



Migrating to Mac OS X and Mac OS X Server

A Guide for Creative Workgroups

January 2005

Contents

- Page 4 Introduction**
 - What You'll Find in This Guide

- Page 7 Preparing for the Transition**
 - Mac OS X Server Documentation
 - Transition Team
 - Transition Schedule
 - Training

- Page 9 Evaluating Your Hardware**
 - Mac OS X Hardware Requirements
 - Third-Party Hardware and Peripherals
 - Network Infrastructure

- Page 11 Evaluating Your Software**
 - Business and Productivity
 - Internet Connectivity
 - Database Access and Hosting
 - Image Editing and Page Assembly
 - Font Management
 - Extensions and Control Panels
 - Color Management

- Page 14 Evaluating Your Workflow**
 - Connectivity
 - File Sharing
 - AppleScript
 - Fonts and Font Servers
 - Print Spooling and Serving
 - Backups
 - Asset Management

- Page 18 Developing a Workgroup Management Strategy**
 - Defining Workgroups
 - Creating and Managing Accounts
 - Organizing Home Folders

- Page 25 Building a Master System for Client Computers**
 - Configuring Disks on the Host Mac
 - Installing Mac OS X and Applications
 - Application Serial Numbers and License Keys
 - Testing the Master System

Page 29	Deploying the New System The Deployment Plan Loading the Image onto the Mac OS X Server System Testing the Network Install Image Deploying Keeping Systems Up to Date
Page 34	Supporting Systems and Users Updating Software Training Users and Administrators Troubleshooting
Page 36	Appendix A: Mac OS X Basics for Administrators Mac OS X File Organization Managing Users with Directory Services Managing Applications Security File Permissions Information Resources
Page 42	Appendix B: System Administration Technologies Network Install NetBoot Apple Remote Desktop PackageMaker Apple Developer Tools Scripting Languages

Introduction

Creative workgroups have special technology requirements. They need the latest graphics applications, consistent access to resources such as fonts and printers, and the ability to share large files. Concurrently, their time is valuable. They can't afford downtime or interruptions resulting from technology, and they're being asked to accomplish more with fewer resources. To do their best work, they need to focus on creativity instead of the technology required to manage a creative workgroup.

The Macintosh and Mac OS X are widely recognized as the world's premier desktop computer system for empowering creative professionals to accomplish their best work. Now Apple has applied its proven "built for creative" technologies to back-end server and storage technologies to deliver a comprehensive platform for creative professionals.

The Apple platform for creative workgroups consists of Xserve G5 servers running Mac OS X Server v10.3.5, Xserve RAID, Power Mac G5 desktop computers, Mac OS X v10.3 "Panther," and Apple Cinema Displays. This powerful, integrated platform removes the barriers to creativity and efficiency for creative professionals while streamlining mundane IT tasks. From workgroup management tools for fast creation and distribution of standard desktop configurations to capabilities such as streaming media, Apple's creative platform helps you take workgroups far beyond simply sharing files. With Apple technologies, creative workgroups are transformed from a collection of single creators to an efficient team that can collaborate for greater creativity and productivity. The Apple platform for creative professionals also integrates your Mac users into the enterprise IT infrastructure better than ever before.

At the heart of the Apple platform for creative workgroups is Mac OS X Server v10.3.5, also known as "Panther Server," Apple's cost-effective, feature-rich server software. More than just a file server, Mac OS X Server lets you develop efficient collaborative groups, tie together Mac and Windows workgroups, set up network services, and deploy dynamic websites and powerful Internet services such as streaming audio and video with ease and efficiency.

Mac OS X Server melds the most popular technologies from the open source community with the latest version of BSD—the long-standing foundation on which the Internet was built. Apple integrates these powerful technologies, tests them fully, and includes an intuitive, graphical interface so you can be assured of ease of use and rock-solid reliability.

You won't find more advanced workgroup management tools for Mac desktops anywhere than in Mac OS X Server. These tools give you fine-grained control, from ensuring that everyone is using the same fonts and color settings to distributing the latest versions of design software to everyone from a centralized location. With the Apple platform for creative workgroups, you can set up an entire studio as quickly and easily as a single desktop.

You can create standardized desktop configurations, set preferences, establish password policies to safeguard client files, and control access to hardware, software, and network resources with ease. Everyone in the workgroup can readily share files, as well as printers and other resources, not only with their Mac counterparts, but also with Windows and UNIX clients throughout the organization. Because Mac OS X Server uses native protocols and offers support for heterogeneous environments right out of the box, file sharing is fast and seamless.

Apple's creative workgroup platform also makes it easier than ever to tie Mac systems into any corporate network. Directory and mail services, for instance, are based on open standards to fit seamlessly and streamline system administration efforts. These capabilities let you equip creative professionals with the tools they need to accomplish their best work, while minimizing your IT efforts and costs.

Further reducing costs, Mac OS X Server offers unlimited-client licenses for Mac users and even lets you avoid client access license fees for Windows. Samba 3, built into Mac OS X Server and integrated with Open Directory, provides native services for Windows clients. This capability means your creative group and your business can grow without incurring ever-higher costs.

The Apple platform for creative workgroups also enables creative and IT groups to offer new types of services, from web hosting and secure Virtual Private Network (VPN) access to QuickTime media streaming. The next time you want to set up a secure website for project reviews, deliver cost-effective e-learning using QuickTime, or quickly set up remote access to the corporate network, the creative workgroup platform from Apple makes the process fast and easy.

With the Apple platform for creative professionals, you have the ideal tools to transform a group of Mac users into a creative powerhouse capable of delivering services that add value to your company, efficiently and cost-effectively.

Mac OS X Server software is included with Apple's Xserve G5, an ideal configuration for creative workgroups. If you're working in a smaller workgroup, you can also run Mac OS X Server software on a Power Mac G5 computer. The latest version of Mac OS X Server v10.3 offers the following advantages:

- Graphical and command-line management tools provide easy setup and administration of network services from anywhere on the Internet.
- Open standards (including Apache, LDAP, SMTP, Samba, SSL, IPSec, and many others) ensure superior compatibility and investment protection.
- The open source UNIX foundation (using BSD 5 with a Mach 3.0 kernel) delivers industrial-strength stability and performance.
- Robust online applications (including JBoss and MySQL) enable administrators to deliver more sophisticated Internet services—quickly, easily, and affordably.
- Built-in support for Windows file sharing, printer sharing, directory services, and more makes Mac OS X Server ideal for heterogeneous networks.
- Available unlimited-client license and comprehensive built-in services support growing organizations—without added cost.
- Automatic restart, journaling, IP failover, directory and authentication replication, software RAID, and other availability features protect Mac OS X Server systems from downtime.
- Innovative tools such as NetBoot, Network Install, and Workgroup Manager make it easy to manage Mac client systems.

- Advanced security features (including SSL/TLS, IPSec, SSH, Kerberos, PKI, and 802.1 authentication) protect your network infrastructure and assets.
- Easy-to-use online support tools and documentation, Apple-created training and certification programs, excellent service and support options, and an affordable server update program minimize support and maintenance costs.

What You'll Find in This Guide

This paper outlines Apple's recommendations for best practices for transitioning to the creative workgroup platform. It will guide you through the steps necessary to:

- Prepare for the transition, including putting together a transition team and developing a transition and deployment schedule.
- Evaluate your organization's hardware, software, and network for Mac OS X compatibility.
- Evaluate your organization's creative workflow and automation tools and procedures.
- Develop a server deployment strategy.
- Test and deploy the new system.
- Develop strategies for supporting the new installation with software updates and user training.

This guide assumes a working familiarity with Mac OS X. An accompanying document, *Migrating to Mac OS X: A Guide to Setting Up a Sample Workgroup*, is designed for those who are new to Mac OS X Server. It takes you step by step through the process of creating a test workgroup that can be modified to your own requirements before you deploy Mac OS X to your entire workgroup or organization.

Preparing for the Transition

Before you begin evaluating your creative team's computer systems and determining how to roll out Mac OS X Server, it's important to become familiar with Mac OS X Server and create the necessary infrastructure for a smooth transition.

Mac OS X Server Documentation

The best way to manage the needs of creative workgroups—Mac OS X users, groups, and system resources—is by using the Workgroup Manager application included in Mac OS X Server. Many of the steps in this document assume that you will manage your creative users with the tools provided by Mac OS X Server.

Before you plan your organization's transition to Mac OS X, it's highly recommended that you read through the current version of the Mac OS X Server documentation. It contains detailed information on how to efficiently manage your organization's Mac computers using Mac OS X Server and the utilities that ship with it. Documentation is included on the Mac OS X Server installation CDs, but Apple recommends that you get the most up-to-date version from the Apple website at www.apple.com/server/documentation.

If you (or the creative workgroups in your organization) are new to Mac OS X, it's recommended that you read *Migrating to Mac OS X: A Guide for Creative Professionals*. This document can be downloaded from the Resources section of www.apple.com/pro or www.apple.com/pro/design.

Transition Team

Before starting the migration, make sure that you have a transition team in place. You will need a project leader and at least one technical advisor. In some cases (especially in small design shops or agencies), one person might have both roles.

- The **project leader** is responsible for determining the deployment schedule as well as which creative groups and computers are going to be transitioned. This person will also be the project champion; he or she will make sure that the project stays on schedule and will support designers, production staff, and other users during the transition process.
- The **technical advisor** is responsible for coordinating the technical aspects of the transition (hardware, software, drivers, networking, and the like). This person should be comfortable using Mac OS X and Mac OS X Server. Mac OS X Server is a powerful tool for managing Mac OS X users in an enterprise environment, and it plays a significant role in the transition process.

Transition Schedule

Take the time to create a master calendar of events. Your calendar should include the following tasks:

- Hardware evaluation
- Software analysis and upgrade strategy
- User and administrator training
- Master disk image creation and testing
- Deployment

Training

Because technology transitions can disrupt both creativity and productivity, it is important that designers and others moving to Mac OS X spend some time learning and becoming comfortable with Mac OS X. For users who are familiar with previous versions of the Mac OS, a three-hour training session should be enough to get them comfortable with the new operating system. Allow about one day for training Windows users on the Mac OS.

Administrators will also need to get up to speed with Mac OS X Server, because the software and its management tools will play a big role in creating a smooth transition from Mac OS 9 to Mac OS X. Training an administrator is a much longer process than training a user. The amount of time needed will depend on the level of support the administrator will be performing.

The most important training topics for users are:

- The Mac OS X system (user interface changes from Mac OS 9)
- Networking
- File sharing
- Font management
- Printing
- Application training

Administrator training should include all of the above topics, as well as:

- Mac OS X Server and its technologies (NetBoot, Network Install, file sharing, directory services)
- Mac OS X Server management tools (Workgroup Manager, Server Admin Utility, Network Image Utility)
- Apple Remote Desktop
- Optional: Basic UNIX commands and the Terminal application

You can find out more about these and other available training sessions at training.apple.com.

Using Mac OS X Server and NetBoot for training

If possible, allow creative teams to use computers that are running Mac OS X during their work day. If spare Mac OS X systems are not available and you have access to a Mac OS X Server system, consider using NetBoot. NetBoot allows users to start up in Mac OS X from their system without disturbing their Mac OS 9 configuration. When using NetBoot, if a mission-critical project with a tight deadline comes up during the training period, a user can simply restart the computer using his or her local Mac OS 9 system and complete the project.

Evaluating Your Hardware

A key step in preparing your creative workgroup to transition from Mac OS 9 to Mac OS X is ensuring that your Mac systems and network hardware are ready to take advantage of this powerful operating system.

Mac OS X Hardware Requirements

Mac OS X version 10.3 “Panther” runs on Mac computers with a PowerPC G3, G4, or G5 processor and a built-in USB port. To make sure your computers are ready for Mac OS X, they must have:

- At least 128MB of physical RAM; 1GB recommended for professional publishing
- A built-in display or a display connected to an Apple-supplied video card (most other video cards sold for Mac systems should also work with Mac OS X; check with the manufacturer)

- At least 2GB of hard disk space; 8GB recommended for creative environments

Apple does not support Mac OS X on systems that have processor upgrade cards. You will need to remove the card or use different Mac systems that can run Mac OS X without an upgrade card.

Mac OS X Server systems must have:

- An Xserve, Power Mac G5, Power Mac G4, Power Mac G3, iMac, or eMac computer with a built-in USB port
- At least 128MB of physical RAM; 256MB for high-demand servers running multiple services
- At least 4GB of available hard disk space

Third-Party Hardware and Peripherals

Thousands of products from Canon, Nikon, HP, Sony, LaCie, Epson, Lexmark, 3M, Kodak, Kensington, Logitech, and many other leading vendors are ready to work with Mac OS X right out of the box. What external devices will you want to use with your upgraded Mac? These devices are the most common ones used in creative work:

- Printers
- Scanners
- Removable storage devices
- Digital cameras
- Camcorders
- Audio devices (microphone, speakers, other devices)

- Video cards
- CD burners
- PDAs
- SCSI add-in cards

Mac OS X features an advanced I/O system based on established open standards so that it can support a wide range of peripherals used by design professionals. It comes preconfigured with support for many camcorders, digital cameras, storage devices, scanners, printers, and input devices.

Other products might require third-party drivers that have been adapted to take advantage of Mac OS X. Information on driver availability can be obtained directly from the manufacturer or from the Apple downloads site at www.apple.com/downloads/macosx/drivers.

Network Infrastructure

Mac OS X and Mac OS X Server make it easier than ever for creative workgroups to collaborate in a networked environment. One of the greatest advantages of Mac OS X is the ability to centralize designers' and other users' account information, home folders, and group folders. Centralizing this information makes it easier for you to manage your users and computers, and it makes it easier for users to share information and files with each other.

If your users' data and files are currently being stored on their individual systems, now is the time to think about moving that data to a central network location. As you will discover while reading through this document, Mac OS X Server makes it very easy to manage creative groups and their data over a network.

Creative workgroups work best in a networked environment. If you follow the steps in this document, you will be using Mac OS X Server to manage users and how they share information with each other over a network. In most cases, your existing network hardware will be up to the task.

Apple recommends the following elements for a network that will be used by creative professionals:

- A wired network of 100 Mbps or faster will increase productivity. (Power Mac G5 and Xserve systems support Gigabit Ethernet.)
- Network switches rather than hubs will maximize network performance.
- If you plan to use AirPort wireless networking for your mobile users, you'll need to ensure that there is adequate signal strength throughout your shop. If coverage is weak in some areas, you will want to get additional base stations to fill coverage gaps.

If your existing network meets these criteria, it's ready for the setup described in this document.

(Apple does not recommend running NetBoot over an AirPort network because of the high bandwidth required to install software on multiple computers. However, you can use an AirPort network for many other routine administrative tasks.)

As you develop your workgroup migration plan, consider which services you will offer, because they will play a large role in determining what kind of infrastructure you will need. If you plan to provide home directories for all users on the workgroup server, and they will be working with large files, you should consider deploying a Gigabit Ethernet network. If you will be using the server only to supply DNS, DHCP, and mail (or similar low-traffic services), you should be fine with a 10BASE-T network.

Evaluating Your Software

By upgrading your creative workgroup to Mac OS X, you and your colleagues will be able to take advantage of more than 10,000 applications specifically written for Mac OS X—including such vital creative applications as Adobe Creative Suite and QuarkXPress.

If you have software you still need to use that has not yet been updated, you can run it in the Classic environment built into Mac OS X. However, Mac OS 9 applications running in Classic cannot use Mac OS X features such as symmetric multiprocessing and automatic memory management. Therefore, whenever possible, you should upgrade to Mac OS X versions of your applications. For information about applications that run on Mac OS X, see the Macintosh Products Guide at guide.apple.com.

Evaluate all of the applications that are regularly used in your organization and determine whether they need to be updated for Mac OS X. If upgrades are necessary, you will want to:

- **Determine software upgrade costs.** Find out which applications are now available in Mac OS X versions and plan on upgrading to them so that you can take advantage of the operating system's innovative features. Many other applications are written in such a way that they will run in either Mac OS 9 or Mac OS X. This capability means that you might be able to use your existing applications in Mac OS X without having to purchase an upgrade. Check with the vendors for details.
- **Create a test workflow.** When upgrading software it's always a good idea to make sure that the new version performs as expected. One way to test your software is to do a few jobs in parallel: Do the same job with the upgraded version of the software and with the previous version. (For your migration evaluation, you will likely run your previous version of software on a Mac OS 9 system and the new version on a system running Mac OS X.) Compare the processes and the results and note any differences. Once you are sure that the new software is performing as expected, you can be confident that there will be no surprises when you deploy it for Mac OS X.
- **Schedule training where necessary.** Evaluate the differences between existing software and new versions that run natively in Mac OS X to determine whether software training is necessary. In many cases, applications that you have been using in Mac OS 9 work the same way in Mac OS X and training is not necessary. However, if there are significant differences, now is the time to schedule training. If you will be purchasing entirely new Mac OS X applications that your users have not worked with before, you'll want to plan for training on those programs, too.

The rest of this section discusses the various types of software for which you might want to obtain Mac OS X upgrades or replacements.

Business and Productivity

If your users have been using Microsoft Word, Microsoft Excel, and other Microsoft Office applications for their productivity tasks, they'll be able to bring their existing documents into Microsoft Office 2004 for Mac. Office 2004 brings the new look and capabilities of Mac OS X to Microsoft's productivity applications. Popular financial applications such as Quicken, QuickBooks, and MYOB are also available in Mac OS X versions, ready to import your existing data files.

Mac OS X ships with a full-featured email application called Mail. Mail can import mailboxes from various email applications, including Entourage, Outlook Express, Claris EMailer 2.0v3, Netscape 4, and Eudora, so switching to it is straightforward. In addition, most third-party email applications have been updated to run natively in Mac OS X. Therefore, if you prefer to keep using your current email program, it's most likely available in a Mac OS X version. Check the vendor's website for details. With the release of Mac OS X v10.3, Mail works with Microsoft Exchange mail servers, so your users will be able to access their Exchange mail accounts from either a Windows or Mac computer.

Internet Connectivity

Mac OS X comes with a fast and versatile web browser called Safari. Users can import their bookmarks from other browsers into Safari, making it easy to switch to this innovative application. Mac OS X versions of other popular browsers are also available.

If you have been running an intranet web server using Personal Web Sharing in Mac OS 9, you'll appreciate the new, even more powerful version in Mac OS X. It's built on the popular Apache web server—the foundation for more than half the sites on the Internet today.

Mac OS X client software includes Virtual Private Network (VPN) support for Mac OS X Server, Windows, and UNIX/Linux servers. Mac OS X Server includes VPN support for Mac OS X, Windows, and UNIX/Linux clients using Point-to-Point Tunneling Protocol (PPTP) and Layer 2 Tunneling Protocol (L2TP/IPSec). It also includes support for strong authentication for VPN using MS-CHAP and IPSec, or for third-party solutions such as SecureID. Encryption using PPTP is 40 bit and 128 bit; L2TP uses IPSec.

Database Access and Hosting

Because Mac OS X includes Java and the Safari web browser, your new Mac OS X users will be ready to connect to web-based corporate databases. However, you should verify that your corporate databases can be accessed through Mac OS X before its deployment.

Mac OS X Server v10.3 includes MySQL, the world's most popular open source database. You might also want to investigate FileMaker, a high-performance multiuser database that makes it easy to share and manage information over a network. Such popular enterprise databases as Sybase Adaptive Server Enterprise and 4D WebSTAR are available for Mac OS X, and Oracle is developing a Mac OS X version of Oracle Database 10g.

Mac OS X also supports an emerging Internet standard called WebDAV, which adds file server capabilities to ordinary web servers. You can mount and navigate these Internet file servers in the Finder like any other file server, allowing you to easily author and access documents over the web.

You can build websites with Mac OS X versions of Macromedia Dreamweaver or Adobe GoLive, and enhance them with interactive content created with Macromedia Flash.

Image Editing and Page Assembly

QuarkXPress, Adobe Photoshop, Adobe Illustrator, Adobe InDesign, Macromedia FreeHand, and most other creative applications are now available in native Mac OS X versions to help your colleagues work more productively than ever. Check with the developers of your applications to find out whether the software has been upgraded. If not, users should be able to use their Mac OS 9 versions in the Classic environment.

A number of popular third-party plug-ins and extensions that add features to Adobe Acrobat, Adobe InDesign, QuarkXPress, and other applications have been updated for Mac OS X, and others are under development. Check with the vendors for the current status of the applications.

Font Management

If your workgroup has been using Mac OS 9 versions of professional font management applications such as Extensis Font Reserve, Extensis Suitcase, or Insider Software FontAgent Pro, your transition will be easy, because the Mac OS X versions will be familiar to everyone. In some cases, the same software being used on Mac OS 9 will also run on Mac OS X. Check the system requirements on the software package or contact the vendor for details. Mac OS X includes a built-in application for managing fonts called Font Book. For more information about it, see the document "Advanced Typography with Mac OS X" available at www.apple.com/pro/design.

Note that you will no longer need Adobe Type Manager Deluxe, because font rendering capability is built into Mac OS X.

Extensions and Control Panels

One of the advantages of Mac OS X is that you no longer have to worry about system extensions and control panels conflicting with each other, because Mac OS X doesn't have them. If you desire specific functionality offered by any of your old extensions, check whether Mac OS X has the equivalent feature built in. If it doesn't, check with the developers of your extensions to see whether they offer similar software for Mac OS X.

If you want your users to be able to use the Classic environment on their new Mac OS X systems, you'll want to go through their Mac OS 9 extensions and control panels to determine which ones they'll need so that you can copy them to the new system.

For information about control panels and the Classic environment, visit docs.info.apple.com/article.html?artnum=107135.

Color Management

In Mac OS X, ColorSync is fully integrated into the operating system. However, if you use color management, take some time to ensure that your existing profiles work as expected with Mac OS X. A number of tools are available for creating color profiles in Mac OS X. To find them, go to the Design and Print page of the online Macintosh Products Guide (guide.apple.com/uscategories/design.jasso) and select the Color Management category.

If you have screen calibration hardware or printer profile generation software, check with your vendors to find out whether you need any upgrades for Mac OS X.

Evaluating Your Workflow

You'll want to examine your current workflow to determine how it will be supported in Mac OS X. You might consider implementing new processes—or refining existing ones—during your transition. Here is a list of topics you should think about:

- Connectivity
- File sharing
- AppleScript
- Fonts and font servers
- Print spooling and serving
- Backups
- Asset management

Connectivity

Some of your current hardware and peripherals (such as scanners and printers) will need new drivers in order to connect to your Mac OS X systems. Contact the vendor for information about Mac OS X compatibility.

If you have any devices for which Mac OS X support is not available, you will have to decide whether to replace them or to keep one or more computers running Mac OS 9 to work with them. You can have both Mac OS X and Mac OS 9 systems on the same network and sharing files seamlessly, so your workgroup's productivity will remain high even if you leave some computers running Mac OS 9.

File Sharing

You're probably familiar with the Personal File Sharing feature in Mac OS 9—an enhanced version of the easy-to-use file sharing that the Mac OS has featured for many years. Mac OS X continues that tradition while strengthening protection against inappropriate access to shared files. In Mac OS X, each user has a designated Public folder that's always accessible and easy to find. Having a specific, uniformly named shared folder on all Mac OS X systems greatly reduces the chances that users will unintentionally share their private files.

However, as part of your migration to a Mac OS X-based creative workgroup, users should be encouraged to store project files in shared workgroup folders on a network file server rather than on their own computers. This procedure centralizes your organization's data, enabling all users to locate the files they need quickly and easily (including the user who created the file in the first place, if he or she ever needs to work from another Mac on the network).

The Workgroup Manager application in Mac OS X Server allows an administrator to designate any volume or individual folder on the server as a shared item. These share points can be easily accessed by any Mac, Windows, or UNIX/Linux client on the network.

You can find more information about Mac OS X file sharing at docs.info.apple.com/article.html?artnum=106461.

AppleScript

AppleScript is an English-like language used to write script files that automate the actions of the computer and the applications that run on it.

Much more than a macro language that simply repeats your recorded actions, AppleScript can “think,” making decisions based on user interaction or by parsing and analyzing data, documents, or situations. Now, with Mac OS X and the award-winning AppleScript Studio software, you can easily create powerful Mac OS X applications that have the Aqua look and feel and are written entirely in AppleScript.

AppleScript is fully supported in Mac OS X. In fact, it has become even more powerful. And Mac OS X version 10.3 ships with dozens of useful preinstalled script tools. Some of your existing AppleScript scripts might need to be modified to work properly in Mac OS X, so you’ll want to test them before you’ve made the transition. Even better would be to conduct a complete evaluation of your workflow and the scripting capabilities of Mac OS X to determine whether writing entirely new scripts might produce a more efficient workflow than revising existing scripts.

Folder Actions

Mac OS X includes a feature called Folder Actions that’s built on AppleScript technology. Folder Actions allow scripts to be “attached” to folders and automatically executed whenever any or all of the following events occur:

- The attached folder is opened.
- The window of the attached folder is closed.
- The window of the attached folder is moved or resized.
- Items are placed in the attached folder.
- Items are removed from the attached folder.

This utility makes it easy to create “hot folders” and “drop boxes” that respond to external actions to trigger a creative workflow or procedure, such as resizing images or changing their color space. These hot folders can be created on Mac OS X Server systems so that all the users in your workgroup can take advantage of them.

AppleScript Studio

Using AppleScript Studio software (included with Mac OS X), you can easily create Mac OS X applications written entirely in AppleScript that have the beautiful Mac OS X interface. AppleScript Studio also allows programmers to include code written in other programming languages, such as C and C++.

Fonts and Font Servers

Because Mac OS X is a multiuser system, fonts are now located in a number of different places in the file system. The different locations make it possible for each user to have a personal font collection. For more information about fonts in Mac OS X, read the document “Advanced Typography with Mac OS X” at www.apple.com/pro/design.

If you don't currently use a network font server, you might want to consider whether your workflow would benefit from one. Among other things, font server software such as that available from Extensis allows you to centrally organize and manage fonts as well as control access to fonts by department or user. Another advantage of adding a centralized font server is for font licensing purposes: The server can help you ensure that each font is being used on only the number of computers for which it's licensed.

If you currently have a Mac OS 9 font server, check with the vendor to find out whether a Mac OS X version is available. If you have a Windows-based font server, moving to a Mac OS X solution will help you take full advantage of the benefits you'll be gaining when you create a Mac OS X-based workgroup.

Print Spooling and Serving

Mac OS X extends Macintosh printing capabilities to even greater levels of performance and versatility, both for printers connected to a single Mac and for workgroup printers.

Because the Mac OS X printing architecture is based on the Common UNIX Printing System (CUPS), Mac users now have access to hundreds of CUPS-compliant drivers for printers from vendors such as Brother, Canon, Epson, HP, Lexmark, and Xerox, including drivers for many legacy printers as well as current models.

Support for the SMB protocol enables Mac OS X v10.3 workstations to print directly to printers shared with Windows systems. It also permits Windows users on your local network to use printers that are connected to Mac systems.

USB Printer Sharing, introduced in Mac OS X v10.2, allows other computers on your network to use your directly attached printer. Because Mac OS X can convert PostScript to PDF for screen display and printing, other computers on your network (both Mac and Windows) can send PostScript files to your Mac, which can convert the files, rasterize the documents, and print them on a USB printer. The ability to share a USB raster printer as a PostScript printer on the network is an industry first.

Mac OS X Server offers additional printing features beyond those available in Mac OS X. Its print service helps you set up a managed printing environment on your network. For example, you can share printers by setting up print queues for them on a server. When a user prints to a shared queue, the print job waits on the server until the printer is available or until established scheduling criteria are met.

When a designer prints a document to print service, the resulting print job moves quickly from the queue on the user's computer to the queue on the server. Using print service has a number of advantages over basic network printing:

- Print jobs transfer quickly from client computers to the server's queue, so users can turn off or disconnect their computers soon after printing.
- Printer error conditions are reported on the server rather than on individual client computers.
- You can easily limit and track the number of pages that individual users print on specific printers.
- You can control when and in what order individual jobs print.

Backups

Once your files are centralized on a network server, backups become much easier—a crucial capability in safeguarding layouts in progress and other creative work. Simply back up that one server, and you will have backed up all of your users' important files. You no longer have to be concerned with backing up every disk on every workstation.

If you already have a network backup solution, you can probably keep using it to back up your Mac OS X file server. If you don't have a backup system, a number of choices are available that work with Mac OS X. For current information, go to the Productivity and Utilities page in the Macintosh Products Guide (guide.apple.com/uscategories/productivity.lasso) and select the Backup and Recovery category.

Asset Management

Many of the popular digital asset managers available for Mac OS 9 have been updated for Mac OS X, so there will likely be an upgrade available to you. If you haven't been using a digital asset management system, you might consider how it could improve your workflow. For a list of asset managers available for Mac OS X, go to the Design and Print page in the Macintosh Products Guide (guide.apple.com/uscategories/productivity.lasso) and select the Asset Databases category.

Developing a Workgroup Management Strategy

Before you start the transition to Mac OS X, you'll need to plan how you're going to manage your creative workgroup's users. User management encompasses everything from setting up accounts for network access and creating home folders to fine-tuning the user experience by managing preferences and settings for users, groups, and computers.

This section briefly highlights some of the concepts discussed in depth in the *Mac OS X Server Open Directory* and *Mac OS X Server User Management* guides (available at www.apple.com/server/documentation). You should familiarize yourself with the concepts in those guides before deploying Mac OS X Server in your organization.

Defining Workgroups

Mac OS X Server comes with the powerful tools you need to manage your creative workgroup. One of the tools you will use frequently is the Workgroup Manager application. Its friendly graphical user interface helps you set up and manage home folders, accounts, preferences, and settings.

Workgroup Manager stores all of the information that you enter in an LDAP directory, allowing this information to be accessed by networked computers. Having such information available from any system on the network can be invaluable for network and client administration. You should, therefore, seriously consider setting up an LDAP directory if you don't already have one. The directory can be on your Mac OS X Server system or another server on the network. For more information about LDAP in Mac OS X, see the Open Directory 2 technology brief available at www.apple.com/server/macosx/open_directory.html.

Keeping user account information in a central location on the network allows users to log in from any Mac on the network; they are not limited to working on a single Mac. This feature is advantageous for creative workgroups, because freelancers and others can use whatever resources are available. And, if users are encouraged to store their project files on a centralized server, they will have access to those files from whichever Mac they're using. Workgroup Manager can be run from any Mac on the network.

Creating user groups

To simplify user management, Workgroup Manager lets you organize users into groups. A group is simply a collection of users with similar needs—much like employees are grouped into departments in a company. By assigning users, such as graphic artists, to a group, you can quickly set the preferences for a number of users simultaneously, because the settings applied to a group affect each group member. Groups you might have in your organization include:

- IT (administrators)
- Accounting
- Sales
- Customer service
- Design
- Production
- Training
- Guest (vendors, clients, and so on)

Also consider the unique needs of users who will be working outside of your network. Unlike in-house users, mobile users are not always connected to the network, so their computers cannot rely on the existence of network resources. Workgroup Manager allows you manage mobile users using the Mobile User account preference. For information on how to do this, see the “User Management for Mobile Clients” chapter of the *Mac OS X Server User Management* guide (see www.apple.com/server/documentation).

Assigning groups

Once you’ve determined your group strategies, you’ll assign each user to a group and use Workgroup Manager to control that group’s access to files, network resources, and system functionality. When you use groups, you can easily:

- Create a shared group folder that only members of a certain group can access. (See the *Mac OS X Server File Services Administration* guide for detailed information about how to set up share points.)
- Grant access to certain printers or other network devices based on group membership.
- Give group members access to the applications that they need to run.

Creating and Managing Accounts

Using Workgroup Manager, you can manage user, group, and computer accounts. Account management allows you to easily customize how designers and others interact with your organization’s network resources and with each other. This section briefly describes managing accounts using Workgroup Manager and account preferences.

Network accounts created with Workgroup Manager are stored in a network-based LDAP directory and are available to all Mac systems on the network. For more information about directory services in Mac OS X, please see the Open Directory 2 technology brief available at www.apple.com/server/macosx/open_directory.html.

For an in-depth discussion of user, group, and computer management, read the *Mac OS X Server User Management* guide.

Account types

Workgroup Manager is used to create network accounts for users, groups, and computers. It's also used to create network share points and mount records so that folders can be shared by all users in the workgroup.

User accounts are used to authenticate users so that they can log in—or be prohibited from logging in—to specific Mac computers on your network. In addition, user, group, and computer accounts can be used to set preferences that affect the tasks a user can perform. Once a user is authenticated during the login process, the preferences and settings stored in these accounts are merged together to create the same desktop experience for that user no matter which Mac on the network he or she uses.

Local vs. network user accounts

Accounts created with Workgroup Manager and saved to a network-based LDAP directory are available to all Mac computers on your network. User accounts created on an individual Mac using the Accounts system preference apply only to the Mac on which they were created.

Don't confuse network user accounts created with Workgroup Manager with accounts created on an individual Mac. Also, don't confuse user accounts with user home folders. Accounts contain the system-level information that permits a user to "exist" on a multiuser computer so that he or she can log in to the system. At first login, a home directory is created for the new user.

User accounts. User accounts contain a user ID, a password, preferences, and other settings applied by the system administrator. Any settings and preferences contained in this account affect only the individual user. If you have a large number of users in your network, you will probably set preferences by group more often than by user.

Group accounts. A group account contains preferences and privileges that apply to a collection of users, such as a group of graphic designers. Any preferences that you define for a group apply to all members of that group. Group accounts give you a lot of flexibility in managing your creative users. You can easily manage a collection of users by assigning them to a group and then setting the group's preferences. Changing any of the group's preferences instantly changes the settings for all of its members.

A given user can be assigned to any number of groups for different purposes. You might also wish to create temporary or guest accounts for freelancers, visiting clients, or the like. For example, you could set up a group account for all the freelancers working on a certain campaign, and restrict them to using only the applications necessary for that project.

Computer accounts. In addition to managing preferences for users and groups, you can set preferences for a computer. This capability is handy for linking a certain computer to a certain printer, for example, or for preventing users from burning CDs on specific computers. You can manage preferences in computer accounts based on known computers (identified by their MAC addresses) or by guest computers (systems whose MAC addresses do not appear in any defined computer account).

What can be managed?

For each of the three account types, Workgroup Manager allows you to configure (and optionally lock) certain user settings. You can set preferences once and allow users to change them, you can keep preferences under administrative control at all times and allow no user changes, or you can choose not to define any preferences at all. To determine which account's settings take precedence, see the "Preference precedence order" section on the next page.

Workgroup Manager provides control over the functions shown in the following table.

Preference	What you can manage
Applications	Applications and system preferences available to users
Classic	Classic startup settings, sleep settings, and the availability of Classic items such as control panels
Dock	Dock location, behavior, and items
Finder	Finder behavior, desktop appearance and items, and availability of Finder menu commands
Internet	Email account preferences and web browser preferences
Login	Login window appearance and items that open automatically when a user logs in
Media Access	Settings for CDs, DVDs, and recordable discs, and for internal and external disks such as hard drives and floppy disks
Mobile Accounts	Ability for users to log in to their computers while not on a network and still maintain their managed preferences
Printing	Available printers and printer access
System Preferences	Which preferences a user can access in the System Preferences window
Universal Access	Universal Access preferences

Preference precedence order

You have probably noticed that each of the three account types has a nearly identical set of preferences that can be controlled. Rules determine which account's preference settings take priority when there is a conflict.

1. Preferences managed by the user account override those set by the computer and workgroup accounts.
2. Preferences managed by the computer account take precedence over those set by the workgroup account.
3. Preferences managed by the workgroup account are overridden by other account types.

In the case of preferences that include a list of items, the effect is cumulative: Nothing is overridden. A good example of this situation would be a group of available printers. If the workgroup's printer preference contains Printer A, and the computer's printer preference contains Printer B, and the user's printer preference contains Printer C, then all three printers will be available to the user on that computer.

For more information about preference precedence order, please read the "Client Management Overview" section of the *Mac OS X Server User Management* guide.

Organizing Home Folders

As a powerful workgroup operating system, Mac OS X Server is tailor-made to take full advantage of a networked environment, so it can work just as easily with server-based home folders as with local ones. If you store your users' home folders on a network server, users can move from one computer to another as their job tasks dictate and their files and desktop environments will move right along with them.

A home folder is simply a folder in which a user's personal files and preferences are stored. The files in a home folder are kept private to that user. Other users can read only files that have been put in the Public folder of a home folder.

Mac OS X Server allows full management of home folders on a centralized server, enabling users to access their private files from anywhere on the network.

Folders and directories

Mac users are accustomed to the term "folder" in discussions of the computer's file system. In the Mac OS X world, you might also see the term "directory." In this document, "folder" is used except when discussing directory services.

Users are encouraged to store all of their files in their home folder. They can quickly navigate to their home folder in a number of ways:

- In any Finder window, click the house icon in the sidebar on the left side of the window.
- In the Finder, choose Home from the Go menu.
- In the Finder, press Shift-Command-H.

For a detailed description of home folders, see the “Setting Up Home Directories” chapter of the *Mac OS X Server User Management* guide.

Home folder template

When a user logs in to his or her account for the first time, a home folder is created, if it hasn't already been created by the system administrator. In either case, a system administrator can customize the home folder that each new user gets. The items in a new user's home folder are copied from a template folder; by editing this template, administrators can control what items appear in each new user's home folder. The template is located on the server in the appropriate localized folder in `/System/Library/User Template/`.

Home folders can reside on either a local computer or a network file server. A local home folder is created automatically the first time a user logs in after his or her user account is enabled. Network home folders created with Workgroup Manager, on the other hand, are stored remotely on a network server.

You will need to determine whether local or network-based home folders are appropriate for your organization. As a general rule, in all but small organizations, network home folders are easier to maintain and more convenient for users than local home folders. Keep in mind that the choice doesn't have to be either/or. It's possible that your organization might want to use a combination of both locations. In-house personnel could use network home folders, while mobile employees (such as sales personnel) could use local home folders on their PowerBook computers through the Workgroup Manager Mobile User preference.

Local home folders

If you have a small organization and each user performs all of his or her work on a single Mac, local home folders will work just fine. If your organization is larger, network-based home folders will simplify your management chores. In either case, local home folders will be necessary for PowerBook users, because they are not always connected to your network.

The use of local home folders in an organization requires more administration effort than network-based home folders, because your users' accounts and home folders are distributed across many computers rather than centralized on one or more file servers. This administration can be simplified by using Apple Remote Desktop software. An Apple Remote Desktop agent is part of Mac OS X Panther, so it's automatically installed when you upgrade your workstations and servers to Mac OS X. All you have to do is purchase Apple Remote Desktop and you'll be able to manage your Mac OS systems remotely. Please see Appendix B for more information on this powerful remote control software.

On the other hand, having your users store their home folders on their own computers reduces network traffic and allows them to continue working should there be networking problems. Also, using local home folders reduces the amount of network storage you will need, because files will be distributed across the local hard drives of your networked systems. Of course, this choice means that each workstation will require more storage capacity. Storing shared work files on local disks can also lead to confusion about which version of the file is the latest one.

Network home folders

If your organization has more than just a few computers, using network-based home folders will likely keep user and system administration time to a minimum. Central storage of home folders on a network server also gives users the freedom to move from one computer to another and still have access to their personal desktop environment. When you create a user account in Workgroup Manager, you specify the server on which the user's home folder is to be stored.

Consider the following benefits of using network home folders:

- You can create, edit, or delete each user's account information without having to physically visit his or her computer.
- Should a user temporarily move to another Mac, the user's files, preferences, and desktop environment will move along with him or her.
- Because network home folders are stored on a central server, backing up the server backs up all users' files.

Before you assign network home folders to your users, estimate the amount of network storage you will need. If your network storage is limited, you can assign quotas to each user's home folder to keep online storage requirements manageable. To effectively use network home folders, a 100-Mbps or faster network is recommended.

Home folder contents

You will notice that each user's home folder contains a number of folders that have special icons. These folders are used by many applications as default locations for saving files. Each folder's name describes the types of files that it is designed to store. Of course, users can actually store any type of file in any of the folders; the folder names are just a convenient way to help users keep their files organized.

Below is a list of the folders that users will see in their home folders when they first use Mac OS X. These folders are what Mac OS X creates as a default. As a system administrator, you can modify the default home folder configuration so that users get the subfolders and other contents that make sense for your organization.

- **Desktop.** This folder contains the contents of all of the files and folders currently being displayed on a user's desktop.
- **Documents.** This is a place to store files such as layouts, comps, and so on.
- **Library.** This special folder holds each user's application preferences, resources, sounds, and other files needed by applications and the system to create their individual desktop experience. For example, each user's browser bookmarks are kept here.
- **Movies.** This folder is used for movie files. To find a movie, a user simply navigates to the home folder and opens the Movies folder.
- **Music.** This folder is used to store music files. To find a song, a user simply navigates to the home folder and opens the Music folder.
- **Pictures.** This folder is used for digital picture files. It is the default location that iPhoto uses to store a user's photos.
- **Public.** This is a special folder that is also available to other users of the system and the network. Files placed in this folder are available to everyone, so users should not store sensitive information in this location. Inside the Public folder is a folder called Drop Box. Any user can put files into the Drop Box, but only its owner can open it. This is a way for users to exchange files that are intended only for the Drop Box owner's eyes.
- **Sites.** This folder is open to all users and allows a user to host a web page on his or her system. Don't store sensitive information in this folder.

Users are free to add their own folders in their home folder. The access privileges for any user-created folders depend on the folder's location. Any folder or file that a user puts in the root level of their home folder is available to all users. If users want a particular folder or file to be available only to them, they should put it into one of the folders that is locked to other users.

Building a Master System for Client Computers

Once you have set up the accounts and services that your workgroup needs, it's time to create a master image of the new operating system that will be deployed to each networked Mac. This section discusses various technologies that you can use to create and deploy your Mac OS X systems.

In most cases, any Mac that can run Mac OS X can run any version of it. However, be sure to check the system requirements for your version of Mac OS X before upgrading your computers. This compatibility check simplifies both your initial Mac OS X migration and later upgrades.

To make the transition process as efficient as possible, you will create a Mac OS X master system that can be copied to each of the Mac computers across all your creative workgroups. You should create your master system on your newest Mac—or a Mac that contains all of the features found on other Mac computers in your network—so that your master system will contain settings for all possible features. When this image is cloned onto another system with similar features, all of the appropriate settings will already be defined in the master system.

Configuring Disks on the Host Mac

Once you have selected the Mac on which to build the master system (the “host Mac”), you need to consider how to set up its disk(s). During the master system creation process, you will need to test the image to make sure that it is working as expected. At some point in the process, you also need to create a Network Install image from your master system, and this requires that you start up from a system other than the one from which you are creating the image. Therefore, some consideration about your system's disk(s) is necessary.

External drive

If you have an external hard disk (a FireWire drive is good for this purpose), you can install your master system on it. You can start up from the external drive when testing the master system, then start up from the internal hard disk when creating the Network Install image. (Store the install image on a network file server rather than archiving the external drive, because drives can go bad if they sit unused for long periods of time.)

Single internal drive

If you are working from a Mac with a single internal hard disk, you should divide it into at least two partitions. One partition will contain the master system, the other will contain a system that can be used to start up the Mac when you are creating the Network Install image. Make sure that, after partitioning the disk, each partition is large enough to hold the necessary files.

Apple Remote Desktop

Mac OS X v10.3 “Panther” includes an Apple Remote Desktop agent. Even if you’re not planning to use Apple Remote Desktop in your organization, make sure that you configure the Apple Remote Desktop settings in the Sharing system preference of your master system before deploying it. Should you decide to purchase Apple Remote Desktop software in the future, your systems will be ready for it. For more information about Apple Remote Desktop, see Appendix B.

Multiple internal drives

If your Mac has multiple internal hard disks, one disk can be used to contain the master system, and another can have a system that is used to start up the Mac when you are creating the Network Install image.

Installing Mac OS X and Applications

You’ll install Mac OS X on your master system partition or disk and then customize it so that it contains all of the applications, drivers, and other files your users will need. Adding all of your organization’s applications to the master system enables any user to log in to a networked Mac and have access to the applications that he or she commonly uses. You can control access to any application or system preference based on a user’s account information, so you needn’t worry about users running applications they aren’t supposed to use.

Important: Before installing software on the master system, make sure you check the software license agreements for the applications to make sure that you comply with their requirements. Also, make sure that you have a Mac OS X license for each client that will be running Mac OS X.

Install Mac OS X on the master system disk or partition

Your first task is to install Mac OS X on the appropriate drive or partition on the host Mac. This software will be the operating system that is used on the master system. Simply insert the Mac OS X Install CD and install Mac OS X, setting the appropriate options that you want your client systems to use. Then start up from the new master system and configure it for use by your networked computers. Keep in mind that some of the settings (such as the computer name and network information) might need to be edited on each client Mac *after* the master system is installed. So don’t worry if some of the settings you enter at this point aren’t appropriate for all the user systems.

Configure the system preferences

Wherever possible, configure the system preferences on the master system in a way that will be appropriate for your client computers. Because you will be running the host Mac from the master system while you are configuring that system, you might need to temporarily configure some preferences inappropriately for the clients. For example, you might need to set a manual TCP/IP address to access your network while building the image, but the final image will need to have a DHCP assigned address. This situation is not a problem. You can change any preferences after the master system has been created and before the Network Install image has been made.

Install applications, scripts, and drivers

You are now ready to install applications on the master system. If possible, the image should contain all the software that any user might need. If you don’t want to include all applications on your master system, you might consider creating more than one master system, such as a different one for each department in your organization. Installing all of your organization’s applications on the master disk image enables any user to log in to any Mac and have access to all required applications. You can control access to applications based on a user’s account information, so you needn’t worry about users running applications they aren’t supposed to use. If the applications require serial numbers or license keys to run, please read the “Application Serial Numbers and License Keys” section before installing them.

In addition to commercial applications, be sure to include on your master system image any internally developed applications that individual users might need. AppleScript scripts, printer drivers, and other programs necessary for workgroup members to do their jobs should also be included. Note that you might prefer to have users run some applications from the server instead of their own computers. That approach could lower the disk capacity requirements for individual workstations. Make sure that the application can handle multiple users simultaneously, and if it's a commercial application, make sure that your software license allows simultaneous multiuser access.

Application Serial Numbers and License Keys

Many of today's creative and other applications require a unique serial number or license key to be installed before they will run. Some applications check the network to make sure that no other copies of the application are running with the same serial number. Some applications might even be serialized to a specific computer. When using a common system image on multiple computers in a network, you need to determine how to deploy your organization's applications so that each user can run his or her required software without conflicting with another system's copy of the application. If an application doesn't allow more than one system to use the same license key at the same time, you will need to locate the file that contains the license key and make sure that each system gets its own unique key. This scenario can usually be dealt with by installing a unique license key on each computer you have cloned from your master system.

Software developers—not Mac OS X—decide where an application stores its license key on the computer (or even whether it will store one). One application might store its license keys in a system location (such as the Library/Application Support folder), while another might choose to store it in a user's home folder (such as ~/Library/Preferences). There isn't one location or method that all developers use for storing license keys.

If an application uses a license key scheme that prevents more than one user from running an application with the same key at the same time, it will complicate your master system installation process. Some developers offer a single multiuser license key (or site license) in place of a number of individual keys. Multiuser license keys allow you to install a single key for an application on your master system without having to do any extra work after the master system has been deployed. They also eliminate the need to assign a particular key to a specific user or computer, greatly reducing system management time.

If you are having difficulty determining how to deal with the license key for particular applications, contact the developers to find out if they offer multiuser license keys or if they have a method for installing their software from a common system image.

License key installation scenarios

How you install your software will depend on whether you have single-user or multi-user keys, and whether you use Network Install or NetBoot. If you deploy your master system to a number of client systems using Network Install, each client system can be individually modified after installation to accommodate various license key scenarios. On the other hand, if you're using NetBoot, each user boots from exactly the same Mac OS X system image stored on a server, so customization is not an option. The following scenarios discuss how to best handle each situation.

Multiuser license key stored in a system location:

- **NetBoot or Network Install.** Store the license key in the system disk image so it will be installed on all Mac computers.

Multiuser license key stored in a user location:

- **NetBoot or Network Install.** If you're using Mac OS X Server and network-based home folders for your users, install the license key in the home folder template (/System/Library/User Template/). The key will be included in each user's home folder when that folder is first created.
- **NetBoot or Network Install.** If some users already have home folders, you can install the license key in each existing user's home folder (either manually or by writing a script).

Single-user license key stored in a system location:

- **NetBoot.** A NetBoot system image is common to each system that starts up from it, which means that every system that uses NetBoot would be running each copy of a serialized application using the same license key. If the application checks the network and finds another copy of the software using the same key, it will likely report a license violation and quit running. You should contact the application's developer for a solution.
- **Network Install.** After the master system has been installed on a client Mac, install a unique single-user license key manually or by running a script. This procedure will need to be repeated on each client Mac.

Single-user license key stored in a user location:

- **NetBoot or Network Install.** Install a unique license key file in the home folder on the computer of each user who needs the application. Those who won't be using the software don't need a key.

Testing the Master System

Once you have created your master system, take the time to implement a testing program that allows you to work on jobs in parallel using both Mac OS 9 and Mac OS X. Doing jobs in parallel allows you to perform a side-by-side comparison of a job completed using a Mac OS X system with the same job using your previous system. If you are happy with the results, you're ready to deploy your master system to the Mac computers in your workgroup.

During your testing, you should:

- Set up a parallel job workflow. In other words, do a few jobs using your regular Mac OS 9 applications, then also do them in Mac OS X. This test will help you make sure that the results you are getting from Mac OS X match those you've been getting with Mac OS 9.
- Have users evaluate the process in Mac OS X, listen to their feedback, and make changes where appropriate. Responding to feedback at this stage is vital to a successful migration.
- Make sure that the test group is sufficiently large to encounter as many potential job scenarios as possible.
- Have a fallback plan so that testers can revert to the old system if rush jobs come in.

Deploying the New System

Now that you have successfully tested your master system, you're ready to deploy it. This section discusses the Apple technologies and methods you can use to deploy Mac OS X to the computers in your creative workgroup. The available technologies include:

- Network Install
- NetBoot
- Network Image Utility
- Apple Remote Desktop

The Network Install and NetBoot features of Mac OS X Server make it easy to manage the operating system and application software your Mac clients need to start up and do their work. Network Image Utility lets you create the image that will be deployed to your workgroup computers. Once you have Mac OS X installed on the computers, you can keep their software up to date and make other configuration changes using Apple Remote Desktop from a central location. These tools free you from having to go from computer to computer to install the system software and applications.

Network Install or NetBoot?

Apple offers two versatile methods for configuring Mac computers within a workgroup environment.

Network Install lets you install Mac OS X, application software, and files directly onto your networked computers' hard drives. A master system is installed on client computers over the network from a Network Install image on a system running Mac OS X Server. You start up the client from the Network Install image once; the software is installed; and from then on, the Mac starts up from its internal hard disk.

Network Install can run completely unattended on the client systems, providing streamlined installation or upgrades. Alternatively, you can specify that certain user actions must occur before or after the installation of a specific software package or system image. Once the installation process is complete, client systems no longer need to be connected to the network. This capability makes Network Install an excellent solution for managing mobile computers.

Alternatively, you can choose not to install the operating system on the clients at all, but instead to have those clients start up each time directly from a NetBoot image stored on a network server. With NetBoot, you can quickly update the operating system and other software for an entire group of systems simply by updating the single boot image. NetBoot is generally used in combination with network-based user home folders so that changes made to user preferences will persist no matter which computer the user logs in to.

Backing up and deploying a Mac OS X system

Unlike previous versions of the Mac OS, Mac OS X can't be drag-copied from one disk to another using the Finder; the resulting copy of Mac OS X will not be able to start up a computer. To back up a copy of a Mac OS X system and have it be bootable, you will need to use Apple's Disk Utility or a third-party backup utility. To deploy a master system that contains Mac OS X to other computers in your network, you need to use the Network Install feature of Mac OS X Server.

How to get Apple Remote Desktop

An Apple Remote Desktop agent is built into Mac OS X version 10.3. Its options can be set in the Sharing system preference.

To take advantage of the agents in your Mac OS X-based workstations, you must purchase Apple Remote Desktop 2 software. It is available from the Apple Store at www.apple.com.

Updating the Startup Disk control panel (Mac OS 9)

Make sure that you have the latest version of the Startup Disk control panel installed on your Mac OS 9 system. The Utilities folder on the Mac OS X CD contains Startup Disk version 9.2, the control panel you use to select the startup disk for your computer. You need to use this version of Startup Disk to select a Mac OS X disk or a NetBoot image as your startup disk.

NetBoot is the most efficient way to manage a large number of Mac clients. Because all the Mac systems start up from a single server-based disk image instead of their internal hard drives, you can easily create a standard configuration and use it on all of the desktop systems in a department. You can even have the NetBoot server host multiple images customized for different workgroups.

NetBoot is especially attractive for use in training labs and public locations, where the ability to quickly revert a system to a known state is important. It can also be used to troubleshoot software and hardware issues, because a Mac that is controlled by NetBoot always starts up from your system image.

With either Network Install or NetBoot, your networked Mac systems will have the software and settings that you built into the master system.

Network Image Utility

With Network Image Utility, you can create a NetBoot or Network Install disk image simply by cloning a local volume; no configuration is required. This feature 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.

Apple Remote Desktop

Apple Remote Desktop gives you the ability to install applications that are not in the package format, such as Photoshop upgrades or a corporate font update. You can schedule tasks to be done at certain times of the night so they won't interfere with your group's creative workflow.

The Deployment Plan

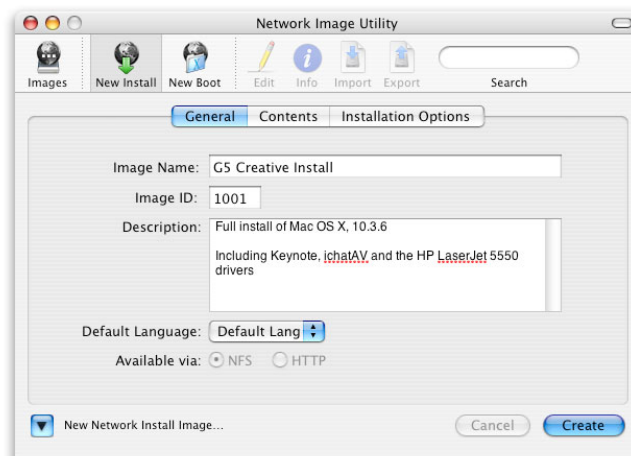
Because many organizations want Mac systems that can start up individually, the rest of this section will detail the steps needed to deploy your master system with Network Install.

To perform the tasks outlined here, you need a copy of *Mac OS X Server System Image Administration*. A PDF file of that guide is included with Mac OS X Server, and you can download the most current version of it from www.apple.com/server/documentation. The guide also contains information about working with NetBoot, should you wish to investigate that option.

Deployment steps overview

The steps you will take to deploy your Mac OS X systems are as follows:

1. From your master system, create a Network Install image using Network Image Utility. (See the *Mac OS X Server System Image Administration* guide for details.)



2. Using the Server Admin utility, select NetBoot Service. Select the Settings tab and click General. Determine which hard drive(s) you are going to use to store your image. (You can select more than one.)
3. Export the Network Install image to your Mac OS X Server system. Put this image in the NetBoot folder located at <volume>/Library/NetBoot/netbootSP.
4. In Server Admin, go to Settings > Images and select the Enable tab to make the images available. If you do not see the images that you copied onto your server, you will need to redo steps 2 and 3.
5. Visit a computer that needs to be updated and make a note of its serial number. You will need this information to identify the computer should you want to use Apple Remote Desktop Administrator to configure the system after updating it. The serial number is also needed if you would like to use the filtering ability of the server to install specific images on specific computers.
6. Start up a Mac from the Network Install image on the server by setting the image as the startup disk from the Startup Disk control panel in Mac OS 9, or from the Startup Disk system preference in Mac OS X. If you cannot see the Network Install image from the Mac OS 9 Startup Disk control panel, you might need to update it. (See the "Updating the Startup Disk control panel" sidebar.)
7. Install Mac OS X from the Network Install image you used to start up the computer. (Depending on the settings of the Network Install image, you might have to supply information during the installation process.)
8. After Mac OS X has been installed, configure the system preferences (computer name, network, accounts, and so on), either from the local computer's system preferences or remotely using Apple Remote Desktop.
9. Test this process on a few systems before updating all of your workgroup's Mac systems. Then repeat steps 4 through 8 for each Mac in your workgroup. Keep in mind that with Network Install, you can perform the update on many computers simultaneously.

Network Image Utility

You will use Network Image Utility to create the Network Install image that will be used by the Mac OS X Server Network Install service. You will find this utility in the /Applications/Server folder of Mac OS X Server.

Network Image Utility cannot make an image from the active system volume. If you created your master system on a Mac computer's internal hard disk, you will have to start up the computer from a different volume before running Network Image Utility. The other volume can be another partition on the internal drive, or a different hard disk. If you installed your master system on an external drive, make sure that the drive is connected and that your master system volume appears in the Finder. Your system image will have to be on a local disk; you cannot create a startup image from a volume over the network. However, you could use NetBoot to start up the computer, then create the NetBoot image on the computer's local drive.

Adding applications

During the Network Install image creation process (see the following section), you will have the opportunity to add installation packages to the image. You use these packages to install additional files or software in the Network Install image. You can create your own packages using Apple's PackageMaker utility, or, if available, simply use a package that has been created by a software developer. Packages added to a Network Install image are installed after the system software is installed.

If you included all the applications and files your users will need on your master system, you will not need to add any packages to the Network Install image. If an application requires installation through a method other than a package installer, you will not be able to include it in your Network Install image. Instead, you can use Apple Remote Desktop after the initial image installation to add such applications.

Creating the Network Install image

To create the Network Install image, follow the instructions in the “Creating Install Images” section of *Mac OS X Server System Image Administration*. As recommended earlier, you should create your Network Install image on a computer other than the Mac OS X Server system that will be hosting the image. Therefore, you need to copy Network Image Utility to the system on which the image will be made. After you create the image, follow the steps in the next section to export it to the server that will be hosting it.

Loading the Image onto the Mac OS X Server System

Now that you have created your Network Install image, you are ready to transfer it to the server that will be hosting it. To do so, use the Export function of Network Image Utility. (To avoid any problems with file permissions, Apple recommends that you do not use Terminal or the Finder to copy boot images or install images across the network to other servers.)

Setting up NetBoot on your server

Network Install runs as part of the Mac OS X Server NetBoot service. To use Network Install, you have to set up the NetBoot service—even if you are not planning to use the NetBoot functionality. You will use the Server Admin application in Mac OS X Server to set up the NetBoot service. For details on setting up Network Install, refer to the “Setting Up NetBoot Service” section in the *System Image Administration* guide.

After you complete this step, your Network Install image will be available to each Mac that is on the same subnet as the server. To confirm, visit one of the clients and open the Startup Disk system preference (or in Mac OS 9, open the Startup Disk control panel). Your Network Install image should appear in the list of startup disk choices. If it doesn't, make sure that you didn't accidentally skip any of the setup steps.

Testing the Network Install Image

Now you're ready to test the Network Install image by installing your master system on some test computers. This testing is not the same as the testing you did in the previous step. In the previous step you tested the Mac OS X versions of your applications; in this step you are testing your Network Install image. As before, your test computers should be typical of the systems that will be used in your workgroup. Your goal here is to make sure that there are no surprises when you deploy your master system to the workgroup computers.

Test the following:

- Make sure the system boots properly.
- Run applications to make sure that they work as expected.
- Connect to network services (servers, Internet, email, and so on).
- If applicable, make sure user account preferences are set properly.

Once you're confident that the install image is working properly on your test systems, you can start your general deployment.

Taking inventory

Because you will be visiting each Mac in your network, you might want to take advantage of these visits by updating your organization's database of Mac computers and their configurations. If you don't have a database already, now would be a great opportunity to create one. You can use Apple Remote Desktop to obtain much of the information for your database remotely.

Deploying

To upgrade your Mac systems to Mac OS X, you will have to physically visit each Mac that is being upgraded. This step is needed because you will have to start up each Mac from the Network Install image and possibly perform some postinstallation tasks. These tasks might consist of configuring the network settings, naming the computer, adding local user accounts, and the like.

Using Apple Remote Desktop

Once you have Mac OS X installed on your workgroup's Mac systems, you can perform all of your system maintenance tasks using Apple Remote Desktop. Among its many features, this software lets you set system preferences and take an inventory of the applications on each computer. You can even install software updates and files to many computers at once as a batch process. This capability lets you put all your creative users on the same page, using the most current versions of everything they need.

If, when you created your Network Install image, you chose "Enable automated installation" and selected the option to have the computer reboot after the installation is complete, you can simply start the installation process and then complete the rest of the configuration remotely from a computer running Apple Remote Desktop. In the scenario discussed in this document, all of your workgroup's computers are being updated from the same Network Install image, so all of them will have the same computer name once the system is rebooted. If you plan to use Apple Remote Desktop, you should note the serial number of each Mac before installing Mac OS X. Doing so will allow you to easily identify a particular system from Apple Remote Desktop so that you can configure its settings.

Some of the settings you will likely want to configure are:

- Assigning a computer name
- Adding local user accounts
- Configuring network settings

You might want to create AppleScript scripts to automate those tasks.

Keeping Systems Up to Date

Once the computers in your creative workgroup have been upgraded to Mac OS X, you can keep them up to date using Apple Remote Desktop and Network Install. In addition, if you keep your master system up to date by applying updates to the software it contains, you can easily create a new Network Install image that will allow you to quickly install your customized Mac OS X system to any new Mac that is added to the workgroup.

Supporting Systems and Users

Once you have deployed Mac OS X, you need to support it. Appendix B describes software products that can help you deploy and maintain your organization's systems.

Common support tasks include:

- Applying system and third-party software updates
- Training users and administrators on Mac OS X and third-party software
- Troubleshooting Mac systems and software

Updating Software

To be safe, you should always test system and application software updates before installing them in your creative workgroup's computers. Set aside a disk partition (or a removable disk) where you can install the master system, then apply and test the updates to make sure that everything works as expected. After you've determined that the update is okay, you can distribute it to your organization's Mac systems.

Software Update is a system preference that automatically keeps your system software and Apple applications up to date. For Software Update to install new software, an administrator user name and a password must be entered. Users may receive a message from Software Update letting them know that an update is available. However, they won't have the proper permissions to install it. This feature means that you don't have to worry about users installing an untested update on their own; an administrator is required.

You can also prevent users from updating third-party software by making sure that they don't have sufficient permissions to write to the Applications folder (or whichever folder your organization uses for software installations). Users will then need to have administrator approval before updating the software that they use, giving you a chance to test the update before it is installed.

Apple Remote Desktop

While there are a number of ways to apply software updates, one of the easiest ways is to use Apple Remote Desktop software. Apple Remote Desktop allows you to remotely control and install software from any computer on the network on which that software has been installed. You can use it to install software on a number of end-user computers simultaneously. Or, if you require fine-tuning for individual computers, you can install software one system at a time.

For more information about Apple Remote Desktop, see Appendix B.

NetBoot and Network Install

With NetBoot, you update software simply by applying the update to the NetBoot image. When users' computers are started up from the revised image, they will have the updates.

If your client systems are not starting up from NetBoot, you can use Network Install to assist you in updating their software. Network Install requires software updates to be "packages" created by Apple's PackageMaker utility. For more information about NetBoot and Network Install, see the *Mac OS X Server System Image Administration* guide. For information about PackageMaker, see Appendix B of this document.

Training Users and Administrators

Apple offers a variety of products and services to help you train users and administrators on Mac OS X and Apple's Mac OS X applications. Some of those offerings are mentioned here; for complete information, please visit www.apple.com/training.

User training (self-paced CDs)

- Mac OS X Fundamentals. Shows users how to organize and find documents, configure personal system settings, increase their productivity, and much more.
- Mac OS X Daily Productivity. Provides an introduction to the built-in Mac OS X address book, calendar, mail, and web browser applications.

Administrator training (instructor-led courses)

- Mac OS X Server Essentials. Provides technical coordinators and entry-level system administrators with the skills, tools, and knowledge to deploy and maintain a Mac OS X Server-based system.
- System Administration of Mac OS X Clients. Teaches attendees how to deploy, integrate, and maintain Mac OS X solutions in a multiplatform environment.
- Help Desk Essentials. Offers a hands-on exploration of the best methods for troubleshooting Mac OS X.
- System Administration of Mac OS X Clients. Covers implementing, integrating, and maintaining Mac OS X in a multiplatform (Mac, Windows, UNIX) environment.
- System Administration Using Mac OS X Server. Provides in-depth information on optimizing the power of Mac OS X Server and effectively managing it in a complex mixed-network environment.
- Directory Services. Offers a combination of lectures and real-world exercises on Mac OS X directory services and tools for effectively managing a network of client computers.

Apple Enterprise Consulting

The highly skilled engineers of the Apple Enterprise Consulting group offer comprehensive, onsite consulting for enterprise-oriented deployments. Services include presales assessment, migration and integration planning, and deployment in heterogeneous environments. Mac OS X services include client deployments using network home folders, creation and deployment of custom Mac OS X images, NetBoot and Network Install deployments, and migration from Mac OS 9 and Windows clients to Mac OS X. For more information or to schedule a consultation, contact consultingservices@apple.com.

Troubleshooting

Mac OS X troubleshooting information is available from a number of sources, including www.apple.com/support.

You might want to consider purchasing one or more AppleCare support products. Developed by the people who know Apple systems best, these services and training CDs include:

- AppleCare Protection Plan
- AppleCare Technician Training
- AppleCare Help Desk Support
- Mac OS X Server Software Support

Visit www.apple.com/support/products for complete information.

Appendix A: Mac OS X Basics for Administrators

Unlike previous versions of the Mac OS, Mac OS X is built on top of a powerful UNIX-based foundation. This architecture means that you, as an administrator, have more control over each user's Mac experience than ever before. This section provides a brief overview of some of the most significant features of Mac OS X and, where appropriate, shows how you can take advantage of these features in a networked environment.

If you (or users in your organization) are new to Mac OS X, it's recommended that you read *Migrating to Mac OS X: A Guide for Creative Professionals*. This document details the differences between Mac OS X and previous versions of the Mac OS and should be very helpful to any level of Mac user not familiar with Mac OS X. It can be downloaded from Apple's website at www.apple.com/pro. You'll find the link in the Resources section of that page.

Mac OS X File Organization

It's important to remember that Mac OS X is a true multiuser operating system. Each user's files and preferences are stored separately from other users' so that each has his or her own personalized user experience. This structure is a major change from previous versions of the Mac OS, and you will have to keep this in mind as you prepare to migrate your users to Mac OS X. The main thing to remember is that in order to take full advantage of Mac OS X capabilities, you will need to organize your files and applications differently from the way you did in previous versions of the Mac OS.

Browsing the file system

The Mac OS X file system is organized into four major sections:

- Ordinary system files
- Required system files
- User files
- Network-based files

As you browse through the file system, you will encounter a number of seemingly duplicate folders. For example, you have probably noticed that there are a number of folders named "Library." Mac OS X uses common folder names so that all it has to do to locate important system files in various places in the file system is to change the starting point of the search.

Fonts are a good example of this. Mac OS X looks for fonts in four places (assuming that the Classic environment is not installed):

- /Library/Fonts
- /System/Library/Fonts
- ~/Library/Fonts (the tilde “~” character indicates a user’s home folder)
- /Network/Library/Fonts

As you can see, fonts are always located in a folder named “Fonts” that is inside a folder named “Library.” The location in the file system of the Library folder determines which users can use the fonts (or any other resources in that Library folder).

Below is a list of Library folder locations and their significance:

- **/Library.** Items stored in this folder are shared by all users of the system and can be edited only by a system administrator. This folder contains preferences and resources for applications that are to be shared by all users of this system. User-specific application and system preferences are not installed in this folder.
- **/System/Library.** This folder contains resources that are required by the system. These files are critical to the operating system and should rarely need to be modified. All users of the system share these files, and the files can be edited only by a system administrator.
- **~/Library.** Items stored in this folder apply only to the currently logged-in user and can be edited by the current user. This folder contains files such as the current user’s Finder and application preferences. Simply put, this is the folder that contains the information that allows each user to personalize the system and applications to match the way he or she works.
- **/Network/Library.** As its pathname implies, this folder is network based and is usually configured using the Workgroup Manager application included with Mac OS X Server.

Managing Users with Directory Services

Mac OS X takes full advantage of the multiuser features of UNIX. Each user can have a unique Mac OS experience, including desktop appearance, access to applications, access to devices (such as printers and servers), and so on.

One of the easiest ways to manage a large number of users and computers is by using directory services. Directory services provide a central repository for information about the systems, applications, and users in an organization. In enterprise environments, directory services are the ideal way to manage users and computing resources. Organizations with as few as 10 people can benefit by deploying directory services.

Directory services can be doubly beneficial. They centralize system and network administration, and they simplify a user’s experience on the network. With directory services, information about all the users—such as their names, passwords, and preferences—as well as printers and other resources on a network can be maintained in a single location rather than on each computer on the network. Using directory services can reduce your user management burden. In addition, users can log in to any authorized computer on the network. Anywhere a user logs in, that user’s personal desktop appears. The user always has access to personal files and can easily locate and use authorized network resources.

Apple has built an open, extensible directory services architecture called Open Directory into Mac OS X Server and Mac OS X. A server or a client Mac can use Open Directory to retrieve authoritative information about users and network resources from a variety of sources. This information includes:

- Directory domains on the computer itself and on other Mac OS X Server systems.
- Directory domains on other servers, including LDAP directory domains and Active Directory domains on non-Apple servers.
- BSD configuration files located on the computer itself.
- Network services (such as file servers) that make themselves known with Rendezvous, AppleTalk, SLP, or SMB service discovery protocols.

A thorough description of Open Directory and directory services is included in the *Mac OS X Server Open Directory Administration* guide. This guide can be downloaded from the Apple website at www.apple.com/server/documentation.

Managing Applications

It's likely that members of each workgroup in your organization will require access to different applications. You control this access with the Workgroup Manager application in Mac OS X Server. You can manage applications by user, group, and computer. See the "Managing References" chapter in the *Mac OS X Server User Management Administration* guide for more information about setting up account preferences with Workgroup Manager.

When managing applications, the most desirable scenario is to install and license each application on the master disk image you will be deploying. Then any user with appropriate permissions will be able to use the application as soon as he or she logs in—without having to register the software.

Not all applications behave in the same way regarding their resource and registration files, so you will have to test each one separately to ensure proper functionality. Make sure that each application can access the resources (such as preferences and registration files) it needs when it's launched. Also, be sure to review and comply with its licensing agreement. For ease of administration, it's advisable to purchase multiuser or site licenses instead of single-user licenses. If you already have single-user licenses, ask your software vendors about converting them.

Security

Many solutions are available to prevent unwanted access to files on your Mac OS X systems. By default, the important system folders are password protected. Users have permission to access only the files and folders in their home folders. An administrator's user name and password are required to modify, add, or remove files in the system's folders. This requirement applies to both the Mac OS X and Classic system folders. In addition, only an administrator can make changes to Mac OS X and Classic applications folders. For most organizations, this security is enough to protect the important files in their Mac OS X systems.

If your users are concerned about keeping the information in their home folders private, they can use FileVault to encrypt those folders. For more information about FileVault, choose the Help menu in the Finder and search for About FileVault. Or visit www.apple.com/macosx/features/filevault.

If you have computers that are accessible to the public and you feel extra security is necessary, you might consider using Open Firmware security. It can prevent users from starting up the computer from a volume other than the one you have chosen as the startup disk. Once Open Firmware security is enabled, you cannot start up that system from other devices, such as an external FireWire disk, a CD-ROM drive, or another partition or disk inside the computer. In addition, all keys that affect the normal startup of the computer are disabled. For example, you cannot start the computer from the internal CD drive by holding down the C key.

Open Firmware security is a very good tool for locking down a computer, but enabling it does make computer support more complex. If a computer is having trouble, a user will have to find a support person who knows the password in order to start up from another disk (such as a disk repair utility) to fix a problem. Consider carefully whether this support requirement is desirable in your organization.

For more information about Open Firmware, please read the Apple Knowledge Base article at docs.info.apple.com/article.html?artnum=120095.

File Permissions

In Mac OS X, each user account has its own set of privileges that allow access to certain files and folders on the system. This capability is especially useful in protecting client files and projects in progress.

The easiest way to examine the permissions for an item is to use the Finder. Simply select the item and choose File > Get Info. In the Info window, click the disclosure triangle next to Ownership & Permissions to view the settings for the item. If you are the owner of the item or an administrator on the system, you might be able to change the item's permissions. You can also view and change file permissions using UNIX commands in the Terminal application.

Working with access permissions

Previous versions of the Mac OS were designed as single-user systems, and users had to work with access permissions (for folders and volumes) only when using file sharing. What's new in Mac OS X is that permissions extend to individual files—not just folders and volumes—and the permissions apply all of the time, not just for file sharing. This feature prevents users from modifying other users' personal files or accidentally deleting or altering a file required by Mac OS X.

Owner, Group, and Others

Each file and folder in the Mac OS X file system has a set of permissions that determines who can access the file and how they can access it. Access is divided into three categories:

- **Owner.** Sometimes called the "user." The owner is the person who created the file.
- **Group.** When a file or a folder is created in Mac OS X, its group setting is inherited from its enclosing folder. Users can change the group setting of files and folders that they own to limit access to members of a particular group.
- **Others.** This setting applies to all users of the system regardless of the user or group that they belong to.

File access settings

Each of the three categories has its own access settings. These settings are as follows:

- **Read Only.** The file or folder can only be read; it cannot be changed.
- **Read and Write.** The file or folder can be read and written to; it can be changed.

- **No Access.** The file or folder cannot be read or written to.
- **Write Only (Drop Box).** This setting applies only to a folder. If you allow “Other” users Write Only access to a folder, anybody can put files into it, but can’t take them out. This setting allows users to give you access to a confidential file without another user being able to access it.

Permissions used for new files

By default, when a Mac OS X user saves a file, its permissions are “read and write” for the owner, “read only” for the group, and “read only” for others. These permission settings allow a user other than the owner to open the file, but the user cannot “save over” (replace) the existing file because its permission setting is read only. This feature protects files from being overwritten or deleted by other users.

Although file permissions are a very powerful feature of Mac OS X, it is useful in some environments for the permissions assigned to a file to be changed to give users, other than the owner, read and write permissions. Of course, the owner of a file can manually edit its permissions in a Finder Get Info window, but this process is time consuming. Using the Mac OS X Server Workgroup Manager application, this process can be easily automated.

To automatically assign the desired permissions to the files, use Workgroup Manager to create a share point that has the “Inherit permissions from parent” feature set for the protocols your organization uses for sharing files. This feature is available for both the Apple and Windows file sharing protocols. With this feature set, any files saved in that share point will inherit the file permissions of the folder in which the file is saved. Simply set up a folder with the appropriate permissions in your share point, and have the workgroup members save their files in that folder—the server will do the rest.

A common example is when users need to create files and folders that are to be shared among all members of the group. For example, without using the “inherit permissions from parent” setting, a user who creates a folder would have to manually set its permissions in order to allow other users to write to it. (By default, only the user who creates a file or folder has read and write permissions for it.) On the other hand, with “inherit permissions from parent” enabled, permissions for the newly created folder automatically take on the settings assigned to its parent folder.

Controlling access to files and folders

As you can see, careful planning of file and folder permissions allows you to control user access to all files and folders on your organization’s Mac systems. Remember, users with administrator privileges (such as IT personnel) are able to change file permission settings of any file and can therefore access any file on a system for which they are an administrator.

Information Resources

Here are some helpful resources for administrators of Mac OS X systems.

- Mac OS X:
www.apple.com/macosx
- Mac OS X Server:
www.apple.com/server/macosx
- Mac OS X Server documentation:
www.apple.com/server/documentation
- Migrating from Mac OS 9 to Mac OS X:
www.apple.com/macosx/upgrade/installation
- Mac OS X downloads (updates, utilities, demos, freeware, and shareware):
www.apple.com/downloads/macosx
- Mac OS X resources (portal page for books, training, and support):
www.apple.com/macosx/resources
- Apple Remote Desktop software:
www.apple.com/remotedesktop
- Main Apple support site:
www.apple.com/support
- AppleCare Knowledge Base:
kbase.info.apple.com
- User forums:
discussions.info.apple.com
- Archived webcasts from the Mac OS X Labs Deployment Project:
www.macosxlabs.org
- Information about how to integrate Mac and Windows-based computers:
www.macwindows.com
- Books about Mac OS X:
www.apple.com/store (click More Accessories under Mac Accessories, then click Books)

Appendix B: System Administration Technologies

A number of tools and technologies have been specifically created for deploying software and maintaining Mac OS X systems in a lab or an enterprise environment. This appendix briefly describes some of these tools and technologies and where you can learn more about them. Many tools are available; you'll have to decide which ones will work best in your organization.

The following tools are described in this section:

- Network Install
- NetBoot
- Apple Remote Desktop
- PackageMaker
- Apple developer tools
- Scripting languages

Network Install

Network Install modifies the operating system to automatically start up in Apple's Installer application.

Network Install is based on the NetBoot technology. A Mac that has been started up using a Network Install image can be used only to install software. In fact, the system immediately launches the Apple Installer application just as if it had been started up from an Apple Install CD. And just as with an Apple Install CD, you are not able to access the Finder to launch other applications.

Starting up from a Network Install image does not use the local computer's hard drive. In fact, the hard drive can even be erased or partitioned during a Network Install session by using the Disk Utility application (Installer > Open Disk Utility).

NetBoot

NetBoot allows you to start up a Mac from an operating system stored on a network server rather than the computer's local hard drive.

You can use a Mac that has started up from NetBoot in the same way you use one that has started up from its local hard drive. A NetBoot image is read only, so any system setting changes that a user makes are stored in the home folder or are cached on the local computer until the system is restarted. It's not possible for a user to directly alter any files contained on the NetBoot disk image.

NetBoot is commonly configured to use the local computer's hard drive to temporarily cache system and other files (called "shadow files") to maximize performance. However, NetBoot can also be set to run in diskless mode, in which shadow files are kept on a server. The shadow files are not maintained between NetBoot startups. When the Mac is restarted from the NetBoot image, it's like starting from a fresh system. NetBoot is particularly useful in training environments where high performance and the ability to quickly get the computer back to a standard configuration are important.

Removing the system software from client computers gives you additional control over users' environments. By forcing the client to start up from the server and by using client management to deny access to the client computer's local hard disk, you can prevent users from saving files to the local hard disk.

Apple Remote Desktop

Apple Remote Desktop helps you keep Mac computers and the software running on them up to date and trouble free. In addition, it lets you interact directly with Mac users to provide troubleshooting support.

An Apple Remote Desktop agent is automatically installed as part of Mac OS X v10.3. Its settings can be found in the Sharing system preference. To control those agents, you must purchase the Apple Remote Desktop application. Make sure that when you create your master system image, you configure the Apple Remote Desktop settings in the Sharing system preference. That way, should you decide to purchase Apple Remote Desktop in the future, your systems will be ready for it.

Detailed information about Apple Remote Desktop, including costs, is available at www.apple.com/remotedesktop.

Administering computers

Apple Remote Desktop lets you perform a wide range of client hardware and software administration activities remotely from an administrative computer (the computer on which Apple Remote Desktop administrator software resides). You can:

- Deploy software and updates.
- Configure system preferences.
- Inventory software to make sure that all users have the applications they need, and to ensure compliance with software licensing agreements.
- Generate a hardware report to make sure that every workstation has the appropriate hardware configuration for its daily tasks.
- Perform file maintenance and housekeeping tasks on client computers.
- Respond to help requests from users.
- Teach users how to use an application without having to physically visit their computers.

Administering multiple computers simultaneously

Most Apple Remote Desktop activities can be performed on multiple computers at the same time. For example, you might want to install or update the same applications on all the computers in a particular department. Or you might want to gather information on the memory installed in all the computers in a certain workgroup.

To manage multiple computers with a single action, you first define a list of the group of computers you want to administer similarly. Setting up computer lists is easy. Computers located on the same subnet as yours show up automatically. You can also search for computers located outside your subnet. Or you can specify the computers' names or IP addresses, if you know them.

A particular computer can belong to more than one list, giving you a lot of flexibility for multicomputer management. A computer can be categorized by its type (laptop, desktop), its physical location (building 3, 4th floor), its usage (marketing, engineering, computing), and so forth.

Once you've set up computer lists, you can perform most administration activities on those groups as well as on individual computers.

PackageMaker

Use PackageMaker to easily create installation packages that enable users to install software with Apple's Installer application. You can also install packages over a network using the Network Install technology in Mac OS X. PackageMaker is included with Mac OS X and is automatically installed with Xcode, the Mac OS X developer tools. For information about how to use PackageMaker, consult its help menu. Additional information can be found in the Developer folder created when you install Xcode, `/Developer/Documentation/DeveloperTools/Conceptual/SoftwareDistribution/index.html`.

Apple Developer Tools

Apple includes its developer tools free with every copy of Mac OS X.

Xcode

Xcode includes all of the tools you need to develop your own system management utilities and other software. With it, you can write Mac OS X applications in C, C++, Objective-C, Java, and AppleScript.

Xcode is located on the Xcode Tools disc that ships with Mac OS X version 10.3. You can also download it from Apple's website. For detailed information about Xcode, visit www.apple.com/macosx/features/xcode.

Script Editor and AppleScript Studio

If you're like many Mac users, you might be familiar with AppleScript but not with other programming languages. In Mac OS X (as with previous versions of the Mac OS) you can use Apple's Script Editor application to create your own AppleScript programs. If you would like to include an Aqua user interface in your AppleScript scripts, take a look at AppleScript Studio, which is included with Xcode. With AppleScript Studio, you can write full-featured Mac OS X applications in the AppleScript scripting language that feature the Mac OS X graphical interface, making them indistinguishable from Mac OS X applications written using other programming languages.

Scripting Languages

Scripting is a powerful way to automate repetitive processes. Mac OS X supports a number of different scripting languages right out of the box. These include AppleScript, Perl, Python, Ruby, and UNIX shell scripting. Other scripting languages are also available from other vendors.

A key feature of Mac OS X is that UNIX is available at all times. If you're familiar with UNIX shell scripting, you can automate many tasks by writing your own shell scripts. Shell scripts can be used to modify system preference settings, add or remove files, and even add or remove users. If you are interested in learning UNIX shell scripting, many books are available about the topic.

For information about the Mac OS X command-line tools as they relate to Mac OS X Server, please read the *Mac OS X Server Command-Line Administration* guide, which is available at www.apple.com/server/documentation.

For More Information

For more information about Mac OS X, visit www.apple.com/macosx. Specific information about upgrading to Mac OS X from earlier versions of the Mac OS is provided at www.apple.com/macosx/upgrade/questions/howto.html.

© 2005 Apple Computer, Inc. All rights reserved. Apple, the Apple logo, AirPort, Apple Cinema Display, AppleScript, AppleScript Studio, AppleTalk, Aqua, Claris, ColorSync, FireWire, iMac, Mac, Macintosh, Mac OS, PowerBook, Power Mac, QuickTime, and Xserve are trademarks of Apple Computer, Inc., registered in the U.S. and other countries. Apple Remote Desktop, eMac, Finder, iPhoto, Panther, Rendezvous, Safari, and Xcode are trademarks of Apple Computer, Inc. AppleCare and Apple Store are service marks of Apple Computer, Inc., registered in the U.S. and other countries. Acrobat, Adobe, and PostScript are trademarks or registered trademarks of Adobe Systems Incorporated in the U.S. and/or other countries. FileMaker is a registered trademark of FileMaker, Inc. Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the U.S. and other countries. PowerPC is a trademark of International Business Machines Corporation, used under license therefrom. Other product and company names mentioned herein may be trademarks of their respective companies. Product specifications are subject to change without notice. Mention of third-party products does not imply an endorsement by Apple. January 2005 L307440A