

Introduction

A+ Certification Training Guide, Fifth Edition, is designed for those with the goal of certification as an A+ certified technician. It covers both the Core Hardware Service Technician (220-301) and Operating System Technologies (220-302) exams.

These exams measure essential competencies for a microcomputer hardware service technician with six months of on-the-job experience. You must demonstrate knowledge that would enable you to properly install, configure, upgrade, troubleshoot, and repair microcomputer hardware. This includes basic knowledge of desktop and portable systems, basic networking concepts, and printers. You also must demonstrate knowledge of safety and common preventive maintenance procedures.

This book is your one-stop shop. Everything you need to know to pass the exams is in here. You do not have to take a class in addition to buying this book to pass the exam. Depending on your personal study habits or learning style, however, you might benefit from buying this book and taking a class.

This book also can help advanced users and administrators who are not studying for the exam but are looking for a single-volume technical reference.

How This Book Helps You

This book provides a self-guided tour of all the areas covered by the Operating Systems Technologies exam and identifies the specific skills you need to achieve your A+ certification. You also will find the features that make Que's training guides so successful: clear organization, helpful hints, tips, real-world examples, and step-by-step

exercises. Specifically, this book is set up to help you in the following ways:

- ▶ **Organization**—This book is organized according to individual exam objectives. This book covers every objective that you need to know for the Operating Systems Technologies exam. The objectives are covered in the same order as they are listed by the certifying organization, CompTIA, to make it as easy as possible for you to learn the information. We also have attempted to make the information accessible in the following ways:
 - The *Study and Exam Prep Tips* section will help you develop study strategies. It also provides valuable exam-day tips and information.
 - This introduction includes the full list of exam topics and objectives.
 - Each chapter begins with a list of the objectives to be covered.
 - Each chapter also begins with an outline that provides an overview of the material and the page numbers indicating where you can find particular topics.
 - Objectives are repeated within the text where the material most directly relevant to them is covered.
 - Information on where the objectives are covered is also conveniently condensed on the tearcard at the front of this book.
- ▶ **Instructional features**—This book has been designed to provide you with multiple ways to learn and reinforce the exam material. Following are some of the helpful methods:

- *Objective explanations*—As mentioned previously, each chapter begins with a list of the objectives covered in the chapter. In addition, immediately following each objective is an explanation in a context that defines it more meaningfully.
 - *Study strategies*—The beginning of each chapter also includes strategies for studying and retaining the material in the chapter, particularly as it is addressed on the exam.
 - *Test tips*—Exam tips appear in the margin to provide specific exam-related advice. Such tips might address what material is covered (or not covered) on the exam, how it is covered, mnemonic devices, and particular quirks of that exam.
 - *Summaries*— Each chapter ends with a summary.
 - *Key terms*—A list of key terms appears at the end of each chapter. This list highlights terms and concepts you should recognize. Where possible, such terms have been italicized in the text.
 - *Notes*—These paragraphs appear in the margin and contain various kinds of useful information such as tips on technology or administrative practices, historical background on terms and technologies, or side commentary on industry issues.
 - *Warnings*—When you are using sophisticated technology improperly, the potential for mistakes or even catastrophes to occur is ever-present. Warnings appear in the margin to alert you to such potential problems.
 - *Challenges*—These instructional elements require you to analyze a situation and come up with a solution to a technical problem. They are included here in anticipation of the application questions that will begin to appear in the A+ exams. Answers appear in the “Apply Your Knowledge” section.
- **Extensive practice test options**—This book provides numerous opportunities for you to assess your knowledge and to practice for the exam. The practice options include the following:
- *Review Questions*—These questions appear in the “Apply Your Knowledge” section. They reflect the kinds of multiple-choice questions that appear on the A+ exams. Use them to practice for the exam and to help you determine what you know and what you need to review or study further. Answers and explanations for them are provided.
 - *Practice exam*—A practice exam is included in the “Final Review” section for each exam (as discussed later).
- **Final Review**—This part of the book provides the following three valuable tools that can help you prepare for the exam:
- *Fast Facts*—This condensed version of the information contained in the book will prove extremely useful for last-minute review.
 - *Practice Exam*—A full practice test for each of the exams is included. Questions are written in the styles used on the actual exams. Use it to assess your readiness for the real thing.

A+ OPERATING SYSTEM TECHNOLOGIES EXAMINATION BLUEPRINT

In addition to passing the Core Hardware exam, you must pass the Operating System Technologies exam to receive your certification. You must demonstrate basic knowledge of Windows 9x/Me and Windows NT/2000/XP for installing, configuring, upgrading, troubleshooting, and repairing microcomputer systems.

This examination blueprint includes weighting, test objectives, and sample content. Sample topics and concepts are included to clarify the test objectives; they should not be construed as a comprehensive listing of the content of this examination.

Table IN.1 lists the domains measured by this examination and the approximate extent to which they are represented.

TABLE IN.1
DOMAIN REPRESENTATION

Domain	% of Examination (Approximately)
1.0 OS Fundamentals	28%
2.0 Installation, Configuration, and Upgrading	31%
3.0 Diagnosing and Troubleshooting	25%
4.0 Networks	16%
Total	100%

Domain 1.0 Operating System Fundamentals

The Operating System Technologies 1.0 domain requires knowledge of underlying structures, functions, and user interfaces in Windows 9x/Me and Windows 2000/XP operating systems. It also requires knowledge to manage files and directories and the ability to run programs. Finally, the domain requires knowledge of navigating through these operating systems from different user interfaces including the command-line prompt as well as using procedures for accessing and retrieving information.

Objectives and Representative Content

1.1 Identify the major desktop components and interfaces, and their functions. Differentiate the characteristics of Windows 9x/Me, Windows NT 4.0 Workstation, Windows 2000 Professional, and Windows XP.

Content may include the following:

- Contrasts between Windows 9x/Me, Windows NT 4.0 Workstation, Windows 2000 Professional, and Windows XP
- Major operating system components
 - Registry
 - Virtual memory
 - File system
- Major operating system interfaces
 - Windows Explorer
 - My Computer
 - Control Panel
 - Computer Management Console
 - Accessories/System Tools
 - Command line

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- Network Neighborhood/My Network Places
- Taskbar/systray
- Start menu
- Device Manager

1.2 Identify the names, locations, purposes, and contents of major system files.

Content may include the following:

➤ Windows 9x-specific files

- IO.SYS
- MSDOS.SYS
- AUTOEXEC.BAT
- COMMAND.COM
- CONFIG.SYS
- HIMEM.SYS
- EMM386.EXE
- WIN.COM
- SYSTEM.INI
- WIN.INI

➤ Registry data files

- SYSTEM.DAT
- USER.DAT

➤ Windows NT-based specific files

- BOOT.INI
- NTLDR
- NTDETECT.COM
- NTBOOTDD.SYS
- NTUSER.DAT
- Registry data files

1.3 Demonstrate the ability to use command-line functions and utilities to manage the operating system, including the proper syntax and switches.

Command-line functions and utilities include

- COMMAND/CMD
- DIR
- ATTRIB
- VER
- MEM
- SCANDISK
- DEFRAG
- EDIT
- XCOPY
- COPY
- FORMAT
- FDISK
- SETVER
- SCANREG
- MD/CD/RD
- DEL/REN
- DELTREE
- TYPE
- ECHO
- SET
- PING

1.4 Identify basic concepts and procedures for creating, viewing, and managing disks, directories, and files. This includes procedures for changing file attributes and the ramifications of those changes (for example, security issues).

Content may include the following:

- Disks
- Partitions
 - Active partition
 - Primary partition
 - Extended partition
 - Logical PARTITION
- File systems
 - FAT16
 - FAT32
 - NTFS4
 - NTFS5.x
- Directory structures (root directory, subdirectories, and so on)
- Creating folders
- Navigating the directory structure
- Maximum depth
- Files
- Creating files
- File-naming conventions (most common extensions, 8.3, maximum length)
- File attributes (Read-Only, Hidden, System, and Archive)
- File compression
- File encryption
- File permissions
- File types (text versus binary file)

1.5 Identify the major operating system utilities, their purpose, location, and available switches.

Content may include the following:

- Disk-management tools
 - DEFRAG.EXE
 - FDISK.EXE
 - Backup/Restore utility (MSBackup, NTBackup, and so on)
 - ScanDisk
 - CHKDSK
 - Disk Cleanup
 - Format
- System-management tools
 - Device Manager
 - System Manager
 - Computer Manager
 - MSCONFIG.EXE
 - REGEDIT.EXE (View information/back up Registry)
 - REGEDT32.EXE
 - SYSEEDIT.EXE
 - COMMAND/CMD
 - Event Viewer
 - Task Manager
- File-management tools
 - ATTRIB.EXE
 - EXTRACT.EXE
 - EDIT.COM
 - Windows Explorer

Domain 2.0 Installation, Configuration, and Upgrading

The 2.0 domain requires knowledge of installing, configuring, and upgrading Windows 9x/Me and Windows NT/2000/XP. This includes knowledge of system boot sequences and minimum hardware requirements.

Objectives and Representative Content

2.1 Identify the procedures for installing Windows 9x/Me, Windows NT 4.0 Workstation, Windows 2000 Professional, and Windows XP and bringing the operating system to a basic operational level.

Content may include the following:

- Verify hardware compatibility and minimum requirements
- Determine OS installation options
 - Installation type (typical, custom, other)
 - Network configuration
 - File system type
 - Dual-boot support
 - Disk preparation order (conceptual disk preparation)
- Start the installation
 - Partition
 - Format drive
 - Run appropriate setup utility
 - Setup
 - WINNT
- Installation methods
 - Bootable CD

- Boot floppy
- Network installation

- Drive imaging
- Device driver configuration
 - Load default drivers
 - Find updated drivers
 - Restore user data files (if applicable)
 - Identify common symptoms and problems

2.2 Identify steps to perform an operating system upgrade from Windows 9.x/ME, Windows NT 4.0 Workstation, Windows 2000 Professional, and Windows XP. Given an upgrade scenario, choose the appropriate next steps.

Content may include the following:

- Upgrade paths available
- Determine correct upgrade startup utility (for example, WINNT32 versus WINNT)
- Verify hardware compatibility and minimum requirements
- Verify application compatibility
- Apply OS service packs, patches, and updates
- Install additional Windows components

2.3 Identify the basic system boot sequences and boot methods, including the steps to create an emergency boot disk with utilities installed for Windows 9x/Me, Windows NT 4.0 Workstation, Windows 2000 Professional, and Windows XP.

Content may include the following:

- Boot sequence
- Files required to boot

- Boot steps (9.x, NT-based)
- Alternative boot methods
- Using a Startup disk
- Safe/VGA-only mode
- Last Known Good Configuration
- Command Prompt mode
- Booting to a system restore point
- Recovery Console
- `BOOT.INI` switches
- Dual-booting
- Creating emergency disks with OS utilities
- Creating an emergency repair disk (ERD)

2.4 Identify procedures for installing/adding a device, including loading, adding, and configuring device drivers and required software.

Content may include the following:

- Device driver installation
- Plug-and-Play (PNP) and non-PNP devices
- Install and configure device drivers
- Install different device drivers
- Manually install a device driver
- Search the Internet for updated device drivers
- Use unsigned drivers (driver signing)
- Install additional Windows components
- Determine if permissions are adequate for performing the task

2.5 Identify procedures necessary to optimize the operating system and major operating system subsystems.

Content may include the following:

- Virtual memory management
- Disk defragmentation
- Files and buffers
- Caches
- Temporary file management

Domain 3.0 Diagnosing and Troubleshooting

The 3.0 domain requires the ability to apply knowledge to diagnose and troubleshoot common problems relating to Windows 9x/Me and Windows NT/2000/XP operating systems. This includes understanding normal operation and symptoms relating to common problems.

Objectives and Representative Content

3.1 Recognize and interpret the meaning of common error codes and startup messages from the boot sequence, and identify steps to correct the problems.

Content may include the following:

- Common error messages and codes
- Boot failure and errors
 - Invalid boot disk
 - Inaccessible boot device
 - Missing NTLDR
 - Bad or missing Command interpreter
- Startup messages
 - Error in `CONFIG.SYS` line XX
 - `HIMEM.SYS` not loaded
 - Missing or corrupt `HIMEM.SYS`
 - Device/Service has failed to start

- A device referenced in SYSTEM.INI, WIN.INI, Registry is not found
 - Event Viewer - Event log is full
 - Failure to start GUI
 - Windows Protection Error
 - User-modified settings cause improper operation at startup
 - Registry corruption
- Using the correct utilities
- Dr. Watson
 - Boot Disk
 - Event Viewer

3.2 Recognize when to use common diagnostic utilities and tools. Given a diagnostic scenario involving one of these utilities or tools, select the appropriate steps needed to resolve the problem.

Utilities and tools may include the following:

- Startup disks
- Required files for a boot disk
- Boot disk with CD-ROM support
- Startup modes
- Safe Mode
- Safe Mode with Command Prompt
- Safe mode with Networking
- Step-by-Step/Single-step mode
- Automatic skip driver (ASD.EXE)
- Diagnostic tools, utilities, and resources
- User/installation manuals

- Internet/Web resources
- Training materials
- Task Manager
- Dr. Watson
- Boot Disk
- Event Viewer
- Device Manager
- WinMSD
- MSD
- Recovery CD
- CONFIGSAFE
- Eliciting problem symptoms from customers
- Having customers reproduce errors as part of the diagnostic process
- Identifying recent changes to the computer environment from the users

3.3 Recognize common operational and usability problems and determine how to resolve them.

Content may include the following:

- Troubleshooting Windows-specific printing problems
- Print spool is stalled
- Incorrect/incompatible driver for print
- Incorrect parameter
- Other common problems
- General Protection Faults
- Bluescreen error (BSOD)
- Illegal operation
- Invalid working directory

- System lockup
- Options (sound card, modem, input device) will not function
- Application will not start or load
- Cannot log on to network (option—NIC not functioning)
- Applications don't install
- Network connection
- Viruses and virus types
- What they are
- TSR (Terminate-and-Stay-Resident) programs and virus
- Sources (floppy disks, e-mails, and so on)
- How to determine presence

Domain 4.0 Networks

The 4.0 domain requires knowledge of network capabilities of Windows and ways to connect to networks on the client side, including the purpose of the Internet, its capabilities, basic concepts relating to Internet access, and generic procedures for system setup. The scope of this topic is only what is needed on the desktop side to connect to a network.

Objectives and Representative Content

4.1 Identify the networking capabilities of Windows. Given configuration parameters, configure the operating system to connect to a network.

Content may include the following:

- Configure protocols
 - TCP/IP
 - Gateway

- Subnet mask
- DNS (and domain suffix)
- WINS
- Static address assignment
- Automatic address assignment (APIPA, DHCP)
- IPX/SPX (NWLink)
- AppleTalk
- NetBEUI/NetBIOS
- Configure client options
 - Microsoft
 - Novell
- Verify the configuration
- Understand the use of the following tools

- IPCONFIG.EXE
- WINIPCFG.EXE
- PING
- TRACERT.EXE
- NSLOOKUP.EXE

- Share resources (understand the capabilities/limitations with each OS version)
- Set permissions to shared resources
- Network type and network card

4.2 Identify the basic Internet protocols and terminologies. Identify procedures for establishing Internet connectivity. In a given scenario, configure the operating system to connect to and use Internet resources.

Content may include the following:

➤ Protocols and terminologies

- ISP
- TCP/IP
- E-mail (POP, SMTP, IMAP)
- HTML
- HTTP
- HTTPS
- SSL
- Telnet
- FTP
- DNS

➤ Connectivity technologies

- Dial-up networking
- DSL networking
- ISDN networking
- Cable
- Satellite
- Wireless
- LAN

➤ Installing and configuring browsers

➤ Enabling/disabling script support

➤ Configuring proxy settings

➤ Configuring security settings

➤ Firewall protection under Windows XP