

**MCSE: Windows®
2000 Network
Infrastructure Design,
Exam Notes™**

William Heldman

SYBEX®

MCSE: **Windows 2000 Network Infrastructure Design**

Exam Notes



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Exam Notes™



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To KL—thanks for hanging with me.

Acknowledgments

With grateful acknowledgment of all those who helped me with these books. I'm especially grateful to the Sybex associate publisher in charge of the study guides, Neil Edde. He was the one who graciously gave me my start in writing computer books—and I feel that I'm privileged to write for the best computer book company on earth.

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Introduction

Microsoft's new Microsoft Certified Systems Engineer (MCSE) track for Windows 2000 is the premier certification for computer industry professionals. Covering the core technologies around which Microsoft's future will be built, the new MCSE certification is a powerful credential for career advancement.

This book has been developed, in cooperation with Microsoft Corporation, to give you the critical skills and knowledge you need to prepare for one of the core requirements of the new MCSE certification program, Designing a Microsoft Windows 2000 Network Infrastructure. You will find the information you need to acquire a solid understanding of the design of a Windows 2000 network infrastructure, to prepare for Exam 70-221: Designing a Windows 2000 Network Infrastructure, and to progress toward MCSE certification.

Is This Book for You?

The MCSE Exam Notes books were designed to be succinct, portable exam review guides that can be used either in conjunction with a more complete study program (book, CBT courseware, classroom/lab environment) or as an exam review for those who don't feel the need for more extensive test preparation. It isn't our goal to give the answers away, but rather to identify those topics on which you can expect to be tested and to provide sufficient coverage of these topics.

Perhaps you're already familiar with the features and functionality of Windows 2000. The thought of paying lots of money for a specialized MCSE exam preparation course probably doesn't sound too appealing. What can they teach you that you don't already know, right? Be careful, though. Many experienced network administrators have walked confidently into test centers only to walk sheepishly out of them after failing an MCSE exam. As they discovered, there's the Microsoft of the real world and the Microsoft of the MCSE exams. It's our goal with these Exam Notes books to show you where the two converge and where they diverge. After you've finished reading

through this book, you should have a clear idea of how your understanding of the technologies involved matches up with the expectations of the MCSE test makers in Redmond.

Or perhaps you're relatively new to the world of Microsoft networking, drawn to it by the promise of challenging work and higher salaries. You've just waded through an 800-page MCSE Windows 2000 study guide or taken a class at a local training center. Lots of information to keep track of, isn't it? Well, by organizing the Exam Notes books according to the Microsoft exam objectives, and by breaking up the information into concise manageable pieces, we've created what we think is the handiest exam review guide available. Throw it in your briefcase and carry it to work with you. As you read through the book, you'll be able to identify quickly those areas you know best and those that require more in-depth review.

NOTE The goal of the Exam Notes series is to help MCSE candidates familiarize themselves with the subjects on which they can expect to be tested in the MCSE exams. For complete, in-depth coverage of the technologies and topics involved, we recommend the MCSE Windows 2000 Study Guide series from Sybex.

How Is This Book Organized?

As mentioned above, this book is organized according to the official exam objectives list prepared by Microsoft for Exam 70-221. The chapters coincide to the broad objectives groupings, such as Designing a Wide Area Network Infrastructure. These groupings are also reflected in the organization of the MCSE exams themselves.

Within each chapter, the individual exam objectives are addressed in turn. Each objective's coverage is further divided into the following sections of information:

Critical Information

This section presents the greatest level of detail on information for the objective. This is the place to start if you're unfamiliar with or uncertain about the objective's technical issues.

Exam Essentials

In this section, we've put together a concise list of the most crucial topics that you'll need to comprehend fully prior to taking the MCSE exam. These summaries can help you identify subject areas that might require more study on your part.

Key Terms and Concepts

Here you'll find a mini-glossary of the most important terms and concepts related to the specific objective. This list will help you understand what the technical words mean within the context of the related subject matter.

Sample Questions

For each objective, we've included a selection of questions similar to those you'll encounter on the actual MCSE exam. Answers and explanations are provided so you can gain some insight into the test-taking process.

How Do You Become an MCSE?

Attaining MCSE certification has always been a challenge. In the past, people could acquire detailed exam information—even most of the exam questions—from online “brain dumps” and third-party “cram” books or software products. For the new MCSE exams, however, this simply will not be the case.

To avoid the “paper-MCSE syndrome” (a devaluation of the MCSE certification because unqualified individuals manage to pass the exams), Microsoft has taken strong steps to protect the security and

integrity of the new MCSE track. Prospective MSCEs will need to complete a course of study that provides not only detailed knowledge of a wide range of topics, but true skills derived from working with Windows 2000 and related software products.

In the new MCSE program, Microsoft is heavily emphasizing hands-on skills. Microsoft has stated that “nearly half of the core required exams’ content demands that the candidate have troubleshooting skills acquired through hands-on experience and working knowledge.”

Fortunately, if you are willing to dedicate time and effort with Windows 2000, you can prepare for the exams by using the proper tools. If you work through this book and the other books in this series, you should successfully meet the exam requirements.

TIP This book is part of a series of MCSE Study Guides and Exam Notes published by Sybex that covers the five core requirements as well as the electives you need to complete your MCSE track.

Exam Requirements

Successful candidates must pass a minimum set of exams that measure technical proficiency and expertise.

- Candidates for MCSE certification must pass seven exams, including four core operating system exams, one design exam, and two electives.
- Candidates who have already passed three Windows NT 4 exams (70-067, 70-068, and 70-073) may opt to take an “accelerated” exam plus one core design exam and two electives.

NOTE If you do not pass the accelerated exam after one attempt, you must pass the five core requirements and two electives.

The following tables show the exams that a new certification candidate must pass. *All* of these exams are required:

Exam #	Title	Requirement Met
70-216	Implementing and Administering a Microsoft Windows 2000 Network Infrastructure	Core (Operating System)
70-210	Installing, Configuring, and Administering Microsoft Windows 2000 Professional	Core (Operating System)
70-215	Installing, Configuring, and Administering Microsoft Windows 2000 Server	Core (Operating System)
70-217	Implementing and Administering a Microsoft Windows 2000 Directory Services Infrastructure	Core (Operating System)

One of these exams is required:

Exam #	Title	Requirement Met
70-219	Designing a Microsoft Windows 2000 Directory Services Infrastructure	Core (Design)
70-220	Designing Security for a Microsoft Windows 2000 Network	Core (Design)
70-221	Designing a Microsoft Windows 2000 Network Infrastructure	Core (Design)

Two of these exams are required:

Exam #	Title	Requirement Met
70-219	Designing a Microsoft Windows 2000 Directory Services Infrastructure	Elective
70-220	Designing Security for a Microsoft Windows 2000 Network	Elective
70-221	Designing a Microsoft Windows 2000 Network Infrastructure	Elective
Any current MCSE elective	Exams cover topics such as Exchange Server, SQL Server, Systems Management Server, Internet Explorer Administrators Kit, and Proxy Server (new exams are added regularly)	Elective

NOTE For a more detailed description of the Microsoft certification programs, including a list of current MCSE electives, check Microsoft's Training and Services Web site at www.microsoft.com/trainingandservices.

Exam Registration

You may take the exams at any of more than 1,000 Authorized Prometric Testing Centers (APTCs) and VUE Testing Centers around the world. For the location of a testing center near you, call Sylvan Prometric at (800) 755-EXAM (755-3926), or call VUE at (888) 837-8616. Outside the United States and Canada, contact your local Sylvan Prometric or VUE registration center.

You should determine the number of the exam you want to take, and then register with the Sylvan Prometric or VUE registration center nearest to you. At this point, you'll be asked for advance payment for the exam. The exams are \$100 each. Exams must be taken within one year of payment. You can schedule exams up to six weeks in advance or as late as one working day prior to the date of the exam. You can cancel or reschedule your exam if you contact the center at least two working days prior to the exam. Same-day registration is available in some locations, subject to space availability. Where same-day registration is available, you must register a minimum of two hours before test time.

TIP You may also register for your exams online at www.sylvanprometric.com or www.vue.com.

When you schedule the exam, you'll be provided with instructions regarding appointment and cancellation procedures, ID requirements, and information about the testing center location. In addition, you'll receive a registration and payment confirmation letter from Sylvan Prometric or VUE.

Microsoft requires certification candidates to accept the terms of a nondisclosure agreement before taking certification exams.

What the Designing a Windows 2000 Network Infrastructure Exam Measures

This exam is going to test your ability to recognize ways that you can provide connectivity to outside users. For example, you'll be tested in Virtual Private Network (VPN) installations—security, authentication, the why and how of building a VPN. You'll also be tested on your understanding of Routing and Remote Access Services (RRAS), Windows 2000's capability of providing connectivity for telecommuting users. Windows 2000 Server can function as a router—you'll be tested on router protocols and why and when you'd use Windows 2000 routers.

There are sections in this book on DHCP, WINS, DNS, Dfs, and other Windows 2000 TCP/IP features. Also, you'll be asked to test your knowledge of TCP/IP subnetting principles.

This book delves into network hardware and infrastructures. The goal of the design test is to help the administrator understand the enterprise concept—that there's more to the network than simply the server farm, there's so much more.

Tips for Taking Your Exam

Here are some general tips for taking your exam successfully:

- Arrive early at the exam center so you can relax and review your study materials, particularly tables and lists of exam-related information.
- Read the questions carefully. Don't be tempted to jump to an early conclusion. Make sure you know *exactly* what the question is asking.
- When answering multiple-choice questions you're not sure about, use a process of elimination to get rid of the obviously incorrect questions first. This will improve your odds if you need to make an educated guess.
- This test has many exhibits (pictures). It can be difficult, if not impossible, to view both the questions and the exhibit simulation on the 14- and 15-inch screens usually found at the testing centers. Call around to each center and see if they have 17-inch monitors available. If they don't, perhaps you can arrange to bring in your own. Failing this, some have found it useful to quickly draw the diagram on the scratch paper provided by the testing center and use the monitor to view just the question.
- You are allowed to use the Windows calculator during your test. However, it may be better to memorize a table of the subnet addresses and to write it down on the scratch paper supplied by the testing center before you start the test.

Once you've completed an exam, you'll be given immediate, online notification of your pass or fail status. You'll also receive a printed Examination Score Report indicating your pass or fail status and your exam results by section. (The test administrator will give you the printed score report.) Test scores are automatically forwarded to Microsoft within five working days after you take the test. You don't need to send your score to Microsoft. If you pass the exam, you'll receive confirmation from Microsoft, typically within two to four weeks.

Contact Information

To find out more about Microsoft Education and Certification materials and programs, to register with Sylvan Prometric, or to get other useful information, check the following resources. Outside the United States or Canada, contact your local Microsoft office or Sylvan Prometric testing center.

Microsoft Certified Professional Program—(800) 636-7544

Call the MCPP number for information about the Microsoft Certified Professional program and exams, and to order the latest Microsoft Roadmap to Education and Certification.

Sylvan Prometric Testing Centers—(800) 755-EXAM

Contact Sylvan to register to take a Microsoft Certified Professional exam at any of more than 800 Sylvan Prometric testing centers around the world.

Microsoft Certification Development Team—<http://www.microsoft.com/trainingandservices>

Contact the Microsoft Certification Development Team through their Web site to volunteer for participation in one or more exam development phases or to report a problem with an exam. Address written correspondence to the Certification Development Team, Microsoft Education and Certification, One Microsoft Way, Redmond, WA 98052.

Microsoft TechNet Technical Information Network—(800) 344-2121

This is an excellent resource for support professionals and system administrators. Outside the United States and Canada, call your local Microsoft subsidiary for information.

How to Contact the Publisher

Sybex welcomes reader feedback on all of its titles. Visit the Sybex Web site at www.sybex.com for book updates and additional certification information. You'll also find online forms to submit comments or suggestions regarding this or any other Sybex book.

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Chapter

1

Analyzing Business Requirements

MICROSOFT EXAM OBJECTIVES COVERED IN THIS CHAPTER:

Analyze the existing and planned business models.
(pages 3 – 12)

- Analyze the company model and the geographical scope. Models include regional, national, international, subsidiary, and branch offices.
- Analyze company processes. Processes include information flow, communication flow, service and product life cycles, and decision-making.

Analyze the existing and planned organizational structures. Considerations include management model; company organization; vendor, partner, and customer relationships; and acquisition plans.
(pages 12 – 23)

Analyze factors that influence company strategies.
(pages 24 – 35)

- Identify company priorities.
- Identify the projected growth and growth strategy.
- Identify relevant laws and regulations.
- Identify the company's tolerance for risk.
- Identify the total cost of operations.



Analyze the structure of IT management. Considerations include type of administration, such as centralized or decentralized; funding model; outsourcing; decision-making process, and change-management process.

(pages 35 – 45)



We'll start by reviewing the makeup of a company, probably your company. We'll analyze the company's management organization, its funding model, tolerance for risk, priorities, and so forth. Looking above, you can see that the exam objectives that revolve around this topic are numerous and yet nontechnical. Why are they important? Because, to get your hands around a Windows 2000 deployment, you need to thoroughly understand the way your company ticks. Windows 2000 has so many new features that you may decide one fits in a given circumstance where another feature would work better in a different place. Recognizing the way that your company works, how it is built, helps you understand how to introduce Windows 2000 into the environment.

Analyze the existing and planned business models.

- **Analyze the company model and the geographical scope. Models include regional, national, international, subsidiary, and branch offices.**
- **Analyze company processes. Processes include information flow, communication flow, service and product life cycles, and decision-making.**

Microsoft, while a software (and hardware) company, is also in the business of making you successful by using their software. People at Microsoft are great project managers, and they realize that in order to make Windows 2000 successful you need to understand how your organization works, so that you can precisely place different Windows 2000 features where needed.

Critical Information

In the following exam objectives, we're interested in taking apart a company's logical makeup and seeing if we can define the company's model, its geographic scope, the processes that are in place and are routinely followed, and the existing and planned organizational structures in the company. It will probably be a great help to you to think about your own company in the context of this section. It is important to thoroughly understand the concepts outlined here in order to succeed with a Windows 2000 deployment, our second objective. (Our first, of course, being to pass the test.)

Analyzing the Company Model and the Geographical Scope

Let's take a moment to review the various company models and what they encompass. Notice that the subobjective says, "Models *include*..." implying that the list isn't limited to only the models suggested. The point here is not that you memorize the models, but that you *recognize* the model(s) your company uses. Here are some of the models and geographical scopes that you might encounter:

Local A *local* company is only in business within a city or the very localized surrounding area relative to a city. For example, suppose that you work for a flower company that has retail stores in several suburban towns and cities close to its headquarters. None of the retail stores are out of state, and all are within a few miles of one another. This would be an incidence of a local company.

Regional A *regional* company operates in several widely geographically dispersed cities within a state, in several states, or both. Suppose, for example, that you work for a company that operates a chain of restaurants localized within one large state, but that it has a presence in different cities within that state. This would be an example of a regional company.

National A *national* company is one that has a presence of some kind within its country of origin. In a U.S. example, this does not specifically imply that there is an office in every state or an office of great proportions, but it does imply that there is some presence in every state. The

most basic and common example is a company that requires a small office in each state to maintain a sales force local to that state. An office might be comprised of just a few people, but it would, nonetheless, be part of your company and make for very interesting connectivity and computing planning.

International A company that has offices all over the world is said to have an *international* presence. Again, these offices don't necessarily have to be very large to influence your evaluation and planning. A company might have a distributed environment with its headquarters in, say, Chicago, another large one in the U.K. (perhaps a "mini-HQ"), and several smaller offices staffed predominantly with salespeople and support personnel in many other countries.

Subsidiary Offices Some companies specialize in a certain venture and then find that they need something else to make their particular area of expertise more palatable to the public. So, rather than reinventing the wheel, they buy a company that's already doing whatever they need done. A company that is purchased and yet retains its own identity is a *subsidiary*. Subsidiaries present unique challenges to network designers and IT people, because typically you inherit a legacy group of administrators who are accustomed to doing things their way and who may not necessarily be amenable to re-inventing their lives in order to fit their new parent's mold.

Branch Offices Some companies may maintain one central headquarters office but also have several branch offices that have some autonomy relative to HQ. A company's size and the nature of its business will determine how many branch offices it may have.

The geographical scope of a company really presents an interesting twist to the whole network design scenario. One must consider a series of things: the area that your network must traverse, its geographic placement, and the resources and funds it will take to set up communications between sites.

Another thing to consider while using the Windows 2000 design is the concept of a *Single Point of Failure (SPOF)* and bottlenecks. A SPOF is a place or places where only one connection or part holds up the system. A server with only one hard drive in it has a SPOF—the hard drive. If that hard drive goes out, the server's down until you get it repaired.

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A bottleneck is a place where things slow to a crawl as data crosses that place. Bottlenecks are like chameleons and take on the characteristics of where they're living. There are some Windows 2000 features such as System Monitor that can help you identify bottlenecks, but it's pretty apparent that your own instincts are going to be the biggest tool you have in helping you discover and eradicate bottlenecks.

Analyzing Company Processes

Some companies do quite a bit of their information interplay by paper or word of mouth, not thinking that computer systems can accomplish the same goal. If your company wants to say something new—to go where no one has gone before—how does it accomplish that? How does your company get information from one point to another? Common corporate processes include using collaborative frameworks in Lotus Notes, public folders on an Exchange server, mainframes, and intranets—or a combination of these things. This is one of the elements you're looking to discover when you do your network design and diagramming.

Information and Communications Flow

In terms of network design, there are generally two practiced forms of communications. The first is inter-company communication such as e-mail, intranets, and virtual meetings. The second area of information and communications flow is the more abstract communications ethos.

Virtual Communications This is where you sit down and take a physical inventory of how your company handles its intercommunications. You would be examining areas such as your phone system, for example. The majority of intra-company communications are either voice-based or e-mail-centric. As companies migrate more and more to network-based communications, e-mail has become the central method of communicating.

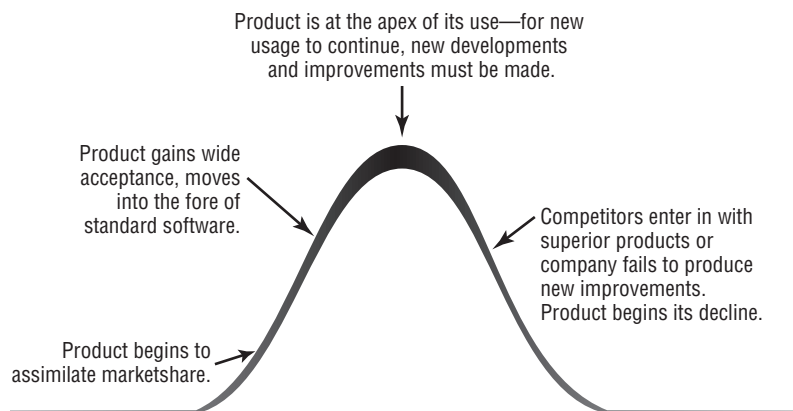
People Communications This area is much more nebulous. You must be able to assess areas such as how people interact in their daily business dealings, how management communicates with their direct reports, and how requests for information are handled. As a network

designer, you need to understand how interpersonal communication at your company works, before you start interrogating people about their technical and business needs. If you don't adapt your approach to the company culture, then your message will never get across.

Product and Service Life Cycles

Products ride a life cycle very similar to the famous bell curve that seems to crop up in most of life. Many products that were leaders just five to ten years ago are either nonexistent or have been incorporated in solutions or packages. Figure 1.1 shows a standard product life cycle. This isn't quite a fair representation of what really happens, because a company that is dynamically trying to improve and release upgrades to their software actually spawns a lengthening of the bell curve, or, more practically, generates a whole new bell curve. Most users never get to the product decline stage, because they've adopted the new software upgrade and the old software version is allowed to die quietly. Nevertheless, software and hardware products go through distinct product life-cycle stages. Service life cycles consist of roughly the same concepts.

FIGURE 1.1: The product life-cycle curve



Decision-Making Processes

This is probably the most complicated part of your network design segment to try to figure out. You must be able to identify who makes the decisions and how the information generated from those decisions is disseminated. Some companies have an “Emerging Technologies” department that’s charged with the research and recommendation of new technologies. Other companies use the “architect” concept—people who have tons of everyday experience in the industry and are now equipped to make corporate decisions regarding technical direction.

Exam Essentials

Know your company’s overall business model. By identifying which business model your company falls into, you can effectively provide a standardized desktop and overall consistent computing environment.

Understand the geographical scope of your company. This scope will help you determine what kind of economic, geographic, facilitation, and political issues you will face with a given connection.

Know why your company does what it does. Understanding your company’s processes will help you figure out how to do your job better.

Know your company’s virtual and people-to-people communications flow. Good communications will facilitate a Windows 2000 rollout. Bad communications will destroy any chance you have of being successful.

Know what product and service life cycles are. An understanding of the product life cycle of software (these days about one year or less) and the accompanying service life cycles are crucial to your applications integration into Windows 2000 rollouts. Example: You have an enterprise fax software program that you’re using in the enterprise. You’re on version 6, the company that wrote the software is now at version 7 and fixing to roll into version 8. You’re out of the product (and probably the service) life cycles.

Know who makes the decisions in your company and why. Getting a Windows 2000 rollout nailed down is all about making sure that the big decisions you need finalized are made, accepted, and not reversible.

Key Terms and Concepts

bottleneck A place where things slow to a crawl as data crosses that place.

international A company that has offices and does business in countries that are foreign to its own home headquarters.

local A company that does business only within a city or region.

national A company that does business within its home country.

regional A company that operates in its own city and several geographic regions nearby. The term “regional” might mean operating in several key cities in adjoining states or simply in suburbs of a city, depending on the size of the company.

Single Point of Failure (SPOF) That place or places where the system is held up by only one connection or part.

subsidiary A part of a company that’s involved in an activity that’s distinct from the parent company.

Sample Questions

1. You have a transoceanic connection between your sites in Madrid and Haifa. Your boss has told you to eliminate all SPOFs on this circuit. How can you make sure that you accomplish this task? Select all that apply.
 - A. Set up a land-based WAN circuit that acts as a backup to the main circuit.
 - B. Create a satellite-based connection between the two sites.