NetBoot

Start up multiple Mac systems from a server-based image.

Features

Standardized desktop configurations

- Configure multiple clients with the same operating system and applications[1]
- Define customized configurations for multiple workgroups, hosting up to 25 disk images per server
- Replicate server configurations for deployment in compute farms and data centers
- Boot client systems "disklessly," with no reliance on the local hard drive

Simplified client administration

- Deploy new systems in minutes with automatic discovery of NetBoot images
- Update an entire workgroup by updating a single disk image
- Modify startup disk images from the Finder
- Restore compromised systems instantly
- Deploy network-based diagnostic and repair utilities

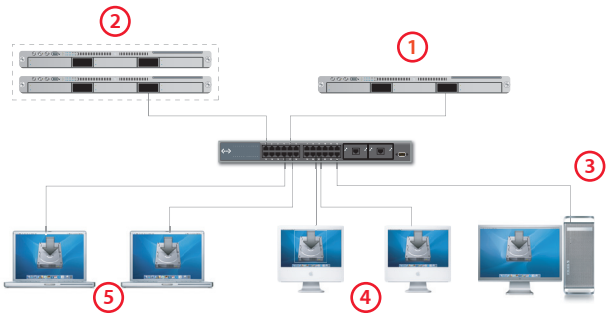
Integration with enterprise infrastructure

- Host startup disk images on Mac OS X Server or other enterprise NFS or HTTP servers
- Deploy disk images across multiple subnets
- Deploy redundant NetBoot images on multiple servers for maximum availability and performance

The NetBoot service in Mac OS X Server makes managing a group of computers as easy as managing a single Mac. By enabling client systems to boot from a single server-based disk image, instead of from their internal hard drive, you can create a standard configuration and use it on all of the desktop systems in a department or classroom—or host multiple images customized for different workgroups. You can even create server configurations and run all of your servers from one image. Updating the disk image on the NetBoot server updates all of these systems automatically the next time they are restarted.

Every time you restart a NetBoot-enabled computer, it is automatically restored to its original state. The system reads the startup disk image from the server, and all software and system settings return to the configuration in the NetBoot image. This enables you to deploy new systems or repurpose existing ones with unprecedented efficiency. It also means you can quickly recover from user alteration, tampering, and network-borne viruses, providing added protection for your network. At the same time, NetBoot improves usability by giving users a consistent computing experience across Mac systems anywhere on the network.

NetBoot at a Glance



1. The administrator creates a startup disk image, which resides on the network server.
2. The images can also be stored on a remote NFS file server.
3. The image can be served via NFS or HTTP.
4. The local hard drive is not required to update the system image.
5. Multiple Mac OS X systems on your network can boot from the server-based image.[2]

Why NetBoot?

The NetBoot service in Mac OS X Server is a proven technology that enables businesses and institutions to streamline the support of Mac clients and reduce system administration costs. The ability to deploy a standard desktop configuration across multiple systems and to protect them from alteration makes NetBoot ideal for computing environments such as classrooms, computer labs, kiosks, and computational clusters.

- **Classrooms and computer labs.** NetBoot makes it easy to configure multiple, identical desktop systems and repurpose them quickly. With NetBoot enabled on all desktop systems, students can log in on any computer and access their home directories from the network. NetBoot also allows you to reconfigure systems for a different class simply by rebooting from a different image.
- **Kiosks and libraries.** NetBoot enables you to set up protected computing environments for customers or visitors. For example, you can configure an information station with an Internet browser that connects only to your company website or a visitor kiosk that only runs a database for collecting feedback. If a system is altered, a simple restart restores it to its original condition.
- **Computational clusters.** NetBoot is a powerful solution for data centers and computational clusters with identically configured web or application servers. Similarly purposed systems can boot from a single NetBoot image maintained on a network-based storage device. NetBoot is also useful for servers hosting scalable services, such as web and application servers or computational clusters, which can be "scaled out" by adding systems running identical copies of the service.

Client management with Network Install
Network Install is a complementary service that's especially useful for standardizing system configurations for laptop deployments. It uses the same core technology as NetBoot, but instead of booting the client system from a server-based disk image, it installs the contents of the image on the client computer's hard drive—so the system no longer needs to be connected to the network.[2]

Customized software suites

Since Mac OS X Server can host up to 25 NetBoot disk images, you can support multiple workgroups, each with its own custom software suite. You can also perform "rolling upgrades," testing a new software update on select systems while maintaining current software on the rest of the network. Or use NetBoot to instantly repurpose a server—for example, from a web server to an application server—by restarting from a different image.

Diskless NetBoot

Mac computers can now boot "disklessly"—entirely from a network-based disk image—without needing to read from or write to the computer's hard drive. In combination with Workgroup Manager, Apple's built-in client management tool, diskless NetBoot simplifies administration of controlled computing environments such as libraries, kiosks, and testing centers. You can use Workgroup Manager to manage system settings and even prevent users from viewing or modifying a computer's hard drive, ensuring a tightly managed computing experience on NetBoot-enabled systems. This is useful, for example, in schools deploying "digital bluebook" solutions for student testing. It's also an ideal solution for environments, such as some government agencies, where security is a paramount concern. You can prevent data from being stored, even temporarily, on the computer's local drive, so sensitive information cannot be compromised by subsequent users once a person logs off or the system is shut down.

System troubleshooting and repairs

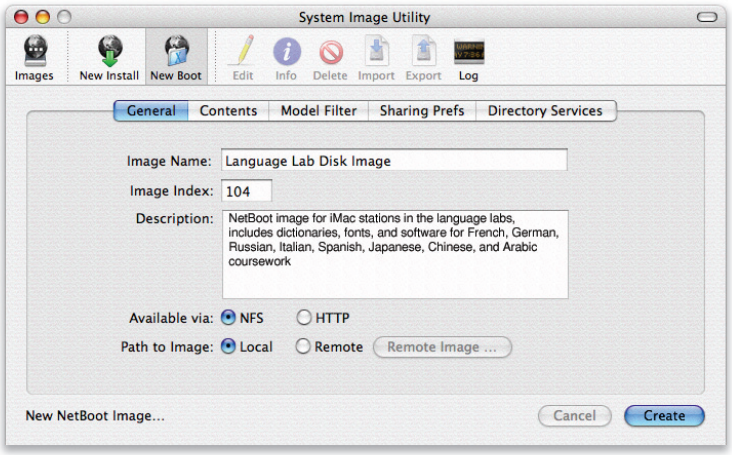
NetBoot can also be used to host hard drive diagnostic and repair utilities. When using diskless NetBoot, the client system runs independently of its hard drive, making it possible to diagnose and fix problems on client hard drives without needing to cart around a collection of CDs. This is also useful for supporting iBook and PowerBook systems—just plug them into the network and boot them from the server-based diagnostic tools. Once repairs are complete, portable systems can be disconnected from the network.

Network-based home directories
In addition to hosting server-based startup disks, you can host users' entire home directories on the server. Network home directories give users the convenience of instant access to their personal computing environment—complete with their own documents, applications, and system preferences—from any Mac on the network.

System Image Utility

Creating a startup disk image

With the new System Image Utility, you can create a NetBoot disk image simply by cloning a local volume—no configuration required. This gives you the opportunity to build a system, complete with user preferences, and to test and refine it locally before deploying it across the entire network.[2]

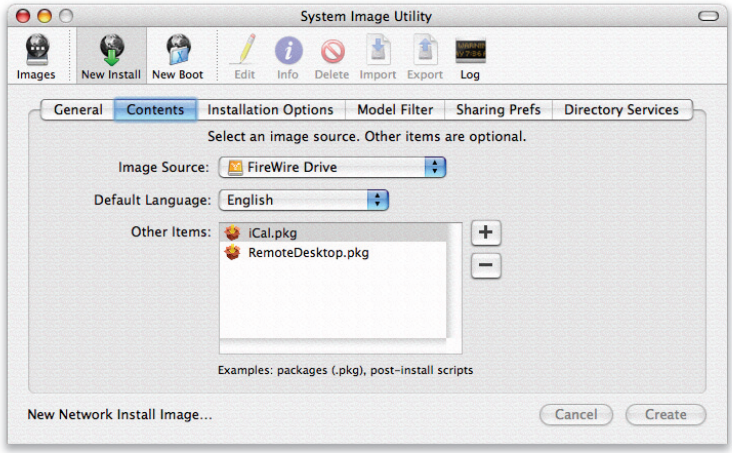


You can also use System Image Utility to build a new NetBoot image from a Mac OS X Install CD. This creates a disk image with a clean installation of the operating system, which you can then customize as you would any volume on your hard drive.

Updating existing images

Mac OS X Server makes it easy to update and maintain disk images. For example, if you want to add a site-licensed application or upgrade the operating system on your NetBoot volume, you don't need to reconfigure the whole disk image. Simply mount the disk image in the Finder and drag new applications, folders, or files into it—or delete obsolete applications and files.

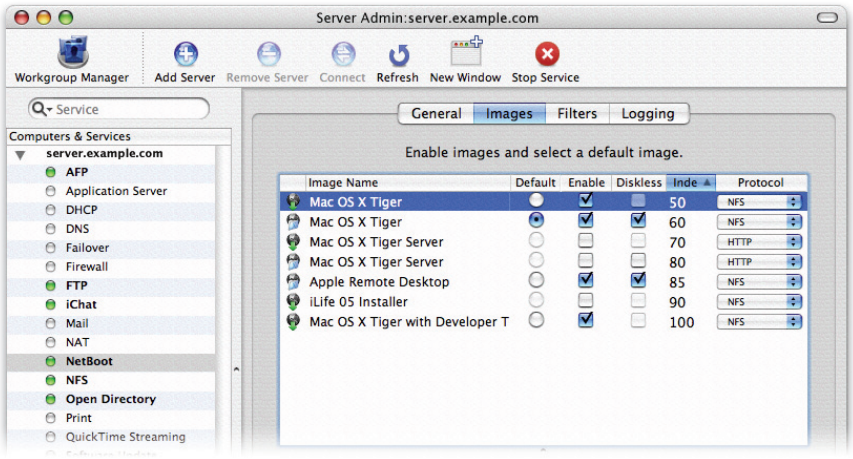
For an operating system update or application upgrade that comes as a package installer, you can simply drag the package into the Contents pane of System Image Utility. The NetBoot volume automatically mounts and performs the installation.



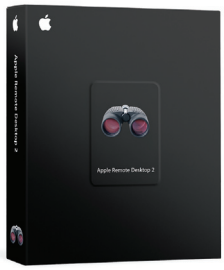
Hosting a NetBoot Disk Image

Once you've created a NetBoot disk image, use the Server Admin utility in Mac OS X Server to configure and turn on the NetBoot service. This makes the selected NetBoot disk image available as a startup disk to Mac systems on your network. A built-in filtering feature gives you the option to control access to a NetBoot disk based on client computer hardware addresses. Mac OS X Server can host up to 25 different disk images, enabling you to support multiple workgroups, each with its own configuration.

NFS or HTTP serving?
With Mac OS X Server v10.4, you can define how NetBoot disk images are served. NFS continues to be the default and the preferred method. HTTP is an alternative that allows you to serve disk images without having to reconfigure your firewall to allow NFS traffic.

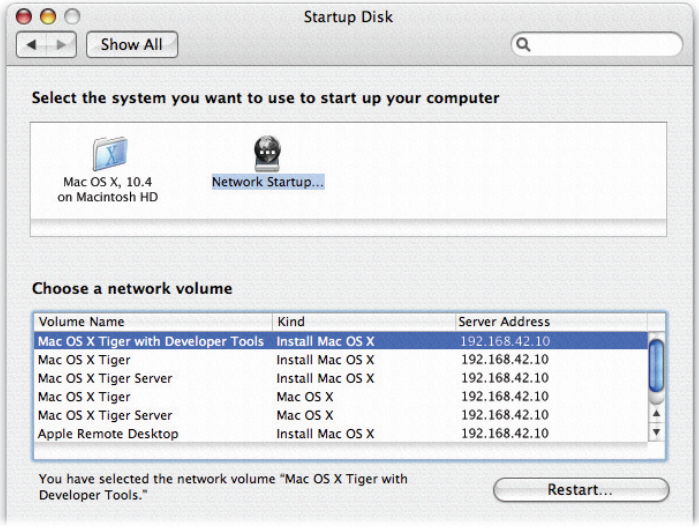


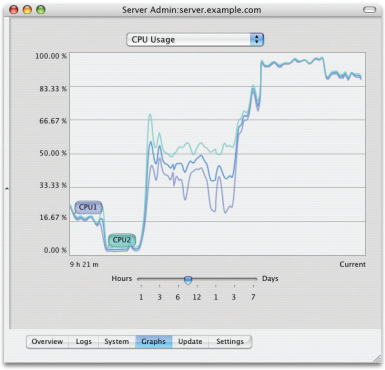
To provide responsive and reliable service, you can set up redundant NetBoot servers in your network infrastructure. If a server becomes unavailable, your NetBoot clients will automatically locate and associate themselves with another available server. A load-balancing feature enhances performance by starting up clients from the server with the fewest connected NetBoot clients.



Apple Remote Desktop 2
By adding the remote control capabilities of Apple Remote Desktop 2 (sold separately), you can specify the NetBoot startup disk for multiple Mac systems on your network—and restart them remotely. With just a few clicks and without leaving your desk, you can set up or update computers for an entire classroom, lab, or office at once. There is no need to walk around and configure each system individually.

Starting up client systems from the network
Ordinarily, when a desktop computer starts up, it looks to its own hard drive for the required startup resources. With NetBoot enabled, a client computer looks to the server for a NetBoot startup disk. You can set computers to start up from a specific NetBoot image by changing the Startup Disk preference in Mac OS X or the Startup Disk control panel in Mac OS 9. You need to set the desktop preference only once; any subsequent changes you make to the disk image take effect the next time the computer starts up.





Remote service monitoring
Mac OS X Server provides comprehensive tools for remotely managing and monitoring network services. Using Server Admin, you can view NetBoot activity logs and lists of client systems that have started up from the server. You can also graph server CPU usage, network throughput, and performance of network services.

Setting Up New Computers

Mac OS X systems can automatically discover boot images on the server using an extension to the BootP and DHCP protocols called Boot Server Discovery Protocol (BSDP). This enables you to take a new computer out of the box and configure it to your specifications in minutes. Just plug in the power cord and Ethernet cable and hold down the "n" key. NetBoot in Mac OS X Server takes care of the rest. The system boots, connects to the network, finds the default NetBoot disk image, and starts up fully configured.

In addition, the Open Directory architecture in Mac OS X supports automatic discovery of directory services using DHCP Option 95, so your newly deployed computer can find your LDAP server the first time you turn it on.[1] This feature dramatically reduces the cost of large-scale system deployments, while providing you with sophisticated capabilities for directory-based management of users, groups, and computers.

Apple Server Solutions

NetBoot is one of the innovative client management solutions built into Apple's UNIX-based Mac OS X Server operating system. Combining the latest open source technologies with Mac ease of use, Mac OS X Server unleashes the power of Xserve G5, Apple's rack-optimized server hardware. With phenomenal performance, massive storage capacity, high-bandwidth I/O, and integrated remote management tools, Xserve G5 running Mac OS X Server is an unparalleled server solution for businesses, schools, and research centers.

For More Information

For more information about Mac OS X Server, Xserve, and other Apple server solutions, visit www.apple.com/server.

[1]NetBoot requires Mac systems released in October 1999 or later and a physical Ethernet connection; it does not support AirPort wireless technology. [2]Licensing terms apply to Apple and third-party software deployments.