The Mac OS X Advanced System Administration v10.5 Exam
Skills Assessment Guide

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The Mac OS X Advanced System Administration v10.5 Exam (Prometric exam no. 9L0-621) is a computer-based test offered at Apple Authorized Training Centers and Prometric Testing Centers.

The exam is one of four required exams in the Apple Certified System Administrator (ACSA) 10.5 certification track. You must pass this exam, the Mac OS X Server Essentials v10.5 Exam, the Mac OS X Deployment v10.5 Exam, and the Mac OS X Directory Services v10.5 Exam to become ACSA 10.5 certified.

You may take up to two hours to complete the exam, which consists of 90 multiple-choice questions that are based on the objectives listed in this guide.

The score required to pass is 70 percent. Eight demographic questions are presented but are not scored.

To prepare for the exam, read through the objectives in this guide to determine which areas you need to review. The primary reference source for this exam is the book: *Apple Training Series: Mac OS X Advanced System Administration v10.5* (Peachpit 2008).

You will not have access to any resources or references during the exam. Please note that the exam is based on Mac OS X and Mac OS X Server version 10.5.3, which was the most current version available at the time of publication. All references to Mac OS X, Mac OS X v10.5, Mac OS X Server, and Mac OS X Server v10.5 refer to version 10.5.3.

The number of test questions drawn from each knowledge area is indicated below. Please note that although this guide divides the objectives into 13 knowledge areas, questions are presented randomly during the exam. Also note that UNIX commands and processes are shown in `monospace font` in the exam.

Planning Systems

This topic has 2 items, drawn from the following objectives:

- Given the server worksheet from Apple's public documentation website and access to a newly installed Mac OS X v10.5 server and a deployed Mac OS X v10.5 server, document the initial set-up configuration and the final deployment configuration parameters including usernames, passwords, IP addresses, software versions, MAC addresses, serial numbers, etc.

- Given the Terminal application on a default installation of an Advanced configuration of Mac OS X Server v10.5.x, configure settings for a service or application using the `sysctl` command.
- Without references, define the terms utilization, headroom, and policy, as they relate to network bandwidth, software/service processes, hardware (CPU and RAM), and storage.
- Without references, describe the factors that contribute to effective planning for future hardware and storage utilization.
- Given accurate hardware specifications for a set of hardware resources, calculate the required power supply and cooling capacity for those resources.
- Without references, describe the factors that contribute to effective planning for future bandwidth, service, and process utilization.

Installing and Configuring Systems

This topic has 12 items, drawn from the following objectives:

- Given a default installation of Mac OS X v10.5.x and a functional network connection, install software remotely from a headless server using the command-line tools `curl`, `hdiutil`, and `installer`.
- Given a default installation of Mac OS X Server v10.5.x , change a server's configuration from Standard or Workgroup to Advanced.
- Given a package installer of unknown origin and with unknown contents that fails upon installation, troubleshoot the package installation and determine the cause of the failure and a remedy for successful completion of the installation.
- Given a valid Apple security update package, determine its compatibility and contents.
- Given a valid Apple security update package and its associated sha1 file, verify the package's checksum using the `sha1` command.
- Without references, describe the differences between the four server configuration types, Standard, Workgroup, Advanced, and MDC.
- Without references, describe the security risks related to using a package updater.
- Without references, describe the purpose and benefits of checksums relative to package installers.
- Without references, state the URL for Apple Security Updates.
- Without references, describe the features and benefits of MacPorts when adding new open source solutions to an existing Mac OS X installation.
- Given a default installation of Mac OS X v10.5.x, configure computer settings using the defaults system.
- Given a default installation of Mac OS X v10.5.x and the developer tools, configure application preference settings using an xml compatible text editor.
- Given a default installation of Mac OS X Server v10.5.x with configured services and the developer tools, configure a computer client's preference settings using Mac OS X Server's preferences editor and preference manifests.
- Given a default installation of Mac OS X Server v10.5.x with an unknown service configuration and the developer tools, verify the configuration of a service's current settings using `defaults`, `plutil`, or `PlistBuddy`, or an xml compatible text editor.

- Given a default installation of Mac OS X Server v10.5.x and the developer tools, with an unknown service configuration, troubleshoot a misconfigured service and determine the proper syntax and valid format for successful operation of the service using `defaults`, `plutil`, `PlistBuddy`, or an xml compatible text editor.
- Without references, describe the features and benefits of Mac OS X Server's managed preferences system (MCX).
- Without references, describe the underlying structure and format of Mac OS X Server's managed client system (MCX).
- Without references, describe the features and benefits of Mac OS X Server's preference manifests.
- Without references, describe the deterministic mechanism for hostname configuration of initial server installations with pre-existing DNS.

Upgrading and Migrating Systems

This topic has 3 items, drawn from the following objectives:

- Given a default installation of Mac OS X Server v10.5.x with configured services, back up the service settings using the `serveradmin` command.
- Given an installation of Mac OS X Server v10.5.x and a set of user records, group records, data store(s), and system settings, export all records, data store(s) and settings in a format suitable for importing on another system.
- Given an installation of Mac OS X Server v10.5.x with default settings, and a domain name from a previous system, configure the existing server to use the previous system's domain name using the `changeip` command.
- Given a fresh installation of Mac OS X Server v10.5.x with default settings, and user, group, data, and system settings exported from another system, migrate the server and its data to the new computer.
- Given a Mac OS X Server v10.5.x with default data, and records exported from another system, verify the format of the records prior to importing them.
- Given an installation of Mac OS X Server v10.5.x with default data, and malformed data exported from another system, troubleshoot the malformed record(s) and determine the proper syntax and format for such records.
- Given a default installation of Mac OS X Server v10.5.x, configure the service settings using the `serveradmin` command.
- Given an installation of Mac OS X Server v10.5.x with default user records, and user and group records, and data and system settings exported from another system, import all records, settings, and data.
- Given a valid Apple security update package, install the update from the command line.
- Given an installation of Mac OS X Server v10.5.x with default settings, and an IP address from a previous system, configure the server to use the previous system's IP address using the `changeip` command.
- Without references, identify the components of a previous Mac OS X Server installation and configuration that can be reused on a new server installation.
- Without references, list the versions of Mac OS X Server that can be upgraded to Mac OS X Server v10.5.x.

- Without references, describe the impact of changing a server's IP address and domain name after initial configuration.
- Without references, describe the variables associated with, and the impact of, upgrading a previous version of Mac OS X Server to the most recent version in terms of hardware, applications, services, and data store compatibility.
- Without references, identify the proper tool to change a server's IP address.
- Without references, identify the proper tool to change a server's domain name.
- Without references, describe requirements and concerns related to porting Unix/Linux software to a Mac OS X computer.

Assessing Systems

This topic has 7 items, drawn from the following objectives:

- Given a recently upgraded installation of Mac OS X Server v10.5.x , review the upgrade history of the server as evidenced by the contents of the package receipts folder and installer log file.
- Given a properly configured and functioning network interface, a Mac OS X Server v10.5.x configured for a particular service, and a set of current users, determine the current bandwidth, service and process, hardware, and storage utilization.
- Given a properly configured and functional data store, a valid data set, a set of users, and a usage trend, calculate future storage requirements.
- Without references, list the important variables of a user workflow, including application dependencies, data formats, access control and collaboration, processing and automation needs, and storage needs.
- Without references, list the built-in tools in a default installation of Mac OS X Server v10.5.x that can measure the current utilization and availability of bandwidth, services and processes, hardware (CPU and RAM), and storage.
- Without references, describe the role of an installation package receipt in Mac OS X v10.5 and Mac OS X Server v10.5.

Working with DNS & NTP

This topic has 17 items, drawn from the following objectives:

- Given a default installation of Mac OS X Server v10.5.x and an exported DNS configuration file, import a primary zone for a domain.
- Given a primary zone, and DNS and NAT services on a Mac OS X Server v10.5.x computer, create a namespace behind a NAT gateway.
- Given a primary zone and DNS services on a Mac OS X Server v10.5.x computer, create a secondary zone for the domain on another Mac OS X Server v10.5.x computer, to establish high availability.
- Given a primary zone, a secondary zone, and two Mac OS X Server v10.5.x computers with DNS services, configure the primary zone to accept zone transfer requests from the secondary zone (whitelist).
- Given a primary zone and a Mac OS X Server v10.5.x computer with DNS services, verify reverse lookups for the primary zone.
- Given a primary zone and a Mac OS X Server v10.5.x computer with DNS services, configure the primary zone to forward requests not contained within its domain to a forward zone.

- Given a primary zone and a Mac OS X Server v10.5.x computer with DNS services, configure a DNS sever to provide caching-only name services to clients internal to a company's intranet and refuse all external queries.
- Given a primary zone and a Mac OS X Server v10.5.x computer with DNS services, configure a DNS server to provide authoritative-only name services.
- Given a primary zone and a Mac OS X Server v10.5.x computer with DNS services, update the DNS root cache using a script.
- Given a properly formatted DNS configuration and a malformed configuration file of unknown origin and content, troubleshoot the bad DNS config by comparing it to a known good config.
- Without references, define the record types in the DNS system, including Address (A), Canonical Name (CNAME), Mail Exchanger (MX), Name Server (NS), Pointer (PTR), Text (TXT), Service (SRV), and Hardware Info (HINFO).
- Without references, list the URL for the official BIND documentation.
- Without references, describe the underlying configuration and directory file structure for DNS services as implemented in Mac OS X Server v10.5.
- Given an unconfigured installation of Mac OS X Server v10.5.x and an existing DNS server providing DNS services, describe the impact of a pre-existing DNS on initial server set up.
- Without references, describe the purpose and benefit of DNS caching.
- Without references, describe the various levels, or "strata", of time service in terms of accuracy and reliability.
- Given a default installation of Mac OS X Server v10.5.x, network access and a valid URL that resolves to a strata 2 time server, configure the server to provide NTP services that are synchronized with the strata 2 time server.
- Given NTP services running on a default installation of Mac OS X Server v10.5.x, network access, and a URL that resolves to the Mac OS X Server v10.5 time service, configure a Mac OS X v10.5 client on the network to get the current time from the NTP service running on the Mac OS X Server v10.5.x computer.
- Given NTP services running on Mac OS X Server v10.5.x and network access, troubleshoot an off-line or unreachable NTP master clock server.
- Without references, describe the underlying configuration and directory file structure for NTP as implemented in Mac OS X Server v10.5.
- Without references, describe the importance of using NTP service on a synchronized network.

Controlling Access to Resources

This topic has 5 items, drawn from the following objectives:

- Given services running on a default installation of Mac OS X Server v10.5.x, network access, and a URL that resolves to the Mac OS X Server v10.5 computer, configure the Mac OS X Server's v10.5.x firewall to restrict access to certain services on certain IP addresses if that service doesn't support binding (specifically, AFP).
- Given a default installation of Mac OS X Server v10.5.x and an Airport Base Station with the proper firmware, configure RADIUS for the Airport Base Station.
- Given a default installation of Mac OS X v10.5.x on several client computers, and a default installation of Mac OS X Server v10.5.x, configure Bonjour network browsing for the client machines.

- Given a default installation of Mac OS X Server v10.5.x with a misconfigured firewall service and a good network connection, troubleshoot the `ipfw` configuration.
- Given a default installation of Mac OS X Server v10.5.x with a misconfigured firewall service and a good network connection, troubleshoot the firewall service by using `tcpdump` to verify packets based on rules established in the firewall configuration.
- Given a default installation of Mac OS X Server v10.5.x, view the adaptive firewall log located in /var/log/alf.log.
- Without references, describe the type, purpose, and benefit of firewall services in Mac OS X Server.
- Without references, describe the purpose and benefit of RADIUS, Bonjour, and VLAN.

Securing Access to Resources

This topic has 4 items, drawn from the following objectives:

- Given a default installation of Mac OS X v10.5.x on one computer, and of Mac OS X Server v10.5.x on another computer, and a good network connection between the two, configure an SSH key pair between the client and server computers so that an SSH connection can be made from the client computer to the server.
- Given a default installation of Mac OS X Server v10.5.x, configure single-user boot for enhanced security.
- Given a default installation of Mac OS X Server v10.5.x, configure the computer hardware's firmware for enhanced security.
- Given a default installation of Mac OS X Server v10.5.x with valid user accounts, configure password policies for these users using the `pwpolicy` command.
- Given a default installation of Mac OS X Server v10.5.x, configure a server's services to use a trusted certificate from an issuing authority.
- Given a default installation of Mac OS X v10.5.x on one computer, and of Mac OS X Server v10.5.x on another computer, with an expired key/certificate from the server, and a good network connection between the two, troubleshoot the source and cause of the expired key/certificate, then generate a new key/certificate to replace the expired one.
- Given a default installation of Mac OS X Server v10.5.x providing file sharing services on one computer, and a default installation of Mac OS X v10.5.x on another computer, and a good network connection between the two, troubleshoot permissions.
- Given a default installation of Mac OS X Server v10.5.x, create a junior administrator account that has the ability to monitor but not change service settings.
- Given a default installation of Mac OS X Server v10.5.x, configure restricted access to a shared storage directory using file system Access Control Lists.
- Given a default installation of Mac OS X Server v10.5.x, configure restricted access to a particular service using Service Access Control Lists.
- Given a default installation of Mac OS X v10.5.x, configure restricted access to specific client resources using /etc/authorization.
- Given a default installation of Mac OS X Server v10.5.x, view default PAM configuration.
- Given a default installation of Mac OS X Server v10.5.x, configure initial system accounts for enhanced security.

- Given a default installation of Mac OS X Server v10.5.x, configure the root account for enhanced security.
- Given a default installation of Mac OS X Server v10.5.x, configure restricted use of the `sudo` tool.
- Without references, describe the major areas of access control including users, hardware, network, services, and filesystems.
- Without references, describe the purpose and operation of PAM, SSL, SSH, keys and certificates, keychains, Default groups, privilege mapping, file system Access Control Lists, Service Access Control Lists, and IPMI.
- Without references, describe the purpose and operation of password policy defaults and the impact on Kerberos integration.
- Without references, describe the features and benefits of umasks.
- Without references, compare and contrast the functions of authentication and authorization.
- Without references, describe the types, applications, and benefits of cryptography.

Monitoring Systems

This topic has 7 items, drawn from the following objectives:

- Given a default installation of Mac OS X Server v10.5.x, monitor users, files, and processes using `strings`, `fs_usage`, `otool`, `ps`, `lsof`, `lsof`, `netstat`, `tcpdump`, `top`, `iostat`, and `vmstat`.
- Given a default installation of Mac OS X Server v01.5.x, troubleshoot logs.
- Given a default installation of Mac OS X Server v01.5.x, troubleshoot notifications.
- Given a Mac OS X v10.5 computer, and a default installation of Mac OS X/Server v10.5.x, create reports for the client computer using `system_profiler` which include all available information about that computer's hardware and software configuration.
- Given a default installation of Mac OS X Server v10.5.x with mail services, configure notifications for key services and components.
- Given a default installation of Mac OS X Server v10.5.x and a property list editor, create a `launchd` item that will monitor a service.
- Given a default installation of Mac OS X Server v10.5.x, monitor logs for key services using the `syslogd` command.
- Given a default installation of Mac OS X Server v10.5.x, configure a remote `syslogd` server to receive logs from an external server or service.
- Given a default installation of Mac OS X Server v10.5.x, monitor the status and activity of key services and processes using the Instruments application and the `dtrace` command.
- Given a default installation of the Advanced configuration of Mac OS X Server v10.5.x, configure particular settings for a particular service/application using the `defaults` command.
- Given a default installation of Mac OS X Server v10.5.x, monitor key system events and status using the `emond` command.

- Without references, identify the different types of data gathering that are useful in planning a monitoring policy for an organization, including historical data collection and real-time monitoring.
- Without references, describe the purpose, features, and benefits of the implementation of SNMP in Mac OS X Server v10.5.
- Without references, describe the benefits of using an Xserve to run Mac OS X Server.
- Without references, describe the purpose, features, and benefits of IPMI on Intel Xserves.
- Without references, describe the key factors to be considered for planning a monitoring response, including response method, response time, scaling (failure frequencies), and testing systems.
- Without references, list the locations of the various service's logs in Mac OS X Server.
- Without references, list the common CLI tools used to monitor users, files, and processes.
- Without references, list built-in tools available to read logs.
- Without references, describe the purpose, features, and benefits of Apple System Logger (ASL).
- Without references, describe the function of facilities and levels as they relate to system logging.
- Without references, describe the structure and syntax of various service's log files, including common keywords that appear in them.
- Without references, describe the purpose, features, and benefits of the Instruments application.

Automating Systems

This topic has 18 items, drawn from the following objectives:

- Given a default installation of Mac OS X Server v10.5.x, view a user's shell profile.
- Given a default installation of Mac OS X Server v10.5.x, automate the back up of key data based on a change in a directory's contents using the `launchctl` command.
- Given a default installation of Mac OS X Server v10.5.x, create new users using an automation based on `dsimport` and a preset created in WGM.
- Given the ARD v3 application on a default installation of Mac OS X Server v10.5.x, configure an ARD task server.
- Given a default installation of Mac OS X Server v10.5.x and a script that contains improper syntax, troubleshoot the shell script and repair the syntax so the script runs properly.
- Given a default installation of Mac OS X Server v10.5.x and a `launchd` configuration file that contains improper syntax, troubleshoot the configuration and repair the syntax so that the `launchd` job will run successfully.
- Given a default installation of Mac OS X Server v10.5.x, configure a user's default shell, and a user’s shell environment variable.
- Given a default installation of Mac OS X Server v10.5.x, create a basic shell script to automate an administration task that must be performed repeatedly.

- Given a default installation of Mac OS X Server v10.5.x, create a `launchd` item to launch a service at startup.
- Given a default installation of Mac OS X Server v10.5.x, create a `launchd` item to launch a service on demand.
- Given a default installation of Mac OS X Server v10.5.x, create a `launchd` item to launch a service at a regular interval.
- Given a `xinetd`, `cron`, `rc.local`, `init.d`, `StartupItem`, `.profile` or `mach_init.d` script and configuration file on a default installation of Mac OS X Server v10.5.x, migrate the item to a `launchd` format such that it will perform the same functions using `launchd`.
- Given a default installation of Mac OS X Server v10.5.x, load a `launchd` job using the `launchctl` command.
- Without references, describe the underlying structure and format of Mac OS X Server's property list (.plist) architecture.
- Without references, list the scripting technologies included with Mac OS X Server.
- Without references, describe the basic categories and sections of man pages included in Mac OS X and Mac OS X Server v10.5.x.
- Without references, list the default locations of the built-in man pages in a standard install of Mac OS Server v10.5.x.
- Without references, list the built-in shells included with Mac OS X Server v10.5.x.
- Without references, list the default locations of the built-in binaries in a standard install of Mac OS Server v10.5.x.
- Without references, define the term "environment variable".
- Without references, define the term "path" as it applies to shells and shell scripting.
- Given a default installation of Mac OS X Server v10.5.x, identify the unique Apple command line tools, binaries, and commands that are useful for scripting.
- Without references, list the tools included with Mac OS X that are capable of altering preference list (.plist) files.
- Without references, compare and contrast the features, purpose, and benefits of the automation technologies built-in to Mac OS X.
- Without references, describe the features and benefits of Mac OS X's defaults system.
- Without references, describe the five methods for running processes on a timed schedule in Mac OS X, including `cron`, `at`, `launchd`, `periodic`, `rc`, and `StartupItems`.
- Without references, describe the built-in maintenance routines and their implementations on Mac OS X Server v10.5.x.
- Without references, describe the purpose, features, and benefits of `launchd` and `launchctl`.
- Without references, list the valid locations for storing `launchd` items in a standard install of Mac OS Server v10.5.x.
- Given a default installation of Mac OS X v10.5.x, identify proper format and syntax of a `launchd` property list file.

- Without references, list the common triggers `launchd` "understands" by default for launching jobs.
- Without references, list the common keys included in a `launchd` property list file.

Ensuring Data Integrity

This topic has 7 items, drawn from the following objectives:

- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, identify and view the data store locations for common services including wiki, calendar, mail, web, etc.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, restore key preferences using an automated method.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, restore key user data using an automated method.
- Given an Advanced installation of Mac OS X Server v10.5.x with data stores, securely delete files from the primary data store using `srm`.
- Given an installation of Mac OS X Server v10.5.x, troubleshoot back up and restore processes.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, back up key service settings using `serveradmin`.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, back up key server settings using a passphrase file with `serveradmin`.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, back up key process configuration files, preferences, and user data using an automated method.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, restore key service settings using `serveradmin`.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, restore key server settings using a passphrase file and `serveradmin`.
- Given an Advanced installation of Mac OS X Server v10.5.x with configured services, restore key process configuration files using an automated method.
- Without references, describe the importance of retaining POSIX permissions, ACL entries, extended attributes, and forked-file structure with a given backup solution.
- Without references, describe the key factors that affect the archiving of data including media format, file/data format, application dependencies, and platform configuration (e.g., CPU and operating system).
- Without references, describe the importance of the terms "backup scope", "backup method", "backup rotation scheme", "media type", and " backup verification" as they relate to implementation within a defined data integrity strategy.
- Without references, DESCRIBE the importance of file data and metadata and any associated database relationships or dependencies with a given backup solution.
- Given an Advanced installation of Mac OS X Server v10.5.x with properly configured services, identify key preference files, plists, and configuration files for all major services.
- Without references, list the four backup utilities included with Mac OS X Server, including `rsync`, `ditto`, `asr`, and Time Machine.

- Without references, describe the advantages and disadvantages of each of the four backup utilities included with Mac OS X Server.
- Without references, describe information life-cycle management as it relates to setting policy for choosing a data storage location based on the data's age or relative value.
- Without references, describe a backup solution or strategy that meets an organization's backup requirements in terms of data integrity, legal compliance, and file system structure.
- Without references, describe the key backup architectures, including traditional, LAN, disk-to-disk, and LAN-free (SAN).
- Without references, describe the impact of tape capacities and speeds on backup and restore times of large data sets.
- Without references, describe the effect of media composition on media shelf-life.

Ensuring Reliability

This topic has 4 items, drawn from the following objectives:

- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, create software RAID sets for data storage using a command-line tool.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, create hardware RAID sets for data storage using a command-line tool.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, configure RAID controller parameters using RAID Utility.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, configure the removal of archived log files at a predetermined capacity on storage using the `diskspacemonitor` command.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x with configured services, configure the server for IP failover.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x and a degraded RAID set, troubleshoot the degraded RAID set.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, troubleshoot a `servermgrd` heartbeat signal.
- Without references, identify the major areas of potential points of failure that would be candidates for establishing fail-over capabilities including computer systems, hard drives, power supplies and data stores.
- Without references, list the components necessary to properly implement UPS protection on a server and/or RAID.
- Without references, define a disk formatting scheme suitable for providing both data and drive availability.
- Without references, describe the purpose and benefit of IP failover, automatic restart, disk mirroring, disk space monitoring, and `servermgrd`.

Troubleshooting

This topic has 2 items, drawn from the following objectives:

- Given access to developer.apple.com, create an online ADC account.
- Given access to bugreport.apple.com, create a bug report for a given product.

- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, configure startup firmware parameters using a command-line tool.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, view system message buffer using `dmesg`.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x, view the startup sequence using verbose mode.
- Given a default installation of an Advanced configuration of Mac OS X Server v10.5.x with an existing user account, configure the user's account by replacing the existing shortname with a new one, while still retaining all existing account information for that user using both graphical user interface and command-line tools.
- Without references, list the two goals of troubleshooting: fixing the problem correctly and fixing the problem quickly.
- Without references, identify proper command usage/syntax from the command synopsis section of a given command's `man` page.
- Without references, describe the value of debugging and verbosity flags when used with command-line tools.
- Without references, describe the features, benefits, and operation of journaling on an HFS+ volume.
- Without references, describe the different support options available from Apple, including AppleCare support contracts, Apple Professional Services, KnowledgeBase articles, discussion groups, Apple Developer Connection, and Apple Consultants Network.
- Without references, list the URL for the official Mac OS X Server documentation at www.apple.com/server/documentation.
- Without references, list the URL for Apple support, bug reports, and Apple Developer's Connection.
- Without references, list and describe the Xserve front panel boot modes.
- Without references, list the components included in the Xserve spare parts kit.
- Without references, compare and contrast the common command-line tools used to diagnose problems with users, files, and processes including the `strings`, `fs_usage`, `otool`, `ps`, `lsof`, `netstat`, `tcpdump`, `iostat`, and `vmstat` commands.
- Without references, describe the features and benefits of the Xserve front panel, relative to using the `ipmitool` command.
- Without references, list the steps required to configure remote diagnostics for an Xserve.
- Without references, describe the three phases of the troubleshooting process and methodology, including assessment, identification, and resolution.
- Without references, describe the three steps involved in the assessment phase of troubleshooting, including gathering information, verifying the problem, and trying quick fixes.
- Without references, describe the three steps involved in the problem identification phase of troubleshooting, including running diagnostics, systematic fault isolation, and researching.
- Without references, describe the three steps involved in the resolution phase of troubleshooting, including repairing, verifying the repair, and informing the user(s).

- Without references, describe the order of elimination of possible problem causes, including user issues, software issues, OS issues, and hardware issues.
- Without references, describe the "four C's" of troubleshooting, including components, connections, configuration, and combinations.
- Without references, describe the purpose and function of starting a computer in verbose mode.

Appendix: Documenting Systems

This topic has 2 items, drawn from the following objectives:

- Given Apple Remote Desktop v3.2, several Mac OS X client computers, and a default installation of Mac OS X/Server v10.5.x, create reports for the client computers which include all available information about each computer's hardware and software configuration.
- Given the ARD Admin application on a default installation of Mac OS X Server v10.5.x, an inactive ARD client on a default installation of Mac OS X v10.5.x, and a remote computer, configure the ARD client to activate the ARD agent using the `kickstart` command from a remote machine.
- Without references, describe several key elements of system documentation including usernames, passwords, IP addresses, software versions, MAC addresses, serial numbers, etc.
- Given a default installation of Mac OS X, list the tools available in Mac OS X to gather system information including Grab, System Profiler, `system_profiler` and `screencapture`.

For More Information

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