folders**
-  **Copies extended attributes, ACLs, and resource forks**
-  **Can compress to PKZip or cpio format**
-  **`$ ditto /var/spool/postfix ./var/spool/postfix`**



# asr(8)

## **/usr/sbin/asr—Apple Software Restore**

 **Back up and restore an entire volume**

 **Source needs to be unmountable**

 `# asr verb [options]`

 `# asr restore --source source --target target [options]`



# Other Useful UNIX Tools

- ❶ **scp (1) —Secure copy data to a remote location**
- ❶ **hdiutil(1) —Disk image manipulation**
- ❶ **tar(1) —Tape archiving utility to create, extract tar archives**
- ❶ **pax(1) —Read/write archives, copy directory hierarchies**
- ❶ **zip(1) —Package and compress (archive) files**
- ❶ **kdb5\_util(8) —Kerberos database maintenance utility**
- ❶ **mkpasswd —Create/modify/back up password server**
- ❶ **dd(1) —Low-level copying and conversion utility**



# Resources

## 🎲 Books - O'Reilly

- 🎲 Learning Unix for Mac OS X Leopard
- 🎲 Mac OS X Snow Leopard for Unix Geeks

## 🎲 Websites

- 🎲 [www.osxfaq.com](http://www.osxfaq.com)
- 🎲 [www.macdevcenter.com](http://www.macdevcenter.com)

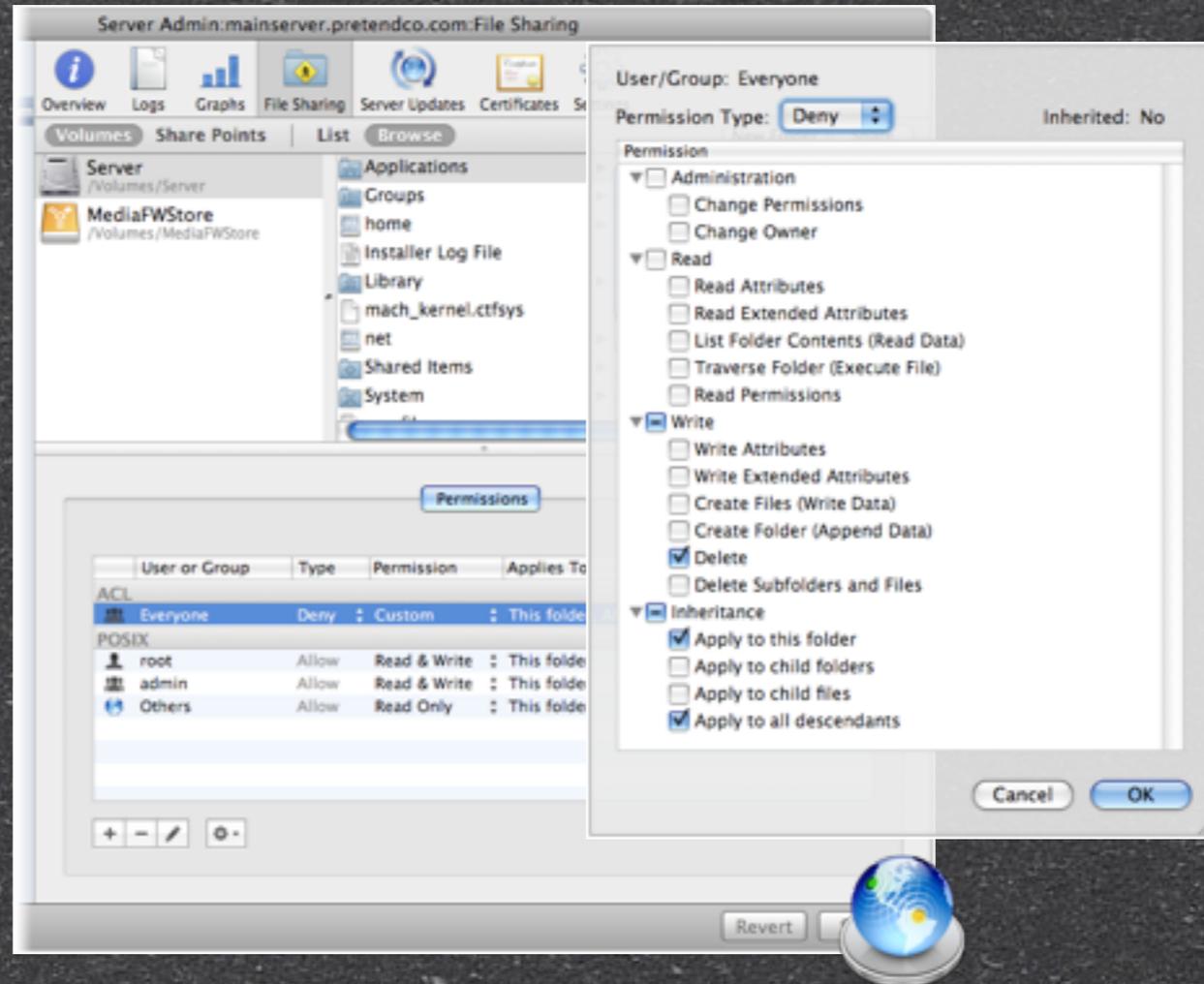
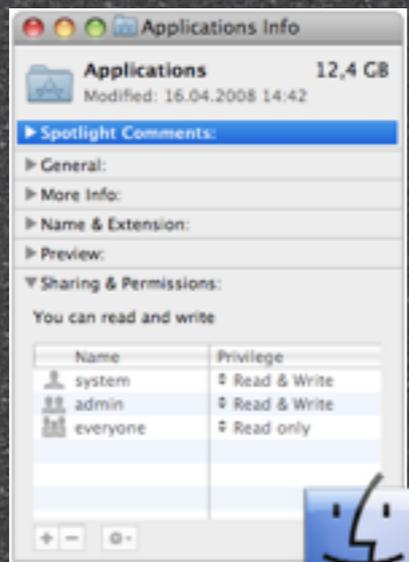
## 🎲 Certification Courses (ACSA)

- 🎲 Directory Services, Deployment and Mobility & Security



# ACL's in the Command Line

# POSIX vs. ACLs Review



```
drwxrwxr-x+ 33 root          admin          1122 Apr 21 13:28 Applications
0: group:everyone deny delete
```



# ACL Command-Line Tools

 **fsaclctl(1) — Controls access control list support**

 `$ fsaclctl -a -e`

 **chmod(1) — Sets access control list**

 `$ chmod +a "w2sdesigner allow list,add_file..." Destination`

 **ls(1) — Lists access control list**

 `$ ls -le`

 `total 0`

 `drwxrwx---+ 2 localadmin admin 68 Apr 19 11:05 Design`

 `0: group:w2sdesigner allow`

`list,add_file,search,delete,add_subdirectory,delete_child,readat`



# Verifying File System ACLs

```
ls -edl
```

```
server14:~ ladmin$ ls -edl "/Shared Items/Public"
```

```
drwxrwxr-x+ 2 root admin 68 Apr 25 14:00 /Shared Items/Public
```

```
0: group:odgroup1 allow  
list,add_file,search,delete,add_subdirectory,delete_child,readat  
tr,writeattr,
```

```
server14:~ ladmin$ ls -edln "/Shared Items/Public"
```

```
drwxrwxr-x+ 2 0 80 68 Apr 25 14:00 /Shared Items/Public
```

```
0: 94FFAC59-F743-402C-95E9-0AF75A7220D2 allow  
list,add_file,search,delete,add_subdirectory,delete_child,readat  
tr,writeattr,  
readextattr,writeextattr,readsecurity,writesecurity,chown,file_i  
nherit,
```



# Binding AD/OD from the CLI

# Binding with dsconfigldap

```
sudo dsconfigldap -fv -a mainserver.pretendco.com -n  
mainserver.pretendco.com -c `hostname -s` -u diradmin -p  
<diradminpw> -l cadmin -q <localpw>
```

- ▶ -f force authenticated binding/unbinding
- ▶ -v verbose logging
- ▶ -a servername
- ▶ -n configuration name displayed in Directory Utility
- ▶ -c client computer id
- ▶ -u directory user with permission to add computers
- ▶ -p password
- ▶ -l local administrator
- ▶ -q local administrator password

# Verifying Binding via Command Line

```
id diradmin
```

```
uid=1000(diradmin) gid=20(staff) groups=20(staff),80(admin)
```

```
id -u diradmin
```

```
1000
```

```
dscl
```

```
Entering interactive mode... (type "help" for commands)
```

```
> cd /LDAPv3/mainserver.pretendco.com/Users
```

```
/LDAPv3/mainserver.pretendco.com/Users > ls
```

```
delegate
```

```
diradmin
```

# Verifying Login at Command Line

- ❏ `id` and `dsc1` to verify the existence of the account in the directory
- ❏ `dirt` to verify user authentication against Open Directory
- ❏ `kinit` to test Kerberos authentication
- ❏ `klist` to verify what tickets a user is granted

# The Binding Process

 **Server Admin and Directory Utility hide a host of steps involved in binding**

 **From the command line, binding manually involves dscl, defaults, dsconfigldap, and DirectoryService**

 **Server Admin and Directory Utility reduce those steps to a few clicks and text fields in a GUI**

```
1) sudo dscl /Search create /  
SearchPolicy CSPSearchPath
```

```
2) sudo defaults write /Library/  
Preferences/DirectoryService/  
DirectoryService LDAPv3 Active
```

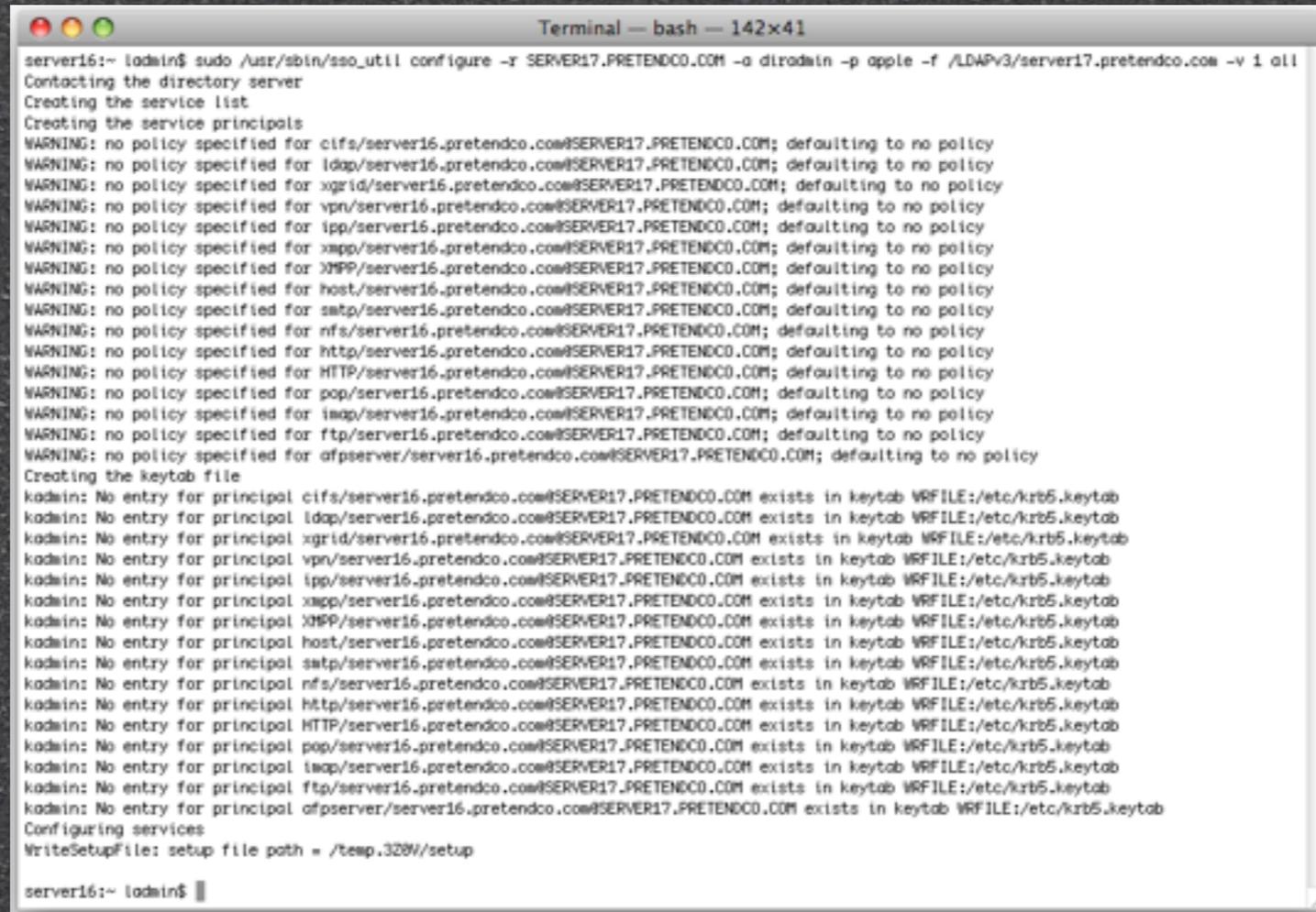
```
3) sudo killall DirectoryService
```

```
4) sudo dsconfigldap -v -a  
server17.pretendco.com -n server17 -  
u diradmin -p apple -l admin -q  
apple
```

```
5) sudo dscl /Search append /  
CSPSearchPath /LDAPv3/  
server17.pretendco.com
```

# Joining Kerberos at the CLI

```
sudo /usr/sbin/ssx_util configure  
-r SERVER17.PRETENDCO.COM -a diradmin -p apple  
-f /LDAPv3/server17.pretendco.com -v 1 all
```



```
Terminal — bash — 142x41  
server16:~ ladmin$ sudo /usr/sbin/ssx_util configure -r SERVER17.PRETENDCO.COM -a diradmin -p apple -f /LDAPv3/server17.pretendco.com -v 1 all  
Contacting the directory server  
Creating the service list  
Creating the service principals  
WARNING: no policy specified for cifs/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for ldap/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for xgrid/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for vpn/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for lpp/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for xapp/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for XMPF/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for host/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for smtp/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for nfs/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for http/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for HTTP/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for pop/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for imap/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for ftp/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
WARNING: no policy specified for afpserver/server16.pretendco.com@SERVER17.PRETENDCO.COM; defaulting to no policy  
Creating the keytab file  
kadmind: No entry for principal cifs/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal ldap/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal xgrid/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal vpn/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal lpp/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal xapp/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal XMPF/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal host/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal smtp/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal nfs/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal http/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal HTTP/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
kadmind: No entry for principal pop/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
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kadmind: No entry for principal afpserver/server16.pretendco.com@SERVER17.PRETENDCO.COM exists in keytab WRFILE:/etc/krb5.keytab  
Configuring services  
WriteSetupFile: setup file path = /tmp.3289/setup  
server16:~ ladmin$
```



# dscl

- ❏ **directory services command-line utility**
- ❏ **Apple-supported command-line tool for managing DS data**
- ❏ **Directory structure appears like file-system structure**
- ❏ **Single-user mode**
- ❏ **Local and external nodes**

```
valkyrie:Apple Training jwelch$ dscl
Entering interactive mode... (type "help" for commands)
> ls
Active Directory
BSD
LDAPv3
Local

Search
Contact
> cd Local/
/Local > ls
Default
/Local > cd Default/
/Local/Default > ls
AFPServer
AFPUserAliases
Aliases
AppleMetaRecord
Augments
Automount
AutomountMap
AutoServerSetup
Bootp
ComputerGroups
ComputerLists
Computers
Config
Ethernets
FTPServer
Groups
Hosts
HostServices
LDAPServer
Locations
Machines
MetaUserNames
Mounts
Neighborhoods
NetDomains
```



# Binding with dsconfigad

1. Enable AD plug-in with defaults command
2. Bind with dsconfigad

```
dsconfigad -a computername \  
-domain pretendco.com \  
-u Administrator -p ADadminpw \  
-lu cadmin -lp cadmin
```

3. Confirm binding with dsconfigad -show
4. Add Active Directory to search path with dscl

# dsconfigad Specific Options

- ❏ `-packetsign <disable | allow | require>`
- ❏ `-packetencrypt <disable | allow | require>`
- ❏ `-namespace <forest | domain>`
  - ❏ For username conflicts across domains
- ❏ `-passinterval <days>`
  - ❏ How often to automatically change the computer password

# Questions



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