Extrem NetBooting

by Brandon Turner
NetBoot
What is NetBoot?

NetBoot

A technology that allows you to boot a machine from a “system” that is kept on a disk image on a NetBoot server.
Why NetBoot?

Classrooms and Labs
• Allows use of machine, changes discarded on restart

Kiosks and Libraries
• Allows use of machine, changes discarded on restart

Diskless NetBoot
• Kiosks, testing centers etc.
• Does not require read and write to the local hard drive

System Troubleshooting and Repairs
• No CD’s
• Repair utilities, diagnostics
• Running diskless allows repair of local hard drive
Configure the Server

DHCP

- Required!
- Setup your DHCP range
- Enable it

Editing: Test Range

<table>
<thead>
<tr>
<th>Enable</th>
<th>Interface</th>
<th>Starting Address</th>
<th>Ending Address</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>en0</td>
<td>192.168.0.2</td>
<td>192.168.0.15</td>
<td>Test Range</td>
</tr>
</tbody>
</table>
Configure the Server

NetBoot

- General Tab
  - Enable the ethernet port
- Enable Volume for:
  - Images
  - Client Data
Configure the Server

NetBoot Continued...

- Images Tab
  - Enable the image(s)
  - Default: image that boots using the “N” Key or Boot Menu
  - Use Startup Disk to select other images.
- Diskless: Great for Terminals, Kiosks, and Utility Images
Configure the Server

NetBoot Continued...

- Index: Use any number
  - For Load Balancing use 4096-65535
    - Across servers and or server hard disks
    - Not partitions - Has reverse effect reduces performance
- Protocol:
  - HTTP - Serve images without re-configuring firewall
  - NFS - Default method, Apple’s preferred method
Configure the Server

NetBoot Continued...
- Server Admin - Filters Tab
- Allow or Deny Clients via MAC Address
  - Browse, Import, or Add machines
- Or use...
- NetBoot Filter Manager
  - Created by Mike Bombich
  - Easily import multiple machines
A NetBoot Set?

A set of five files maintained on the NetBoot server that allow client machines to boot.

- booter
- mach.macosx
- mach.macosx.mkext
- Imagename.dmg
- NBImageInfo.plist

These files are stored in
/Library/NetBoot/NetBootSP0/<name.nbi>
Create A NetBoot Set

Setup a “Master” computer
- Setup machine, like accounts and software updates
- Install utilities such as DiskWarrior etc.
- Boot into target disk mode

Use System Image Utility
- Located in Applications/Server folder on your server
- Can be copied to another machine for use
- Choose the “New Boot” button
- “Contents” tab, choose your target disk, language, packages

Upload <name.nbi> to Server
- /NetBootSP0 (Is the default Share Point)
- Configure “Images Tab” on NetBoot section on the server
NetBoot Process...

1. BSDP DISCOVER, DHCP Request
2. Downloads the "booter" file

- Startup disk is set, or "N" key is used
- BSDP Discover & Offer
- DHCP Discover, Offer, Request, ACK
- Client has DHCP address
- Downloads booter file via TFTP

/var/log/system.log

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STUDENT COMPUTING LABS
NetBoot Process...

- Loads boot file
- Downloads the Kernel and Kernel Extension Cache
  - mach.macosx
  - mach.macosx.mkext
NetBoot Process...

- Kernel mounts NetBoot disk image via NFS
- Loads the Kernel Extension Cache
- Client booted from image on server
Using ARD to NetBoot

- Open Remote Desktop
- “Manage” menu item
- Set Startup Disk
- Choose and Image
- Select Restart when done
NetInstall Using NetRestore
NetInstall What is it?

- NetInstall

The difference between NetInstall and NetBoot is that its sole purpose is to provide an environment in which you can install software onto the local drive.

- Like booting from an installation CD!
A NetInstall Set?

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Create A NetInstall Set

Download NetRestore from Mike Bombich’s site

Open NetRestore Helper
  • Click “Create NetInstall Set” tab
  • Fill in the fields
  • Choose a Protocol - NFS or HTTP

Upload <name.nbi> to server
  • /NetBootSP0 (Is the default Share Point)
  • Configure “Images Tab” on
    • NetBoot section in Server Admin application
Create An Image

Tools to create and ASR Ready Disk Images:

- Disk Utility
- SuperDuper
- NetRestore Helper

** Disk Utility is an excellent solution

Setup the “Master” machine (Updates, Tools, Software)

- Target Disk Mode the “Master” computer to another computer
- Create the disk image
- Scan image for ASR
  - SuperDuper and NRH do this automatically
Upload & Configure

Mount the NetInstall-Restore.dmg from /NetBootSP0/<name.nbi>/NetInstall-Restore.dmg
• Upload your ASR Disk Image
  • **Option 1**: /NetBootSP0/<name.nbi>/NetInstall-Restore/Applications/Utilities/Resources/Disk Images/
  • **Option 2**: Open NetRestore.app and edit the Configurations to use an AFP share point

Open NetInstall-Restore/Applications/Utilities/NetRestore.app
• Configure the Preferences and Configurations
• Enable Full Automation etc..
• Eject Image and Volume when finished
Resources Folder

- Resources folder
  - Store ASR images in “Disk Images” folder
  - Set “pre” and “post” action scripts (optional)
- Preferences Folder
  - Configure “machine_specific_data.csv” (force settings to machines via MAC address)
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- Loads the Kernel Extension Cache
- Client booted from image on server
- But there's more!!!!...
NetInstall Process...

- Instead of "Finder" or "Login Window" it boots into NetRestore
  - If set to "Automate" it will run automatically
NetInstall Process...

- NetRestore requests image based on preferences you set
NetInstall Process...

- NetRestore
  - Runs pre-action scripts
  - Erases and images the hard disk
  - Runs post-action scripts
- Preferences that can be set:
  - Verify hard disk
  - Set target as boot disk
  - Reboot when finished
  - Others..
NetRestore PHP Services
What is PHP Services?

NetRestore PHP Services

A technology that allows you to image a machine using a PHP website and a MySQL database that contains specific information about a client by it’s hardware address.
Why Use PHP Services?

- Everything is stored in a database
- Changes can be made to the settings from a web page
  - No longer have to update the preference file in the application
- Machines can be imported from a Remote Desktop database
  - Use ADAM, a program created by Mike Bombich
Prepare for the Image

Create a user on the server
- Imaging User
  - Short Name “Image”
  - Create a password

Create a share point
- Images

- This setup information can be found in the “Resources/Documentation” folder in the NetRestore download

Upload the image(s) to the share point
Enable PHP Module

“Web” under Computers and Services list
- Settings Tab
  - Modules
    - Enable php4_module

Start web services
Configure MySQL

- Download the latest version of MySQL
  - [www.dev.mysql.com](http://www.dev.mysql.com)
    - The default Apple install has errors
      - Supposed to be fixed in 10.4.4 update
  - Install Package, Startup Item, and Preference Pane
  - Reboot server

- MySQL Administrator
  - GUI application to edit MySQL users and settings

- Cocoa MySQL
  - GUI application to edit MySQL databases
Configure MySQL

Open MySQL Administrator
- Server Host Name: 127.0.0.1
- Port: 3306 (Check firewall to allow this connection if on remote box)
- Username: root (This is not the local root)
- Password: <blank> (Change later..)

Click Options button
- Click “Create” on “Config my.cnf” popup (Important file!)

Click “Security” pulldown menu
- Check “Use Old Passwords” check box
  - 10.4.4 server update no longer needs this option checked
Configure MySQL

- Click Accounts button
- Click “root” <arrow to reveal others>
- Click localhost
- Change password
  - Instead of “root” you can create other MySQL users for security
  - This username and password is what you would use for your .php config files to connect to the databases
Configure MySQL

Use your favorite text editor

- edit /etc/my.cnf
- Configure my.cnf to use the "mysql.sock" socket

In server OS's before 10.4.4 change to..

```
[mysqld]
socket=/tmp/mysql.sock
# Use old password encryption method (needed for 4.0 and older clients)
old-passwords

[client]
socket=/tmp/mysql.sock
```
Configure MySQL

In Mac OS X Server 10.4.4, change to..

```
[mysqld]
socket=/var/mysql/mysql.sock
# Use old password encryption method (needed for 4.0 and older clients)
old-passwords

[client]
socket= /var/mysql/mysql.sock
```
Configure PHP Services

Upload NetRestore PHP Services folder to your web server
  • Rename to something simple like “nr”
  • Edit config.php with your settings
  • Open http://yourdomain.com/nr/install.php
  • Follow on screen instructions

Write down the nr_admin password
  • This user is to edit database settings only
  • Create a new admin user once logged in
    • This user is used for adding machines and making changes

HELP!

<yournamed “nr” folder>/docs/
Use this documentation for help configuring NetRestore PHP Services
Configure PHP Services

Login to http://www.yourdomain.com/nr/
Login as: nr_admin

- Manage Admin Groups
  - Create admins group
  - Set group password
- Manage Users
  - Create your “admin” user
  - Select “admins” group to administer
  - Check “Allow user to administer groups”
- Configure your other settings as well
- Logout of nr_admin
Configure PHP Services

Login to http://www.yourdomain.com/nr/
  Login as: <your admin user>
  • Manage Machine Groups
    • Upload Mac Addresses
      • Comma delimited file!
  • Manage NetRestore Configurations
    • Link images to your share point.
  • Manage NetRestore Preferences
    • Choose a machine group
    • Set the preferences
  • With a few tweaks you should be ready to image
  • Logout of <your admin user>
Configure for Imaging

Mount the NetInstall-Restore.dmg from /NetBootSP0/<name.nbi>/NetInstall-Restore.dmg

Open NetInstall-Restore/Applications/Utilities/NetRestore.app

Configure Remote Settings

[Diagram and screenshot of NetRestore settings interface]
Configure for Imaging

Fill in the fields:

- Type in path to your netrestore.php
- Administrative Group:
  - admins (login to web page to set)
- Group Password:
  - This is also set online as nr_admin

Save and unmount NetInstall-Restore image
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- Instead of "Finder" or "Login Window" it boots into NetRestore
NetInstall Process...

- NetRestore requests `netrestore.php`
- Downloads a .plist of settings
  - Settings are based on MAC address
    - Authorized to restore => "yes", "no"
      - If "no", error: machine not auth. to restore
- Erases and images hard disk
- Sets IP address
- Sets computer name
- Sets other settings you specify
- Reboots if you set the preference
Troubleshooting

Q: Why after enabling a DHCP Subnet the server not handing out addresses?
A: Check DHCP subnet settings, Reboot server, Check system.log

Q: Clients cannot see the NetBoot Images?
A: Check firewall, Disable and try again, If it works troubleshoot the firewall

Q: NetBoot Filter Manager gives me an AppleScript error on import?
A: Filename has spaces (I submitted this bug to Mike Bombich)

Q: How do I use multiple NetBoot/NetInstall images?
A: Set Startup Disk, Use ARD, The “N” key only boots default image
Troubleshooting

Q: Getting mysql.sock errors?
A: Check and update etc/php.ini and etc/my.cnf

Q: Fatal error: Call to undefined function: pg_connect()... on line 72?
A: Check config.php, set ARD to “no” or check ARD database

Q: Error: Upgrade Client?
A: Set root password using MySQL Administrator
Hot Tips!

Fat Pipe! = Fast Restores

- Connect Xserve to **GIGABIT** backbone
- Connect clients to 100mb switches.

  **Note:**
  
  Gigabit switches will increase restore times even if clients have 100mb ethernet cards

**My Personal Stats: (your stats may vary)**

- 30 Clients on 10/100 Switches = approx. 6 hrs.
- 30 Clients on 1000mb Switches = approx. 2-3 hrs.

**DHCP & NetRestore Troubleshooting:**

Check `/var/log/system.log` using any of these tools: Server Admin, Console, or Terminal
Useful Resources

**Mike Bombich Software** - [http://www.bombich.com](http://www.bombich.com)
- Video: [http://homepage.mac.com/bombich/intel_iMac.mp4](http://homepage.mac.com/bombich/intel_iMac.mp4)

**Apple Server Manuals** - “Managing NetBoot Service”
Useful Resources

Apple Docs:
How to setup NetBoot to use existing DHCP Server
  • http://docs.info.apple.com/article.html?artnum=106459

How to create NetBoot image from existing system
  • http://docs.info.apple.com/article.html?artnum=107354

How to create a customized NetBoot image
  • http://docs.info.apple.com/article.html?artnum=107353
Special Thanks To

Mike Bombich - http://www.bombich.com


Anyone else I borrowed information from.
Questions & Answers

Any questions or answers?