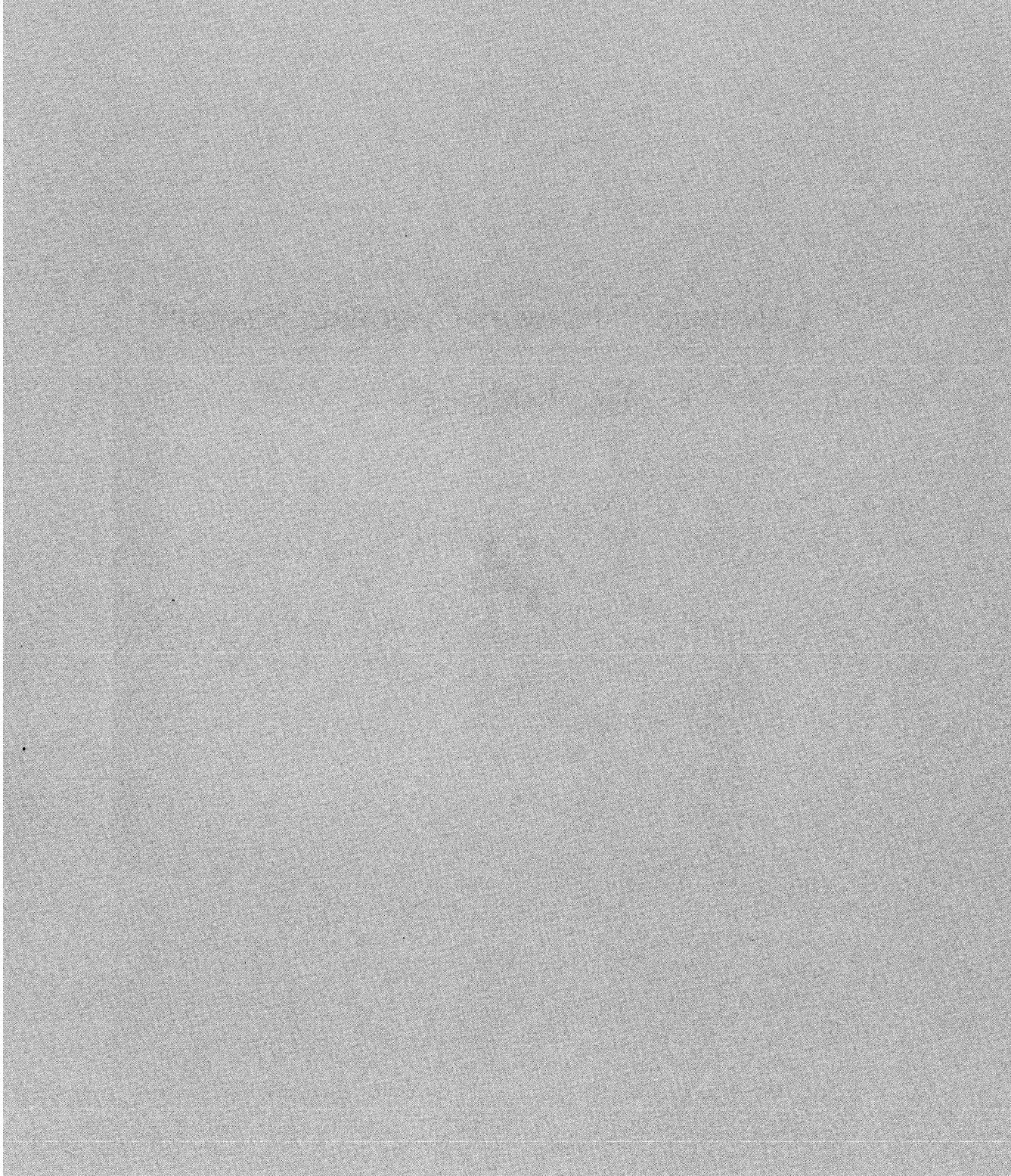


# LANtastic™ Network Operating System

---

## User's Manual





## **COPYRIGHT**

© 1990 ARTISOFT, Inc. All Rights Reserved. This manual and the software described in it are copyrighted with all rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system or translated into any language in any form by any means without the written permission of ARTISOFT, Inc.

## **TRADEMARKS**

LANtastic is a trademark of ARTISOFT, Inc.

Brand names and product names are trademarks or registered trademarks of their respective companies.

## **LIMITED WARRANTY ON SOFTWARE**

If you discover physical defects in the media on which the software is distributed or in the User's Manual, ARTISOFT will replace the media or manuals for a period of ninety (90) days after purchase by the retail customer. You must return the disk or manual to ARTISOFT or an authorized ARTISOFT dealer within the warranty period accompanied by proof of purchase.

**ARTISOFT LIMITS ALL IMPLIED WARRANTIES ON THE MEDIA AND MANUALS, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY, PERFORMANCE AND FITNESS FOR A PARTICULAR PURPOSE TO A PERIOD OF NINETY (90) DAYS FROM DATE OF PURCHASE BY THE RETAIL CUSTOMER, AS ESTABLISHED BY THE CUSTOMER'S PAID INVOICE. ARTISOFT WILL NOT BE LIABLE FOR ANY BUG, ERROR, OMISSION, DEFECT, DEFICIENCY, OR NONCONFORMITY IN ANY SOFTWARE. AS A RESULT, THE SOFTWARE IS SOLD "AS IS," AND THE PURCHASER ASSUMES THE ENTIRE RISK AS TO ITS QUALITY AND PERFORMANCE.**

**ARTISOFT SHALL IN NO EVENT BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONTINGENT OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE SOFTWARE OR ITS DOCUMENTATION INCLUDING DAMAGES FROM LOSS OF DATA, EVEN IF ARTISOFT OR AN AUTHORIZED ARTISOFT DEALER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. You agree that ARTISOFT'S liability arising out of contract, negligence, strict liability in tort or warranty shall not exceed any amounts paid by you for this product. Any written or oral information or advice given by ARTISOFT dealers, distributors, agents or employees will in no way increase the scope of this warranty. Nor may you rely on such oral or written communication. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.**

The laws of the State of Arizona shall govern this Agreement.

ARTISOFT, Inc.  
ARTISOFT Plaza  
575 East River Road  
Tucson, Arizona 85704  
602-293-6363  
Fax 602-293-8065

Version 1.02



This manual is printed on recycled paper

# Contents

---

<b>Chapter 1: Introduction</b> .....	<b>1</b>
Shared Resources.....	1
Non-Dedicated Server.....	2
Printer Spooling.....	2
Quick Installation.....	2
Electronic Mail.....	3
Full Security.....	3
Audit Trails.....	3
The LANtastic Disk Caching System.....	4
5100 Open Files Per Server.....	4
NETBIOS Compatibility.....	4
Typeface Conventions.....	4
Installation Overview.....	5
<b>Chapter 2: Basic Networking Concepts</b> .....	<b>7</b>
Chapter Overview.....	7
Servers And Workstations.....	7
Logging In To A Server.....	8
Network Paths.....	9
Redirection.....	10
Sharing Network Resources.....	11
Sharing Subdirectories.....	12
Sharing Network Printers.....	13
Network Security.....	14
Log In Security.....	14
Access Control List (ACL).....	15
Audit Trail Security.....	17
Chapter Summary.....	17
<b>Chapter 3: Software Installation</b> .....	<b>19</b>
Chapter Overview.....	19
Running The LANtastic INSTALL Program.....	19
Default Resources.....	21
<b>Chapter 4: Using LANtastic</b> .....	<b>23</b>
Chapter Overview.....	23
Using The STARTNET Program.....	23
Using The NET Show Command.....	23
Reading A File On The Server's Disk.....	24
Using Menus.....	25
Logging In To A Server.....	26
Redirecting To Server Resources.....	27
Cancelling A Redirection.....	30
Exiting LANtastic.....	31

<b>Chapter 5: Sharing Network Printers</b> .....	<b>33</b>
Chapter Overview.....	33
Bringing Up The Network.....	33
Redirecting A Printer.....	34
<b>Chapter 6: Configuring Your LANtastic Network</b> .....	<b>39</b>
Configuring Your Server.....	39
User Account Information.....	40
Network Configuration Checklists.....	42
<b>Index</b> .....	<b>45</b>

# Chapter 1: Introduction

---

Congratulations on the purchase of LANtastic Network Operating System (NOS). Whether you intend to connect two PC's, or network your entire corporation, you will find that your present computer capabilities have just increased dramatically. With a low memory requirement at a low price, LANtastic Network Operating System offers you great performance features in a Local Area Network:

- Low memory requirements
- Fast, efficient printer spooling
- Quick installation
- Full network security
- Peer-to-peer sharing of hard disks, floppy disk drives and printers
- Supports DOS 3.1, 3.3 and above file and record locking
- Compatible with most NETBIOS adapters
- Access control of disk drives and subdirectories by user or group
- Audit trails
- Electronic mail
- LANtastic Chat, for on-screen, station-to-station communications
- CD-ROM drive support
- Boot ROM support for diskless workstations
- LANcache disk caching system
- Maximum open files up to 5100 per server (DOS only allows 255)
- Indirect file support
- Up to 300 concurrent users per server

and with the optional LANtastic Voice Card installed

- Voice mail
- Real-time voice communications through the network

## **Shared Resources**

With LANtastic NOS, whatever resources were once used by only a single computer can now be utilized by any user in the system. If one computer has a printer, and one doesn't, now both can use it. If one PC has a hard drive and the other three only have floppies, all four will function as if they each had hard disk drives. You can also share directories, databases and applications programs such as word processors and spreadsheets across the network.

## ***Non-Dedicated Server***

A server is a computer that allows other computers in a network to use its resources (disk drives, directories, application programs, and printers). With most Local Area Network (LAN) systems, the memory required to keep the network running is so great that the server has to be dedicated full time to running the network. With LANtastic, our system uses so little memory, you can use your server just like a regular computer. It can even log in to other servers to use their resources. LANtastic NOS allows up to 300 computers to be logged in to one server at a time.

## ***Printer Spooling***

Your network can share any printer attached to a server. Data sent to a printer is temporarily stored in a location called the printer spool area, located on the server's disk. The file is then sent to the appropriate printer. Each server can send data to up to five different printers: LPT1, LPT2, LPT3, COM1, and COM2. The letters "LPT" designate parallel printers (such as Laser, or Dot Matrix Printers) and the letters "COM" designate serial printers (such as plotters).

Most LAN's can despool to only one printer at a time, which can slow network printing. With LANtastic NOS while one file prints, the server searches through the Queue for any files targeted for a different printer. If one is found, the server will simultaneously despool to two or more printers.

To make network printer despooling even more efficient you can change the location of where the despooling area is kept. You can move its location to another section of your disk, to a second disk in the server, or even to RAM disk for faster network printing.

## ***Quick Installation***

Installation of the LANtastic software is remarkably easy. The INSTALL program will provide you with default options and a username to help you quickly set up your network. It will also set up your server's resources for network use and assign access rights and privileges for you. Once the network is running, you can fine tune it to suit your needs.



## ***Electronic Mail***

You can avoid a paper trail in your office by sending your messages by electronic mail. Simply select the recipient(s), type in your message and send it. A pop-up message will inform the user(s) when E-Mail is waiting. You can send electronic mail to one user, to a select few, or to the entire network.

## ***Full Security***

Even the friendliest networks need order, and LANtastic allows you to have just as much as you need. You can have mainframe quality security if you want it, or if easy access is more important, you don't even have to assign passwords.

You can assign when each user can log in to the system, what resources they can use, and how they can use them. For example: one user might have access to a directory of files, but may only be allowed to read them and not write to them. Another might have access to read and write to a set of files, but might not be allowed to delete files or directories. Or you can set privileges by user group. For example, the administrative staff might have full access to all resources, but the accounting staff might have access to only those resources necessary to perform their duties.

You can also limit access to the server's control directory, so users can't change their privileges and gain access to network resources you don't want them to.

## ***Audit Trails***

Audit trails help you keep track of how your network is being used. You can find out who used the system, for how long, and which resources were requested. If you charge users for time on the network and services used, this is an excellent way of keeping track of accounts. You can also see which users tried to use resources they're not allowed access to.

## ***The LANtastic Disk Caching System***

Disk caching means faster network functions. Instead of constantly having to read and write to the hard disk, the LANtastic disk cache (LANcache) will “read ahead,” that is read an entire track into memory in case the information you will need can be found there. That way, when you request it, the data is already in memory, and there is no need to physically access the disk. It can also delay writing to disk. This allows the cache to store more data and reorganize it before writing it to disk. To make our cache even faster, it can access cached data even as it's writing to disk. Most caches must first write, and then read. LANcache also caches write operations. By delaying writing to disk, LANcache is able to reorganize the data as it writes to disk. Reduces disk head movement for both reads and writes.

## ***5100 Open Files Per Server***

Other peer-to-peer LAN's can support hundreds of nodes, yet because of DOS limitations are only able to have up to 255 open files per server. This is far too few for large networking applications. LANtastic is better able to support large networks by allowing up to 5100 open files per server.

## ***NETBIOS Compatibility***

LANtastic NOS is designed to run with most network adapters that have a NETBIOS interface. The NETBIOS (Network Basic Input/Output System) is the software that your computer uses to communicate with the rest of the network.

## ***Typeface Conventions***

The commands that you will type in at the keyboard will be printed in this **bold font**. The text that you will see on the screen in response to those commands will be printed in this plain font. Block numbers are placed before steps that you are to perform (①, ②, ...). If a procedure requires only one step, it will be preceded by a double arrow icon (»).

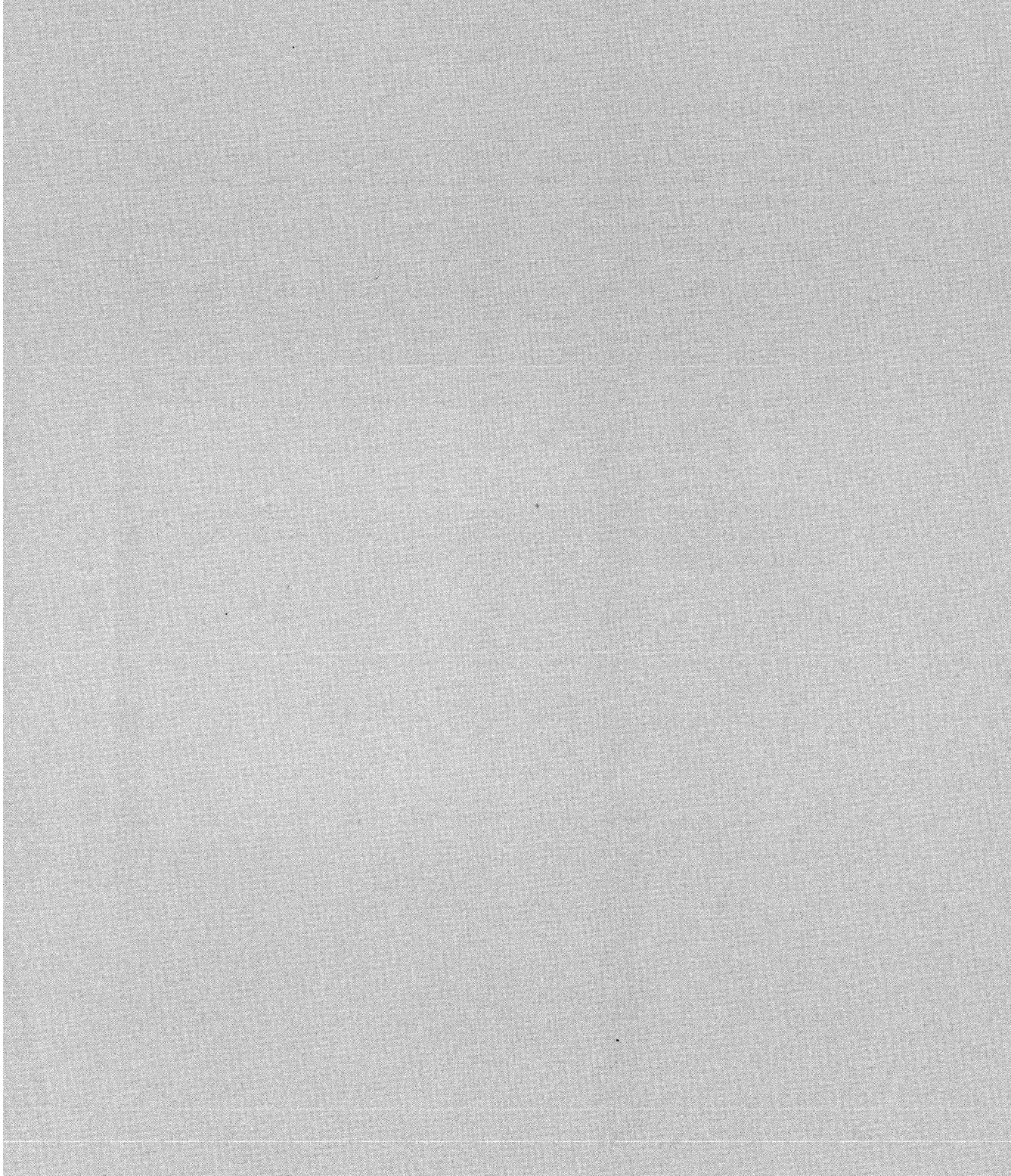
Throughout this text, LANtastic NOS and NOS refer to LANtastic Network Operating System.

## ***Installation Overview***

Install your adapter cards first, then run the NETBIOS to support them. Refer to your hardware manual for adapter and NETBIOS installation. You must use DOS version 3.1, 3.3 or higher when running LANtastic software. You should not use DOS 3.2 as it has errors in the internal stack handler.

If you're familiar with networking concepts, refer to "Chapter 3: Software Installation." You can then read chapters 4 through 6 if you want to get acquainted with using LANtastic, or skip to the reference section to enable the features you want to use in your network.

If you are new to LANtastic and networking in general, "Chapter 2: Basic Networking Concepts" is highly recommended. You will then use the information in "Chapter 3: Software Installation," to install the Network Operating System software. Chapters 4 and 5 will get you acquainted with using LANtastic, and "Chapter 6: Reconfiguring Your Network" will help you plan how to set up your network. You can then refer to the reference section of the manual for information on using any of LANtastic's many features.



# Chapter 2: Basic Networking Concepts

---

## Chapter Overview

This chapter will provide you with the necessary background information to set up and operate LANtastic network software. You will use the terms and concepts presented here later in this manual, so this chapter is highly recommended reading.

This chapter will cover the following topics:

- Servers and workstations
- Logging in to a server
- Network paths
- Redirection
- Sharing disk drives
- Network security

## Servers And Workstations

There are two types of computers in the LANtastic local area network: servers and workstation. Both types of computers are also called nodes. A server shares its resources (printers, disk drives, applications programs etc.) with the rest of the network, and workstations use these resources. Workstations are often called redirectors, because their requests to use their own devices are redirected across the network to the server's devices. To a user at a workstation, using a server's printer or any other device is no different from using one attached to his or her own computer. Suppose you wanted to read a file on a remote server's disk, the following steps would take place:

1. You would type in your DOS command asking to read the file.
2. The redirector program in your computer would transmit this request across the network.
3. The server would receive the request.
4. The server would check your access rights to this file.
5. If you're allowed access, the server transmits the contents of the file back to your computer.
6. The redirector program would receive the information.
7. This information is given to your DOS program and displayed for you.

What is important to realize about this process is that while these steps are being executed, to you at the workstation, this process appears exactly the same as if you were asking to read a file on one of your own drives. This is because redirectors treat network resources as if they were local, that is located on, or attached to themselves. So even if you're reading a file found on a remote server's disk, your computer will think that it is reading from one of its own disks.

The memory requirement for the server on most local area networks, is so great that it can do nothing except run the network. Such a server is called a dedicated server. LANtastic's memory requirement is so low, your server can run the network and function as a regular PC. Servers can also log in to other servers and use their resources, making them both servers and redirectors. This why LANtastic is called a Peer-To-Peer LAN.



Note: a computer with only the redirector program installed in it CANNOT share its resources with the rest of the network. To share its resources a computer must be set up as a server.

## ***Logging In To A Server***

You must first log in to a server and establish a network session to use its resources. A session is the logical connection between the server and the node for the exchange of data. To log in, you must provide the correct username, and password. This is the first level of security in the LANtastic system. For this chapter, examples will be given using NET line commands.

You can also perform any of these tasks using the NET program's menus. You will learn more about using menus in both the User's and Reference sections of this manual.

To log in to a server, use the syntax:

**NET LOGIN \\SERVERNAME USERNAME PASSWORD**

where SERVERNAME represents the name of the server computer you want to log in to; USERNAME denotes the name of your account with that server, and PASSWORD represents your current password.

For example:

**NET LOGIN \\MAINSERVER BILL SECRET**

would log you in to the server MAINSERVER under the account name BILL using the password SECRET. LANtastic NOS also allows you to hide your keystrokes when you enter your password. For information on this topic refer to “Using NET Line Commands In Batch Files” in the reference section of this manual.

To end a session with a server, use the command:

**NET LOGOUT \\SERVERNAME**

For example:

**NET LOGOUT \\MAINSERVER**

would end your session with MAINSERVER.

## ***Network Paths***

Once you’ve logged in to a server, you will use network paths to access resources just as you would use DOS file paths to find resources in a non-network environment. In DOS, when you need to access a file, you must first give a file path telling which drive and subdirectory that file can be found in. For example:

**C:\HOMEWORK\MATH\LESSON.001**

specifies that the file LESSON.001 can be found in the subdirectory MATH which is in the subdirectory HOMEWORK on disk drive C:

If this same computer were a network server, and you wanted to find that file from a remote workstation, the network path to it would look very similar to its local DOS path. LANtastic NOS uses a syntax that is similar to DOS, except it substitutes the network resource name of the disk drive and the name of the server for the disk drive specifier. For example:

**\\MAINSERVER\C-DRIVE\HOMEWORK\MATH\LESSON.001**

indicates that the file LESSON.001 resides in the subdirectory MATH which is in the subdirectory called HOMEWORK on a network disk drive named C-DRIVE located on a server named MAINSERVER. The

double backslashes \\ must be used to designate a server name. Server names can be up to fifteen characters long, but the rest of the path must follow the DOS constraint of only eight characters followed by an optional three character extension.

## **Redirection**

The syntax given above will work with many DOS commands, but many commands need you to designate a disk drive to work properly. For example, it would be convenient to type:

```
DIR \\MAINSERVER\C-DRIVE\HOMEWORK
```

But, the DOS DIR command requires you to designate a disk drive to provide you with a directory.

The solution to this problem lies in the redirection process. As was mentioned before, redirectors treat all network resources as though they are local. So you can designate a new disk drive D: (assuming you don't have one already) and redirect it to \\MAINSERVER\C-DRIVE. It doesn't matter that a D: drive doesn't exist on your computer, because even if it did that drive would be redirected to \\MAINSERVER\C-DRIVE. Your computer can then use the hard drive on MAINSERVER just like any other drive in your computer. To perform this redirection, you would type:

```
NET USE D: \\MAINSERVER\C-DRIVE
```

This means take local disk D: and connect it to C-DRIVE found on the server MAINSERVER. The server's disk will perform all commands given to your D: disk. Now you can type:

```
DIR D:\HOMEWORK
```

and get the directory that the command:

```
DIR \\MAINSERVER\C-DRIVE\HOMEWORK
```

could not get for you.

You can repeat the redirection process to NET USE as many disk drives as your network servers allow you access to. If you use the DOS LASTDRIVE= command to set Z: as your last logical drive, you can use drives A: through Z:



To cancel the redirection of drive D: use the command:

**NET UNUSE D:**



Note: LANtastic provides the NET DIR command to provide you with a list of all the files within a network directory. For more information, refer to “NET Commands” in the reference section of this manual.

## Sharing Network Resources

In order for a resource to be shared with the rest of the network, you must give it a resource name. The device or directory is given this name so there will be no confusion as to which server resources you wish to share. For example:

**NET USE D: \\MAINSERVER\A-DRIVE**

The user is requesting the use of A-DRIVE, the A: drive found on \\MAINSERVER. This same drive can be known by three different names. When used locally on the server, this is drive A: This drive's network resource name is A-DRIVE. And once the workstation's D: drive has been redirected to use A-DRIVE, this same disk drive will now appear to be the workstation's D: drive. The following chart illustrates this:

The way this resource is seen at the workstation	Network Resource Name	Local name on the server
D:	A-DRIVE	A:

In this way, if at the workstation you were to key in:

**TYPE D:AUTOEXEC.BAT**

it would be exactly the same as if you had entered:

**TYPE \\MAINSERVER\A-DRIVE\AUTOEXEC.BAT**

With either command, the request to open and read the AUTOEXEC.BAT file would have come across the network to the server, and been linked to the real disk drive A: of MAINSERVER. The server would check the user's access rights to this server device. If access is allowed, the server will open the file and transmit the

contents across the network to the remote node. The DOS program would then display the AUTOEXEC.BAT file on the workstation's monitor.

### **Sharing Subdirectories**

In the previous example, the workstation's D: drive was redirected to a disk drive on the server. You can also redirect a drive to a subdirectory just as if it were a disk drive. For example:

<b>The way this resource is seen at the workstation</b>	<b>Network Resource Name</b>	<b>Local name on the server</b>
E:	LOTUS	C:\123

Here, the user has redirected his E: drive to the subdirectory using the following command:

**NET USE E: \\MAINSERVER\LOTUS**

Now the user's E: disk is connected to the subdirectory C:\123. As far as the node is concerned, E: is a disk, but any actions to E: will take place within the server's C:\123 directory.

If you wanted users to have access to only the subdirectory TEST within the C:\123 directory you could set up a shared resource for only that subdirectory:

<b>The way this resource is seen at the workstation</b>	<b>Network Resource Name</b>	<b>Local name on the server</b>
F:	SUBLOTUS	C:\123\TEST

You should be getting an idea of how useful this can be. You can allow users access to a directory of files without having to give complete access to the disk these files are stored on. In this way, you can protect important files by not setting up a network resource for them.

Now the remote workstation's redirected F: drive will use only the subdirectory C:\123\TEST and not the entire C:\123 subdirectory. Any requests to the workstation's F: drive will be carried out within the server's subdirectory C:\123\TEST.

## Sharing Network Printers

Just as you can share disk drives and subdirectories across the network; you can also share printers. One important rule to remember, however, is that network printer resource names must have the "@" sign preceding them to distinguish them from other types of network resources. A list of network printer resources might look like this:

The way this resource is seen at the workstation	Network Resource Name	Local name on the server
LPT1	@LASER	LPT1
LPT2	@DRAFT	LPT2
LPT3	@LQUALITY	LPT2
COM1	@PLOTTER	COM1
COM2	@SLOW	COM2

In the above table, the workstation's LPT1 port has been redirected to the server's LPT1 port. The resource name designates that this is a laser-type printer. The LPT2 and LPT3 ports are connected to the server's LPT2 port. This printer has been set up for two types of output, draft quality and letter quality. The workstation's two serial ports, COM1 and COM2 have been redirected to the server's COM ports. COM1 has been linked to a plotter-type printer and COM2 has been linked to a plotter-type printer set to operate at a slower baud rate. LANtastic NOS allows you to set up as many printer types as you want for specifying draft mode, letter quality, font types or whatever options your printer(s) can perform.

You don't have to redirect all your ports to the same server. To make the redirections above, the user could have typed:

```
NET USE LPT1 \\MAINSERVER\@LASER
NET USE LPT2 \\MAINSERVER\@DRAFT
NET USE LPT3 \\SERVER1\@LETTER
NET USE COM1 \\HOST2\@PLOTTER
NET USE COM2 \\HOST2\@SLOW
```

When you send a file to a network printer, the data will be temporarily stored on the server's disk in a location called the printer spool area. Here the file will wait with the other print jobs in a queue. That way your file can be sent to the spool area even if the printer is busy. When the destination printer is available, your file will be despoiled to the printer. If the server is already printing one

file, but your file is designated for another printer on that server, LANtastic NOS will despool to both printers, so that files will spend less time in the queue.

In order for you to print a file on the server's printer, @LASER, the following steps would take place:

1. You would log in to the server.
2. You would redirect your LPT1 port to @LASER.
3. You would type in your DOS command to print the file on your LPT1 port.
4. The redirector program would send this print request to a server instead.
5. The server would check your access rights to @LASER.
6. The server would place the file in the server's printer spooling area.
7. When @LASER is free, it would print your file.

Again, you can see the power of LANtastic NOS; because once your LPT1 is redirected, the command to print a file across the network is exactly the same as if you had sent that file to a printer attached to one of your own LPT or COM ports.



Note: Once despooling has been enabled on a network printer, you cannot print locally to your own printer. To use the printer, first log in to your own computer, just if you were accessing it from a remote workstation, then redirect one of your printer ports to this shared printer resource and send data to the redirected port. You can also disable despooling in the *NET\_MGR Server Startup Parameter* to print locally.

## **Network Security**

There are three levels of security in LANtastic Network Operating System.

- Log in
- Access Control Lists Security
- Audit Trail Security

### **Log In Security**


Just as in a large mainframe computer system, you must have a user account set up and a valid password to access the system. If you want to set up temporary accounts, you can give them expiration dates.

You can further control access by limiting the time of day and the days of the week that a user can have access to the system. You can also give password expiration dates and extension days, so that your users will have to change their passwords more frequently.

### **Access Control List (ACL) Security**

This is a list set up on the server which contains the names of users or user groups and their access privileges (if any) for each network resource. Listed below are the types of access that LANtastic NOS supports:

<b>R--Read Access</b>	The user can open files for reading.
<b>W--Write Access</b>	The user can open files to write to them.
<b>C--Create A File</b>	The user can create files. The user will not be able to write to these files if you do not enable the W (Write access) privilege.
<b>M--Make Directory</b>	The user can create new subdirectories.
<b>L--File Lookups (DIR's)</b>	The user can display or search through directories or subdirectories.
<b>D--Delete Files</b>	The user can delete files.
<b>K--Delete Directories</b>	The user can delete subdirectories.
<b>N--Rename Files</b>	The user can rename files.
<b>E--Execute Program</b>	The user can execute programs.
<b>A--Change File Attributes</b>	The user can change the attributes of files in a shared directory.
<b>I--Indirect File</b>	Indirect files are supported within this shared directory.
<b>P--Physical Access</b>	The user can use a special directory to connect to DOS devices directly and not go through the server's spooler. Enabling this type of access can result in network users having a prolonged wait for printer or other device requests to be performed.

 Note: You are strongly urged not to enable the physical access privilege.

Access privileges can be set up by user or group. For example, a user who has full privileges would have an ACL that looks like this:

**MANAGER                      RWCMLDKNEAI-**



## **Audit Trail Security**

This is the third and final level of security in LANtastic NOS. With audit trails you can keep a complete record of each type of access that a user performs on a server. You can record all successful and unsuccessful attempts to log in, and you can check for users who have tried to access restricted files and devices. Information such as the length of time a user was on the network, or the number of characters sent to a printer can also be logged, to allow you accurate charges for billing.

## **Chapter Summary**

There are two types of computers in the LANtastic network: servers, which share their resources with the network, and workstations, which redirect the requests made to local devices and send them across the network. Workstations are sometimes called redirectors, and both servers and workstations are sometimes called nodes. Servers can also be redirectors, and log in to other servers.

To log in to a server, use the following syntax:

**NET LOGIN \\SERVERNAME USERNAME PASSWORD**

where SERVERNAME represents the name of the server computer you want to log in to; USERNAME denotes the name of your account with the server, and PASSWORD represents your current valid password on the network (optional).

Network paths closely resemble the DOS paths used to find directories and devices in a non-network environment. A network path replaces the drive letter at the start of a file path, with the name of a server and a resource name.

A workstation can redirect its disk drives to a drive or subdirectory on a server. Any commands given to the redirected drive are executed on the remote server's drive. A workstation's drive can also be redirected to a server's subdirectory.

The name that a server resource is known by to users on the network is its resource name. This is different from the drive or device's local name on the server.

You can also redirect printer ports across the network. Print requests to your own LPT or COM ports are sent to the server's LPT and COM ports. Before the server computer prints any files, they are first sent to a location on the server called the printer spool area. They are then placed in a queue until the destination printer is available. Printers can be set to print in various modes by setting up a resource name for each mode of printing.

With LANtastic NOS, network security has three levels: first, a user must have an account (which you can set up to allow access for only certain days of the week and hours of the day) and a valid password (which you can give an expiration date) must be given; second, Access Control Lists (ACL's) are set up to determine the types of access that network users are allowed to have with network resources; and third, audit trails can be set up to keep track of which resources were requested and how they were used.

This concludes the introduction to LANtastic Network Operating System. You should now be familiar with some basic concepts of a Local Area Network and some of LANtastic's commands.



# Chapter 3: Software Installation

---

## Chapter Overview

This chapter will provide you with the necessary information to install the LANtastic Network Operating System software. The LANtastic INSTALL program helps you get your Local Area Network running quickly and easily. The program will perform the following functions:

- Set up computers as servers, workstations or both
- Prepare the network control directory for servers
- Modify your CONFIG.SYS file (optional) to set the appropriate number of files, buffers, FCB's and logical drives
- Find out which resources you have and construct a list of network resources
- Set up a user account with default access privileges

## Running The LANtastic INSTALL Program

Make a copy of your distribution diskette and put the original diskette in a safe place. Once you've done this, complete the following steps:



Note: If you wish to use a floppy disk that your computer can boot from, you should first format a disk with the DOS system software, using the syntax:

**FORMAT A:/S**

This will place the DOS system files on the diskette. You can then proceed with the installation process. If you have two floppy drives you can run the INSTALL program from the A: drive and install the NOS software to the B: drive or vice-versa. If you have only one floppy disk drive, you must install the NOS software to your hard disk on the server, then run the INSTALL program from there to place the necessary files on the floppy disk.

- ① Place the copy of your distribution diskette in the A: drive and close the drive door.
- ② Type **A:INSTALL** then press **Enter**. If you are using a monitor that emulates a VGA or a CGA display, you may want to use the MONO

switch when you run the INSTALL program. The MONO switch makes the program operate in two-color monochrome mode. Use the following syntax to use the MONO switch:

### **A:INSTALL MONO**

The program will guide you through the steps required to create your network by asking you a question, and supplying you with a default answer. If the suggested answer is appropriate, press **Enter**. If not, type in the appropriate response. You will need to specify a unique name for each computer on the network. For example, you might name a server MAINSERVER or SERVER1. You might also use a descriptive name such as SCOTTS-PC or ADMIN-AT. The top window is provided to input your answers. When entering data into these windows you can:

- Type over any previous text in the window
- Use the arrow keys to move the cursor left and right
- Use the backspace key to delete a character to the left of the cursor
- Use the **Del** key to delete a character the cursor is on
- Use the **Ins** key to place yourself in and out of insert mode

In the bottom window you will find a brief explanation of each step in the installation process. If at any time you wish to exit the INSTALL program, simply press the **Esc** key to return to the DOS prompt.

- ③ If you are using NON-ARTISOFT adapter cards, run the low-level driver software for your adapter card as instructed in your hardware manual. The STARTNET batch file will run the supporting software for you if you are using an ARTISOFT adapter card. If you have changed any of the default settings for your ARTISOFT adapter (e.g. IRQ number, I/O Address and memory address) you will need to modify the low-level driver command lines within the batch file to include these changes. For information on setting these values, refer to your hardware adapter manual.
- ④ Once the software has been installed, you can bring up the network by typing:

### **C:\LANTASTI\STARTNET**

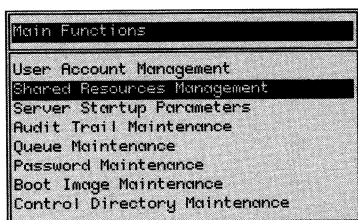
where C: is the drive that contains the LANTASTI directory created with the INSTALL program. If you decided to use a name other than STARTNET for the batch file, type that name instead.

The STARTNET program will automatically log you in to the server you specified in the INSTALL program (if it is running). You can now make any network requests.

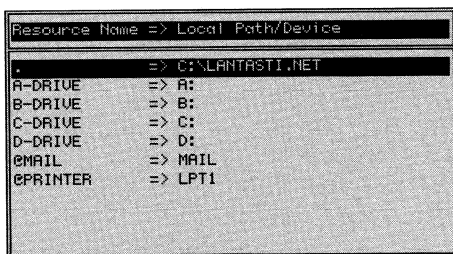
## Default Resources

If you let INSTALL set up your server to share all disk drives installed in your computer, you can see what resources were set up:

- 1 At the DOS prompt type: **NET\_MGR** then press **Enter**. You will see the *NET\_MGR Main Functions* menu.
- 2 Select the second option, *Shared Resources Management*, as shown below and press **Enter**.



You will see a display similar to this:



The menu above displays the resources set up for this computer.

- . The LANTASTI.NET control directory.
- @PRINTER** The server's LPT1 port. If you request this resource, data will be sent to the printer attached to LPT1.
- @MAIL** The server's mail queue. This is a file which stores the mail entries.
- A-DRIVE** The server's A: floppy disk drive.
- C-DRIVE** The server's C: hard disk drive.
- D-DRIVE** The server's D: hard disk drive.

The example above is for a computer with only an A: and a C: drive installed. If your computer has any other drives installed, you would see those listed as resources as well. If you would like to modify any of these resources or create new ones, refer to “Shared Resources” in the reference manual. For information on setting up additional accounts or limiting user access, refer to “Accounts” in the reference manual.

# Chapter 4: Using LANtastic

---

## Chapter Overview

In this chapter, you will practice three of the most commonly used functions of LANtastic Network Operating System: Logging in to a server, redirecting a local drive to use one of the server's disks, and reading a file located on the server's disk. You will also learn an orderly way to shut down your computer if it's a server.

## Using The *STARTNET* Program

The easiest way to bring up the network software if you are a beginner is with the LANtastic *STARTNET* batch file. If you haven't done so yet, execute *STARTNET*. Type:

```
C:\LANTASTI\STARTNET
```

where C: is the drive that contains the *LANTASTI* directory created with the *INSTALL* program. Usually this will be your C: drive.

*STARTNET* is a DOS batch file which executes the system software and logs you in to the server specified in the *INSTALL* program.

You will see messages informing you of the programs installed. If you see an error message, refer to "Appendix E: Messages" in the *LANtastic NOS Reference Manual* for an explanation of the message.

You can edit *STARTNET* like any other batch file. You can add command line switches to the *NETBIOS*, and to the *SERVER* or *REDIR* programs (a complete list of these switches is found in "Command Line Switches" in the *LANtastic NOS Reference Manual*). You can also add any other commands you want executed when you bring up the network.

## Using The *NET SHOW* Command

To find out what server you're logged in to and what connections have been made, type the command:

```
NET SHOW
```

You will see a display similar to this:

```
LANTastic (tm) Connection Manager V3.00 - (C) Copyright 1990 ARTISOFT Inc.
Machine WORDMAN is being used as a Redirector and a Server
File and record locking is currently ENABLED
Unsolicited messages will BEEP and POP-UP
LPT timeout in seconds: 0
Logged into \\WORDMAN as $BOB on adapter 0
Logged into \\TECH_LASER as $BOB on adapter 0
Server \\WARE          is available on adapter 0
Server \\ACCT1         is available on adapter 0
Server \\SAMS          is available on adapter 0
Disk E: is redirected to \\TECH_LASER\ROOT
Disk F: is redirected to \\TECH_LASER\MAGIC
Disk G: is redirected to \\TECH_LASER\C-DRIVE
Disk H: is redirected to \\TECH_LASER\D-DRIVE
Disk I: is redirected to \\TECH_LASER\A-DRIVE
```

In the above display, the computer has attached to a server with many resources. The NET SHOW text tells you:

- WORDMAN, the computer the NET SHOW command was issued from, is both a server and a redirector.
- File and record locking have been enabled by running the DOS SHARE program.
- Pop-up messages will appear to inform the user when E-Mail arrives or another user wants to chat.
- Print jobs have not been set to close after a set wait interval.
- Someone with the account name \$BOB has logged in to the servers, WORDMAN (the user's local computer) and TECH\_LASER (a remote server) using the first adapter (adapter 0) in WORDMAN.
- The local drives E: through I: are connected to devices on the server TECH\_LASER.

Your output may look different from this, depending on the server resources the STARTNET program logged you in to.

## ***Reading A File On The Server's Disk***

Since drives E: through I: are now redirected to devices on TECH\_LASER, any requests made to drives E: through I: will be executed in the server's drives. Since you now have redirected drives, you can see what's located there. Select the drive that is connected to the server's C: drive.

❶ Using our example above, we would type **G:** then press **Enter**.

❷ Type **DIR** and press **Enter**.

You will now see a directory of all the files and directories on the server's C: drive. Notice that getting a directory of this drive is no

different from getting one from any local drive. The result is exactly the same as if the drive resided in your computer.

Look for the subdirectory LANTASTI and change to it.

③ Type **CD \LANTASTI** then press **Enter**.

④ Type **DIR** and press **Enter**.

Since this is a large directory, you may want to use the /W (wide) or /P (pause) switch when you enter the DIR command. This will help you see the entire directory.

⑤ Look for the file README.DOC. It contains the most recent documentation for LANtastic NOS. To read the file, key in:

#### **TYPE README.DOC**

Press and hold the **Ctrl** and the **S** keys to pause the screen when you read the file.

You have now opened and read a file on another computer as if it resided on one of your own disks. This is the power of the redirection process.

Now if you need to read another file or execute a program, you can accomplish this the same way you would if the file or program resided on your own disk. As long as you are allowed access to a resource, you can use it as if it were installed in your own computer.

## ***Using Menus***

For the next section, you will use the windows method of the NET program. When using the NET and NET\_MGR menus, the term “select” means you will use the arrow keys to move the highlight bar to the desired option. You can also use the movement of a mouse to imitate the functions of the arrow keys, and the right and left mouse buttons to perform the same functions as the **Esc** and **Enter** keys respectively. If at any point you want more information about the fields displayed in a menu, press the **F1** function key for help information. The help windows can be enlarged and reduced by pressing **Z**.

Some windows will appear asking you for information. When entering data into these windows you can:

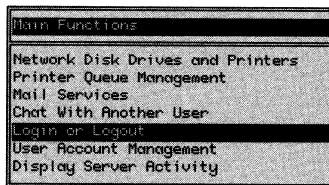
- Type over any previous text in the window
- Use the arrow keys to move the cursor left and right
- Use the backspace key to delete a character to the left of the cursor
- Use the **Del** key to delete a character the cursor is on
- Use the **Ins** key to place yourself in the insert mode

At the bottom of each screen, you will find special instructions for manipulating each field.

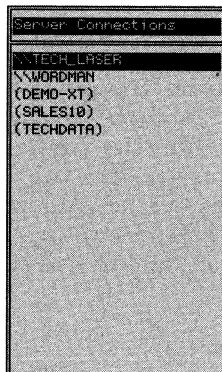
## Logging In To A Server

To log in to another server and use its resources:

- ① Type **NET** and press **Enter**. You will see the *NET Main Functions* menu.
- ② Use the arrow keys to move the highlight bar to *Login or Logout* as shown below and press **Enter**.



You will see the *Server Connections* menu:





Server names preceded by the double backslashes \\ indicate those servers you are already logged in to. Server names within the parentheses () are available to be logged in to.

- ③ To log in to any of the other servers on the list (if you have an account with them) use the arrow keys to move the highlight bar to the server's name, and press **Enter**. If you want to log in to a server whose name does not appear on the list, press the **Ins** key and type the name of the server and press **Enter**.
- ④ Type in your username.
- ⑤ Type in your password, if you have one.
- ⑥ If you want to set your computer's clock to the server's clock type **YES**, if not, press **Enter**. (Normally this won't be necessary unless you have a computer without an internal clock.)

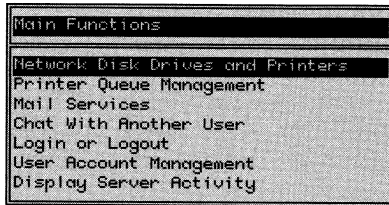
The name of the server that you logged in to will now have the double backslashes \\ before its name. You can now use any of this server's resources that your username allows you access to. Press the **Esc** key to exit each window to return to the DOS prompt.

## ***Redirecting To Server Resources***

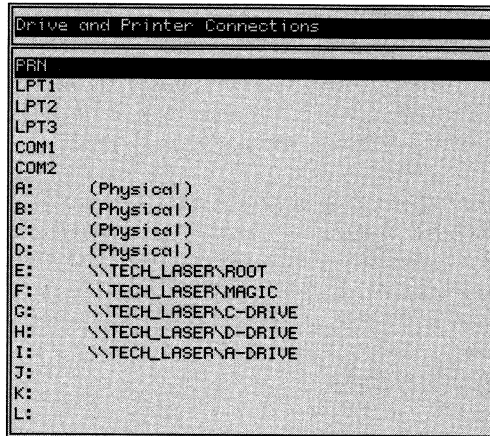
You can use the NET program to find out what server resources are available to you and redirect your local drives and printer ports to them. This program can also help you manage a server's print queue, send and read electronic mail, use the Chat and Voice Chat features, and many other functions, described in the *LANtastic NOS Reference Manual*. To redirect to a directory or device located on a server:

- ① Type **NET** and press **Enter**. You will see the *NET Main Functions* menu.

- ② Select *Network Disk Drives And Printers* as shown below and press **Enter**.

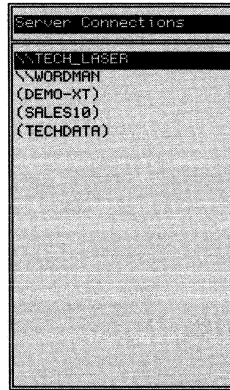
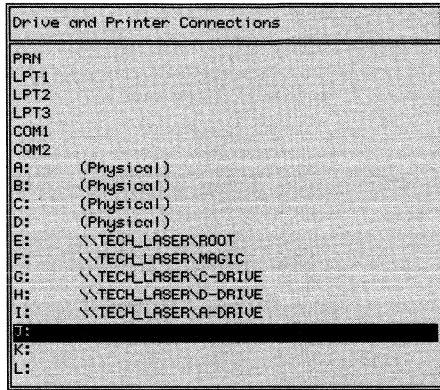


You will see the *Drive And Printer Connections* menu:

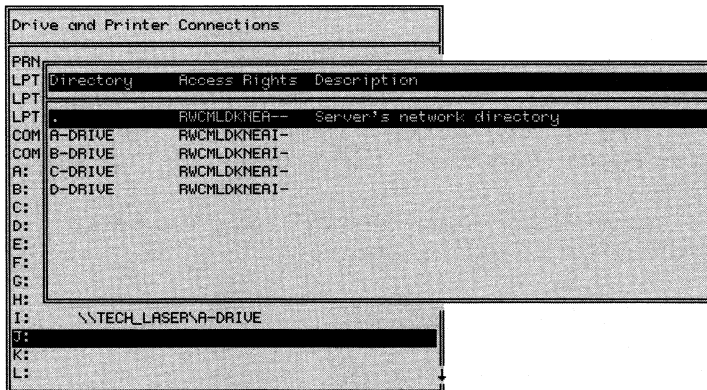


This menu displays the redirections which have already been made, which drives and printer ports are available for redirection, and which resources are physically attached to your computer. In the example above, no printer ports have been redirected. Drives E: through I: have been connected to devices on TECH\_LASER. Drives A: through D: are local drives (physically installed in the computer). Drives J: through Z: are available for redirection. You can redirect physical and logical drives. Any requests made to a redirected drive will be carried out on the server's drive.

- ③ Use the arrow keys to move the highlight bar to the drive you want to redirect and press **Enter**. You can also type the letter that corresponds to the drive you want to redirect and press **Enter**. You will see a list of available servers:

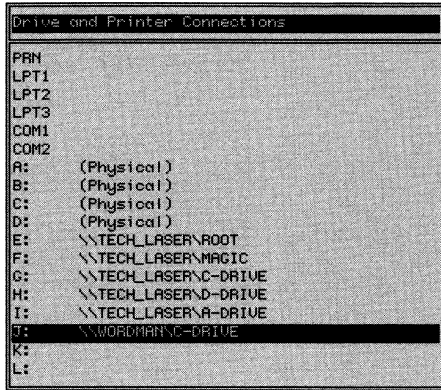


- 4 Use the arrow keys to move the highlight bar to the server you want to redirect to, and press **Enter**. If the desired server is not on the list, press the **Ins** key and type in the server's name. If you select a server that you are not logged in to, you will be prompted for your username, password and whether you want to set your computer's clock to the server's clock. Once logged in, you will see a list of the directories and devices that this server shares with the network.



In the far left column you will see the resource names of these drives and directories. Next to this are the access rights you are allowed for each resource. All access rights are given by default.

- 5 Move the highlight bar to the drive you would like to connect to and press **Enter**. The *Drive and Printer Connections* menu will appear again with the new redirection highlighted.

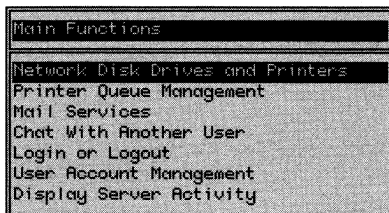


In the example above, the user has redirected the J: drive to “C-DRIVE” or the C: drive of \\WORDSMAN. If there are other servers in your network, you can also redirect to their drives and devices as well. You can log in to as many servers as is specified with the LOGINS= switch when you install the REDIR program. The default value is two, allowing you to log in to two different servers at one time. Refer to “Command Line Switches” in the *LANtastic Network Operating System Reference Manual* for more information on this subject.

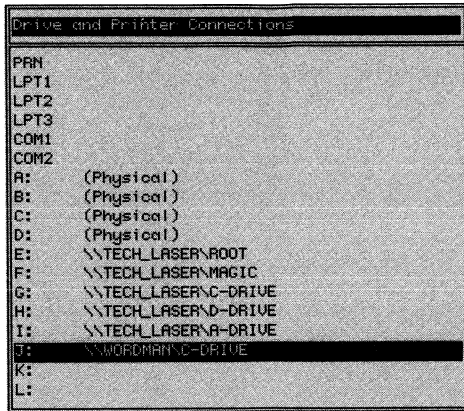
## Cancelling A Redirection

When you log out of a server, all redirections to that server are automatically cancelled. But to cancel an individual redirection:

- ① From the DOS prompt type **NET** and press **Enter**. You will see the *NET Main Functions* menu:



- ② Select *Network Disk Drives And Printers* and press **Enter**. You will see the *Drive And Printer Connections* menu:



- ③ In the *Drive and Printer Connections* menu, use the arrow keys to move the highlight bar to the redirected drive that you want to disconnect from the server and press the **Del** key.
- ④ Press **Enter** to confirm the deletion.

To exit the NET program, press the **Esc** key in each window to return to the DOS prompt.

## Exiting LANtastic

If your computer is a server, you must never just shut off the computer or press the reset button. This is because a user might be accessing your server remotely. If you need to shut down or reboot a server, follow these steps:

- ① Press **Ctrl-Alt-Del**. LANtastic NOS will intercept the reboot command and present you with a menu informing you of the number of users currently logged in to your server and the number of files open through the network. This suspends all processing on the server.

You will hear two quick informative tones if remote users have any files open.

- ② Inform the users that you want to shut the server down.
- ③ Press the **S** key to close all the open files and shut down the server. If you are using a PS/2 computer or a BIOS that supports disk

parking, LANtastic will park the disk for you. If you want to reboot the server, press and hold the **Ctrl-Alt-Del** keys. To cancel rebooting, press any other key.

# Chapter 5: Sharing Network Printers

---

## Chapter Overview

In this chapter you will bring up the network, log in to a server, redirect one of your printer ports, and print a file using the server's printer.

## Bringing Up The Network

If you logged out of the server and shut down your computer at the end of the last chapter, you will need to bring up the network again. You can bring it up using the STARTNET program as you did in chapters three and four. To do this type:

```
C:\LANTASTI\STARTNET
```

where C: is the drive that contains the LANTASTI directory created with the INSTALL program. If you installed the software to a drive other than C: then use the appropriate drive letter.

You can also bring up the network by issuing some of the commands from the STARTNET program yourself. This can be helpful if you want to create a batch file of your own to bring up the network. First, you *MUST* run the NETBIOS for your adapter. Refer to your hardware manual for information on this software. The commands you can then execute are as follows:

<b>SHARE</b>	To enable file and record locking.
<b>REDIR MACHINE_NAME</b>	Run this program if you want you use a network server's drives and devices. Here you also give your computer a unique name on the network. You will need to run this program to finish this tutorial.
<b>SERVER</b>	Run this program if you want to share your computer's resources with the rest of the network.

You may want to include a PATH statement so you can use the NET and NET\_MGR programs from any directory. For example:

```
PATH C:\;C:\DOS;C:\APPS;C:\LANTASTI
```

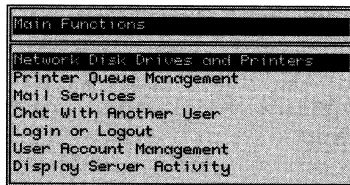
This is especially useful in a batch file. The above example, lists the default directory (LANTASTI) and drive (C:) that the INSTALL program writes to.

You can also use command line switches to customize the REDIR and SERVER programs. Refer to “Command Line Switches” in the *LANTastic NOS Reference Manual* for a complete list of these switches.

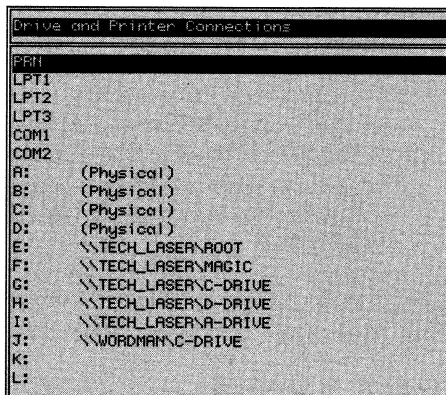
## Redirecting A Printer

Once you’ve brought up the network, you’re ready to redirect a local printer port:

- ① At the DOS prompt type **NET** and press **Enter**. You will see the NET *Main Functions* menu.
- ② Select *Network Disk Drives And Printers* as shown below and press **Enter**.



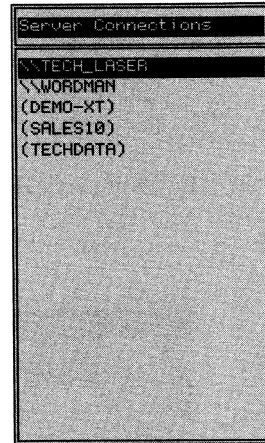
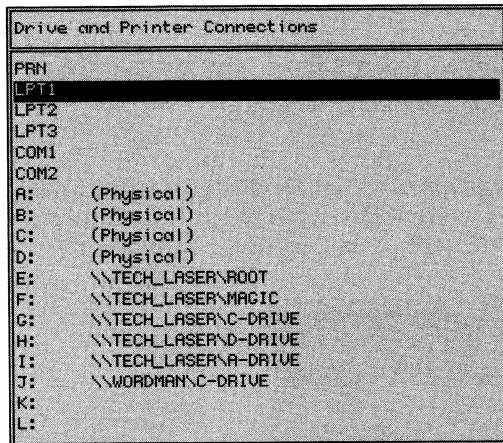
You will see the *Drive And Printer Connections* menu:



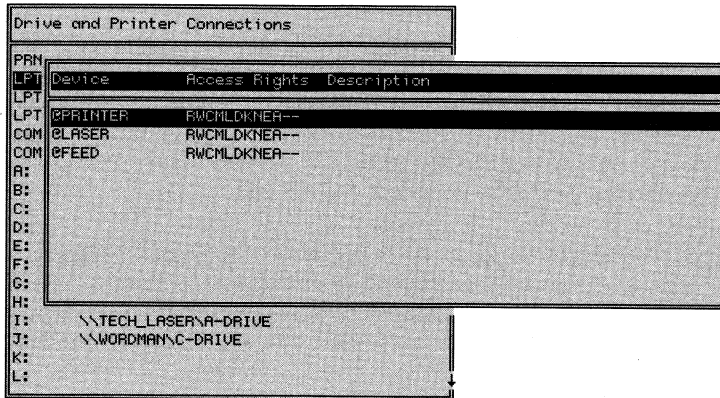


This menu displays which redirections have been made, which drives and printer ports are available for redirection, and which resources are physically attached to your computer. In the example above, the drives E: through I: have been redirected to devices on TECH\_LASER. Drives A: through D: are local drives (installed in the computer). Drive J: is connected to C:DRIVE on the server \\WORDMAN. None of the printer ports have been redirected.

- Use the arrow keys to move the highlight bar to the printer port you want to redirect and press **Enter**. You can also type in the number that corresponds to the printer port and press **Enter**. Here LPT1 has been selected. You will see a list of available servers:

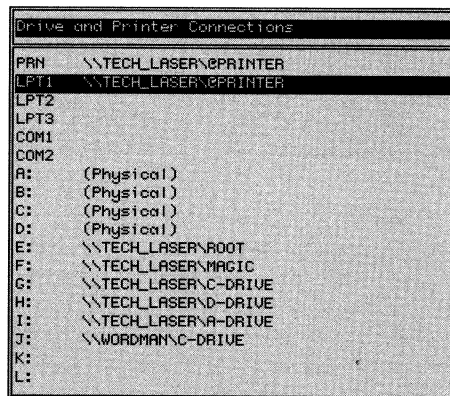


- Use the arrow keys to move the highlight bar to the server you want to redirect to, and press **Enter**. If the server you want to redirect to is not on the list, press the **Ins** key and type in the server's name. If you select a server that you are not logged in to, you will be prompted for your username, password and whether you want to set your computer's clock to the server's. Once you are logged in, you will see a list of the printer resources that this server shares with the network.



In the far left column you will see the resource names of these print modes. Next to this, are the access rights you are allowed for each resource.

- 5 Move the highlight bar to the device you would like to connect to and press Enter. The Drive and Printer Connections menu will appear again with the new redirection highlighted.



In the example above, the user has redirected LPT1 to @PRINTER on TECH\_LASER. Now any print commands sent to PRN or LPT1 will be printed at the device named @PRINTER on TECH\_LASER. Functionally LPT1 and PRN are the same printer port. PRN is listed because it can be used in place of LPT1.

You can make any other redirections that you want to make, and use as many server resources as you have access to. Keep in mind that

you can only log in to as many servers as is specified with the LOGINS= switch in the REDIR program. (For more information on the LOGINS= and other switches refer to "Command Line Switches" in the *LANTastic NOS Reference Manual*.)

- ⑥ Press the **Esc** key to exit out of each window until you return to the DOS prompt.
- ⑦ You can now print any file on any of your local or redirected drives. Print the README.DOC you read in the last chapter. If you've cancelled this redirection, go ahead and reconnect D: to C-DRIVE again, then issue the command:

```
NET PRINT D:\LANTASTI\README.DOC LPT1
```

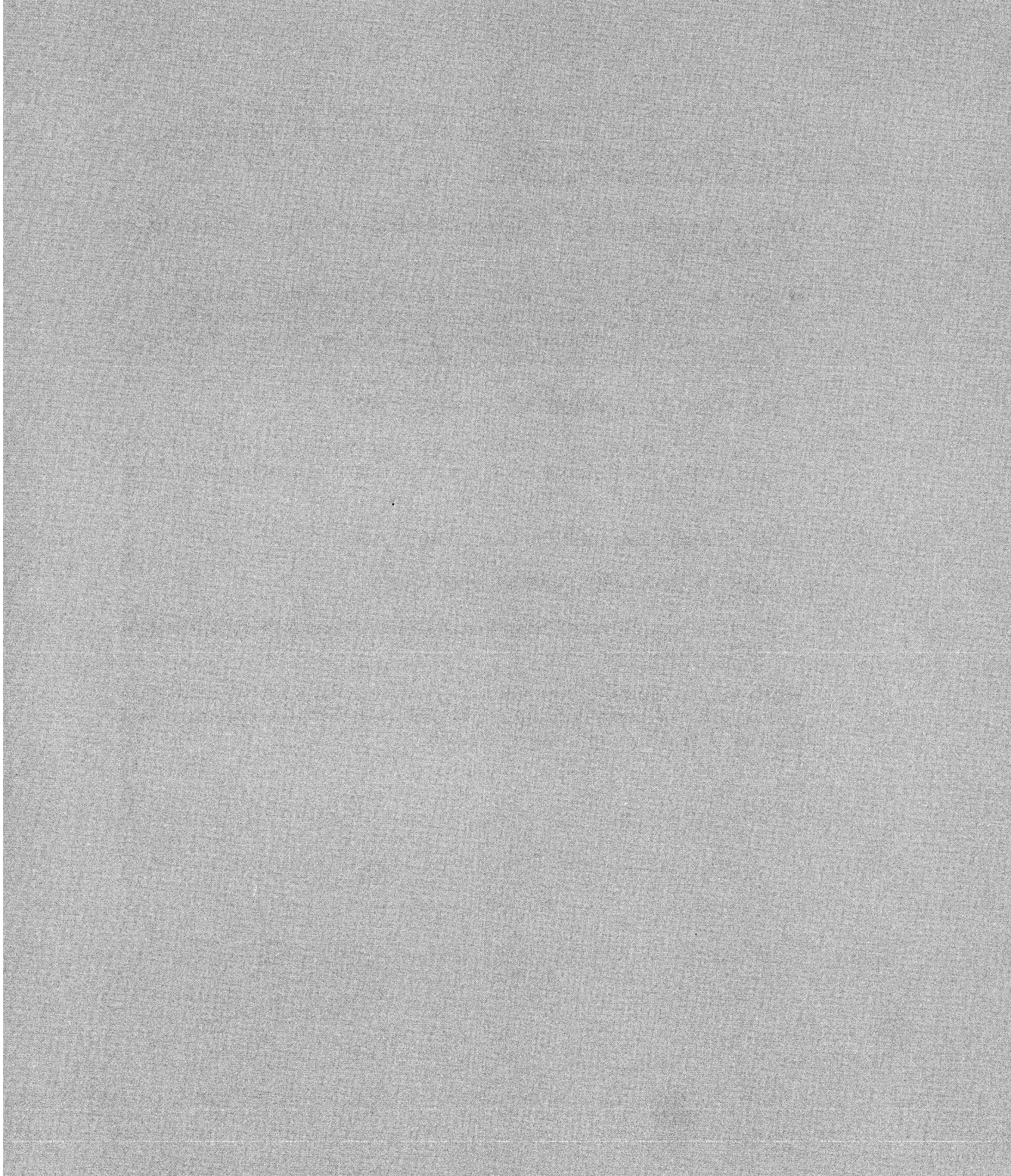
where LPT1 denotes the LPT or COM port you redirected, and D:\LANTASTI\README.DOC represents the full DOS path of the README.DOC file on the server.

You can also use the DOS COPY command:

```
COPY D:\LANTASTI\README.DOC LPT1
```

The data would be redirected from LPT1 and sent to @PRINTER on TECH\_LASER instead.

When you've finished, you will have opened a file on a server's disk and sent it to a server's printer. All this occurred just as though both devices were attached to your computer.



# Chapter 6: Configuring Your LANtastic Network

---

Now that you've installed the network software, and are more familiar with LANtastic NOS, you should give some consideration to how you want to set up your network. Though you may have already used the LANtastic INSTALL program to set up default resources and user accounts, you may want to fine tune the network to your specific needs. This chapter will help you organize your Local Area Network.

The first consideration in designing your network is the present location of your computers and how they are used. By effectively placing your resources to where they will be the most accessible to users, you can increase your work environment's efficiency. Answer the questions in the following section.

## Configuring Your Server

Use the "Server Configuration" form at the end of this chapter to write down your answers to these questions:

- *What will be the name of the server computer?*

You must give each server a unique name on the network in order for users to log in and use its resources. For example, you might choose names such as SERVER1 or HOST. You can also descriptive names such as CINDYS-PC or ADMIN-AT.

- *Will this server be used to boot up remote workstations?*

You will have to create a boot image on the server if you want to use this feature. For more information on this topic, refer to "Remote Booting" in the *LANtastic NOS Reference Manual*.

- *What applications do you want to run on your LAN?*

If many users will be running the same applications program (such as a word processor or spreadsheet program), you may want to designate a server for just this program. Make sure you are using a network version of the software, and that sharing the program does not conflict with any licensing agreements.

- *What resource name will you give each program?*

Pick a name that is easily identifiable by the users. For example, you might name your C:\LOTUS subdirectory LOTUS or 123.

- *What files will your users share?*

Try to allocate only those files that each user or user group must have access to. This makes for better network security and more efficient sharing.

- *What resource name will you give these sets of files?*

As with shared applications programs, you should give each subdirectory a resource name that is easily identifiable.

- *What printer resources do you want to set up?*

You can set your printers to operate in various print modes and give each mode a resource name. For example, you could set the same dot matrix printer to print in letter quality or landscape mode. You might name the letter quality mode @LQUALITY and the landscape mode @LANDSCP. For more information on setting up print modes as network resources refer to “Network Printing” in the *LANtastic NOS Reference Manual*.

- *Are there any other network resources you want to share?*

You might want to include a CD-ROM or any other kind of device in your network.

## ***User Account Information***

The “User Accounts” form is provided at the end of this chapter to write down your answers to these questions:

- *What users will have access to the system?*

You will have to set up an account for each user. For security reasons, it's best not to let users share accounts. You may also want to set up a guest account to accommodate a temporary system user.

- *What username will you give to each account?*

If your users can be organized by departments, it may help to have a user group prefix for each department. You might have a symbol such

as ! or the ACCT- prefix as the first part of any username from the accounting department (for example ACCT-LINDA or ACCT-BILL). Creating a user group prefix also makes it easier to assign ACL privileges. For more information on setting up user accounts, refer to “Accounts” in the *LANtastic NOS Reference Manual*.

- *Will you require each user to give a password to access the system?*

If you’re not concerned about network security, then you need not require passwords. If security is a major concern, require users to have them. To avoid having passwords stolen, it is recommended that you not write them down.

▲ **Caution:** Be very careful when keying in passwords, once entered, there is no way to find out what password was typed.

- *What resources will each user have access to?*

For each device on your computer that your users will have access to, you will need to create a network resource. Refer to “Shared Resources” in the *LANtastic NOS Reference Manual* for more information on this subject.

- *What access rights will each user or user group have?*

If you’re concerned about security, you should carefully consider what types of access to each user needs to perform their duties. Just because a user may need to read a file doesn’t mean that he or she should have the access right to delete the file. The easiest way to set up access privileges is by user group. Simply create a template for the user group and assign access rights to that prefix (or example \$ or ADMIN), then any user with that prefix in his or her username will have the access rights set up for that group. (For more information on this subject refer to “Shared Resources” in the *LANtastic Network Operating System Reference Manual*.)

## Network Configuration Checklists

<b>Server Configuration</b>		
<b>Name of Computer:</b>		
<b>Boot Server? Y/N</b>		
<b>Shared Applications Programs:</b>		
Program Name:	Resource Name:	Local DOS Path On The Server
<b>Shared Files:</b>		
Directory Name:	Resource Name:	Local DOS Path On The Server
<b>Printer Resources:</b>		
Printer Device:	Resource Name:	Local Name On The Server
<b>Additional Shared Devices:</b>		
Resource Name:	Local DOS Path On The Server	



## ***User Accounts***

<b>User Or Group</b>	<b>Username</b>	<b>Password Y/N</b>	<b>Assigned Resources</b>	<b>Access Rights</b>



# Index

---

Access Control Lists (ACL's) 15  
Audit Trails 3, 17  
Batch files 20, 23, 33, 34  
Bringing Up The Network 33  
Buffers 19  
CONFIG.SYS 19  
Control Directory 3  
Default Resources 21  
DOS paths 17  
Electronic Mail 3  
Files 4  
File Paths 9  
Installation 19-22  
LANcache 4  
Local Area Network (LAN) 1, 2, 8, 39  
Log In Security 14  
Logging In To A Server 8, 26  
Menus 25  
NETBIOS 4, 5, 23, 33  
Network Paths 9, 17  
Network Security 14-17  
Nodes 7, 17  
Non-Dedicated Server 2  
Password 8, 9, 15  
Printer  
    resource names 13  
    Sharing 13, 33-37  
    spool area 2, 13, 18  
    queue 13, 18  
Reading A File On A Server's Disk 24, 25  
Redirecting A Printer 34-37  
Redirecting To Server Resources 27-30  
Redirection 7, 8, 10, 11, 27-30  
    Cancelling 30, 31  
Redirectors 7, 8, 17  
Resource name 7, 9, 11, 17  
Resources 1, 11-14, 21  
    Default 21, 22  
Security 3, 14-17  
Servers 2, 7, 8, 17  
Session 8  
STARTNET 20, 23, 24, 33  
Typeface Conventions 4  
Username 8  
Workstations 7, 8, 17

