

## Backup and Recovery Strategies - Part 2

### Backup and Recovery Strategies for Mission-Critical 4D Server Databases: Automatic Backup and Mirroring with 4D Backup

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4<sup>th</sup> Dimension Technical Note 97-7

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#### Introduction

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This technical note is the second of two parts. Part 1 was entitled *General Principles of Database Backup and Recovery*.

The trend that we are seeing in ACI Technical Support is that thousands of customers are using 4D Server for mission-critical data storage. Daily, we are talking with customers who have 4D Server installations with as many as 100 users connected, and with data files as large as five gigabytes. The customers view these applications as mission-critical, meaning that the organization cannot function properly if the system is down. Often, these databases are running 24/7: twenty-four hours a day, seven days a week.

You can depend on 4D Server to give you mission-critical, 24/7 stability, **if** you apply some common sense to your Database Administration duties and **if** you follow a few simple rules of backup and recovery. Many customers have been able to maintain 4D Server installations that run for months—seven years—with little or no downtime. The purpose of this two-part technical note is to provide you with the information that you need in order to set up a 4D Server installation that gives you that kind of stability and reliability.

In this part, Automatic Backup and Mirroring with 4D Backup, we will cover:

- ¥ The concept of 4D Backup
- ¥ Tricks and tips for using 4D Backup
- ¥ Tricks and tips for mirroring with 4D Backup

#### The concept of 4D Backup

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4D Backup is a tool for DBAs who are responsible for mission-critical databases. 4D Backup can perform stand-alone backups of 4D databases; it can also work in conjunction with 4th Dimension or 4D Server to perform scheduled backup and mirroring. To use 4D Backup, you need to take the following steps:

- ¥ Turn on the Mandatory Log File preference in the Design environment.
- ¥ Use 4D Backup to make a full backup of your structure, data, and other necessary files. This becomes your starting point.
- ¥ Create a Backup Project to save your preferences and other settings.
- ¥ Create a transaction Log File to record all changes to the database.



¥ Set up a Mirror on another machine. This mirror contains a copy of the database, structure, 4D Server, and all related files.

¥ Launch your database on the primary server. As the users make changes to the database, 4D Backup stores those changes in the transaction log. This log file is not indexed, and it only contains the fields that were actually modified. Therefore, writing to the log file has little or no effect on the performance of 4D Server.

¥ At regularly scheduled intervals (for example, every half-hour), 4D Backup on the main server sends the log file to the mirror machine. The Mirror machine automatically integrates the log file into the mirror copy.

¥ After it integrates the log file, 4D Backup creates an additional backup of the database on the mirror machine. This means that you always have at least two copies of the database on the mirror machine: the current mirror, and the most recent backup.

¥ At regularly scheduled intervals (for example, every evening after business hours), 4D Backup makes another complete backup, this time on your primary server machine. This means that you always have at least four copies of your data: two on the server machine, and two on the mirror machine.

¥ If the Primary Server goes down, you can go to the Mirror machine, integrate the latest log file that has not yet been mirrored, launch 4D Server on the mirror machine, move licenses to the mirror machine, and instruct the users to connect to the Mirror machine instead of the primary Server. Even if your database is several gigabytes, you can complete the entire process in less than 15 minutes.

## **Tricks and tips for using 4D Backup**

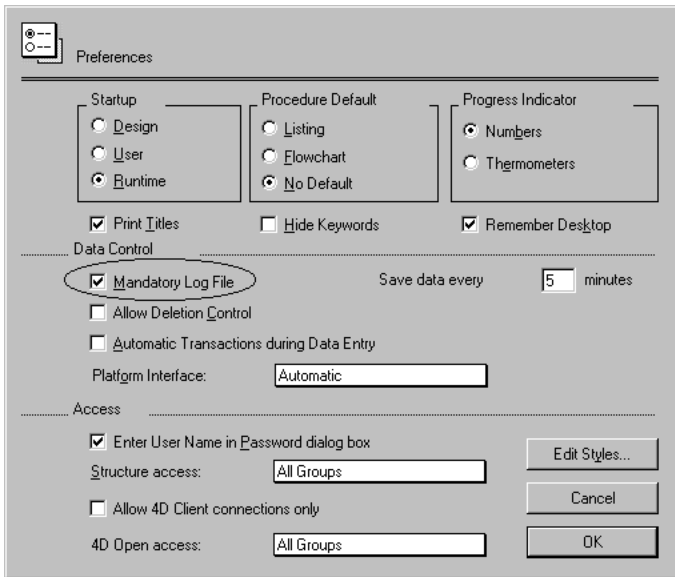
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4D Backup has many powerful features that make it an ideal tool for helping you to get your database back on-line quickly in case the primary server goes down. The following sections list of the most important features. For step-by-step instructions on the use of these features, see the *4D Backup Reference Manual*.

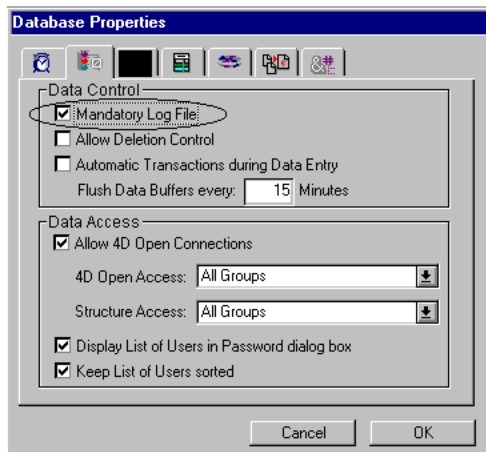
### **Mandatory Log File option**

The entire backup and recovery process works on the assumption that 4D Backup has been maintaining a real-time log file of changes to the database, as they were happening. Therefore, it is imperative that you go to the Design environment and turn on the Mandatory Log File option.

The following screen shots show the Mandatory Log File option in Version 3 and in Version 6 of 4thEDimension.



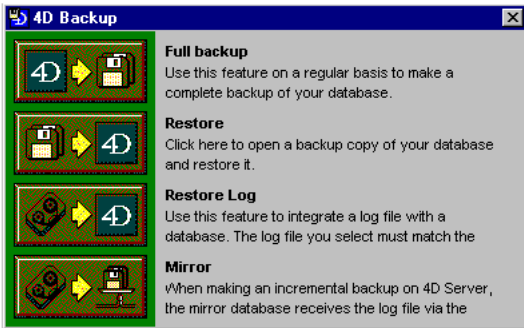
Mandatory Log File option, Version 3



Mandatory Log File option, Version 6

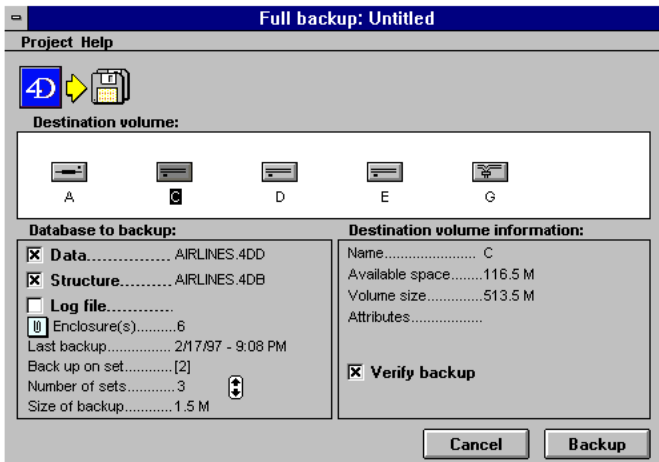
## Performing full backups

The following is the 4D Backup main screen.



4D Backup main screen

When you click the Full Backup button, 4D Backup presents a dialog that allows you to do a complete of backup of your structure, data, and related files.



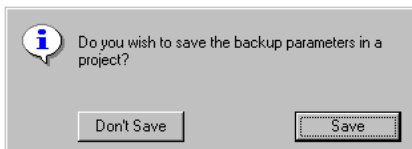
Full backup dialog

In this case, the originals of the structure and data are on drive E, and we will be storing the backup on drive C.

Here are some hints and tips about performing Full Backups.

¥ If you are making your backups to the same drive as the originals, 4D Backup will warn you that this is not a good practice. If you must continue with the backup on the same drive, you should copy the backup to another drive after it is done.

¥ When prompted to save the backup parameters in a project, always choose **Yes**. Having this project will save you time later.



Saving backup parameters dialog

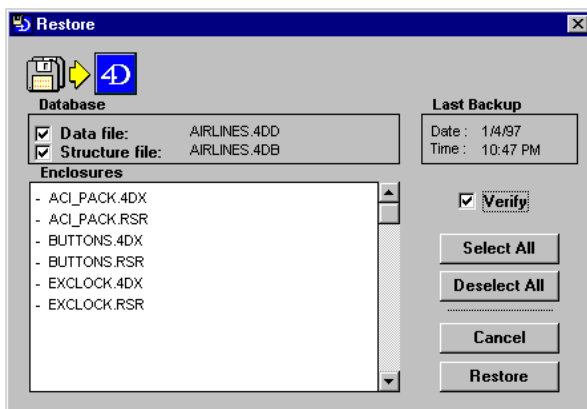


¥ It is also a good idea to use a compression utility such as WinZip (Windows) or DiskDoubler (Macintosh) to compress the backup file. You can save as much as 70% of the space that is used by the uncompressed file. If you do compress the backup, be sure to compress it as a self-extracting archive (SEA), so you will be able to expand the file, even if you do not have the application that compressed the file.

¥ Include all the 4D Extensions that the application needs as a part of the backup. When you are backing up from within 4D or 4D Server, make an extra copy of the extensions that are in the Mac4DX and Win4DX folders and include those extra copies as Attachments. The reason you cannot use the originals is that 4D Backup cannot make backup copies of extensions while they are in use.

## Restoring a Backup

The following screenshot shows a Restore dialog when Extensions were included in the project. These Extensions were extra copies, located in a spare Win4DX folder.



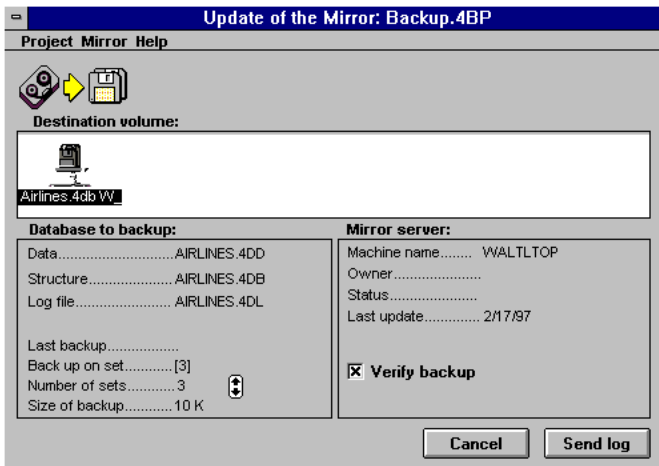
Restore dialog

¥ Always click the Verify button, both for a backup or for a restore. The backup will take a bit longer, but you will be assured of having a true copy.

## Tricks and tips for using the Backup Mirror

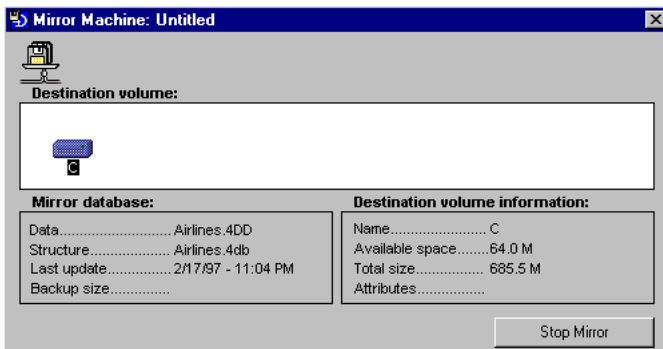
Setting up a Mirror is the best way to ensure that your system will never be down for more than a few minutes at a time. If your primary machine goes down, you can integrate the latest log file, transfer licenses to the mirror, and be back up and running in less than 15 minutes.

If you have already set up a Mirror with 4D Backup, you know that it is relatively simple and straightforward. The following are screen shots of what the DBA sees happening on the primary server and on the mirror machine.



Dialog on the Primary Server while waiting to send a log file

This is an example of a Windows-to-Windows mirror. The primary database is located on Drive E of computer A; the mirror is located on Drive C of computer B. If you want to manually update the mirror, you can click the Send log button. However, the most efficient way to send the log file is to use the Scheduler, which we will discuss later.



Dialog on the Primary Server while waiting to receive a log file

## **Mirror to the Same Platform**

Although 4D Backup supports cross-platform mirroring (Macintosh to Windows or Windows to Macintosh), the ideal situation is to mirror to a similar machine on the same platform. For example, if your primary server is an Intel Pentium running Windows NT 3.51, then your mirror machine should also be an Intel Pentium running Windows NT 3.51. The reasons for this recommendation are:

¥ This same-platform mirror is the simplest and most trouble-free. You will have fewer chances for error than you will have if you mirror cross-platform from (for example) an NT server to a Mac server.

¥ When you are preparing your mirror, you should shut down the primary server long enough to install the same 4D Server license number on the mirror server. As long as both copies of 4D Server are not running at the same time, 4D Server's licensing will allow you to do this.

¥ If your hard drive crashes on the primary machine, you will be able to use the same 4D Server Expansion Packs on the mirror machine that you had been using on your primary server. During the installation process, expansion packs store the license number of the server to which they belong. They can be re-installed, even after they have been used, as long as they are installed into a copy of 4D Server that has exactly the same license number as the original installation.

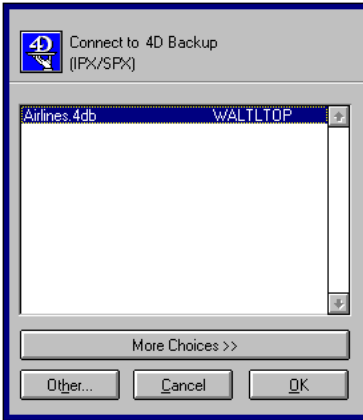
¥ In other words, if your primary hard drive crashes, you will be able to recover, even though you had not de-installed the licenses from the original server. This is the "safety net" that is built-in to 4D Server.

¥ Windows and Macintosh have different numbering series for 4D Server licensing. Therefore, if your primary server is on an NT machine and your backup server is on a Mac, then it will be impossible for both copies of 4D Server to have the same license number. Therefore, in order to ensure quick recovery, you will have to have to purchase two copies of 4D Server (one Macintosh and one Windows). You will also have to purchase two sets of expansion packs, one for Macintosh and one for Windows. This is an unnecessary expense.

## **Experiment with different networking protocols**

Although you may be using one networking protocol as your primary mode of communication between 4D Client and 4D Server, do not assume that the same protocol will be the best choice for communication between your primary server and the mirror machine. If you are having trouble communicating with mirror using your primary protocol (e.g., ADSP), then you should experiment with the other two protocols: TCP/IP and IPX/SPX. It may be that the reduced traffic in a different protocol might yield a more reliable mirror environment.

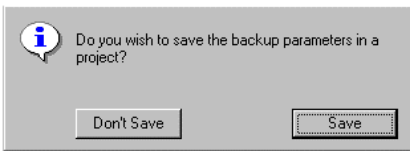
In the following example, 4D Client and 4D Server are communicating primarily in TCP/IP; however, we have chosen IPX/SPX as the protocol for mirroring.



Connect to 4D Backup dialog

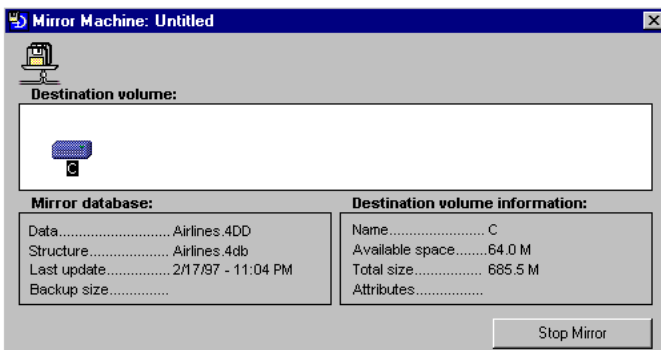
### Save your Backup and Mirror projects

4D Backup allows you to save your settings for backups and mirrors. You should do this to save time and increase efficiency. Whenever you create a backup project or make changes to an existing project, the following dialog appears:



Save backup parameters dialog

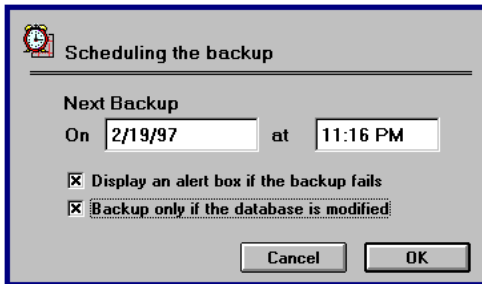
Normally, you should click Save to save the project parameters. However, we have had user reports that sometimes a Windows to Mac cross-platform mirror will fail if the backup project was saved before the first mirror was performed. In that case (if you are mirroring cross-platform Windows to Mac), you should wait until after you have performed the first Send Log operation to create a backup project file on the primary server.



Mirror dialog

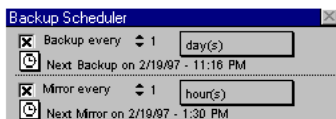
## Use the Backup and Mirror Scheduler

4D Backup provides you with a Scheduler to set times for automatic backups and automatic mirrors. The scheduling dialog looks like this.



Scheduling dialog

4D Backup uses the identical dialog for scheduling backups and for scheduling mirrors. After you set the dates, times, and frequency, your completed scheduler window looks like this:



Scheduler window

## Use the 4D Backup programming language

4D Backup has a rich programming language that allows you to schedule backups and to send log files to the mirror programmatically. You might want to use the programming language in the following cases:

¥ To programmatically send a log and do a backup after importing a large number of new records into your database, or after a large posting operation that would take several hours to repeat if your hardware failed before the next backup or mirror.

¥ To make the operation more turnkey if the DBA of the database is not comfortable with computers, or if the DBA does not feel confident using the Scheduler.

## Conduct regular fire drills

The military, the Civil Defense, the fire department, and many other crisis-response organizations perform simulations of emergencies. If your database is truly mission-critical, meaning that your organization cannot function if the database is down for any period of time, then you should conduct emergency drills. About once a month, simulate a hardware failure.

Go through the motions of transferring from the primary to the backup:

¥ Integrate the latest log file.

¥ Launch 4D Server on the mirror.

¥ Install the user licenses on the mirror machine.

¥ Ask the users to test the 4D Client connection to the mirror machine.



As we said in Part 1 of this series, you should have a recovery goal, for example: Never down for more than 15 minutes. When you do the simulation, you should count the minutes that it takes to do the changeover operation. When the drill is finished, compare the results against your goal. Continue to improve the process until you can comfortably meet your goal, and then do the drill once a month to keep maintain proficiency.

## **Summary**

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In part one, we discussed the wisdom of making frequent backups and the need to keep historical backup copies, on-site and off-site. In part two, we discussed how 4D Backup, with its automatic mirroring capability, fits into the overall backup and recovery strategy. If you apply the rules and techniques that we have discussed in this two-part technical note, you can depend on 4D Server to give you mission-critical, 24 hour a day, seven day a week stability.

## **See Also**

[Backup and Recovery Strategies - Part 1](#) .