Mac OS X Server

Version 10.3 "Panther"

Technology Overview
October 2003

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Introduction

Mac OS X Server

Mac OS X Server combines the latest open source technologies with Apple's industry-leading manageability and ease of use. The result is a world-class server platform that's both easy and affordable to deploy and maintain.

The power and simplicity of Mac OS X Server are a reflection of Apple's operating system strategy, one that favors open industry standards over proprietary technologies. It begins with a UNIX-based foundation with Mach 3, FreeBSD 4.8, and the latest advances from FreeBSD 5 at the core. This kernel, known as Darwin, provides a stable, high-performance platform for developing groundbreaking applications and system technologies. As Mac OS X continues to redefine the desktop computer operating system, Mac OS X Server delivers industry-leading services that maximize the performance of Mac OS X and mixed-platform environments.

Open source made easy
Mac OS X Server version 10.3 "Panther" is the fourth major release of Apple's award-winning server software, providing standards-based workgroup and Internet services without the complexity inherent in other UNIX-based solutions. Instead of developing proprietary server technologies, Apple has built on the best open source projects—Samba 3, OpenLDAP, Kerberos, Postfix, Apache, and more. Mac OS X Server integrates these robust technologies and enhances them with a unified, consistent management interface. Powerful administrative tools permit novices to configure and maintain core network services, while providing the advanced features and functionality required by experienced IT professionals.

Built on open standards, Mac OS X Server is compatible with existing network and computing infrastructures. It uses native protocols to deliver directory services, file and printer sharing, and secure network access to Mac, Windows, and Linux clients. A standards-based directory services architecture offers centralized management of network resources using any LDAP server—even proprietary servers such as Microsoft Active Directory or Novell eDirectory. The open source UNIX-based foundation makes it easy to port and deploy existing tools to Mac OS X Server.

Best of all, Mac OS X Server fits easily into IT budgets everywhere. A complete suite of workgroup and Internet services is included in the box, so network administrators can get started right away. Mac OS X Server is available in 10-client and unlimited-client editions and does not require additional per-user fees, making it an affordable solution for organizations of any size.

Mac OS X Server: for supporting Mac and Windows workgroups, deploying powerful Internet services, and hosting enterprise applications—all with an ease of use that is uniquely Macintosh.

New in Version 10.3
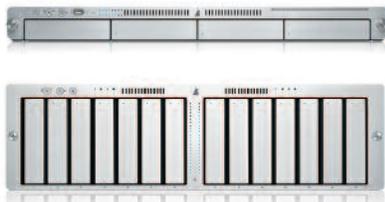
Xserve and Xserve RAID
Mac OS X Server unleashes the power of Xserve, Apple's 1U rack-optimized server hardware. With phenomenal performance, massive storage capacity, high-bandwidth I/O, and integrated remote management tools, Xserve running Mac OS X Server is an unparalleled server solution for businesses, schools, and research centers. For even more storage, Xserve RAID offers a high-availability, high-performance storage solution in a 3U enclosure.

The combination of powerful open source software and easy-to-use management applications in Mac OS X Server v10.3 highlights the rapid pace of innovation at Apple and in the open source community at large. This latest release has more than 150 new features, including:

Automatic Setup. Now configuring a rack of servers is as easy as configuring one server. The new Automatic Setup simplifies data center deployments by enabling administrators to set up multiple servers from configurations stored in a directory server, an iPod, or any FireWire or USB storage device.

Server Admin. This innovative application makes it easy to set up, manage, and monitor the network services built into Mac OS X Server, such as Samba 3, Apache, DHCP, Postfix, and QuickTime Streaming Server—all from the same intuitive interface.

Open Directory 2. Apple's next-generation directory server delivers enterprise-class LDAPv3 directory services using OpenLDAP and Kerberos authentication. Advanced features such as replication increase scalability and availability.

Single sign-on. With support for Kerberos v5 built into Mac OS X and Mac OS X Server v10.3, Apple offers simpler and more secure access to network services. Users can log in once, authenticate at the login window, and securely access all authorized network services—without entering additional passwords.

Samba 3. Apple is the first major operating system to ship with Samba 3. By integrating the latest release of the popular open source SMB/CIFS server, Mac OS X Server v10.3 can deliver high-performance, reliable file and printer sharing for Windows clients, as well as support for NT Domain services. In addition, users can access a single home directory from either Mac or Windows systems.

VPN server. Apple provides an integrated client/server solution for secure network access from outside the firewall. The new VPN server in Mac OS X Server supports both PPTP and L2TP/IPSec for compatibility with Mac, Windows, and Linux clients.

Postfix mail server. A robust, scalable mail server features elegant integration of open source technologies, including Postfix for SMTP transport with server-side spam and virus filtering, Cyrus for receiving IMAP and POP mail, OpenSSL encryption, Mailman, and SquirrelMail.

JBoss application server. Built-in JBoss server and deployment tools make it easy to configure and host J2EE-based applications for scalable three-tier enterprise solutions.
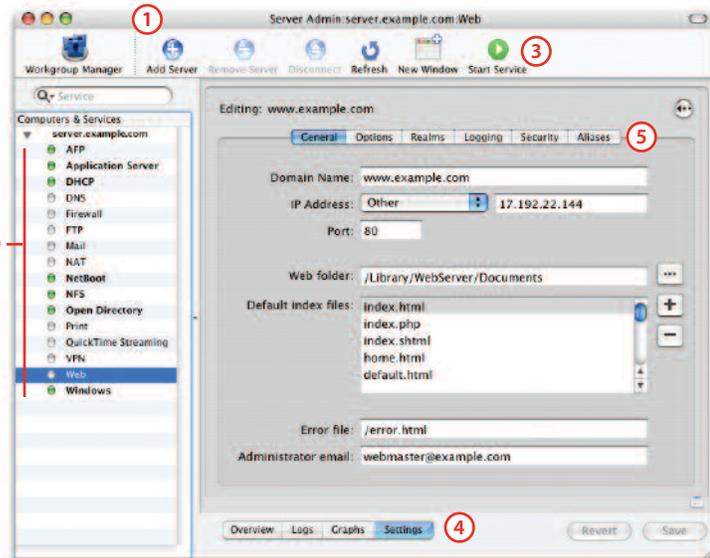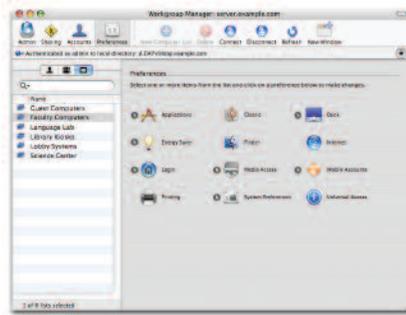
Managing Mac OS X Server
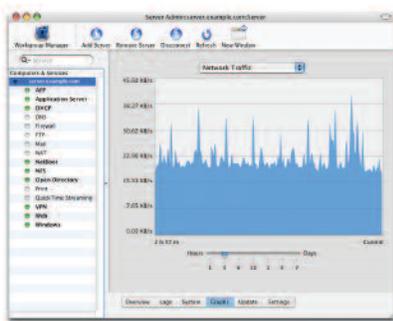
Remote service monitoring
Server Admin displays service activity in real time, as well as graphs of network traffic, throughput, and performance history.

Mac OS X Server comes with industry-leading management tools that simplify the configuration and deployment of workgroup and Internet services. Server Admin provides a graphical user interface, making it easy to set up, manage, and monitor services from any Internet-connected Mac OS X Panther system.[1] Mac OS X Server also supports SSH2 for secure remote administration from the command line, as well as the open-standard SNMPv3 protocol for integration with third-party monitoring and management software.

Managing Services with Server Admin

① **Encrypted, authenticated access.** Use Server Admin to securely access servers from any Internet-connected Mac OS X system. Manage and monitor multiple servers from a single interface.

② **List of services.** Select a service to manage settings and monitor activity. Indicator lights display at-a-glance information about the status of individual services.

③ **Start button.** Turn services on or off with a single click.

④ **Admin tools.** Choose from a selection of logs and graphs to view real-time and historical information. Or choose Settings for detailed configuration and management options.

⑤ **Functions.** Configure services and change settings using context-sensitive functions.

Managing preferences and policies
Workgroup Manager makes it easy to control passwords, access privileges, print quotas, desktop configuration, email servers, group membership, and more for Mac OS X users and computers.

The powerful Workgroup Manager application provides an easy-to-use interface for managing accounts, setting up group relationships, and assigning preferences for users, groups, and computers across the network.[2] Settings and preferences are stored using Open Directory, Apple's standards-based directory services architecture that works with any LDAP server.

Managing Users, Groups, and Computers with Workgroup Manager

① **Share points.** Designate folders or volumes to share among Mac, Windows, and Linux clients on the network.

② **Account settings.** Set up user and group accounts and lists of computers in the directory.

③ **Preferences.** Set preferences and policies for Mac OS X systems on the network.

④ **Users, groups, and computers.** Choose to define settings on a per-user, per-group, or per-computer basis. Depending on the selection, Workgroup Manager displays a list of users, groups, or computers currently defined in the directory.

⑤ **List of users.** Select a name to set up accounts or change settings.

⑥ **Network resources.** Manage network resources and settings for individual users.

Robust Workgroup and Internet Services

No per-user licensing fees
The unlimited-client edition of Mac OS X Server allows organizations to add clients as their needs grow—without draining their IT budget.

Everything required to deliver powerful network solutions—within a department, across an enterprise, or over the Internet—is built into Mac OS X Server. Leveraging the latest open source projects, it offers native workgroup services for Mac, Windows, and Linux clients. Samba 3, the new version of the popular open source SMB/CIFS server, provides reliable file and printer sharing for Windows clients, as well as support for NT Domain services. And with a new Postfix mail server, a high-performance Apache web server, and support for hosting enterprise Java applications, Mac OS X Server makes the power of UNIX-based technologies accessible to organizations of any size.

Open Directory 2

Mac OS X Server v10.3 introduces Open Directory 2, based entirely on open standards. This robust, scalable directory server is perfect for organizations that haven't yet deployed centralized directory services—as well as for businesses and institutions migrating from expensive proprietary solutions.

Directory services and authentication
• Open Directory 2 (OpenLDAP, Kerberos, SASL)
• NT Domain Controller (Samba 3)

Open Directory services
The built-in Open Directory Server offers robust LDAP services and an integrated authentication authority. With Apple's intuitive management tools and no per-user or per-seat licensing fees, it's the easiest and most affordable way to deploy centralized directory and authentication services.

Open Directory 2 uses OpenLDAP, the most widely deployed open source LDAP server, to deliver directory services for Mac and mixed-platform environments. LDAP provides a common language for directory access, enabling administrators to consolidate information from different platforms and define one name space for all network resources. This means a single directory for all Mac, Windows, and Linux systems on the network; there's no need maintain a separate server or separate user records for each platform. It also results in a streamlined user experience: Users can authenticate to Mac OS X Server and access network resources from any platform using a single password.

Single sign-on using Kerberos
Open Directory integrates an authentication authority based on MIT's Kerberos technology to provide users with single sign-on access to secure network resources. Using strong Kerberos authentication, single sign-on maximizes the security of network resources while providing users with easier access to a broad range of Kerberos-enabled network services. For services that have not yet been "Kerberized," the integrated SASL service automatically negotiates the strongest-possible authentication protocol.

Reliability and scalability

Open Directory 2 features the open source Berkeley DB, the world's most scalable database, for high-performance indexing of hundreds of thousands of user records. The open standard LDAP and Kerberos technologies make it easy to add clients from any platform and services from many vendors. In addition, a robust replication feature maximizes availability and scalability. The ability to replicate directory and authentication servers enables organizations to maintain failover servers for high availability, as well as remote servers for fast client interaction on distributed networks.
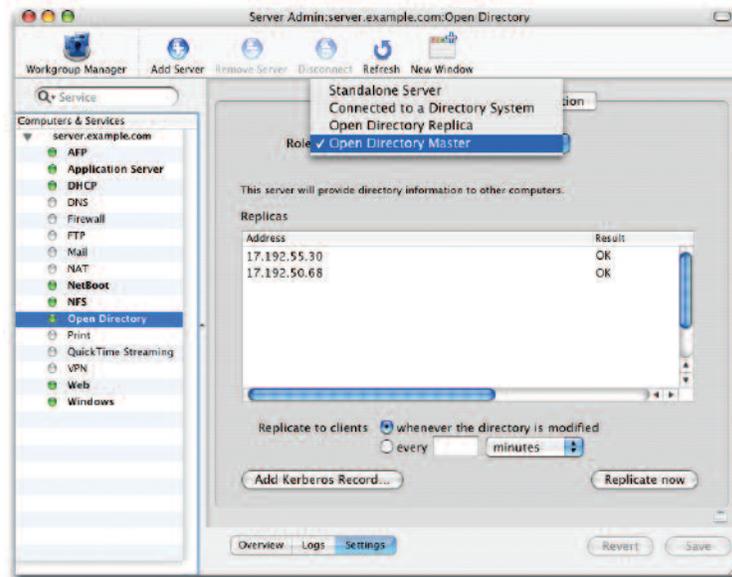
Server Admin makes it easy to set up replication services for Open Directory. Replica directories automatically synchronize with the master directory, so user accounts and authentication information remain consistent across distributed networks.

Directory support for Windows clients

Mac OS X Server integrates the open source Samba 3 project with Open Directory, making it possible to host NT Domain services. With Mac OS X Server configured as a Primary Domain Controller (PDC) for the network, Windows users can authenticate against Mac OS X Server directly from the PC login window.

PDC support also enables Mac OS X Server v10.3 to host roaming profiles and network home directories for Windows clients. All users in the directory can securely log in and access their home directories and other network resources from a Mac or a Windows system. These capabilities make Mac OS X Server ideal for replacing aging Windows NT or Windows 2000 servers, without requiring organizations to transition to an expensive Active Directory infrastructure.

Samba 3

Samba is a popular open source replacement for Microsoft's SMB/CIFS file and print services that is designed to run on UNIX-based platforms. The latest version, Samba 3, delivers major enhancements, including support for NT Domain services and single sign-on authentication with Kerberos. For more information about Samba, visit www.samba.org.

Workgroup Manager

Mac OS X Server features the innovative Workgroup Manager application for defining and managing directory information. This powerful tool makes it easy for administrators to set up user accounts, define group relationships, and manage computing resources in a directory-based network environment. Workgroup Manager scales from managing local accounts on a single server to managing an entire organization using an enterprise directory server.

By taking full advantage of the robust manageability features built into the Mac OS X client operating system, Workgroup Manager provides greater control over organizational resources. At the same time, it optimizes the user's computing experience with consistent settings, network-based home directories, and easy access to network resources, such as printers and group folders.

Defining users, groups, and computers

Workgroup Manager features an intuitive interface for directory-based management of user and group account information. Administrators can control passwords, print quotas, email servers, and group membership, as well as set up share points, for Mac, Windows, and Linux clients—all from a single interface. The information defined in Workgroup Manager can be stored on the local server or in a central LDAP directory server.

Defining preferences for Mac OS X clients

Administrators can use Workgroup Manager to set preferences and define privileges by user, group, computer, or any combination of the three—for an appropriate balance of organizational control and user flexibility. For example, custom computing environments can be created for an individual workgroup or classroom. When users log in, predefined group applications launch automatically, and shared network resources are mounted on the desktop. The same functionality can be used to restrict operations, for example, by disabling media burning, directing outgoing email traffic, or requiring authentication for access to specific devices or printers.

Use the Preferences function in Workgroup Manager to set preferences for Mac OS X users, groups, or computers. Preferences are stored in a central LDAP directory, providing a consistent, managed computing environment across the network.

Use Workgroup Manager to:
• Define accounts for users, groups, and computers
• Control access to hardware, software, and network resources
• Set up network-based group folders and printers
• Create customized settings for individual users and groups[2]

Integration with directory services
Workgroup Manager works with Open Directory 2 or any other LDAP solution to access and store user, group, and computer information. Based on open standards, Apple's Open Directory architecture features built-in directory access modules that simplify integration with third-party directory services, including Microsoft Active Directory, Novell eDirectory, OpenLDAP, SunONE, NIS, and NetInfo.

File and Print Services

Mac OS X Server is the easiest, most cost-effective way for small businesses and departments to share network resources. Since native support for Mac, Windows, and Linux is built in, all users can have access to storage on the server and shared PostScript and raster (inkjet) printers. Apple's innovative tools for streamlined remote administration make it easy to configure services, manage user access privileges, enforce disk and print quotas, and view system traffic from virtually anywhere on the network or over the Internet.[1]

Support for mixed-platform networks
Mac OS X Server v10.3 features enhanced support for heterogeneous networks, maximizing user productivity and making file services more secure and easier to manage. Users on any platform have the convenience and security of single sign-on authentication using Kerberos. Mac OS X Server now integrates Samba 3, providing advanced SMB/CIFS capabilities for Windows clients, including high-speed file and print services and support for authenticated login, home directories, and roaming profiles. Support for native service discovery protocols enables Mac OS X Server systems to appear right in the network browser, just like a Windows server, so Windows users can browse folders and share files without having to install additional software.

File and print services
- Macintosh (AFP, AppleTalk PAP)
- Windows (SMB/CIFS)
- UNIX and Linux (NFS, LPR/LPD)
- Internet (FTP, WebDAV)

Shared volumes hosted on Mac OS X Server appear in the network browser on Windows clients.
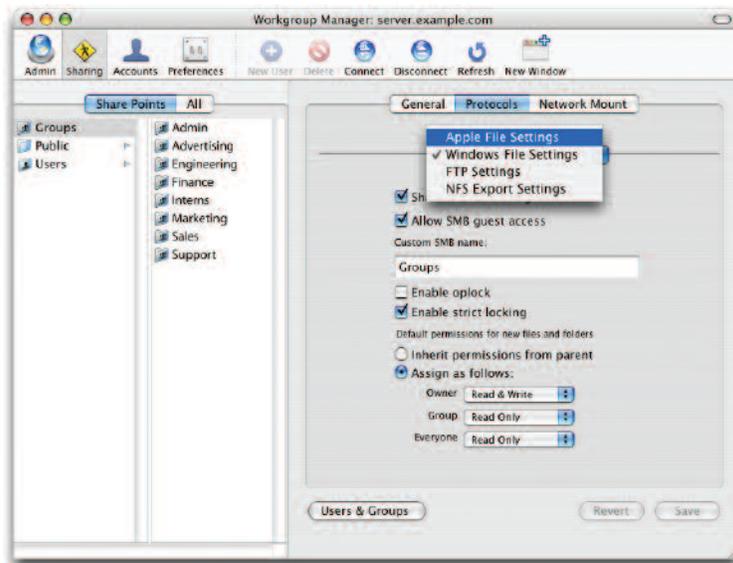
Any disk, volume, or folder hosted on Mac OS X Server can be shared using any combination of protocols, making it available to Mac, Windows, and Linux clients.

CUPS print services
At the heart of Mac OS X Server print services is Common UNIX Printing System (CUPS), an open source printing architecture that supports standard cross-platform print protocols. Using Open Directory and Workgroup Manager, Mac OS X Server provides centralized, directory-based management of printer resources. Printers can be assigned to any combination of users, groups, and computers, and print quotas can be enforced on a per-user and per-queue basis. Flexible queue management and remote monitoring tools allow management of high-volume, cross-platform printing for Mac, Windows, and Linux clients from a single, intuitive interface. Settings and access policies are stored in any LDAP server using Open Directory.

NetBoot and Network Install

System imaging capabilities using the new Network Image Utility streamline system deployment and reduce administration costs. NetBoot allows multiple Mac clients to start up from a single server-based disk image, and Network Install enables automated software installation.[3]

NetBoot

The NetBoot service makes managing a group of computers as easy as managing a single Mac. Client systems can boot from a server-based disk image, which enables the same operating system and applications to be deployed across an entire workgroup. NetBoot can even be used to create server configurations and run multiple servers from one image. Updating the disk image on the server updates all of these systems automatically the next time they are restarted. NetBoot is also a powerful tool for deploying new systems, repurposing desktop or server systems, and deploying network-based diagnostics and repair utilities.

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

The new Network Image Utility makes it easy to create a NetBoot disk image by cloning a local volume—no configuration required—or to build a new image from a Mac OS X Install CD.

Network Install

Network Install uses the same technology as NetBoot, but instead of starting up the client system from a server-based disk image, it installs the contents of the image on the client computer's hard drive. Once the installation process is complete, client systems no longer need to be connected to the network, making Network Install an excellent tool for managing mobile computers.

Designed for administrators who manage operating system installations and software updates for their organizations, Network Install performs automated software installations—whether it's a new version of the operating system, a specific suite of applications for a workgroup, or both—saving time and eliminating the expense of distributing software on CD. With new block-copy installation capabilities, this powerful tool makes it faster and more reliable to configure new systems or repurpose existing ones.

Use NetBoot to:
• Configure multiple desktop computers with the same operating system and applications
• Replicate server configurations for compute farms and data centers
• Deploy new systems and restore compromised systems instantly

Use Network Install to:
• Install system software and packaged applications on desktop and mobile computers
• Standardize configurations and upgrade schedules
• Manage options for automated or semi-automated installations
• Configure new systems or repurpose existing systems
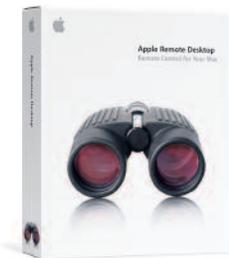
Apple Remote Desktop
The remote control capabilities of Apple Remote Desktop (sold separately) enable administrators to specify the startup disk for multiple networked Mac computers and restart them remotely. This makes it easy to configure or update computers for an entire classroom, lab, or office at once. There is no need to walk around and configure each system individually.

Networking and VPN

Mac OS X Server includes everything needed to set up and secure a local area network. The Server Admin tool adds an intuitive interface to core network services, including DNS, NAT, NTP, DHCP, and Firewall, so it's easier to set up an IP network infrastructure.
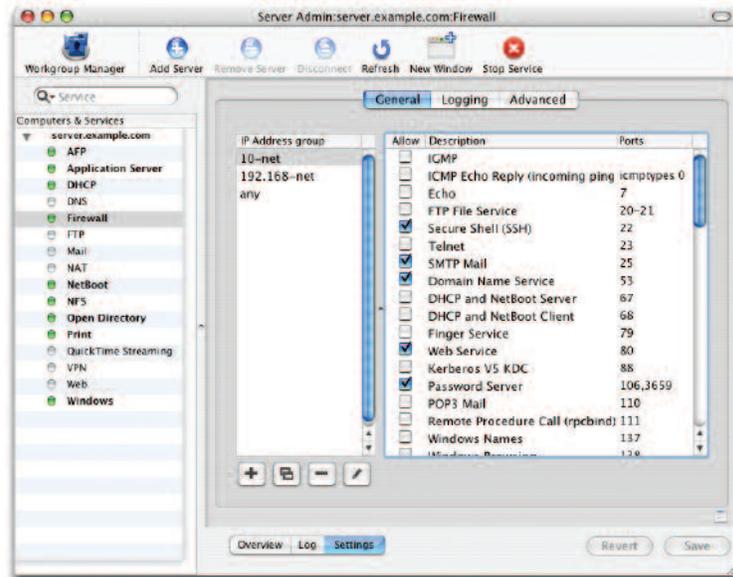
For maximum security, Mac OS X Server comes with all ports, except those used for remote administration and monitoring, locked by default. Any port can be opened by selecting the service using Server Admin.

In addition, Mac OS X supports automatic discovery of directory-based configurations using DHCP Option 95. This means any networked system can automatically discover its directory server and retrieve user, group, and computer configurations—with no user or administrator intervention. After obtaining an IP address from the DHCP server, the computer contacts the LDAP network directory, which configures the client system and provides user account information, group settings, and managed system preferences. This ensures that users can easily access authorized network resources. At the same time, it simplifies management of equipment pools and group resources by freeing technicians and administrators from continual system reconfiguration.

Windows network infrastructure

Samba 3 provides network browsing and name-to-address translation services for Windows clients by integrating WINS (Windows Internet Naming Service) and NetBIOS (Network Basic Input/Output System) services. WINS allows Windows clients to use dynamic computer name registration and resolution to find each other on the same network, or when used with NetBIOS, to discover Windows clients and domains across subnets without requiring a local domain controller. DHCP can be configured to automatically assign WINS and NetBIOS information to Windows clients, simplifying system configuration and network administration.

VPN server

The built-in Virtual Private Network (VPN) server provides secure remote access to the LAN from any Internet-connected computer. Using L2TP and PPTP tunneling protocols, Apple's VPN server works with standards-based VPN clients to support encrypted IP connections for Mac, Windows, and Linux systems. Mac OS X Server VPN services use highly secure authentication methods, including MS-CHAP and network-layer IPSec.

Mail Services

Mac OS X Server combines robust technologies from the open source community to deliver comprehensive, easy-to-use mail server solutions. Full support for Internet mail protocols—Internet Message Access Protocol (IMAP), Post Office Protocol (POP), and Simple Mail Transfer Protocol (SMTP)—ensures compatibility with standards-based mail clients on Mac, Windows, and Linux systems. With support for thousands of users per server and no per-user licensing fees, these high-performance mail services offer significant cost savings for small organizations and large enterprises alike.

Core mail services

Mac OS X Server uses the high-speed Postfix server for SMTP messaging and the Cyrus mailbox server for scalable, enterprise-class POP and IMAP mail. Flexible mail storage makes it easy to scale the mail server to meet growing needs, and high-performance Berkeley DB indexing ensures continued responsiveness when clients access their mail, delete messages, and move files on the mail server. To protect network mail services from unauthorized access or abuse, Mac OS X Server includes built-in SSL/TLS encryption of mail messages, a choice of authentication methods, and support for standards-based spam- and virus-filtering products.
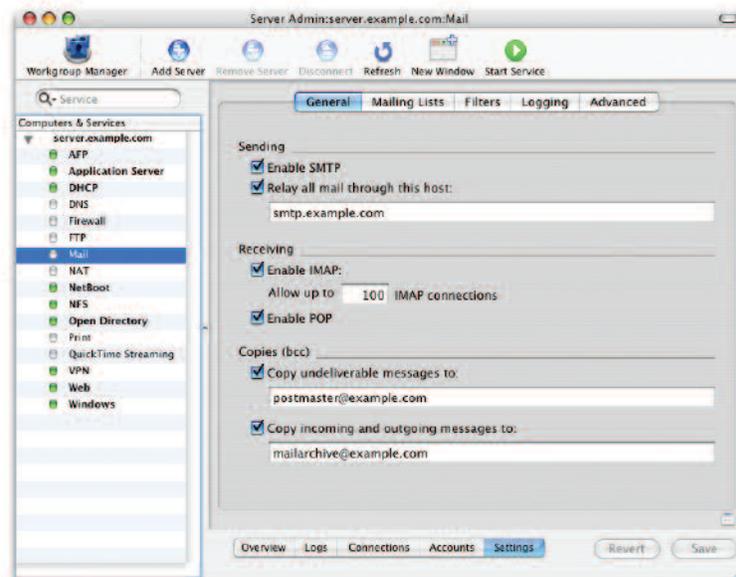
Postfix and Cyrus are easy to configure and manage using the Server Admin utility.

Additional standards-based mail solutions

Mac OS X Server provides a graphical user interface for Mailman, making it easy to deploy one of the most popular listserve solutions in the world. Mailman features list archiving, content filtering, and digest delivery options, as well as a web-based interface that enables end users to create and maintain lists.

Completing its suite of industry-standard mail solutions, Mac OS X Server includes webmail services using the open source SquirrelMail project. SquirrelMail allows users to access their email from any standards-based browser, with full support for MIME, address books, and folders for organizing stored messages. PHP is fully integrated with the Apache web server, so webmail pages render in pure HTML 4.0—with no JavaScript required—for maximum compatibility across browsers. SquirrelMail is very easy to configure and works with any IMAP server.

Web Hosting

Combining the latest open source and standards-based Internet services, Mac OS X Server makes it possible for organizations of any size to host websites and deploy powerful web applications—quickly and affordably. Mac OS X Server web technologies are based on the open source Apache web server, the most widely used HTTP server on the Internet. Performance optimized for Mac OS X Server, Apache provides fast, reliable web hosting and an extensible architecture for delivering dynamic content and sophisticated web services.

Web services
- Apache web server (1.3 and 2.0)[4]
- SSL/TLS (OpenSSL)
- WebDAV
- Server-side includes (SSIs), PHP
- Perl, Ruby, Python
- MySQL 4

Getting started with Apache

Apple's innovative administration tools take the complexity out of configuring, hosting, and managing websites. Apache is preconfigured with default settings, so novices can create a static website in a few simple steps and add features as their expertise grows. The web server supports aliases for greater website flexibility, making it possible to move web pages without breaking links and to create multiple URLs that refer to a single file. In addition, support for virtual hosting allows multiple sites on a single server; each website can be configured with unique security options and separate log files for tracking and reporting.
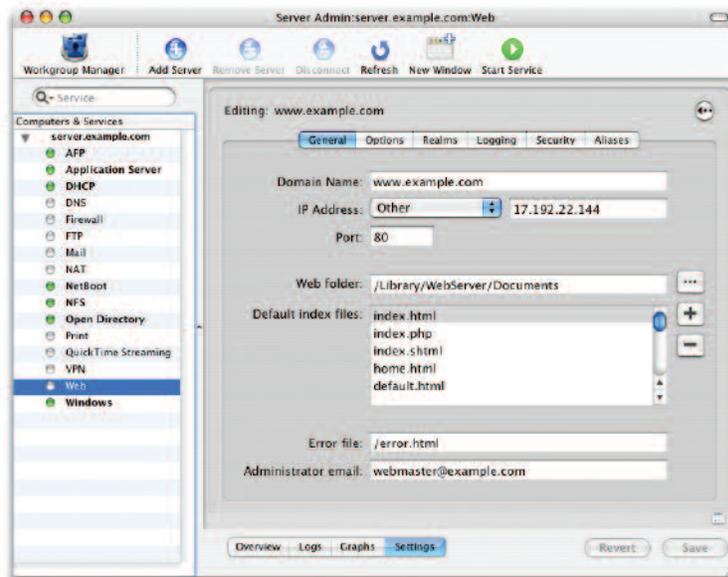
A graphical interface makes it easy to customize web server settings, as well as to implement advanced web hosting features.

Hosting dynamic content

Mac OS X Server also includes everything professional webmasters need to deploy sophisticated web services: integrated tools for collaborative publishing, inline scripting, Apache modules, and custom CGIs—as well as support for JavaServer Pages and Java Servlets. Database-driven sites can be linked to the included MySQL database; ODBC and JDBC connectivity to other database solutions is also supported.

Security and authentication

To protect credit card information and business data transmitted during web transactions, Mac OS X Server integrates OpenSSL with the Apache web server for strong 128-bit encryption. For intranet sites and collaborative publishing scenarios, it's also easy to set up realms to require user authentication.

Application services
- JBoss application server (EJB)
- Apache Tomcat (JavaServer Pages, Java Servlets)
- Java virtual machine (J2SE)
- Apache Axis (SOAP, WSDL Web Services)
- WebObjects Deployment

WebObjects

Apple's WebObjects (sold separately) provides a rapid development environment for J2EE-compatible applications. With built-in assistants, it's easy to create web services or three-tier Java server applications—backed by robust relational databases—with rich HTML or Java client interfaces. WebObjects applications can be deployed, without reconfiguration, on virtually any J2EE-capable server—including the new JBoss application server.

Enterprise Applications

Mac OS X Server is now the easiest way to develop and deploy robust, reliable enterprise applications based on Sun's Java 2 Platform. It comes with all the components necessary to host J2EE applications, including JBoss, Apache Tomcat, and Axis. Together, they enable enterprise application services such as Enterprise JavaBeans (EJB), Java Message Services (JMS), XML-based web services, and Java Database Connectivity (JDBC). Mac OS X Server also supports SOAP and WSDL Web Services standards for exchanging data among distributed applications. Increasingly popular for business-to-business transactions, these transport protocols provide the integration essential in sophisticated, multitiered applications.

The J2EE architecture

The Java 2 Platform, Enterprise Edition (J2EE) standard defines a modular architecture for building secure and interoperable enterprise applications. Using a standards-based framework, these enterprise-grade Java server applications can deliver advanced features such as automatic data persistence, secure transactions, database connectivity, and dynamically generated web pages. Applications that adhere to the J2EE 1.3 standard, originating from another system or even another application server, can usually be hosted on Mac OS X Server.
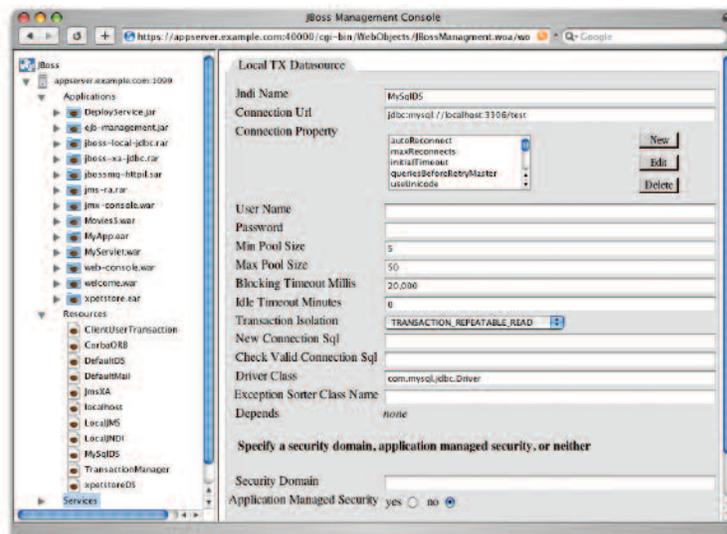
JBoss application server

Mac OS X Server v10.3 makes it easy to manage and deploy J2EE-based applications, without having to edit numerous XML files by hand. A JBoss application server comes preinstalled and integrated for use with the built-in Apache web server, along with MySQL, the popular open source SQL database. And unlike expensive proprietary J2EE application servers, Mac OS X Server does not impose per-CPU license fees or high-priced maintenance fees.

Apple's JBoss application server features graphical management tools for validating, configuring, and monitoring J2EE applications. Deploying an enterprise application can be as easy as starting JBoss and copying the application resources to the deployment directory. Upgrading is instant—there's no need to restart the server. JBoss also features clustering, load-balancing, and failover capabilities that increase reliability and scalability of J2EE deployments.

The JBoss Management Console allows administrators to monitor the activity of applications and services on the JBoss application server, as well as to configure new resources such as databases and message queues.

Media Streaming

Media streaming services
- QuickTime Streaming Server (MPEG-4, MP3, AAC, RTP/RTSP)
- QuickTime Broadcaster
- QTSS Publisher
- Unicast and multicast

QuickTime
QuickTime is the most versatile, cost-effective platform for creating, playing, and streaming digital media over the Internet. It supports all the latest digital media standards, including MPEG-4 and 3GPP, so content can be played anywhere, using any standards-compliant media player.

Mac OS X Server v10.3 includes the latest version of the popular QuickTime Streaming Server, providing a complete, affordable solution for delivering rich audio and video over the Internet. Using the open-standard Real-Time Transport Protocol/Real-Time Streaming Protocol (RTP/RTSP), QuickTime Streaming Server streams media—from modem to broadband rates—to users everywhere. Mac OS X Server also supports progressive downloads of media content using the built-in Apache web server.

QuickTime Streaming Server provides three ways to stream media:

- **Live.** Live events, such as concerts, speeches, news, or sports coverage, can be streamed over the Internet with the help of broadcast software such as QuickTime Broadcaster, also included with Mac OS X Server. QuickTime Broadcaster encodes the live source—from a microphone, video camera, or other recording device—in real time and delivers the resulting stream to the server. The server then serves, or "reflects," the stream so the audience experiences the event as it happens.

- **Simulated live.** Internet radio and TV producers, distance learning teachers, and corporate trainers can simulate live broadcasts by creating playlists of music, lectures, interviews, and other prerecorded media. As with live broadcasts, all users connecting to the stream see the same point in the simulated live broadcast at the same time. Since the event is not live, broadcasting software is not required.

- **On demand.** On-demand streaming provides "anytime" access to feature films, lectures, presentations, and other content. In this scenario, each user initiates the stream independently, so everyone experiences the audio or video content from the beginning.

For simulated live and on-demand streaming, media must be compressed, hinted, and uploaded to the streaming server. The new QuickTime Streaming Server (QTSS) Publisher application simplifies these tasks, as well as helping to manage server-side media content.
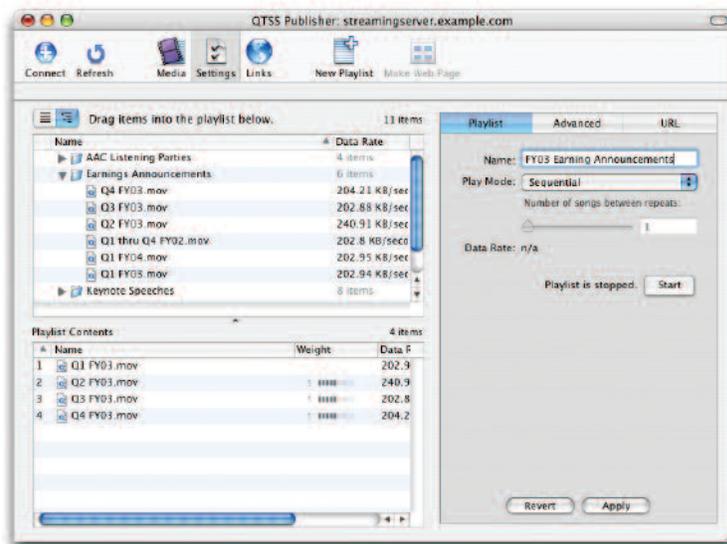
The intuitive QTSS Publisher interface makes it easy to upload prerecorded media to the streaming server and manage media playlists for simulated live broadcasts or on-demand viewing.

Apple's Directory Services Architecture

Open Directory

Mac OS X and Mac OS X Server feature Open Directory, Apple's directory and authentication services architecture. Based on the LDAPv3 standard, the Open Directory architecture allows Mac OS X systems to use any LDAP directory, leveraging the directory services in existing network infrastructures.

Why directory services?
A key component of any modern computing environment, directory services allow organizations to centralize information about users, groups, and computing resources. This network-based repository serves as the foundation for critical IT services, including managing users and groups, directing workflow solutions, providing employee directories, and controlling access privileges. By maintaining a centralized directory, organizations can consolidate resources, simplify system management, and reduce support and administration costs—while providing strong authentication and password-protected access to network resources.

What is LDAP?
LDAP (Lightweight Directory Access Protocol), an open standard accepted by the IETF, is the most commonly deployed directory services protocol. Today most desktop and server operating systems, including those from Apple and Microsoft, support the LDAP standard for communicating with a directory service.

Information about all the users on a network—such as names and passwords, preferences, printers, and other resources—can be maintained in the network-based directory service, rather than stored on individual computers. Without having to leave their desks, system administrators can modify information in the directory, and the changes are immediately available to all systems. For example, when an employee leaves the company, the administrator can change the user's password, archive the user's network home directory, and delete the user's account from directory services. The moment the password is changed, the user can no longer access network-based computers, printers, and enterprise applications.

By storing the location of home directories and centralizing user preferences and settings, directory services provide benefits for users as well. Users can log in to any authorized computer on the network and have access to their custom desktop environment and all authorized network resources—including preferred printers— just as though they were sitting at their own computer.

Standards-based architecture
To simplify the deployment of Mac OS X systems in existing infrastructures, Apple has adhered to published open standards, including OpenLDAP and the RFC 2307 schema. The Open Directory architecture comes with directory access modules for various popular directory services solutions. It also allows for customized schema mappings, so attributes in an LDAP-based directory can be mapped to settings on the Mac—eliminating the need to configure each client system. Apple has published these extensions as part of a comprehensive open source project that includes all interoperability components.

Open Directory schema
Apple uses an open-schema format based on RFC 2307, an IETF standard, to define directory data specific to Mac OS X systems. This schema is published within the operating system and includes a unique Object Identity (OID), making it easy for administrators to integrate Mac OS X schema into an existing directory.

By using open standards and publishing the schema extensions specific to the Mac, Apple has made it easy to integrate Mac OS X and Mac OS X Server systems into virtually any directory-based network. For example, Mac OS X and Mac OS X Server systems can be easily added to networks based on open-standard solutions from IBM and Sun. In addition, Mac OS X users can be authenticated using Active Directory, their network home directories can mount based on information stored in Active Directory, and system administrators can manage Macintosh user, group, and computer preferences through Active Directory.[5]

For organizations that have not yet implemented a directory service, Mac OS X Server includes a robust LDAP directory server and a secure Kerberos password server to provide directory and authentication services to Mac, Windows, and Linux clients.

Product Details

Mac OS X Server can be purchased in 10-client and unlimited-client editions to meet the needs of server deployments of any size. License restrictions apply only to simultaneous file sharing services for Mac and PC clients.

• **Mac OS X Server 10-Client Edition.** The easiest way to deploy powerful network services, the 10-client edition is designed for small workgroups and Internet hosting services that do not require simultaneous file sharing among more than 10 Mac and PC clients.

• **Mac OS X Server Unlimited-Client Edition.** The most cost-effective way to support Mac and Windows workgroups, the unlimited-client edition is perfect for classroom labs, creative professionals, and medium-size to large workgroups with high volumes of file sharing activity.

Also available is an unlimited-client upgrade from the 10-client edition.

Package Contents

The Mac OS X Server package includes Mac OS X Server v10.3, Admin Tools, and Xcode developer tools. Product documentation includes a getting started guide and the following electronic administration guides:

• Migrating to Mac OS X Server
• User Management
• File Services Administration
• Print Services Administration
• System Imaging Administration
• Mail Service Administration
• Web Service Administration
• Network Services Administration
• Open Directory Administration
• QuickTime Streaming Server Administration
• Windows Services Administration
• Command-Line Administration
• Java Application Server Administration

System Requirements

Mac OS X Server requires an Xserve, Power Mac G5, Power Mac G4, Power Mac G3, iMac, or eMac computer; 128MB of RAM (at least 256MB for high-demand servers running multiple services); built-in USB; and 4GB of available disk space.

Apple Maintenance Program

This optional program for Mac OS X Server makes it easy for customers to manage software expenditures while benefiting from the latest technologies and improvements. With one payment, they'll automatically receive major Mac OS X Server software upgrades for three years. For more information, including program terms and conditions, visit www.apple.com/server/maintenance.

AppleCare Technical Support

Mac OS X Server comes with 90 days of toll-free telephone support for installation, launch, and recovery and lifetime access to Apple's online support resources, such as the AppleCare Knowledge Base and discussion forums.

In addition, Apple offers consultative phone and email support for advanced server migration and integration issues. Customers can choose from three levels of AppleCare technical support:

Select covers up to 10 incidents with four-hour response for priority 1 issues (server down), 12 hours a day, 7 days a week.[6] Support for additional incidents can be purchased as needed.

Preferred covers an unlimited number of incidents with two-hour response for priority 1 issues, 12 hours a day, 7 days a week,[6] and assigns a technical account manager to the organization.

Alliance covers an unlimited number of incidents at multiple locations with one-hour response for priority 1 issues, 24 hours a day, 7 days a week. This plan includes an onsite review by an Apple technical support engineer.

For more information about AppleCare support products, including terms and conditions, visit www.apple.com/server/support.

Training and Certification

Apple offers comprehensive instruction on Mac OS X and Mac OS X Server applications and technologies. A combination of lectures, demonstrations, and hands-on exercises, classes are taught by Apple Certified Trainers with real-world experience and dynamic presentation skills. Customers can choose to attend classes at an Apple Authorized Training Center or have Apple deliver training onsite at their business or institution.

Once IT professionals have acquired the requisite skills, Apple certification programs provide tangible evidence of their technical expertise. Three certification levels—Apple Certified Help Desk Specialist, Apple Certified Technical Coordinator, and Apple Certified System Administrator—are based on corresponding training course content.

For more information about Apple training and certification programs, visit www.apple.com/training.

Open Source Projects

Mac OS X Server v10.3 Panther integrates more than 80 open source projects.

Mac OS X Server
- Darwin 7: developer.apple.com/darwin
- FreeBSD 4.8 (portions in kernel): www.freebsd.org
- FreeBSD 5.0/5.1 libraries (libc): www.freebsd.org
- X11 (XFree86) 4.3: www.xfree86.org
- Bash 2.05: www.gnu.org/software/bash
- Tcsh 6.12.00: www.tcsh.org
- Zsh 4.1.1: www.zsh.org
- Perl 5.8.1-RC3: www.perl.org
- Python 2.3: www.python.org
- Tcl 8.4.4: tcl.tk
- Expect 5.38.0: expect.nist.gov
- Ruby 1.6.8: www.ruby-lang.org/en
- Enscript 1.6.1: people.ssh.fi/mtr/genscript
- Vim 6.2: www.vim.org
- Emacs 21.2: www.gnu.org/software/emacs
- srm 1.2.7: srm.sourceforge.net
- Grep 2.4.2: www.gnu.org/software/grep
- Tar 1.13.25: www.gnu.org/software/tar
- gzip (zlib) 1.2.4: www.gzip.org
- bzip2 1.0.2: sources.redhat.com/bzip2
- diff (diffutils) 2.7: www.gnu.org/software/diffutils/diffutils.html
- Groff 1.18.1: www.gnu.org/software/groff/groff.html
- Curl 7.10.2: curl.haxx.se
- Common UNIX Printing System (CUPS) 1.1.19: www.cups.org
- Gimp-Print 4.2.5: gimp-print.sourceforge.net
- efax 0.9a-001114: www.cce.com/efax
- QuickTime Streaming Server 5: developer.apple.com/darwin/projects/streaming
- Cyrus: asg.web.cmu.edu/cyrus
- SquirrelMail 1.4.1: www.squirrelmail.org
- Tomcat 4.1.24: jakarta.apache.org/tomcat
- JBoss 3.2.2RC2: www.jboss.org
- MySQL 4.0.14: www.mysql.com
- OpenLDAP: www.openldap.org
- Berkeley DB4 for OpenLDAP and Cyrus: www.sleepycat.com
- Sar: ftp.atcomputing.nl/tools/linux
- IPv6/IPSec 20010528 (via FreeBSD 4.8): www.kame.net

- OpenSSH 3.6.1p1+CAN-2003-0693: www.openssh.com
- OpenSSL 0.9.7b: www.openssl.org
- Sudo 1.6.6: www.courtesan.com/sudo
- Xinetd 2.3.11: www.xinetd.org
- Rsync 2.5.6: samba.org/rsync
- Tcpdump 3.6-cvs: www.tcpdump.org
- tcp_wrappers: ftp.porcupine.org/pub
- Rendezvous 58: developer.apple.com/darwin/projects/rendezvous
- Apache 1.3.28 and 2.0: www.apache.org/httpd
- PHP (apache_mod_php) 4.3.2: www.php.net
- mod_perl: perl.apache.org
- mod_ssl: www.modssl.org
- Samba 3.0.0: www.samba.org
- BIND 9.2.2: www.isc.org/products/bind
- Net-SNMP 5.0.8: net-snmp.sourceforge.net
- Procmail 3.21: www.procmail.org
- Fetchmail 6.1.2: catb.org/~esr/fetchmail
- Postfix: www.postfix.org
- Kerberos (for Macintosh) 5.0 (krb5 1.3): web.mit.edu/macdev/www/kerberos.html
- Pluggable Authentication Modules (PAM) 0.76+: www.kernel.org/pub/linux/libs/pam
- Common Data Security Architecture (CDSA): developer.apple.com/darwin/projects/cdsa
- Blowfish (with CAST-128): www.openssl.org/docs/crypto/blowfish.html

Developer tools and APIs
- GNU Compiler Collection (gcc) 3.3: gcc.gnu.org
- GNU Project Debugger (gdb) 5.3: www.gnu.org/software/gdb
- distcc 2.0.1: distcc.samba.org
- glibtool 1.5: www.gnu.org/software/libtool
- automake 1.6.3: www.gnu.org/software/automake
- autoconf 2.57: www.gnu.org/software/autoconf
- GNU m4 1.4: www.seindal.dk/rene/gnu
- yacc: www.freebsd.org/cgi/cvsweb.cgi/src/usr.bin/yacc
- flex 2.5.4: sourceforge.net/projects/lex
- Bison 1.28: www.gnu.org/software/bison
- Gnumake 3.79: www.gnu.org/software/make
- BSDmake: www.freebsd.org/cgi/cvsweb.cgi/src/usr.bin/make
- RCS 5.7: www.cs.purdue.edu/homes/trinkle/RCS
- CVS 1.10: www.cvshome.org
- KHTML (WebCore), KJS (JavaScriptCore) 3.0.1+: www.kde.org
- GNU libiconv 1.9: www.gnu.org/software/libiconv
- International Components for Unicode (ICU) 2.6: oss.software.ibm.com/icu
- Ncurses: www.gnu.org/software/ncurses/ncurses.html
- GNOME XML C parser (libxml2) 2.5.4: www.xmlsoft.org
- dlcompat (dlopen/dlclose): www.opendarwin.org/projects/dlcompat
- poll (shim on select) 1.2: www.clapper.org/software/poll
- iODBC 3.0.6: www.iodbc.org
- HeaderDoc doc generator 7.2: developer.apple.com/darwin/projects/headerdoc

Additional Resources

We invite you to explore Apple's website to learn more about Mac OS X Server and Apple server solutions.

To download documentation and technology briefs: www.apple.com/server/documentation

To learn about third-party products that extend or enhance the capabilities of Mac OS X Server: www.apple.com/server/resources

To learn about development resources: developer.apple.com/server

To access technical support resources: www.apple.com/server/support

For information about Xserve and Xserve RAID: www.apple.com/xserve

For a list of Apple press contacts: www.apple.com/pr/contacts.html

For More Information

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

[1]Remote server administration requires Mac OS X v10.3. [2]Management of preferences requires client systems running Mac OS X v10.2 or later. [3]NetBoot requires Macintosh systems released in October 1999 or later and a physical Ethernet connection; it does not support AirPort wireless technology. Network Install requires Macintosh systems released in October 1999 or later; application installation requires client systems running Mac OS X v10.2 or later. Licensing terms apply to Apple and third-party software deployments. [4]Apache versions 1.3 and 2.0 are installed in Mac OS X Server v10.3 and accessible from the command line; Server Admin provides a user interface for configuring and managing Apache 1.3. [5]Mac OS X Server includes Active Directory support for Windows Server 2000; schema modifications are required to manage Mac OS X client systems using Active Directory. [6]Represents typical response times. Actual onsite response time and availability of onsite services depend on location; see www.apple.com/support/products/premium for details.