# Managing Your Directory Structure and Disk Space

## By Doug Archell

Network administrators are always looking for a way to automate management tasks, but many companies cannot afford a sophisticated management system. The May/June edition of Field Notes offered some tips to help you perform daily management tasks, and suggested several useful shareware and freeware utilities. (See "Managing Your Servers Doesn't Have to Be Expensive," *NetWare Connection*, May/June 1995, p. 38-46. You can download this article from *NetWare Connection*'s Networking Home Page at http://www.mcrlabs.com/net/documents.html.)

I received a lot of feedback about that article. One reader in particular asked me to explain how to manage disk space more effectively. As a result, this edition of Field Notes will focus on two important aspects of disk space management: creating an efficient directory structure and file system, and implementing space restrictions.

No matter which version of NetWare you are running, the way you structure your directory and file system plays a crucial role in the overall manageability of your servers. With the introduction of more advanced operating systems such as NetWare 4.1, the enterprise has become the focal point for network administrators. Although these operating systems present a more enterprise-based network outlook, managing server resources is still an important part of a network administrator's job. You must continue to address directory structure and disk space usage.

## The Ideal Directory Structure

The first task involved in disk space management is setting up the directory structure. If you design a sound directory structure, you will minimize the work required to complete many management tasks, including the following:

- Installing and maintaining applications
- Backing up and restoring applications and files
- Assigning trustee rights
- Setting up space restrictions

Although opinions vary on the best way to set up a NetWare directory structure, one setup has proven to be effective for many companies. In addition to the directories created by NetWare (such as LOGIN, ETC, MAIL, SYSTEM, DOC, and PUBLIC), you should, at a minimum, create the following directories:

- Application directory
- Home directory
- Shared group directory

### Application Directory

You should create a parent application directory, under which you can create a subdirectory for each application that will be installed on the server. Storing all application program files in a single directory system will resolve several management issues:

- **Trustee Rights.** Because users require the same rights to access most applications, you can grant trustee rights to the application parent directory rather than to each application subdirectory.
- **Backup and Restore Procedures.** Because application program files are usually updated only when the software is upgraded on the server, these files do not need to be backed up daily. If you create a parent application directory, you can configure your backup system to archive the application directory once a week or only as needed. This configuration will shorten the time it takes to archive your system.
- **Disk Space Management.** Creating an application directory structure will allow you to better control disk space. Because users cannot create data files in the application program directories, you do not have to assign users disk space to these directories. (Assigning disk space restrictions will be explained later in this article.)
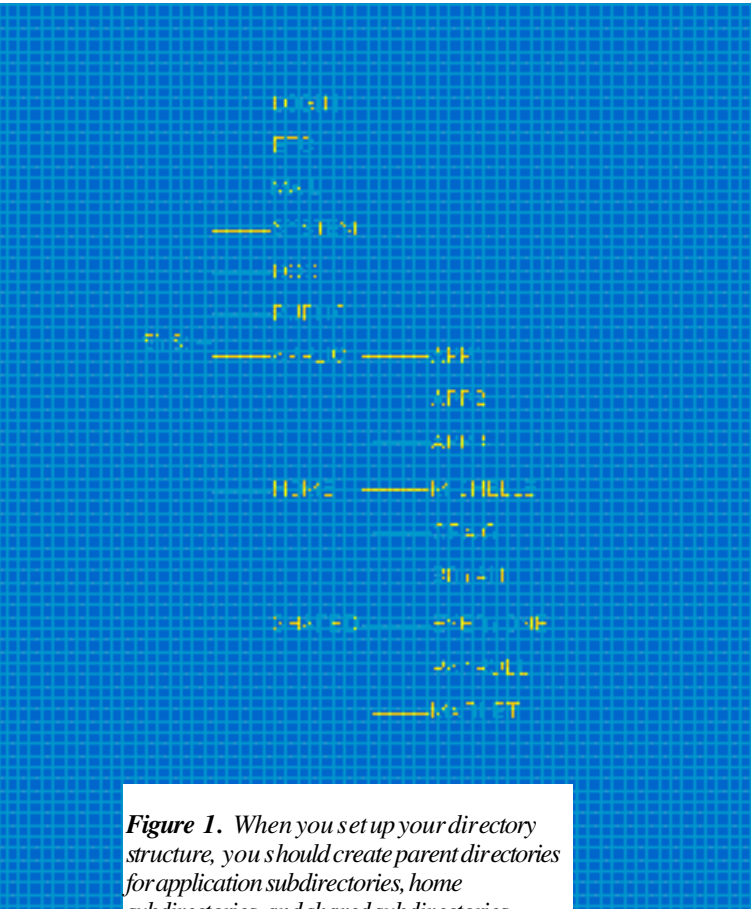
### Home Directory

You should also create a parent home directory, and within that directory, you should create a home subdirectory for each user. Because a server can support hundreds or thousands of users, organizing users' home subdirectories in a parent directory will help you manage and protect your users' data files. First, users will be able to maintain files within their home subdirectories without worrying about other users accessing those files. Second, when you create users and allow NetWare to create their home subdirectories for you, users' trustee assignments are made automatically. Whenever possible, let NetWare do the work for you.

Using this directory structure, you can configure your backup system to archive the entire parent home directory, rather than specifying numerous individual directories. This setup will save you time and simplify the backup process.

## Shared Group Directories

Many network administrators a[llow] users to grant other users access to [their] home subdirectories. For most inst[itu]tions, this practice results in exces[sive] rights being granted, and it may co[mpro]mise network security. A better so[lution] would be to create a shared direct[ory that] will allow users to share and excha[nge] files. Then you can create groups [on the] server, using the SYSCON utility f[or] NetWare 3 and the NETADMIN u[tility or] the NetWare Administrator (NWA[dmin)] utility for NetWare 4. You assign u[sers as] members of these groups and then [grant the] groups access to specific directories[.] Shared directories allow you to im[pose] space restrictions more effectively, [as I'll] explain later in this article.

Figure 1 illustrates a typical Ne[tWare] directory structure for a file server [named] FS1. This server includes three app[lica]tions (APP1, APP2, and APP3), t[hree] users (MICHELLE, CRAIG, and BRYAN), and three groups (EVE[RYONE,] PAYROLL, and MARKET for the Marketing department).



**Figure 1.** *When you set up your directory structure, you should create parent directories for application subdirectories, home subdirectories, and shared subdirectories.*

# Managing Disk Space

How does your directory structure affect how you manage disk space? To answer this question, let's look at the two ways you can assign space restrictions: The first and most commonly used method is to restrict space on the server on a per user, per volume basis. The second method is to restrict the size of directories.

## Restrict Disk Space on a Per User Basis

At first glance, it may seem easier to restrict disk space on a per user, per volume basis. However, this method may create more problems than it solves. When you impose space restrictions on individual user IDs, you must know exactly what kind of work each user will be doing. Gathering this information can be overwhelming or even impossible if your server supports hundreds or thousands of users.

Consequently, some network administrators arbitrarily restrict disk space for all user IDs, but this approach can cause problems because users do not fully understand space restrictions. In most cases, users think that if they are assigned 10MB on the server, this 10MB restriction applies only to their personal subdirectory.

However, NetWare uses the file owner attribute to calculate the amount of space a particular user is consuming. For example, suppose you assign a 10MB space restriction to user GAIL on the SYS: volume. GAIL then creates a file in her personal subdirectory that is 2MB in size, leaving her with 8MB available on the server. Next, GAIL sends a 1MB print job to the PQ1 print queue. The print job is put on hold, leaving GAIL with only 7MB available until the job actually gets printed.

GAIL then runs the Marketing department's presentation application on the server and updates a 10MB graphic file. Before she opened the file, BOB was the file owner, but when GAIL tries to save the file, she becomes the file owner. Because the file is 10MB, GAIL runs out of available space on the server volume, and the save procedure cannot be completed.

The potential for file corruption in this situation is obvious. Hours of work have been lost, and GAIL and her manager blame *you* because you placed a space restriction on GAIL's ID.

Of course, some applications will not change file ownership. It depends on how the application saves and updates files. Unfortunately, many popular applications do change the file owner.

## [S]ize of Directories

[...]he problems described above [...] by restricting the size of [...]any administrators feel that [...]an create a huge manage[...]e, but if your directory [...]ll organized, it's much [...]seems.

[...]way to explain this method [...]ace restrictions is to use an [...]tory structure, which is [...]re 1. Now take a look at [...]. 54), which lists the [...]and the directory space [...]r the directories shown in [...]igure 2 shows, no users [...]create files within the [...], SYSTEM, DOC, and [...]tories. As a result, you do [...]mpose disk space restrictions [...]tories.

[...]ave rights to their own [...]rectory within the HOME [...]y, however. For each sub[...]would assign a space limita[...]n the needs of your users and [...]f disk space available. In our [...]ork, each personal subdirectory has a 3MB limitation. Make sure

| Directory | Trustee Assignments | Restricted Directory Size |
|---|---|---|
| LOGIN Directory | RF to EVERYONE | Not Restricted |
| ETC directory | None | Not Restricted |
| MAIL directory | C to EVERYONE | 50MB |
| SYSTEM directory | None | Not Restricted |
| DOC directory | None | Not Restricted |
| PUBLIC directory | RF to EVERYONE | Not Restricted |
| APP1 subdirectory | RF to EVERYONE | Not Restricted |
| APP2 subdirectory | RF to EVERYONE | Not Restricted |
| APP3 subdirectory | RF to MARKET group | Not Restricted |
| MICHELLE subdirectory | RWCEMF to MICHELLE | 5MB |
| CRAIG subdirectory | RWCEMF to CRAIG | 5MB |
| BRYAN subdirectory | RWCEMF to BRYAN | 5MB |
| EVERYONE subdirectory | RWCEMF to EVERYONE | 100MB |
| PAYROLL subdirectory | RWCEMF to PAYROLL | 50MB |
| MARKET subdirectory | RWCEMF to MARKET | 200MB |

*Figure 2.* *If you set up your directory structure properly, restricting the size of directories is fairly simple. Using a chart like this, you restrict only the directories to which users have rights. (The Read, Write, Create, Erase, Modify, and File Scan rights are abbreviated as RWCEMF.)*

your users know how much data they can store in their personal subdirectories.

Figure 1 shows that the SHARED parent directory contains three subdirectories. Groups have been created on the file server, and the appropriate users have been set up as members of these groups. In turn, the groups have been granted Read, Write, Create, Erase, Modify, and File Scan rights to their respective subdirectories in the SHARED parent directory.

Before you limit the size of each shared subdirectory, you should consult the group that will use the subdirectory. For example, the Marketing group shown in Figure 1 uses an application that creates large files, so the group thinks it will need 200MB for its data files. The MARKET subdirectory has been restricted accordingly. (See Figure 2.) The PAYROLL group, on the other hand, requires only 50MB for its data files. Finally, the network administrator created the EVERYONE subdirectory so that users can share and exchange files; the administrator then limited the directory space to 100MB. If you create this kind of

subdirectory, make sure users understand the purpose of the subdirectory and the space limitation you impose.

Although assigning space limitations on a per directory basis does not completely eliminate the chance of a user encountering insufficient space errors, it does offer several advantages:

- **Improved Awareness**. It is easier for most users to understand space limita-

tions on directories. As I explained earlier, users may have trouble saving a file if you assign space restrictions on a per user basis. You must foresee such problems and plan accordingly. It is not the users' responsibility to know if an application updates the file owner.
- **Improved Cost Allocation.** In most environments, several workgroups or departments use a particular server. If you restrict space by directory, workgroups and departments can "purchase" a portion of disk space on the server, and this space will always be available to them. Some companies choose to have separate volumes for each department or workgroup, but this solution is not a viable one for many companies.
- **Accountability.** After you set up your directory structure as outlined in this article, you can meet with workgroups and departments and ask them to predict how much disk space they will need. If you allow users, workgroups, and departments to determine these requirements, they will be more accountable for any errors that occur.
- **Improved Management.** If you impose space restrictions on a user ID and the user consumes all of the allocated disk space, you have two choices: You can grant the user more space, or you can scan the server and list all of the files owned by the user. You can then evaluate how the space is being used and ask the user to delete unneeded files. On the other hand, if space restrictions are imposed on a directory structure and a user encounters an insufficient space error when saving a file, you can more easily pinpoint the problem. You can find out what application the user was using and locate the directory in which the application saves its files. You can then check the space restrictions for that directory and determine what the problem is. This approach

| Address | Purpose |
|---|---|
| enhclient@novell.com | Client products |
| enhserver@novell.com | Server products (such as installing, monitoring, licensing) |
| enhprint@novell.com | Printing and utilities (such as PCONSOLE, FILER, NDIR) |
| enhnds@novell.com | Directory services, Timesync, and related utilities |

*Figure 3.* *If you want to recommend an enhancement to NetWare, send a message to one of these e-mail addresses.*

takes less time than reviewing all of the files a user has on the volume and determining which files can be deleted.

Limiting the size of directories provides significant advantages for most environments. However, you must weigh the benefits of both approaches and determine the best solution for your environment. One method does not work for everyone, but if you have never considered restricting the size of directories, you may want to think about the benefits of doing so.

## Tell Novell What You Think

If you are like most network administrators, you have a wish list of features that you would like to be added to or improved in the next update of NetWare. So what do you do with this wish list?

If you want to request an enhancement or a new feature, send an e-mail message to the appropriate address listed in Figure 3. Please send only messages about enhancements or new features; these e-mail

addresses are not intended for reporting bugs or for requesting product information.

## Write Us!

The purpose of this column is to provide you with helpful tips and tricks. If you would like me to address a particular topic in a future edition of Field Notes or

if you have a quick tip or trick that you want to share with other readers, drop me a line on CompuServe at the address listed below.

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