

CHAPTER 6

TESTING AND RESULTS

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6.1 INTRODUCTION

This chapter investigates usability and functionality testing of the proposed local and remote data backup system. This involves a mock disaster where deletion of data file is performed. Testing results and discussions of each module in the system are included in this chapter. Eventually, the evaluation, strengths and drawbacks of the local and remote data backup system are also discussed.

6.2 PURPOSE AND HYPOTHESIS

6.2.1 PURPOSE

The purpose of testing is to ensure functionality of all modules in the local and remote data backup system and to detect any defects or errors that may arise that compromise the usability of the system. Hence, purpose of system testing is to verify that:

1. local data backup module successes in transferring selected data files from a workstation to another workstation, which resides in LAN.
2. remote data backup module achieves data files transfer from a local workstation to a remote FTP server.
3. remote data restore module successes in restoring backed up data files from remote server to local workstation.
4. scheduled backup module accomplishes the activation of local and remote data backup procedures in scheduled manner, according to specified days, time and time interval.
5. incremental backup module achieves the ability to backup data files that have been changed since the last backup.

6.2.2 HYPOTHESIS

The hypothesis made is that the local and remote data backup system is transferring files in a secured network environment. This hypothesis should be made because most of the network security services like data confidentiality and data integrity are not provided in this system.

In the case of remote backup module where files transfer over the Internet is involved, it is usually advisable to minimize the size of files in bytes. Hence, there is another hypothesis should be formed where all selected files are compressed before they are backed up to the remote server. On the other hand, the remote data restoration module requires this hypothesis too.

In the remote data backup and restore module, an FTP server is needed. Thus, hypothesis should be made that the users of this system hold a valid account in any FTP server, with authenticated user name and password, in order to permit files upload and download in the FTP server.

6.3 TESTING

6.3.1 TESTING VENUE

There are two testing sessions performed. The first session has been done in the Master Laboratory in Faculty of Science Computer and Information Technology, University of Malaya, while the other has been performed in a business organization, SEA Automation Sdn. Bhd. This business organization is the target of case study as discussed in chapter 4.

The local and remote data backup system has been tested on the local area network in both of the venues. With the installation of system in one of the client computer, system testing is conducted. Testing of local data backup module is conducted on the LAN while

testing of the remote backup module involves an FTP server, which acts as an off-site storage.

6.3.2 TESTING SCHEDULE AND PARTICIPANTS

The first testing session in the Master Laboratory was conducted on 15 May till 17 May 2000. Participants who were involved in this session were the voluntary course-mates pursuing master degree in computer science. In this session, all of the modules were tested for its functionality. Besides, many valuable suggestions and comments were also received.

On the other hands, the second session of testing the local and remote data backup system was also started simultaneously on 15 May 2000 and ended on 21 May 2000. This daily backup process was scheduled to be performed at 5.30 pm on Monday to Friday and 1.00 pm on Saturday. This testing involves both the local and remote backup in a non-incremental backup manner.

In addition, for the frequently changed files typically database files, backup process was scheduled to be performed in every hours started from 9.00 pm to 5.00 pm on Monday to Friday and 9.00am to 1.00pm on Saturday. This testing involves both the local and remote backup in an incremental backup manner. The main participant of this session is Angie Ng, the Administrative Executive in SEA Automation Sdn. Bhd.

6.3.3 PROBLEMS

Both testing sessions were conducted successfully. Procedures and results of testing in the first session were provided in following section. Due to the confidential business information involved in the second session, the testing procedure is not shown in this dissertation. On the other hand, only local magnetic disk drive was selected as the media backup during the testing sessions. Hence, CD-R, CD-RW, Zip disk and other storage media were not utilized.

6.3.4 PROCEDURES AND RESULTS

In order to verify all modules, the local and remote data backup system was installed in Aust1, which acted as a backup client. Besides, local and remote backup servers are also needed in this testing procedure. Hence, the following table summarized the workstations in LAN and the remote server that have been utilized in Master Laboratory.

Table 6.1 Host Name and IP Address of Client and Servers in Testing Session

| | Host Name | IP Address |
|----------------------------|------------------|-----------------|
| Local Workstation (client) | Aust1 | 202.185.108.151 |
| Local Backup Server | Aust12 | 202.185.108.140 |
| Remote Backup Server | ftp.malaysia.net | 216.15.159.131 |

6.3.4.1 LOCAL DATA BACKUP MODULE

6.3.4.1.1 TESTING PROCEDURES

In order to verify local data backup module, two local workstations in the Master Laboratory were selected, Aust1 as the backup client and Aust12 as the local backup server. Aust1 and Aust12 are the host name of the workstations. In Aust1, a DATA folder has been created and it contains files that needed to perform local data backup. This is depicted in Figure 6.1 where DATA directory has been chosen in the “files/directories to be backed up” window.

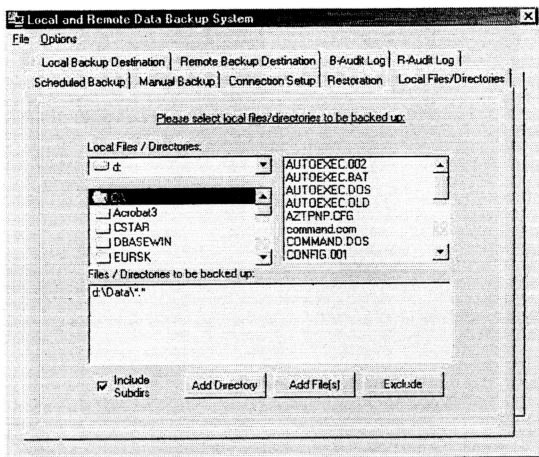


Figure 6.1 Local Files/Directories

However, destination of local backup server, where backup files are stored in, must be identified before local data backup module can be executed. So, as illustrated in Figure 6.2, there is a window showing network neighborhood of the LAN in the Faculty of Computer Science and Information Technology. Aust12 has been determined as the local backup server and files will backup to its directory, D:\Backup.

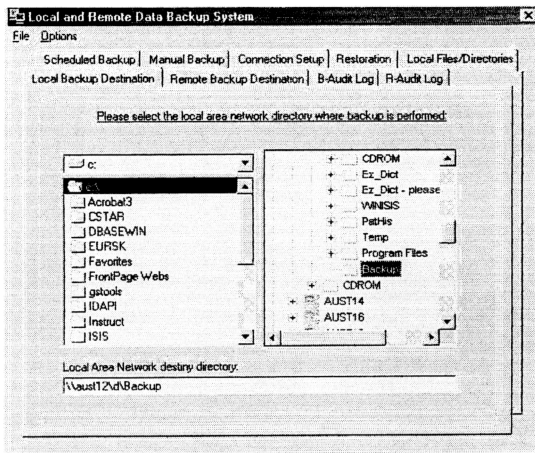


Figure 6.2 Local Backup Destination

6.3.4.1.2 TESTING RESULTS

Local backup module can be activated after the previous settings have been completed. A “Local Manual Backup” button has been designed to activate this module. By pressing it, a status window will appear to show the backup progress. This is shown in Figure 6.3.

With Log Files module, log file of local data backup module will appear in text form, verifying the procedures. This log file is data backup documentation provided to validate time, date and files transfer in backup module.

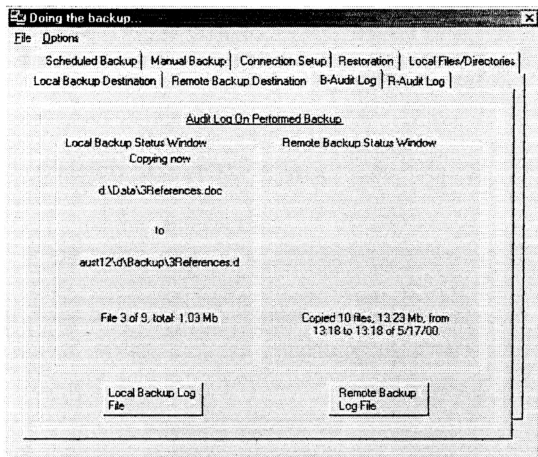


Figure 6.3 Local Backup Status Window

The testing result of local data backup module is listed in the content of the Log Local_Backup.txt:

```

Initializing local backup at 5/17/00 1:19:38 PM
d:\Data\scheduled.bmp --> \\aust12\d\Backup\scheduled.bmp, status: Ok!
d:\Data\conte.doc --> \\aust12\d\Backup\conte.doc, status: Ok!
d:\Data\2Contents.doc --> \\aust12\d\Backup\2Contents.doc, status: Ok!
d:\Data\3References.doc --> \\aust12\d\Backup\3References.doc, status: Ok!
d:\Data\IACKNOWLEDGEMENTS.doc -->
\\aust12\d\Backup\IACKNOWLEDGEMENTS.doc, status: Ok!
d:\Data\cover.doc --> \\aust12\d\Backup\cover.doc, status: Ok!
d:\Data\Screen.doc --> \\aust12\d\Backup\Screen.doc, status: Ok!

```

d:\Data\Screen.zip --> \\aust12\d\Backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> \\aust12\d\Backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> \\aust12\d\Backup\user interface1.zip, status: Ok!
Copied 10 files, 13.23 Mb, from 13:19 to 13:20 of 5/17/00.

6.3.4.2 REMOTE DATA BACKUP MODULE

6.3.4.2.1 TESTING PROCEDURES

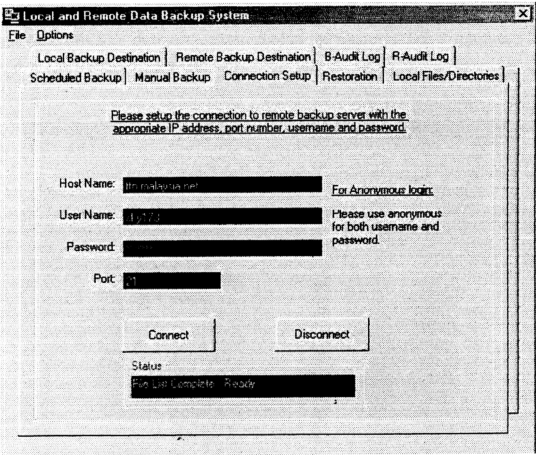


Figure 6.4 Connection Setup

The first step in procedures of remote data backup is to setup a connection between local backup client and remote backup server. The remote server with hostname ftp.malaysia.net and IP address 216.15.159.131, has been chosen to be backup server. This host requires authenticated Username and Password to establish a connection

between backup client and server at Port 21. These connection setup procedures are depicted in Figure 6.4.

Similar with local data backup module, Austl acts as the backup client. In addition, DATA directory, which contains files that needed to perform local data backup, is selected in the “files/directories to be backed up” window.

If FTP connection setup to remote server is successful, directories and files will be listed in window in Figure 6.5. From there, remote data backup destination would be identified. In this case, BACKUP directory is determined as the remote backup destination. Please refer to Figure 6.5 for a clear view.

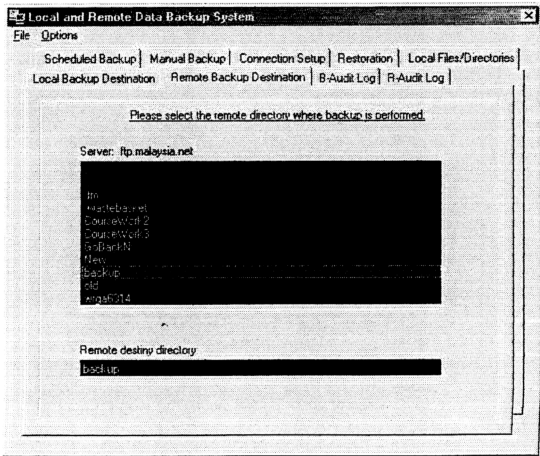


Figure 6.5 Remote Backup Destination

6.3.4.2.2 TESTING RESULTS

In the same case, remote backup module can be activated after previous settings have been completed. A “Remote Manual Backup” button has been designed to activate this module. As illustrated in Figure 6.6, a status window will appear to show the backup progress.

Log Files module, will verify the backup procedures. As a result, a text form log file is created as documentation to validate time, dates and files transfer in the backup module.

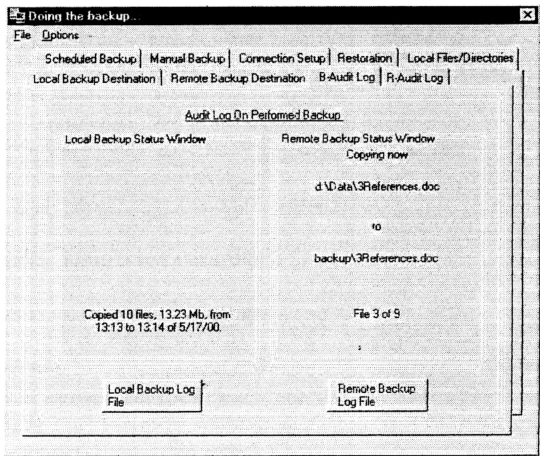


Figure 6.6 Remote Backup Status Window

The testing result of remote data backup module was listed in the content of the Log Remote_Backup.txt:

Initializing remote backup at 5/17/00 1:18:06 PM

d:\Data\scheduled.bmp --> backup\scheduled.bmp, status: Ok!
d:\Data\conte.doc --> backup\conte.doc, status: Ok!
d:\Data\2Contents.doc --> backup\2Contents.doc, status: Ok!
d:\Data\3References.doc --> backup\3References.doc, status: Ok!
d:\Data\1ACKNOWLEDGEMENTS.doc --> backup\1ACKNOWLEDGEMENTS.doc,
status: Ok!
d:\Data\cover.doc --> backup\cover.doc, status: Ok!
d:\Data\Screen.doc --> backup\Screen.doc, status: Ok!
d:\Data\Screen.zip --> backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> backup\user interface1.zip, status: Ok!

Copied 10 files, 13.23 Mb, from 13:18 to 13:18 of 5/17/00.

6.3.4.3 REMOTE DATA RESTORE MODULE

6.3.4.3.1 TESTING PROCEDURES

In order to perform data restoration from remote server, connection between local backup client and remote backup server must be established. Files that have been backed up to the server with hostname ftp.malaysia.net and IP address 216.15.159.131 will be restored back to the local backup client.

As shown in Figure 6.7, black windows indicating remote site and the whites indicating local site. After a successful establishment of connection to remote server, remote

directories and files will be listed to their respective window. The next procedure continues in choosing remote file for restoration and local directory where it is restored.

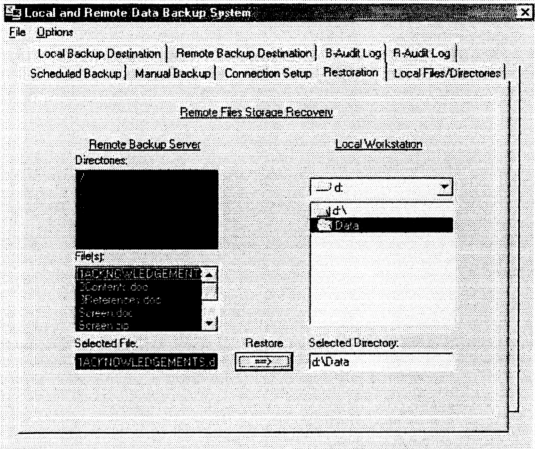


Figure 6.7 Restoration

6.3.4.3.2 TESTING RESULTS

After settings on both of the remote file and local directory, pressing the “Restore” button will activate this module. A status window will appear to show the restoration progress and it is as illustrated in Figure 6.8.

With Log Files module, log file of remote data restore module will record data backup procedures, validating time, date and files transfer in the restore module. This log files will appear in text form.

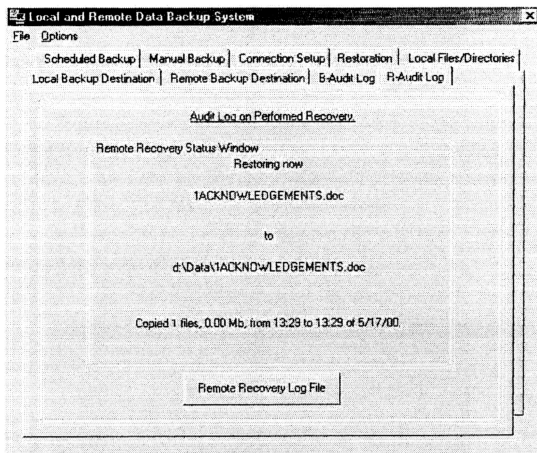


Figure 6.8 Data Restore Status Window

The testing result of remote data backup module is listed in the content of the Log Remote_Restore.txt:

Initializing restore at 5/17/00 1:29:01 PM

1ACKNOWLEDGEMENTS.doc -> d:\Data\1ACKNOWLEDGEMENTS.doc, status: Ok!

Copied 1 files, from 13:29 to 13:29 of 5/17/00.

6.3.4.4 SCHEDULED BACKUP MODULE

6.3.4.4.1 TESTING PROCEDURES

With this module, automated local and remote data backup will be performed in a scheduled manner. The backup schedule can be specified according to days, time and time interval. In day option, any days in a week, hence from Monday to Sunday, can be specified to perform local and remote data backup procedures in a specified time. In addition, time interval for data backup procedure may also be specified. Figure 6.9 gives a clear view on the menu of scheduled backup module.

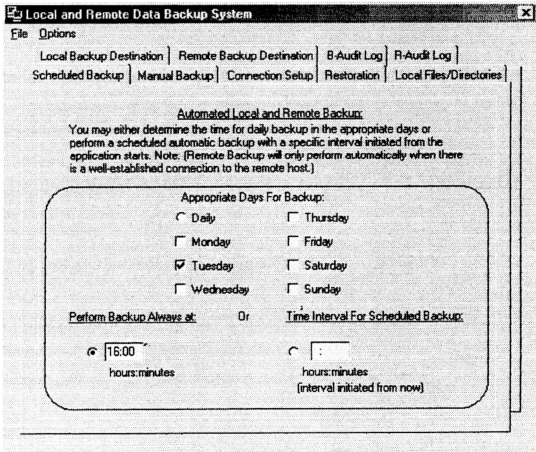


Figure 6.9 Scheduled Backup

In the testing session, scheduled backup module has been tested its functionality according to the timetable as below. Whilst, it has been also tested according on a 00:15 time interval. Note that this time interval scheduled test has been performed in the non-incremental basic.

Table 6.2 Timetable for Scheduled Backup Module

| Day | Time |
|-------------------------|-------|
| Monday (16 May 2000) | 15:00 |
| Tuesday (17 May 2000) | 16:00 |
| Wednesday (18 May 2000) | 15:30 |

6.3.4.4.2 TESTING RESULTS

Both of the local and remote backup modules would be activated if the time and days condition were satisfied. As described, a status window will appear to show the backup progress whenever it is activated.

The testing result on Tuesday at 16:00, as specified in Table 6.2 for the scheduled backup is as below:

Initializing local backup at 5/17/00 4:00:00 PM

```
d:\Data\scheduled.bmp --> \\aust12\d\Backup\scheduled.bmp, status: Ok!  
d:\Data\conte.doc --> \\aust12\d\Backup\conte.doc, status: Ok!  
d:\Data\2Contents.doc --> \\aust12\d\Backup\2Contents.doc, status: Ok!  
d:\Data\3References.doc --> \\aust12\d\Backup\3References.doc, status: Ok!  
d:\Data\IACKNOWLEDGEMENTS.doc -->  
\\aust12\d\Backup\IACKNOWLEDGEMENTS.doc, status: Ok!  
d:\Data\cover.doc --> \\aust12\d\Backup\cover.doc, status: Ok!  
d:\Data\Screen.doc --> \\aust12\d\Backup\Screen.doc, status: Ok!
```

d:\Data\Screen.zip --> \\aust12\d\Backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> \\aust12\d\Backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> \\aust12\d\Backup\user interface1.zip, status: Ok!

Copied 10 files, 13.23 Mb, from 16:00 to 16:01 of 5/17/00.

Initializing remote backup at 5/17/00 4:01:00 PM

d:\Data\scheduled.bmp --> backup\scheduled.bmp, status: Ok!
d:\Data\conte.doc --> backup\conte.doc, status: Ok!
d:\Data\2Contents.doc --> backup\2Contents.doc, status: Ok!
d:\Data\3References.doc --> backup\3References.doc, status: Ok!
d:\Data\1ACKNOWLEDGEMENTS.doc --> backup\1ACKNOWLEDGEMENTS.doc,
status: Ok!
d:\Data\cover.doc --> backup\cover.doc, status: Ok!
d:\Data\Screen.doc --> backup\Screen.doc, status: Ok!
d:\Data\Screen.zip --> backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> backup\user interface1.zip, status: Ok!

Copied 10 files, 13.23 Mb, from 16:01 to 16:01 of 5/17/00.

The testing result for scheduled backup, which would perform backup every 00:15 time interval started from 2:29:53 pm is as below:

Initializing local backup at 5/17/00 2:44:53 PM

d:\Data\scheduled.bmp --> \\aust12\d\Backup\scheduled.bmp, status: Ok!
d:\Data\conte.doc --> \\aust12\d\Backup\conte.doc, status: Ok!
d:\Data\2Contents.doc --> \\aust12\d\Backup\2Contents.doc, status: Ok!
d:\Data\3References.doc --> \\aust12\d\Backup\3References.doc, status: Ok!

d:\Data\IACKNOWLEDGEMENTS.doc -->
\\aust12\d\Backup\IACKNOWLEDGEMENTS.doc, status: Ok!
d:\Data\cover.doc --> \\aust12\d\Backup\cover.doc, status: Ok!
d:\Data\Screen.doc --> \\aust12\d\Backup\Screen.doc, status: Ok!
d:\Data\Screen.zip --> \\aust12\d\Backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> \\aust12\d\Backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> \\aust12\d\Backup\user interface1.zip, status: Ok!

Copied 10 files, 13.23 Mb, from 14:44 to 14:45 of 5/17/00.

Initializing local backup at 5/17/00 2:59:53 PM

d:\Data\scheduled.bmp --> \\aust12\d\Backup\scheduled.bmp, status: Ok!
d:\Data\conte.doc --> \\aust12\d\Backup\conte.doc, status: Ok!
d:\Data\2Contents.doc --> \\aust12\d\Backup\2Contents.doc, status: Ok!
d:\Data\3References.doc --> \\aust12\d\Backup\3References.doc, status: Ok!
d:\Data\IACKNOWLEDGEMENTS.doc -->
\\aust12\d\Backup\IACKNOWLEDGEMENTS.doc, status: Ok!
d:\Data\cover.doc --> \\aust12\d\Backup\cover.doc, status: Ok!
d:\Data\Screen.doc --> \\aust12\d\Backup\Screen.doc, status: Ok!
d:\Data\Screen.zip --> \\aust12\d\Backup\Screen.zip, status: Ok!
d:\Data\user interface1.doc --> \\aust12\d\Backup\user interface1.doc, status: Ok!
d:\Data\user interface1.zip --> \\aust12\d\Backup\user interface1.zip, status: Ok!

Copied 10 files, 13.23 Mb, from 14:59 to 15:00 of 5/17/00.

6.3.4.5 INCREMENTAL BACKUP MODULE

6.3.4.5.1 TESTING PROCEDURES

The procedures involved in incremental backup module are very simple, it could be accomplished by clicking on the Incremental Backup option in the Options sub-menu. Figure 6.10 illustrates this option.

Recall that the objective of incremental backup is to minimize the redundant backup progress in transferring files that have not been changed since the last backup. Thus, no file would be transferred if the files have not been changed since the last backup. This option is very useful especially for the frequent backup, which performs backup at every time interval.

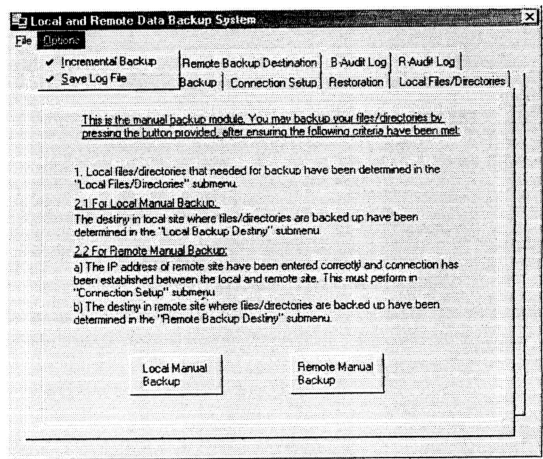


Figure 6.10 Incremental Backup

6.3.4.5.2 TESTING RESULTS

In the previous section, scheduled backup that has been tested for 00:15 time interval is in the non-incremental basic. Thus, continuing with the testing, incremental backup module has been tested by selecting the incremental option. Figure 6.11 shows the status window of the performed incremental backup.

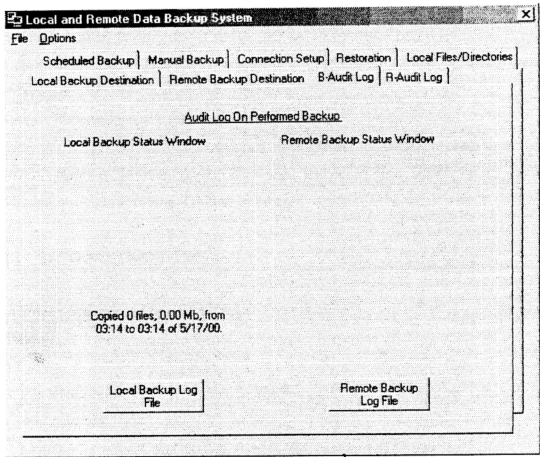


Figure 6.11 Incremental Backup Status Window

The testing result of incremental backup module showing that no files are transferred for another 15 minutes because these files haven't been changed since the last backup.

Initializing local backup at 5/17/00 3:14:53 PM

Copied 0 files, 0.00 Mb, from 15:14 to 15:14 of 5/17/00.

6.4 DISCUSSION

6.4.1 EVALUATION

The local and remote data backup system had been tested successfully and fulfilled the requirements that had been made since the synthesis of system in Chapter 2. This system succeeded to perform data backup to a local or remote server in an automated and scheduled manner. In addition, it could activate incremental backup process frequently for every time interval that has been specified. Furthermore, it also offered a complete documentation of performed backup procedure.

In essence, this system is a well-developed strategy after the complete analysis in disaster recovery planning to prevent the data loss and it is best suited in all networks environments, embraces from LAN to Internet.

6.4.2 SYSTEM STRENGTHS

The implementation of Local and Remote Data Backup System offers several advantages as follows,

- i) It is a successful strategy in disaster recovery planning to protect the data assets and eliminate data loss.
- ii) It can perform local data backup, remote data backup and restoration.
- iii) It can execute backup system automatically in a scheduled manner.
- iv) It provides the incremental backup option.
- v) It provides documentation of time, date and files for the performed backup procedures.
- vi) It suits in all network environments.

6.4.3 SYSTEM DRAWBACKS

The testing results that have been taken out from the local and remote data backup system prove functionality and connectivity of all the modules. However, during these testing processes, there are some valuable suggestions have been given by the participants. They are summarized as below:

- i) Its compatibility has been restricted to Windows 98 platform.
- ii) It lacks of attractive graphical design in remote server directory listings.
- iii) It doesn't include the data compression and encryption module.
- iv) Drawbacks in data restore module, which allows restoration of single file in each time.