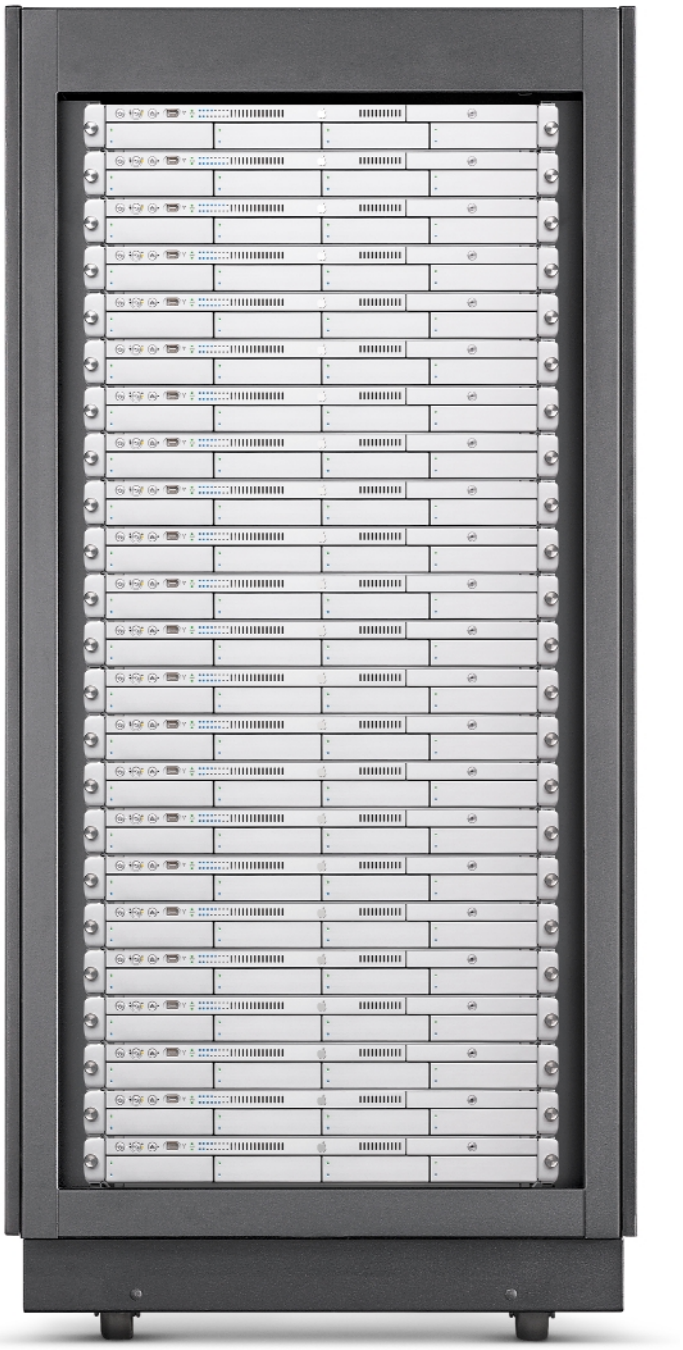
Xserve

Technology Overview

May 2002



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Introduction

Xserve is designed from the ground up to match the power and capabilities of Mac OS X Server, Apple's UNIX-based operating system with advanced workgroup and Internet services. Featuring server-optimized hardware in a high-density 1U rackmountable enclosure, it offers incredible value while delivering breakthrough processing power, enormous internal storage capacity, and superfast I/O.

Xserve works seamlessly with Mac OS X Server, which now includes intuitive remote management tools that make network services fast to set up and easy to monitor—even for those without experience in network administration. And since the system ships with an unlimited-client license for Mac OS X Server, there are no per-seat client access license fees. For added peace of mind, Apple offers a new service and support plan that covers both Xserve hardware and Mac OS X Server configuration issues, with only one AppleCare number to call.

This uniquely Apple integration results in superior performance, increased uptime, and unparalleled ease of use. Xserve with Mac OS X Server dramatically reduces the complexity of system administration and the total cost of ownership—enabling businesses and institutions to minimize maintenance costs, resolve problems quickly, and reduce the pressure on network administrators.

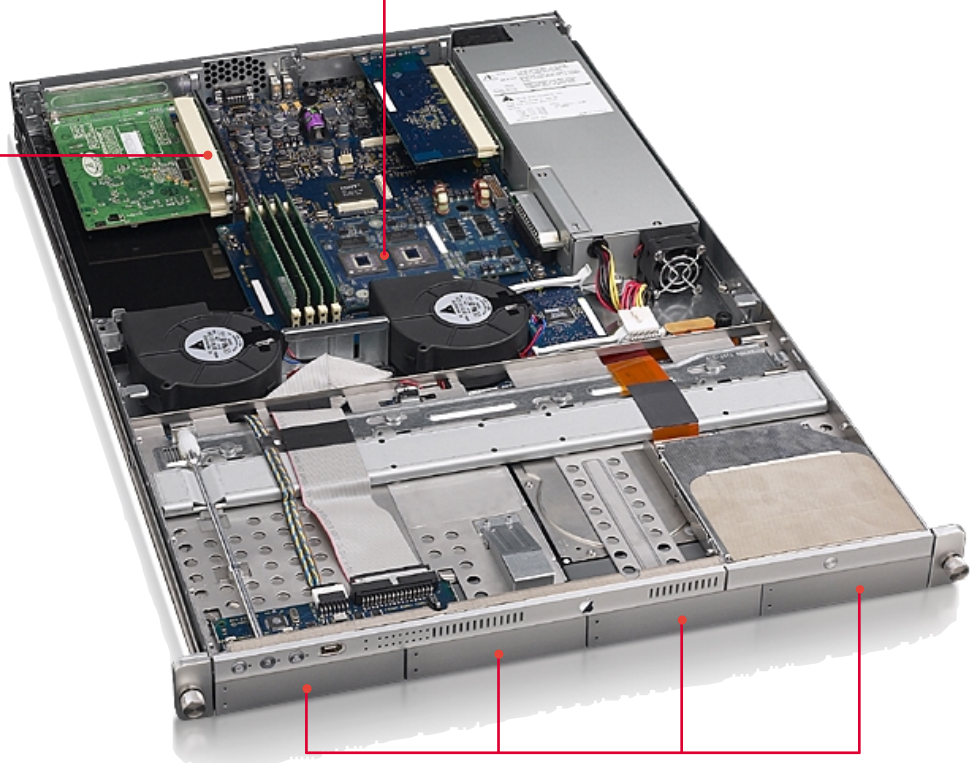
Xserve is perfect for traditional server applications such as cross-platform file and print, web publishing, Internet applications, directory services, and Mac desktop management. It also has the horsepower for server applications with demanding computation and I/O requirements, including RIP, OPI, rendering, and encoding farms; numerical clusters; media database engines; and rackmount audio and video workstations. Xserve delivers the solution our customers need—whether in higher education or K–12 schools, small and medium-size business, creative departments, or science and technology research centers.

Product Overview

Powerful server-optimized hardware

The new Xserve features an advanced server architecture that combines PowerPC G4 performance with high-throughput I/O and massive internal storage capacity.

Processing power. Xserve is equipped with single or dual 1GHz PowerPC G4 processors. Each processor has an integrated vector processing unit, called the Velocity Engine, and a powerful floating-point unit that supports single-cycle, double-precision calculations. An advanced memory architecture with 2MB of dedicated L3 cache per processor and up to 2GB of DDR SDRAM increases efficiency even further.

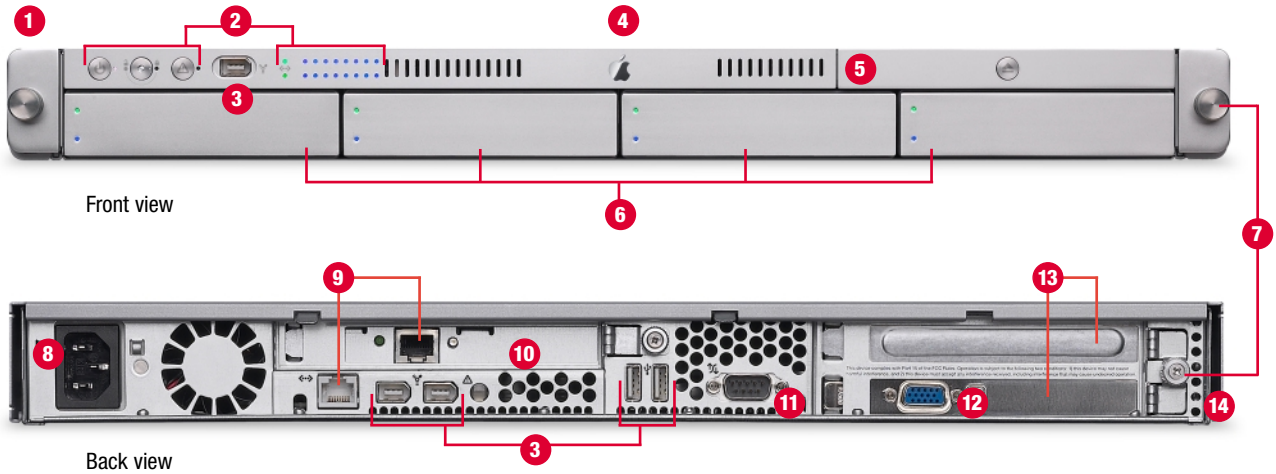


High-performance I/O. Xserve features two full-length 64-bit, 66MHz PCI slots with throughput of up to 533MB per second, providing the bandwidth for demanding I/O applications and connectivity to high-performance networking, storage, and backup devices. Two independent Gigabit Ethernet ports—one on the main logic board and one on a preinstalled PCI card—provide tremendous networking bandwidth and deployment flexibility.

Flexible, scalable storage. Four drive bays offer up to 480GB—nearly half a terabyte—of internal disk space[1] using hot-plug Apple Drive Modules. This makes it easy and affordable to add storage as data needs grow. In addition, high-performance PCI slots allow connectivity to external SCSI storage and backup systems.

High-density rackmount 1U design

Xserve offers dual 1GHz RISC processors[2] and up to 480GB of storage[1] in an ultradense 19-inch-wide enclosure. All the necessary rackmounting hardware is in the box, including rack rails with sliders, mounting brackets for industry-standard four-post racks and telco center-post racks, and complete setup instructions. Each server unit slides out of the rack like a drawer, and the cable management arm allows the cables to travel with the system. Xserve is designed for instant access to drives, PCI cards, and blowers, and all key components can be replaced without special tools.



Front view

Back view

1. Xserve features a 19-inch rack-optimized 1U enclosure. Up to 600 gigaflops of processing power and over 20 terabytes of internal disk space[1] fit in a standard 42U rack.
2. Indicator lights display status at a glance for power, enclosure lock, system identifier, Ethernet links, and system activity.
3. Xserve connects to industry-standard peripherals—FireWire hard drives and tape backup units; audio and video devices such as speakers, microphones, and DV cameras—with three FireWire ports (one on the front, two on the back) and two USB ports on the back.
4. Each server is equipped with one or two 1GHz PowerPC G4 processors, with 2MB of dedicated L3 cache per processor. Xserve supports up to 2GB of high-performance DDR SDRAM for running demanding applications and caching huge files.
5. The tray-loading 24x-speed CD-ROM drive is convenient for software installation and recovery.
6. Four drive bays support up to 480GB of hot-plug Ultra ATA/100 internal storage on four independent channels. Hot plugging makes it easy to add storage without bringing down the server: Pop in a new Apple Drive Module at any time and it's instantly available to the system. Apple Drive Modules have LEDs indicating drive activity and status.
7. Thumbscrews make it easy to swap hardware without hunting for tools. There are rackmounting thumbscrews on the front and thumbscrews on the back for securing PCI cards.
8. The power cord connection has a cable-locking clip to avoid accidental unplugging, and the cable management arm keeps the cables with the system when you slide it out of a four-post rack.
9. Xserve comes with Gigabit Ethernet on the main logic board and a Gigabit Ethernet card in the half-length PCI/AGP slot. Dual Gigabit Ethernet allows multihoming for serving more users, providing redundant links, or setting up an isolated management network independent of a client services network.
10. A half-length 32-bit, 66MHz combination PCI/AGP slot comes with a Gigabit Ethernet card preinstalled in standard configurations. Or choose to add a high-performance AGP 4X video card for graphics and video applications.
11. The DB-9 serial port allows for system access through a serial console session, even when the network is down.
12. A server-class VGA graphics card comes standard in the lower 64-bit, 66MHz PCI slot—making it easy to connect to cross-platform VGA KVM switches, as well as industry-standard VGA displays. Xserve also supports headless booting and allows hot plugging of display devices.
13. Two full-length 64-bit, 66MHz PCI slots offer throughput of up to 533MB/s for I/O-hungry applications and high-performance networking and storage systems. The top slot is open for user configuration.
14. Rackmounting brackets support two-post telco racks and four-post racks 29 to 36 inches deep.

System Architecture

Xserve is designed from the ground up to deliver industry-leading server performance in a dense 1U enclosure. Its server-optimized system architecture features ultraefficient PowerPC G4 processors, a superfast memory architecture, and a high-bandwidth I/O system—providing the power and throughput needed for demanding Internet applications, robust network infrastructure solutions, and high-performance clustering environments.

Superior processing power

While the competition is still using Pentium III processors in 1U enclosures, Xserve is equipped with up to two 1GHz PowerPC G4 processors—making it the industry's first server with dual RISC processors in a 1U system. The G4 processor is intelligently designed for maximum efficiency and performance; it includes a powerful floating-point unit, the Velocity Engine vector processing unit, and impressive parallel processing capabilities. In fact, one dual processor system can execute up to 15 billion floating-point operations per second, or 15 gigaflops. That means that a 42U rack filled with Xserve systems can offer more than 600 gigaflops of processing power.

PowerPC G4 processor. The PowerPC G4 chip set was designed by Apple, Motorola, and IBM for superior processing performance. It features a short seven-stage pipeline, full 128-bit memory paths between L1 and L2 cache, and a floating-point unit capable of executing double-precision mathematical calculations in a single processor cycle. The PowerPC G4 also supports prefetching operations with up to four simultaneous 32-bit data streams, compared with the Pentium III processor, which supports only a single 32-bit block prefetch. Data stream prefetching improves processor performance by retrieving and caching data before it's actually demanded by the processor, ensuring optimal utilization of each processor cycle.

Velocity Engine vector processing unit. The G4 processor improves efficiency further with a powerful 128-bit vector parallel processing unit called the Velocity Engine. In applications written to take advantage of vector processing, the Velocity Engine accelerates processing by executing an operation on multiple pieces of data at the same time. It processes data in large, 128-bit chunks, instead of the smaller 32-bit or 64-bit chunks used in traditional processors. The Velocity Engine operates concurrently with the integer and floating-point units in the PowerPC G4 chip set. This allows highly parallel operations—for simultaneous execution of up to sixteen 8-bit or four 32-bit floating-point calculations in a single cycle. That's two to four times faster than Pentium III processors. Support for the Velocity Engine is built into Mac OS X Server to dramatically speed up high-bandwidth data processing and algorithm-intensive tasks, such as data encryption, audio and video compression, multimedia processing, and networking.

Dual processing. Dual 1GHz PowerPC G4 processors provide the high-density power required by demanding applications such as research computing and numerical clustering environments; rendering, encoding, and compression farms; audio and video editing; and high-bandwidth networking. Symmetric multiprocessing in Mac OS X Server dynamically manages multiple processing tasks across both processors, allowing the dual processor Xserve to accomplish up to twice as much as a single-processor system in the same amount of time—without requiring any special optimization of the application.

Applications and tasks that have been written for multithreading can take further advantage of dual processing. A thread is a self-contained task; when tasks are broken down into multiple threads, the threads can be assigned to separate processors. By utilizing both processors at the same time, a multithreaded application can achieve up to twice the performance on a dual processor system as on a single-processor system running at the same clock speed. In fact, since Mac OS X Server is also multithreaded, server applications that use network file services, access databases, or encrypt and authenticate communications will experience a dramatic performance boost on the dual processor Xserve.

Advanced memory architecture

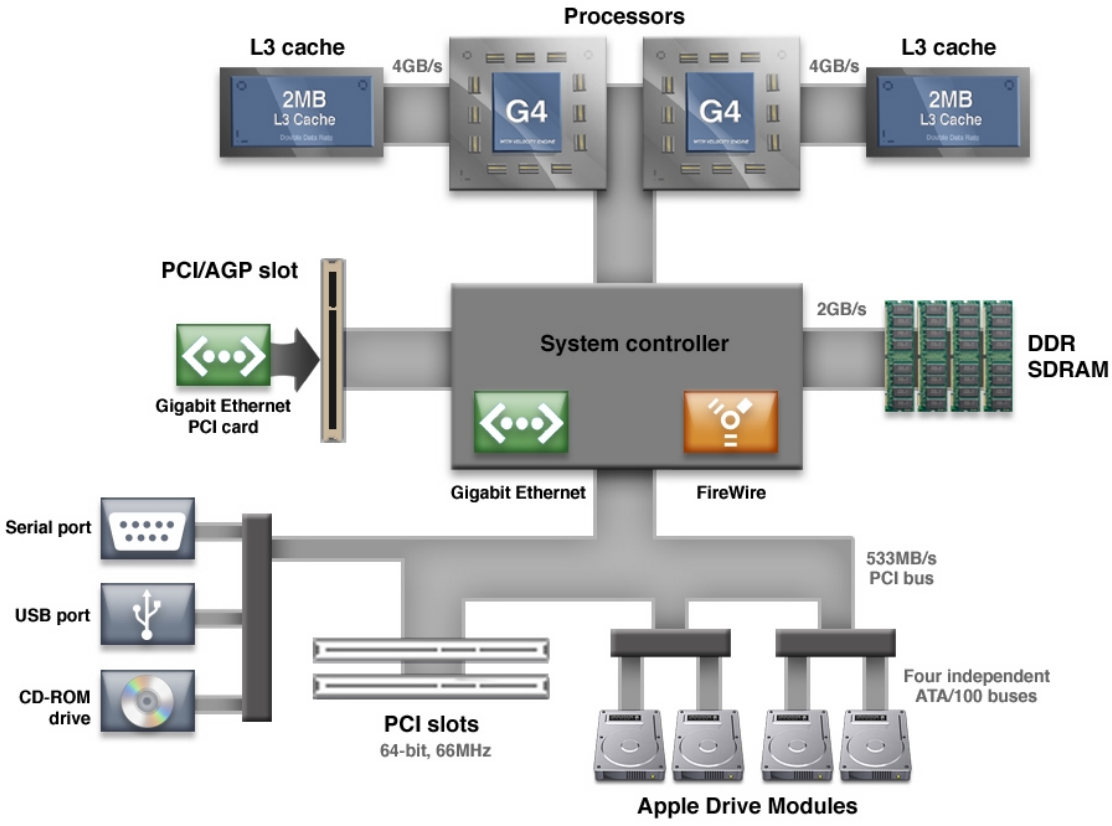
Xserve maximizes the efficiency of its computing power with an advanced memory architecture. Featuring L2 cache running at full processor speed, dedicated ultrafast L3 cache memory, and Double Data Rate (DDR) main memory, it's ready to process the massive data sets found in science and technology research centers, higher education, or audio and video production environments.

L3 cache. In addition to an on-chip L2 cache, Xserve processors each have 2MB of DDR L3 cache, providing fast access to data and application code. For increased effectiveness, it features a dedicated 64-bit data path to the processor, with 4GB per second of throughput and no interference from other data transfers. In fact, the processor can receive data from the L3 cache up to five times faster than from main memory. This low-latency memory keeps feeding the processor data—so it doesn't sit idle, waiting for the next task to arrive. In dual processor Xserve systems, each processor has its own L3 cache and dedicated high-throughput bus, enabling the two processors to share data with each other seamlessly, without pausing to update main memory.

The L3 cache is ample enough to store large portions of active application code and data. When Xserve is rendering 3D graphics or serving a web application, most of the active code for the program can be stored in the L3 cache. This keeps the most important information close to the processor and quickly accessible. In contrast, in the standard Pentium III– or Pentium 4–based system architecture, all data travels from main memory to the processor through the system controller, where data and instructions from other subsystems are also moving. Congestion among these various data streams causes slowdowns in the overall rate of data transfer, which hampers server performance.

Double Data Rate (DDR) memory. Xserve features four DIMM slots that use industry-standard PC2100 DDR SDRAM. This high-performance memory handles two memory operations per clock cycle for a 266MHz data rate—a throughput of 2.1GB per second. That's twice the throughput of the Single Data Rate (SDR) memory used in other 1U servers. Xserve comes standard with 256MB or 512MB of DDR SDRAM, and memory is scalable up to 2GB—allowing customers to increase server memory as their application requirements increase. More main memory enables the server to run demanding programs simultaneously and to accommodate spikes in demand.

For added system efficiency, the Xserve I/O subsystems have direct access to the high-speed DDR memory. Direct Memory Access (DMA) in the system architecture enables attached devices, such as PCI cards and hard drives, to bypass the processor and communicate directly with the server's main memory. This direct access allows the attached components to work faster and frees the processor from involvement with the data transfer.



Xserve system architecture

Server-optimized I/O

I/O throughput is essential to server performance, and Xserve features Apple's fastest-ever I/O system to meet the demands of high-bandwidth networking and storage deployments.

High-performance PCI slots. Xserve features two full-length 64-bit, 66MHz PCI slots with throughput of up to 533MB per second—providing the bandwidth for demanding I/O applications, such as media asset databases, numerical clusters, and connectivity to high-performance networking, storage, and backup devices. Standard Xserve models ship with one slot open for user configuration and one with a VGA graphics card preinstalled. In addition, a half-length combination PCI/AGP slot on an independent bus can be used as a 32-bit, 66MHz PCI slot or as an AGP 4X graphics card slot. On standard models, it is configured as a PCI slot with a Gigabit Ethernet card preinstalled.

Users who demand powerful 3D graphics capabilities can order Xserve with an ATI Radeon 8500 graphics card installed in the AGP 4X slot. Ideal for graphics and video workstation applications, this high-performance card uses ATI's Charisma Engine II for integrated hardware transform and lighting, at rates of up to 62.5 million triangles per second, and the Pixel Tapestry II rendering engine, which delivers per-pixel shading capabilities at fill rates of up to 2.4 gigatexels per second. The ATI Radeon 8500 graphics card offers 64MB of DDR video memory, dual display support, and DVI, VGA, and S-video connectors. This graphics option leaves both full-length PCI slots open for specialized processing cards or connectivity to external audio, video, or storage devices.

Dual independent Gigabit Ethernet ports. Xserve features two independent 10/100/1000BASE-T Ethernet ports—one on the main logic board and one on a card in the half-length PCI/AGP slot—to provide tremendous networking bandwidth and deployment flexibility. Separate buses ensure maximum throughput—up to 1000Mb per second per port—to alleviate bottlenecks even with very large files. Combined with the multihoming function in Mac OS X Server, dual ports enable Xserve to serve more client systems, to provide redundant links, or to support an isolated management network that is independent from a client services network. Dual Gigabit Ethernet also enables the high-speed network interconnect needed by many compute farms.

Additional connectivity. Xserve offers a number of easy-to-access ports for connecting industry-standard I/O devices.

- *VGA graphics port.* The preinstalled graphics card features a VGA port for easy connection to industry-standard VGA displays and KVM (keyboard-video-mouse) switches. It supports headless booting by defaulting to a known safe resolution (800 by 600 pixels at 60Hz) and allows hot-plugging of a display device to the server.
- *DB-9 serial port.* An industry-standard 9-pin serial port allows for system access through a serial console session.
- *Three FireWire ports.* Two ports on the back panel and one on the front panel connect to high-bandwidth FireWire (IEEE 1394a) devices, such as storage devices and audio and video input devices.
- *Two USB ports.* Two ports on the back panel connect to keyboards, mice, speakers, and other industry-standard peripheral devices.

Storage

The growth of digital content creation and distribution in business and education is driving the need for high-capacity data storage. Digital video footage, large databases, media-rich student documents, high-resolution digital images, immense scientific data sets, and uncompressed audio all place enormous demands on server storage resources. Xserve addresses this growing need by providing flexible and affordable storage solutions. With nearly half a terabyte of internal storage capacity, it breaks new ground in the 1U server category.

High-speed I/O lets users connect to external devices for even greater storage capacity or to share storage among multiple servers. Optional PCI-based Fibre Channel or SCSI cards connect to high-performance rackmounted storage and backup systems, while three FireWire ports provide hot-plug connectivity to tape backup systems and portable storage devices.

High-capacity storage

Xserve has more than twice the internal storage capacity of most other 1U servers on the market, providing customers with scalable, easy-to-deploy server storage.

Four drive bays with Apple Drive Modules

Four drive bays. Xserve has four hard drive bays for inexpensive storage expansion using 60GB or 120GB Apple Drive Modules.[1] The drive modules use sophisticated hot-plug connectors called SCA II, or Single Connector Attachment II. Hot-plugging allows administrators to add storage without bringing down the server: Insert a new Apple Drive Module at any time and it's instantly available to the server. Apple Drive Modules feature a unique handle design for easy installation and a positive locking mechanism to hold them tightly in place after insertion. Carefully tested and qualified to ensure maximum performance and reliability, Apple Drive Modules work seamlessly with the sophisticated Xserve remote hardware monitoring system.

Price/performance. Xserve features an advanced storage subsystem with the best balance of performance, capacity, and price. Apple Drive Modules use 7200-rpm Ultra ATA/100 hard disk drives. Each drive employs an independent ATA/100 bus, which allows maximum individual drive performance without hindering the throughput of the other drives. The ATA drive subsystem is backed by a fast, high-bandwidth I/O bus that minimizes bottlenecks, even when all four drives are active at once. This enables Xserve to provide theoretical performance of up to 266MB per second, compared to 160MB-per-second theoretical performance with Ultra160 SCSI disk drives. In addition to this performance advantage, Apple Drive Modules offer higher capacities at a lower cost and generate less heat than SCSI drives.

Apple Drive Module

Internal storage competitive comparison

Server	Apple Xserve	Dell PowerEdge 1650	Compaq ProLiant DL360	IBM eServer xSeries 330	Sun Sun Fire V100
Maximum internal storage capacity	480GB (four 120GB drives)	219GB (three 73GB drives)	146GB (two 73GB drives)	146GB (two 73GB drives)	80GB (two 40GB drives)
Onboard disk controller	Four independent Ultra ATA/100	Dual Ultra160 SCSI	Single Ultra160 SCSI	Dual Ultra160 SCSI	Single Ultra ATA/100
Hot-plug drives	Yes	Yes	Yes	Yes	No
Cost of additional drives*	$499 (120GB)	$999 (73GB)	$950 (73GB)	$1099 (73GB)	$250 (40GB)
Cost per GB*	$4	$14	$13	$15	$6
Maximum theoretical throughput	266MB/s	160MB/s	160MB/s	160MB/s	100MB/s

Xserve offers affordable internal storage that scales to more than twice the capacity of most other 1U servers on the market. Four independent ATA/100 drive channels provide a throughput of up to 266MB/s—significantly faster than the 160MB/s maximum theoretical throughput of Ultra160 SCSI–based storage subsystems.

* Based on suggested retail prices published on manufacturers' websites as of May 4, 2002.

Scalability. Affordable and easy-to-install hard drive modules make it simple to expand Xserve systems to meet growing storage needs over time. Because each drive operates on an independent bus and connects to a high-speed I/O system, the Xserve storage subsystem scales without compromising performance.

Storage management and monitoring

Apple Drive Modules integrate seamlessly with Mac OS X Server, delivering software RAID support and built-in remote monitoring capabilities.

Software RAID. With multiple Apple Drive Modules, software RAID support enables users to match their storage configuration with their data needs at a very modest cost. They can increase data redundancy by mirroring drives or increase disk performance by striping drives. For maximum performance, they can stripe data across all four drives. In addition, Mac OS X Server on Xserve can boot from a mirror or a stripe. If a mirrored drive fails, Server Monitor sends a notification, enabling administrators to swap in a new drive module, run a utility, and have the system up again in minutes.

Monitoring drive health. Xserve hardware and software work together to provide industry-leading remote monitoring and alerting capabilities. The server operating system reads Self Monitoring, Analysis, Reporting Technology (SMART) data from each hard drive. SMART data allows the drive to report its own degradation and enables the operating system to warn the administrator of a prefailure condition—providing the opportunity to back up critical data and replace the hard drive before a failure occurs. For local monitoring, each drive module has two LEDs: one for drive activity and one for drive health (Green—OK, Yellow—Warning, and Red—Fail).

Mac OS X Server

Xserve ships with an unlimited-client license for Mac OS X Server, Apple's UNIX-based server operating system. Hardware and software work together seamlessly to deliver powerful, integrated solutions for workgroup and Internet services—all with Apple's legendary ease of use. Industry-leading configuration and management tools make the system easy to deploy, even for those without experience in network administration, and all-new monitoring capabilities make it possible to monitor critical hardware subsystems remotely. Xserve with Mac OS X Server dramatically reduces the complexity of system administration—enabling businesses and institutions to minimize maintenance costs and lower their total cost of ownership.

Industrial-strength operating system

The foundation of Mac OS X Server is a UNIX-based open source operating system called Darwin, designed from the ground up for stability, performance, and interoperability with industry-standard technologies. Based on the Mach 3.0 microkernel, FreeBSD, and NetBSD, this industrial-strength foundation enables advanced capabilities such as protected memory, real-time preemptibility, and symmetric multiprocessing. And for UNIX and Linux users who are at home with a command-line environment, Mac OS X Server offers a full BSD UNIX command set accessible from the Terminal application.

To protect network assets from unauthorized access, Mac OS X Server takes maximum advantage of its advanced architecture and secure operating system design. In addition to a UNIX file system permissions architecture, Mac OS X Server supports the latest in data and protocol security: It features integrated SSL support for encrypted and authenticated client/server communications and Secure Shell (SSH2) for encrypted and authenticated log-on and secure remote administration from a command line.

Easy-to-use services

On the powerful Darwin foundation, Mac OS X Server delivers a comprehensive set of standards-based file and print, Internet and web, networking, desktop management, and directory services. Together they provide a superior architecture for connecting Macintosh, Windows, and UNIX clients, sharing files and printers, hosting dynamic websites, streaming real-time digital media, exchanging email, providing network services, and deploying flexible and scalable network applications.

The evolution of Darwin

Darwin evolved from a collaborative effort by Apple engineers and programmers in the open source community, and Apple has made the full Darwin source code available online—creating a model for the development of state-of-the-art technologies and the evolution of operating system design. Developers can use portions of Darwin in their own products; they can also customize and make improvements to Darwin that enhance its quality, performance, and feature set. There are more than 100,000 registered developers in the Darwin community.

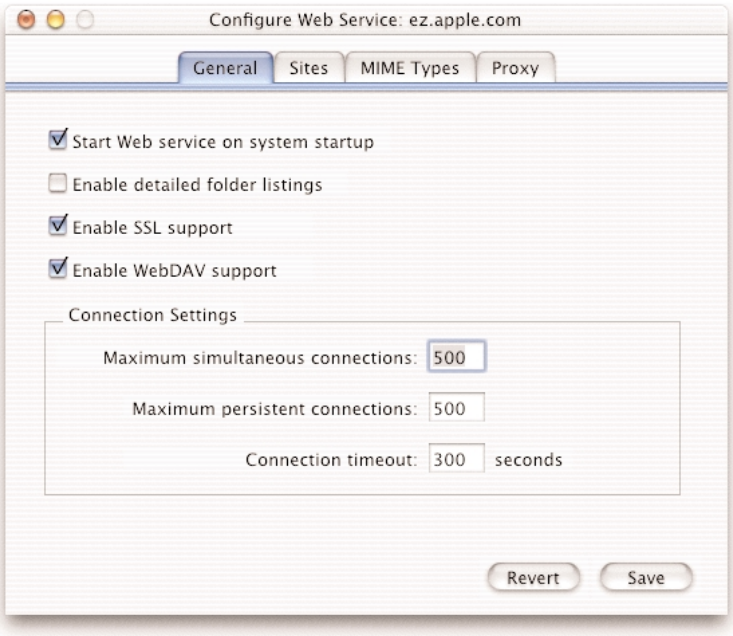
Failure recovery

To ensure maximum uptime for Xserve systems, Mac OS X Server:

- Watches over system services and, if one stops functioning, restarts it automatically
- In the event of a systemwide freeze, power-cycles the server and restarts all services
- After a power failure, restarts the server and system services—without intervention

File and print services

- *File access and sharing.* Provides IP-based services for native file sharing with Mac, Windows, UNIX, and Linux clients.
- *Printer sharing and queuing.* Provides high-performance printer sharing and queuing services for Mac, Windows, UNIX, and Linux clients, with support for multiple print queues to PostScript-capable printers over TCP/IP, AppleTalk, or USB.



Apple has added an intuitive interface to Apache, making the world's most popular web server easy to set up and manage.

Internet and web services

- *Apache.* Provides reliable, high-performance delivery of both static and dynamically generated web content, plus a front-end cache for improved performance and support for Apache modules, WebObjects, PHP, MySQL, JavaServlets, JavaServer Pages (JSP), Perl, and UNIX and Mac CGI scripts.
- *WebDAV.* Simplifies web publishing and content management, allowing users to check out web pages from anywhere on the network, make changes, and check them back in while the website is running.
- *Secure Sockets Layer (SSL) support.* Enables secure high-grade encryption and authentication of transactions.
- *QuickTime Streaming Server.* Uses the industry-standard Real-Time Protocol/Real-Time Streaming Protocol (RTP/RTSP) to deliver, or stream, media in real time over the Internet.
- *WebObjects 5 deployment software.* Provides a complete Java-based web application environment for the rapid deployment of scalable, cross-platform network applications that can connect to multiple databases and generate HTML and Java user interfaces for a standard web browser.
- *Mail services.* Supports standard Internet mail protocols including Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP), and the Internet Message Access Protocol (IMAP).

Networking services

- *IP filtering firewall.* Prevents unauthorized network and server access, by scanning incoming IP packets and rejecting or accepting them based on predefined filters.
- *Dynamic Host Configuration Protocol (DHCP) server.* Assigns and leases IP addresses dynamically as computers are added to the network.
- *Domain Name Server (DNS) support.* Allows users to locate computers on the Internet by domain name and enables administrators to define host names.
- *Service Location Protocol (SLP) Directory Agent (DA).* Allows administrators to organize IP-based networks into logical groupings, making it easy for users to locate shared resources.

Workgroup management services

- *Macintosh Manager 2.* Provides a centralized method for securing and managing Mac OS 9 desktop computers and controls user access to applications, file server volumes, and printers.
- *NetBoot.* Enables multiple Mac OS 9 computers to boot from a single network-based system image instead of an internal disk drive.

Directory services

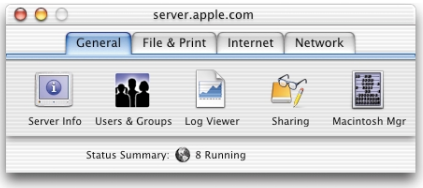
- *NetInfo and LDAP support.* Enables Mac OS X Server to interoperate with existing directories and allows sharing of accounts and access privileges among servers.

For more information about Mac OS X Server, visit www.apple.com/macosx/server.

Remote Management and Monitoring

Mac OS X Server integrates new, easy-to-use remote management and monitoring capabilities into its suite of network services for Xserve. These valuable tools make it possible for network administrators to stay in touch with their Xserve systems whether they're on the other side of campus or away on vacation. To protect management data and server deployment, Xserve remote management and monitoring tools run over an authenticated, encrypted TCP/IP link. Now administrators can easily and securely configure network services—and even manage multiple Xserve systems at once—from anywhere on the Internet.

Administrators can also monitor critical hardware components remotely. Embedded hardware sensors and sophisticated software combine in a complete, user-friendly solution for checking the status of key hardware subsystems. To maximize server uptime—and peace of mind—the Xserve system uses its monitoring capabilities to perform automatic, continuous self-checks. If it detects a potential hardware problem, the system can instantly notify administrators via email or email-capable pager or cell phone, allowing them to respond quickly to prevent or repair the problem. Key software services are also monitored: If an essential service fails, Mac OS X Server automatically restarts it, with minimal downtime. In addition, Simple Network Management Protocol (SNMP) support allows integration of Xserve systems with third-party monitoring tools.



Server Admin window

Remote administration of network services

Mac OS X Server integrates key network administration tools in a single application called Server Admin and makes them accessible in an easy-to-use interface. Network administrators can remotely manage multiple servers at the same time, making it easy to configure and monitor IP-based file and print services, web publishing systems, networking services, and workgroup management. In addition, Xserve is equipped with a DB-9 (9-pin) serial port, giving UNIX-savvy administrators a way to access the system through a serial console session when network services are down.

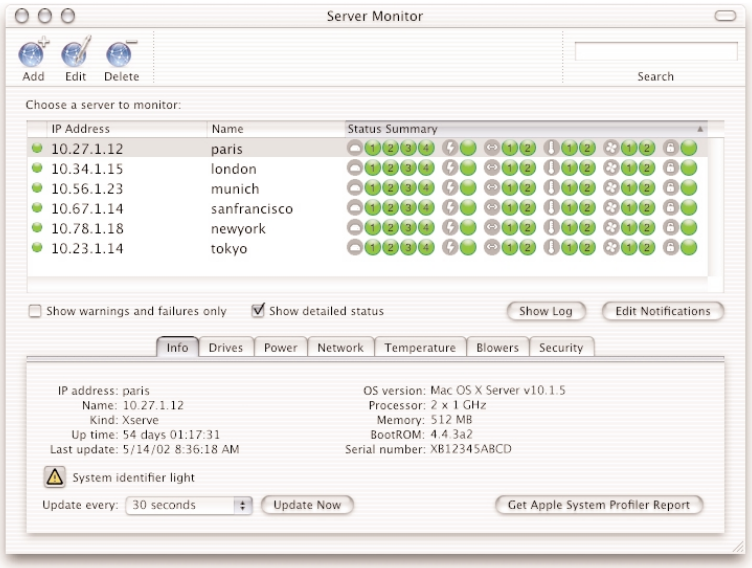
The latest version of Mac OS X Server includes new tools for setting up and managing servers remotely, without requiring a display to be attached to each server. Administrators can use any networked Mac OS X computer to install software (including system software), set system or network preferences, set up directory services, create print queues, and view real-time logs of server usage.

To guard against unauthorized access, Mac OS X Server is designed with the latest in advanced protocol-level data security standards. Built-in Secure Shell (SSH2) technology enables encrypted and authenticated log-on through the terminal interface for secure remote administration from anywhere on the Internet. New command-line tools are available with Xserve, allowing administrators to remotely install software, run Software Update, or set system and network preferences.

Hardware monitoring using Server Monitor

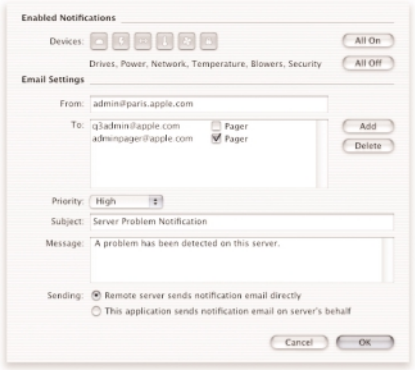
Xserve expands on the power of Mac OS X Server with Server Monitor, an advanced software tool that monitors server hardware and displays information on all key subsystems—aiding in early identification and easy diagnosis of system problems. Built-in sensors in Xserve detect and report on system temperature, blower operation, hard drive health, Ethernet links, and power supply condition. Server Monitor uses this data to provide a detailed, continuously updated report on the health of all Xserve systems. If operating conditions for any subsystem exceed predefined thresholds, Server Monitor can automatically notify system administrators via email or email-capable pager or cell phone.

Server Monitor is easy to set up and can manage dozens of servers using a single interface. Red, yellow, and green lights indicate the health of each server, identified by name and IP address (or DNS host name). Next to the server name is at-a-glance summary information; the tabs below provide detailed status and performance information.



Status Summary. Reports the status of each subsystem. The status line for each server displays gray icons for the server subsystems and colored icons indicating the status of the individual components: hard drives, power supply, Ethernet links, temperature sensors, blowers, and system security (Green—OK, Yellow—Warning, and Red—Fail). A click on any gray icon opens the corresponding tab for instant retrieval of subsystem details.

Show Log. Opens a log of activities and messages for each monitored Xserve. For example, the log may show the times Server Monitor attempted to contact the server and whether a connection was successful. The log also shows changes in server status.



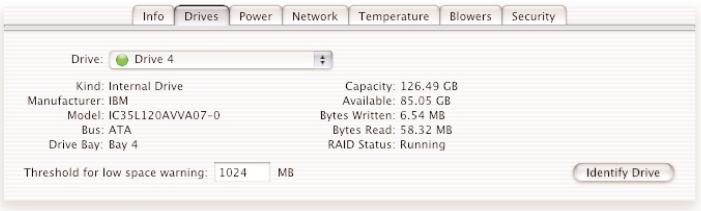
Notification settings

Edit Notifications. Automatically sends a customized email to alert specified individuals when operating conditions exceed predefined thresholds. Short text messages can be sent to email-capable pagers, cell phones, or PDAs; full-text details can be sent to email clients or full-function PDAs.

Info. Lists key attributes of the server: name, IP address, device kind, operating system version, processor type, amount of memory, uptime, last update, and hardware serial number.

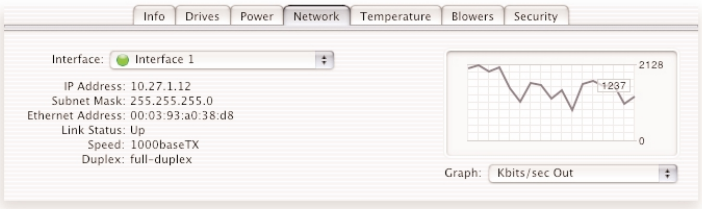
Get Apple System Profiler Report. Opens the Apple System Profiler report for the selected server or for multiple servers. This file can be saved for asset tracking or support logging.

Drives. Shows the status of each of the server's hard drives (in this case, drive 4), as well as SMART data for predictive failure notification. Administrators can set a low-space threshold and receive an automatic warning if disk space drops below that level.



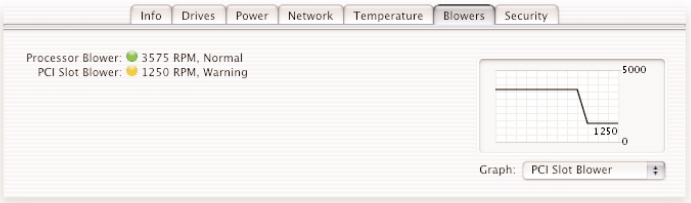
Power. Shows the status of the power supply, including a historical line graph for each supply rail and Uninterruptible Power Supply (UPS) information and status.

Network. Shows the status of the two Ethernet links and a historical line graph for each link.



Temperature. Shows the values of the two thermal sensors, one for the processor card and one for the enclosure itself, as well as a historical line graph for each sensor reading. Users can set a preference for centigrade or Fahrenheit temperature values.

Blowers. Shows the revolutions per minute and status of the two blowers, including a historical line graph for each blower. In this case, Server Monitor displays a warning about the second blower.



Security. Shows the status of the enclosure locks and I/O port security.

Additional monitoring tools

In addition to Server Monitor, Xserve comes with InterMapper, an intuitive network monitoring and alerting application from Dartware. InterMapper makes at-a-glance maps of the servers on a network and displays detailed network statistics, including strip charts of errors and use of LAN and WAN circuits. When there are problems, InterMapper can notify the administrator via sound, email, or pager—or by running scripts to take corrective action. For more information about InterMapper, visit www.dartware.com.

Xserve supports SNMP for monitoring and managing multiplatform networks. Mac OS X Server provides useful system and network statistics via its default Net-SNMP management information bases (MIBs), allowing administrators to use commercial and open source tools for remote monitoring of data, such as processor utilization, bandwidth use, and disk space levels. For more information about Net-SNMP, visit www.net-snmp.com.

Service and Support

When your operation hinges on server reliability, you can't afford downtime. To ensure rapid issue resolution for Xserve systems, Apple offers a comprehensive range of service and support options. And since both Xserve and Mac OS X Server come from Apple, customers don't need to figure out where the problem lies: AppleCare service and support products are as integrated as Apple's hardware and software.

In addition to the included 90 days of support and one-year limited warranty, Xserve customers can purchase the AppleCare Premium Service and Support Plan, which delivers up to three years of expert telephone and email support and onsite hardware service. For deployments with aggressive uptime requirements, AppleCare Service Parts Kits facilitate rapid onsite repairs. These and other AppleCare service and support products are designed to ensure responsive technical support for critical server installations.

AppleCare Premium Service and Support Plan[3]
A powerful server solution like Xserve calls for world-class service and support to match. The AppleCare Premium Service and Support Plan provides up to three years of expert telephone and email support and onsite hardware service. The plan covers both Xserve hardware and Mac OS X Server software. Apple technical support experts are available 24 hours a day to help customers determine whether they're experiencing a hardware failure or a Mac OS X Server configuration issue. In either case, Apple support staff will work to get systems up and running as quickly as possible. And because Apple hardware and software are uniquely integrated, there's only one AppleCare number to call.

The AppleCare Premium Service and Support Plan delivers expert telephone and email support with 30-minute response time—24 hours a day, seven days a week. The hardware repair coverage ensures four-hour onsite response during business hours and next-day onsite response after business hours (terms apply). For added peace of mind, Apple-authorized technicians perform repairs using genuine Apple parts.

Training and support resources available on the AppleCare support website can also help keep Xserve systems running smoothly. This easy-to-use website publishes in-depth product information, training on hardware and software installation and configuration, and technical resources, including the AppleCare Knowledge Base, discussions, and downloadable software on Apple's Featured Software website.

Xserve customers can purchase the AppleCare Premium Service and Support Plan at any time while the hardware is still under its original one-year warranty. However, since coverage ends three years after the hardware purchase date, customers will get maximum advantage when they make both purchases at the same time.

AppleCare Service Parts Kit

AppleCare Service Parts Kits for Xserve

Customers can also purchase AppleCare Service Parts Kits, which include a logic board, a power supply, a blower, and an Apple Drive Module (60GB or 120GB). Xserve is designed for quick and easy swapping of crucial parts; no special tools or training certifications are needed. AppleCare Service Parts Kits let system administrators keep key components handy to address the most common hardware failures. When customers combine an AppleCare Premium Service and Support Plan with an AppleCare Service Parts Kit, Apple experts can often help them troubleshoot and fix their system right over the phone—day or night—without having to wait for a technician.

Additional service and support products

Apple offers additional support options ranging from personalized technical support through Apple Professional Services to troubleshooting tools through AppleCare Professional SupportLine and Tools.

Apple Professional Services. Complex applications and network installations may require expert long-term technical support. Apple Professional Services Technical Support provides cost-effective and flexible support programs to keep your Xserve up and running. Designed for medium-size and large organizations looking to integrate Xserve and Mac OS X Server with other enterprise systems (such as Windows, UNIX, and LDAP), Apple Professional Services offers support and consulting beyond the scope of traditional technical product support. Services include installation and integration, planning and migration, application development, and project consulting, as well as extended system administration and development support for Mac OS X Server.

Apple Professional Services also offers comprehensive training and certification programs for system administrators and developers using Mac OS X Server. These highly acclaimed classes offer the fastest and most cost-effective path to understanding Mac OS X and Mac OS X Server in depth. Training classes are taught in Apple Authorized Training Centers or onsite at customer locations by a team of veteran instructors with real-world experience. Apple Professional Services certification programs are intended to ensure the skills and capabilities of technical coordinators and system administrators. These programs are a great way to develop technical skills and also to market those skills to IT management. Certification testing centers are available in most major U.S. metropolitan areas.

For more information about Apple Professional Services offerings, including training schedules, registration instructions, and certification details, visit www.apple.com/services.

AppleCare Professional SupportLine and Tools. AppleCare Professional SupportLine and Tools provides one year of phone support with priority access to Apple's senior technical support staff. It also provides a wide range of tools for optimizing and troubleshooting Apple systems and software, including Xserve and Mac OS X Server.

Visit www.apple.com/support/products or call 800-275-2273 for more information about AppleCare service and support products.

Deployment Environments

Xserve is a versatile server solution with the flexibility to fit in a variety of deployment scenarios. Customers in small and medium-size businesses, creative departments, and K–12 education can use Xerve to provide cross-platform file and print services, administer Internet services, and run web and database servers; and an unlimited-client license for Mac OS X Server lowers overall deployment costs. At the same time, Xserve delivers the performance required for advanced applications in higher education, science and technology research centers, and audio and video production environments.

Small and medium-size business

Xserve provides a robust server platform for web serving, database servers, and back-end file and printer sharing in small and medium-size businesses, and the rack-optimized 1U enclosure maximizes floor space in server closets or data centers. Out-of-the-box support for Mac, Windows, UNIX, and Linux clients makes Xserve the easiest way to provide and manage network and Internet services for multiplatform workgroups. Network administrators, whether novices or experts, will appreciate the intuitive management and monitoring tools built into Mac OS X Server, as well as the AppleCare support products available for Xserve systems. And with four drive bays and up to 480GB of internal disk space, Xserve makes it easy and affordable for businesses to expand their storage configuration and services as business grows.

Design and publishing

Design and publishing professionals operate in small shops or self-contained departments and have many of the same server deployment issues as small businesses. In addition, since their work and media assets often reside on the server, they require robust storage options and ultrafast throughput for accessing and sharing large files quickly. Xserve provides what they need to optimize digital workflow in creative groups and production teams: nearly half a terabyte of internal storage capacity, high-speed PCI slots for external storage expansion, and dual Gigabit Ethernet for fast file sharing. To simplify workflow management, Mac OS X Server makes it easy to update software and configure computers identically across a workgroup.

Printing operations in particular rely on the computational capabilities of their servers. The 1GHz PowerPC processors in Xserve systems feature 2MB of dedicated L3 cache per processor and integrated vector processing units—perfect for cranking through RIP tasks, OPI jobs, and print output with phenomenal performance. With an array of fast Xserve systems, each with up to 480GB of internal storage, print shops can process big jobs faster or process many large jobs simultaneously.

Creative professionals work in deadline-driven environments and place a high premium on server availability. To protect critical media assets, Xserve offers software RAID solutions and high-throughput connectivity to external RAID storage devices. Customers in printing environments, where availability requirements are even more stringent, will appreciate the powerful monitoring capabilities built into Xserve systems. Network administrators can even receive notifications via email or email-capable pager if hardware problems are detected, so they can respond quickly and make immediate adjustments as necessary.

Science and technology

Customers in life sciences, physical sciences, and government research centers use UNIX applications for specific research tasks, such as analyzing genomes or calculating the texture map of a 3D model. For maximum processing efficiency and faster research results, these data-intensive projects are often conducted across multiple systems in a numerical clustering environment. High-density computing power is critical—and rack-optimized solutions are a requirement—for clustering and compute farms. With up to 15 gigaflops in a single 1U system, Xserve packs tremendous computational power in a very small space: 84 RISC processors, performing at up to 600 gigaflops, can fit in a standard 42U rack. Dual Gigabit Ethernet provides high-speed interconnectivity for compute farms, while the 64-bit, 66MHz PCI bus supports high-performance switching fabrics used in tightly coupled numerical clusters.

The UNIX foundation of Mac OS X Server enables scientists and researchers to implement open source and third-party clustering solutions and to use familiar UNIX utilities, shells, scripting languages, and compilers to build specialized software for their work. A full suite of developer tools comes with Mac OS X Server, including the gcc command-line compiler and a development IDE called Project Builder, for writing Mac OS X applications, tools, frameworks, libraries, plug-in bundles, kernel extensions, and device drivers in C, C++, Objective-C, or Java. Project Builder can be used either to port command-line applications to Mac OS X or to enhance them with a Mac OS X user interface.

Audio and video production

Xserve is the perfect rackmount workstation for audio and video professionals. Featuring dual 1GHz PowerPC G4 processors[2] with integrated vector processing units in a rackmountable enclosure, Xserve cranks through audio production or video editing tasks with phenomenal speed. It supports up to 2GB of high-performance DDR SDRAM for running memory-hungry applications and caching huge media files. And with all that high-quality digital audio and video, storage systems quickly fill to capacity. Xserve is designed for flexible storage that can scale as data needs grow, with four drive bays supporting up to 480GB of internal storage. In addition, 64-bit, 66MHz PCI slots allow superfast connections to external SCSI storage and backup systems.

Apple Final Cut Pro turns Xserve into the ultimate video workstation. Users can configure Xserve as a video editing and production system by adding a high-performance ATI Radeon 8500 AGP 4X graphics card and connecting one of Apple's world-class displays, such as the new 23-inch Apple Cinema HD Display.[4] Since the Radeon 8500 supports dual displays, video professionals can also add a VGA or S-video monitor for previewing their work. Optional DVI cable extenders allow producers to work at a monitor in one room and keep their AV rack and Xserve system in another room or in an equipment closet, up to 330 feet away.

Three built-in FireWire ports connect to industry-standard FireWire hard drives, tape backup systems, and other high-bandwidth devices, including professional digital audio and DV camcorders and decks—allowing Xserve to be used for audio and video applications without special cards or adapters. Xserve also has two USB ports for connecting to keyboards, speakers, microphones, and other devices.

Xserve and Mac OS X Server combine with Apple QuickTime, the industry-standard file format for digital media, to provide the most integrated cross-platform streaming media server available. With QuickTime Streaming Server enabled, Mac OS X Server can stream digital video—for news, entertainment, or education—over the Internet using RTP/RTSP. QuickTime Streaming Server can deliver more than 2000 low-bit-rate streams simultaneously from one Xserve system—and there's no per-stream license fee. For streaming live events over the Internet, separate QuickTime Broadcaster software provides an affordable, end-to-end webcasting solution. Xserve can also be used for back-end video compression and encoding with QuickTime Pro.

AppleCare Professional SupportLine and Tools

This optional AppleCare product provides one year of phone support with priority access to Apple's senior technical support staff. It also provides a wide range of tools for optimizing and troubleshooting Apple systems and software, including Xserve, Mac OS X Server, QuickTime, and Final Cut Pro.

K–12 education

Xserve is an easy-to-use server solution with flexible, high-capacity storage options. It comes with an unlimited-client license for Mac OS X Server—so it's ready, out of the box, to tackle the challenges of K–12 desktop management, cross-platform file and print, web publishing, authentication, and directory services. Xserve can be configured with nearly half a terabyte of internal storage, allowing administrators to give students and teachers more server space for their large, media-rich projects. Since Xserve uses 7200-rpm Ultra ATA/100–class storage, it can deliver huge capacity and performance at affordable prices.

As network services become mission critical in the day-to-day learning process, schools require high server reliability and availability. Xserve provides powerful remote management of both centralized and decentralized server deployments, whether in the wiring closet of an elementary school or a data center at district offices. Mac OS X Server includes Server Admin for remote management of core services and the intuitive Server Monitor application, making it easy for district staff to configure and manage software services and monitor multiple Xserve systems from anywhere on the network.

Higher education

Higher education customers operate within a complex organizational structure and engage in widely varied activities. Their server deployments may include distance learning, lab management, research clusters, directory services, and audio and video production.

As in K–12 education, servers in higher education are playing a larger role in e-learning and distance learning, where high-availability features are critical. Xserve provides powerful tools for remotely managing both centralized and decentralized server deployments and data centers. Mac OS X Server includes Server Admin for remote management of core services over an authenticated, encrypted TCP/IP link, and administrators can log in to one or multiple servers simultaneously from the same application. When the network is down, Xserve provides extensive command-line tools to allow UNIX-savvy administrators to configure and manage systems through the serial port. Xserve also features the easy-to-use Server Monitor application, enabling network administrators to remotely monitor all their servers in a single window and receive notification of problems as they are detected.

Like scientific and technology companies, universities are building large numerical cluster environments for their researchers. Like creative shops, university departments—such as film, TV, media, arts, and architecture—are looking for render and compression farm solutions, as well as cost-effective storage for massive files. With its dual 1GHz processors,[2] Velocity Engine vector processing unit, and integrated floating-point unit, Xserve delivers the power required for numerical research and processor-intensive applications. And a 64-bit, 66MHz PCI bus and up to 480GB of storage in a single 1U system provide the throughput and storage for serving massive data sets and media files.

System administrators in higher education are looking for servers, storage, and software that integrate with their larger heterogeneous network environment. Xserve has the versatility they need: It runs both UNIX and Macintosh server applications, supports Mac clients, and includes integrated cross-platform services for Windows clients. It also supports cross-platform authentication using LDAP and Active Directory and system monitoring using industry-standard SNMP solutions.

Technical Specifications

Hardware

Processor

- Single or dual 1GHz PowerPC G4 processors
- Velocity Engine vector processing unit
- Full 128-bit internal memory data paths
- Powerful floating-point unit supporting single-cycle, double-precision calculations
- Data stream prefetching operations supporting four simultaneous 32-bit data streams
- 256K on-chip L2 cache running at processor speed
- 2MB DDR SRAM L3 cache per processor with up to 4GB/s throughput
- 133MHz system bus supporting over 1GB/s data throughput

Memory

- 256MB or 512MB of 266MHz PC2100 DDR SDRAM with up to 2.1GB/s throughput
- Four DIMM slots supporting up to 2GB of DDR SDRAM using the following:
  - 128MB or 256MB DIMMs (64-bit-wide, 128Mb technology)
  - 512MB DIMMs (64-bit-wide, 256Mb technology)

I/O connections

- Two full-length 64-bit, 66MHz PCI slots (lower slot filled with PCI graphics card in standard configurations); support for 32-bit or 64-bit 3.3V PCI cards running at 33MHz or 66MHz, respectively
- One half-length 32-bit, 66MHz combination PCI/AGP slot with one of the following:
  - Gigabit Ethernet card (standard configurations)
  - AGP 4X graphics card (build-to-order option)
- Two 10/100/1000BASE-T (Gigabit) RJ-45 Ethernet connectors, one on logic board and one on PCI card
- Optional Fiber Gigabit Ethernet PCI card (IEEE 802.3z)
- Three 400Mb/s FireWire ports (two on back panel, one on front panel; 15W total power)[5]
- Two USB ports (12Mb/s each)
- One DB-9 serial port

Graphics support

- ATI PCI graphics card with 32MB of DDR SDRAM graphics and VGA connector; support for 33MHz or 66MHz operation
- Optional ATI Radeon 8500 AGP 4X graphics card with 64MB of DDR SDRAM and DVI, VGA, and S-video connectors; dual display support; support for digital and analog resolutions up to 2048 by 1536 pixels

Storage

- Four internal bays with independent 100MHz buses for up to 480GB of internal storage[1] using hot-plug Apple Drive Modules, available in the following capacities:
  - 60GB 7200-rpm Ultra ATA/100 with 2MB disk cache
  - 120GB 7200-rpm Ultra ATA/100 with 2MB disk cache
- One bay filled with 60GB 7200-rpm Apple Drive Module (standard configurations)
- Support for reading SMART data from Apple Drive Modules for prefailure notification
- Tray-loading 24x-speed CD-ROM drive with front-panel eject button
- Optional Ultra160 SCSI PCI card for connecting to external storage and backup devices

Rack support

- Fits EIA-310-D–compliant industry-standard 19-inch-wide racks, including:
  - Four-post racks from 29 to 36 inches deep
  - Two-post telco racks (center-mount brackets included)
- Mounting screws with M5 and 10/32-inch threads included
- Cable management arm for four-post racks included
- Front-to-back cooling for rack enclosures

Electrical requirements

- Line voltage: Universal input (90V to 264V AC), power factor corrected
- Frequency: 47Hz to 63Hz, single phase
- Maximum input current: 3.6A
- Power usage
  - Typical continuous power: 125W (single-processor system); 175W (dual processor system)
  - Maximum continuous power: 400W
- Agency-approved 12-foot power cable included

Environmental requirements and approvals

- Operating temperature: 50° to 95° F (10° to 35° C)
- Storage temperature: –40° to 116° F (–40° to 47° C)
- Relative humidity: 5% to 95% noncondensing
- Maximum altitude: 10,000 feet
- FCC Class A approved

Size and weight

- Height: 1.73 inches (4.4 cm)
- Width: 17.6 inches (44.7 cm) for mounting in standard 19-inch rack
- Depth: 28 inches (71.1 cm)
- Weight: 26 pounds (11.8 kg); 31 pounds (14.1 kg) with four Apple Drive Modules[6]

Software

Mac OS X Server

Unlimited-Client License

Included services

- File services: Macintosh (AFP over TCP/IP), Windows (SMB/CIFS), Internet (FTP), UNIX and Linux (NFS)
- Printer sharing: Macintosh and UNIX (LPR/LPD), Windows (SMB/CIFS)
- Internet and web: Apache web server, QuickTime Streaming Server, WebObjects deployment software, Mail (SMTP, POP, IMAP), WebDAV, SSL, PHP, MySQL, JavaServer Pages, Java Servlets, Perl, Mac CGI, caching web proxy
- Networking and security: BSD networking, SSH2, IP filtering firewall, DHCP server, DNS server, SLP server
- Workgroup management: Macintosh Manager 2, NetBoot
- Directory services: NetInfo, LDAP

Remote monitoring and management tools

- Server Monitor for remote monitoring of key hardware subsystems: enclosure temperature, processor temperature, blower speed, hard drives (SMART data), Ethernet links, power supply and UPS systems, enclosure security
- Server Admin (TCP/IP)
- Remote Setup Assistant
- Simple Network Management Protocol (SNMP)
- InterMapper from Dartware
- Secure Shell (SSH2) for secure remote login
- Command-line tools for remote configuration and management, including installing software, running Software Update, and setting system and network preferences

Configurations

Standard configurations

The following Xserve configurations are available.

Order no.	M8627LL/A	M8628LL/A
Processor	1GHz PowerPC G4	Dual 1GHz PowerPC G4
On-chip L2 cache	256K at 1GHz	256K at 1GHz per processor
L3 cache (DDR SRAM)	2MB with 4GB/s throughput	2MB per processor with 4GB/s throughput
Memory (PC2100 DDR SDRAM)	256MB	512MB
Hard disk drive[1]	60GB (7200 rpm)	60GB (7200 rpm)
Optical drive	CD-ROM	CD-ROM
PCI slots	Two full-length 64-bit, 66MHz slots (one slot open) and one half-length 32-bit, 66MHz combination PCI/AGP slot	
Ethernet	One 10/100/1000BASE-T port onboard and one 10/100/1000BASE-T card in PCI/AGP slot	
Ports	Three FireWire, two USB, one DB-9, one VGA	

All models include rackmounting hardware; Mac OS X Server v10.1.5 with unlimited-client license (Mac OS X Server Install CD, WebObjects Deployment CD, Macintosh Manager 2 CD, NetBoot CD, Developer Tools CD, Admin Tools CD); Apple Hardware Test CD; complete setup, learning, and reference documentation; and one-year limited warranty.

Product contains electronic documentation. Backup software is provided on CD-ROM.

Build-to-order options

Customers can order a custom-configured Xserve from an authorized Apple reseller or the Apple Store online. Build-to-order options can include the following; however, availability can vary. For up-to-date information on these options and products that enhance Xserve deployments, visit www.apple.com/store or call 800-MY-APPLE.

- *System software:* Mac OS X v10.1[7]
- *Memory:* 512MB, 1GB, 1.5GB, 2GB
- *Internal storage:* 60GB Ultra ATA/100 Apple Drive Module (7200 rpm), 120GB Ultra ATA/100 Apple Drive Module (7200 rpm)[1]
- *Graphics:* ATI Radeon 8500 AGP 4X graphics card (includes AGP riser)
- *Other:* Ultra160 SCSI PCI card, Fiber Gigabit Ethernet PCI card

Service and support details

Xserve includes 90 days of free telephone support and a one-year limited warranty. With the AppleCare Premium Service and Support Plan, customers receive up to three full years of 24/7 telephone and email support and onsite hardware repair (terms apply).[3]

Additional services and programs include the following:

- **AppleCare Service Parts Kits for Xserve.** Include crucial parts for rapid onsite replacement.
- **Apple Professional Services.** Offers expert long-term system support and consulting.
- **AppleCare Professional SupportLine and Tools.** Provides one year of premium phone support for Apple systems and software, with priority access to Apple's senior technical support staff.

Visit www.apple.com/support/products or call 800-275-2273 in the United States or Canada for more information about AppleCare service and support products.

For More Information

For more information about Xserve, visit www.apple.com/xserve.

Apple

1 Infinite Loop
Cupertino, CA 95014
408-996-1010
www.apple.com

1 For hard drive capacity measurements, 1GB = 1 billion bytes and 1TB = 1 trillion bytes; actual formatted capacity less. Maximum capacity of 480GB achieved through use of four 120GB Apple Drive Modules.

2 Selected models.

3 A separate AppleCare Premium Service and Support Plan must be purchased for each Xserve system to be covered. To qualify, Xserve systems must be within the one-year hardware warranty. Coverage ends three years after date of Xserve purchase. Actual onsite response time and availability of onsite service depend on location; see www.apple.com/support/products/premium for details. Local telephone fees may apply; telephone numbers may vary and are subject to change. For terms and conditions associated with AppleCare service and support products, visit www.apple.com/support/products in the United States or www.apple.com/ca/support/products in Canada.

4 Requires a DVI to ADC adapter.

5 Actual rates will vary.

6 Weight varies by configuration and manufacturing process.

7 Requires an attached display.

May 2002 L20375A