Novell

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WHITE PAPER

"Selling Guide against MS"

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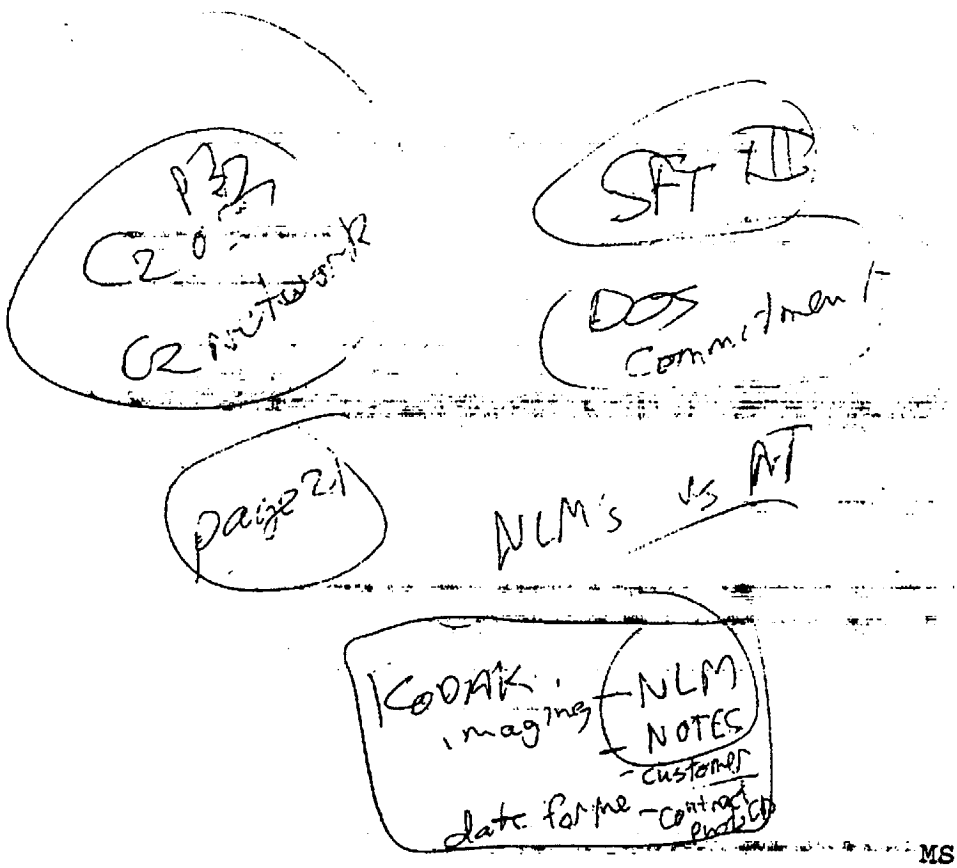

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Executive Summary

Section I: Introduction

- This document is to educate the Novell sales person on Windows NT and Microsoft's networking strategy. It also has the objective to train how to sell NetWare against Windows NT's networking capabilities.
- Novell's general positioning about Windows NT can be summarized as follows:

  Novell and Microsoft are working to ensure that when Windows NT becomes available it will properly function in the NetWare environment—both as a client to NetWare servers and as application server to other Windows NT clients on the LAN. Windows NT is a general purpose operating system. No one, especially Microsoft, is positioning NT as a premier network server OS capable of supporting multiple desktop and host environments. Only NetWare makes that claim. Microsoft certainly has their work cut out for them in promoting Windows NT, but the battle isn't with NetWare. It's with other competing general purpose operating systems such as OS/2, UNIX, NeXT and others. Whatever the outcome, Novell's position remains constant: We will support the platforms that our customers demand.

Section II: Microsoft's Networking Direction

- Microsoft has centered their networking strategy around Windows. There are four key products that make up the Windows family. These are Windows 3.1, Windows for Workgroups 3.1, Windows NT 3.1 and LAN Manager for Windows NT 3.1.
- Windows for Workgroups 3.1 is an add-on product that gives Windows users peer-to-peer networking capability. It also includes electronic mail (and possibly scheduling).
- Windows NT 3.1 is a 32-bit, multitasking OS that provides built-in fault tolerance and networking support. Microsoft has included a single domain version of LAN Manager as part of Windows NT. It can be used for peer-to-peer networks or traditional client/server networking.
- LAN Manager for Windows NT 3.1 provides multidomain networking and enhanced fault tolerance to Windows NT.

Section III: Selling Strategies

1. **Position Windows NT as Primarily a Desktop Operating System.** Because Windows NT is a general purpose OS, it has the potential to be a great NetWare client. And because it is general purpose, it is a lot like Univel's UnixWare. Windows NT is more a competitor to UnixWare than it is to NetWare.

2. **Sell NetWare as a Better Server Operating System.** NetWare was designed as a true 32-bit server operating system. Because of this architecture, it provides excellent performance, management, reliability, security and heterogeneous networking support. General purpose OSs, like Windows NT, are not able to perform server tasks as efficiently as NetWare can.

3. **NetWare Provides Better Heterogeneous Client Support.** Microsoft is clearly biased towards Windows and so their client support favors Windows and Windows NT. NetWare was designed for multivendor desktop support.

   Microsoft's version of heterogeneity is client-based and requires Windows NT. Windows NT can support multiple requesters, enabling the user to access different servers. Novell's approach is server-based, providing multidesktop integration at the server. This minimizes special requirements at each desktop.

   Microsoft's heterogeneous network application support, called WOSA, is client-based and requires Windows or Windows NT. Novell's approach will be to provide a common set of network service APIs across all key desktops.

4. **NetWare 4.0—Two Years Ahead and Gaining.** NetWare 4.0 provides a number of new features that are not available in Windows NT: directory services, authentication, time synchronization, security auditing, file compression, suballocation, imaging services and concurrent multi-language support.

5. **SFT III.** SFT III provides nonstop operation for client/server applications. It will do it using industry standard hardware. Windows NT's does not provide anything close to SFT III.

6. **NetWare Requires Less Hardware.** Because NetWare is a server OS, it is much more efficient in the way it takes advantage of server hardware. Windows NT is a general purpose OS and requires substantially more hardware to provide network services. While configuration data does not exist yet, any savings Windows NT offers by bundling basic network OS services will be more than like offset by the extra hardware required.

7. **NetWare's Built-In Internetworking.** NetWare provides multiprotocol routing of IPX, IP and AppleTalk. LAN Manager for Windows NT, which supports "multiple domains" does not support any routing. This means third party bridges and routers are required in larger Windows NT networks. This makes NetWare a more cost effective solution in many configurations.

8. **NetWare Management.** While Microsoft plans to add SNMP and NetView support to Windows NT networks, Novell provides it today. The NetWare Management System is far superior in its scope and design than anything Microsoft is working on. And the first release of NMS is available now.

9. **Windows NT Client/Server Networking.** The good news about Windows NT is that it includes parts of the current LAN Manager. The bad news about Windows NT is that it includes parts of the current LAN Manager. On the one hand this bundling strategy appears to be a cost savings. On the other hand, LAN Manager was never very successful. You get what you pay for.

10. **NetWare Third Party Vendor Support.** NetWare dominates because of its extensive third party support from network vendors. And because of its large install base, it offers an attractive market for new vendors to provide new levels of functionality. Windows NT has only promises of third party support. It also lacks an install base, which may be prohibitive to most third party vendors.

11. **NetWare Network Support Infrastructure.** In addition to the excellent third party support, NetWare has a service, support and education infrastructure that rivals the industry. Microsoft has nothing close to it. In fact, Windows NT will push Microsoft's channels beyond their current ability. Windows NT's complexities will require new levels of service, support and training that currently do not exist in the majority of the Microsoft support channel.

12. **Windows NT—Version 1.0.** Version 1.0 of anything generally has too many problems to be considered a serious platform for critical applications. Windows NT is brand new 32-bit OS code with a new file system. It is unproven technology. And it will be quite a while before Windows NT is a stable environment.

13. **Sell the Univel (or NetWare for UNIX) Alternative.** In many ways, Windows NT is a me-too OS. UNIX has provided many of the features that Windows NT is now promoting. Univel's UnixWare is based on a very stable and mature UNIX platform—SVR4.2.

    For those companies that want a single OS for client and server, UNIX is a much better choice than Windows NT. UnixWare will work as a NetWare client and/or NetWare server. And with NetWare for UNIX, provided by 11 companies today, the user can have NetWare running on a variety of UNIX servers.

14. **DOS Future.** It is questionable how much development Microsoft will do on future versions of DOS. Novell is committed to enhancing DR DOS well beyond its current capabilities. Novell may well take over the lead in driving the future of DOS and DOS networking.

15. **Networking Priority.** Novell is far more committed to networking than Microsoft is. Novell is completely focused on networking whereas Microsoft is not. Novell is spending more R&D than anyone in the industry on network computing system software. This puts Novell is a position of being a better supplier of networking technology.

Section IV: Answering Microsoft Selling Attacks

1. **Pricing.** Microsoft is promoting Windows NT as a more economical networking solution. But bundling LAN Manager functionality in Windows NT has some problems: a) There is no margin for the channel to support networking in Windows NT. This means the user will need to do it, but many users will not be able to. b) It demonstrates that Microsoft is willing to give LAN Manager away and that has no value. c) Windows NT has a hidden cost of networking when compared to NetWare—it requires more hardware. While it appears NT's networking software is less expensive, the hardware to support it will be substantially more than NetWare.

2. **Reliability.** Microsoft will pitch that Windows NT is more reliable than NetWare because it has memory protection for applications. NetWare 4.0 is a superior solution, however, because it provides NLMs with the option of running in a memory protected area or in the kernel. This gives administrators the option of installing unknown NLMs in a safe area until they have proven to be reliable, when they can be loaded into the kernel for high performance.

   Microsoft will pitch their RAID 5 support as going beyond NetWare in System Fault Tolerance. RAID 5 is an approach to provide disk storage redundancy without requiring one-for-one disk drive mirroring. Novell will leap frog RAID 5 with SFT III 3.11, which will be control released during 4Q92. And third party hardware vendors, such as Maxtor, deliver RAID 5 support for NetWare today.

3. **Responsiveness.** Microsoft claims Windows NT is a more responsive OS because of its preemptive scheduling. We agree that preemptive scheduling is critical for desktop environments, but for servers it is not necessarily the optimum. In fact, it is our assertion that non-preemption is better for servers because it is easier for NLM developers to program around timing issues than concurrency issues. A non-preemptive server OS gives the programmer the ability to minimize concurrency code and handle the easier timing issue. A preemptive server environment forces the more difficult concurrency issues to be handled in the application.

4. **Broad Applications Support.** Microsoft claims Windows NT is a better server because it can be used in a non-dedicated mode, supporting DOS applications concurrent with the server software running, for example. For simple applications, NetWare Lite enables DOS desktops to also function as a server. As configurations become more complex, NetWare 4.0 will have the ability to run DOS and OS/2 applications in the NetWare for OS/2 server configuration, giving users a non-dedicated server option.

   Microsoft is promoting WOSA (Windows Open Systems Architecture) as the hot, new open standard for the industry. WOSA is a set of network service APIs that are available for client applications. While WOSA does allow NetWare to participate, it is restrictive because it only supports Windows and Windows NT desktops. It does not take into account heterogeneous networks with DOS, OS/2, Macintosh and UNIX workstations. And Microsoft did not choose the industry standard APIs for WOSA, rather they only chose their own.

   Microsoft claims it has better development tools for server applications than Novell has for NLMs. Our response is that the tools for building NLMs are adequate today, and by the end of the year, some very strong NLM development tools will be available by key tool vendors. Also, most client/server applications development will be done at the client. The requirement for server development tools is not that broad. And if this issue gets pushed real far, it is best to compare Windows NT to UnixWare. There are substantially more development tools for UNIX than there are for Windows NT.

   Microsoft may claim Windows NT is easier to manage because the server console can support a Windows or a Windows NT interface. Our response is a GUI server console is nice but not critical. Only a few people ever see the console. More important are GUI user and server utilities which NetWare 4.0 will provide for both Windows and OS/2 PM. Also, the NetWare Management System provides a GUI management console.

Microsoft is promoting the POSIX application interface support in Windows NT. Supporting POSIX is nice, but it does not mean UNIX applications will automatically run on Windows NT. They will have to still be ported. Also, an application that runs through the POSIX interface cannot be a Windows application. This almost defeats the purpose of POSIX on Windows NT. If a customer is committed to POSIX, they need to take a strong look at UnixWare. It is fully POSIX compliant with support for a lot more application standards than just POSIX.

5. **Portable Design.** Microsoft is making a big play about Windows NT's ability to run on different processors. This is a nice capability. Novell announced plans for a future release of NetWare after 4.0 to support HP's PA-RISC. Other RISC systems will be supported as well, although Novell has not made a public statement about which ones will be.

   Some key things to remember, however, is that boosting processing speed alone is not enough. I/O speed is in many cases more important in the server. And there are capability issues that Windows NT will face when running on non-Intel servers. For example, it will not support enhanced mode Windows or 386-DOS extended programs. And all applications that were developed to the Intel version of Windows NT will need to be reported. Some ISVs may choose not to do the port because of the limited market of the RISC implementation.

6 **Scalability.** Microsoft is strongly promoting Windows NT's SMP (Symmetric Multiprocessing) support. This ability to support extra processors in the server is nice. But the bottom line is that Windows NT needs all the hardware it can get. It will take a lot of CPU power for Windows NT to try to match NetWare's performance. There are a number of key points to address the SMP issue:

   a) More processors are not better if the implementation is not done well. No one today knows how well NT will provide SMP.

   b) A next generation faster processor from Intel may make up for any performance advantage of a multiprocessing server that is using the previous generation' chip set.

   c) The key bottleneck in the server is I/O speed, not processing speed.

   d) Novell is committed to deliver multiprocessing when it will really add value. The first implementation will be with SFT III.

   e) There are numerous LAN, disk and other bus master cards that run in a NetWare server, giving it multiprocessing capability.

   f) It has been reported in the press that Oracle and NetFrame have teamed up to provide a multiprocessing server running NetWare and Oracle 7 on NetFrame multiprocessing servers. This will run standard NetWare on one processor and up to 4 additional processors each running the Oracle 7 NLM and NetWare Runtime.

7. **Security.** Microsoft is promoting Windows NT as "C2 certified." The fact is that they may have designed Windows NT to be C2 certified (by NCSC), but the bottom line is that it has not gone through the certification process. That process takes 18-24 months and it appears they have either not started the process or are not very far into the process.

   Novell is well into a C2 certification with NetWare 4.0. Another big difference is that Novell is going after a network C2 rating, while it is our belief that Microsoft will attempt to get an OS C2 rating. The network rating will have substantially more weight for network configurations than an OS rating will.

8. **Built-in Networking.** Microsoft is promoting the peer-to-peer networking of both Windows for Workgroups and Windows NT. Both are compatible with each other. And in the future, DOS users will be able to participate as clients. Our response is that NetWare Lite 1.1 can do it today. DOS support is here now. NetWare Lite users can access NetWare servers today. And if we are talking about futures, it is Novell's plans to tie all of the key desktops together in a peer-to-peer environment, not just DOS, Windows and Windows NT.

   Microsoft is promoting that Windows NT is a platform for distributed applications by its support of the "OSF DCE RPC." However, Microsoft's RPC is only DCE interoperable, it is not identical and therefore not really standards based. Novell believes RPC support is important. Novell currently supports the Sun/Netwise/Novell defined TIRPC that is based on the NFS standard.

   Windows NT can run its network services over native TCP/IP. While this important for some customers, being able to standardize on one protocol is difficult for most end users. More important is an integration platform that can easily accommodate the key network protocol standards. NetWare also can encapsulate IPX packets in an IP envelope to support the goal of a single backbone protocol. In the future, we will support NetWare services over TCP/IP. And while Windows NT can support TCP/IP, it does it in a very restrictive manner that makes the management of such a network very complex and cumbersome.

9. **Remote Windows Users.** Microsoft claims they have the best support for remote Windows users. The fact is that their Remote Access Service is slow. The new NetWare Access Services 1.3 now supports Windows 3.0/3.1 applications, and does it much better than Microsoft's product.

10. **Naming Service.** Microsoft claims that LAN Manager for Windows NT's new multidomain capability will compete with NetWare. But NetWare 4.0's directory service is substantially more powerful. In fact there is very little comparison between NT's multidomain facility and the NetWare Directory Services.

I. Introduction

It is always difficult to fight a paper tiger. Microsoft is the king at promoting technologies that are not available. This competitive guide was put together based on past experience of selling against Microsoft "SlideWare."

This document is targeted for following audiences:

- Novell sales people
- Novell channel sales people (dealers, resellers, systems integrators, consultants, etc.)

  NOTE: This document is not intended for end users. A white paper version is available for end users.

The objective of this document is to:

- Increase understanding of Microsoft's new networking strategy and products (Section II—Microsoft's Networking Direction)
- Highlight NetWare's strengths in relation to Microsoft's products that you can directly sell to your customers (Section III—Selling Strategies)
- Provide answers to sales objections Microsoft is sending to the market (Section IV—Handling Microsoft Selling Attacks)

The document is outlined to accomplish these three objectives.

A summary of Novell's general positioning about Windows NT is:

> Novell and Microsoft are working to ensure that when Windows NT becomes available it will properly function in the NetWare environment—both as a client to NetWare servers and as application server to other Windows NT clients on the LAN. Windows NT is a general purpose operating system. No one, especially Microsoft, is positioning NT as a premier network server OS capable of supporting multiple desktop and host environments. Only NetWare makes that claim. Microsoft certainly has their work cut out for them in promoting Windows NT, but the battle isn't with NetWare. It's with other competing general purpose operating systems such as OS/2, UNIX, NeXT and others. Whatever the outcome, Novell's position remains constant: We will support the platforms that our customers demand.

II. Microsoft's Networking Direction

In recent Microsoft presentations, we have seen from Microsoft a networking strategy that is totally centered around Windows and Windows NT. There are four tiers of the Windows family:

	Product	Description	Availability	Price
1.	Windows 3.1	Today's released product. No general networking capabilities except to allow for network add-ons.	Now	$149
2.	Windows for Workgroups 3.1	Adds peer-to-peer networking and network applications (email and possibly group scheduling).	4Q92	< $300
3.	Windows NT 3.1	High-end, 32-bit version of Windows with built-in client/server networking and basic fault tolerance. Compatible with LAN Manager for OS/2.	1Q93-2Q93	< $500
4.	LAN Manager for Windows NT 3.1	Adds support for multidomain networks and advanced fault tolerance.	Approx. 3-6 months after Windows NT ships	> $500

The networking strategy that Microsoft appears to be promoting is as follows:

1. **Windows for Workgroup**—the Trojan horse. Microsoft wants to make peer-to-peer networking a transparent extension of Windows. The goal is to be so simple and integrated, that it naturally becomes the choice for entry networking of Windows. Once in the door, the goal is to migrate the customer up to Windows NT and LAN Manager for Windows NT.

2. **Windows NT as a Desktop**—the optimum desktop for LANs, including NetWare LANs. Ultimately Microsoft wants to go after the NetWare installed customer and get them to use their networking software while still accessing NetWare servers. Windows NT can support two requesters concurrently, in this case using both the LAN Manager or peer-to-peer requester and the NetWare Requester. (Microsoft will bundle the NetWare Requester and IPX/SPX with Windows NT.) This appears to be another Trojan horse strategy, to get into existing NetWare accounts without giving up anything (or so it seems) and show them that their networking software is better than Novell's.

3. **Windows NT as a Server**—Windows NT will include the file server software that used to come with LAN Manager. This server software will be limited to single domain networks and can support DOS, Windows and OS/2 clients. A single domain can have any number of servers. This software can be used in the traditional client/server model or in a peer-to-peer model. The software does not limit the number of users as LAN Manager did in the past. Windows NT also includes basic fault tolerant features, such as hot-fix and a TTS-like facility.

4. LAN Manager for Windows NT—adds to the basic LAN Manager support in Windows NT support for multidomain networks and increased fault tolerance. LAN Manager for Windows NT adds disk mirroring, drive duplexing, RAID 5 (redundant array of inexpensive disks) and support for UPSs.

   Microsoft is positioning LAN Manager for Windows NT as their "enterprise server" solution, being designed for the Fortune 1000 account.

The Windows NT and LAN Manager for Windows NT Client/Server Network

We all know Microsoft has lost the first two rounds in their boxing match with Novell. With LAN Manager for Windows NT, it appears they may come back swinging with many of the same messages aimed at Novell, but with improvements. Here is Microsoft's positioning of the same LAN Manager on the new Windows NT:

- Windows NT is a substantially better platform for a server, with better performance, 32-bit operation, enhanced reliability and an architecture that was designed for networking from the ground up. (Sounds familiar, doesn't it?)
- Windows NT is not plagued with all of the "ugliness" of NetWare, such as being a non-preemptive environment, lack of memory protection, lack of multiprocessor support, etc. (See "Section IV—Handling Microsoft Selling Attacks" section below for the more complete list.)
- Windows NT includes basic file and print service that use to be part of LAN Manager. This basic networking is much more solid because Windows NT is a much stronger OS than OS/2 1.x was. (Microsoft will try to show that 16-bit OS/2 was the cause of all of LAN Manager's problems.) With Windows NT, basic networking is now an exceptional.
- Pricing. Because basic networking is bundled with Windows NT, the cost of simple client/server networks is very economical. The number of users supported by a Windows NT server is not restricted from a pricing model, except that only a single domain is supported. Multidomain support is added by LAN Manager for Windows NT.
- Aggressive marketing to large account. Microsoft has done an excellent job marketing to corporate accounts. They have a large staff in their regional offices that sell the Fortune 1000 companies on the Microsoft vision and complete product family. Even Bill Gates is heavily involved in this campaign, as evidenced by the fact that he personally visits so many accounts directly, both in North America and Europe. In some cases, he promises these companies the "moon."

Bringing all of this together seems to show a dual end run offensive tactic on Microsoft's part. One strategy is to go after the low end. This is a strategy Novell knows and implements very well. Much of Novell's success has been through what one might call a "foot-in-the-door strategy." That is, coming in the organization through simple networks and eventually growing to much larger networks over time. It appears with the above strategies that Microsoft may be trying to do to Novell, what Novell has done to IBM, DEC and other large systems vendors—come into the organization through simple networks and grow up, or by being an extensions to a NetWare LAN, and then try to displace us.

The second end run strategy is aimed at the corporate account. While not a new strategy, Microsoft feels now they have more ammunition to go after this prized "buck" with Windows NT and the "new and improved" LAN Manager for Windows NT.

Microsoft's strategy is a lot like IBM's strategy has been for most of its existence—1) force users to throw away their existing investments and 2) to lock users into a single vendor solution. By comparison, Novell wants to protect users investments in technology, yet give them the freedom to choose to deploy technologies of the future.

III. Selling Strategies

In this section, we will highlight the major strengths that NetWare has, which become the best way to sell against Windows NT and LAN Manager for Windows NT. The best strategy is a good offensive.

1. Position Windows NT as a Desktop Operating System

- **Client support in NetWare.** Novell plans to provide support for Windows NT as a client operating system. Towards the release of Windows, Novell will release a workstation kit for Windows NT. This will enable a Windows NT user to access many of the same resources as any other desktop. And it will be very transparent to Windows NT users, since it will use NT's file and print managers. In fact, Microsoft may bundle the NetWare Requester for NT.
- **General purpose OS.** Microsoft is trying to position Windows NT as both a client and a server operating system. But no OS can do everything well. While NT may be better than OS/2 1.X for a server environment, it is still not a server operating system. It is a general purpose operating system.
- **Compare to Univel.** If a customer is totally set on this general purpose approach (i.e., using the same OS in the server as well as the client), then an alternative approach is to demonstrate the value of Univel's UnixWare. See Section III-13 "Sell the Univel Alternative" below for this information.

2. Sell NetWare as a Better Server Operating System

- **True server OS.** NetWare 3.x/4.x were designed from the ground up to be true 32-bit server operating systems. They are not a general purpose in nature. They are designed for high performance, excellent management, exceptional reliability and security, as well as heterogeneous networking support.

  Windows NT is not designed to provide this level of server support. Being general purpose in nature means that it cannot do these things to the level that NetWare can. Otherwise, it would be improperly designed for a client desktop.

  - **Example 1: system fault tolerance.** NetWare 3.x/4.x were architected to provide completely mirrored server technology, known as SFT III, on industry standard hardware. Windows NT's architecture will not be able to provide this capability. Microsoft may be able to get to something like a hot standby, but they will not get a completely automated mirrored server.
  - **Example 2: database server support.** Every benchmark has shown that NLM-based database engines perform better than their 16-bit OS/2 or 32-bit UNIX versions when running on the same hardware. While the benchmarks do not exist today between NetWare and Windows NT (since Windows NT is not available), it is our strong conviction that the same will be true: NLM-based database engines will perform better than their Windows NT version when running on the same hardware. For example, the Oracle NLM will run faster than the Oracle NT version. Windows NT's performance will not be much different than UNIX and NetWare NLM databases outperform UNIX databases today.

3. NetWare Provides Better Heterogeneous Client Support

- Microsoft is biased. Microsoft has a vested interest to only push Windows and Windows NT. While they will have some connectivity features for other desktops, they will clearly be promoting their own revenue-producing products. How can they be truly objective here?

  One can just hear their sales pitch: "Sure, you can connect all of these desktops into a Windows NT or LAN Manager for Windows NT network. But to get all of the really nice features, you need to be using Windows NT at the desktop."

  Only NetWare provides the robust support that gives each desktop excellent support across the board.

  While one might say the same of Novell now with DR DOS, there should be no question that Novell is first and foremost a networking vendor. The question can be answered by asking another question—Where does the company generates its revennes? Revenue generation shows where a company's real heart is. Microsoft clearly generates a lot of money from their desktop operating system business.

- **Technology limits.** Windows NT does not support multiple name spaces like NetWare 3.11/4.0. This severely limits the ease of sharing files between clients. A Macintosh user still see a DOS file name.

  While Windows NT as a desktop OS includes TCP/IP and appropriate utilities (Telnet, FTP, etc.) to connect to UNIX resources, support for native NFS still does not exist in an add-on product, hence there is no connectivity for UNIX desktops. Windows NT Services for Macintosh will provide connectivity for Macintosh users. The product is similar to LAN Manager Services for Macintosh ($995 per server). TCP/IP code came from Spider. Macintosh connectivity was developed by Pacer Software.

- **Microsoft's philosophy of heterogeneity.** Microsoft's approach for supporting heterogeneity is to run multiple requesters (one for NetWare, one for LAN Manager, etc.) as long as you run Windows NT. Their heterogeneity strategy is client-based (run Windows NT and you can connect to everything).

  On the other hand, Novell's strategy for heterogeneity is server-based—provide the complete integration of multiple protocols in a high performance, transparent manner at the server. This minimizes any special changes to the client and allows complete freedom of choice at the desktop. It requires less hardware, minimizes the amount of code in the desktop and is easier to manage. Plus applications developers do not have to worry about the unique plumbing when connecting to different servers.

- **Application development support.** Microsoft has come out with a set of network service APIs called Windows Open Systems Architecture (WOSA). But the bottom line is that it only defines APIs for Windows and Windows NT. There is no comprehensive set of APIs for DOS, OS/2, Macintosh or UNIX.

  Novell's desktop strategy is to provide a comprehensive set of common network service APIs for all of the major desktops. It will not be restricted to a few platforms.

Jamie Lewis, Vice President at the Burton Group, a market analyst firm, wrote in a PC Week article:

> "Until Microsoft is willing to allow developers to cross platforms with its services, the impact of its strategy will be limited to Windows. And vendors that integrate disparate environments on the the network—such as Novell—will have a major role to play in the networking strategies of the '90s."
>
> —*PC Week*, July 27, 1992, page 69

4. NetWare 4.0—Two Years Ahead and Gaining

- NetWare 4.0 provides major functionality not found in Windows NT or LAN Manager for Windows NT:

  NetWare Directory Services (NDS). NDS goes way beyond LAN Manager for Windows NT's multidomain service. While their multidomain service is a step up from the single name database of 3.11, it is no comparison with NDS.

  NDS is a true global name service that provides many features not found in LAN Manager for Windows NT's domain service:

  - The directory is a global, distributed, replicated database with no single point of failure.
  - Automatic directory synchronization, done as a background process, is configurable by the administrator to meet performance objectives.
  - A global time synchronization facility maintains complete database integrity even with multiple concurrent updates to the distributed directory database. (Each database event is time stamped.)
  - The directory design allows multiple network "partitions," enabling administrations to logically organize their networks into smaller segments for higher performance and simplified management.
  - User utilities enable browsing the network and looking up network objects by "white page" and/or "yellow page" like facilities.
  - Authentication services guarantee that users are who they say they are. Logins are authenticated and all requests for network services are authenticated in background process transparent to the user. The network is substantially more secure.
  - Complete access control definition is done by object (such as a user) to restrict access to network services and data within the directory down to individual object properties and values.
  - Custom end user definitions of new classes of users, such as a "backup administrator" or "workgroup manager" will be possible.
  - Backwards compatibility with bindery emulation to minimize upgrading issues from existing NetWare LANs is supported.
  - A platform for global, distributed client/server applications with a full suite of APIs is provided. Developers can add their network service application as an object to the directory database.

  Security auditing. NetWare 4.0 allows for complete auditing of all server and supervisor activities, configurable by the user. Security auditors that have been disclosed the planned support think it is ideal. Windows NT does not provide this.

File compression. NetWare 4.0 will automatically compress files on a file by file basis to improve disk storage by up to 200% for binary files and up to 400% for ASCII files. (Most compression's work on a per disk block basis. NetWare as always provides higher-end functionality.) In fact, file compression can now completely offset the cost of disk mirroring. Windows NT does not have this capability.

Suballocation. It will now be possible to store multiple files within one disk block, making disk storage even more efficient (compared to 3.11).

Imaging Services. The next release of NetWare will have core back-end imaging services that will enable lots of applications to become image aware. This support was done jointly with Kodak, bringing to server operating systems a new level of functionality. Windows NT does not provide this.

International support. NetWare 4.0 has the ability to support multiple languages concurrently. Each individual user can come up using a different language. All of the utility executables are exactly the same, the only difference being the message tables. This also makes it easier for translation to multiple languages very quickly by organizations outside Novell. Windows NT can only support one language at a time in a server; it will not have concurrent multi-lingual support.

- Windows NT networking services and LAN Manager for Windows NT are closer in functionality to NetWare 3.11, not NetWare 4.0. With NetWare 4.0, Novell maintains a strong industry leadership in technology.

5. SFT III

- SFT III provides 1) nonstop operation for client/server applications, 2) an optimum network platform for disaster recovery and 3) an easily maintainable environment for servers that must provide high availability (such as 7 days/week and 24 hours/day operation).

  The exciting thing about SFT III is that it accomplishes these benefits with industry standard hardware. Tandem, Stratus and others require very complex and expensive hardware—special disk drives and controllers, special network adapters, etc. And typically, because of these investments, most "nonstop" hardware systems are a generation behind in their architecture. And software development on these systems is very expensive. The bottom line is that SFT III will create a major opportunity for downsizing applications that will be affordable and use leading edge technology.

- Windows NT and LAN Manager for Windows NT do not support an architecture for full server mirroring. It will be technically very difficult for them to develop anything close to SFT III in software.

- By fourth quarter 1992 (calendar), Novell will provide a controlled release version of SFT III based on NetWare 3.11. By 1993, a NetWare 4.0 version of SFT III will be commercially available.

6. NetWare Requires Less Hardware

- Windows NT requires approximately 10-12 MB RAM and 70 MB disk just for the OS. NetWare 3.11 requires approximately 4-5 MB RAM and 40 MB disk; NetWare 4.0 will require approximately 5 MB RAM and 60 MB disk. However, when performance is taken into account, a Windows NT server will require a much faster processor than NetWare will.
- Microsoft conceded publicly that Windows NT will run Windows applications slower than Windows on DOS on the same hardware! Paul Maritz, Senior VP of System Software at Microsoft, said the goal was to hit a less than 10% performance penalty when running Windows NT.
- The file compression and suballocation capabilities of NetWare 4.0 makes this more acute. With compression, for example, a 1.2 GB disk drive might appear as a 2-3 GB disk drive. Disk storage is therefore less expensive with NetWare 4.0, even compared to LAN Manager for Windows NT's RAID 5 support.
- Take all of these factors into account and NetWare requires less hardware to run it, making it a better price performer.

7. NetWare's Built-In Internetworking

- LAN Manager for Windows NT design for "multidomain" networks does not support any built-in routing capability. This means that any network that goes beyond simple networking (beyond Windows NT) requires additional hardware/software to perform the bridging or routing functions. Also, LAN Manager for Windows NT will still not be able to bridge topologies. A mixed Ethernet and token ring network requires additional hardware/software to solve the problem.

  NetWare 3.x/4.x can do all of these, including multiprotocol routing. Once again, a Windows NT solution will require more hardware to run than NetWare.

- Also missing from Microsoft's product portfolio is a lack of wide area networking add-on products. Novell has the added advantage of building software products, specifically the NetWare WAN Links family, that can run on industry standard hardware, which support many low-cost configurations.

8. NetWare Management

- If we define network and systems management as those tools that go beyond the basic utilities that come with a network operating system, then Microsoft will have nothing to offer at the time Windows NT ships. Some time after Windows NT ships, Microsoft plans to introduce two network and systems management efforts.

  The first is support for SNMP and a NetView Alerter. Their SNMP (simple network management protocol) support will include some APIs, an SNMP agent, and SNMP MIB I database and a LAN Manager MIB (management information base). The MIBs will be extensible by third parties. The NetView Alert service converts Windows NT event log entries to NetView alerts. It also supports the NetView run command, so that the NetView console can issue commands down to the Windows NT command line.

The second effort of Microsoft is a project named Hermes that is designed to provide 1) a single, logical view of the network, 2) support a configuration inventory of PC hardware/software on the network, 3) a software distribution facility, and 4) some tools to better manage network applications, including a software metering mechanism. It will support DOS, Windows, Windows NT and LAN Manager for Windows NT nodes on the network. It will be extensible by third parties.

- Built-in support for SNMP and NetView is nothing new to NetWare. NetWare 3.11 provided basic SNMP and NetView support today. Numerous other NetWare products add enhanced functionality. For example:
  - NetWare Management System provides strong SNMP MIB functionality for third party SNMP management consoles to be able to manage NetWare LANs.
  - NetWare WAN Links 2.0 provides an SNMP agent that supports TCP/IP and IPX. It also allows third parties of WAN cards to interface their MIBs into the NetWare environment.
  - NetWare for Macintosh 3.011's AppleTalk router support the AppleTalk MIB I specification for SNMP. (Microsoft's network management strategy appears to ignore the Macintosh.)

    LANtern supports SNMP management consoles. And the RMON standard that Novell helped promote, which will form the basis of the next generation of LANtern, supports a new multivendor SNMP MIB with better integration between the management console and the remote monitor.
  - NetWare for SAA 1.2 now supports NetView's run command interface, so that NetView console operators can send NetWare servers commands to load/unload NLMs, manage NetWare 3.11 services and perform file, volume or directory management. Also, a single server can be used as a NetView management link. This server acts as a collection and distribution point for NetView alerts and commands. (Microsoft's proposal will require a separate NetView link for each server.)

  The good news is that Novell has all of these capabilities today (except for the RMON functionality). Microsoft is just talking about them.

- Microsoft's Hermes projects is nothing like NetWare Management System. NMS is a complete networking environment. First, NMS includes the NetWare Management Map, an object-oriented console that automatically discovers the network and displays it graphically. The NetWare Management Map provides continuous network monitoring and a foundation for management applications, such as the NetWare Services Manager, to be launched from with the map.

  The NetWare Services Manager provides server and workstation configuration and schematics, user-defined alert thresholds, an NLM monitor, and automatic server fault and alert notification.

  The Communications Services Manager is another management application that is built on NMS. It provides a comprehensive set of tools for fault, performance and configuration management of NetWare for SAA and NACS. Being built on NMS, it can operate concurrently with other management applications.

  Third party vendors are planning to develop management applications (and agents) for NMS as well. For example, Compaq, Synoptics, Networth and Stoney Brook (developing management applications for Wellfleet and Cisco routers) have all announced plans to develop management applications that run on the NetWare Management Map. Over 200 third party developers have received NMS developer tool kits to date.

- Novell evens adds to NMS additional management products, such as LANalyzer for NetWare, LANalyzer and LANtern. Later this year, LANtern RMON will be released as an NLM for tighter integration with NetWare.

- One part of Hermes is software distribution. With the acquisition of Annatek, Inc., Novell now has the best software distribution product on the market. The goal of the Annatek acquisition is to completely merge this high-end software distribution technology, the Network Navigator product, into the NetWare management framework. The combination of this with NMS will be awesome.

- A third party analysis of Microsoft's Windows strategy was done by the Burton Group. They write the following about Microsoft's network management support:

> "At the enterprise, LAN Manager for Windows NT will lack many of the features, such as directory, network management, and communications, that prevented LAN Manager 2.x from achieving wide acceptance and use . . .
>
> "While Microsoft has built some interesting network management features into Windows NT, Windows NT and LAN Manager for Windows NT still won't give enterprise customers a platform for comprehensive and integrated LAN management . . . Novell [has] at least started [a] more comprehensive network management strategy."
>
> —*Microsoft's New Windows Strategy, June 1992*, Burton Group Report, pages 2 and 15

- The bottom line is that Novell is "two years ahead and gaining" on Microsoft in the area of network management.

9. Windows NT Client/Server Networking

- Windows NT bundled client/server networking is still based on the old LAN Manager. LAN Manager has limited acceptability with only a 2-2.5% market share (according to InfoCorp and Gartner Group). Even with Windows NT, a potential user is still faced with LAN Manager functionality as being the networking solution.

- How much value is this bundling of LAN Manager? In another article written by Jamie Lewis about Windows NT, he writes:

> "Many users say that by giving it away [with Windows NT], Microsoft has finally figured out what LAN Manager is really worth."
>
> —*PC Week*, August 31, 1992, page 85

- Microsoft sacrificed their LAN Manager networking product for Windows. They changed their strategy overnight and left many customers "holding the bag" who bought their 4 year networking strategy. Can we trust this new strategy? Are they really commited or is this another interim deal "until we get it right?"

10. NetWare Third Party Vendor Support

- Because of NetWare's dominance in the marketplace, there is excellent third party support simply because it is a large market for third party vendors to target. Limited customer acceptance means a limited market to sell to. Gartner Group estimates that there were 14.5M NetWare nodes and 338K LAN Manager nodes at the end of 1991. What would you develop to?

This gives NetWare a huge advantage over Windows NT and LAN Manager for Windows NT. Not only is there a limited installed base of LAN Manager to sell into, all applications will need to be ported to take advantage of the new 32-bit environment. Going from 16-bit to 32-bit is a major porting job for any application vendor. Some developers may simply choose not to do it—the market is too small to justify at this point.

The same argument is true for hardware. New drivers for any hardware device need to be rewritten from a 16-bit to a 32-bit model. Writing device drivers is not easy. Poorly written drivers can cause major performance problems. It usually takes one or two revs to get the drivers right. How big is the market for a hardware vendor to go through the effort to write new drivers for Windows NT?

- One example of more applications support is in the area of database servers. NetWare has more database servers available than Windows NT. Today Oracle, Sybase, Gupta and Informix deliver off-the-shelf products. How long before Windows NT has more than just SQL Server available? (Right now Windows NT has 0.)
- One area that encourages lots of third party vendor support is the programs Novell has to assist the developer. For example, Novell has the Independent Manufacturers Support Program (IMSP) to assist hardware developers to write, test and certify hardware compatibility with NetWare. Microsoft has nothing equivalent to IMSP. Novell also provides the following which Microsoft does not support:
  - Novell Labs Certification Alliance. Novell trains and authorizes hardware developers to conduct NetWare compatibility testing themselves. This enables the hardware developer to release NetWare-compatible products in a more timely fashion.
  - Strategic Engineering Support. Hardware vendors can elect to have engineers located at Novell development centers to test and certify compatibility with NetWare. This enables them to get even closer to Novell development to increase compatibility.
  - Software Test Program. Software vendors can submit their products for testing and compatibility certification by Novell.

11. NetWare Network Support Infrastructure

- Having a good product to market is only part of the complete customer solution. Networking service and support are key components. NetWare is light years ahead of anyone because of our network support infrastructure. For example:
  - Novell has more resellers than anyone. In North America, there are approximately 500 Platinum, 3000 Gold and 7300 Authorized resellers. Microsoft is said to have less than 300.
  - Novell has more certified support engineers than anyone. There are over 14,000 CNEs today and another 10,000 people are in process of becoming CNEs.
  - Novell has more education centers than anyone. There are 500 Novell Authorized Education Centers. Over 50,000 students are trained every quarter on NetWare technology.

- Microsoft has a major challenge with Windows NT. This product is more powerful and complex than any earlier Microsoft product. It will require new levels of service, support and training that currently do not exist in the majority of the Microsoft support channel. Who is going to provide systems integration? Microsoft currently does not have strong relationships with the key integrators in the industry. Who will provide support? Typical Windows resellers are simply not prepared to handle the technology. Where can the customer get trained? There is nothing like the NAEC training channel in the Microsoft infrastructure.

12. Windows NT—Version 1.0

- Version 1.0 of anything generally has too many problems to be considered a serious platform for critical applications. Windows NT has many new things that are commercially unproven, especially new 32-bit OS code and a new file system. It is a totally unproven product.

  In a research report on Windows NT, Wessels, Arnold & Henderson wrote:

  > "The introduction of the first release of any new software package is often met with a substantial number of bugs that ultimately affect the features and/or performance of the product. Microsoft has historically been most successful on round three of a new product introduction. . . Windows NT could be a solid offering in its initial release. It is more likely, however, that it will take an additional six to twelve months before the initial bugs are worked out."
  >
  > —*Windows NT*, Wessels, Arnold & Henderson, June 11, 1992, page 6

- Microsoft is "hyping" a lot of features in Windows NT. But there is a big difference between having a "feature" and delivering it in an exceptional manner.

  A good example is multiprocessing support, which Microsoft heavily promoted with LAN Manager 2.1. Yet how well did it really work? According to Apricot, a LAN Manager OEM, the multiprocessing versions of LAN Manager on OS/2 were actually slower than the single processor implementation. A big question that the entire industry needs to ask is how well does Windows NT implement multiprocessing support. This is true of many of the new features in version 1.0 of Windows NT.

- Applications compatibility is going to be a big issue with Windows NT. Just going from Windows 3.0 to 3.1 was problem enough. Windows NT is a whole new environment. It is our opinion that Windows NT will experience significant compatibility problems running DOS and Windows 3.0/3.1 applications. This will force users to wait for applications that are specifically written to Windows NT. Consider the following:

  - Windows NT does not support DOS or Windows (Win-16) device drivers. Any application that requires hardware device drivers, such as 3270 emulators, fax cards and backup software, will have to be rewritten to run on Windows NT.

    Remember the hassles Novell faced with NetWare 3.0? Microsoft has them all over again with Windows NT. All LAN, disk, communications, fax and any other hardware device will require brand new device drivers. Writing good, fast device drivers is not easy. In fact, it usually takes two or three releases to get it right. (Remember the first 3Com drivers for NetWare 3.0—their performance was awful.)

    By the way, OS/2 2.0 can load DOS character-mode device drivers for DOS sessions.

- Graphics-mode DOS programs will not run in a Windows NT window. All non-Windows graphic DOS applications will not run.
- DOS or Win-16 programs cannot bypass the operating system in order to access the hardware or the file system directly.

In a special PC Week report on Windows & OS/2, Larry Seltzer wrote:

> "To those for whom compatibility with existing hardware and DOS software is critical, however, NT may not be an ideal solution."
>
> —PC Week, August 17, 1992, page S/9

- Windows NT appears to be behind schedule. Forrester Research said the following:

> "NT's shipment date is slipping. The product will go out to users for beta testing in late September/October. It will take 3-6 months to debug the product. [Microsoft] said that the worst case scenario calls for the product to ship June, 1993. Microsoft will not set a final ship date until November. Forrester expects a late April/May 1993 release."
>
> —*Update on Windows NT*, Forrester Research, August 26, 1992

Quoting from William Zachmann, a former VP at IDC, in a recent PC Week article:

> "Windows NT not only won't ship by year's end—it won't ship in any reasonable and affordable form with broad hardware support, solid performance, and adequate DOS and Windows 3.1 compatibility in the first quarter of 1993, either. Microsoft will be fortunate if it can deliver all that any time before the second half of '93."
>
> —*PC Week*, July 27, 1992, page 66

Also, the word on the street is that LAN Manager for Windows NT is about 3 to 6 months behind the development of Windows NT. If that's true, we will not see a real competitive product for quite a while.

13. Sell the Univel (or NetWare for UNIX) Alternative

- In many ways, Windows NT is a me-too OS. Many of the features that Windows NT is now promoting have been in UNIX for many years. But there is are two things that UNIX has that Windows NT does not have—experience and time. And in any software product, that is a tremendous advantage. Version 1.0 of anything compared to a mature technology with similar features is no comparison at all.

  This makes UnixWare a great alternative to Windows NT. It has full compatibility with 95% of all Intel-based UNIX applications. (Those that run on SCO UNIX, Interactive UNIX, etc.) This means it is compatible with over 6,000 UNIX SVR4 applications, giving it immediately a larger base of applications compared to Windows NT. (Windows NT will not run UNIX applications. They have to be ported.) It has a great window environment, based on X-Windows that offers users a choice of OPEN LOOK (Sun) or Motif (SCO). And it comes bundled with the NetWare Unix Client technology. This means it will not need NetWare NFS to communicate with a NetWare server.

  For the standards-oriented customers, UnixWare shines compared with Windows NT. It supports POSIX, FIPS, SVID, X/OPEN and a host of other standards.

- For those companies that want a single OS for client and server. UNIX is a much better choice than Windows NT. UnixWare will be available in both client and server editions. And with NetWare for UNIX available today from numerous vendors, the customer has lots of options when they choose UNIX. The bottom line: NetWare gives the customers choices; Microsoft sell them a lock in strategy based on one vendor.

  Vendors shipping NetWare for UNIX today:

  - Altos
  - Data General
  - Hewlett-Packard
  - IBM
  - Integraph
  - MIPS
  - NCR
  - Prime
  - Pyramid Technology
  - Sequent Computer Systems
  - Sun Microsystems (NEW!)

  Vendors developing NetWare for UNIX for the future:

  - Digital Equipment (1993)
  - Stratus Computer (1993)
  - Univel (1992)

14. DOS Future

- Microsoft appears to be putting most of their OS development on Windows NT and not on DOS. This could lead to weak enhancements of DOS. In fact, Mike Maples, VP at Microsoft, confirmed that the main features in the next release of DOS will be to go after DR DOS 6.0 (i.e., file compression). Microsoft confirmed that MS DOS 6.0 will also include peer-to-peer networking services as a client to a Windows for Workgroups server.

  Microsoft has made statements about future features that will not be in DOS:

  - No multitasking support in DOS
  - No installable file system in DOS
  - No 32-bit flat memory model in DOS

  While Novell has not publicly announced future features in DR DOS, we can say that we are committed to continue the development and enhancement of DR DOS. It appears that Novell will take the lead in driving the future of DOS and DOS networking.

15. Networking Priority

- Novell will always be more committed to networking than Microsoft will. As stated before, Novell generates all of its revenues from network computing. Microsoft on the other hand gets very little revenue from networking. Novell is investing more than $100M in fiscal 1992 towards R&D in networking system software. It is our belief that this is more than anyone else in this industry, including Microsoft. This investment will help Novell continue to provide industry leadership.

IV. Answering Microsoft Selling Attacks

The following are the key messages Microsoft will use to sell Windows NT against NetWare. The format of this section first gives Microsoft's message (*Microsoft says:*) and then gives answers to reply to the Microsoft message (*Novell response:*).

1. Pricing

Microsoft says:

- Windows NT is a more economical networking solution than NetWare. Standard networking is included in the price of Windows NT. This can be used for both client/server and peer-to-peer networking. We believe networking needs to be included in the OS because "networking is a fundamental requirement for business desktops."

Novell response:

- There is no question Microsoft is trying to change the economics of networking by including basic networking in with Windows NT. However, there are some significant problems with this strategy.

  First of all, bundling networking with NT assumes that networks are super easy to install, that users can do it themselves. In some cases, this can be true, usually with very experienced users. But experienced users generally want more than basic networks. Most users do not have the savvy to install their own networks. They need support from resellers and integrators. But by giving away the network software with the desktop OS, there is no money for the reseller/integrator. This bundling strategy might be a disincentive to the channel to want to support Microsoft's new networking solutions.

  Second, most examples of software that is bundled with a mainstream product show one primary thing—the company can afford to give away the product. You look at just about any example where software is bundled with something else and it is generally because the vendor did not see it as a money making product. Because they did not have much to lose with it, they gave it away to help sell a mainstream product.

  As stated appropriately by Jamie Lewis:

  > "Many users say that by giving it away, Microsoft has finally figured out what LAN Manager is really worth."
  >
  > —*PC Week*, August 31, 1992, page 85

  Third, there is a hidden cost when using Windows NT's built-in networking. While the basic networking is included, Windows NT requires more hardware than NetWare to get similar performance. Therefore, while it may appear Windows NT is less expensive, it has an extra hardware cost which may negate the "free bundled software." (Right now, because Windows NT is not a real product, we can't make a comparison.)

2. Reliability

Memory Protection

- Memory protection prevents an ill-behaved application running in a multitasking OS from bringing down the entire system. Applications are protected from impacted each other.

Microsoft says:

- Windows NT provides memory protection so that in a server configuration any one application will not crash the server. Because NetWare does not provide this it is an unreliable environment for server applications. (This attack attempts to limit NetWare to primarily a file and print server.)

Novell response:

- Memory protection, while useful, is not as important in server configurations as it is in the client. In client environments, users are bringing applications up and down all the time. Users are not controllable by the network administrator on what they will and will not load in their desktop. On the other hand, server applications tend to be very stable. They are loaded when the server is booted and generally stay loaded. The applications loaded are known and can be controlled.

  Where memory protection is useful is with new server applications that are "untested" in a particular customer configuration.

- NetWare 4.0 adds memory protection. This means that NLMs have the option to run in a protected environment (Ring 3) or in the kernel (Ring 0). Many users will choose to run their applications in a protected mode at first and once the configuration proves itself, will move the applications to native NLM kernel mode for improved performance. Windows NT does not allow applications to run in the kernel nor does it allow the same set of code run in either Ring 3 or Ring 0 without any modifications. In fact, no other network operating system we know of can do this.

  When an NLM runs in Ring 3, there is some overhead to pay for the protection. NLMs will run approximately 20-30% slower. But with the option to move NLMs that have proven themselves to be trusted, the user can then run the NLM in Ring 0 and pick up the extra performance.

System Fault Tolerance

Microsoft says:

- Windows NT file system (NTFS) has built-in fault tolerant features, such as hot-fix and a full recovery system to quickly restore file integrity (similar to TTS). LAN Manager for Windows NT adds disk mirroring, drive duplexing, RAID 5 (redundant array of inexpensive disks) and support for UPSs. NetWare does not support RAID 5. This gives LAN Manager for Windows NT servers a competitive advantage.

Novell response:

- We agree that system fault tolerance is very critical for many applications running on networks today. For that reason, NetWare pioneered many of the reliability features found in today's network operating systems. In 1986, Novell introduced hot-fix, disk mirroring, drive duplexing, TTS and UPS support. This gives NetWare close to 7 years of experience with SFT functionality. For example, the notion of NTFS's maintaining a transaction log to insure integrity of the file system (journaling) has been in NetWare TTS for 7 years.

  We also agree that taking steps to increase reliability are important. During the fourth quarter 1992, Novell will introduce a controlled release of the next major technology stage of system fault tolerance—SFT III. This technology will create a new market by enabling many applications to be developed/downsized to network computing that would not have been without it.

- Introducing RAID 5 support in software is a good step for Microsoft. It is a relatively inexpensive way to introduce redundancy in a file system. We laud them for this feature.

  It is possible to get RAID 5 support for NetWare servers. RAID 5 is being implemented by many hardware vendors. Today, Maxtor delivers a product that supports RAID 5 on NetWare. Other hardware vendors are working on this capability. Novell is looking at providing this support in the future.

3. Responsiveness

Preemptive Scheduling

- Preemptive scheduling is a function of specific operating systems to control how much of the CPU's resources a given application is able to use.

Microsoft says:

- Windows NT surpasses NetWare because it limits the ability of server applications to take control of the server by being a preemptive, multitasking OS. NetWare requires that all applications are "nice guys."

Novell response:

- Preemptive scheduling is absolutely mandatory in multitasking, client OSs. It is important that the windowing environment, support of keyboard, mouse, etc. be extremely responsive to the desktop user. This is a good example of how Windows NT is designed to be a high-end desktop OS.

  Server environments are a lot different than the desktop. In any multithreaded application (generally most server applications are), there is an issue of programming around timing constraints or around concurrency problems (i.e., locks on memory). The key point is that it is easier for programmers to program around timing issues, especially in server applications, than it is around concurrency. This makes a non-preemptive server environment easier to develop to than a preemptive one. For single-threaded applications, a preemptive environment is probably best. But most server applications are multithreaded.

4. Broad Applications Support

DOS Applications Support

Microsoft says:

- Windows NT is ideally suited for a non-dedicated server, because it has the ability to run DOS, Windows and Windows NT applications while it performs as a server. This can be as either a peer-to-peer server or in a client/server configuration.

Novell response:

- There is no question that for selected configurations, a non-dedicated server is ideal. Generally, these are low-end servers that are supporting only a modest number of users running applications that are low-to-medium in their demands on the server.

  NetWare Lite, of course, is well suited to this configuration. When non-dedicated operation has been needed in the past, Novell has recommended NetWare 2.2. When NetWare 4.0 is released, there will be another configuration option that will be well suited to this configuration—NetWare for OS/2. Running on OS/2 2.0, the server can also support DOS, Windows and OS/2 applications. In fact, some people are surmising that OS/2 will be better at running DOS and Windows 3.1 applications than Windows NT will be. The only restriction to NetWare 4.0 on OS/2 is that it will not run Windows NT applications. But there are more OS/2 applications than Windows NT applications right now.

Windows Applications Support

Microsoft says:

- Microsoft has defined a set of application interfaces for network services, such as file, print, mail, dambase, and administration. This set of APIs is called Windows Open Systems Architecture (WOSA). WOSA allows users of Windows to access information and services across a multivendor computing environment. Other networking vendors, such as Digital, Novell and Banyan, are supporting WOSA.

Novell response:

- WOSA is a baseline set of APIs for developers to access network services. Novell is supporting it in our Windows and Windows NT client support. WOSA is a good attempt to standardize APIs to backend network services that can be provided by a number of vendors.

  However, WOSA does not support any of the other desktops—DOS, Macintosh, OS/2 and UNIX are completely ignored. This demonstrates Microsoft's lack of true commitment to heterogeneity at the desktop.

  Also, Microsoft did not necessarily pick the most popular API for a given network service. They picked the APIs they developed. For example, more vendors are supporting the VIM API for messaging (such as IBM, Apple, Lotus, Novell and Borland) than are supporting MAPI. MAPI, of course, was defined by Microsoft. (We could argue that MHS's SMF API has more developer support than either of these and is more of an industry standard.)

WOSA also does not take into account that other networking vendors may add services that are not provided for in WOSA (such as fax or imaging). It is not a comprehensive list. Nor does it allo[w] for extensions beyond the basic set of services provided by Microsoft by network operating systems' vendors who may have more functionality than Microsoft's networking products. As such, it may be considered too restrictive.

Better Development Tools

Microsoft says:

- Windows NT has better, more elegant development tools than does NetWare for building server applications. Microsoft is a leader in supplying development tools, and all are being moved to the Windows NT platform.

Novell response:

- NetWare NLMs are an extension of the OS. Building NLMs are like building system level software. While the tools for building NLMs are adequate today, Novell is not satisfied and is pushing for better. By the end of the year, there will be some excellent development tools available from significant tool vendors that will significantly enhance the ability to develop NLMs. This will make up for any short coming in the ability to develop server applications in NetWare compared to Windows NT.

  Most application development in a client/server network is done at the desktop. This means the programmer can use all of the development tools available for software development, including 4GL tools for client/server database access. They can take full advantage of Windows NT development tools if they plan to use Windows NT as a NetWare client.

  Microsoft claims that one OS is optimum for both the server and the desktop. But the client environment is very different from the server. There is no one OS that can do it all well on both client and server without compromise.

- Compared to UNIX and UnixWare, Windows NT's tools are not all that good. Again from the Wessels, Arnold and Henderson report on Windows NT:

  > "If one could point a finger at a weakness in the Windows NT environment, it is the software development tools. The UNIX developer is used to a plethora of development tools that assist in front-end design through to debug and testing. Windows NT will not initially have [a] rich development tool kit."
  >
  > —Ibid., June 11, 1992, page 6

Windows Console

Microsoft says:

- LAN Manager for Windows NT will have a significant advantage over NetWare in that it can support Windows and Windows NT console applications whereas NetWare cannot.

Novell response:

- Running Windows and Windows NT applications at the console is nice. But it is not absolutely critical to the operation of the server. And only a few individuals are ever exposed to the server console. The key is running easy-to-use, graphical, desktop network utilities for the user and supervisor.

  With NetWare 4.0, both user and administrative utilities will be Windows and OS/2 PM based, giving users the full benefits of graphical user interface in a NetWare environment. (Eventually, Macintosh and UNIX GUI utilities will be provided.) Also, the NetWare Management System is based on a graphical NetWare Management Map, which has both Windows and OS/2 PM support. (The Windows version of the map will probably be the most widely used of the two.) And the NetWare Services Manger makes up for any loss of a graphical user interface on the console. For example, it provides an NLM monitor, which displays a list of active NLMs in the server with associated memory utilization and other key information. With NetWare 4.0 and NMS, users will have plenty of graphical network utility support.

POSIX

- POSIX is an IEEE application interface definition standard. It was defined to assist users in developing portable applications, so that they would not be locked into a single hardware vendor to be able to run any specific application. POSIX is especially important in government computing circles. To make POSIX a worthwhile standard, all APIs within POSIX must be supported. POSIX is widely supported by most current UNIX implementations.

Microsoft says:

- Windows NT has built-in support for POSIX-based applications, making it a more standard environment than NetWare, which has no POSIX application support in the server.

Novell response:

- First of all, Windows NT is not UNIX. Even with a POSIX interface, this does not mean that no porting is required. You cannot take a UNIX application that was written to POSIX and run it on Windows NT. POSIX simplifies the porting effort, but applications still need to be moved over to the new environment. And just having a POSIX interface will not necessarily motivate UNIX ISVs to support Windows NT. It still boils down to the market potential. (See Section III-10 "NetWare Third Party Support," for more discussion on this thought.)

- Microsoft's POSIX support is really unclear at this point. At the time of this writing there is no documentation, only a verbal commitment to support it. It appears that this is a low priority and more of a "check off" item for submitting government proposals against UNIX.

- While Windows NT may have a POSIX interface subsystem for applications, an application cannot use it at the same time it is using the Windows subsystem. This defeats some of the value of Windows NT—giving a developer a standards interface with Windows. Because of this mutual exclusivity, Microsoft will really down play POSIX because Windows is so strategic to NT. It is our opinion that POSIX will not be actively promoted to developers.
- It is possible to build client-server applications that use POSIX in a NetWare LAN. Using a UnixWare desktop and NetWare, the client application can be fully POSIX compliant. Using UnixWare as both desktop and server, the client and server applications can be completely POSIX compliant.

5. Portable Design

- Operating system portability means that it can be easily moved to different hardware architectures. There will always be some effort to port the operating system, but it can be minimized when designed to be portable from the ground up.

Microsoft says:

- Windows NT was designed to be a portable OS, thereby enabling it to be ported to run on multiple different processors, such as MIPS R4000, DEC's Alpha RISC chip, etc. Applications running on RISC platforms will run approximately 50% faster than on a 486 server. This will enable Windows NT to be very scalable as a server platform. It will run on low cost 386 servers up to high-end RISC machines. Native NetWare does not have the ability to be ported to different processors and is limited to run only on Intel 386/486 processor-based servers.

Novell response:

- In December 1991, Novell announced a strategic relationship with Hewlett-Packard. In this announcement, Novell disclosed plans to move NetWare to run on the HP PA-RISC chip. While no availability dates have been discussed publicly, Novell has indicated that other RISC architecture's are being explored.

  Novell gained quite a bit of portability and hardware independence experience with NetWare for UNIX and NetWare J (the Japanese version of NetWare). The next major release of NetWare after 4.0 is being designed to run native NetWare on any number of hardware architecture's. The approach that Novell is taking is one that will enable NetWare to maintain NLM compatibility (NLM code will need to be recompiled, just like Windows NT applications will need to be recompiled) and provide high performance. It is our assertion that NetWare running on the same RISC system will be substantially faster than Windows NT will be.

- Microsoft is doing as much as they can to have lots of hardware horsepower because Windows NT needs it. Windows NT is going to be very processor hungry. As stated earlier, NetWare will outperform Windows NT because of its fundamental architecture.

- A key fact about server performance is that it has more to do with server I/O speed and less with processor speed. Therefore, it is more important to speed up the I/O on servers (both hardware and OS) than to find the fastest processor. This is clearly an area that Novell leads the market in—being written to support very high I/O speeds and supporting the largest set of third party I/O products in the market, including fast bus master LAN, disk and other I/O adapters.

- As stated earlier, there will be some compatibility issues running Windows NT on a RISC machine. For example, enhanced mode Windows 3.0/3.1 applications will not work on Windows NT when running on RISC machines. Also, 386-DOS extended programs will not work. Both of these run in 386 mode. Only standard mode (286) Windows applications will run. (This is because DOS and Windows applications run under the Windows NT version of Insignia Solutions's SoftPC product, a PC emulator which emulates 286 mode only.) We can only wonder what else will not run on the RISC environment.

- Most Windows NT applications will be developed on the Intel-based version of Windows NT. All of these applications have to be recompiled to run on any specific RISC version of NT. It will be challenging for many ISVs to port their NT application to every different RISC implementation. This might limit the marketability of the different NT versions.

  NOTE: This is an issue that UNIX vendors have had to face for a long time. Microsoft is only beginning to understand this issue.

6. Scalability

Symmetric Multiprocessing Support

- Multiprocessing describes a system with multiple processors where different tasks run on different processors. There are two types: symmetric (SMP) or asymmetric (AMP). With symmetric multiprocessing, any task can be assigned to any processor. With asymmetric multiprocessing, each processor is permanently assigned a particular set of tasks.

Microsoft says:

- Windows NT surpasses NetWare in performance potential because of its built-in design to support symmetric multiprocessing. NetWare does not support SMP.

Novell response:

It is our assertion than SMP is over promoted to the industry for the following reasons:

- Windows NT is not as fast as NetWare and therefore needs the extra processor support to perform like NetWare. This means an extra hardware expense to match performance.

- More is not necessarily better. As each processor is added, increased processing time is spent by the CPUs arbitrating for system resources. One example highlighted in the press recently demonstrates this. The study concluded that a four processor SPARC system actually ran slower than a two processor SPARC system. In a second example, Apricot, a LAN Manager OEM, found LAN Manager MP (on OS/2) to be slower than the single processor implementation.

- Quite often, new higher speed processors may be faster than MP systems. For example, a 486 50 MHz server is faster than a MP 386 33 MHz system. Does it justify the energy to develop an MP system when the next processor is due out in the next 6-12 months. By the time it takes to get an MP hardware server out the door, the next processor from Intel may be just about ready to ship.
- The bottleneck for >90% of the servers is not processing time. It is generally disk and network I/O. For that reason, Novell engineering has spent the majority of development resources on improving performance in these areas.
- Novell is committed to build a multiprocessor implementation that will truly add value and performance. SFT III will be the first implementation that will take advantage of a second processor in the server to boost performance. Other future implementations will add the ability to run NLMs on additional server processors.
- A case can be made that a limited version of AMP is available in NetWare today. There are a number of bus master LAN and disk adapters that support NetWare which have on-board processors to speed up these respective server I/O operations.
- PC Week broke a story August 31, 1992 about a new development to provide a NetWare multiprocessing server. Oracle and NetFrame have teamed up together to develop a multiprocessing version of Oracle 7 running under NetWare on NetFrame servers. Oracle is bringing the multiprocessing support in Oracle 7 to their NLM version. Up to five processors will be supported in a NetFrame server. One of these processors can be standard NetWare that can run any NLM. Up to four "application processors" that run the Oracle NLM can be added. While the product has not been officially announced by Oracle or NetFrame, it is a confirmed direction for both companies.

7. Security

C2

- C2 is a security rating by the US government. The National Computer Security Center (NCSC), an arm of the National Security Agency, is responsible for certifying computer systems as meeting one of a number of higher security levels. C2 security rating is especially important for government computer users.

Microsoft says:

- Windows NT is designed to support C2-level security. This will make it a very secure environment.

Novell response:

- While Windows NT may be designed for C2 security, it is not C2 certified. Getting any security rating with NCSC is not an easy task. It generally takes 18-24 months to go through the process. Because the process is so long, one public indicator is whether or not a MOU, or Memo of Understanding, has been issued for any product by the NCSC. If so, it means that the product is well into the security certification process. To date, no MOU on Windows NT has been announced publicly. This means Microsoft has at least 12-18 months before Windows NT will reach the objective of being C2 certified. Assuming, that is, that it passes. (If it doesn't, it will have to start the process all over again.)

- It is our opinion that Windows NT is only being planned to be certified as a desktop OS. There is an ENORMOUS difference between being designed and certified for C2 as an OS versus as a network server. (An OS certification is defined in the "Orange Book" whereas the network certification is defined in the "Red Book.") Novell is way ahead of all other competitors with respect to getting a network certification of NetWare. Novell is taking 4.0 through the certification process. (4.0 adds authentication and auditing, two features that were necessary to achieve C2 network certification.) We are very close to obtaining an MOU. No MOUs have been announced by NCSC for any network product. Because C2 network certification is so new, NCSC is only doing one certification at a time. Because we are in the evaluation pipe, we believe Novell is leading all NOS vendors in getting a network C2 certification. And a network C2 rating will be substantially stronger than an OS certification.

8. Built-in Networking

Peer-to-Peer Networking

Microsoft says:

- Windows for Workgroups 3.1 provides peer-to-peer networking for Windows users. Future MS DOS 6.0 users will be able to participate as well. It is a cost effective solution for networking Windows users and is totally integrated into Windows 3.1. Plus Windows for Workgroups users can access a Windows NT server. Microsoft will also provide sofrware to allow DOS clients to access Windows for Workgroups servers, but DOS machines will only be able to function as clients.

- Windows NT includes built-in networking that can be used on a peer-to-peer basis, which is compatible with Windows for Workgroups. Both products will offer great support for Windows applications. Neither NetWare Lite allow DOS or Windows users to connect to Windows NT servers.

- Windows NT's peer-to-peer networking can be mixed and matched with client/server networking. This gives you tremendous versatility.

Novell response:

- NetWare Lite 1.1 is now compatible with Windows. The next release will add Windows-based utilities.

- The add-on software to enable DOS to participate in a Windows for Workgroups peer-to-peer network has not been talked about much. It almost appears as if DOS is an after thought. We will probably hear the typical Microsoft reply: "Oh yes, DOS users can participate in Windows networks, but to get all the functionality, you need ..."

  NetWare Lite allows DOS users to function as a peer-to-peer server. There are no restrictions on the DOS user. DOS and Windows are treated equally. Microsoft forces users to upgrade to Windows to get server support.

  The Windows support for DOS nodes in a peer-to-peer network is too restrictive. Jamie Lewis wrote:

  > "There's one overriding issue in [the peer-to-peer] market. Because it's too expensive, most people using peer-to-peer networks at the low end are still using character-based DOS. At best, low-end networks are a mix of DOS and Windows. . . . Contrary to the noise level, more people are buying character-based DOS than are buying Windows."
  >
  > —*PC Week*, July 27, 1992, page 69

- Whether NetWare Lite can access a Windows NT server is not a big issue. What is the install base of Windows NT servers? Obviously none today. The real issue is "Can a NetWare Lite user access a NetWare server?" A NetWare Lite user can access a NetWare server by running both Lite and NetWare requesters at the DOS or Windows desktop. There is work to provide tighter integration in the future, but mixing and matching NetWare Lite and NetWare is possible right now.

- Novell's future direction for peer-to-peer is to completely integrate all of the key desktops. Rather than limit simple networking to DOS, Windows and Windows NT only, Novell is working towards connecting DOS, Windows, Windows NT, Macintosh, OS/2 and UNIX desktops together. The freedom of choice will extend to peer-to-peer networking.

- If Microsoft attempts to push peer-to-peer networking too strongly, then it is best to promote the advantages of client/server networking over peer-to-peer:

  - Client/server requires less software on the desktop by putting the majority of the shared software on the server. This means less overhead on the desktop. It also means client/server is more cost/effective as networks grow beyond a small LAN, because it uses less overall resources in the network to support connectivity.
  - Peer-to-peer networking is well suited for small networks, but is difficult to manage for larger networks. For example, how do you do distributed server backups in a peer-to-peer network?
  - Client/server networking is required when running over wide area networks or internetworks. Peer-to-peer is only suited for small, locally-contained networks.
  - While peer-to-peer services are being bundled in many desktop operating systems, a number of future trends are leaning more towards client/server network. For example, many new desktops, such as pen based or sub-laptop, are too small to support peer-to-peer. Also, higher end PC functionality, such as multimedia, is too demanding to work well in peer-to-peer. Client/server is the only practical networking approach for supporting these new technology advancements.

  NOTE: For information on responding to Windows NT's built-in client/server capability, see Section IV.1 "Pricing."

Platform for Distributed Applications

- Windows NT has a built-in RPC (Remote Procedure Call) that is interoperable with Open Software Foundation's (OSF) networking model called Distributed Computing Environment (DCE).

Microsoft says:

- Windows NT provides a DCE-compliant RPC (called MS RPC) for the development of distributed applications. Support for DOS and Windows will be provided. Named Pipes, NetBIOS and TCP/IP transports will be supported. Microsoft will also provide support for IPX/SPX in the future. Because it is DCE based, Windows NT support for standards is unparalleled in the industry.

Novell response:

- We agree that RPC technology is very useful for the development of client/server applications. Our current support for RPC is based on the definition done by Sun, Netwise and ourselves, called Transport Independent RPC, or TIRPC. The TIRPC has its real roots in Sun's RPC, which is a part of NFS (which is supported by over 150 vendors). Because of that, the install base of TIRPC is very large. The install base of DCE RPC is limited today to primarily Apollo and some HP installations.

  Supporting the DCE RPC would not be that difficult. It is more a matter of resources. If there were enough implementations of the DCE RPC on the market, then perhaps it would justify the effort. (Since Microsoft will support IPX/SPX for DOS, Windows and Windows NT, Novell only needs to consider NetWare and possibly OS/2 and UnixWare.) But the interesting thing is that while Windows NT's RPCwill interoperate with, it is not identical to the DCE-defined RPC.

- To support multivendor network applications, DCE RPC support also requires a common transport, primarily TCP/IP. When LAN Manager for Windows NT supports TCP/IP, this will allow client/server applications between it and DCE hosts. When NetBEUI is used, client/server applications will be limited to between DOS, Windows and Windows NT nodes.

Native TCP/IP Support

Microsoft says:

- Windows NT and LAN Manager for Windows NT can run on TCP/IP for all network services, such as file and print, enabling it to run better in a standards-based networking environment. NetWare does not provide native support for TCP/IP between DOS, Windows or Windows NT clients and NetWare servers for basic services.

Novell response:

- We recognize that some customers desire the ability to run all of their network services on a single protocol. TCP/IP is probably the most common single protocol that is requested. However, it is often very difficult to standardize a single protocol in any sizable network. What about SNA, DECnet and AppleTalk? It is our assertion that the most important aspect of networking is to identify and standardize on a multiprotocol integration platform that can minimize the issues of multiple protocols on the network.

- For those companies that still want a single protocol standard, we have two key points to make:

  1) Novell delivers the ability to encapsulate IPX packets within an IP envelope. This implementation fully addresses migration and compatibility with negligible performance loss. Novell delivered a white paper at Interop last year that outlines this implementation.

  2) Novell is working towards obtaining full transport protocol independence. Every release of NetWare since 3.0 is getting us closer to being able to deliver this capability. While a date for this functionality has not been given publicly, we can give a commitment to deliver running NetWare (NCPs) on TCP/IP in the future.

  This commitment is backed by an incredible set of TCP/IP functionality that has been delivered to the market with products such as LAN WorkPlace, NetWare NFS, FlexIP, built-in TCP/IP routing services in NetWare 3.11, NetWare Multiprotocol Router, and SNMP support in LANtern, NetWare Hub Services and the NetWare Management System.

- Microsoft's TCP/IP support is not without its own set of issues. Being NetBIOS based, LAN Manager on TCP/IP has some definite scalability and management issues. NetBIOS is not well suited to TCP/IP addressing. And any medium-to-large TCP/IP network cannot handle NetBIOS broadcast packets. The LAN Manager implementation therefore is based on static node address tables that become complex to manage, change and update.

  Also, Microsoft lacks many of the TCP/IP features that Novell offers, such as IP routing, strong SNMP support, no FTP server capability, no Line Printer services for general TCP/IP nodes, and no file sharing for TCP/IP NFS nodes. Again, Novell can offer a lot more to the true "TCP/IP shop."

9. Remote Windows Users

Microsoft says:

- The Microsoft Remote Access Service provides excellent support for remote Windows users and will support Windows NT. RAS enables remote users to run Windows applications with excellent performance. Novell support for remote Windows users through the NetWare Access Server is so restrictive that users are limited to running only text-based applications when remote.

Novell response:

- The NetWare Access Services 1.3 now supports Windows! NAS 1.3 supports standard mode Windows 3.0 and 3.1 applications. And the performance of Windows applications and Mouse support on a remote PC through NAS 1.3 is good. Support for enhanced mode Windows applications is planned for a future release.
- Reviews done by third parties have shown Microsoft's Remote Access Service to be slow:

> "The Remote Access Service works well with client/server applications (specifically SQL Server), although simple file- and print-sharing activities are slow with common modems."
>
> *PC User NSTL Lab Report*, April 22, 1992

10. Naming Service

- Windows NT bundled network services only support a single domain. Each NT node will maintain its own access control database, much like the bindery. LAN Manager for Windows NT is required for each Windows NT server to get multidomain support.

Microsoft says:

- LAN Manager for Windows NT's domain service now enables users to span multiple domains. With a single user account and password, a user will be able to access the resources of the entire network, not just a single domain.
- Novell's install base is 100% NetWare 2.X and 3.X. None of these operating systems support any type of domain or global naming service. Administration of medium to large existing NetWare LANs is difficult because of the single-server management orientation of the current NetWare install base.

  Novell claims their lack of global naming service is solved in NetWare 4.0. Maybe so, but upgrading to NetWare 4.0 will be difficult at best. This will prevent most users from wanting to upgrade to NetWare 4.0.

  NetWare 4.0 is so different, users might as well re-evaluate their network OS standard. In many cases, they will find migrating to LAN Manager for Windows NT to be easier than upgrading to NetWare 4.0. Or make all of you new installations be LAN Manager for Windows NT. Users can connect to both NetWare and LAN Manager for Windows NT.

Novell response:

- Upgrading from any network software release to one with major changes is not simple and will always have some issues to plan for. Novell is developing a number of tools that will simplify the upgrade from NetWare 2.X/3.X to NetWare 4.0. A directory service planning guide will be available in October. There will also be migration utilities available with NetWare 4.0 that will simplify conversion from NetWare 2.X or 3.X servers to 4.0.