

From the Chime to the Desktop

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Session M202

Ed Marczak
Radiotope, MacTech,
WheresSpot, etc.



Chime

(Power button)



(Lots-o-stuff)

Desktop

(Logged in and
Running)

History

Chime!

BootROM

Checks hardware

Initializes CPU and RAM

Boot chime or error beeps

Transfer control to Open Firmware

OpenFirmware

Builds device tree/more hw init

Checks for modifier keys

Selects the OS to boot

OS X: Find and run BootX



Circle-with-slash

Square-with-globe

Metallic-spinning-globe

Flashing-Question-Mark

BootX

Draws Apple logo

`/System/Library/CoreServices`

Can load from Disk, CD or NetBoot (tftp)

Loads kexts

Hands control to `/mach_kernel`

Kernel

Starts indeterminate spinner

OF disappears

Initializes vnodes (data structures)

Initializes I/O kit

Mounts root file system

Launches launchd

launchd!

Runs /etc/rc

Sources /etc/hostconfig

sysctl settings (tunes the system)

Starts vm sub-system

Deals with kernel extensions

Runs mach bootstrap services

Loads launchd items using launchctl

Runs SystemStarter

Looks for .AppleSetupDone

Runs WaitingForLoginWindow

Modifying Boot

Verbose: Command-V

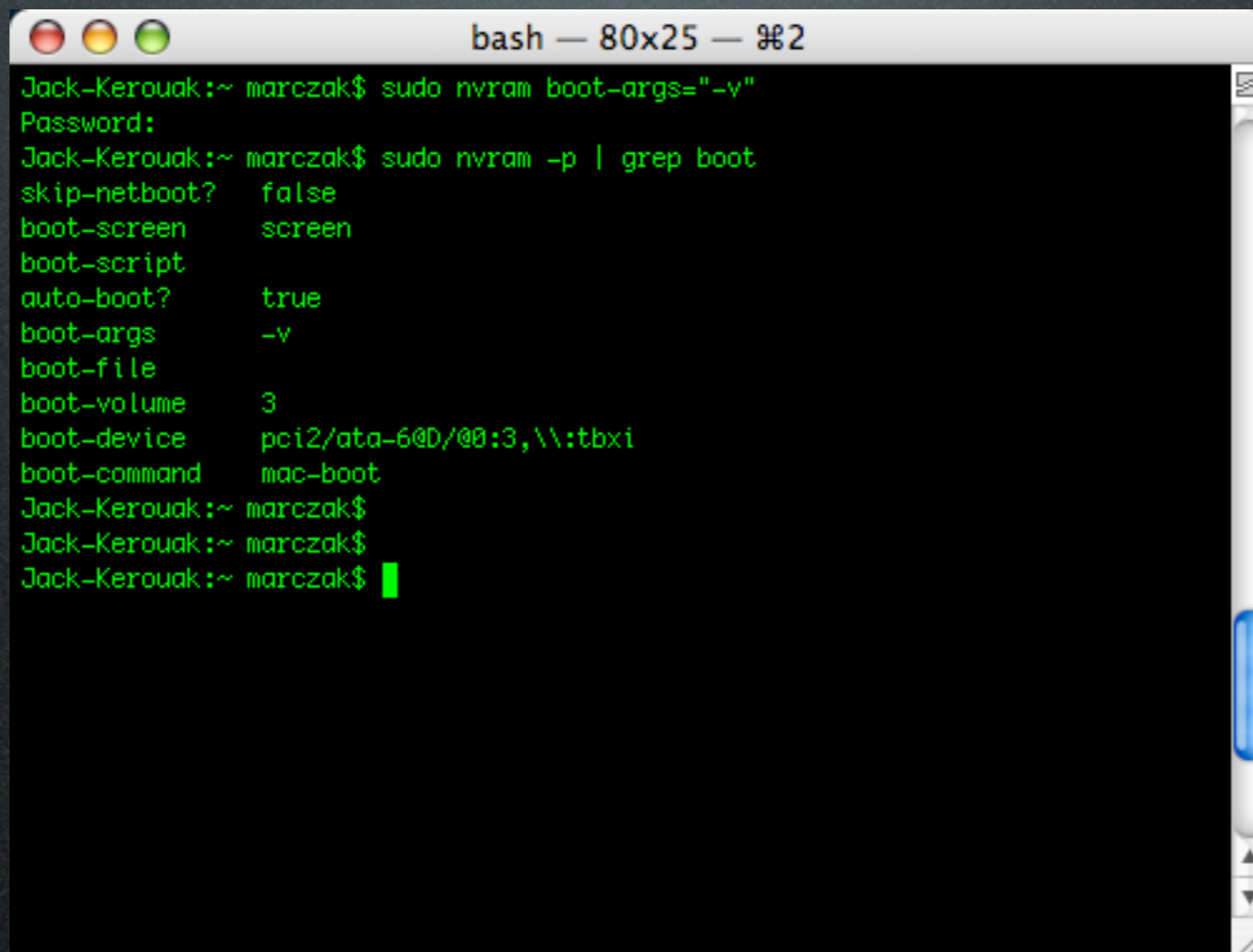
Modifying Boot

Verbose: Command-V

```
IOPCCard info: Intel PCIC probe: TI 1510 rev 00
FireWire (OHCI) Apple ID 31 built-in now active, GUID 000a95ff fee09504; max speed s000.
[HCIController][start]
ADB present:8c
[AppleUSBHCIController][StopIsochPipeRead] - mInt1IsochInPipe = 0 - numReadsPending = 0
[start] 1
Security auditing service present
BSM auditing present
disabled
rooting via boot-uuid from /chosen: 845469A8-4F81-3E48-B3F6-12E8A2508A9D
Waiting on <dict ID="0"><key>IOProviderClass</key><string ID="1">IOResources</string><key>IOResourceMatch</key><string ID="2">boot-uuid-media</string></dict>
Got boot device = IOService:/MacRISC2PE/pci@f4000000/AppleMacRiscPCI/ata-600/AppleKauaiATA/ATADeviceNub00/IOATABlockStorageDriver/IOATABlockStorageDevice/IOBlockStorageDriver/FUJIT
SU MHT2000AT Media/IOApplePartitionScheme/Apple_HFS_Untitled_203
BSD root: disk0s3, major 14, minor 2
hfs mount: enabling extended security on Zero
Nov 15 22:07:51 launchd: ioctl(SIOCAIFADDR ipv6): File exists
Safeboot is
VerboseFlag is -v
Checking disk
Mounting local filesystems
kern.sysv.shmax: -1 -> 4194304
kern.sysv.shmin: -1 -> 1
kern.sysv.shmmni: -1 -> 32
kern.sysv.shmseg: -1 -> 8
kern.sysv.shmall: -1 -> 1024
Resetting files and devices
Starting virtual memory
Removing /mach.sym /var/tmp/folders.581 /etc/nologin /private/_tmp_ /var/_run_ /private/var/vm/swapfile0 /private/var/vm/swapfile1
\mach.sym
Configuring kernel extensions
Jettisoning kernel linker.
Nov 15 22:07:57 kextd[28]: registering service "com.apple.KernelExtensionServer"
Resetting IOCatalogue.
Matching service count = 0
Matching service count = 4
Matching service count = 4
Matching service count = 4
Matching service count = 4
Matching service count = 4
Class "AppleADBMouse" is duplicate
Duplicate class
Nov 15 22:07:59 kextd[28]: 328 cached, 0 uncached personalities to catalog
Couldn't alloc class "AppleADBMouseType4"
Couldn't alloc class "AppleADBMouseType2"
Couldn't alloc class "AppleADBMouseType1"
iScroll2: starting up driver.
iScroll2: enableEnhancedMode called.
iScroll2: deviceClass = 0xd (Extended Mode, scrolling supported)
IPv6 packet filtering initialized, default to accept, logging disabled
launchctl: propertyList is NULL
launchctl: no plist was returned for: /Library/LaunchDaemons/sayitain.plist
launchctl: no plist was returned for: /Library/LaunchDaemons/sayitain.plist
UniENet: Ethernet address 00:0a:95:e0:95:04
nightlybackup.sh: Already loaded
AirPortPCI_M: Ethernet address 00:03:93:ee:cd:b3
Nov 15 22:08:09 localhost mDNSResponder-107.3 (Aug 22 2005 11: 46:54)[45]: starting
```

Modifying Boot

Verbose: Persistent using 'nvram'



```
bash — 80x25 — 2
Jack-Kerouak:~ marczak$ sudo nvram boot-args="-v"
Password:
Jack-Kerouak:~ marczak$ sudo nvram -p | grep boot
skip-netboot?  false
boot-screen    screen
boot-script
auto-boot?    true
boot-args     -v
boot-file
boot-volume   3
boot-device   pci2/ata-6@D/@0:3,\:\:tbxi
boot-command  mac-boot
Jack-Kerouak:~ marczak$
Jack-Kerouak:~ marczak$
Jack-Kerouak:~ marczak$
```

Modifying Boot

Verbose: Command-V

Single-User: Command-S

Modifying Boot

Single-User: Command-S

```
standard timeslicing quantum is 10000 us
vm_page_bootstrap: 314483 free pages
mig_table_max_displ = 70
85 prelinked modules
Copyright (c) 1982, 1986, 1989, 1991, 1993
    The Regents of the University of California. All rights reserved.

using 3276 buffer headers and 3276 cluster IO buffer headers
AppleKauaiATA shasta-ata features enabled
DART enabled
FireWire (OHCI) Apple ID 52 built-in now active, GUID 001124ff fe307d50; max speed s400.
Security auditing service present
BSM auditing present
disabled
rooting via boot-uuid from /chosen: 4CF0541E-4A57-3606-9F82-C9426B12A859
Waiting on <dict ID="0"><key>IOProviderClass</key><string ID="1">IOResources</string><key>IOResou
Got boot device = IOService:/MacRISC4PE/ht00,f20000000/AppleMacRiscHT/pcl03/IOPCI2PCIBridge/k2-sat
lockStorageDriver/ST3160023AS Media/IOApplePartitionScheme/Untitled03
BSD root: disk0s3, major 14, minor 2
AppleSMU -- shutdown cause = 2
AppleSMU::PMU vers = 0x000d004c, SPU vers = 0x15, SDB vers = 0x01,
Singleuser boot -- fsck not done
Root device is mounted read-only

If you want to make modifications to files:
    /sbin/fsck -fy
    /sbin/mount -uw /

If you wish to boot the system, but stay in single user mode:
    sh /etc/rc
localhost:/ root# █
```

Modifying Boot

Verbose: Command-V

Single-User: Command-S

Safe-Boot: Shift Key

Modifying Boot

Safe-Boot: Shift Key



loginwindow

Lives at /System/Library/CoreServices/
loginwindow.app

Name is deceptively simple!

Handles user authentication

- Records login

- Loads Finder, Dock and Login Items

- Handles logout, restart, shutdown and
Force Quit

- Writes stderr to /Library/Logs/Console/
(shortname)/console.log

- Sets up user environment (prefs)

loginwindow

Login Hooks:

loginwindow

Login Hooks:

Runs a script when a user logs in
(simple, right?)

```
defaults write com.apple.loginwindow  
LoginHook /path/to/somescript
```

Must be root or use sudo

Job will run as root.

Also: LogoutHook

launched
in
space?

launchd
in
userspace

launchctl

plist



launchd

Replaces:

init

mach_init

xinetd (still exists)

watchdog

cron (kind of)

Wants to replace:

rc

SystemStarter

launchd

Panther process listing

```
Reception-1:~ ladmin$ ps ax
  PID  TT  STAT      TIME COMMAND
    1  ??  Ss      0:00.00 /sbin/init
    2  ??  Ss      0:00.27 /sbin/mach_init
   83  ??  Ss      0:00.00 /usr/sbin/syslogd -s -m 0
   89  ??  Ss      0:00.00 kexthd
   91  ??  Ss      0:00.31 /usr/sbin/configd
   92  ??  Ss      0:00.05 /usr/sbin/diskarbitrationd
   97  ??  Ss      0:00.29 /usr/sbin/notifyd
  122  ??  Ss      0:00.73 netinfod -s local
  124  ??  Ss      0:03.16 update
  127  ??  Ss      0:00.00 dynamic_pager -F /private/var/vm/swapfile
  148  ??  Ss      0:00.66 /System/Library/CoreServices/coreservicesd
  151  ??  S       0:00.00 /usr/libexec/ioupsd
  153  ??  Ss      0:00.22 /usr/sbin/distnoted
  163  ??  Ss      0:00.00 /usr/sbin/KernelEventAgent
  164  ??  Ss      0:00.06 cron
  170  ??  Ss      0:01.93 /usr/sbin/mDNSResponder
  179  ??  Ss      3:19.24 /System/Library/Frameworks/ApplicationServices.framework
  180  ??  Ss      0:00.28 /System/Library/CoreServices/SecurityServer -X
  182  ??  Ss      0:03.35 /System/Library/Frameworks/ApplicationServices.framework
  186  ??  Ss      0:04.03 /System/Library/CoreServices/loginwindow.app/Contents
  190  ??  Ss      0:01.23 /usr/sbin/DirectoryService
  206  ??  Ss      0:02.37 /usr/sbin/lookupd
  255  ??  Ss      0:00.00 /usr/libexec/crashreporterd
```


launchd

Tiger process listing

```
Jack-Kerouak:~ marczak$ ps ax
PID  TT  STAT      TIME COMMAND
  1  ??  Ss      0:03.77 /sbin/launchd -v
 24  ??  Ss      0:00.23 /sbin/dynamic_pager -E -F /private/var/vm/swapfile
 28  ??  Ss      0:02.78 kextd
 35  ??  Ss      5:55.05 /usr/sbin/configd
 36  ??  Ss      0:06.87 /usr/sbin/coreaudiod
 37  ??  Ss      0:02.95 /usr/sbin/diskarbitrationd
 38  ??  Ss      0:00.18 /usr/sbin/memberd -x
 39  ??  Ss      0:02.30 /usr/sbin/securityd
 41  ??  Ss      0:04.34 /usr/sbin/notifyd
 42  ??  Ss      0:26.22 /usr/sbin/DirectoryService
 43  ??  Ss      0:00.03 /usr/sbin/KernelEventAgent
 44  ??  Ss      0:17.70 /usr/sbin/mDNSResponder -launchdaemon
 45  ??  Ss      0:07.32 /usr/sbin/netinfod -s local
 46  ??  Ss      0:05.60 /usr/sbin/syslogd
 49  ??  S       0:00.53 /usr/sbin/blued
 59  ??  Ss      3:51.27 /usr/sbin/update
 61  ??  Ss      0:19.71 /System/Library/CoreServices/loginwindow.app/Contents
 65  ??  Ss      0:03.73 /usr/sbin/distnoted
 66  ??  Ss     10:34.84 /System/Library/CoreServices/coreservicesd
 68  ??  Ss     67:16.43 /System/Library/Frameworks/ApplicationServices.framework
 74  ??  Ss      0:11.00 /System/Library/Frameworks/ApplicationServices.framework
101  ??  Ss      0:11.12 ntpd -f /var/run/ntp.drift -p /var/run/ntpd.pid
```

launchd - plist

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple Computer//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
  <dict>
    <key>Label</key>
    <string>com.openssh.sshd</string>
    <key>Program</key>
    <string>/usr/libexec/ssh-keygen-wrapper</string>
    <key>ProgramArguments</key>
    <array>
      <string>/usr/sbin/ssh</string>
      <string>-i</string>
    </array>
    <key>SessionCreate</key>
    <true/>
    <key>Sockets</key>
    <dict>
      <key>Listeners</key>
      <dict>
        <key>Bonjour</key>
        <array>
          <string>ssh</string>
          <string>sftp-ssh</string>
        </array>
        <key>SockServiceName</key>
        <string>ssh</string>
      </dict>
    </dict>
    <key>StandardErrorPath</key>
    <string>/dev/null</string>
    <key>inetdCompatibility</key>
    <dict>
      <key>Wait</key>
      <false/>
    </dict>
  </dict>
</plist>
```

launchd - plist

Standard XML, Apple DTD

Text (non-binary)

Edit/create with:

Text editor (vi, TextWrangler, etc.)

Property List Editor

launchd Editor from code poetry

Lingon, by Peter Borg

launchd - plist

Keys:

Label - identifies job

Disabled - Disables job

Program/Program Arguments - Program to run

OnDemand - Run on demand, or continuously

RunAtLoad - Run at first load?

WatchPaths/QueueDirectories - Run based on presence of files.

Nice - Nice value to apply to job

StartInterval/StartCalendarInterval - Run based on time.

Use:

```
launchctl load -w /Library/LaunchAgents/some.plist
```

```
launchctl start labelname
```

```
launchctl unload -w /path/to/some.plist
```

plists get stored in:

/Library/LaunchAgents - System-wide programs

/Library/LaunchDaemons - System-wide
daemons

~/Library/LaunchAgents - per-user programs

~/Library/LaunchDaemons - per-user daemons

Demo

launchd

launched

(a work in progress)

Caveats

Use the latest OS version - at least 10.4.2

SystemStarter still exists for a reason

Start up dependencies

Sending shutdown signals

cron it ain't

```
0 8-20/3 * * 1-5 root /path/to/prog
```

(every 3 hours, M-F only, between 8am and 8pm)

Questions?

Thank You!

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