IBM DB2 File Manager
for AIX

Quick Beginnings

Version 5.2

S04L-6231-00

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Before using this information and the product it supports, be sure to read the general information under Appendix D, “Notices” on page 79.

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Contents

Welcome to DB2 File Manager for AIX!

This book describes how to install and configure DB2 File Manager to work with DB2 Universal Database.

Part 1 gives an overview and brief introduction to DB2 File Manager.

Part 2 provides planning, installing, and basic configuration information for DB2 File Manager. A test scenario is also included to verify that DB2 File Manager is configured correctly.

Part 3 describes how to use and administer the File Manager using the **dlfm** command.

Part 4 contains error reference information, CLI example code for use with DB2 File Manager, and describes viewing, printing, and how to order manuals.

Conventions

This book uses these highlighting conventions:

- **Boldface type** indicates commands or graphical user interface (GUI) controls such as names of fields, folders, icons, or menu choices.
- *Italics* indicates variables that you should replace with a value. It is also used to indicate book titles and to emphasize words.
- `Monospace` indicates file names, directory paths, and examples of text you enter exactly as shown.

This is a fast path icon. It tells you if you can skip sections to get to the "how to" information. It is shown to indicate where you should go next.

This icon marks a tip. It provides additional information that can help you complete a task.

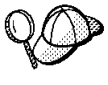
Part 1. Introduction to DB2 File Manager

Chapter 1. Using DB2 File Manager

The amount of data stored digitally is growing rapidly because computer systems and storage systems have become very affordable. The file paradigm is very common for such datatypes as video, image, text, graphics, engineering drawings (and so on), because capture, edit, and delivery tools use the file paradigm for these datatypes.

A large number of applications store, retrieve, and manipulate data in files. These applications may use files to store their data for one or more of the following reasons:

- The expense required to rewrite applications that use standard file I/O semantics to instead use a database as a repository where the data in the files is stored and accessed as large objects.
- The *store and forward* model of data is unacceptable; for example, it is unacceptable for the database manager to materialize a BLOB into a file (and the converse) each time the data needs to be accessed as a file.
- You want to access data directly from a file server close to a workstation. (The file server is configured so that the network distance is much shorter to the user, compared to the database where all the BLOBs are stored. The number of bytes that flow for a large object are much larger than the number of bytes for an answer of an SQL query: the network distance matters.)
- The application uses a stream server, for example, because it has real time requirements for delivery and capture (for example, video data). The data is expected to be large, and you may require synchronous delivery. In these kinds of applications, it is likely that such data will not be moved into the database as a BLOB, but rather stay on the file server.



Synchronous delivery is best explained by an example. The video server has to deliver a video to a client workstation in real time (that is, there is time dependence for the data that is delivered; otherwise, you would see jitters in the picture). Video servers reserve memory, disk, and network bandwidth to deliver a video without a jitter. (The term used is the *quality of service* that the video servers guarantee for simultaneous delivery of video and audio.)

- Data is captured in high volumes, and, for performance reasons, you do not want to store it in the database.
- The application utilizes tools that work with the file paradigm.

Many of these applications need search capabilities to find the data in the files. These search capabilities, however, do not require physically bringing the data into the database system, because their raw content is not needed for the query. Typically, you would extract features of an image or a video and store them in the database for performing a search on the extracted features. An example of the features that can be

extracted from an image are color, shape, and texture. The IBM Query By Image Content (QBIC) product supports extraction and search on such features.

The ability to store a *reference* to such files, along with parametric data that describes their contents is, in general, the approach used by these applications to combine the search capabilities of SQL with the advantages of working directly with files to manipulate the raw data. The DB2 relational extenders for text, voice, image (and so on) provide this functionality. They keep the parametric data that describes the raw data for objects so that you can search on the important aspects of those objects. The extenders allow you to specify whether the object itself is to be maintained either in or outside the database.

The extenders, however, do not provide referential integrity between the files on a file server and their references in the databases. Thus, it is possible to independently delete either the reference or the file. Moreover, the extenders provide neither access control to the related files nor coordinated backup and recovery of the database and the files.

DB2 File Manager solves these problems, and provides the functionality required by these applications. It includes both the DATALINK data type, which represents an object, and the DB2 File Manager components that are installed on the File Manager Server. The DATALINK data type is described below. For information about the components on the File Manager Server, see “DB2 File Manager Components” on page 5.

You use the DATALINK data type, just like any other data type, to define columns in tables. The DATALINK values encode the name of the File Manager Server containing the file and the file name in terms of a Uniform Resource Locator (URL). You can only specify file server names that are known to the DB2 database in a DATALINK value. You enter the set of known file servers in a configuration file. Each database that contains DATALINK values has a configuration file in its database directory to contain the file server names. For additional information, see “Register a DB2 File Manager on the DB2 Server” on page 23. The DATALINK value can be robust in terms of integrity, access control, and recovery: DB2 treats a DATALINK value as if the object were stored in the database (even though it is not).

Even though the DATALINK value represents an object that is stored outside the database system, you can use SQL queries to search parametric data to obtain the file name that corresponds to the query result. You can create indexes on videos, images, text (and so on), and store those attributes in tables along with the DATALINK value. With a central repository of files on the file server and DATALINK data types in a database, you can obtain answers to questions like *"what do I have?"* and *"find what I'm looking for"*. Examples of applications that can use the DATALINK data type are:

- Medical applications, in which X-rays are stored on the file server and the attributes are stored in the database.
- Entertainment industry applications that perform asset management of video clips. The video clips are stored on a file server, but attributes about the clips are stored

in a database. Access control is required for accessing the video clips based on database privileges of accessing the meta-information.

- World Wide Web applications to manage millions of files and allow access control based on database privileges.
- Financial applications, which require distributed capture of check images, and a central location for those images.
- CAD and CAM applications, where the engineering drawings are kept as files, and the attributes are stored in the database. Queries are run against the file attributes.

DB2 File Manager Components

Typically, the DB2 database server and the File Manager Servers are on separate machines connected on a network. You install two DB2 File Manager components on each participating File Manager Server:

File Manager
Registers all the files on a particular file server that are linked to a DB2 database. This component tracks the metadata for the linked files. It also tracks previously linked files, if they were linked to DATALINK columns for which the RECOVERY=YES option was specified, so that DB2 can provide point-in-time roll-forward recovery for any file that is specified by the DATALINK column. (For information about attributes that you can specify for DATALINK columns, refer to the *SQL Reference*.)

The File Manager receives and processes *link-file* and *unlink-file* messages arising from INSERT, UPDATE, and DELETE statements when DATALINK columns are involved. Logically, for each linked file, it tracks the database instance, the fully qualified table name, and the column name.

File Manager Filter
Filters file system commands to ensure that registered files are not deleted or renamed. Optionally, it also filters commands to ensure that proper access authority exists.

Figure 1 on page 6 shows an overview of the interaction between DB2, the DB2 File Manager components, and a remote client application.

In Figure 1 on page 6, application processing to perform a SELECT followed by an UPDATE could be as follows:

1. The remote client application issues a CONNECT to a database on the DB2 server.
2. The application then issues a SELECT statement, for example:

   ```
   select dlurlpath(dl1) into :var_dl1 from test
   ```

3. Then, the application would copy the `:var_dl1` file to the `temp` file, over an NFS mount.

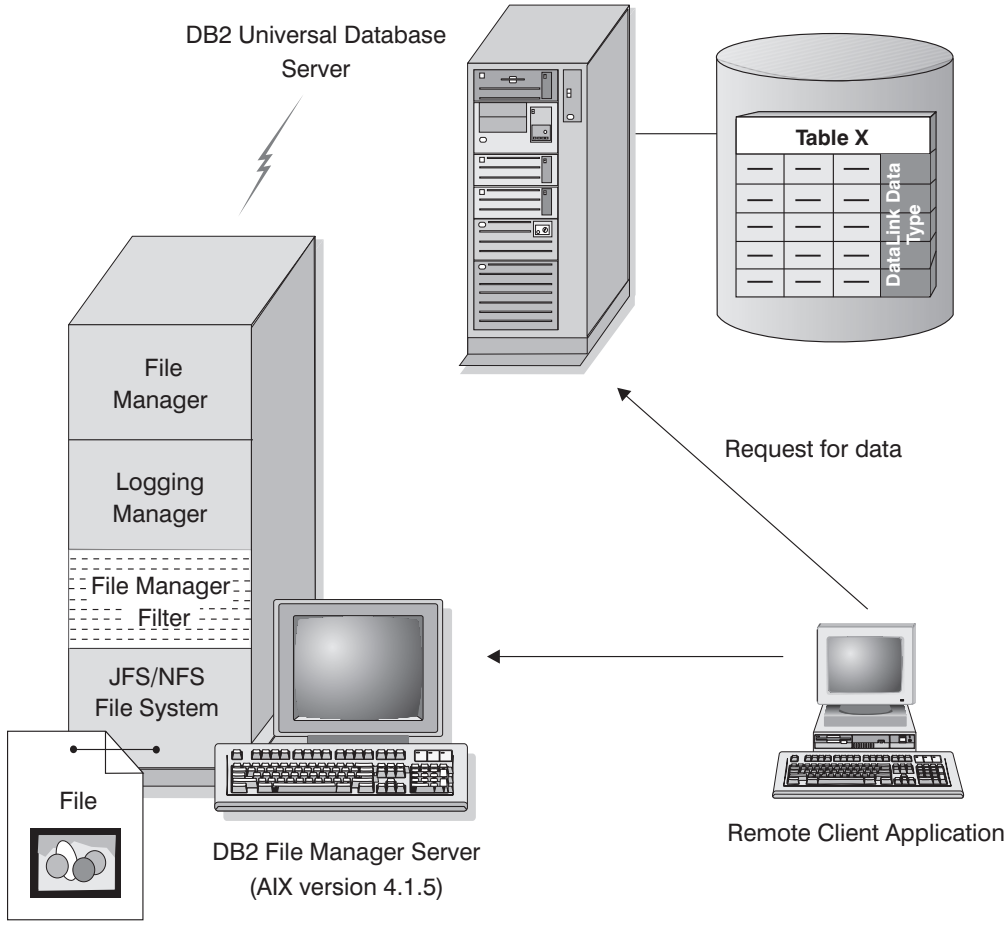


Figure 1. Overview of DB2 File Manager Processing

4. Then you would edit the `temp` file and add a line similar to the following:

```
update set dl1=dlvalue(:temp)
```

For more information about remote clients, refer to the *Quick Beginnings for UNIX* . For an example of a CLI program interacting with DB2 File Manager, see Appendix B, " CLI Example" on page 61.

Figure 2 on page 7 and Figure 3 on page 7 show tables that contain DATALINK columns and the associated DB2 File Manager configuration files on the DB2 database server. Note that the DB2 File Manager configuration file is associated with each database, not the table.

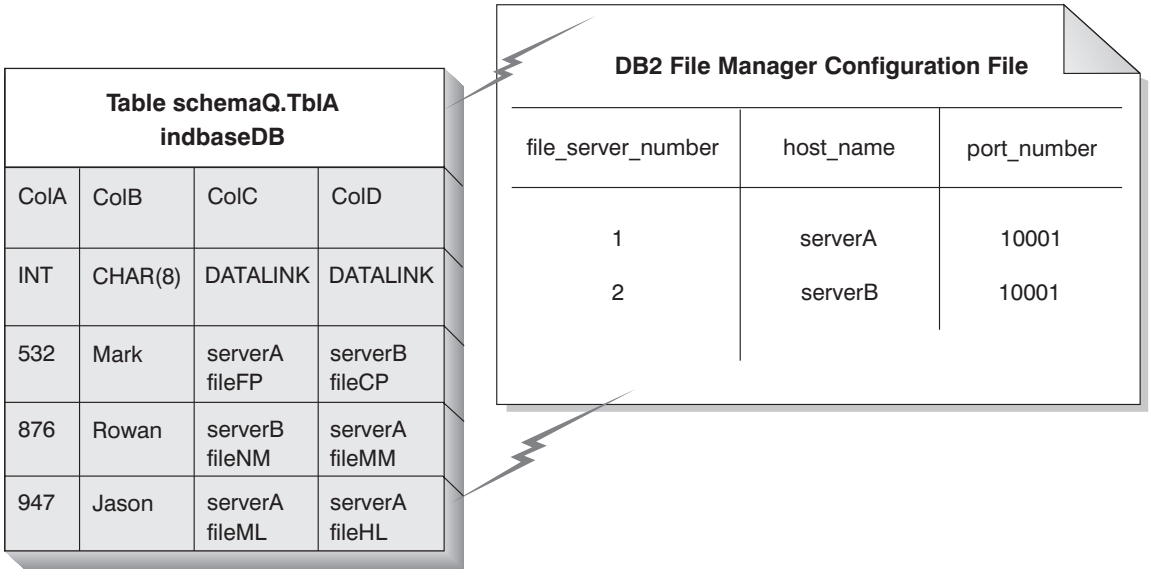


Table schemaQ.TblA
indbaseDB

ColA	ColB	ColC	ColD
INT	CHAR(8)	DATALINK	DATALINK
532	Mark	serverA fileFP	serverB fileCP
876	Rowan	serverB fileNM	serverA fileMM
947	Jason	serverA fileML	serverA fileHL

DB2 File Manager Configuration File

file_server_number	host_name	port_number
1	serverA	10001
2	serverB	10001

Figure 2. Table schemaQ.TblA

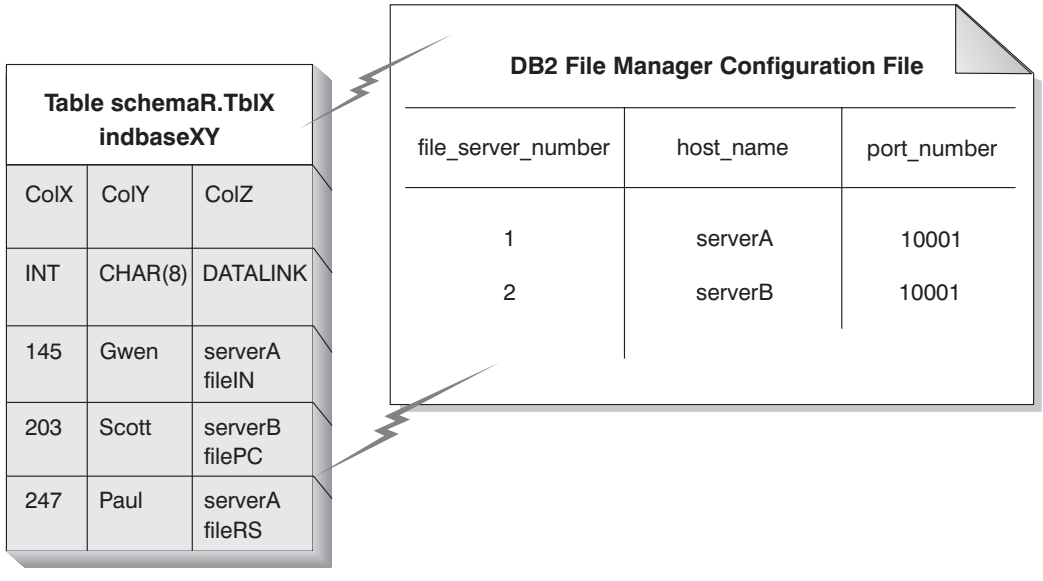


Table schemaR.TblX
indbaseXY

ColX	ColY	ColZ
INT	CHAR(8)	DATALINK
145	Gwen	serverA fileIN
203	Scott	serverB filePC
247	Paul	serverA fileRS

DB2 File Manager Configuration File

file_server_number	host_name	port_number
1	serverA	10001
2	serverB	10001

Figure 3. Table schemaR.TbleX

Figure 4 on page 8 shows how the information contained in the previous two tables is recorded in the File Manager registration table on the File Manager Server. The information shown here is in logical form for illustration purposes only.

File Name	Database	Table	Column	Current Owner	Original Owner	Original Privileges
fileFP	dbaseDB	schemaQ.TblA	ColC	DATALINK	RYAN	rwx rwx r —
fileHL	dbaseDB	schemaQ.TblA	ColD	GARTNER		
fileIN	dbaseXY	schemaR.TblX	ColZ	DATALINK	GWENHO	rwx — —
fileMM	dbaseDB	schemaQ.TblA	ColD	SANTILLI		
fileML	dbaseDB	schemaQ.TblA	ColC	DATALINK	GARTNER	rwx rwx rwx
fileRS	dbaseXY	schemaR.TblX	ColZ	DATALINK	ZIKOPOULOS	rwx r — r —

Note:
The databases that are recorded in the registration table may belong to different instances.

Figure 4. Registration Table in File Manager on File Server serverA

Part 2. Installing and Configuring DB2 File Manager

Chapter 2. Installing and Configuring DB2 File Manager

This section describes how to install and configure DB2 File Manager to store files that are associated with DATALINK columns defined in a Version 5 DB2 Universal Database (DB2 UDB) database.

To install and configure DB2 File Manager, you must perform following steps:

Step 1. Read and ensure that you meet all of the requirements in "Before You Begin."

Step 2. Install DB2 File Manager on the File Manager Server. See "Step 1. Install DB2 File Manager" on page 13.

Step 3. Configure DB2 File Manager on the File Manager Server. See "Configure DB2 File Manager on the File Manager Server" on page 18.

Step 4. Configure the DB2 UDB server to communicate with the File Manager Server. See "Register a DB2 File Manager on the DB2 Server" on page 23.

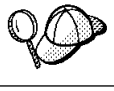
Before You Begin

Read and perform the steps in this section to be sure that you have the required items and information to install DB2 File Manager.

You can use the DB2 Installer to optionally create the DB2 File Manager Administrator user ID. If you would like the DB2 Installer to create this user ID for you, skip this step and proceed to next checkoff list item.

__ 1. You need to have a user ID that will be used to administer the File Manager. If you do not create a user ID, the DB2 Installer program will create one for you.

For example, the name of this user ID could be `dlfm`. This user ID will be known as the DB2 File Manager Administrator.



You should never administer the File Manager with a user ID that has `root` authority.

The home directory of the DB2 File Manager Administrator must *not* reside in a file system that is using a File Manager Filter.

To create the DB2 File Manager Administrator's group and user ID (if they do not already exist):

Step a. Log in as a user with `root` authority.

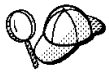
Step b. Create the DB2 File Manager Administrator's group (for example, `dlfmgrp`) and user ID (for example, `dlfm`), using the `/u/dlfm` directory as the home directory of the DB2 File Manager Administrator, by entering the following commands:

```
/usr/bin/mkgroup dlfmgrp
/usr/bin/mkuser pgrp='dlfmgrp' groups='dlfmgrp' home='/home/dlfm' dlfm
```

Step c. Assign a password to this user ID by entering the following command:

```
passwd userid
```

where *userid* is the user ID that you created for the DB2 File Manager Administrator.



The user ID used for the DB2 File Manager Administrator should never own files or directories on a file system using a File Manager Filter. The DB2 File Manager Administrator is a special user who should only be administering the File Manager.

__ 2. Ensure that the version of DB2 that resides on the remote DB2 server is the version of DB2 UDB that was shipped with *this* release.

__ 3. Ensure that DB2 is not installed on the machine that will become the File Manager Server. If DB2 is currently installed on this machine, you must uninstall it before installing DB2 File Manager.

__ 4. Ensure that there is at least 50 MB of free disk space in the `/home` directory on the machine that will become the File Manager Server. To check available free disk space, enter the **df -k /home** command.

__ 5. Ensure that there is at least 85 MB of free space in the `/usr/lpp` directory on the machine that will become the File Manager Server. To check available free disk space, enter the **df -k /usr/lpp** command.

__ 6. Ensure that the system clocks on the machine that will become the File Manager Server and the DB2 server are synchronized (and remain synchronized).

Enter the **date** command to list a system's date and time. For more information on synchronizing system clocks, refer to your *AIX Administration Guide*.

Step 1. Install DB2 File Manager

To install DB2 File Manager, perform the following steps:

Step 1. Log in as a user with `root` authority.

Step 2. Insert the DB2 File Manager CD-ROM into the CD-ROM drive.

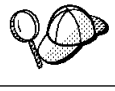
Step 3. Mount the CD-ROM drive using the **smit device** command.

Step 4. Enter the **./db2setup** command, from the mounted CD-ROM, to start the DB2 Installer.

The Install DB2 V5 window opens. (Your screen will be different if you have already installed a DB2 Version 5 product on your system; select the **Install** option to continue.)

```
+------------------------ Install DB2 V5 -------------------------+
|                                                                 |
|    Select the products you are licensed to install. Your Proof of |
|    Entitlement and License Information booklet identify the products for |
|    which you are licensed.                                      |
|    To see the preselected components or customize the selection, select |
|    Customize for the product.                                   |
|    [   ] DB2 Client Application Enabler          :  Customize. . . :  |
|    [ * ] DB2 File Manager                        [  Customize. . . ]  |
|                                                                 |
|    To choose a language for the following components, select Customize for |
|    the product.                                                 |
|        DB2 Product Messages                      [  Customize. . . ]  |
|        DB2 Product Library                       [  Customize. . . ]  |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|    [    OK    ]              [  Cancel  ]              [   Help   ]  |
+-----------------------------------------------------------------+
```

From the product list on the Install DB2 V5 window, select the products that you want to install and select **OK**.

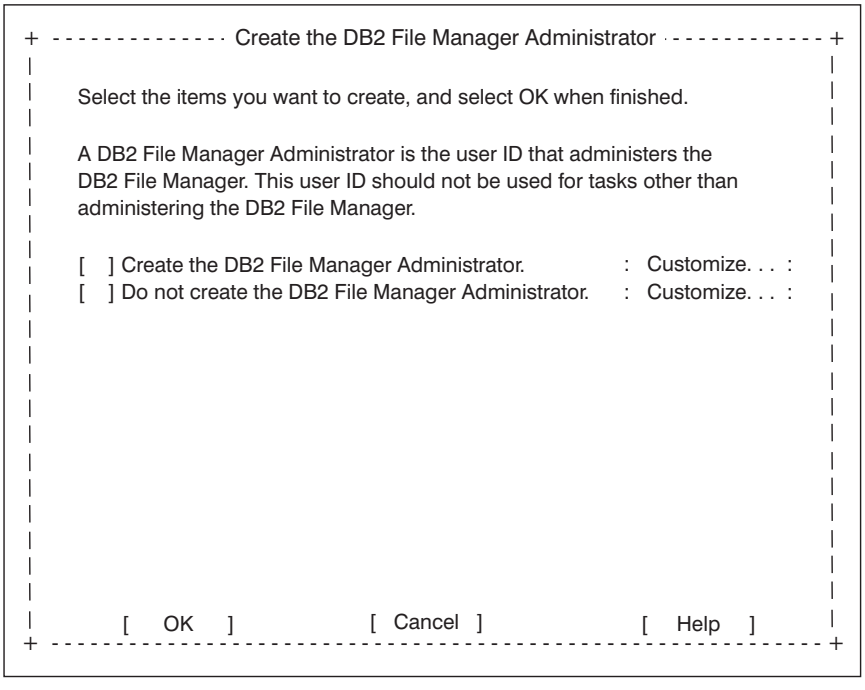


If you are installing DB2 File Manager, DB2 Universal Database will also be installed on this workstation. DB2 File Manager uses DB2 to maintain logged information for the linked files.

Press the Tab key to change the highlighted option and the Enter key to select or deselect the option you want.

To display the required and optional components for a product that you want to install, select **Customize**. To go back to a previous window at any time, select **Cancel**. To get help on any window, select **Help**.

Step 5. The Create the DB2 File Manager Administrator window opens.

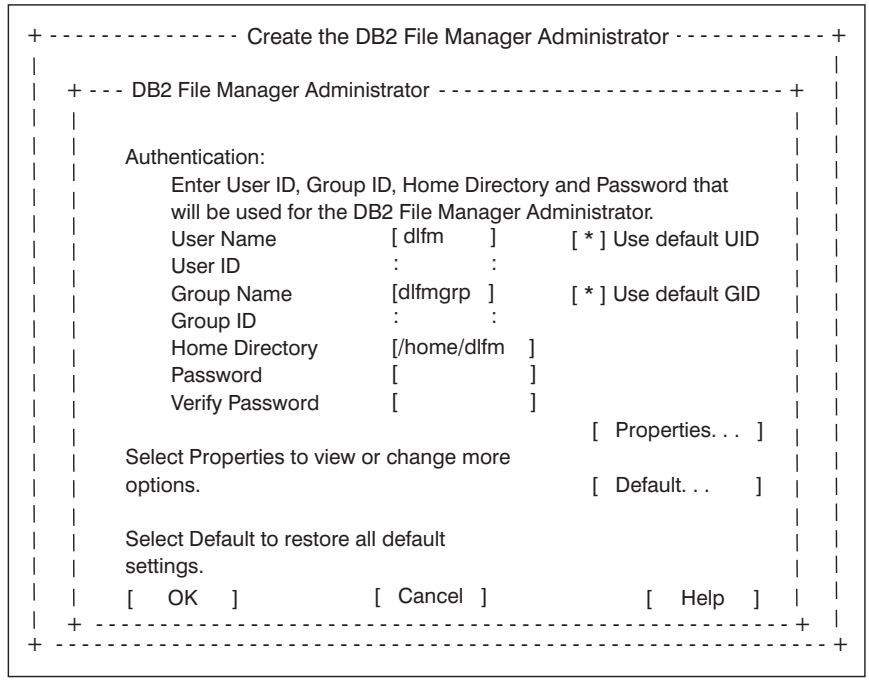


If you want to install DB2 File Manager *and* create the DB2 File Manager Administrator, select the **Create the DB2 File Manager Administrator** option.

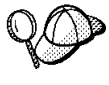
If you only want to install DB2 File Manager, ensure that the **Create the DB2 File Manager Administrator** option *is not* selected and select **OK**.

If you *did not* choose the **Create the DB2 File Manager Administrator** option, skip the rest of this step and go to DB2 Installer Tasks on page 16.

If you chose the **Create the DB2 File Manager Administrator** option, a pop-up window opens as follows:



Default values for the DB2 File Manager Administrator user ID are provided. To use these default values, select **OK**.



If you did not specify a user ID for the DB2 File Manager Administrator, and the `dlfm` user ID *does not* exist, the default password for the default user ID will be `ibmdb2`. For security reasons, since this is the default password for any DB2 File Manager installation and therefore is well known, we recommend that you change this password after installing DB2 File Manager.

If you did not specify a user ID for the DB2 File Manager Administrator, and the `dlfm` user ID *currently* exists, the password will remain unchanged.

To use the user ID that you may have created for the DB2 File Manager Administrator in Step 1 of "Before You Begin" on page 11, replace the **User Name** field with that user ID and select **OK**.

By default, the DB2 Installer will reserve the TCP/IP port number *10001* and the service name *dlfmd* for communications with the File Manager Server. If you want to specify another port number or corresponding service name for communications, select the **Properties** option. The DB2 File Manager Administrator Properties pop-up window opens. Select the **Properties** option from this pop-up window and change the port number or service name reserved for TCP/IP communications with the File Manager Server. Select **OK** on each pop-up window.

Step 6. You are returned to the Create the DB2 File Manager Administrator window. Select **OK** to continue.

Step 7. Select **OK**. The Summary Report window opens.

Step 8. Highlight the **Summary Report** field and press the Page Up or Page Down keys to scroll though the summary. Review the options that you selected and select **Continue**.

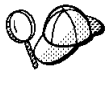
Step 9. The Warning pop-up window opens.

If you have correctly verified all of the installation and configuration options in the Summary Report, select **OK** to begin the installation. If you want to change any of the values in the Summary Report, select **Cancel**.

DB2 Installer Tasks

The DB2 Installer will perform the following tasks:

1. Install DB2 File Manager in the `/usr/lpp/db2_05_00` directory.
2. Install DB2 Universal Database in the `/usr/lpp/db2_05_00` directory.
3. Set up the required links for the File Manager Filter.
4. Create a group and user ID for the DB2 File Manager Administrator, if you did not specify an existing one. If you created a group and user ID using the DB2 Installer, but did not specify a group name or user name, the default group created for the DB2 File Manager Administrator is `dlfmgrp` and the user ID is `dlfm`. The default password, if you do not specify one, for any user ID created by the DB2 Installer is `ibmdb2`.
5. Create a DB2 File Manager Administration instance for the DB2 File Manager Administrator's user ID.



If you did not use the DB2 Installer to create the DB2 File Manager Administrator, you must create a DB2 File Manager Administration instance by entering the following command:

```
/usr/lpp/db2_05_00/instance/dlfmcrt -p  port_number userid
```

where:

- *port_number* is the port number reserved for communications with the File Manager Server.
- *userid* is the user ID of the DB2 File Manager Administrator.

For example, if you reserved the TCP/IP port *10001* and the user ID you specified for the DB2 File Manager Administrator was `dlfm`, enter the following command:

```
/usr/lpp/db2_05_00/instance/dlfmcrt -p 10001 dlfm
```

6. Reserve a port number for the File Manager and add an entry similar to the following in the `/etc/services` file:

```
dlfmd      10001/tcp
```

If a port number already exists for the File Manager, the DB2 Installer will use this reserved port number; otherwise, the port number will default to *10001*.

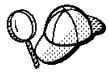
If the port number *10001* is already in use by another application, the DB2 Installer will prompt you for another port number for use by the File Manager.

7. Set the following variables in the DB2 File Manager Administrator's `db2profile` script file:

```
export DLFM_INSTALL_PATH=/usr/lpp/db2_05_00
export DLFM_PORT=PORT_NUMBER
export DLFM_LOG_LEVEL=LOG_ERR
export DB2_RR_TO_RS=ON
export DB2INSTANCE=DLFM_USERID
export DLFM_BACKUP_DIR_NAME=$INSTHOME/dlfm_backup
export PATH=$PATH:$INSTHOME/sqllib/bin:$INSTHOME/sqllib/adm:$INSTHOME/sqllib/misc
```

   where:

   - *PORT_NUMBER* is the port number reserved for the File Manager. If you did not specify one, and it is available for use, the default port number is *10001*.
   - *DLFM_USERID* is the user ID of the DB2 File Manager Administrator.



To run the DB2 File Manager Administrator's `db2profile` script file each time this user logs on to the system, add the following entry to the DB2 File Manager Administrator's `profile` script file:

```
. dlfm_directory/sqllib/db2profile
```

where *dlfm_directory* is the home directory of the DB2 File Manager Administrator.

8. Append an entry to the `/etc/syslog.conf` file for the File Manager error log. To change the diagnostic level for error messages, see “Changing the Diagnostic Level for the Error Messages Log File” on page 38.
9. Add the following entry to the `/etc/vfs` file:

```
dlfs 12       /usr/lpp/db2_05_00/bin/dlfs_mnthlp       /usr/lpp/db2_05_00/bin/dlfs_fshelper
```

   If the vfs number *12* is already in use, the DB2 Installer will specify a different number between *8-15* for use by the Virtual File System (VFS).

10. Create a DB2 database, called `DLFM_DB`, which is used to keep track of those files that are under the control of the File Manager and used in a database that has a table that was created with DATALINK columns. This database was automatically backed up after it was created.
11. Start the File Manager.

Step 2. Configuring DB2 File Manager

This section describes how to configure DB2 File Manager on your File Manager Server and how to configure the DB2 Universal Database server that contains databases with tables using DATALINK columns.

The user ID used for the DB2 File Manager Administrator should never own files or directories on a file system using a File Manager Filter. The DB2 File Manager Administrator is a special user who should only be administering the File Manager.

Configure DB2 File Manager on the File Manager Server

This section describes how to configure DB2 File Manager on your File Manager Server.

To configure your File Manager Filter on the File Manager Server, perform the following steps:

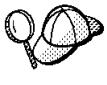
Step 1. Log in as a user with `root` authority.

Step 2. Prepare a file system to use a File Manager Filter as follows:

a. Create a Journaled File System (JFS) file system using the **smit manfs** command and set the *Mount AUTOMATICALLY at system restart?* option to *no*; or you can use an existing JFS file system. For more information, refer to your *AIX Administration Guide*.

b. Open the `/etc/filesystems` file, record the current setting for the *vfs* entry (for example, *jfs*) for *this* file system and edit its stanza, such that:

```
mount    = false
vfs      = dlfs
```



To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add `write` authority to a file called `test`, located in the `/etc` directory, enter:

```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

c. Add the following attribute to the stanza of the `/etc/filesystems` file for *this* file system:

```
nodename = -
```

Note: You must ensure that there are no blank spaces after the null character (-) for this entry.

d. Edit the stanza for the `/etc/filesystems` file for *this* file system and set the *Basefs* parameter, in the options attribute, to the value that you recorded for the *vfs* entry above. For example, the entry would be similar to the following:

```
options = rw,Basefs=jfs
```

Step 3. Configure the system to automatically mount any file systems that will use this filter as follows:

a. Copy the `/usr/lpp/db2_05_00/samples/dlfm/rc.dlfs.sample` file to the `/etc/rc.dlfs` file.

b. Edit the `/etc/rc.dlfs` file to have this machine enter the **mount** command for any existing file systems using the File Manager Filter, whenever the `/etc/rc.dlfs` file is run.

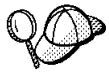
For example, to have the `/etc/rc.dlfs` file automatically mount the *filesystem_name* file system, add the following entry to the `/etc/rc.dlfs` file:

```
mount -v dlfs /filesystem_name
```

where:

- *filesystem_name* is the name of the file system that you want to mount.
- *-v* specifies that the file system is defined by the *VfsName* parameter in the `/etc/vfs` file.

Note: The *-v* flag *must* be used when mounting a file system to use a File Manager Filter.



To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add `write` authority to a file called `test`, located in the `/etc` directory, enter:

```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

Step 4. Ensure that this file system is not currently mounted by entering the following command:

```
unmount /filesystem_name
```

where *filesystem_name* is the name of the file system.

Step 5. Run the `/etc/rc.dlfs` file to mount the file systems using a File Manager Filter by entering the following command:

```
/etc/rc.dlfs
```

This file must be run whenever the machine is rebooted to mount the file systems using a File Manager Filter.

To automate the process of mounting a File Manager Filter each time the system is rebooted, add the following entry to your `/etc/inittab` file:

```
rcdlfs:2:once:/etc/rc.dlfs > /dev/console 2>&1 #AutoMountFMF
```

Step 6. Ensure that the **mount** command for the new File Manager Server completed successfully by entering the following command:

```
mount ] grep filesystem_name
```

where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.

The output of this command should be similar to the following:

```
/dev/dlinklv1   /jfsdlink    dlfs   Apr 04 16:18 rw,log=/dev/loglv00
```

Step 7. Log out.

Step 8. Log in as the DB2 File Manager Administrator.

Step 9. Run the `.db2profile` or `.db2cshrc` script as follows:

```
. dlfm_directory/sqllib/db2profile    (for Bourne or Korn shell)
source dlfm_directory/sqllib/db2cshrc (for C shell)
```

where *dlfm_directory* is the home directory of the DB2 File Manager Administrator.

Step 10. Ensure that the `DLFM_DB` database was created during the installation by entering the following command from a DB2 command window:

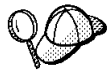
```
db2 list database directory
```

If it does not exist, see “Creating and Dropping the DB2 Database on the File Manager Server” on page 42.

Step 11. Copy and edit the sample `/usr/lpp/db2_05_00/samples/dlfm/DbRegistrationfile` file so that it lists any existing databases that are using the DATALINK data type and storing this data type's corresponding files on this File Manager Server.

For example, if you had two databases that contained tables using the `DATALINK` data type, the `DbRegistrationfile` would be similar to the following:

```
#Format for each database registration entry is as follows,
#DATABASE_NAME DATABASE_INSTANCENAME FULLY QUALIFIED NODE_NAME
sample         db2                  paulz.torolab.ibm.com
db2cert        db2a                 jgartner.torolab.ibm.com
```



The `DLFM_DB` should not appear in this list. This is a local database that is used to keep track of those files that are under the control of the File Manager.

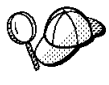
Step 12. Register the DB2 databases that contain tables with DATALINK columns by entering the following command:

```
dlfm add_db < DbRegistrationfile
```

Step 13. Copy and edit the sample `/usr/lpp/db2_05_00/samples/dlfm/PrefixRegistrationfile` file so that it describes the location of all file systems, mounted with a File Manager Filter, that are being used to store the files associated with the DATALINK data type on a DB2 database.

For example, if you had two file systems using a File Manager Filter, the `PrefixRegistrationfile` would be similar to the following:

```
#Format for the prefix registration file
#The Prefix_Name is the mount point of the
#File Manager Server
#Prefix_Name
/jfsdlink
/nfsdlink
```



Any file prefix that is registered should be mounted using a DB2 File Manager Filter.

Step 14. Register the location of any file systems using a File Manager Filter by entering the following command:

```
dlfm add_prefix < PrefixRegistrationfile
```

Step 15. Enable the File Manager Server for backup and recovery.

Whenever a DATALINK value is inserted into a table with a DATALINK column that is defined for recovery, the corresponding DATALINK files on the File Manager Server are scheduled to be backed up to an archive server.

Currently two options are supported for file backup to an archive server:

(1) Disk Copy (default method)
When the **backup** command is entered on the DB2 server, all the backup files on the File Manager Server are verified and copied to the directory specified by the *DLFM_BACKUP_DIR_NAME* environment variable.

The *DLFM_BACKUP_DIR_NAME* environment variable is located in the `db2profile` script file.

The default setting for this environment variable is to set the backup directory *`dlfm_directory`*`/dlfm_backup` (where *dlfm_directory* is the home directory of the DB2 File Manager Administrator).

If you choose to change the location specified by the *DLFM_BACKUP_DIR_NAME* environment variable, you must ensure that the directory you specify is *not* located on a file system using a File Manager Filter.

You can specify a directory that is NFS mounted, however, you must ensure that any user ID with `root` authority on this file server has read and write access to this mounted directory.

The DB2 File Manager Administrator's user ID must also exist on the machine from where this directory was NFS mounted and exported.

This method is not recommended.

Notes:

a. If you change the default setting for the *DLFM_BACKUP_DIR_NAME* environment variable, you must make sure that you stop and restart the File Manager. See “Starting and Stopping the File Manager” on page 33 for more information.

b. You must maintain and ensure that the required space is available in the directory specified by the *DLFM_BACKUP_DIR_NAME* environment variable.

(2) ADSM Archive Server

To use ADSM as an archive server, perform the following the steps:

a. Install ADSM on the File Manager Server. For more information, refer to your ADSM product documentation.

b. Register the File Manager Server client application with the ADSM server. For more information, refer to your ADSM product documentation.

c. Add the following environment variables to the DB2 File Manager Administrator's `db2profile` script file:

```
export DSMI_DIR=/usr/lpp/adsm/bin
export DSMI_CONFIG=dlfm_directory/adsm/dsm.opt
export DSMI_LOG=dlfm_directory/dldump
export PATH=$PATH:/usr/lpp/adsm/bin
```

where *dlfm_directory* is the home directory of the DB2 File Manager Administrator

d. Ensure that the `dsm.sys` ADSM system options file is located in the `/usr/lpp/adsm/bin` directory.

e. Ensure that the `dsm.opt` ADSM user options file is located in the *dlfm_directory*`/adsm` directory (where *dlfm_directory* is the home directory of the DB2 File Manager Administrator).

f. Set the *PASSWORDACCESS* option to `generate` in the `/usr/lpp/adsm/bin/dsm.sys` ADSM system options file.

g. Register an ADSM password with the `generate` option *before* starting the File Manager for the first time. This way, you will not need to provide a password when the File Manager initiates a connection to the ADSM server. For more information, refer to your ADSM product documentation.

h. In the `db2profile` script file, set the *DLFM_BACKUP_DIR_NAME* environment variable to *ADSM*. This will activate the ADSM backup option.

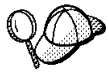
i. Stop the File Manager by entering the **dlfm stop** command.

j. Start the File Manager by entering the **dlfm start** command.

Register a DB2 File Manager on the DB2 Server

This section describes how to register a DB2 File Manager on your DB2 Universal Database (DB2 UDB) server.

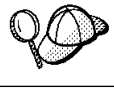
To register a DB2 File Manager on the DB2 UDB server where the databases that contain tables defined with DATALINK columns reside, perform the following steps:



The TCP/IP port number *10001* is assumed to be reserved for TCP/IP communications with a File Manager Server.

Step 1. Set the *DB2DATALINKS* environment variable to *ON* by entering the following command:

```
db2set -g DB2DATALINKS=ON
```



We recommend that you also set the *DB2DATALINKS* environment variable to *ON* in the `db2profile` script file.

Step 2. Connect to the database that contains the tables created with a DATALINK column and where the DATALINK columns were created using the *FILE LINK CONTROL* option by entering the following command:

```
db2 connect to database_alias user userid using password
```

where:

- *database_alias* is the alias name of the database.
- *userid* represents a user with system administrative (SYSADM) authority.
- *password* is the password for the *userid* specified above.

Step 3. Create a `datalink.cfg` file for this database by entering the following command:

```
db2 add file manager hostname port_number
```

where:

hostname Is the *fully qualified* hostname or the IP address (but not both) of the File Manager Server.

port_number Is the port number that you have reserved for communications from the DB2 server to the File Manager Server.

For example, if a DB2 database stored its DATALINK files on a File Manager Server with the hostname *paulz.torolab.ibm.com* using the reserved port *10001* (for DB2 File Manager communications), enter the following command:

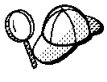
```
db2 add file manager paulz.torolab.ibm.com 10001
```

The `datalink.cfg` will be placed in the *instance_name*`/`*node0000*`/`*database* directory.

where:

- *instance_name* is the name of the instance that contains the database where the table using the `DATALINK` data type resides.
- *node0000* is the node.
- *database* is the directory where the database resides.

For example, `DB2/NODE0000/SQL00002` would be the directory for the second database created on a node, in the DB2 instance, on a DB2 server.

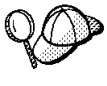


Do not edit the `datalink.cfg` file. Instead, use the db2 file manager commands to create or update it.

To retrieve a list of all the databases listed in the `datalink.cfg` file, enter the following command:

```
db2 list file managers
```

For more information on defining DATALINK columns with the *FILE LINK CONTROL* option, refer to the *SQL Reference*.



After you create or change the `datalink.cfg` configuration file, and disconnect all applications from the database, the first connection to the database reads the configuration file and then creates a new file called `datalink.cfg__dl`. If this file does not exist, communications with a File Manager Server is not possible. Only after this file is created can values be added to the DATALINK columns.

You have completed all of the steps necessary to install and configure DB2 File Manager. Go to Chapter 3, “Testing DB2 File Manager: An Example Scenario” on page 25.

Chapter 3. Testing DB2 File Manager: An Example Scenario

This section describes how to verify that you have correctly installed and configured DB2 File Manager.

To verify the installation and configuration of DB2 File Manager, perform the following steps:

Step 1. On the File Manager Server

a. Log in as the DB2 File Manager Administrator.

b. Start the File Manager by entering the **dlfm start** command.

c. Ensure that the File Manager started successfully by entering the **dlfm see** command.

   If the File Manager did not start successfully, this command will not return any output. For more information, see "Monitoring the File Manager Back-End Processes" on page 34.

d. Copy and edit the sample `/usr/lpp/db2_05_00/samples/dlfm/DbRegistrationfile` file so that it lists the `DLFMTEST` database.

   The `DbRegistrationfile` would be similar to the following:

```
#Format for each database registration entry is as follows,
#DATABASE_NAME DATABASE_INSTANCENAME FULLY QUALIFIED NODE_NAME
DLFMTEST       db2a                 paulz.torolab.ibm.com
```

e. Register the `DLFMTEST` database by entering the following command:

```
dlfm add_db < DbRegistrationfile
```

f. Ensure that the **mount** command for the new File Manager Server completed successfully by entering the following command:

```
mount ] grep filesystem_name
```

   where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.

   The output of this command should be similar to the following:

```
/dev/dlinklv1   /jfsdlink    dlfs   Apr 04 16:18 rw,log=/dev/loglv00
```

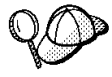
g. Log out.

h. Log in as a user with `root` authority.

i. Create a directory called `pictures` on a mounted file system that is using a File Manager Filter by entering the following command:

```
mkdir /filesystem_name/pictures
```

where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.



The DB2 File Manager Administrator should never be the owner of any files or directories that reside on a File Manager Server.

j. Change the permissions for the `/filesystem_name/pictures` directory so that any user can create a file in it by entering the following command:

```
chmod 777 /filesystem_name/pictures
```

where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.

k. Log out.

l. Log in as any user (except as a user with `root` authority, or as the DB2 File Manager Administrator).

m. Create a file called `pcz.bmp` in the `/filesystem_name/pictures` directory (to be managed by the File Manager) by entering the following command:

```
echo "This is an employee's picture" > /filesystem_name/pictures/pcz.bmp
```

where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.

n. Log out.

Step 2. On the DB2 server:

a. Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority. For more information, refer to the *Administration Guide*.

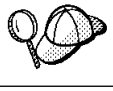
b. Set up the instance environment by entering the following command:

```
. INSTHOME/sqllib/db2profile    (for Bourne or Korn shell)
```

where *INSTHOME* is the home directory of the instance owner.

c. Set the *DB2DATALINKS* environment variable to *ON* by entering the following command:

```
db2set -g DB2DATALINKS=ON
```



We recommend that you also set the *DB2DATALINKS* environment variable to *ON* in the `db2profile` script file.

d. Start the database manager by entering the **db2start** command.

e. Create a database called `DLFMTEST` by entering the following command:

```
db2 create database dlfmtest
```

f. Connect to the DLFMTEST database by entering the following command:

```
db2 connect to dlfmtest user userid using password
```

where:

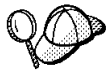
- *userid* represents a user with SYSADM authority
- *password* is the password for the *userid* specified above.

g. Create a datalink.cfg file for this database by entering the following command:

```
db2 add file manager hostname port_number
```

where:

hostname	Is the *fully qualified* hostname or the IP address (but not both) of the File Manager Server.
port_number	Is the port number that you have reserved for communications from the DB2 server to the File Manager Server.



If you are not using the default TCP/IP port number *10001*, replace this number with the port number that you reserved for communications with the File Manager Server.

h. Terminate all connections to this database by entering the following command:

```
db2 terminate
```

i. Connect to the DLFMTEST database by entering the following command:

```
db2 connect to dlfmtest user userid using password
```

where:

- *userid* represents a user with SYSADM authority
- *password* is the password for the *userid* specified above.

j. Create a table called DATALINK_TEST, in the DLFMTEST database that you just created, that will have a column defined with a DATALINK data type by entering the following command:

```
db2 "create table datalink_test (id int, name varchar(30), picture datalink
linktype url file link control integrity all read permission db write permission
blocked recovery yes on unlink restore)"
```

k. Insert an entry into the DATALINK_TEST table that you just created in the previous step by entering the following command:

```
db2 "insert into datalink_test values
(001,'Paul Z',dlvalue('http://hostname/filesystem_name/pictures/pcz.bmp'))"
```

where:

- *hostname* is the fully qualified hostname or IP address of the File Manager Server. If you specified the *hostname* of the File Manager Server when you entered the **db2 add file manager** command, then you must specify the fully qualified hostname here as well. If you specified the *ip_address* when you entered this command, you must specify the IP address when you enter this command. You cannot interchange the different methods of referring to the File Manager Server.
- *filesystem_name* is the name of the mounted file system using a File Manager Filter
- `pictures` is the directory that you created.
- `pcz.bmp` is the file that you created.

Step 3. On the File Manager Server

a. Log in as any user (except as a user with `root` authority, or as the DB2 File Manager Administrator).

b. Verify that the `pcz.bmp` file is now controlled by the File Manager by entering the following command:

```
ls -l filesystem_name/picture/pcz.bmp
```

If this file is being controlled by the File Manager, you will receive a `"Permission denied"` error similar to the following:

```
/filesystem_name/pictures/pcz.bmp: Permission denied
```

where *filesystem_name* is the name of the mounted file system that is using a File Manager Filter.

c. Log out.

Step 4. On the DB2 server:

a. Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority. For more information, refer to the *Administration Guide*.

b. Set up the instance environment by entering the following command:

```
. INSTHOME/sqllib/db2profile    (for Bourne or Korn shell)
```

where *INSTHOME* is the home directory of the instance owner.

c. For the purposes of testing the connection, update the database configuration file by entering the following command (you will reset this configuration parameter to the default when you have verified that you have installed and configured DB2 File Manager correctly):

```
db2 update database configuration for dlfmtest using dl_expint 600
```

d. Connect to the `DLFMTEST` database by entering the following command:

```
db2 connect to dlfmtest user userid using password
```

where:

- *userid* represents a user with SYSADM authority
- *password* is the password for the *userid* specified above.

e. Select the `pcz.bmp` file for update by entering the following command:

```
db2 "select dlurlpath(picture) from datalink_test where name = 'Paul Z'"
```

This command will return an access token similar to the following:

```
/filesystem_name/picture/token_key;pcz.bmp
```

where:

- *filesystem_name* is the name of the mounted file system that is using the File Manager Filter
- *token_key* is an encrypted key assigned by the database manager that will be used to read this file on the File Manager Server

Record this output for use on the File Manager Server.

f. Reset the *dl_expint* database configuration parameter to the default by entering the following command:

```
db2 update database configuration for dlfmtest using dl_expint 1
```

g. Log out.

Step 5. On the File Manager Server:

a. Log in as any user (except as a user with `root` authority, or as the DB2 File Manager Administrator).

b. Verify that you can access the `pcz.bmp` file by entering the following command:

```
ls -l '/filesystem_name/picture/token_key;pcz.bmp'
```

where:

- *filesystem_name* is the name of the file system using a File Manager Filter.
- *token_key* is the encrypted key that you recorded.

You should receive output from this command. This verifies that you have access to this file and that you have installed and configured DB2 File Manager correctly. If you received an error, see “Troubleshooting the Configuration” on page 30.

c. Log out.

For more information on the SQL commands used in this example, refer to the *SQL Reference*.

Troubleshooting the Configuration

If the connection fails, use the following checklist and go through the configuration instructions again, verifying each item as you complete the task.

At the File Manager Server:

__ 1. Ensure that you correctly registered the file system that is using the File Manager.

__ 2. Ensure that the DB2 database was registered correctly.

__ 3. Ensure that the directory where the `DATALINK` file is stored was *not* created by the DB2 File Manager Administrator user ID or a user ID with `root` authority.

__ 4. Ensure that the File Manager was started.

At the DB2 server:

__ 1. The *DB2DATALINKS* environment variable is set to *YES* or *ON*.

__ 2. The `datalink.cfg` file was created correctly, using the **db2 add file manager** *hostname port_number* command.

If you are connected to the database, you should see the `datalink.cfg__dl` file; this means that your connection is valid.

For information on any error messages that you may encounter, see Appendix A, “DB2 File Manager Errors and Messages” on page 49.

Part 3. Using DB2 File Manager

Chapter 4. Using the File Manager

This section describes the basic commands that the DB2 File Manager Administrator may have to perform on a File Manager Server during day-to-day operations.

For a complete list of all the File Manager commands, enter the **dlfm** command.

Starting and Stopping the File Manager

You must start the File Manager before you can access or create data stored on a DB2 File Manager File Server.

To start the File Manager:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm start** command.

When you enter the **dlfm start** command to start the File Manager, it will also attempt to start the DB2 database on the File Manager Server. If it is unsuccessful, you must enter the **dlfm startdbm** command to start the database manager. For more information, see “Starting and Stopping the DB2 Database Manager on the File Manager Server” on page 35.

To stop the File Manager:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm stop** command.

When you enter the **dlfm stop** command to stop the File Manager, it will also attempt to stop the DB2 database on the File Manager Server. If it is unsuccessful, you must enter the **dlfm stopdbm** command to stop the database manager. For more information, see “Starting and Stopping the DB2 Database Manager on the File Manager Server” on page 35.

To stop and restart the File Manager by entering only one command:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm restart** command.

Monitoring the File Manager Back-End Processes

For every connection that DB2 makes to the File Manager Server, a `dlfm_child` back-end process will be started.

To monitor the File Manager back-end processes, enter the following command:

```
dlfm see
```

If the File Manager back-end process started successfully and is running, you will receive output similar to the following:

```
PID   PPID  PGID      RUSER    EUSER   ETIME   COMMAND

 7624 49852 55994     dlfm     dlfm    02:44   dlfm_upcalld
49852     1 55994     dlfm     dlfm    02:44   dlfmd
52674 49852 55994     dlfm     root    02:44   dlfm_gcd
54214 49852 55994     dlfm     dlfm    02:44   dlfm_delgrpd
54720 49852 55994     dlfm     root    02:44   dlfm_retrieved
56260 49852 55994     dlfm     root    02:44   dlfm_copyd
56510 49852 55994     dlfm     root    02:44   dlfm_chownd
```

If the File Manager back-end process did not start successfully, this command will not return any output.

Recovering the File Manager from an Abnormal Termination

If the File Manager terminates abnormally, or you simply cannot stop the File Manager using the **dlfm stop** command, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm shutdown** command to bring down the active File Manager.

Step 3. Terminate all connections to any DB2 databases by entering the **db2 terminate** command on any machines that are connected to a database associated with this File Manager.

Step 4. Start the File Manager by entering the **dlfm start** command.

You should *never* stop a File Manager using the `kill -9` signal.

Starting and Stopping the DB2 Database Manager on the File Manager Server

You must start the DB2 database manager before you can access or create data stored on a File Manager Server. Under normal circumstances, the **dlfm start** and **dlfm stop** commands will start and stop the database manager automatically. Follow the instructions in this section if the **dlfm start** and **dlfm stop** commands fail to start or stop the database manager.

To start the database manager:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm startdbm** command.

To stop the database manager:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm stop** command to stop the File Manager.

Step 3. Enter the **dlfm stopdbm** command.

Using a File Manager Filter on Another File System

To use a File Manager Filter on another file system, perform the following steps:

Step 1. Log in as a user with `root` authority.

Step 2. Prepare a file system to use a File Manager Filter as follows:

a. Create a Journaled File System (JFS) file system using the **smit manfs** command and set the *Mount AUTOMATICALLY at system restart?* option to *no*; or you can use an existing JFS file system. For more information, refer to your *AIX Administration Guide*.

b. Open the /etc/filesystems file, record the current setting for the *vfs* entry (for example, *jfs*) for *this* file system and edit its stanza, such that:

```
mount    = false
vfs      = dlfs
```

To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add write authority to a file called test, located in the /etc directory, enter:

```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

c. Add the following attribute to the stanza of the /etc/filesystems file for *this* file system:

```
nodename = -
```

Note: You must ensure that there are no blank spaces after the null character (-) for this entry.

d. Edit the stanza for the /etc/filesystems file for *this* file system and set the *Basefs* parameter, in the options attribute, to the value that you recorded for the *vfs* entry above. For example, the entry would be similar to the following:

```
options = rw,Basefs=jfs
```

Step 3. Edit the /etc/rc.dlfs file to have this machine enter the **mount** command for any existing file systems using the File Manager Filter, whenever the /etc/rc.dlfs file is run.

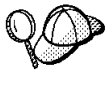
For example, to have the /etc/rc.dlfs file automatically mount the *filesystem_name* file system, add the following entry to the /etc/rc.dlfs file:

```
mount -v dlfs /filesystem_name
```

where:

- *filesystem_name* is the name of the file system that you want to mount.
- *-v* specifies that the file system is defined by the *VfsName* parameter in the /etc/vfs file.

Note: The *-v* flag *must* be used when mounting a file system to use a File Manager Filter.



To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add write authority to a file called test, located in the /etc directory, enter:

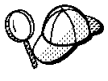
```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

Step 4. Add an entry to the `PrefixRegistrationfile` file so that it describes the location of the new file system, mounted with a File Manager Filter, that will be used to store the files associated with the DATALINK data type on a DB2 database.

For example, if you had two file systems using a File Manager Filter, and decided to add another file system called `temp` to use a File Manager Filter, the `PrefixRegistrationfile` file would be similar to the following:

```
#Format for the prefix registration file
#The Prefix_Name is the mount point of the
#File Manager Server
#Prefix_Name
/jfsdlink
/nfsdlink
/temp
```



Any file prefix that is registered should be mounted using a DB2 File Manager Filter.

Step 5. Register the location of any file systems using a File Manager Filter by entering the following command:

```
dlfm add_prefix < PrefixRegistrationfile
```

Registering Databases or File Systems with the File Manager

To register a new database with the File Manager, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Update the `DbRegistration` file.

Step 3. Enter the **dlfm add_db** < **DbRegistrationfile** command, where *DbRegistrationfile* is the name of the database registration file.

To register more file systems for monitoring by the File Manager Filter, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Update the `PrefixRegistrationfile` file.

Step 3. Enter the **dlfm add_prefix** < **PrefixRegistrationfile** command, where *PrefixRegistrationfile* is the name of the prefix registration file.

Each time you register a database, or a file system using a File Manager Filter, the database is automatically backed up.

Changing the Diagnostic Level for the Error Messages Log File

Error messages log files are maintained for DB2 File Manager, DB2 on the File Manager Server, and for the DB2 system that contains the database with the DATALINK data type. The location for the error messages log files are as follows:

DB2 File Manager `/home/dlfm/dldump/dldiag.log`

DB2 on the File Manager Server `/dlfm_directory/sqllib/db2dump/db2diag.log`

where *dlfm_directory* is the home directory of the DB2 File Manager Administrator.

DB2 System `/INSTHOME/sqllib/db2dump/db2diag.log`

where *INSTHOME* is the home directory of the instance owner.

The information in this section describes how to change the diagnostic level for the DB2 File Manager error messages log file. For more information on error messages log files, refer to the *Administration Guide*.

By default, the `dlfm_directory/dldump/dldiag.log` file (where *dlfm_directory* is the home directory of the DB2 File Manager Administrator) is used to trace all File Manager error messages using the **syslog** utility.

The default diagnostic level is to trace `error` information. In this case, the entry in the `/etc/syslog.conf` file would be similar to the following:

```
# ERROR_LOG  PATH_OF_ERROR_FILE
  user.err  dlfm_directory/dldump/dldiag.log
```

where *dlfm_directory* is the home directory of the DB2 File Manager Administrator.

To include more detail in the error log file, use the `debug` trace level. To change the diagnostic level to `debug`, perform the following steps:

Step 1. Log in as a user with `root` authority.

Step 2. Edit the `/etc/syslog.conf` file and declare the type of error to monitor and the location of the error log. The `/etc/syslog.conf` file should be similar to the following:

```
# ERROR_LOG  PATH_OF_ERROR_FILE
user.debug  dlfm_directory/dldump/dldiag.log
```

Step 3. Enter the **refresh -s syslogd** command to refresh the `syslog` daemon.

Step 4. Log out.

Step 5. Log in as the DB2 File Manager Administrator.

Step 6. Enter the **dlfm stop** command to stop the File Manager.

Step 7. Set the *DLFM_LOG_LEVEL* environment variable to *LOG_DEBUG* by entering the following command:

```
db2set -g DLFM_LOG_LEVEL=LOG_DEBUG
```

Step 8. Enter the **dlfm start** command to start the File Manager.

Increasing the Size of a DB2 File Manager File System

This section describes how to increase the size of a file system using a File Manager Filter.

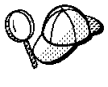
If you need to allocate more space to an existing file system that is using a File Manager Filter, perform the following steps:

Step 1. Unmount the file system by entering the following command:

```
unmount filesystem_name
```

where *filesystem_name* specifies the name of the mounted file system that is using the File Manager Filter.

Step 2. Edit the `/etc/filesystems` file for this file system and set vfs= *jfs*.



To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add `write` authority to a file called `test`, located in the `/etc` directory, enter:

```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

Step 3. Edit the /etc/filesystems file for this file system and remove the `nodename=` - and `Basefs=jfs` entries.

Step 4. Mount this file system as JFS by entering the following command:

```
mount -v jfs /filesystem_name
```

where

- *-v* specifies that this file system is defined by the *dlfs* parameter in the `/etc/vfs` file.
- *filesystem_name* specifies the name of the file system.

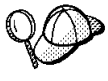
Step 5. Enter the **smit manfs** command to increase the size of this file system.

Step 6. Unmount the JFS file system by entering the following command:

```
unmount /filesystem_name
```

Step 7. Open the `/etc/filesystems` file, record the current setting for the *vfs* entry (for example, *jfs*) for *this* file system and edit its stanza, such that:

```
mount    = false
vfs      = dlfs
```



To edit this file, you may need to alter its file permissions. Use the **chmod** command to change file permissions for a file.

For example, to add `write` authority to a file called `test`, located in the `/etc` directory, enter:

```
chmod u+w /etc/test
```

For more information, refer to your *AIX Administration Guide*.

Step 8. Edit the `/etc/filesystems` file for this file system and add an entry such that:

```
nodename = -
```

You must ensure that there are no blanks spaces after the null character (-) for this entry.

Step 9. Edit the stanza for the `/etc/filesystems` file for *this* file system and set the *Basefs* parameter, in the options attribute, to the value that you recorded for the *vfs* entry above. For example, the entry would be similar to the following:

```
options = rw,Basefs=jfs
```

Step 10. Mount this file system for use by the File Manager Filter by entering the following command:

```
mount -v dlfs /filesystem_name
```

where:

- *-v* specifies that this file system is defined by the *dlfs* parameter in the `/etc/vfs` file.
- *filesystem_name* specifies the name of the file system.

Chapter 5. Advanced Administration Tasks

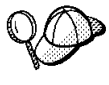
This section describes some of the more advanced administration tasks that the DB2 File Manager Administrator may have to perform.

Creating the DB2 File Manager Administrator and Instance

If you did not specify the **Create the DB2 File Manager Administrator** option in the DB2 Installer (when installing DB2 File Manager), or you did not use the DB2 Installer to install DB2 File Manager, perform the following steps to create the DB2 File Manager Administrator and the associated instance:

Step 1. You need to have a user ID that will be used to administer the File Manager.

For example, the name of this user ID could be `dlfm`. This user ID will be known as the DB2 File Manager Administrator.



You should never administer the File Manager with a user ID that has `root` authority.

The home directory of the DB2 File Manager Administrator must *not* reside in a file system that is using a File Manager Filter.

To create the DB2 File Manager Administrator's group and user ID (if they do not already exist):

Step a. Log in as a user with `root` authority.

Step b. Create the DB2 File Manager Administrator's group (for example, `dlfmgrp`) and user ID (for example, `dlfm`), using the `/u/dlfm` directory as the home directory of the DB2 File Manager Administrator, by entering the following commands:

```
/usr/bin/mkgroup dlfmgrp
/usr/bin/mkuser pgrp='dlfmgrp' groups='dlfmgrp' home='/home/dlfm' dlfm
```

Step c. Assign a password to this user ID by entering the following command:

```
passwd userid
```

where *userid* is the user ID that you created for the DB2 File Manager Administrator.

The user ID used for the DB2 File Manager Administrator should never own files or directories on a file system using a File Manager Filter. The DB2 File Manager Administrator is a special user who should only be administering the File Manager.

Step 2. Create the DB2 File Manager Administration instance by entering the following command:

```
/usr/lpp/db2_05_00/instance/dlfmcrt -p  port_number userid
```

where:

- *port_number* is the port number reserved for communications with the File Manager Server.
- *userid* is the user ID of the DB2 File Manager Administrator.

For example, if you reserved the TCP/IP port *10001* and the user ID you specified for the DB2 File Manager Administrator was `dlfm`, enter the following command:

```
/usr/lpp/db2_05_00/instance/dlfmcrt -p 10001 dlfm
```

Creating and Dropping the DB2 Database on the File Manager Server

To create the DB2 database on the File Manager Server, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm setup** command to start the DB2 database manager, create the `DLFM_DB` database and tables, and then stop the DB2 database manager.

To drop the DB2 database on the File Manager Server, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm dropdb** command to drop the `DLFM_DB` database.

Shutting Down and Cleaning Up the File Manager

Cleaning up the File Manager involves clearing the File Manager log data from all the logs and removing the database and prefix registration entries from the File Manager Filter.

To shut down and clean up the File Manager, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm cleanup** command.

Loading, Unloading, and Querying the File Manager Filter

This section describes how to load, unload, and query the File Manager Filter. You may want to use any of the following commands to disable a File Manager Server (in order to install a fix pack, debug problems, or cleanup an existing machine), and then enable it for use.

Loading the File Manager Filter
Enter the **strload -f /usr/lpp/db2_05_00/cfg/dlfs_cfg** command.

Unloading the File Manager Filter
Enter the **strload -u -f /usr/lpp/db2_05_00/cfg/dlfs_cfg** command.

Querying the File Manager Filter
Enter the **strload -q -f /usr/lpp/db2_05_00/cfg/dlfs_cfg** command.

Retrieving Archive Server Information

To retrieve a list of files that have been backed up to the archive server, perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **retrieve_query -h** *hostname* **-d** *database_name* **-i** *instance_name* **-p** *PrefixRegistrationfile* command.

where:

hostname	Is the hostname of the archive server
database_name	Is the name of the database that contains that files that were backed up to the archive server
instance_name	Is the name of the instance where the database that contains that files that were backed up to the archive server resides.
PrefixRegistrationfile	Is the name of the `PrefixRegistrationfile`

If you enter the **retrieve_query** command without any parameters, you will be asked to provide them interactively, using a generated list of options for the *database_name* and *instance_name* parameters.

This command, entered without parameters, will retrieve output similar to the following:

```
   No database specified. Going for default database : dlfm_db

Please make your choice of hosts registered with DLFM.
0       ARROW.TOROLAB.IBM.COM
Enter the number
Please make your choice of the database/instance.
0       TSTDB001        regress ARROW.TOROLAB.IBM.COM
1       TSTDB002        regress ARROW.TOROLAB.IBM.COM
2       TSTDB003        regress ARROW.TOROLAB.IBM.COM
3       TSTDB004        regress ARROW.TOROLAB.IBM.COM
4       TSTDB005        regress ARROW.TOROLAB.IBM.COM
Enter the number
Please make your choice of the prefix Name.
0       /dlfstest/
Enter the number
RETRIEVE QUERY OUTPUT

The following files were backed up from database TSTDB001, on host ARROW.TOROLAB
.IBM.COM from the instance regress
------------------------------------------------------------------------------
Copy Status     Link Status     Operation time          File Name
------------------------------------------------------------------------------
E1              L       1998-06-03-13.26.49.586476      /dlfstest/fileA1
E1              L       1998-06-03-13.26.50.243762      /dlfstest/fileA2
E1              L       1998-06-03-13.25.55.345240      /dlfstest/fileA3
E1              L       1998-06-03-13.27.03.034247      /dlfstest/fileA31
E1              L       1998-06-03-13.27.03.937676      /dlfstest/fileA32
E1              L       1998-06-03-13.25.56.176132      /dlfstest/fileA4
E1              L       1998-06-03-13.25.56.961493      /dlfstest/fileA5
E1              L       1998-06-03-13.25.58.424379      /dlfstest/fileB1
E1              L       1998-06-03-13.25.59.126102      /dlfstest/fileB2
E1              L       1998-06-03-13.26.51.973211      /dlfstest/fileB3
E1              L       1998-06-03-13.26.52.623260      /dlfstest/fileB4
E1              L       1998-06-03-13.26.53.278827      /dlfstest/fileB5

Legend:
L - Linked
U - Unlinked
G - File to be garbage collected
E1 - Marked Copied and in backup
E2 - Marked Copied and not in backup
E3 - Marked To be Copied and not in backup
E4 - Marked To be copied but in backup
**************************************
```

Part 4. Appendixes

Appendix A. DB2 File Manager Errors and Messages

This section describes the errors, messages, causes, and required actions to errors that you may encounter when using the File Manager.

Error messages are directed to the `dldiag.log` file, specified in the `/etc/syslog.conf` file. In certain cases, an e-mail message may be sent to the DB2 File Manager Administrator.

DLFM001I: File Manager started.

Cause: The File Manager has started successfully.

Action: None.

DLFM101E: Error in the File Manager start-up. See the appropriate reason code.

Reason Code -1: The File Manager is already running.

Cause: Possible causes are:

1. The File Manager is already running.
2. The File Manager (or one of its agents) is still active, even after stopping the File Manager.

Action: Perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm stop** command to stop the File Manager.

Step 3. Enter the **dlfm shutdown** command to shutdown the File Manager Server.

Step 4. Enter the **dlfm start** command to start the File Manager.

Reason Code -2: Initialization of the File Manager log manager failed.

Cause: There is a problem in initializing the File Manager log manager.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Report the problem to an IBM technical service representative.

Reason Code -3: File Manager initialization failed.

Cause: Possible causes are:

1. An operating system call failed.
2. There was an error in initializing global shared resources for the File Manager.
3. There was an error in initializing a critical File Manager service.
4. There was an error in initializing a communication service.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Contact the system administrator for further help.

DLFM201E: Error in the File Manager registration service. See the appropriate reason code.

Reason Code -1: There is an invalid database server registration entry.

Cause: The *DATABASE_NAME*, *INSTANCE_NAME*, or *NODE_NAME* parameters in the registration entry are not valid.

Action: The DB2 File Manager Administrator should register the correct values for the *DATABASE_NAME*, *INSTANCE_NAME*, or *NODE_NAME* parameters.

For more information, see “Using a File Manager Filter on Another File System” on page 35.

Reason Code -2: Error in database registration.

Cause: There is an error with the File Manager log manager.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home

directory of the DB2 File Manager Administrator).

Step 2. Report the problem to an IBM technical service representative.

Reason Code -3: Invalid prefix entry.

Cause: Possible causes are:

1. A file system does not exist on the local system.
2. The file system is not mounted using the specified File Manager Filter.

Action: The DB2 File Manager Administrator should mount the file system using the File Manager Filter as the specified file prefix.

Reason Code -4: Error in prefix registration.

Cause: There is an error with the File Manager log manager.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Report the problem to an IBM technical service representative.

For more information, see “Using a File Manager Filter on Another File System” on page 35.

DLFM301E: File Manager agent closing connection with remote database.

Cause: The File Manager log manager was interrupted while the File Manager was running.

Action: Perform the following steps:

Step 1. Log in as the DB2 File Manager Administrator.

Step 2. Enter the **dlfm shutdown** command to shutdown the File Manager Server.

Step 3. Enter the **dlfm start** command to start the File Manager.

DLFM401E: Connection management service failed and therefore the database could not connect to the File Manager. See the appropriate action (Connect or Disconnect).

Connect

Cause: The database failed to connect to the File Manager. The database is not registered with the File Manager, or there was an error accessing system shared resources, or an operating system error occurred.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. The DB2 File Manager Administrator should register the database with the File Manager or report the problem to an IBM technical service representative.

Disconnect

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DLFM501E: Transaction management service failed. See the appropriate action (AbortTxn, BeginTxn, CommitTxn, PrepareTxn, QueryARTxn, or QueryPreparedTxn).

AbortTxn

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory

(where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

BeginTxn

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

CommitTxn

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

PrepareTxn

Cause:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.

3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

QueryARTxn

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

QueryPreparedTxn

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DLFM601E: Group management service failed. See the appropriate action (DefineGroup, DeleteDatabase, DeleteGroup, and QueryGroups).

DefineGroup

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DeleteDatabase

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DeleteGroup

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

QueryGroups

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DLFM701E: Prefix management service failed. See the appropriate action (ResolvePrefixId or ResolvePrefixName).

ResolvePrefixId

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

ResolvePrefixName

Cause: The prefix for the given file is not registered with the File Manager.

Action: The DB2 File Manager Administrator should register this file with the File Manager Server.

DLFM801E: File management service failed. See the appropriate action (LinkFiles, ReleaseDelete, ReleaseRestore, Takeover, or UnlinkFile).

LinkFiles

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

ReleaseDelete

Cause: The File Manager is unable to delete the file in its current state. The file was deleted or modified while it was being managed by the File Manager.

Action: In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Check the status of this file and delete it if necessary.

ReleaseRestore

Cause: The File Manager is unable to restore the original owners and the permissions of this file. The file was deleted or modified while it was being managed by the File Manager.

Action: In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Check the status of this file and delete it if necessary.

Takeover

Cause: The File Manager is unable to initiate the management of a file. The file was deleted or modified while it was being managed by the File Manager.

Action: In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Check the status of this file and delete it if necessary.

UnlinkFile

Cause: Possible causes are:

1. There is an error with the File Manager log manager.
2. There was an error encountered when accessing system shared resources or an operating system error occurred.
3. The File Manager log file is corrupt.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Restart the File Manager (if needed).

Step 3. Report the problem to an IBM technical service representative.

DLFM9001: The File Manager server is stopped.

Cause: The File Manager was stopped normally or abnormally. In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Action: None required.

DLFM901E: One of the File Manager agents terminated abnormally.

Cause: The File Manager was stopped normally or abnormally. In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Log in as the DB2 File Manager Administrator.

Step 3. Enter the **dlfm shutdown** command to shutdown the File Manager Server.

Step 4. Enter the **dlfm start** command to start the File Manager.

DLFM905E: There was an abnormal shutdown of the File Manager.

Cause: There was an abnormal shutdown of the File Manager due to a problem with global shared system resources. In addition to tracing this error in the error log, this error will also be reported to the DB2 File Manager Administrator via e-mail.

Action: Perform the following steps:

Step 1. See the error trace information in the `dldiag.log` file, located in the *`dlfm_directory`*`/dldump` directory (where *dlfm_directory* specifies the home directory of the DB2 File Manager Administrator).

Step 2. Log in as the DB2 File Manager Administrator.

Step 3. Enter the **dlfm shutdown** command to shutdown the File Manager Server.

Step 4. Enter the **dlfm start** command to start the File Manager.

Appendix B. CLI Example

The following is an example of a DB2 CLI program designed to:

- Connect to a database
- Create a table with a single DATALINK row
- Insert a single row into this database
- Fetch the data parse information
- Drop the table
- Disconnect from the database.

```
/******************************************************************************
**
** Source File Name = datalink.c
**
** Licensed Materials - Property of IBM
**
** (C) COPYRIGHT International Business Machines Corp. 1998
** All Rights Reserved.
**
** US Government Users Restricted Rights - Use, duplication or
** disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
**
**    PURPOSE :
**  Modified version of the CLI sample clisampl.c to demonstrate creating and
**  parsing
**
**  The following operations are performed:
**       - Connect to a database.
**       - Create a table with a single datalink
**       - Insert a single row using SQLBuildDataLink() and SQLBindParameter()
**       - Fetch the data
**       - parse information from the retrieved datalink using SQLGetDataLinkAttr()
**       - Drop the table
**       - Disconnect from the database.
**
******************************************************************************/
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <sqlcli1.h>
#include "samputil.h"          /* Header file for CLI sample code */
/*
 * Global Variables for user id and password.
 * To keep samples simple, not a recommended practice.
 */
extern SQLCHAR server[SQL_MAX_DSN_LENGTH + 1' ;
extern SQLCHAR uid[MAX_UID_LENGTH + 1' ;
extern SQLCHAR pwd[MAX_PWD_LENGTH + 1' ;

void getattr(
          SQLHSTMT hStmt,
          SQLSMALLINT AttrType,
          SQLCHAR* DataLink,
          SQLCHAR* Attribute,
          SQLINTEGER BufferLength )
{
     SQLINTEGER  StringLength ;
     SQLRETURN   rc ;

rc = SQLGetDataLinkAttr(
                hStmt,
                AttrType,
                DataLink,
                strlen( (char *)DataLink),
                Attribute,
                BufferLength,
                &StringLength
              ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hStmt, rc ) ;

printf("Attribute #%d) <%s>\n", AttrType, Attribute) ;
return ;
}

int main(int argc, char * argv[' ) {

      SQLHANDLE henv, hdbc, hstmt ;
```

```
      SQLRETURN rc ;

      SQLCHAR szCreate⅛' = "CREATE TABLE DL_SAMPL "
                           "( "
                           "DL1 DATALINK "
                             "LINKTYPE URL "
                             "FILE LINK CONTROL "
                             "INTEGRITY ALL "
                             "READ PERMISSION DB "
                             "WRITE PERMISSION BLOCKED "
                             "RECOVERY NO "
                             "ON UNLINK RESTORE "
                           ")";

SQLCHAR szInsert⅛'= "INSERT INTO DL_SAMPL VALUES (?)" ;

SQLCHAR szFileLink⅛' = "http://mycomputer.company.com/nfsdlink/userid/test_1.jpg" ;
SQLCHAR szComment⅛' = "My First Datalink" ;

SQLCHAR szSelect⅛'= "SELECT * FROM DL_SAMPL" ;
SQLCHAR szDrop⅜' = "DROP TABLE DL_SAMPL" ;
SQLCHAR szDLCol⅛254' ;
SQLCHAR szBuffer⅛254' ;
SQLSMALLINT cCol ;
SQLCHAR szColName⅜33' ;
SQLSMALLINT fSqlType ;
SQLUINTEGER cbColDef ;
SQLSMALLINT ibScale ;
SQLSMALLINT fNullable ;
SQLINTEGER  siLength= SQL_NTS ;

/* macro to initialize server, uid and pwd */
INIT_UID_PWD ;

/* allocate an environment handle */
rc = SQLAllocHandle( SQL_HANDLE_ENV, SQL_NULL_HANDLE, &henv ) ;
if ( rc != SQL_SUCCESS ) return(terminate( henv, rc ) ) ;

/* allocate a connect handle, and connect */
rc = DBconnect( henv, &hdbc ) ;
if ( rc != SQL_SUCCESS ) return( terminate( henv, rc ) ) ;

rc = SQLAllocHandle( SQL_HANDLE_STMT, hdbc, &hstmt ) ;
CHECK_HANDLE( SQL_HANDLE_DBC, hdbc, rc );

/*
* Create the sample table. This code assumes
* that the table DL_SAMPL does not exist.
*/

printf( "Create table - %s\n", szCreate ) ;
rc = SQLExecDirect( hstmt, szCreate, SQL_NTS ) ;
CHECK_HANDLE(SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Commit the changes.  */
rc = SQLEndTran( SQL_HANDLE_DBC, hdbc, SQL_COMMIT ) ;
CHECK_HANDLE(SQL_HANDLE_DBC, hdbc, rc ) ;

/*  Prepare an insert statement. */
printf( "Insert - %s\n", szInsert ) ;
rc = SQLPrepare( hstmt, szInsert, SQL_NTS ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/* Build Datalink */
rc = SQLBuildDataLink( hstmt,
               (SQLCHAR *)"URL",
               strlen("URL"),
```

```
                szFileLink,
                strlen((char*)szFileLink),
                szComment,
                strlen((char *)szComment),
                szDLCol,
                sizeof(szDLCol),
                &siLength
              );

CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Set input parameter.  */
rc = SQLBindParameter(
                hstmt,
                1,
                SQL_PARAM_INPUT,
                SQL_C_DATALINK,
                SQL_DATALINK,
                sizeof(szDLCol),
                0,
                (SQLPOINTER)szDLCol,
                sizeof(szDLCol),
                NULL
              ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Insert row into the database.  */
rc = SQLExecute( hstmt) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Commit the changes.  */
rc = SQLEndTran( SQL_HANDLE_DBC, hdbc, SQL_COMMIT) ;
CHECK_HANDLE( SQL_HANDLE_DBC, hdbc, rc ) ;

/*  Reset input parameter.  */
rc = SQLFreeStmt( hstmt, SQL_RESET_PARAMS ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Execute the select statement.  */
printf( "Select - %s\n", szSelect ) ;
rc= SQLExecDirect( hstmt, szSelect, SQL_NTS ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Return number of columns and describe result set. */
rc = SQLNumResultCols( hstmt, &cCol ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;
printf( "Number of columns - %d\n", cCol ) ;
rc = SQLDescribeCol(hstmt,
                1,
                szColName,
                sizeof( szColName ),
                NULL,
                &fSqlType,
                &cbColDef,
                &ibScale,
                &fNullable
              ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;
printf( "Column name - %s\n", szColName ) ;
printf( "Column type - %d\n", fSqlType ) ;
printf( "Column precision - %ld\n", cbColDef) ;
printf( "Column scale - %d\n", ibScale ) ;
printf( "Column nullable - %s\n", ( fNullable ) ? "TRUE" : "FALSE" ) ;

/*  Bind the output parameter.  */
rc = SQLBindCol( hstmt, 1, SQL_C_DATALINK, szDLCol, sizeof(szDLCol), NULL ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;
```

```
/*  Fetch data.  */
rc = SQLFetch( hstmt ) ;
CHECK_HANDLE(SQL_HANDLE_STMT, hstmt, rc ) ;

printf( "Column value - %s\n", szDLCol ) ;

getattr(hstmt, 1, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 2, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 3, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 4, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 5, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 6, szDLCol, szBuffer, sizeof(szBuffer) );
getattr(hstmt, 7, szDLCol, szBuffer, sizeof(szBuffer) );

/*  Close cursor and free bound columns.  */

/*  Free statement resources  */

rc = SQLFreeStmt(hstmt, SQL_UNBIND ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

rc = SQLFreeStmt( hstmt, SQL_CLOSE ) ;
CHECK_HANDLE(SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Drop table.  */
rc = SQLExecDirect(hstmt, szDrop, SQL_NTS ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

/*  Commit the changes.  */
rc = SQLEndTran( SQL_HANDLE_DBC, hdbc, SQL_COMMIT ) ;
CHECK_HANDLE( SQL_HANDLE_DBC, hdbc, rc ) ;

/*  Disconnect and free up CLI resources.  */

rc = SQLFreeHandle(SQL_HANDLE_STMT, hstmt ) ;
CHECK_HANDLE( SQL_HANDLE_STMT, hstmt, rc ) ;

printf( "\n>Disconnecting .....\n" ) ;
rc = SQLDisconnect(hdbc ) ;
CHECK_HANDLE( SQL_HANDLE_DBC, hdbc, rc ) ;

rc= SQLFreeHandle( SQL_HANDLE_DBC, hdbc ) ;
CHECK_HANDLE( SQL_HANDLE_DBC, hdbc, rc ) ;

rc = SQLFreeHandle( SQL_HANDLE_ENV,  henv ) ;
if ( rc != SQL_SUCCESS ) return( terminate( henv, rc ) ) ;

return(SQL_SUCCESS ) ;

}                               /* end main */

/* ============================================================
** Sample Output:
**
** >Enter Server Name:
** sample
** >Enter User Name:
** userid
** >Enter Password:
** password
** >Connected to sample
** Create table - CREATE TABLE DL_SAMPL
**    ( DL1 DATALINK LINKTYPE URL FILE LINK CONTROL INTEGRITY ALL
**    READ PERMISSION DB WRITE PERMISSION BLOCKED RECOVERY NO ON UNLINK RESTORE )
** Insert - INSERT INTO DL_SAMPL VALUES (?)
** Select - SELECT * FROM DL_SAMPL
```

```
** Number of columns - 1
** Column name - DL1
** Column type - -400
** Column precision - 254
** Column scale - 0
** Column nullable - TRUE
** Column value - 1,URL,79,17,19,HTTP://mycomputer.company.com/nfsdlink/userid/
**    HVJ5NXGC0WQ.I5KKB6;test_1.jpgMyFirst Datalink
** Attribute #1) <My First Datalink>
** Attribute #2) <URL>
** Attribute #3) <HTTP://mycomputer.company.com/nfsdlink/userid/
**    HVJ5NXGC0WQ.I5KKB6;test_1.jpg>
** Attribute #4) </nfsdlink/userid/HVJ5NXGC0WQ.I5KKB6;test_1.jpg>
** Attribute #5) </nfsdlink/userid/test_1.jpg>
** Attribute #6) <HTTP>
** Attribute #7) <mycomputer.company.com>
**
** >Disconnecting .....
**
**
============================================================ */
```

Appendix C. How the DB2 Library Is Structured

The DB2 Universal Database library consists of SmartGuides, online help, and books. This section describes the information that is provided, and how to access it.

To access product information online, you can use the Information Center. You can view task information, DB2 books, troubleshooting information, sample programs, and DB2 information on the Web. See “Information Center” on page 77 for details.

SmartGuides

SmartGuides help you complete some administration tasks by taking you through each task one step at a time. SmartGuides are available through the Control Center. The following table lists the SmartGuides.

Note: Not all SmartGuides are available for the partitioned database environment.

SmartGuide	Helps you to...	How to Access...
Add Database	Catalog a database on a client workstation.	From the Client Configuration Assistant, click on **Add**.
Create Database	Create a database, and perform some basic configuration tasks.	From the Control Center, click with the right mouse button on the **Databases** icon and select **Create**->**New**.
Performance Configuration	Tune the performance of a database by updating configuration parameters to match your business requirements.	From the Control Center, click with the right mouse button on the database you want to tune and select **Configure performance**.
Backup Database	Determine, create, and schedule a backup plan.	From the Control Center, click with the right mouse button on the database you want to backup and select **Backup**->**Database using SmartGuide**.
Restore Database	Recover a database after a failure. It helps you understand which backup to use, and which logs to replay.	From the Control Center, click with the right mouse button on the database you want to restore and select **Restore**->**Database using SmartGuide**.

SmartGuide	Helps you to...	How to Access...
Create Table	Select basic data types, and create a primary key for the table.	From the Control Center, click with the right mouse button on the **Tables** icon and select **Create**->**Table using SmartGuide**.
Create Table Space	Create a new table space.	From the Control Center, click with the right mouse button on the **Table spaces** icon and select **Create**->**Table space using SmartGuide**.

Online Help

Online help is available with all DB2 components. The following table describes the various types of help. You can also access DB2 information through the Information Center. For information see “Information Center” on page 77.

Type of Help	Contents	How to Access...
Command Help	Explains the syntax of commands in the command line processor.	From the command line processor in interactive mode, enter: **?** *command* where *command* is a keyword or the entire command. For example, **? catalog** displays help for all the CATALOG commands, while **? catalog database** displays help for the CATALOG DATABASE command.
Control Center Help	Explains the tasks you can perform in a window or notebook. The help includes prerequisite information you need to know, and describes how to use the window or notebook controls.	From a window or notebook, click on the **Help** push button or press the F1 key.

Type of Help	Contents	How to Access...
Message Help	Describes the cause of a message, and any action you should take.	From the command line processor in interactive mode, enter: **?** *XXXnnnnn* where *XXXnnnnn* is a valid message identifier. For example, **? SQL30081** displays help about the SQL30081 message. To view message help one screen at a time, enter: **?** *XXXnnnnn* **| more** To save message help in a file, enter: **?** *XXXnnnnn* > *filename.ext* where *filename.ext* is the file where you want to save the message help.
SQL Help	Explains the syntax of SQL statements.	From the command line processor in interactive mode, enter: **help** *statement* where *statement* is an SQL statement. For example, **help** *SELECT* displays help about the SELECT statement.
SQLSTATE Help	Explains SQL states and class codes.	From the command line processor in interactive mode, enter: **?** *sqlstate* or **?** *class-code* where *sqlstate* is a valid five-digit SQL state and the *class-code* is first two digits of the SQL state. For example, **? 08003** displays help for the 08003 SQL state, while **? 08** displays help for the 08 class code.

DB2 Books

The table in this section lists the DB2 books. They are divided into two groups:

Cross-platform books These books contain the common DB2 information for UNIX-based and Intel-based platforms.

Platform-specific books These books are for DB2 on a specific platform. For example, for DB2 on OS/2, on Windows NT, and on the UNIX-based platforms, there are separate *Quick Beginnings* books.

Most books are available in HTML and PostScript format, and in hardcopy that you can order from IBM. The exceptions are noted in the table.

If you want to read the English version of the books, they are always provided in the directory that contains the English documentation.

You can obtain DB2 books and access information in a variety of different ways:

View See "Viewing Online Books" on page 74.
Search See "Searching Online Books" on page 75.
Print See "Printing the PostScript Books" on page 75.
Order See "Ordering the Printed DB2 Books" on page 76.

Book Name	Book Description	Form Number File Name
	Cross-Platform Books	
Administration Getting Started	Introduces basic DB2 database administration concepts and tasks, and walks you through the primary administrative tasks.	S10J-8154 db2k0x50
Administration Guide	Contains information required to design, implement, and maintain a database to be accessed either locally or in a client/server environment.	S10J-8157 db2d0x51
API Reference	Describes the DB2 application programming interfaces (APIs) and data structures you can use to manage your databases. Explains how to call APIs from your applications.	S10J-8167 db2b0x51
CLI Guide and Reference	Explains how to develop applications that access DB2 databases using the DB2 Call Level Interface, a callable SQL interface that is compatible with the Microsoft ODBC specification.	S10J-8159 db2l0x50
Command Reference	Explains how to use the command line processor, and describes the DB2 commands you can use to manage your database.	S10J-8166 db2n0x51

Book Name	Book Description	Form Number File Name
DB2 Connect Enterprise Edition Quick Beginnings	Provides planning, migrating, installing, configuring, and using information for DB2 Connect Enterprise Edition. Also contains installation and setup information for all supported clients.	S10J-7888 db2cyx51
DB2 Connect Personal Edition Quick Beginnings	Provides planning, installing, configuring, and using information for DB2 Connect Personal Edition.	S10J-8162 db2c1x51
DB2 Connect User's Guide	Provides concepts, programming and general using information about the DB2 Connect products.	S10J-8163 db2c0x51
DB2 Connectivity Supplement	Provides setup and reference information for customers who want to use DB2 for AS/400, DB2 for OS/390, DB2 for MVS, or DB2 for VM as DRDA Application Requesters with DB2 Universal Database servers, and customers who want to use DRDA Application Servers with DB2 Connect (formerly DDCS) application requesters. **Note:** Available in HTML and PostScript formats only.	No form number db2h1x51
Embedded SQL Programming Guide	Explains how to develop applications that access DB2 databases using embedded SQL, and includes discussions about programming techniques and performance considerations.	S10J-8158 db2a0x50
Glossary	Provides a comprehensive list of all DB2 terms and definitions. **Note:** Available in HTML format only.	No form number db2t0x50
Installing and Configuring DB2 Clients	Provides installation and setup information for all DB2 Client Application Enablers and DB2 Software Developer's Kits. **Note:** Available in HTML and PostScript formats only.	No form number db2iyx51
Master Index	Contains a cross reference to the major topics covered in the DB2 library. **Note:** Available in PostScript format and hardcopy only.	S10J-8170 db2w0x50
Messages Reference	Lists messages and codes issued by DB2, and describes the actions you should take.	S10J-8168 db2m0x51
DB2 Replication Guide and Reference	Provides planning, configuring, administering, and using information for the IBM Replication tools supplied with DB2.	S95H-0999 db2e0x52
Road Map to DB2 Programming	Introduces the different ways your applications can access DB2, describes key DB2 features you can use in your applications, and points to detailed sources of information for DB2 programming.	S10J-8155 db2u0x50

Book Name	Book Description	Form Number File Name
SQL Getting Started	Introduces SQL concepts, and provides examples for many constructs and tasks.	S10J-8156 db2y0x50
SQL Reference	Describes SQL syntax, semantics, and the rules of the language. Also includes information about release-to-release incompatibilities, product limits, and catalog views.	S10J-8165 db2s0x51
System Monitor Guide and Reference	Describes how to collect different kinds of information about your database and the database manager. Explains how you can use the information to understand database activity, improve performance, and determine the cause of problems.	S10J-8164 db2f0x50
Troubleshooting Guide	Helps you determine the source of errors, recover from problems, and use diagnostic tools in consultation with DB2 Customer Service.	S10J-8169 db2p0x50
What's New	Describes the new features, functions, and enhancements in DB2 Universal Database, Version 5.2, including information about Java-based tools.	S04L-6230 db2q0x51
	Platform-Specific Books	
Building Applications for UNIX Environments	Provides environment setup information and step-by-step instructions to compile, link, and run DB2 applications on a UNIX system.	S10J-8161 db2axx51
Building Applications for Windows and OS/2 Environments	Provides environment setup information and step-by-step instructions to compile, link, and run DB2 applications on a Windows or OS/2 system.	S10J-8160 db2a1x50
DB2 Personal Edition Quick Beginnings	Provides planning, installing, migrating, configuring, and using information for DB2 Universal Database Personal Edition on OS/2, Windows 95, and the Windows NT operating systems.	S10J-8150 db2i1x50
DB2 SDK for Macintosh Building Your Applications	Provides environment setup information and step-by-step instructions to compile, link, and run DB2 applications on a Macintosh system. **Note:** Available in PostScript format and hardcopy for DB2 Version 2.1.2 only.	S50H-0528 sqla7x02
DB2 SDK for SCO OpenServer Building Your Applications	Provides environment setup information and step-by-step instructions to compile, link, and run DB2 applications on a SCO OpenServer system. **Note:** Available for DB2 Version 2.1.2 only.	S89H-3242 sqla9x02
DB2 SDK for SINIX Building Your Applications	Provides environment setup information and step-by-step instructions to compile, link, and run DB2 applications on a SINIX system. **Note:** Available in PostScript format and hardcopy for DB2 Version 2.1.2 only.	S50H-0530 sqla8x00

Book Name	Book Description	Form Number File Name
Quick Beginnings for OS/2	Provides planning, installing, migrating, configuring, and using information for DB2 Universal Database on OS/2. Also contains installing and setup information for all supported clients.	S10J-8147 db2i2x50
Quick Beginnings for UNIX	Provides planning, installing, configuring, migrating, and using information for DB2 Universal Database on UNIX-based platforms. Also contains installing and setup information for all supported clients.	S10J-8148 db2ixx51
Quick Beginnings for Windows NT	Provides planning, installing, configuring, migrating, and using information for DB2 Universal Database on the Windows NT operating system. Also contains installing and setup information for all supported clients.	S10J-8149 db2i6x50
DB2 Extended Enterprise Edition for UNIX Quick Beginnings	Provides planning, installing, configuring, and using information for DB2 Universal Database Extended Enterprise Edition for UNIX. This book supercedes the *DB2 Extended Enterprise Edition Quick Beginnings for AIX* book, and is suitable for use with all versions of DB2 Extended Enterprise Edition that run on UNIX-based platforms.	S99H-8314 db2v3x51
DB2 Extended Enterprise Edition for Windows NT Quick Beginnings	Provides planning, installing, configuring, and using information for DB2 Universal Database Extended Enterprise Edition for Windows NT.	S09L-6713 db2v6x51

Notes:

1. The character in the sixth position of the file name indicates the language of a book. For example, the file name `db2d0e50` indicates that the *Administration Guide* is in English. The following letters are used in the file names to indicate the language of a book:

Language	Identifier	Language	Identifier
Brazilian Portuguese	B	Japanese	J
Bulgarian	U	Korean	K
Czech	X	Norwegian	N
Danish	D	Polish	P
English	E	Russian	R
Finnish	Y	Simp. Chinese	C
French	F	Slovenia	L
German	G	Spanish	Z
Greek	A	Swedish	S
Hungarian	H	Trad. Chinese	T
Italian	I	Turkish	M

2. For late breaking information that could not be included in the DB2 books:
   - On UNIX-based platforms, see the `Release.Notes` file. This file is located in the `DB2DIR/Readme/%L` directory, where `%L` is the locale name and DB2DIR is:

  - /usr/lpp/db2_05_00 on AIX
  - /opt/IBMdb2/V5.0 on HP-UX, Solaris, SCO UnixWare 7, and SGI.
- On other platforms, see the RELEASE.TXT file. This file is located in the directory where the product is installed.

Viewing Online Books

The manuals included with this product are in Hypertext Markup Language (HTML) softcopy format. Softcopy format enables you to search or browse the information, and provides hypertext links to related information. It also makes it easier to share the library across your site.

You can use any HTML Version 3.2-compliant browser to view the online books.

To view online books:

- If you are running DB2 administration tools, use the Information Center. See "Information Center" on page 77 for details.
- Use the open file function of your Web browser. The page you open contains descriptions of and links to DB2 books:
  - On UNIX-based platforms, open the following page:

    file:/*INSTHOME*/sqllib/doc/*%L*/html/index.htm

    where *%L* is the locale name.
  - On other platforms, open the following page:

    sqllib\doc\html\index.htm

    The path is located on the drive where DB2 is installed.

    You can also open the page by double-clicking on the **DB2 Online Books** icon. Depending on the system you are using, the icon is in the main product folder or the Windows Start menu.

    Note: The **DB2 Online Books** icon is only available if you do not install the Information Center.

Setting up a Document Server

By default the DB2 information is installed on your local system. This means that each person who needs access to the DB2 information must install the same files. To have the DB2 information stored in a single location, use the following instructions:

1. Copy all files and sub-directories from \sqllib\doc\html on your local system to a web server. Each book has its own sub-directory containing all the necessary HTML and GIF files that make up the book. Ensure that the directory structure remains the same.

2. Configure the web server to look for the files in the new location. For information, see *Setting up DB2 Online Documentation on a Web Server* at:

   `http://www.software.ibm.com/data/pubs/papers/db2html.html`

3. If you are using the Java version of the Information Center, you can specify a base URL for all HTML files. You should use the URL for the list of books.
4. Once you are able to view the book files, you should bookmark commonly viewed topics such as:
   - List of books
   - Tables of contents of frequently used books
   - Frequently referenced articles like the *ALTER TABLE* topic
   - Search form.

For information about setting up a search, see the *What's New* book.

Searching Online Books

To search for information in the HTML books, you can do the following:

- Click on **Search the DB2 Books** at the bottom of any page in the HTML books. Use the search form to find a specific topic.
- Click on **Index** at the bottom of any page in an HTML book. Use the Index to find a specific topic in the book.
- Display the Table of Contents or Index of the HTML book, and then use the find function of the Web browser to find a specific topic in the book.
- Use the bookmark function of the Web browser to quickly return to a specific topic.
- Use the search function of the Information Center to find specific topics. See "Information Center" on page 77 for details.

Printing the PostScript Books

If you prefer to have printed copies of the manuals, you can decompress and print PostScript versions. For the file name of each book in the library, see the table in "DB2 Books" on page 70.

Note: Specify the full path name for the file you intend to print.

On OS/2 and Windows platforms:

1. Copy the compressed PostScript files to a hard drive on your system. The files have a file extension of `.exe` and are located in the `x:\doc\language\books\ps` directory, where x: is the letter representing the CD-ROM drive and *language* is the two-character country code that represents your language (for example, EN for English).

2. Decompress the file that corresponds to the book that you want. The result from this step is a printable PostScript file with a file extension of `.psz`.
3. Ensure that your default printer is a PostScript printer capable of printing Level 1 (or equivalent) files.
4. Enter the following command from a command line:

   ```
   print filename.psz
   ```

On UNIX-based platforms:

1. Mount the CD-ROM. Refer to your *Quick Beginnings* manual for the procedures to mount the CD-ROM.
2. Change to `/cdrom/doc/%L/ps` directory on the CD-ROM, where */cdrom* is the mount point of the CD-ROM and *%L* is the name of the desired locale. The manuals will be installed in the previously-mentioned directory with file names ending with `.ps.Z`.
3. Decompress and print the manual you require using the following command:
   - For AIX:

     ```
     zcat filename ] qprt -P PSPrinter_queue
     ```

   - For HP-UX, Solaris, or SCO UnixWare 7:

     ```
     zcat filename ] lp -d PSPrinter_queue
     ```

   - For Silicon Graphics IRIX and SINIX:

     ```
     zcat < filename ] lp -d PSPrinter_queue
     ```

   where *filename* is the name of the full path name and extension of the compressed PostScript file and *PSprinter_queue* is the name of the PostScript printer queue.

   For example, to print the English version of *Quick Beginnings for UNIX* on AIX, you can use the following command:

   ```
   zcat /cdrom/doc/en/ps/db2ixe50.ps.Z ] qprt -P ps1
   ```

Ordering the Printed DB2 Books

You can order the printed DB2 manuals either as a set, or individually. There are three sets of books available. The form number for the entire set of DB2 books is `SBOF-8915-00`. The form number for the set of books updated for Version 5.2 is `SBOF-8921-00`. The form number for the books listed under the heading "Cross-Platform Books" is `SBOF-8914-00`.

Note: These form numbers only apply if you are ordering books that are printed in the English language.

You can also order books individually by the form number listed in “DB2 Books” on page 70. To order printed versions, contact your IBM authorized dealer or marketing

representative, or phone 1-800-879-2755 in the United States or 1-800-IBM-4YOU in Canada.

Information Center

The Information Center provides quick access to DB2 product information. You must install the DB2 administration tools to obtain the Information Center.

Depending on your system, you can access the Information Center from the:

- Main product folder
- Toolbar in the Control Center
- Windows Start menu
- Help menu of the Control Center
- **db2ic** command.

The Information Center provides the following kinds of information. Click on the appropriate tab to look at the information:

Tasks	Lists tasks you can perform using DB2.
Reference	Lists DB2 reference information, such as keywords, commands, and APIs.
Books	Lists DB2 books.
Troubleshooting	Lists categories of error messages and their recovery actions.
Sample Programs	Lists sample programs that come with the DB2 Software Developer's Kit. If the Software Developer's Kit is not installed, this tab is not displayed.
Web	Lists DB2 information on the World Wide Web. To access this information, you must have a connection to the Web from your system.

When you select an item in one of the lists, the Information Center launches a viewer to display the information. The viewer might be the system help viewer, an editor, or a Web browser, depending on the kind of information you select.

The Information Center provides some search capabilities so you can look for specific topics, and filter capabilities to limit the scope of your searches.

For a full text search, follow the *Search DB2 Books* link in each HTML file, or use the search feature of the help viewer.

The HTML search server is usually started automatically. If a search in the HTML information does not work, you may have to start the search server via its icon on the Windows or OS/2 desktop.

Refer to the release notes if you experience any other problems when searching the HTML information.

Appendix D. Notices

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Contacting IBM

This section lists ways you can get more information from IBM.

If you have a technical problem, please take the time to review and carry out the actions suggested by the *Troubleshooting Guide* before contacting DB2 Customer Support. Depending on the nature of your problem or concern, this guide will suggest information you can gather to help us to serve you better.

For information or to order any of the DB2 Universal Database products contact an IBM representative at a local branch office or contact any authorized IBM software remarketer.

Telephone

If you live in the U.S.A., call one of the following numbers:

- 1-800-237-5511 to learn about available service options.
- 1-800-IBM-CALL (1-800-426-2255) or 1-800-3IBM-OS2 (1-800-342-6672) to order products or get general information.
- 1-800-879-2755 to order publications.

For information on how to contact IBM outside of the United States, see Appendix A of the IBM Software Support Handbook. You can access this document by accessing the following page:

`http://www.ibm.com/support/`

then performing a search using the keyword “handbook.”

Note that in some countries, IBM-authorized dealers should contact their dealer support structure instead of the IBM Support Center.

World Wide Web
http://www.software.ibm.com/data/
http://www.software.ibm.com/data/db2/library/

The DB2 World Wide Web pages provide current DB2 information about news, product descriptions, education schedules, and more. The DB2 Product and Service Technical Library provides access to frequently asked questions, fixes, books, and up-to-date DB2 technical information. (Note that this information may be in English only.)

Anonymous FTP Sites
ftp.software.ibm.com

Log on as anonymous. In the directory /ps/products/db2, you can find demos, fixes, information, and tools concerning DB2 and many related products.

Internet Newsgroups
comp.databases.ibm-db2, bit.listserv.db2-l

These newsgroups are available for users to discuss their experiences with DB2 products.

CompuServe
GO IBMDB2 to access the IBM DB2 Family forums

All DB2 products are supported through these forums.

To find out about the IBM Professional Certification Program for DB2 Universal Database, go to http://www.software.ibm.com/data/db2/db2tech/db2cert.html

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