Macintosh Forensics

Mac Networkers Retreat

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Rules of the game

- Make no changes to suspect system
- Document everything
- Document, document and then document some more…
- Take very good notes
- A case could take 2-3 years to go to court, your memory will never last

Data changes fast

- Under normal conditions as soon as an HFS partition mounts on your desktop, you will change your last modified date and time
- You want to avoid this, if you can't document it
- You can use physical write-blockers or turn off diskarbitrationd (In Panther and Tiger)

Files/Folders created

- 560 files/folders can be created between boot-ups
- 10000-11000 files/folders can be created in a 24 hr perioed (Normal use)
- Temp files, plists, .DS_Store, virtual memory, browser cache file, e-mail cache files, e-mail databases etc…

Interesting commands

- Mount
- ls /dev/disk?
- ioreg -c “IOMedia”
- dd and dcfldd
- pdisk
- hdiutil pmap
- hdiutil attach
- Hdiutil attach /some/image.dmg -shadow

Disk Arbitration

- Diskarbitration is now the main process in Panther used to manage and mount disk partitions
- BBT has provided a GUI app to disable Diskarbitrationd similar to the autodiskmounting procedure in 10.1-10.2
- /etc/mach_init.d/diskarbitrationd.plist

Disk Arbitration

- /etc/mach_init.d directory example

Disk Arbitration

- Contents of diskarbitrationd.plist
- Contents in standard XML

Disk Arbitration - Disabling

- Go to the /etc/mach_init.d Directory
  - cd /etc/mach_init.d
- Create a directory in /Library called DiskArb_Backup
  - sudo mdir /Library/DiskArb_Backup
- Copy diskarbitrationd.plist to DiskArb_Back (Always make sure you have a backup before you remove the file)
  - sudo cp /etc/mach_init.d/diskarbitrationd.plist /Library/DiskArb_Backup
- Now you can remove (delete) the file
  - sudo rm /etc/mach_init.d/diskarbitrationd
- Once the file has been removed, you can Reboot the System

- To re-enable DiskArbitration reverse the process, copy the file (diskarbitrationd.plist back to /etc/mach_init.d

- Always make sure you make a Backup of diskarbitrationd.plist before you delete or move it

Warning!!!

- Make sure you turn off FileVault or use a non FileVaulted user!!!!
- Added Oct 30, 2005 (Aptos, CA)

Diskarbitration

- When diskarbitration is off, partitions do not get mounted automatically
- It is not a write-blocker, if you do something stupid you can change data on a suspect system
- You have to mount destination partitions manually
- You can also mount read-only

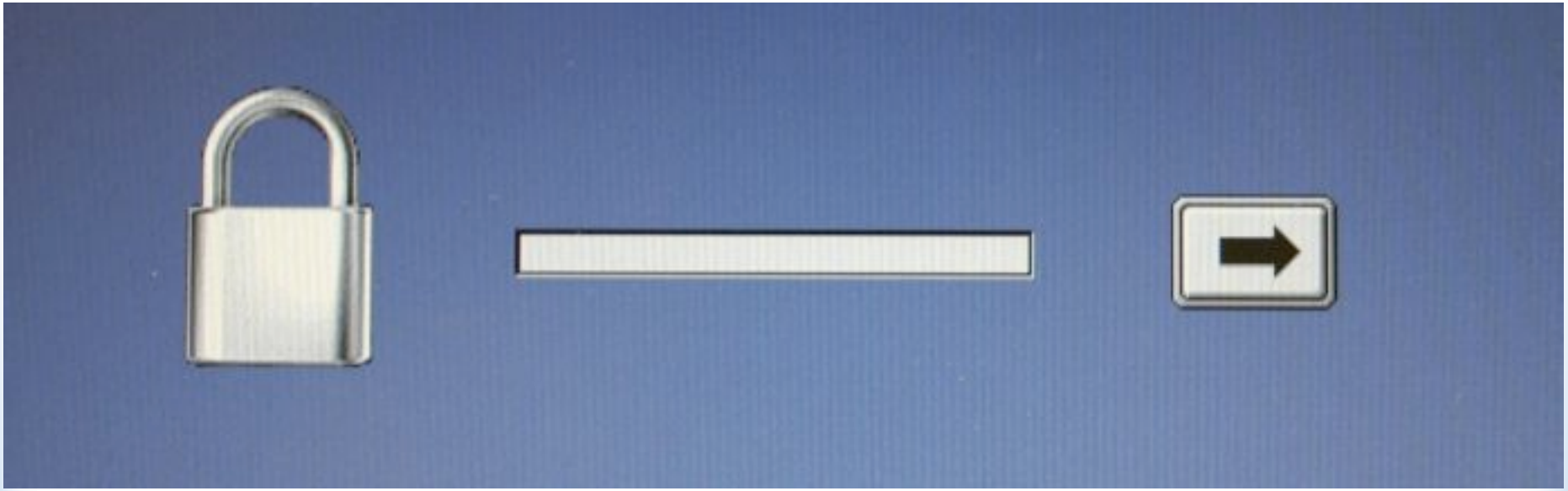
Open Firmware

- Use “Open Firmware Password” to set a password for your Open Firmware
- You can find this utility on the first CD of your Install CDs
- If a user sets the firmware password it may interfere with FireWire Target Mode

Open Firmware Password

Open Firmware

- If you boot up and hold the “Option” key and you see this screen a firmware password has been set by the user



Open Firmware

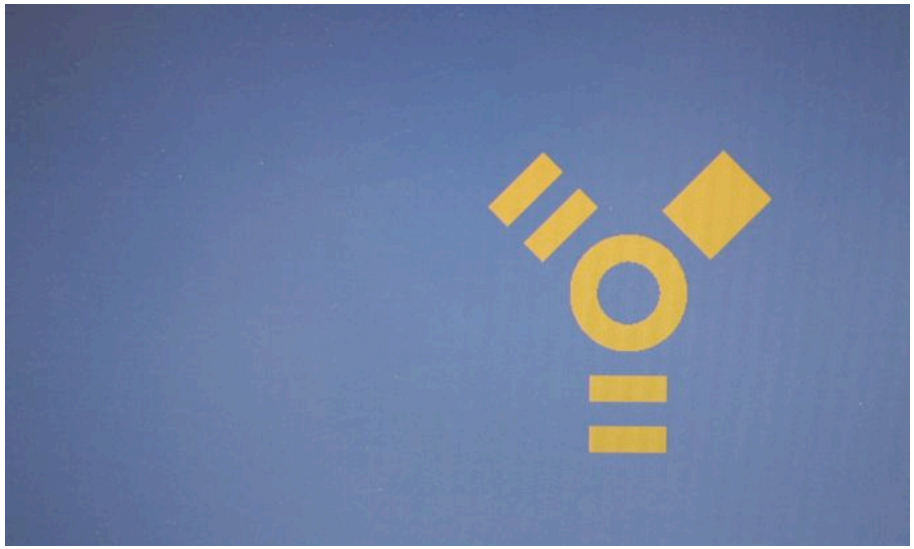
- Or the computer might continue to Boot as normal, if you see this you want to kill the power

Open Firmware

- Normal bootup screen

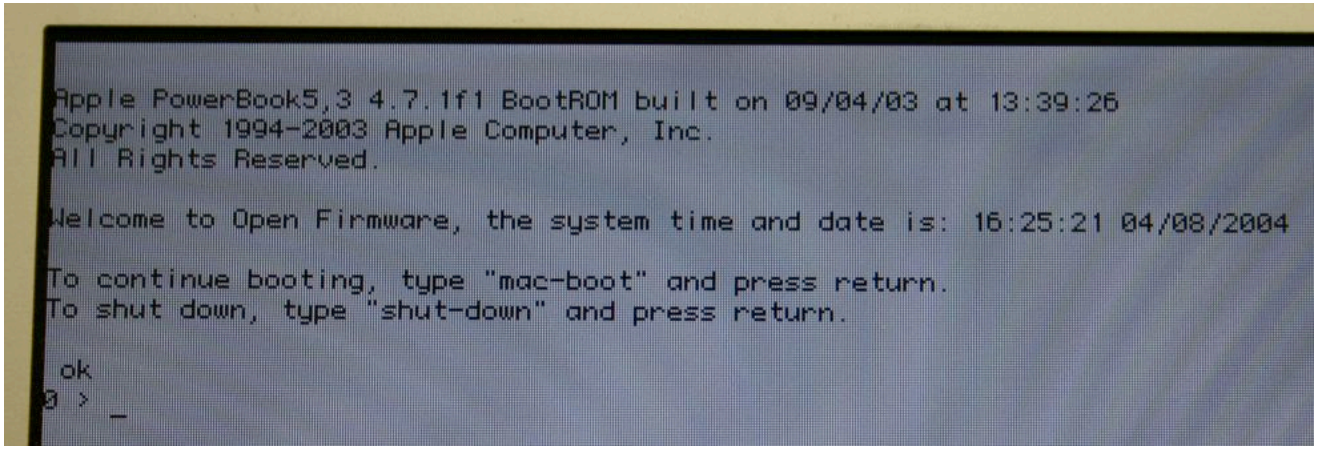
Open Firmware

- For proper FireWire target mode you should see the yellow FireWire logo



Open Firmware

- If you hold down “Apple” + “Option” + “O” + “F” you will drop into the Open Firmware

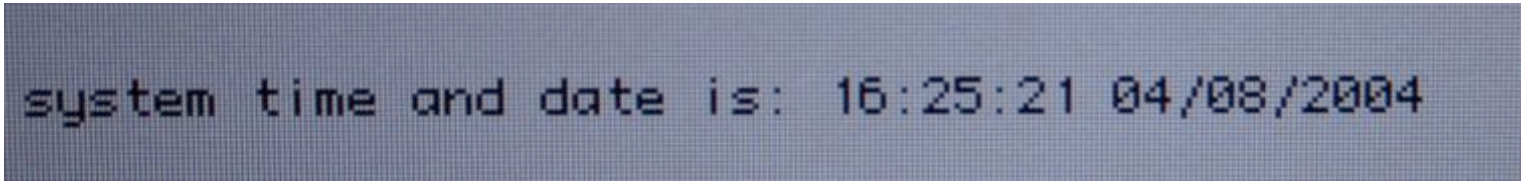


Open Firmware

- To continue normal booting type:
  - mac-boot (you do not want to do this on a suspect system)
- To shutdown from open firmware type:
  - shut-down
- This can be handy if you just want to check the system time
- This process will not write to the drive

Open Firmware

- Notice you can see the system time from this screen
- Time will be in GMT



Looking for devices

- ioreg -c “IOMedia”
- ioreg -l | more
- ioreg -c “IOMedia” | more
- ioreg -c “ATADeviceNub”

- ls /dev/disk?
  - /dev/disk0 /dev/disk1

Output from ioreg

```
| |   |       +-o Hitachi IC25N080ATMR04-0 Media  <class IOMedia, regis$
|   | |   |       | {
|   | |   |       |   "Leaf" = No
|   | |   |       |   "Writable" = Yes
|   | |   |       |   "BSD Minor" = 0
|   | |   |       |   "IOBusyInterest" = "IOCommand is not serializable"
|   | |   |       |   "Preferred Block Size" = 512
|   | |   |       |   "BSD Major" = 14
|   | |   |       |   "BSD Name" = "disk0"
|   | |   |       |   "Size" = 80026361856
|   | |   |       |   "Content Hint" = ""
|   | |   |       |   "Removable" = No
|   | |   |       |   "IOMediaIcon" = {"IOBundleResourceFile"="Internal.i$
|   | |   |       |   "BSD Unit" = 0
|   | |   |       |   "Ejectable" = No
|   | |   |       |   "Content" = "Apple_partition_scheme"
|   | |   |       |   "Whole" = Yes
|   | |   |       | }
```

ioreg -c “ATADeviceNub”

- | | | +-o ATADeviceNub@0 <class ATADeviceNub, registered, matched, active, busy 0, retain count 6>
- | | | | {
- | | | | "ata device type" = "ata"
- | | | | "unit number" = 0
- | | | | "IOUnit" = 0
- | | | | "socket type" = "internal"
- | | | | "device model" = "Hitachi IC25N080ATMR04-0 "
- | | | | "extended LBA capacity" = 156301488
- | | | | "device serial" = " MRG426K4GH031H"
- | | | | "device revision" = "MO4AAD0A"
- | | | | }
- | | | |

Imaging drives

- Standard dd command (suspect drive=/dev/disk1)
- sudo dd if=/dev/disk1 bs=1024 conv=noerror,sync of=/evidence/Imagefile.dmg
- sudo dd if=/dev/disk1 bs=1024 conv=noerror,sync | split - -b2000m /evidence/Imagefile.

Working dcfldd

- sudo dcfldd if=/dev/disk1 hashwindow=0 conv=noerror,sync bs=1024 of=/evidence/imagefile.dmg
- Sudo dcfldd if=/dev/disk1 hashwindow=0 conv=noerror,sync bs=1024 | split - -b2000m /evidence/imagefile.
- Dcfldd has been updatednow called dccidd (Supports sha1, sha-256)

Imaging Live systems

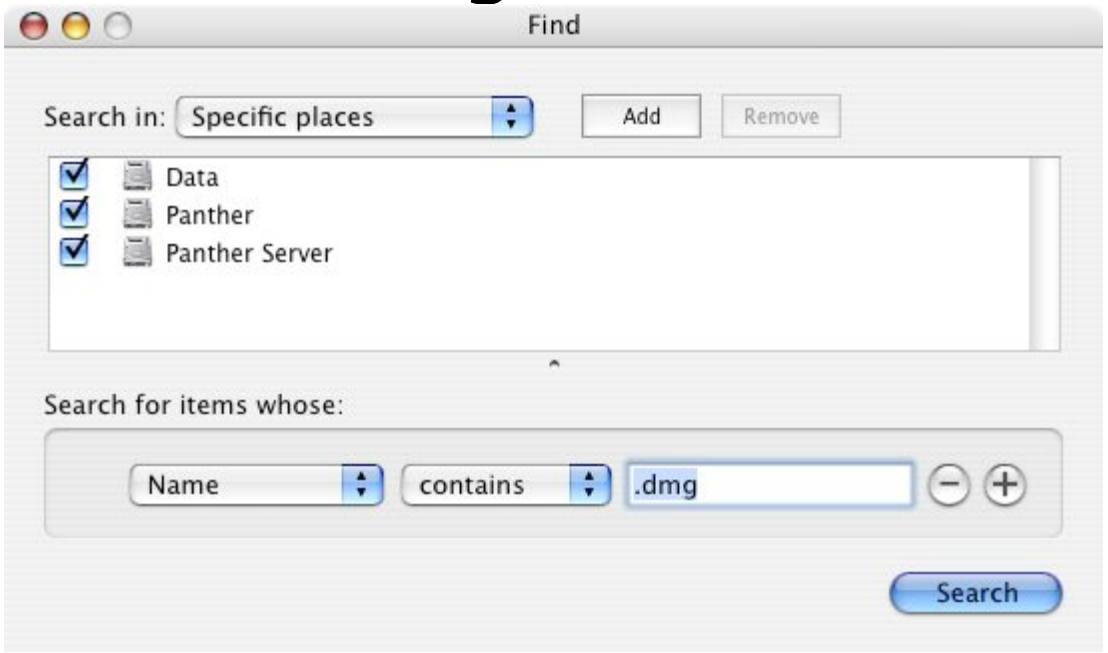
- Use rdisk entries (ls /dev/rdisk?)
- Rdisk= raw disk (buffered copy)
- Sudo dd if=/dev/rdisk0 conv=noerror,sync bs=1024 of=/evidence/imagefile.dmg
- Make sure you have enough space to image a full drive
- Lock your image files before mounting them with DiskCopy (DiskUtility)

Places to look for evidence

- Remember Mac OS X is a Unix based system
- Most user files are created and saved in the User's home directory
- A Mac OS X System can have multiple users

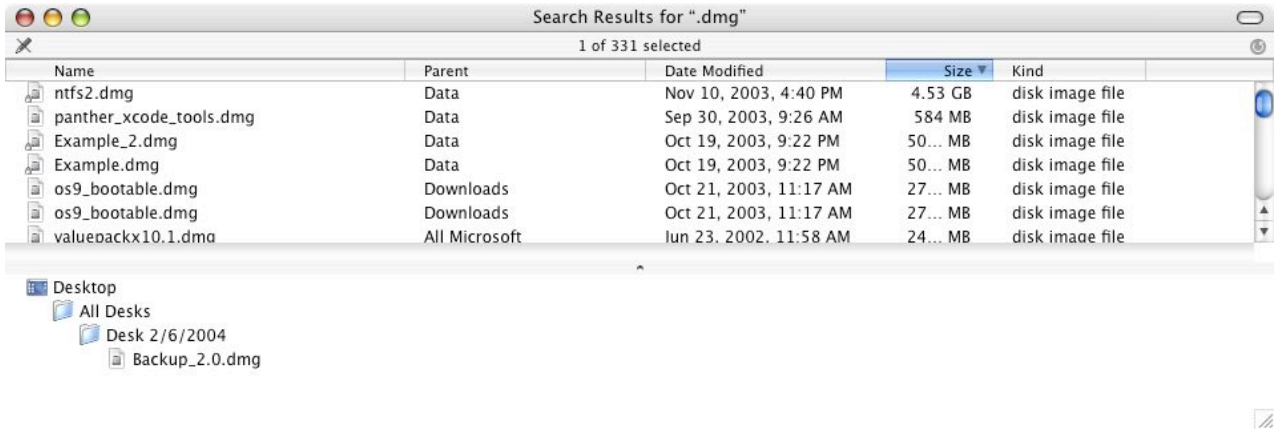
Panther Built in Tools

- Always use find to search for large .dmg or sparse files
- You could be missing entire sub volumes



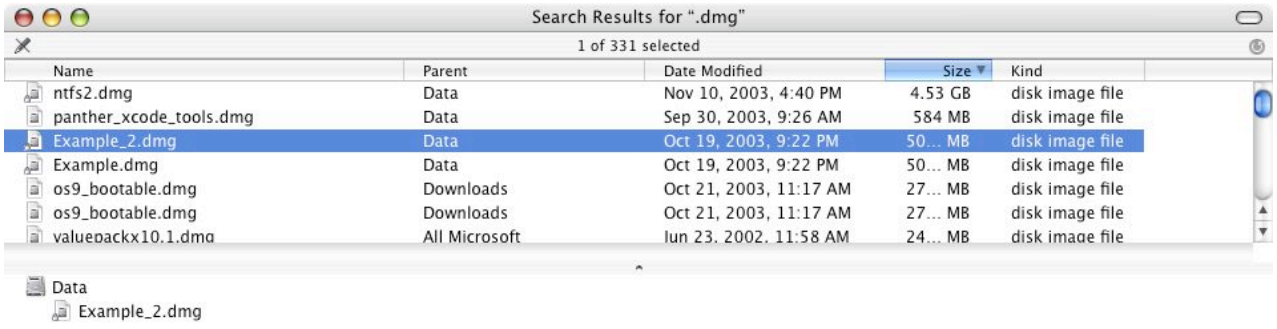
Panther Built in Tools

- Sort results by size, to find all the large disk images



Panther Built in Tools

- Click on the results to find the paths to the files in question



Open Source Solutions

- SleuthKit
  - Forensic Tools from Brain Carrier
  - Installation
    - Requirements:
      Developer Tools
    - Available from www.sleuthkit.org
  - Use
    - For SluethKit to see data, you need to manually break out the partitions.
- Autopsy
  - Graphical Front end to SleuthKit

iPod

- Music only FAT 32 formatted

```
Differential:/dev charnota$ ioreg -c IOMedia+-o Apple iPod Media  <class IOMedia, registered,
    matched, active, busy 0, retain count 10$
| |  |     | |  |     |  | {
| |  |     | |  |     |  |   "Leaf" = No
| |  |     | |  |     |  |   "Writable" = Yes
| |  |     | |  |     |  |   "BSD Minor" = 8
| |  |     | |  |     |  |   "Preferred Block Size" = 512
| |  |     | |  |     |  |   "BSD Major" = 14
| |  |     | |  |     |  |   "BSD Name" = "disk2"
| |  |     | |  |     |  |   "Size" = 5007744000
| |  |     | |  |     |  |   "Content Hint" = ""
| |  |     | |  |     |  |   "Removable" = Yes
| |  |     | |  |     |  |   "IOMediaIcon" =
    {"CFBundleIdentifier"="com.apple.iokit.IOStorageFamily","IOBundleRes$
```

iPod (in ioreg)

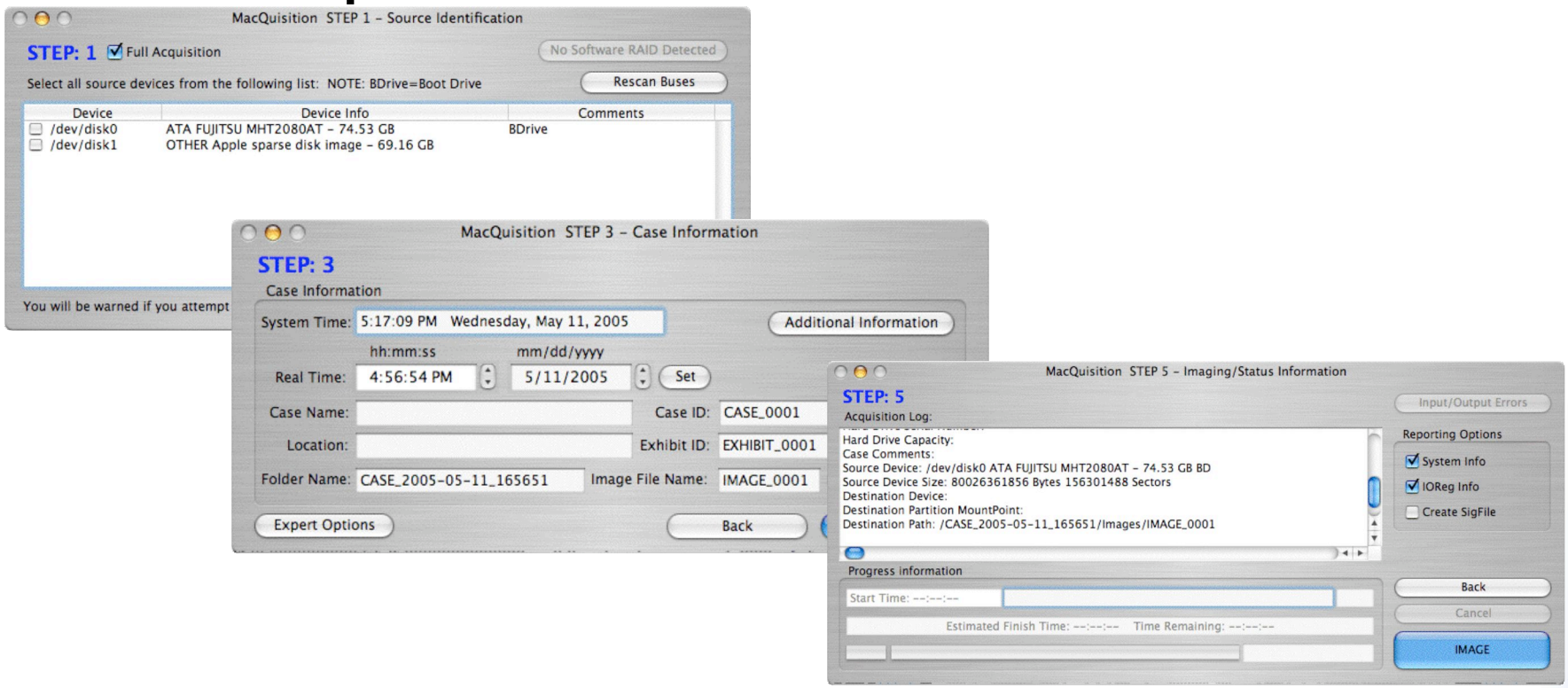
```
| | |   | | |   | | "BSD Unit" = 2
| | |   | | |   | | "Ejectable" = Yes
| | |   | | |   | | "Content" = "FDisk_partition_scheme"
| | |   | | |   | | "Whole" = Yes
| | |   | | |   | | }
| | |   | | |   | |
| | |   | | |   | +-o IOMediaBSDClient  <class IOMediaBSDClient, registered, matched, active, busy 0, reta$
| | |   | | |   | +-o IOFDiskPartitionScheme  <class IOFDiskPartitionScheme, !registered, !matched, active$
| | |   | | |   |   +-o Untitled 2@2  <class IOMedia, registered, matched, active, busy 0, retain count 9>  | | |   | | |   |   |
      {
| | |   | | |   |     | "Leaf" = Yes
| | |   | | |   |     | "Writable" = Yes
| | |   | | |   |     | "BSD Minor" = 9
| | |   | | |   |     | "Preferred Block Size" = 512
| | |   | | |   |     | "Partition ID" = 2
| | |   | | |   |     | "BSD Major" = 14
| | |   | | |   |     | "BSD Name" = "disk2s2"
| | |   | | |   |     | "Size" = 4959843840
| | |   | | |   |     | "Content Hint" = "DOS_FAT_32"
| | |   | | |   |     | "Removable" = Yes
| | |   | | |   |     | "BSD Unit" = 2
| | |   | | |   |     | "Ejectable" = Yes
| | |   | | |   |     | "Content" = "DOS_FAT_32"
| | |   | | |   |     | "Whole" = No
| | |   | | |   |     | }
| | |   | | |   |     |
| | |   | | |   |     +-o IOMediaBSDClient  <class IOMediaBSDClient, registered, matched, active, busy 0, $
```

Commercial Data Recovery

- FileSalvage SubRosa Soft
- DataRescue, DataRescue II
- DiskWarrior
- Drive 10
- Tech Tool

MacQuisition Boot CD

- Image Mac systems without taking them apart



BlackBag Services

- Software Forensic Suite
- Forensic Hardware (Firebox)
  - IDE and SCSI Write Blocker using the Firewire bus
- Mac Forensic Training
  - (Local Santa Clara and Mobile Class)
- Forensic analysis consulting and Data Recovery

Mac Forensic Forum

- Join us on the Mac Forensic forum on Yahoo
- http://groups.yahoo.com/group/macos_forensics/
- http://www.blackbagtech.com/forensics.html
- The group is closed group mostly for Law enforcement

Contact

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