PSUMAC202:
Imaging

PENNSTATE

MACADMINS CONFERENCE 2010

Remember us?

- Justin Elliott, Penn State University
  - IT Manager, Classroom and Lab Computing
- Rusty Myers, Penn State University
  - IT Support Specialist, College of Education

Quick Audience Survey

- New to imaging on Macs?
- Have Mac OS X Server(s)?
- Basic Scripting Skills?
- Have Windows (SMB) Servers?

Overview

- What Is Imaging?
- System Images
  - Why Use Them
  - Master Mac Configs
- How to Create Them

It’s All in the Image...

What Is Imaging?

- Configure Master Mac Operating System with all custom Applications and Configurations.
- Process of copying all files from a Mac's disk and storing them in a single, 'disk image' file.

What Are System Images?

- A “Virtual disk”
- File Extension is “.dmg”
- The standard system disk image format
- Read/Write or Compressed
- Used for Software Installers, OS X System Disks Copies

Why Use System Images?

- Need to clone Master Mac image to many Macs
- Consistency
- Save your sanity and time, stop doing manual installs

Master Mac Setup

Master Mac Requirements

- Use newest Mac available
- Test master image on other Macs models and types
- Be aware of operating system requirements

Master Mac Image Stages

- Install OS X, configure for users
- Manually Install OS and updates, applications, configure settings
  - Clean the image of cruft files
  - Create .dmg master image
  - Add Checksums to image

Master Mac Configs

- Specific Configs for your Environment
  - Printers, Apps, Files, all other configs you need
- User Template Defaults
- File Permissions - limit write access
- Managed Client for OS X (MCX)
  - Desktop Picture, Dock Items, etc.

New Hardware Support

- New Macs ship with newer “special” builds of OS X
  - Apple does not test this build on other Macs
  - Don’t use these OS Installer DVDs for master images
- Wait for next dot rev of OS X to use for all supported Macs, ***or*** ...

New Hardware Support

- Restore same major revision master system image
- Upgrade in place with new Mac included OS X DVD
  - Caution: May break custom system configurations

New iMac System DVD

10.6.3.Special

New Hardware Support

- List of OS X build numbers shipped with Macs: http://tinyurl.com/osxbuilds
- Eg: Lab Image at 10.6.3, buy new Macs, did they ship with OS X before 10.6.3 GM build, or after?
- Always use “Combo” Updaters, NOT deltas for your master image
  - Combo Updaters contain all drivers

Scripting System Configs

Scripting System Configs

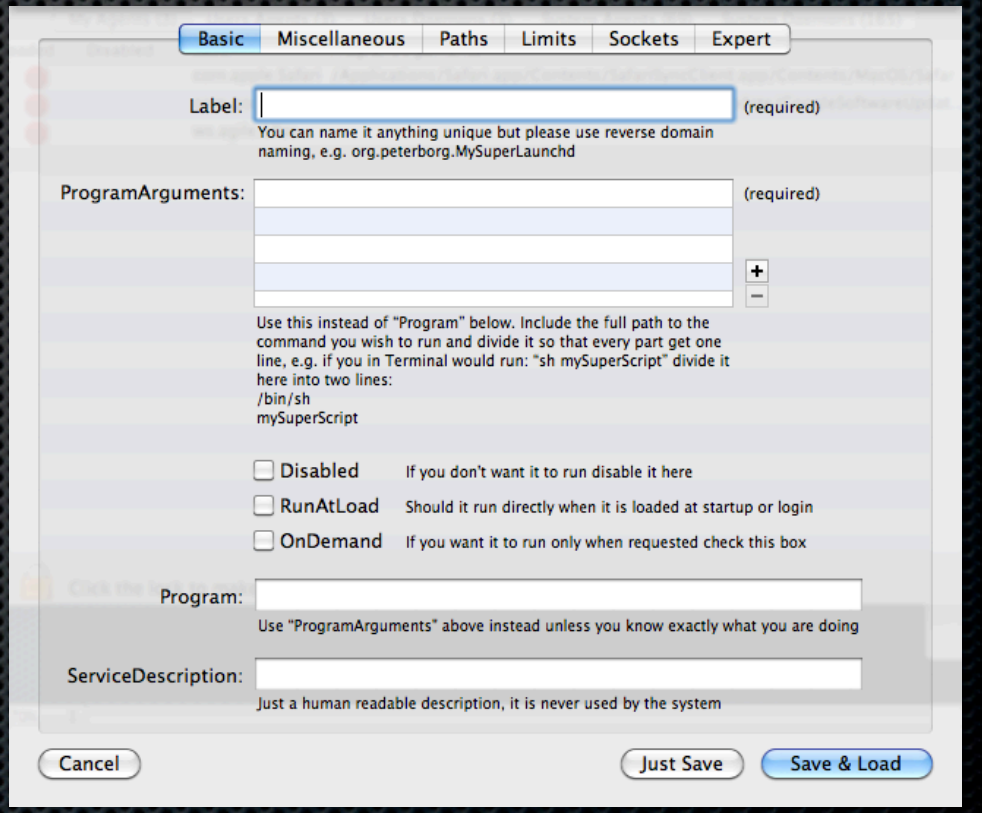
- Setup environment at user login and logout
- Login and Logout Hooks

sudo defaults write com.apple.loginwindow LoginHook /path/to/script

  - “iHook” GUI app for Logout Scripts

Scripting System Configs

- Launchd
  - Daemon Process
    - Runs as root, example: Set Computer Name
  - Agent
    - Runs as user, example: KeyChain Minder

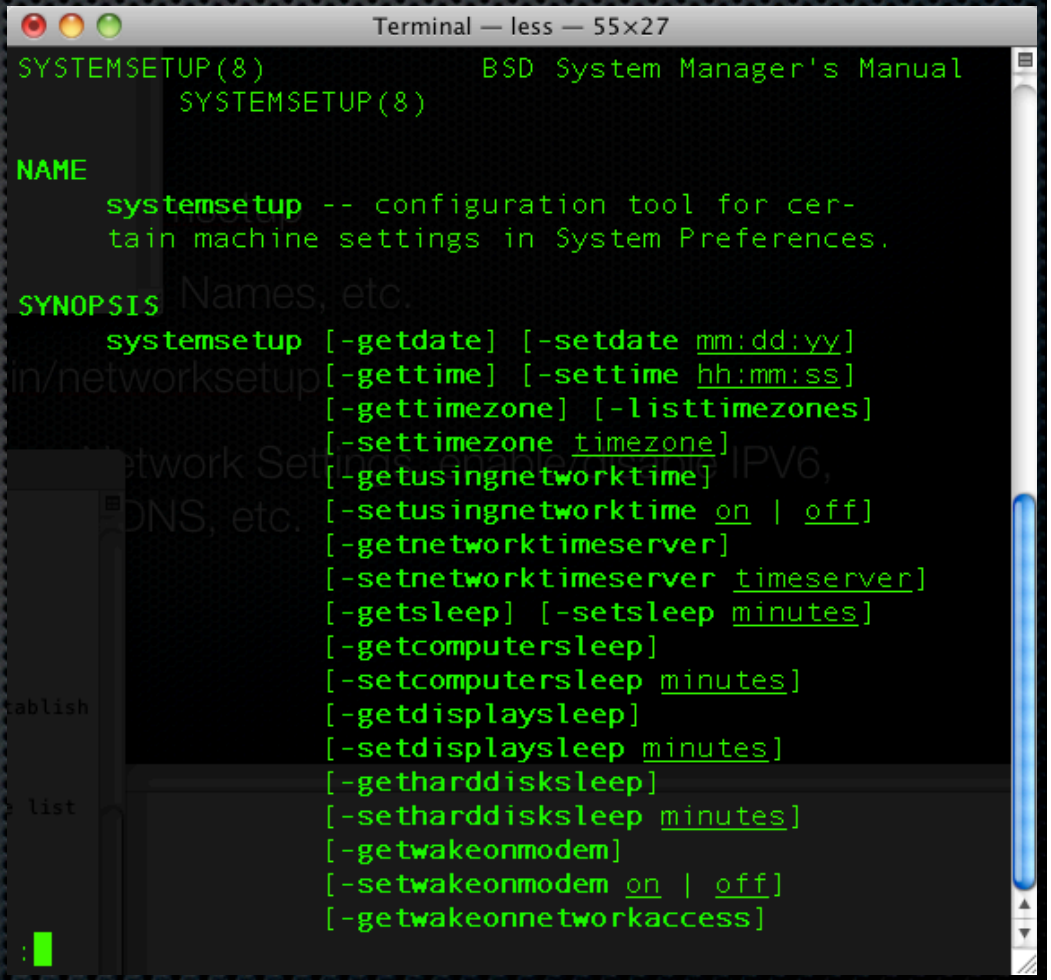


Scripting System Configs

- Launchd
  - Control with /bin/launchctl
    launchctl -load /Library/LaunchAgents/com.org.plist
  - Run at First Boot, On Demand, or Persistently

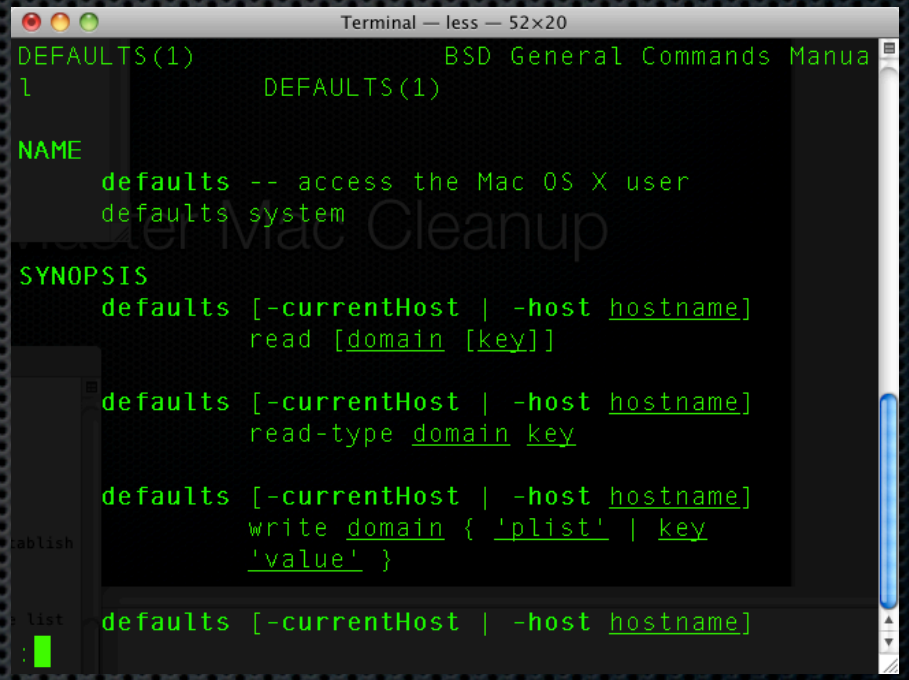
Scripting System Configs

- /usr/sbin/systemsetup
  - NTP, Sharing Names, etc.
- /usr/sbin/networksetup
  - Change Network Settings, enable/ disable IPV6, Configure DNS, etc.



Scripting System Configs

- Edit plist Files
  % /usr/libexec/PlistBuddy
  % /usr/bin/defaults
- Edit Local Directory Service
  % /usr/bin/dscl
- Start Remote Desktop via Script
  % /System/Library/CoreServices/RemoteManagement/ARDAgent.app/Contents/Resources/kickstart



Scripting System Configs

- Run Constantly, Time Of Day, or On Demand
- Launch Only Once Option

Master Mac Cleanup

Cruft Files

- Files specific to the Mac that booted must be cleaned and either removed or regenerated
- Empty Trash, Browser Histories, Downloads, etc.
- Don’t use the Master Mac as your personal workstation...

System Cleanup Script

- Greg Neagle's clean system script
  - http://tinyurl.com/systemcleanup
- ByHosts, Browser Caches, SleepImage File, and more...
- Local KDC Cleanup
  - rm -rf /var/db/krb5kdc
  - /usr/libexec/configureLocalKDC

Reset Defaults

- Force New Mac Setup
  - rm /var/db/.AppleSetupDone

Image Creation

Methods

- Classic (Monolithic) Method
  - Created from already booted Master Mac
- Modular (Package Installers to .dmg)
  - Creates clean, never booted system
- Hybrid Images
  - Creates Master Image, and NetBoot Image

Tools

- Apple
  - Disk Utility
  - System Image Utility
  - /usr/sbin/asr - restores AND creates images
- 3rd Party
  - SuperDuper, Carbon Copy Cloner, JAMF Casper suite, InstaDMG, many more ...

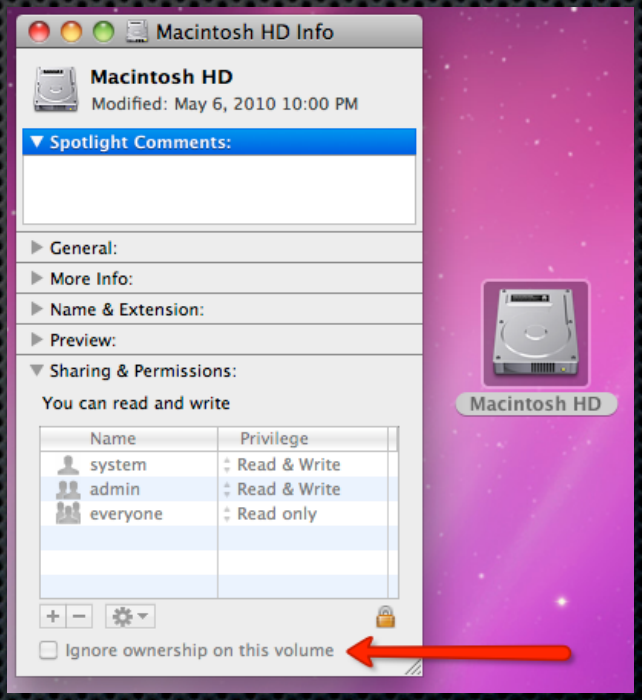
Classic Method

Classic Method

- Creates “Monolithic” Images
- Pros
  - Simple to learn, Apple documented
- Cons
  - Need to clean up files - caches, etc.
  - No automation, slow process

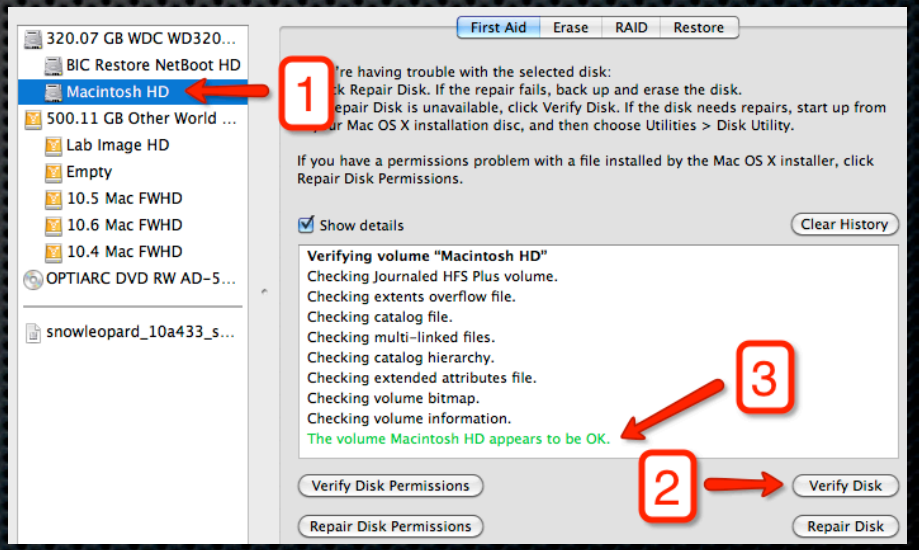
Classic Method

- Boot from another disk,
- Enable permissions, **uncheck** “Ignore Ownership on this volume”



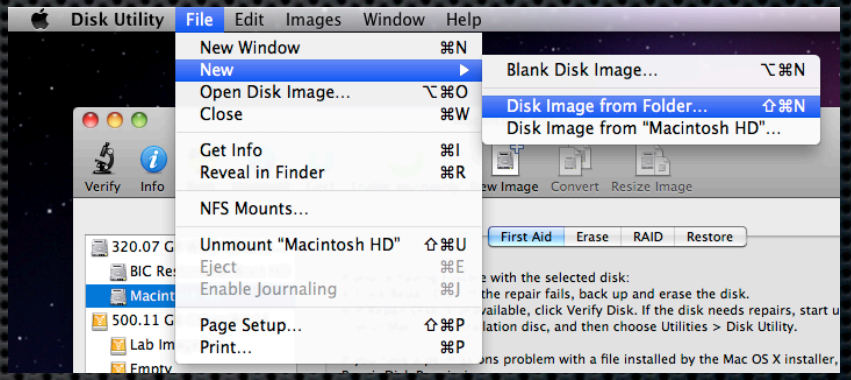
Classic Method

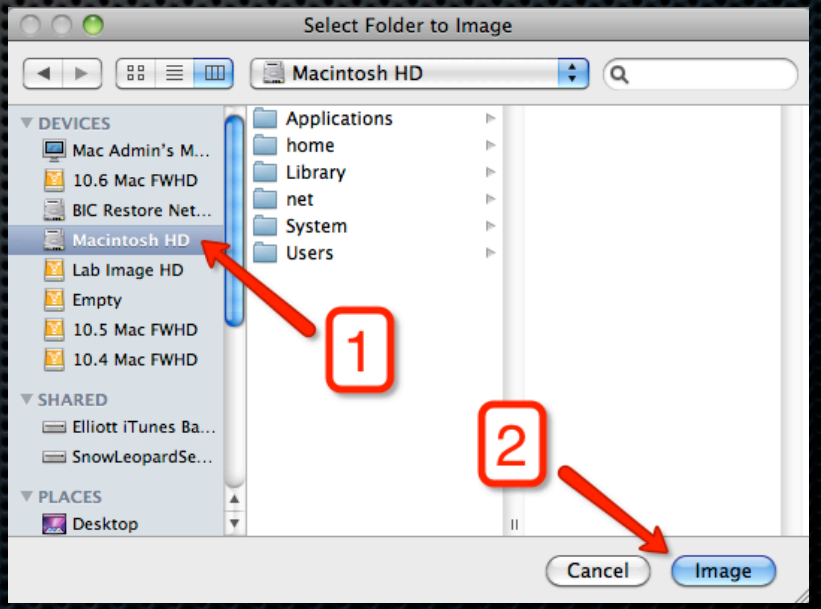
- Launch /Applications/Utilities/Disk Utility
  - Verify health of Master disk ***before*** imaging it



Classic Method

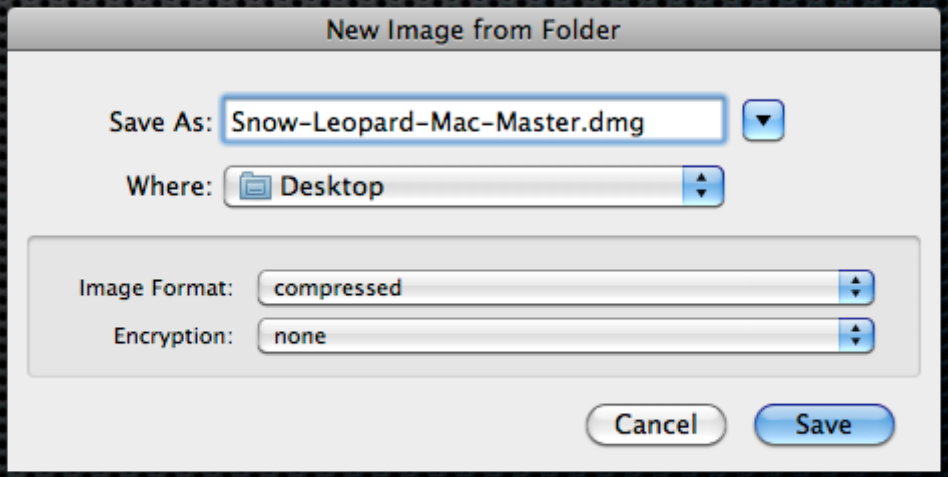
- Use “File -> New -> Image From Folder ...”
- Select ***root*** of Master disk





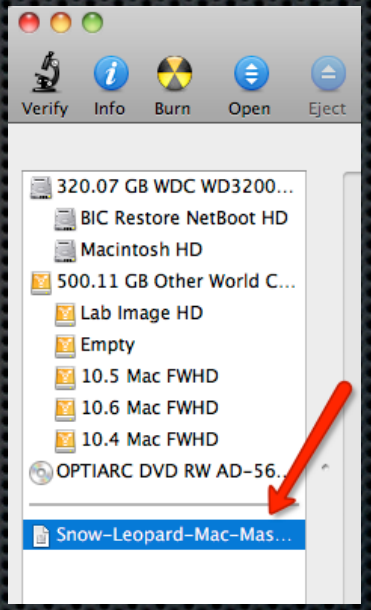
Classic Method

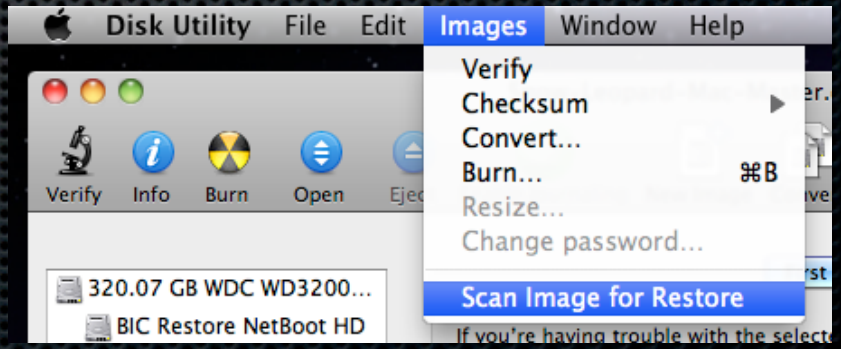
- Save image as Compressed, or Read-Only if using with ASR Multicast



Classic Method

- Scan Image for Restore
  - Adds checksums to image
  - Used to verify data integrity on restore
  - Optimizes image data for ASR multicast restores





Classic Method

- Disk image now ready for restore tools that use ASR restore disk images

Modular Image Creation

Modular Image Creation

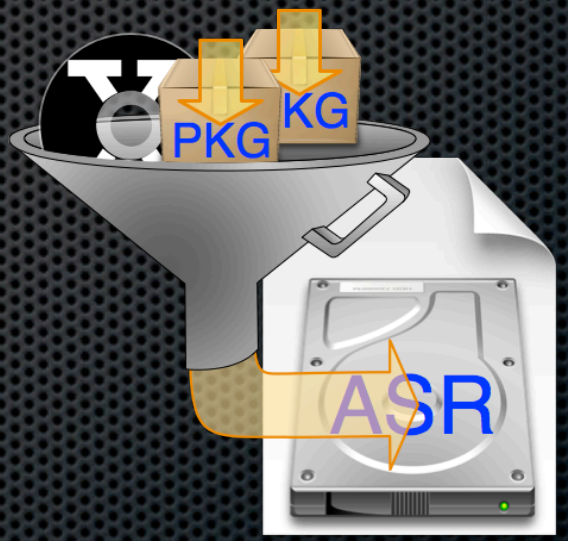
- Leverage the packages you've created
- Removes need to clean up the Master Mac
- Create much, much cleaner system images
- InstaDMG to the rescue!

Package Installers to .dmg

- Pros
  - Produces clean, never booted system
  - Easier to update than monolithic images
  - Scriptable
- Cons
  - Requires package installers*
    - *Many other tools leverage package installers

InstaDMG Overview

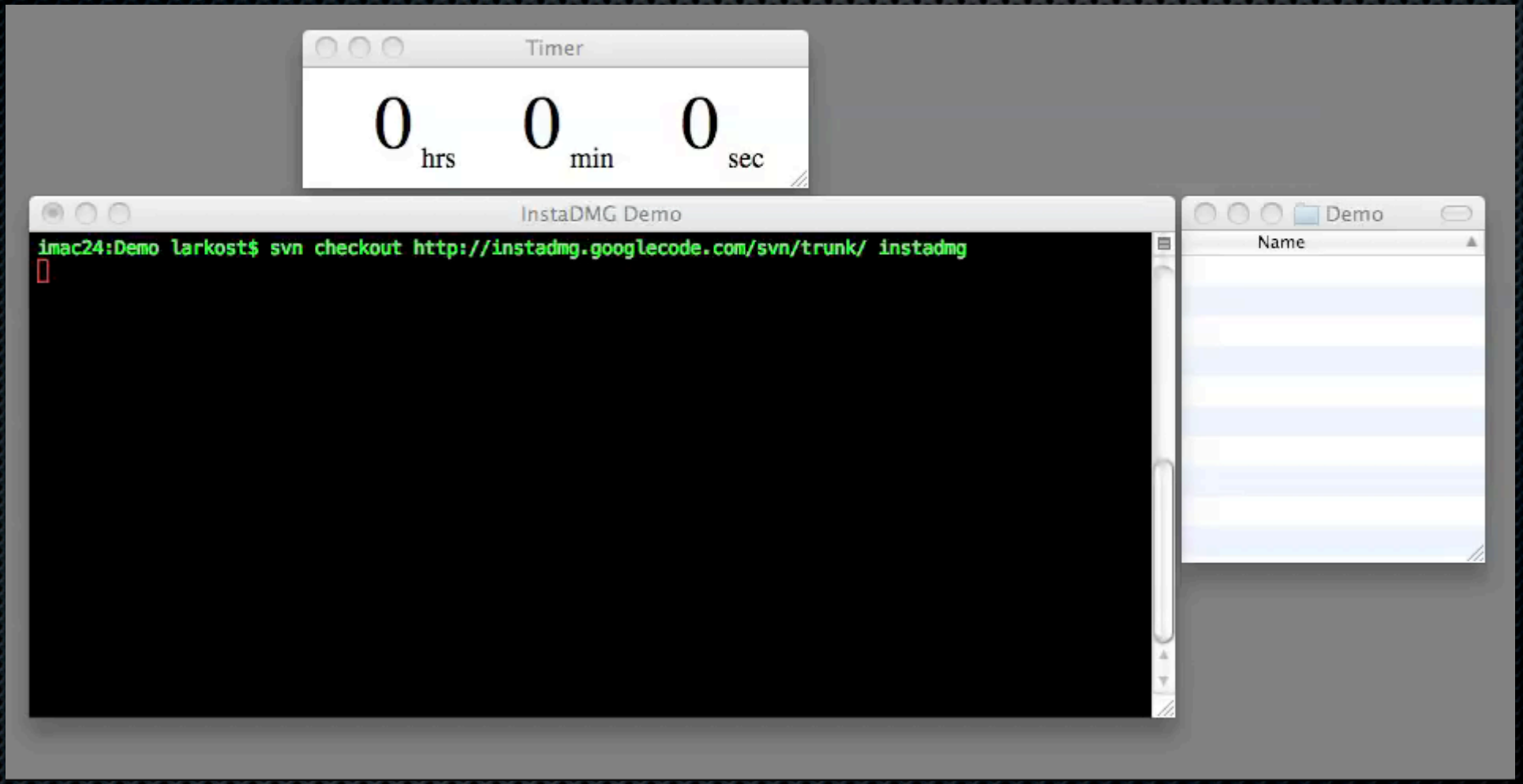
- Use Retail OS X Installer DVD
- Installs
  - Base System to Disk Image
  - Packages into Disk Image
- Runs Scripts on Disk Image
- Builds Vanilla 10.5.8 or 10.6.3 system image



InstaDMG in 3 Steps

- svn checkout http://instadmg.googlecode.com/svn/ trunk instadmg
- sudo ./instadmg/AddOns/InstaUp2Date/importDisk.py --automatic --legacy
- sudo ./instadmg/AddOns/InstaUp2Date/instaUp2Date 10.6_vanilla --process

InstaDMG In Action



*Credit for Movie: Karl Kuehn

InstaUp2Date

- List of Software to Install to Disk Image (Catalog)
  - Create your own catalogs & Nest Catalogs
- sha1 Checksum on downloads
- Create Checksum with checksum.py tool
  - Outputs Lines for Catalog Files

Installer Choices

- Each String is a mouse click
- Click choices to remove or add item to install

```
<array>
    <string>PrinterDriversGroup</string>
    <string>Guten_Printer_Drivers</string>
    <string>AdditionalFonts</string>
    <string>LanguageTranslations</string>
</array>
```

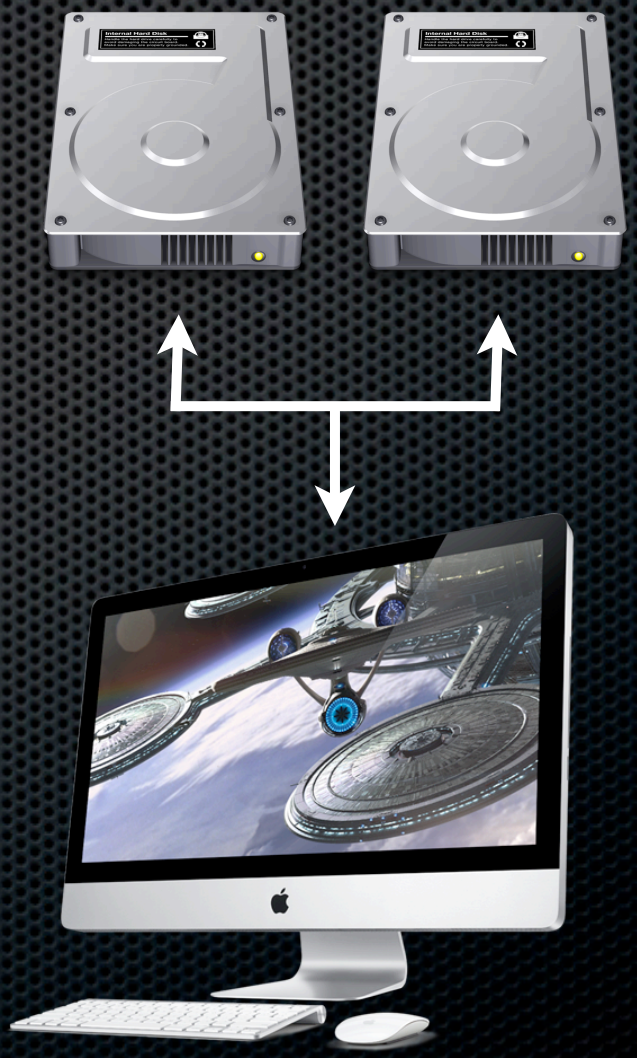
CreateUser.pkg

- Creates User Account
- Can
  - Be Admin
  - Hidden Account
  - Change User Image
- Password Stored as Shadow Hash

Optimizing

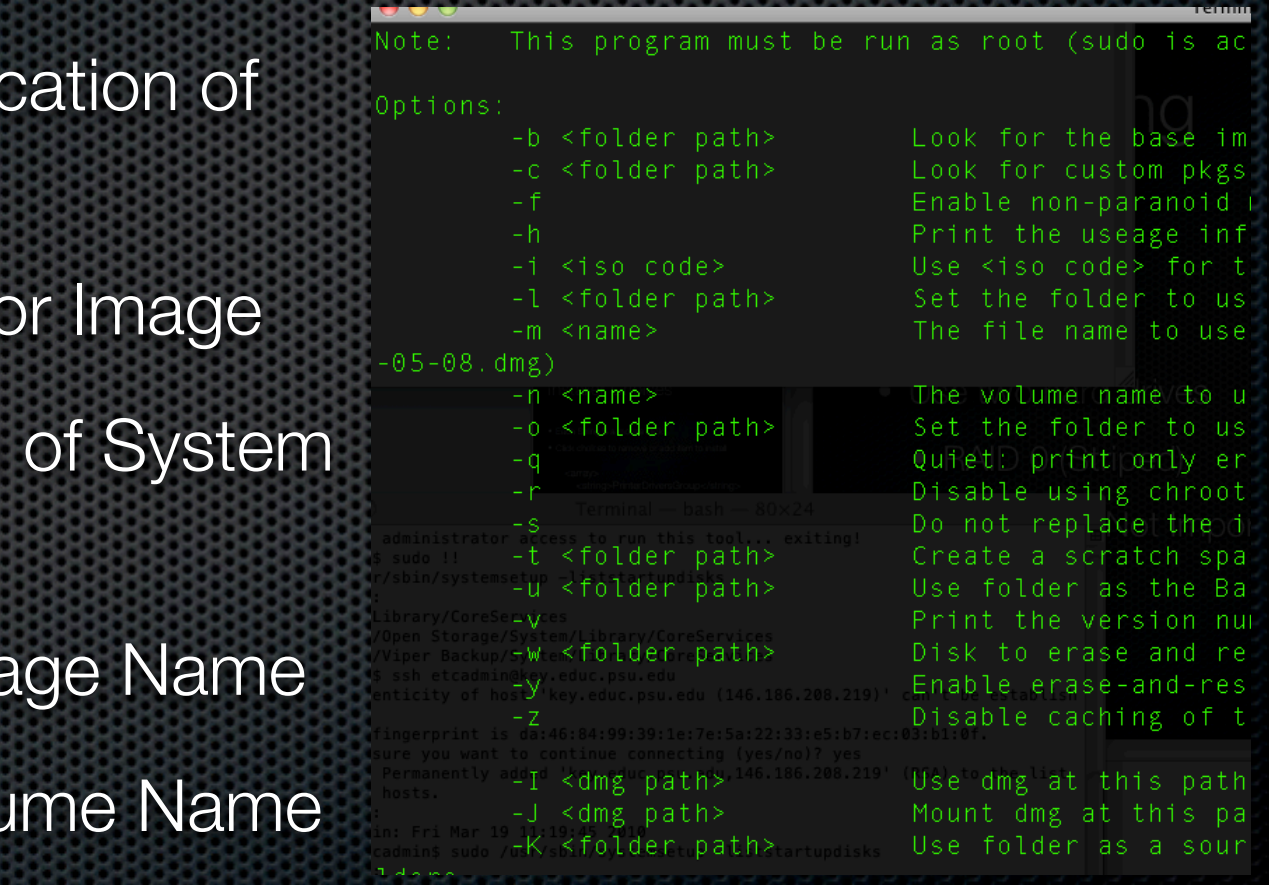
- Fast Drives
- Use two hard drives
  - RAID 0 (Striped)
- RAM & CPU Not Important

Striped (RAID 0)



Flags

- -f Skip Image Verification of Checksum
- -t Temp Directory for Image
- -o Output Location of System Image
- -m Output Disk Image Name
- -n Output Disk Volume Name



The Thorns

- Some Packages don’t work (iTunes, Cisco VPN)
  - Repackage them yourself
- All System Changes need to be Scripted or Captured
- Some System Config changes req booted System
  - Solution: First Boot Scripts

Hybrid Images

System Image Utility

- Included with Server Admin Tools Installer
  - Google for “Server Admin Tools 10.6.3”
- Can create Image of Master Mac
- Produces Images for NetBoot, NetInstall, NetRestore

NetRestore Images

NetRestore

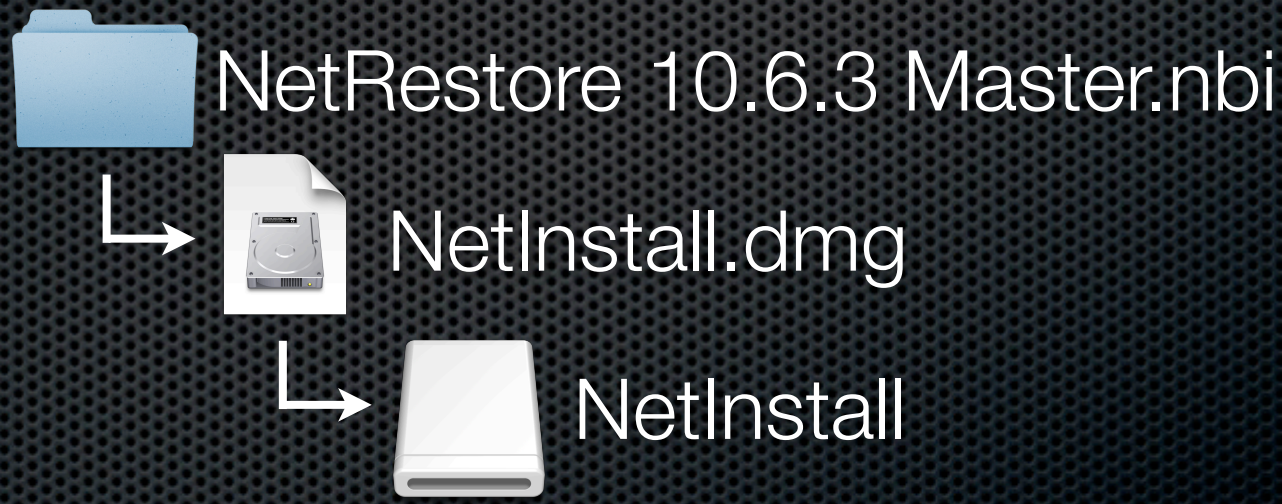
- Two ways to access Master Image
  - Master System.dmg included in the .nbi folder, or
  - System.dmg is zero bytes if restoring from network sources (http, mASR server)

NetRestore

- Apply package installers to restored image
- Cleans System Cruft for Deployment (Local KDC)

NetRestore Image Structure

- Master image in .nbi



NetRestore Image Structure

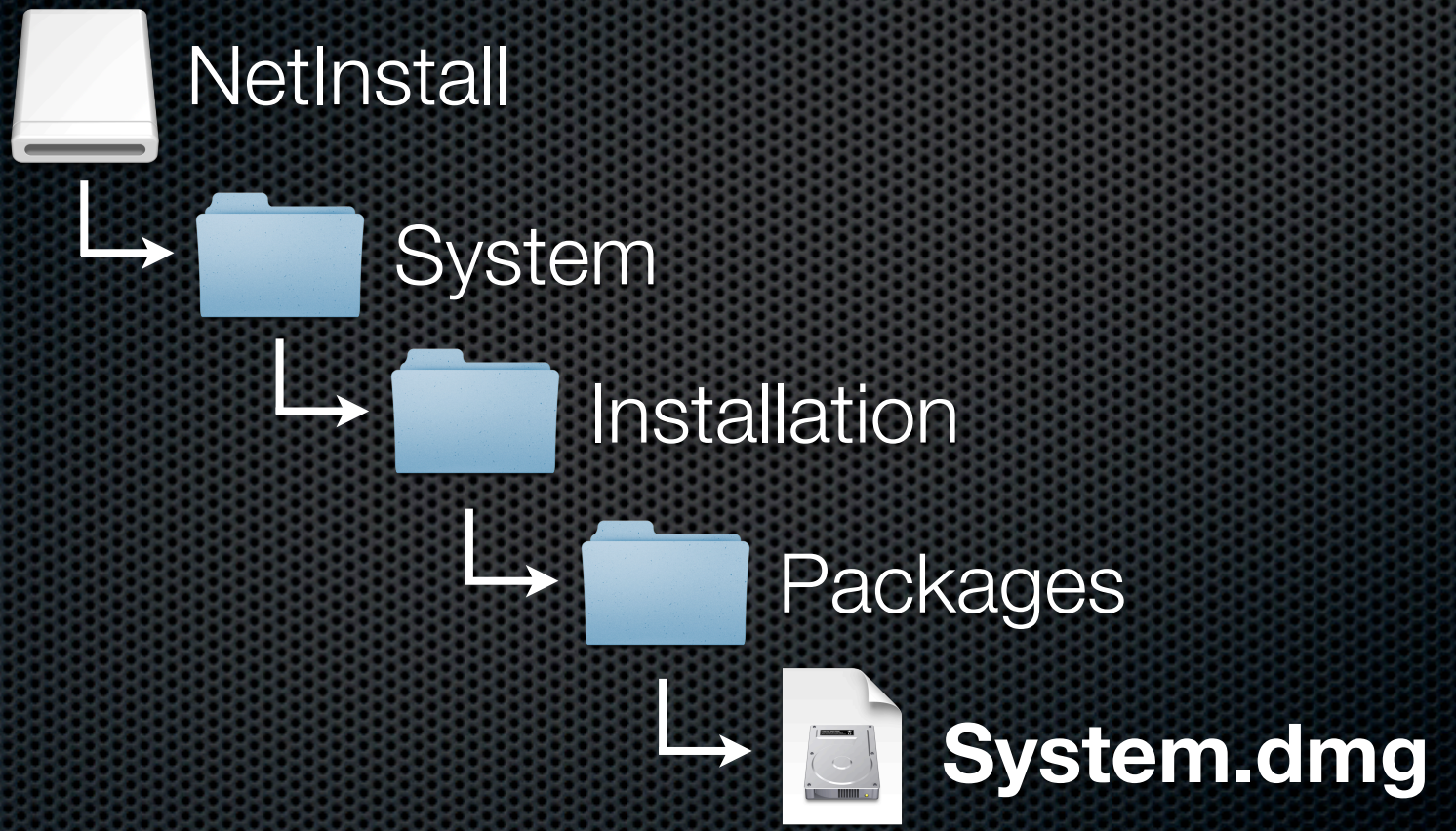


Image Tweaking

Image Formats

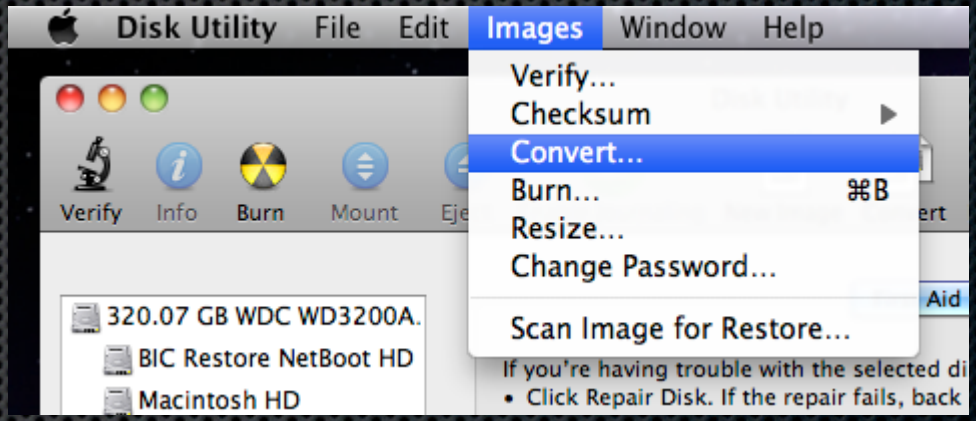
- Format Options for Disk Images
  - Read/Write
  - Compressed
  - Read-Only (For ASR Multicast)

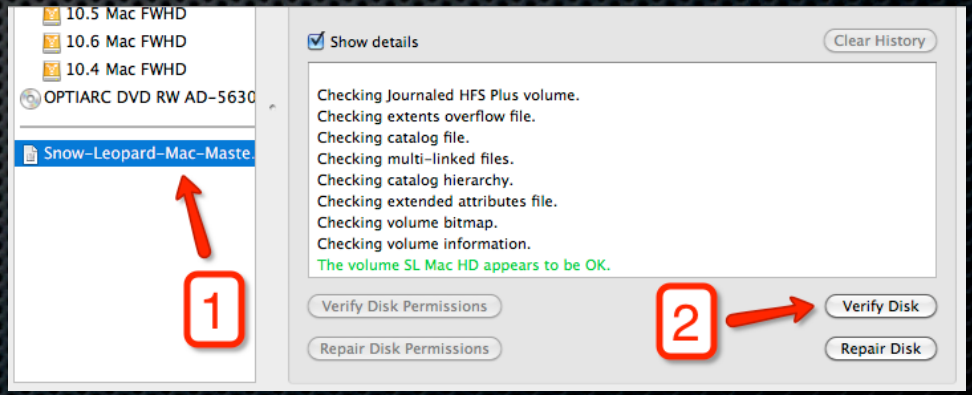
ASR Scan for Restore

- Adds checksums to image data
- Used to verify data integrity on restored volume
- Applies only to Read-Only/ Compressed Images
- Re-orders data in file for ASR Multicasting

Image Testing

- Create Read-Write Images for quicker changes
  - Convert to Read-Only/ Compressed when ready
- Verify the health of your Master Disk Images



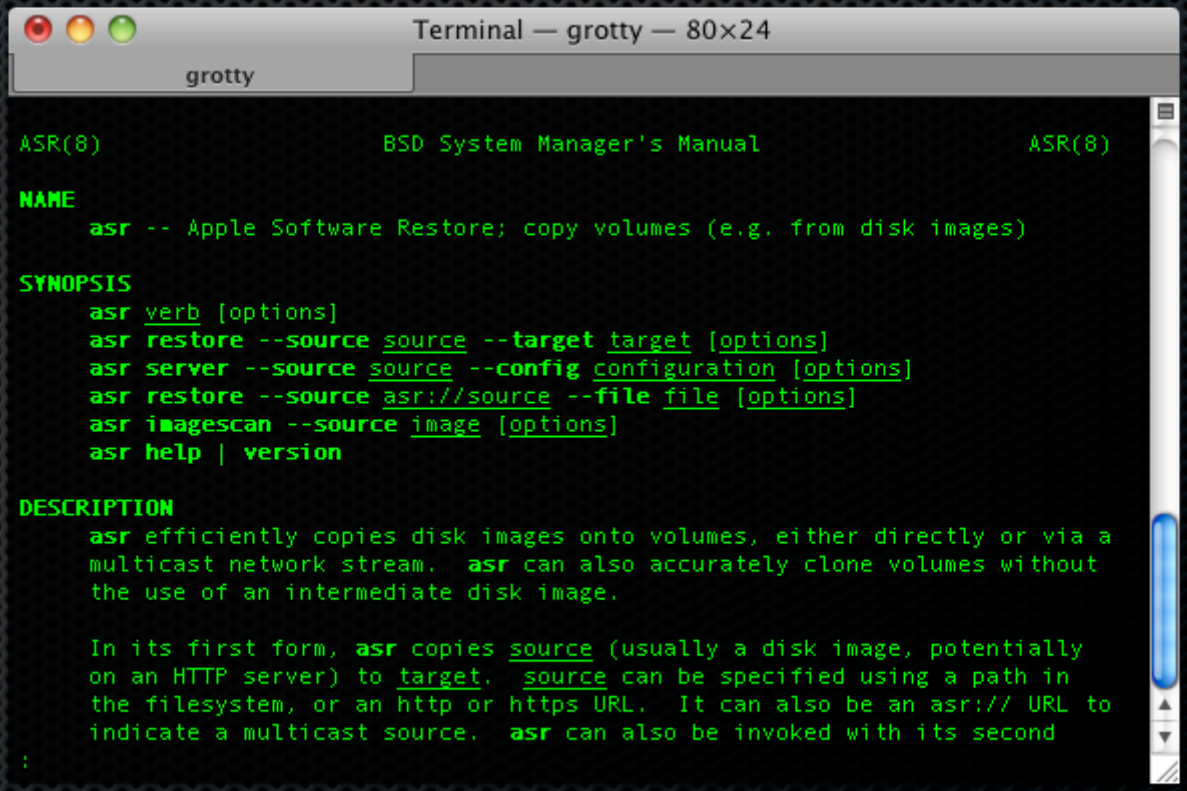


For the Command Line Junkies ...

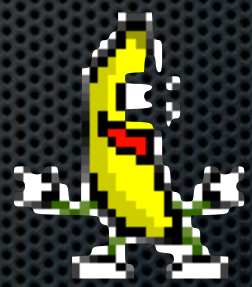
(I'm one of them!)

Command Line Tools

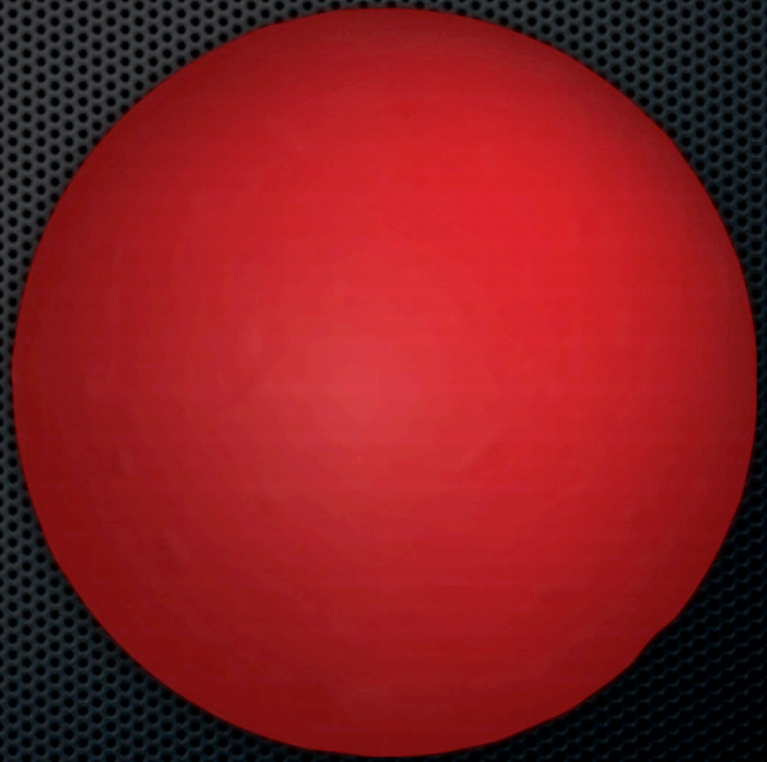
- % man asr
- % man hdiutil
- % man bless
- % man diskutil



Demo Time



LaunchD



Resources

- Read Apple's OS X Server Docs, specifically "System Imaging & Software Update Administration"
  - http://www.apple.com/server/macosx/resources/
- http://clc.its.psu.edu/Labs/Mac/Resources/
- BIC Home Page: http://tinyurl.com/psubic
- Deploy Studio: http://www.deploystudio.com/
- InstaDMG Home Page on Google Code

Resources

- Apple's System Imaging List
  - http://lists.apple.com/mailman/listinfo/system-imaging
- MacEnterprise.org list
- afp548.com

Q & A

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