Imaging MacOS X

Karl Kuehn - Lead developer InstaDMG

MacSysAdmin Conference 2009

Introduction

Presentation Overview

- Imaging Concepts
- Available Systems
- Important Tools
- Choosing your path
- Tips & Tricks
- More InstaDMG (time allowing)

Introduction

What I will not cover

- Windows Imaging
- Multi-volume imaging (nothing handles it well)
- Computer Maintenance (post imaging)

Imaging Concepts

An introduction to system imaging

Imaging Concepts

What is system imaging

- *Take the setup work for one computer and apply it to others*

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Applications

Imaging Concepts

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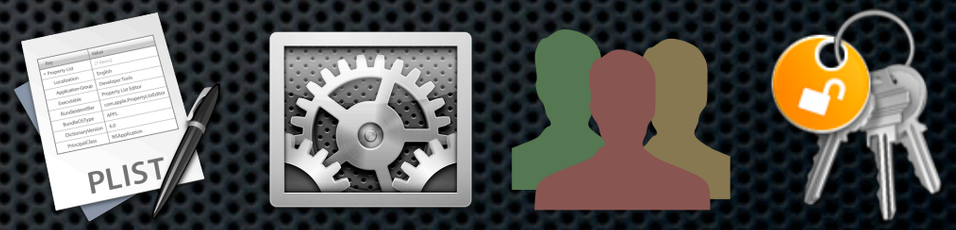
Applications

Settings and Preferences



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Settings and Preferences

Setup

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Imaging Concepts

Image Files

- Apple's .dmg format is the standard on MacOS
- Encapsulates one or more filesystems
  - In practice just one
  - Typically replaces entire volume - "Monolithic Image"
  - Can also be used to replace specific files (much slower)
  - Capture or restore can be block-level or file-by-file

Imaging Concepts

Image Files

Block Create

- Copies disk exactly
- Image any format
- Faster capture/restore

Block Restore

- Much faster (10x +)
- Wipes out disk first

File-by-File Create

- New pristine image
- Makes native format
- Avoid disk corruption

File-by-File Restore (copy)

- Essentially file copy
- Replaces individual files

Why Image

- *“Laziness: The quality that makes you go to great effort to reduce overall energy expenditure.”*

  Larry Wall, Programming Perl

- Trade up-front setup time for less time per-computer
- Three types of time:

  wall time, your time, computer time
- Indispensable in some setups, impractical for others

When to Image

Good Situations

- Initial deployment
- Tightly controlled systems
  - Computer Labs
  - Testing Labs
- Nuke ‘n Pave
- Don’t care about the data

Bad Situations

- Every computer is unique
  - Software & Hardware
  - Users are local admins
  - Lots of local changes
  - Computer based licenses

Imaging Concepts

Review

Imaging Concepts

Review

Create
Golden Master

Imaging Concepts

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Capture
Image

Imaging Concepts

Review

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Capture
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Restore
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Imaging Concepts

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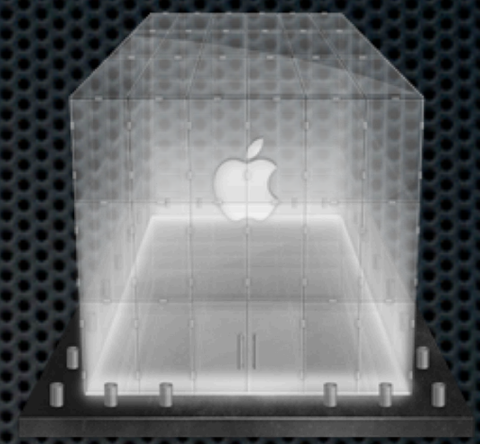
Post-Restore
Actions

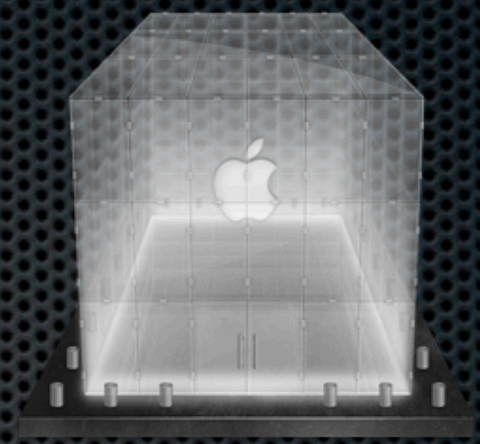
Golden Computer

Golden Computer



Golden Computer

The retail experience



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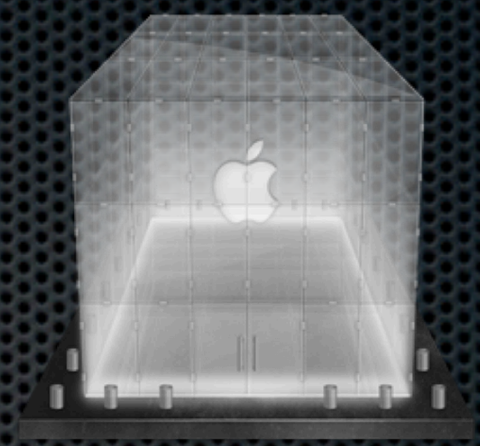

Buy a New
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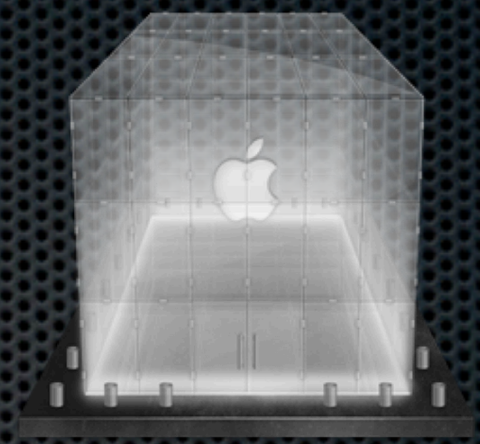

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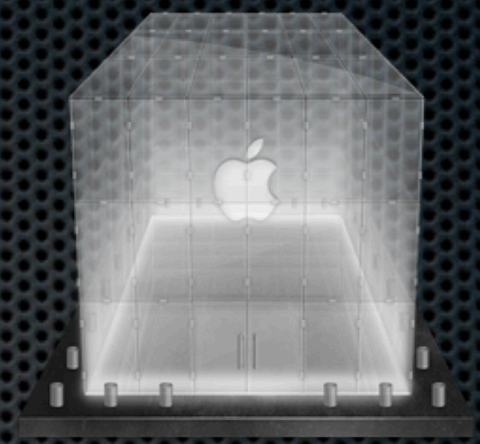

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Manually Install Apps and Settings

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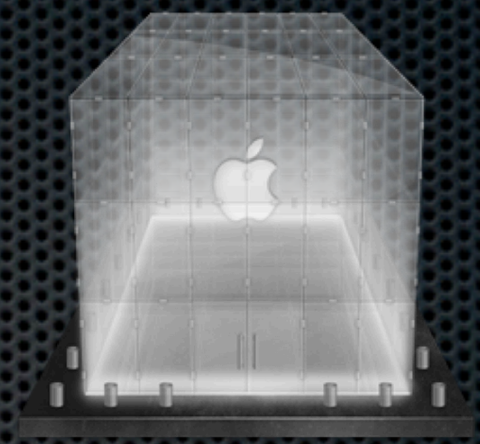

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Applying the image

- Small step from retail experience
- Much faster to restore than install (10 min. vs. 45 min.)
- Little setup or hardware required

- Very manual, does not scale
- There are some problems... (later)
- How do you update the image? Clean or Dirty?

MegaPackage

An alternate route

- Wrap up your work in neat bundles, and let the computer repeat it the same way every time
- Learn to create packages, it is really, really worth it
- Wrap all of your packages in a single meta-package:

  A one (... err.. few) click install of your settings and apps
- Apply this to a new computer, to update an in-the-field computer, or as a troubleshooting step

Packaging

- Learn to create packages
- Many tools available:

PackageMaker

Iceberg

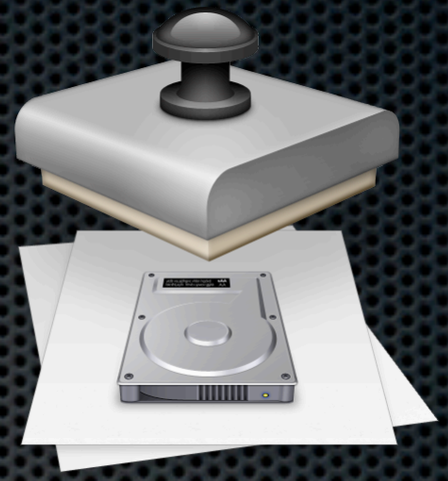
JAMF Composer

InstallEase

- Useable in so many different parts of a workflow
- Think of packages as a bank where you store your time
- If you invest early, then you get rewarded by interest
- More than worth the effort and learning curve

System Image Utility

Leopard Version



- Comes with Server Admin Tools (free download)
- Creates NetBoot (.nbi) sets from your setup
  - NetBoot clients
  - NetInstall
  - NetInstall Block restore - (NetRestore)
- Workflow items to add users, packages, etc...

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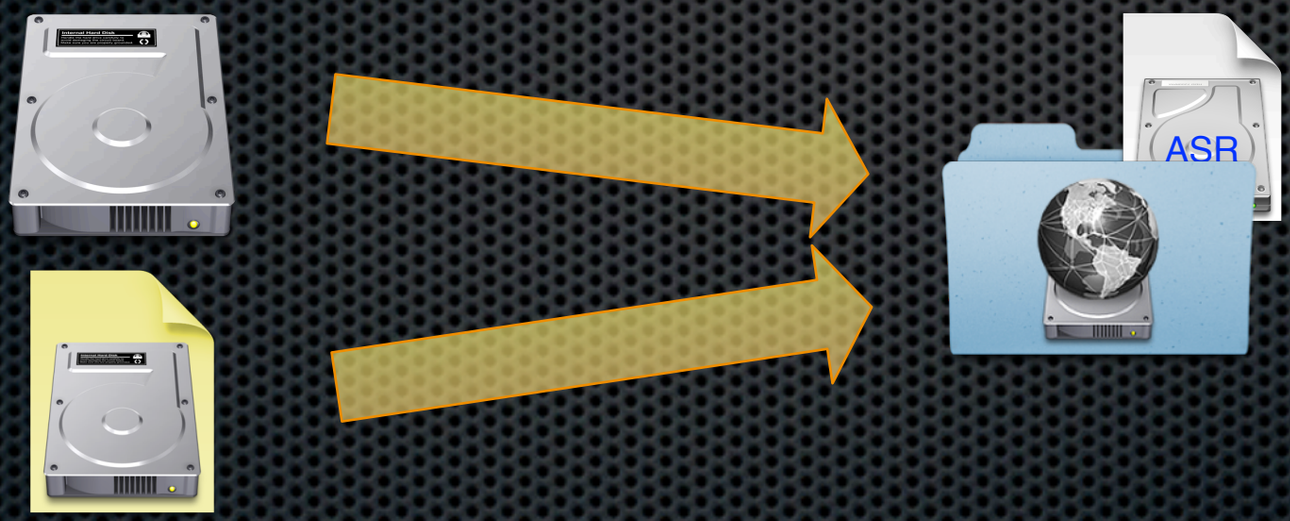

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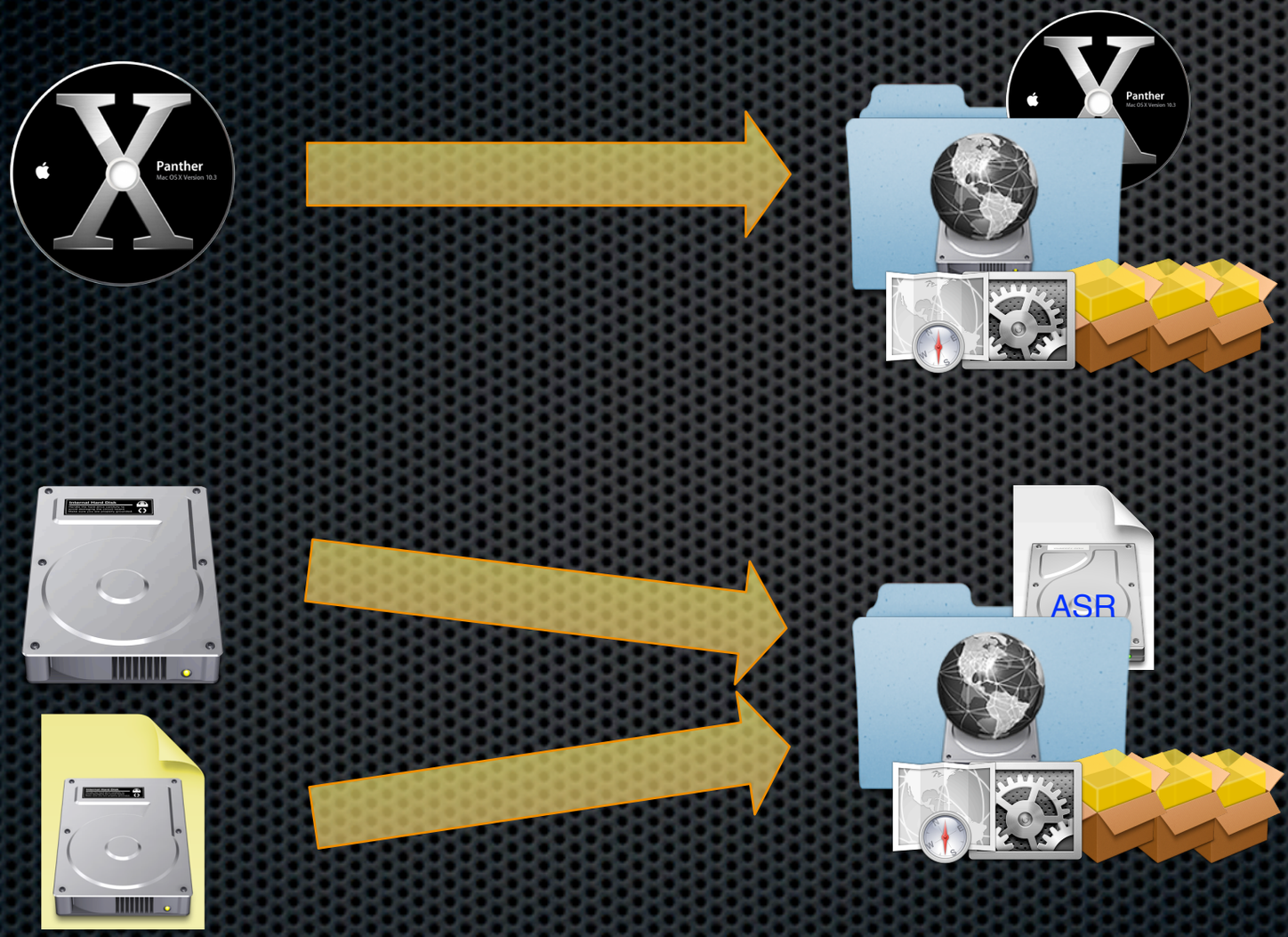

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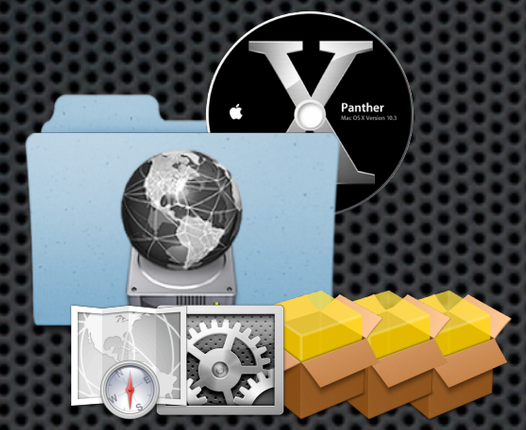

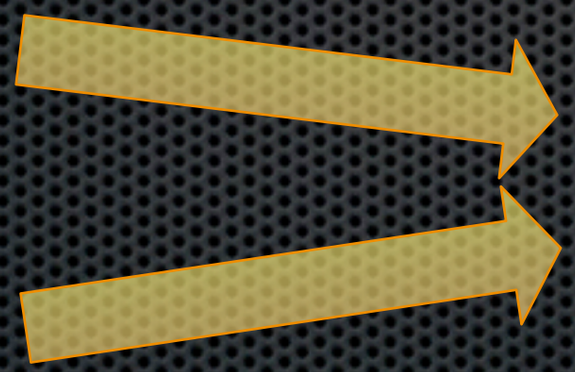

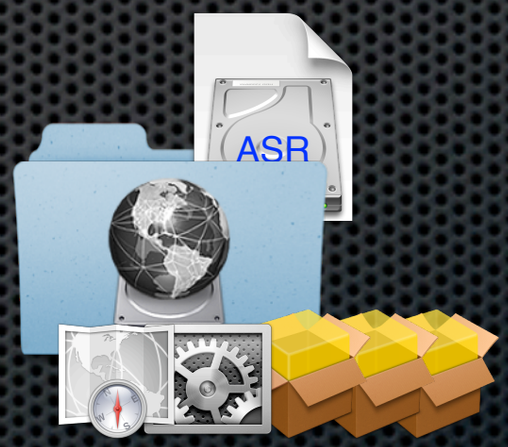

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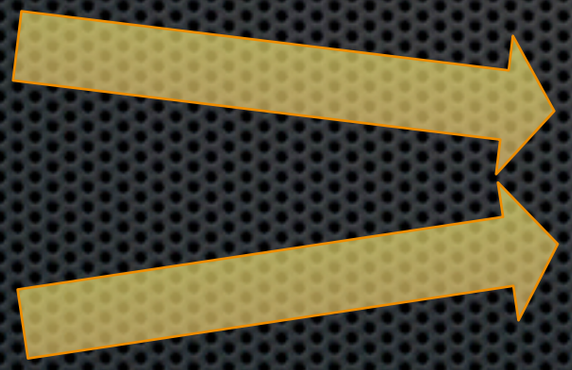

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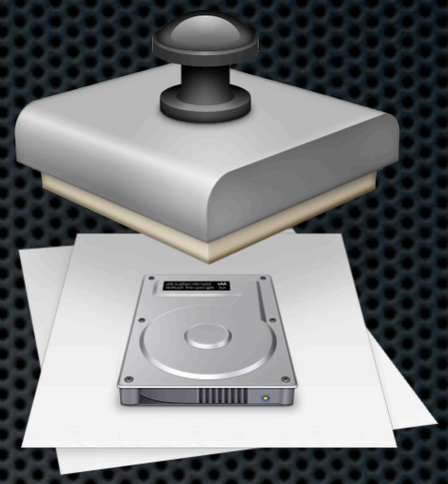

- NetBoot makes it easier to scale/delegate
- Some automation is possible
- NetInstall is slower to install, but possibly safer
- Block restore is much faster, and can take your images
- Both can have additional packages/settings
  - No support for computer-by-computer choices

Bombich NetRestore

The retired champ

- *Probably most used restore technique - the basis of comparison*
- *Has been withdrawn*
- *A tool for creating and deploying ASR images*
  - *Evolved from a tools disk item*
  - *Creates .nbi sets from booted computer*
    - *.nbi is a good tools disk setup*
  - *Can be automated or scripted, but a lot of custom development*

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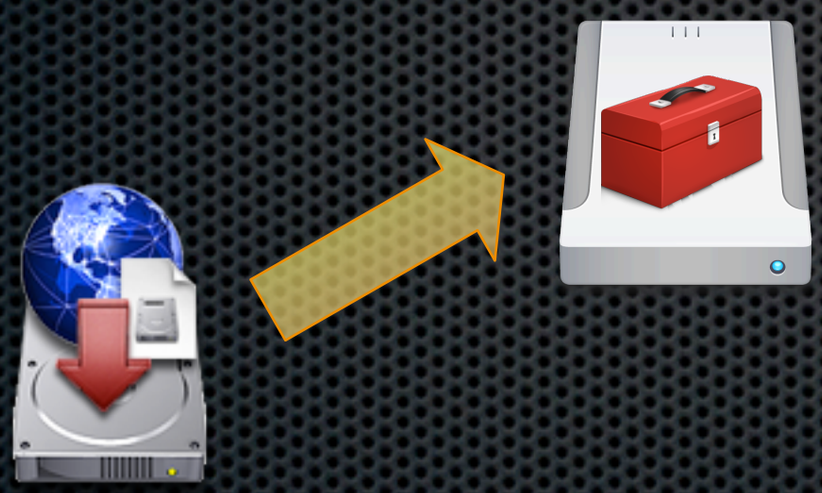

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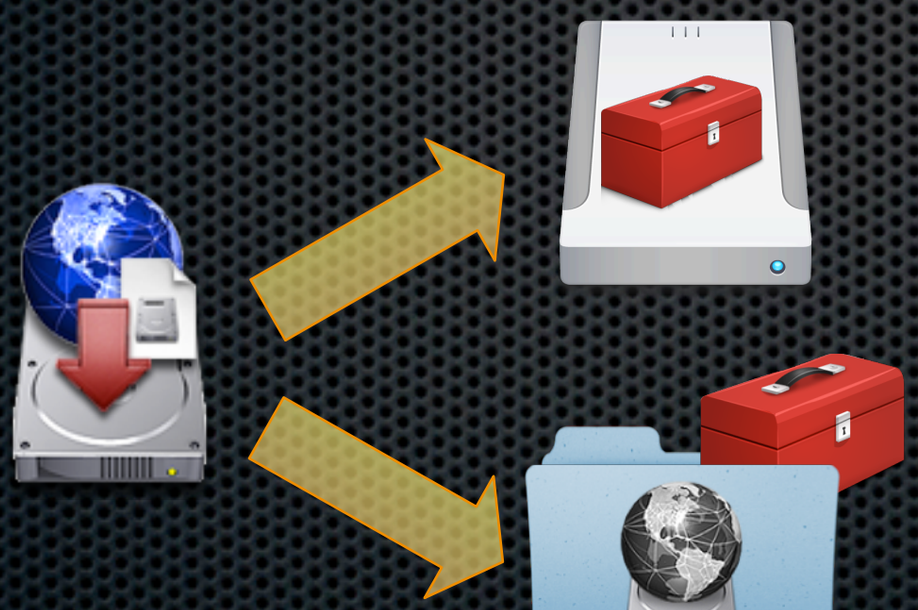

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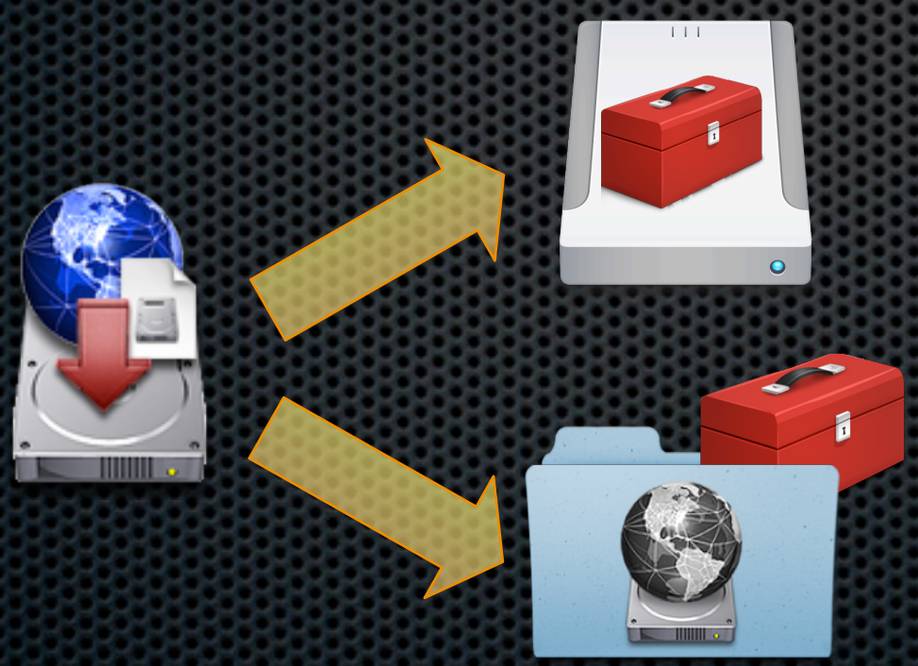

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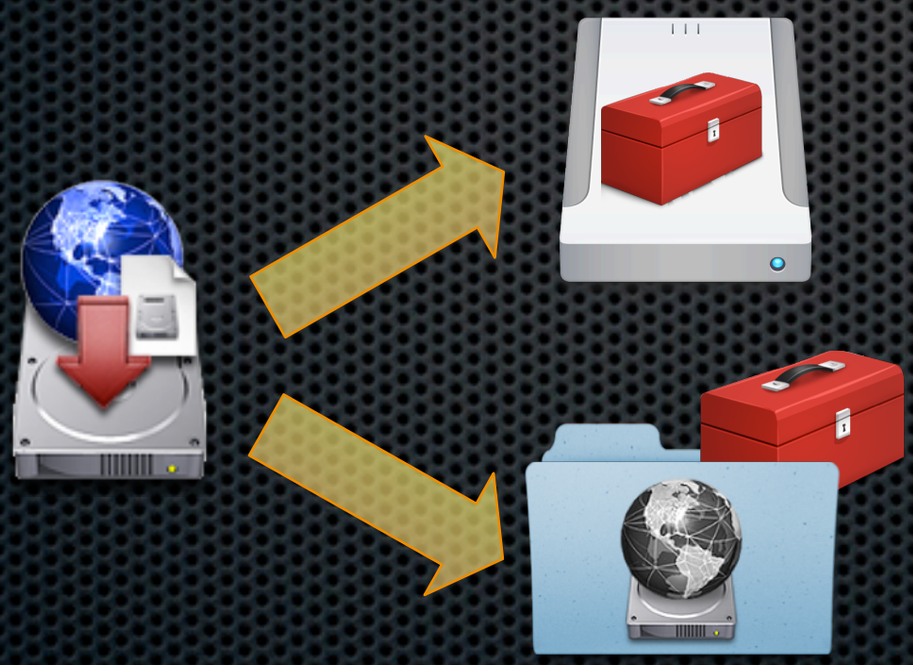

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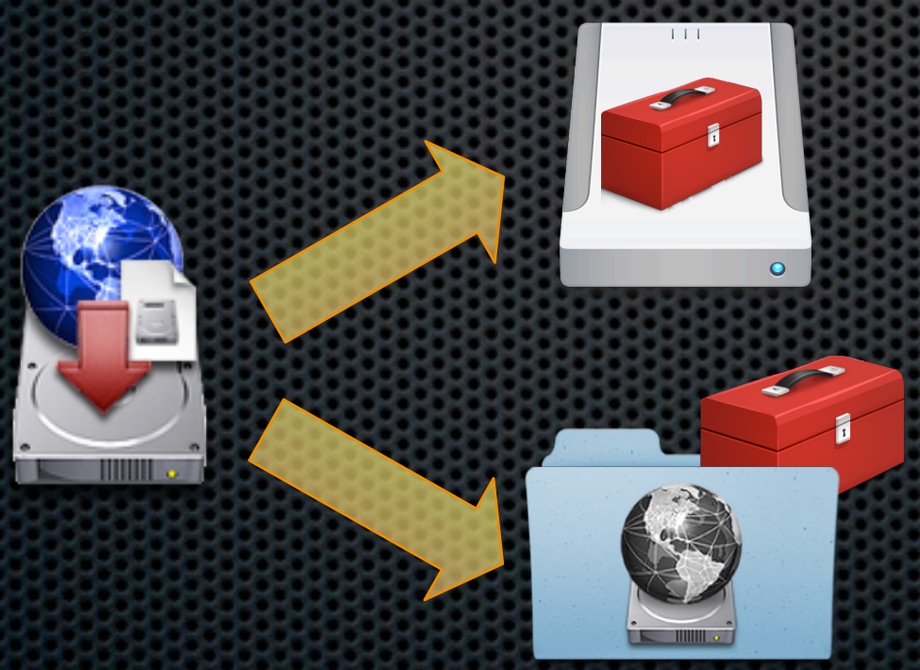

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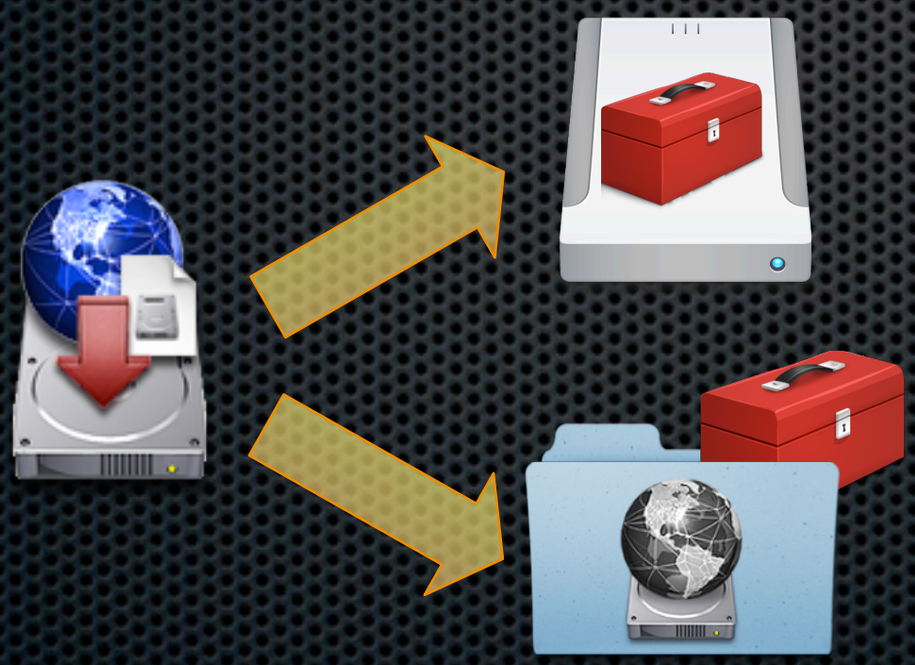

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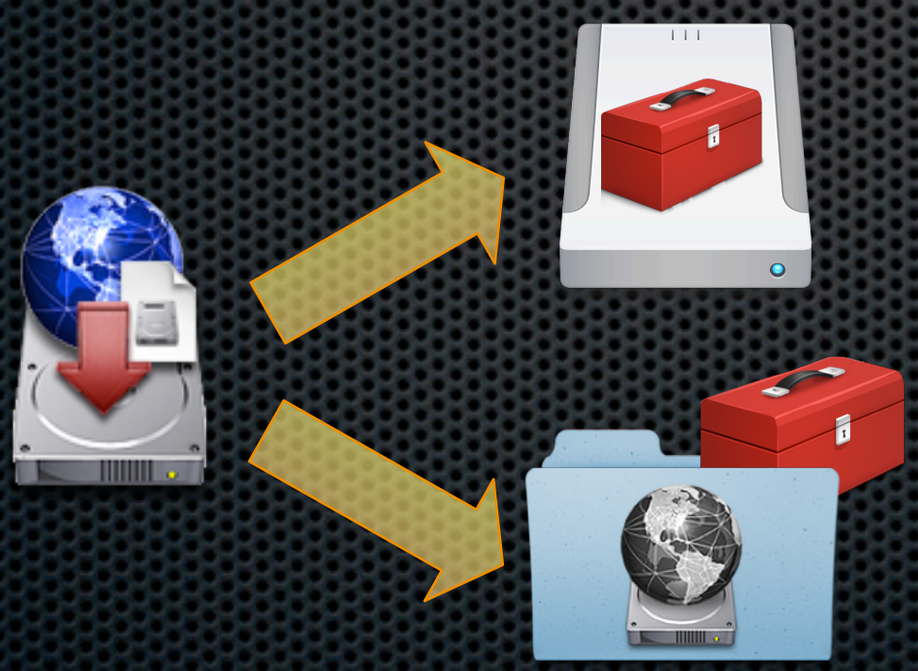

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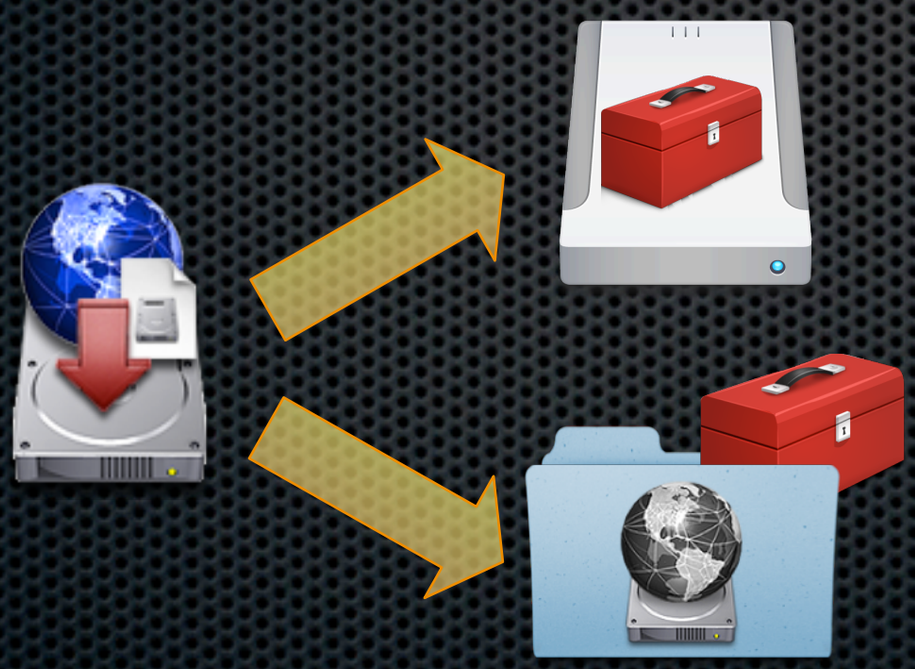

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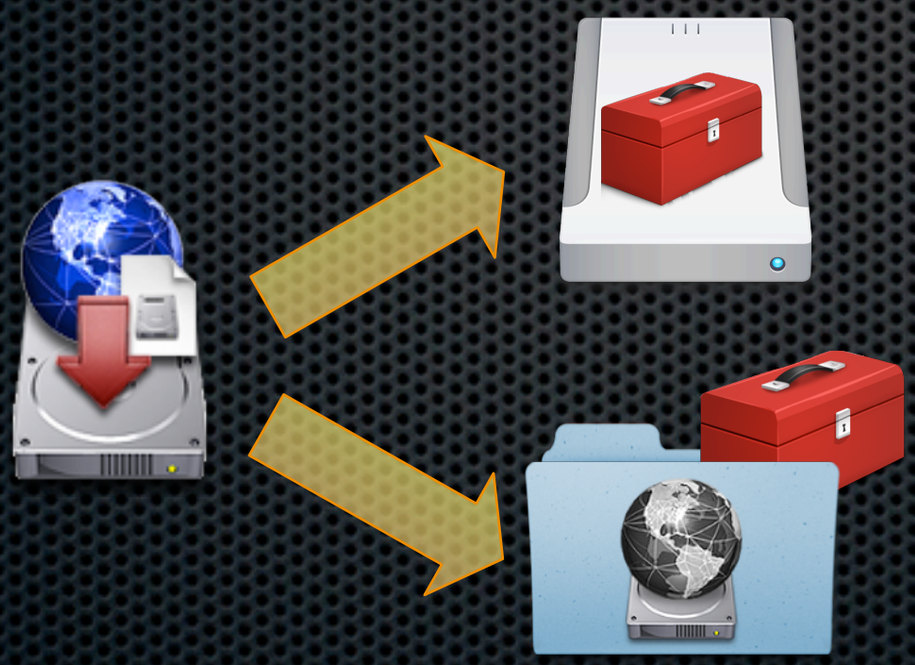

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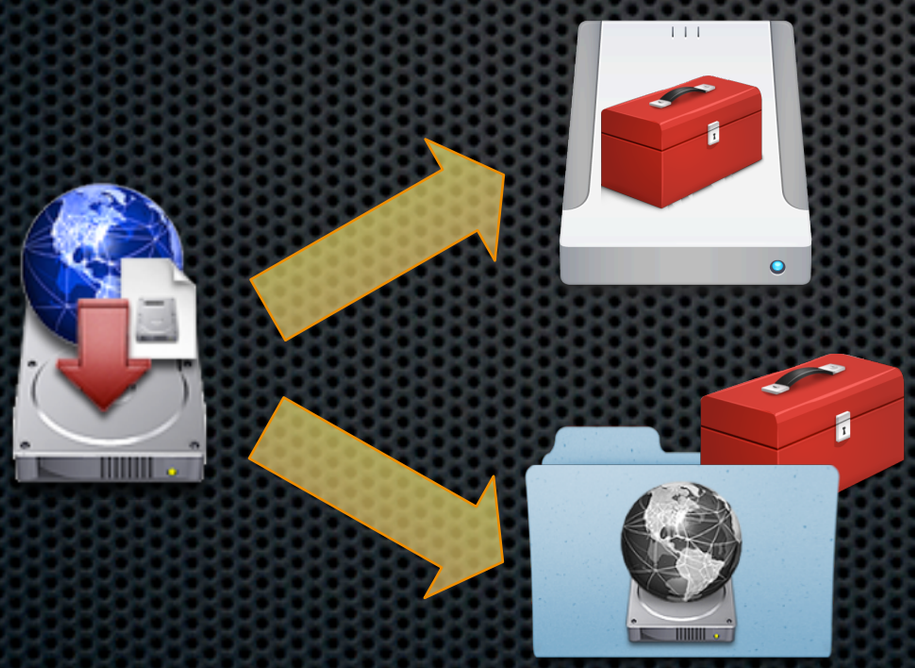

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- Allowed for portable drives or netboot
- User could choose the image and the target
- Auto-configuration with PHP (extra setup)
- Central admins could delegate to others
- Can even use ASR broadcasting

Where we are

Create Golden Master

Capture Image

Restore Image

Post-Restore Actions

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DeployStudio Server

The new kid on the block

- The anointed inheritor to NetRestore
- Everything is handled with a workflow full of items:

  Packages, Binding, Naming, etc..
- Packages can be installed during first boot
- Many decisions can be automated, or deferred to console

DeployStudio Server

The new kid on the block

Dirty Images

- Trashes, Caches, /tmp, Kernel Caches
- Leftover downloads, Browser history, etc...
- First boot configuration
- Sets up the network ports and hostname
- Setup Local KDC (weird effects in Bonjour iChat)
- SSH host keys
- And a lot more...

Dirty Images

Greg Neagle's cleanup script

```
#!/bin/sh
#this script does some cleanup in preperation for building an image
#best to run this from single user mode, or at least right before you shutdown
#run this as root, or with sudo rights

#set machine names back to generic
/usr/sbin/scutil --set ComputerName "OSX_Standard_Image"
/usr/sbin/scutil --set LocalHostName "osximg"

#delete swapfiles
rm /private/var/vm/swapfile*

#delete volume info DB
rm /private/var/db/volinfo.database

#cleanup local admin's home dir
rm -rf /Users/admin/Desktop/*
rm -rf /Users/admin/Documents/*
rm -rf /Users/admin/Library/Caches/*
rm -rf /Users/admin/Library/Recent\ Servers/*
rm -rf /Users/admin/Library/Logs/*
rm -rf /Users/admin/Library/Keychains/*
rm -rf /Users/admin/Library/Preferences/ByHost/*
rm -f /Users/admin/Library/Preferences/com.apple.recentitems.plist
rm -rf /Users/admin/Movies/*
rm -rf /Users/admin/Music/*
rm -rf /Users/admin/Pictures/*
rm -rf /Users/admin/Public/Drop\ Box/*

#cleanup root's home dir
rm -rf /private/var/root/Desktop/*
rm -rf /private/var/root/Documents/*
rm -rf /private/var/root/Downloads/*
rm -rf /private/var/root/Library/Caches/*
rm -rf /private/var/root/Library/Recent\ Servers/*
rm -rf /private/var/root/Library/Logs/*
rm -rf /private/var/root/Library/Keychains/*
rm -rf /private/var/root/Library/Preferences/ByHost/*
rm -f /private/var/root/Library/Preferences/com.apple.recentitems.plist
rm -rf /private/var/root/Public/Drop\ Box/*

#clean up global caches and temp data
rm -rf /Library/Caches/*
rm -rf /System/Library/Caches/*
rm -rf /Users/Shared/*
rm -f /private/etc/ssh_host*

#network interfaces - this is regenerated on reboot and can differ on different
hardware
rm /Library/Preferences/SystemConfiguration/NetworkInterfaces.plist

#Leopard - cleanup local KDC, see http://support.apple.com/kb/TS1245
/usr/sbin/systemkeychain -k /Library/Keychains/System.keychain -C -f
rm -rf /var/db/krb5kdc
/usr/bin/defaults delete /System/Library/LaunchDaemons/
com.apple.configureLocalKDC Disabled

#log cleanup.  We touch the log file after removing it since syslog
#won't create missing logs.
rm /private/var/log/alf.log
touch /private/var/log/alf.log
rm /private/var/log/cups/access_log
touch /private/var/log/cups/access_log
rm /private/var/log/cups/error_log
touch /private/var/log/cups/error_log
rm /private/var/log/cups/page_log
touch /private/var/log/cups/page_log
rm /private/var/log/daily.out
rm /private/var/log/ftp.log*
touch /private/var/log/ftp.log
rm -rf /private/var/log/httpd/*
rm /private/var/log/lastlog
rm /private/var/log/lookupd.log*
rm /private/var/log/lpr.log*
rm /private/var/log/mail.log*
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rm /private/var/log/run_radmind.log
rm -rf /private/var/log/samba/*
rm /private/var/log/secure.log
touch /private/var/log/secure.log
rm /private/var/log/system.log*
touch /private/var/log/system.log
rm /private/var/log/weekly.out
rm /private/var/log/windowserver.log
touch /private/var/log/windowserver.log
rm /private/var/log/windowserver_last.log
rm /private/var/log/wtmp.*
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http://managingosx.wordpress.com/2009/01/23/image-cleanup-script/

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rm /private/var/log/cups/page_log
touch /private/var/log/cups/page_log
rm /private/var/log/daily.out
rm /private/var/log/ftp.log*
touch /private/var/log/ftp.log
rm -rf /private/var/log/httpd/
rm /private/var/log/lastlog
rm /private/var/log/lookupd.log*
rm /private/var/log/lpr.log*
rm /private/var/log/mail.log*
touch /private/var/log/lpr.log
rm /private/var/log/mail.log
touch /private/var/log/mail.log
rm /private/var/log/monthly.out
rm /private/var/log/run_radmind.log
rm -rf /private/var/log/samba/*
rm /private/var/log/secure
touch /private/var/log/secure.log
rm /private/var/log/system.log*
touch /private/var/log/system.log
rm /private/var/log/weekly.out
rm /private/var/log/windowserver
touch /private/var/log/windowserver.log
rm /private/var/log/windowserver_last.log
rm /private/var/log/wtmp.*
```

http://managingosx.wordpress.com/2009/01/23/image-cleanup-script/

The Solution

- Computers are good at repetition, let it do that
- The solution is to create a script to do this for you

  http://www.afp548.com/article.php?story=instadmg

- Started by Josh Wisenbaker of AFP548.com
- I took over in July ’08 (1.2b)

InstaDMG

Generate Clean Images

- A command line script - written in bash
- Produces a never-booted, clean image
  - No trash, no downloaded items, no LKDC, etc...
- Run twice in a row the image will be nearly identical
- Almost anything that can be put in a .pkg can be used
- Most packages just work (ie. MS Office)

InstaDMG

Generate Clean Images

- Creates a 300GB sparse disk image
- Installs MacOS X and provided .pkg's onto the .dmg
- ASR scans the image for quick restore

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InstaDMG

Overview

Create Golden Master

Capture Image

Restore Image

Post-Restore Actions

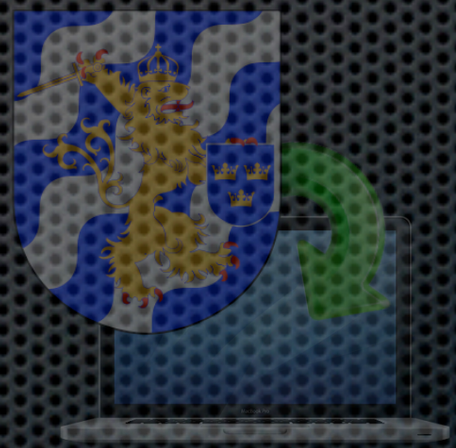
Overview

Create Golden Master

Capture Image

Restore Image

Post-Restore Actions

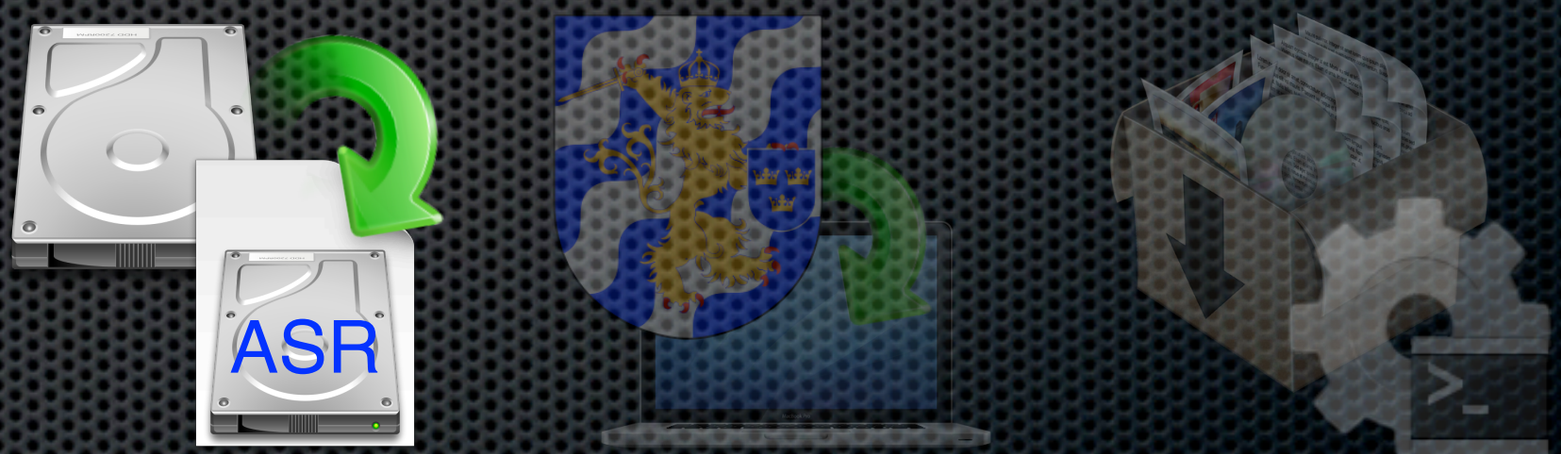


Overview

Capture Image

Restore Image

Post-Restore Actions



InstaDMG

Generate Clean Images

InstaDMG

InstallerFiles

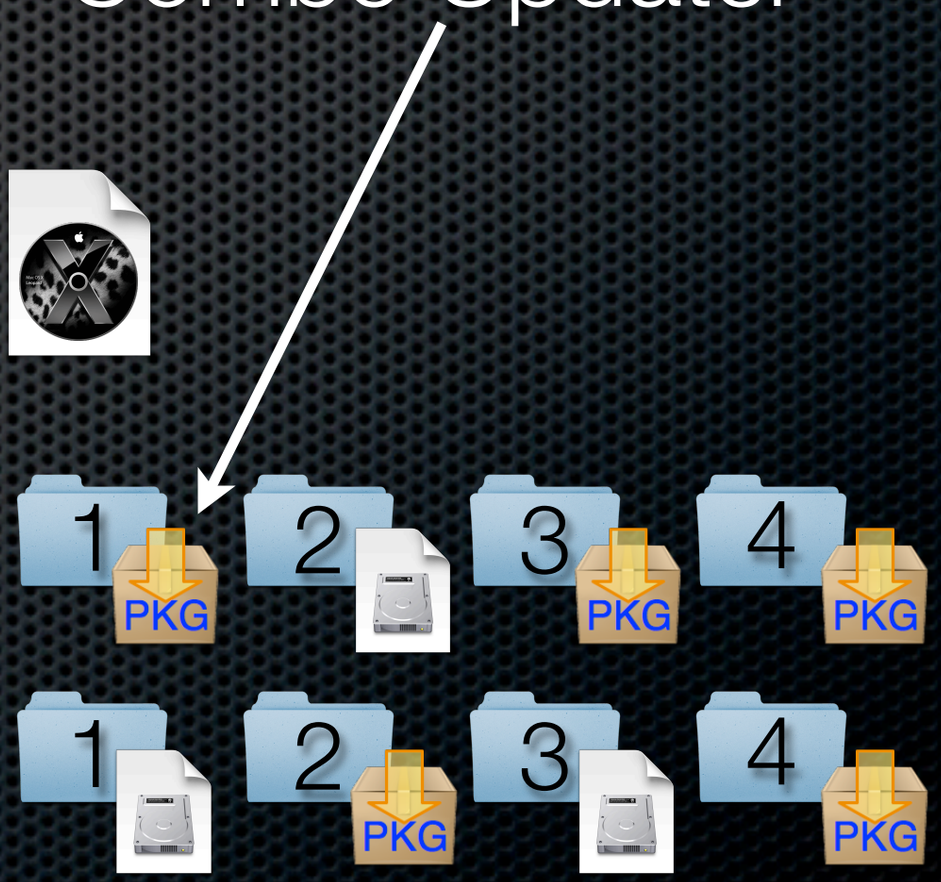
BaseOS

BaseUpdates

CustomPKG

OutputFiles

Combo Updater



InstaDMG

Generate Clean Images

- The bad:
  - Command line script (scary)
  - Snow Leopard not working well (turn off chroot jail)
    - Some packages just don’t work (distribution scripts)
    - When it goes wrong, it just keeps going (bad)
    - By itself a folder is dedicated to one image

InstaDMG

InstaUp2Date

- Included with InstaDMG
- Takes control of the source folders
- Uses “catalog” files to fill them with links to your items
- Allows multiple “build trains”
- Catalogs can reference files via http (will be cached)
- Catalogs can nest other catalog files
- Makes multiple variations of a image easy

InstaDMG

Summary of a run

- To setup for an InstaDMG/InstaUp2Date run:
  - Get the latest version (rev. 212 or better)
  - Create a DMG of a retail 10.6 disk with default name:

“Mac OS X Install Disc 1” or “Mac OS X Install DVD”

- Create the following catalog file (10.6_vanilla):

Output Volume Name = Macintosh HD
Output File Name = 10.6.1 Vanilla

OS Updates:
MacOS X 10.6.1 Update http://supportdownload.apple.com/download.info.apple.com/Apple_Support_Area/Apple_Software_Updates/Mac_OS_X/downloads/061-7124.20090910.6oxdt/MacOSXUpd10.6.1.dmg
sha1:2e20c303e0078a488702172d782cb1b882eef543

Apple Updates:
iTunes 9 http://appldnld.apple.com.edgesuite.net/content.info.apple.com/iTunes9/061-6350.20090909.tnzs2/iTunes9.dmg sha1:eb436fbe738bfa9682805d7ea76bd03c72736e89

InstaDMG

Summary of a run

./instaUp2Date.py -p 10.6_vanilla

1. InstaUp2Date looks for the needed files and links them
2. InstaDMG is run and looks for the installer DVD image
3. Checks to see if there is already a base install cache
4. If so mounts it, if not creates a new base image
5. Adds the packages found in the folders by order
6. Cleans up, and makes the ASR image

InstaDMG

Tips and Tricks

- Completely I/O limited - get RAID, but not XSan
- Learn to love creating packages, they are your friend
- Get on the forums, watch the developer list
- installerchoices.xml files can modify what is installed
- Use the included CreateUser package to create users
- Bypass first run: “/private/var/db/.AppleSetupDone”

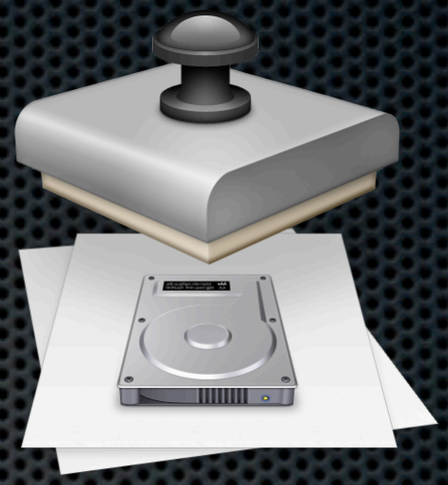
InstaDMG

Future directions

- Has been on hiatus - intend to get back into it
- 2.0
  - Move to Python
  - Integrate InstaUp2Date
  - Checkpoints
  - 10.6 chroot and sandbox
- Look at sharing common configs with Munki
  - http://code.google.com/p/munki/

System Image Utility

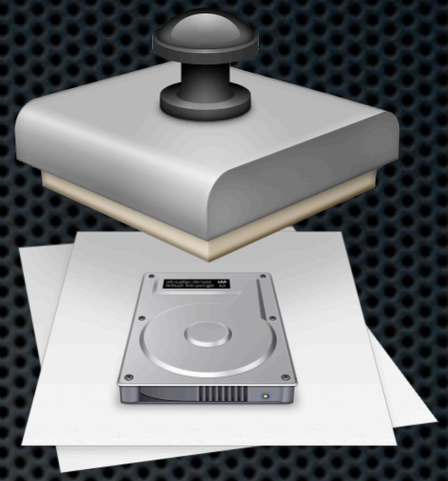
Snow Leopard edition



- “NetRestore”
  - Accepts either Installer Disk or a Golden Master
  - Installer Disk route works like InstaDMG
    - Create a NetBoot image
      - Console user choses the base image from list
        - Can be allowed to type one in, or select from broadcast sources
      - This does not allow for more workflow

System Image Utility

Snow Leopard edition



- My take on it:
  - The BYO image NetBoot is really nice, but lacks a workflow
  - InstaDMG-like setting not yet ready, and I don’t know when it will be

JAMF Casper

Imaging Suite

- New product from JAMF, separated from Casper
- Is able to create ASR's in InstaDMG-like fashion

... or so they tell me.... Compiled Configurations

Create Package Demo

Q & A

Imaging MacOS X

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MacSysAdmin Conference 2009