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Logging In to IBM LAN Server and NetWare from a DOS Workstation

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This Application Note explains how a DOS workstation can simultaneously log in to an IBM LAN Server and a NetWare v3.11 server connected to a Token Ring network. It summarizes the procedure for setting up each server environment and for loading the IBM and Novell workstation software. It also gives tips on managing workstation memory and working in the dual login environment. This AppNote is the first in a series on IBM/Novell interoperability issues.

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Introduction

This Application Note is the first in a series dealing with IBM/Novell interoperability issues. This introductory Appnote explains how a DOS client can log in concurrently to both IBM LAN Server and a NetWare file server.

We begin with a short overview of DOS and OS/2 and the role they play in the interoperability matter. We also briefly discuss the IBM LAN Server and NetWare v3.11 environments and how they interact with the DOS client operating system. After this overview, our focus turns to the setup of the various operating systems. Finally, we discuss the components and steps needed for a DOS client to have dual login capability in a Token Ring network.

This document is intended to provide information for Novell and IBM users who want concurrent access to both NetWare and LAN Server environments. It is also useful for IBM people who want to sell NetWare or use it as a leverage point in a sale.

DOS and OS/2

DOS (disk operating system) has been around for many years. While it works fine as a single-tasking operating system, DOS is limited in the amount of memory it can access (640KB) and is not a suitable platform for processing more than one task at a time.

OS/2 was created to overcome DOS's multitasking and memory handling shortcomings. With OS/2, a user can load several programs at once and switch between them at will. For example, a user can leave a word processing program without terminating it, work for a while in a spreadsheet program, and then return to the word processing program.

OS/2 uses preemptive scheduling to handle its multitasking operations. At any time, OS/2 can stop the currently running program and turn control of the CPU over to another program. Thus each program gets its turn at the CPU. This switching occurs so rapidly that it appears to the user as if each program is truly running simultaneously with other programs (in other words, "parallel" multitasking).

OS/2 can also execute programs in addition to those the user is running. Thus it is able to provide advanced services such as network mail in the background, without interrupting or interfering with the user's work.

OS/2 has the ability to handle large amounts of RAM. In addition, it can swap memory segments temporarily to the hard disk drive, giving it the capability of using more RAM than is physically installed in the computer.

Due to OS/2's advanced multitasking and memory management features, it is used as the base operating

system for the IBM LAN Server program. As a single-tasking operating system, DOS cannot perform all the concurrent tasks required of a network server. Consequently, DOS is used as a client operating system only, while OS/2 is used as both a client operating system and as the platform for the LAN Server program.

IBM LAN Server and NetWare v3.11

The following sections describe the IBM LAN Server and NetWare v3.11 environments, giving a brief overview of system requirements, features, and configuration options.

LAN Server Features

Figure 1 shows the basic components of the IBM LAN Server environment.

Figure 1: IBM's LAN Server runs as an OS/2 Extended Edition application.

IBM LAN Server is an OS/2 application that runs on an 80286 or greater CPU. It requires OS/2 Extended Edition version 1.3 and a minimum of 5MB of RAM, with at least 30MB of hard disk space. These minimum system requirements may need to be increased depending upon the particular environment workload.

LAN Server works with Token Ring, Ethernet (which IBM refers to as "Etherand"), and IBM PC Network interface cards. Intermingling Token Ring and Ethernet networks can be accomplished by using the IBM 8209 bridge, or by using the internal routing capabilities of a NetWare server. (These alternate configurations will be discussed in future AppNotes.)

LAN Server coordinates the sharing of resources such as disks, files, printers, and serial-attached devices (such as modems and plotters). It also provides overall security for all shared resources. In addition, LAN Server allows remote program execution. In other words, OS/2-based clients (users) can run their programs remotely on the LAN Server.

Configuration control and fine tuning is done through the CONFIG.SYS and IBMLAN.INI file. The CONFIG.SYS file controls the OS/2 configuration; IBMLAN.INI controls the LAN Server environment.

NetWare v3.11 Features

NetWare also coordinates resource sharing for network users. However, NetWare is not an application—it is a full-fledged network operating system. Unlike LAN Server, NetWare does not require a base operating system to function. NetWare features advanced multitasking capabilities and powerful memory management features, as

well as full network support capabilities.

NetWare v3.11 is a 32-bit operating system which requires an 80386 CPU, 4MB of RAM, and at least 30MB of hard disk space. (Again, these specifications are minimums and in most cases need to be increased.)

NetWare v3.11 can accommodate up to 16 network interface cards, each supporting multiple protocols simultaneously. NetWare tunes itself dynamically, but various tuning parameters can be manually altered through the use of the SET console command.

DOS and OS/2 Client Support

Both OS/2-LAN Server and NetWare take advantage of great amounts of memory and disk storage, while providing network users with a stable and secure computing environment. Each system fully supports the DOS and OS/2 client operating systems. DOS clients can log in to both systems by using IBM's DOS LAN Requester and the NetWare shell. For OS/2 clients, dual login can be established via Presentation Manager's LAN Requester option and the NetWare Requester for OS/2. (The exact procedure for OS/2 will be addressed in a future AppNote.)

To illustrate how "dual requester" interoperability works, we set up a small test network in our lab. The configuration is shown in Figure 2.

Figure 2: Our test configuration consists of an IBM LAN Server, a NetWare server, and two DOS workstations.

NetWare and LAN Server Setup

In this section, we present the basic steps required to set up a NetWare v3.11 server and an IBM LAN Server. These are quick guidelines only; refer to Novell and IBM documentation for detailed installation instructions.

Installing a NetWare v3.11 Server

To set up a NetWare v3.11 file server, follow these steps:

1. Set up the hardware. You must have an 80386 CPU, a minimum of 4MB RAM, an appropriate hard disk, and one or more network interface cards.

2. Decide where you want to place the file server boot files. You can choose to boot a NetWare v3.11 file server from a floppy drive or from an internal hard disk.

3. Run SERVER.EXE. SERVER.EXE loads the core NetWare

v3.11 operating system.

4. Load disk drivers (NetWare loadable modules with a .DSK extension) for the server's hard disks. This step allows the file server to access its storage devices.

5. Load the INSTALL NetWare loadable module. This utility formats and mirrors hard disks, creates partitions, volumes, and file server boot files, and loads the SYSTEM and PUBLIC files onto the network.

6. Load LAN drivers and other NLMs. You must load one or more specific LAN drivers depending upon the network interface cards installed. Other NLMs will vary, depending on your customized system configuration.

7. Bind the protocol to the LAN driver. NetWare's native protocol is IPX (internetwork packet exchange). Other protocols (such as IP or AppleTalk) may be bound or tied to the installed network interface cards.

8. Create the AUTOEXEC.NCF and STARTUP.NCF files. These files are accessed by the file server before normal operation begins. They basically activate the hardware and set up a working file server environment.

After these eight steps have been completed (which can take as little as 15 minutes), the NetWare file server setup has been completed. You can then commence with administrative and security-related tasks.

IBM LAN Server 1.3 Setup

Here are the basic steps required to set up an IBM LAN Server. Again, these are quick guidelines; refer to IBM's documentation for detailed installation instructions.

IBM LAN Server 1.3 is a separate software package that must be installed after the base OS/2 installation. Before installing LAN Server, you must first install OS/2 Extended Edition 1.3 and two of its component programs: the Communications Manager and the LAN Requester.

Installing OS/2 EE 1.3

Here are the steps for installing OS/2 Extended Edition 1.3:

1. Install the base OS/2 operating system options. These include country information, documentation, and fonts.

2. Partition the fixed disk and create logical drives.

3. Choose a file system type: high performance file system (HPFS) or File Allocation Table (FAT). For a LAN Server installation, it's best to use the High Performance File System. HPFS provides several enhancements over the FAT-based file system, including fast access to large disks, file name lengths up to 254 characters, and caching directory and file system structures. These features are especially beneficial to local area networking.

4. Install optional system utilities. These include BACKUP, FDISKPM, LABEL, LINK, RECOVER, RESTORE, SORT and TREE.

5. For LAN Server, turn off the option of installing the OS/2 DOS environment. It is not needed, and the OS/2 DOS environment takes up valuable memory and system cycles, which may degrade LAN Server performance.

6. Install support for attached serial devices (such as a mouse).

7. Install serviceability and diagnostic aids. These provide information for problem determination.

Installing Communications Manager

The base Communications Manager component allows remote communication connections, remote data services using Structured Query Language (LAN Only option), and the ability to recognize LAN adapter types and NetBIOS. This capability is necessary for the LAN Requester and LAN Server components to function.

Installing the LAN Requester

This step installs the OS/2 LAN Requester files on the server disk. These files must be present before LAN Server can start. They also allow the administrator to use the server as a workstation.

Installing LAN Server

Once the base OS/2 operating system is installed, along with the Communications Manager and the LAN Requester, the groundwork has been laid for the final step—the LAN Server installation.

Reboot the machine. The OS/2 operating system will initialize and display the Presentation Manager graphical front-end. To install LAN Server, open an OS/2 full-screen window and follow the LAN Server installation instructions outlined below.

One tricky part involves defining the computer as either a "domain controller" or an "additional server." A domain is a set of one or more servers that share resources. The domain controller is a server within the domain that stores a database of all the domain's servers, resources, users, and their rights. The domain controller is responsible for coordinating and maintaining activities on the domain. Additional servers are simply other servers that are part of the domain.

1. Enter the server name and the domain name. These two names must be different. The server name identifies the actual computer the server program is running on. The

domain name is simply an alphabetical string assigned to the domain so that it can be easily identified by users.

2. Select the Requester network service that will be activated upon system startup.

3. Select the Server network services that will automatically engage upon startup.

4. Hit the F3 key to save the selections.

After these steps have been completed, you can make the OS/2 LAN Server 1.3 program operational by double-clicking on its icon.

Setting Up a DOS Client for Dual Login

So far, we have discussed the Novell and IBM server environments. The last element of our interoperability discussion is the DOS client, or workstation. It is in the client that the dual login functionality exists.
The DOS client should be a 286 or higher CPU, with at least 2MB of RAM. If the workstation is a 286-based machine, install extra RAM according to the LIM 4.0 *expanded* memory specification. If the workstation is a 386- or 486-based machine, we recommend using an *extended* memory management software package. Two of the better known packages are QEMM by Quarterdeck and 386Max Professional by Qualitas.

All of the IBM components mentioned below are supplied with the IBM LAN Server 1.3 package; the Novell components are all supplied with NetWare v3.11.

Loading the IBM LAN Server Client Software

To achieve a dual login environment, the DOS client user must log in to the IBM LAN Server first. Three software components must be loaded to accomplish this from a DOS client:

1. Load IBM PC-DOS version 3.3 or greater.

2. Load the IBM LAN Support Program v1.2 or greater (see "The IBM LAN Support Program" for more information).

3. Load the IBM DOS LAN Requester (DLR).

After Step 3, the workstation has a logical link with the IBM LAN Server.

Note: Currently, IBM's version of DOS (PC-DOS) must be the base operating system for the dual requester client. This is a requirement of the installation portion of the LAN Support Program only. Once installed, both the LAN Support Program

and the DLR will function with most generic versions of DOS. According to IBM, future versions of the LAN Support Program (including the installation portion) and the DLR will function with all generic DOS versions 3.3 or greater.

Loading the Novell Workstation Software

The next stage is to load Novell's DOS workstation software. This software includes the LAN card driver, IPX, and the NetWare shell.

There are two different ways of logging into a dual environment from the Novell side: using ODI drivers or using standard NetWare LAN drivers.

Using ODI Drivers. The preferred method of loading the NetWare workstation software is to use Novell's ODI (Open Data-Link Interface) drivers. These drivers provide greater flexibility in communication and control of the network interface cards being used.

The individual ODI modules use more of the 640KB base memory than the standard LAN drivers do. However, since the ODI modules are separate programs, they are easier to load into high memory using memory manager software.

Figure 3 illustrates how the IBM and Novell ODI workstation software modules coexist in the PC.

Figure 3: The dual login workstation environment for DOS ODI clients.

Load the ODI modules in the following order:

1. Load the Link Support Layer module (LSL.COM).

2. Load the LANSUP.COM module. This driver interfaces with IBM's LAN support program for Token Ring and Ethernet version 1.2 or greater.

3. Load IPXODI.COM.

4. Load the NetWare expanded memory shell that corresponds to the workstation's version of DOS (EMSNET3 for DOS 3.x, or EMSNET4 for DOS 4.x).

Loading these modules attaches the workstation to the nearest Novell file server. The user can then log in to the server using the NetWare LOGIN command.

Using Standard LAN Drivers. The second method of loading the Novell workstation software is to use the standard Novell network interface drivers. These are the drivers created with Novell's WSGEN.EXE program.

Generate and load the standard workstation software as follows:

1. Run WSGEN and select the driver for Token Ring. Choose the LAN Support configuration option—this allows the driver to coexist with the previously-established IBM drivers by talking with the IBM LAN Support Program. If you choose a standard Token Ring option, it will grab control of the card away from the IBM drivers and cause a system lockup.

2. Load the resulting IPX.COM file at the workstation.

3. Load the NetWare shell. You have several choices, depending on what type of memory you have installed in the workstation. Use the standard shell (NET3, NET4, or NET5) if the workstation has no extra memory. A general purpose shell (NETX.COM) is available that will work with all versions of DOS. Currently, this is the preferred shell for use with DOS 5.0.

   Use the expanded memory shell (EMSNET3, EMSNET4, or EMSNET5) if the workstation has the appropriate amount of expanded memory. Use the extended memory shell (XMSNET3, XMSNET4, or XMSNET5) if it has extended memory. The expanded and extended memory shells conserve base memory by loading the main portion of their code into expanded or extended memory, leaving only a small portion resident in the main memory work area.

When the above steps have been completed, the user can log in via the NetWare LOGIN command.

Figure 4 shows how the IBM and standard Novell workstation software coexist in the PC.

Figure 4: The dual login environment for workstations using Novell's standard DOS shell.

The IBM LAN Support Program

The IBM LAN Support Program (LSP) is the underlying foundation for the dual requester client. The LSP consists of a set of drivers that provide the program interface to support network applications through Token Ring, IBM PC Network, or Ethernet network interface cards. In this AppNote, however, we discuss the LAN Support Program only as it pertains to Token Ring networks.

Figure 5 illustrates the components of the LAN Support Program for Token Ring.

Figure 5: Components of the IBM LAN Support Program.

LSP Device Drivers

The drivers are loaded at boot time through the DOS client's CONFIG.SYS file. On Token Ring networks, three files must be loaded as "DEVICE=" statements in CONFIG.SYS. These are:

DXMA0MOD.SYS The interrupt arbitrator device driver (*always* needed)
DXMC0MOD.SYS The Token Ring card device driver
DXMT0MOD.SYS The NetBIOS interface device driver (must be loaded *last*)

For dual login to function, all three LAN Support modules must be installed and operating. The order in which these device drivers are loaded is important. The DXMA0MOD.SYS file must be loaded first; the DXMT0MOD.SYS file must be last.

The parameters following the device driver names will be set according to the responses given in the LAN Support installation program (DXMAID).

DXMA0MOD.SYS Parameters. The "001" following the interrupt arbitrator driver is the country code value. The value specified determines what language text will appear in for any screen massages. Currently these countries include the United States, Germany, Denmark, Latin America, Sweden, Portugal, and Japan.

DXMC0MOD.SYS. The DXMC0MOD.SYS device driver is the Token Ring specific module. When installing the LAN Support Program, you are given the option of the following interface card types:

- Token Ring (C0)
- Ethernet (E0)
- PC Network (G0, G1, or G2)

The values shown in parentheses appear as the fourth and fifth characters in the device driver name (DXM*C0*MOD.SYS, DXM*E0*MOD.SYS, and so on).

NetBIOS Parameters. The last module, DXMT0MOD.SYS, is the NetBIOS interface. This module acts as the link between the network hardware support drivers and the network application software. The DXMT0MOD.SYS module has several switches that can alter the LAN Server environment:

S= (Sessions=) Indicates the maximum number of NetBIOS interface device driver sessions that can be defined. A session is a connection used to identify the logical path between communicating partners. The parameter must be a decimal number from 0 to 254. If

omitted or 0, the default value is 16. If the value is less than the number specified by the Stations parameter (explained below), it will be set to the value of Stations.

C= (Commands=) Indicates the maximum number of NetBIOS interface command network control blocks (NCBs) that can be outstanding at one time. These are commands that are being processed by servers or requesters. This parameter must be a decimal number from 0 to 255. If omitted or 0, the default value is 12.

ST= (Stations=) Indicates the maximum number of NetBIOS interface link stations that can be defined. A link station identifies a physical path between workstations that use the same connection-oriented protocol. The parameter must be a decimal number from 0 to 254. The realistic maximum depends on the amount of shared RAM on the adapter. If omitted or 0, the default value is 16.

Dual Logon CONFIG.SYS and AUTOEXEC.BAT Files

This section discusses the CONFIG.SYS and AUTOEXEC.BAT files as they pertain to the DOS client invoking dual login functionality. The CONFIG.SYS and AUTOEXEC.BAT files must be modified for dual login. The examples below show a CONFIG.SYS and AUTOEXEC.BAT optimized for memory and functionality.

Usable memory (640KB base) and speed are factors that can be increased or decreased depending on the many environmental variables. These variables include:

- Operating system type and version
- Memory manager
- CPU
- Amount of extra RAM

The sample files contain all the necessary statements we used to enable our test ACER 1100/33 with 8MB of RAM to function as a dual requester DOS client.

We used IBM PC-DOS 3.3 and 4.01. For memory management, we used Quarterdeck's QEMM 5.11, as well as the BUFFERS and LOADHI utilities supplied with that package.

We also added the "/ems" and "/pop" switches for the DOS LAN Requester. The "/ems" parameter enables the use of expanded memory in a DOS machine; "/pop" provides the workstation with a pop-up window for incoming mail messages.

Sample CONFIG.SYS File

Here is the CONFIG.SYS file we used in our test configuration.

```
DEVICE=C:\QEMM\QEMM386.SYS RAM NOSORT X=CC00-CDFF
 X=D800-DBFF
files=50
buffers=1
lastdrive=i
FCBS=16,8
SHELL=C:\COMMAND.COM /E:2000 /P
device=c:\qemm\loadhi.sys /r:1 c:\DXMA0MOD.SYS 001
device= c:\qemm\loadhi.sys c:\DXMC0MOD.SYS
device=c:\qemm\loadhi.sys /r:2 c:\DXMT0MOD.SYS S=12 C=14
 ST=12
```

The key points of interest in the CONFIG.SYS file are the insertion of the QEMM related lines, the additional environment space (E:2000), and the LASTDRIVE command.

Environment Space. The additional DOS environment space provides the DLR more working room for any system variables it might use.

LASTDRIVE Command. The LASTDRIVE command is important because this tells the system where the last LAN Server drive letter ends and where the first Novell drive letter will begin.

Since the LAN Server is the first server that will be attached, it does all the logical drive map archiving. In other words, to see all logical drives and resources (such as printers and serial devices) available to the current workstation, the user must perform the IBM LAN Server NET USE command. This complete accounting will only appear through the NET USE command, not through the Novell MAP command. (See "NET USE Directory Resource Listing" in the appendix for more information.)

Sample AUTOEXEC.BAT

Here is the AUTOEXEC.BAT file we used in our test configuration. The file has two main sections: the DLR and the Novell section.

```
REM  *** Autoexec.bat for DOS 3.3 workstation ***
cls
prompt $P$_$g
PATH=C:\QEMM;C:\DOSLAN;c:\;c:\dos;c:\util;c:\novl
cls
@ECHO OFF
YNPROMPT Y N 30 Start DOS LAN Requester (Y/N)?
IF ERRORLEVEL 1 GOTO NODLR
rem ****  The IBM DLR section *******
NET START
IF ERRORLEVEL 1 GOTO NODLR
CALL INITFSI.BAT
net logon dos1
:NODLR
YNPROMPT Y N 30 Start NetWare Requester (Y/N)?
if errorlevel 1 goto NONW
rem ***** The Novell Section ********
c:
cd\novl
loadhi lsl
```

```
loadhi lansup
ipxodi
c:\qemm\loadhi /r:3 c:\qemm\buffers=25
emsnet3
j:
login dos1
path c:\qemm;z:;y:;c:\;c:\doslan;c:\dos;c:\util;c:\novl
:NONW
```

YNPROMPT is a small program provided with DLR software which allows a yes or no question to be answered at the DOS command line. This enables the possible execution of selected portions of the batch file.

DLR Section. There are two points of interest in the DLR section: the NET START and the NET LOGON DOS1 commands. The NET START command initializes the DOS LAN Requester program at the workstation. The NET LOGON command automatically logs the user in to the LAN Server with the user name "DOS1," bypassing the standard logon screen.

Novell Section. In the Novell section, the LSL.COM and LANSUP.COM programs are both loaded into high memory with the LOADHI.COM utility supplied with QEMM.

Note also that 25 buffers have been loaded high in the AUTOEXEC.BAT file, while only one buffer was loaded low in the CONFIG.SYS file. This technique saves base memory space.

Workstation Memory

As can be seen in the sample QEMM memory layout shown below, all the LAN Support Program modules have been loaded into high memory. The other programs (LSL, LANSUP, and the 25 system buffers) fit into high memory as well.

Region	Area	Size	Status
1	C600 - C644	1K	Used (DXMA0MOD)
1	C645 - C655	0.2K	Available
1	C656 - C73F	3.6K	Used (LSL)
1	C740 - C927	7.6K	Used (LANSUP)
1	C928 - CBFE	11K	Available
2	CE00 - D049	9.1K	Used (DXMC0MOD)
2	D04A - D595	21K	Used (DXMT0MOD)
2	D596 - D7FE	9.6K	Available
3	DC00 - DC10	0.2K	Available
3	DC11 - DF2F	12K	Used (BUFFERS)
3	DF30 - DFFF	3.2K	Available

Along with the use of the expanded memory netware shell (EMSNET3 or EMSNET4), loading the network software high should free up enough space to run all the major applications currently available.

In testing, we found that these memory management implementations amounted to an additional 100KB, providing the test system with a total of 518KB of free base memory. This increased base memory allowed the test units

to run such programs as:

- Paradox 3.5
- Lotus 1-2-3 Release 3
- WordPerfect 5.1

These applications were loaded on both servers (LAN Server and the NetWare server) and accessed by our two workstations. Data from all applications was accessed from different servers flawlessly. System security was maintained for each server internally. Switching between servers was as easy as changing drive letters.

Note: Different memory manager configurations and DOS versions will change the amount of free base memory available.

Conclusion

In this AppNote, we have discussed DOS as a client operating system and OS/2 both as a client operating system and as the base platform for LAN Server. We have also introduced the basic steps for installing NetWare and LAN Server. When reduced to its basic components, the dual login procedure is simple to implement. When combined with an adequate workstation and memory management software, dual login can provide the solution to many migration issues.

Future AppNotes in this series will feature such topics as OS/2 as a client, bridging between Token Ring to Ethernet or vice versa, management of print queues, and performance optimization.

Appendix A: Interesting Facts, Tips, and Tricks

This appendix provides additional information about using IBM's DOS LAN Requester program and working in the dual login environment.

The DOS LAN Requester Program

When installing the DOS LAN Requester, it may appear that the DLR will not function with any DOS other than IBM PC-DOS. This is true for the installation program. But actually, the DLR will function with MS-DOS 3.3 or greater. Later releases of the DLR will include an installer that will allow installation with MS-DOS and other DOS versions.

The IBM LAN Server DOS LAN Requester manual states that a DLR station cannot perform any administrative duties on the network. This is due to the lack of any interactive menu panels or command line programs. But the capability for administration does exist. The full set of administrative APIs is available, but can be accessed only through a user-created program. The user must also have administrator rights on the server.

NET START and the Redirector

The NET START command initializes the DLR. It loads the TSR portion of NET.COM, which is the API interface to the Redirector. It aids in issuing and executing NetWork Control Blocks (NCBs), and also helps with NetBIOS commands and sessions.

The Redirector is the heart of the network control I/O mechanism. It automatically senses what DOS version (such as 3.3 or 4.01) the workstation is running and loads the correct internal module.

NET START Parameters

Various NET START command line parameters directly affect the Redirector. NET START gets its initial load parameters from the DOSLAN.INI file (which is set up at installation time and can be modified with a text editor). Any parameters appended to the NET START command line will override the defaults in the DOSLAN.INI file.

DLR Performance Parameters. In some cases, some of the parameters that can be appended to the NET START command line can improve the performance of the DLR. Two parameters that affect DLR performance are network buffer size (NBS) and big buffer size (BBS), which control the buffer caching at the DLR workstation.

The defaults for these parameters (1KB for NBS and 4KB for BBS) are found in the DOSLAN.INI file. As long as the application being used at the DLR workstation is sending packets between 1 and 4KB in size, the default system will function efficiently.

If the application is sending packets over 4KB in size, the system goes into RAW PROTOCOL mode. This mode allows large packets of data to be sent. The DLR sends a message to the server informing it that it will be receiving large packets and that it should be ready. This takes one SMB (server message block). Sending the packet requires another SMB. These extra packets degrade the system performance. If you know the packet size of the applications being used, you can set the NBS and BBS parameters appropriately, thus increasing efficiency by not having to send two SMBs.

DLR Unload Parameters. In order to unload the DLR or use the NET STOP command, the NET START command must be started with these additional parameters:

/mms /nvs /api

The main option of interest here is "/api" which loads the API code into memory. This code contains the routines to unload DLR. The other options are there to provide support for the "/api" parameter.

Password Encryption Parameter. When the NET START command is loaded with the "/enc" parameter, the DLRENCR.EXE module is loaded. This module takes 2KB of RAM and basically encrypts all passwords from the DLR workstation before it goes out over the wire.

Message Receipt Parameters. The default for NET START is to be in redirector (RDR) mode. This allows resource utilization, but no message receiving. For message receiving at the DLR workstation to take place, the "/rcv" parameter must be invoked. This allows message receiving from other workstations as well as resource sharing (files, printers, serial devices). The "/rcv" option takes 10.5KB of RAM when loaded.

In addition, the "/pop" command loads the MSGPOPUP.EXE module. This module displays a pop-up window for approximately one minute upon message delivery. This module can take anywhere from 8 to 20KB of RAM, depending on the type of monitor used. Monochrome monitors are the lowest, VGA are the highest. This is due to the memory storage requirements of each character display on the screen.

On initial load, another module (XSI1.EXE) takes 2KB of RAM for miscellaneous network management functions at the DLR workstation.

NET USE Directory Resource Listing

Since the user must log in to the IBM LAN Server first and the NetWare server second, the LAN Server tracks all network resources. Therefore, to receive an accurate listing of available resources in both environments, the user must perform the NET USE command from the DOS workstation. The NET USE command is similar to the Novell MAP command in that it lists directory resources that have been assigned logical drive descriptions.

Sample NET USE Printout

If the LASTDRIVE command in the CONFIG.SYS file is set to I, the logical drive letter I: would be the last drive letter the LAN Server would use. J: would be the first drive letter available for NetWare.

Here is a sample printout of network resources as produced by the NET USE command.

```
Status       Local Device          Network Name

OK              J:                 \\NOVELL\SYS
OK              K:                 \\NOVELL\WP51
OK              Z:                 \\NOVELL\PUBLIC
OK              D:                 \\OS2LS\APPS
OK              E:                 \\OS2LS\MISC
OK              F:                 \\OS2LS\DATA
```

Performed from the same workstation, the NetWare MAP command would display only drives J:, K:, and Z: as network drive mappings.

The name following the double slash is the server name. Note that descriptive server names can be helpful for identifying resources in a coexistence environment.

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