

IBM® DB2 Universal Database™



Quick Beginnings for DB2 Data Links Manager

Version 8

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Version 8

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About this book

This book will guide you through the planning, installation, and configuration of DB2 Data Links Manager on Windows NT, Windows 2000, AIX, and the Solaris Operating Environment.

Related documentation

Once your DB2 Data Links Manager is installed and configured, you will validate the installation through a test scenario.

After you have installed, validated, and tested your Data Links Manager setup, you should refer to the *DB2 Data Links Manager Administration Guide and Reference*.

For more information on how to define a DATALINK type column using the CREATE TABLE command, see the *DB2 SQL Reference*.

For information on DB2 Data Links replication, see the *DB2 Data Links Manager Administration Guide and Reference* and the *DB2 Replication Guide and Reference*.

For more Data Links Manager information, including redbooks and whitepapers, see the <http://www.ibm.com/software/data/db2/datalinks/> website.

Who should read this book

This book is intended for anyone who needs to install and configure DB2 Data Links Manager for Windows NT, Windows 2000, AIX, or Solaris operating environment. You do not need any previous experience with DB2 Data Links Manager to complete the procedures described in this book.

Conventions

This book uses these highlighting conventions:

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

The term Windows refers to Windows NT or Windows 2000.

Chapter 1. Introduction to DB2 Data Links Manager

What's new in DB2 Data Links Manager Version 8

Version 8 includes the following enhancements:

- The new *DB2 Data Links Manager Administration Guide and Reference* is a reference for system administrators, database administrators, and application programmers. Its contents include:
 - Link and unlink files
 - Update linked files
 - Replicate linked files with DB2 DataPropagator
 - Administer and secure both data and access on a Data Links server
 - Recover a Data Links server
 - Tune your Data Links Manager configuration
 - Troubleshoot Data Links Manager
 - Integrate various file systems to work with Data Links Manager
- DB2 Data Links Manager is now available on the Windows 2000 operating system, in addition to Windows NT, AIX, and the Solaris Operating Environment.
- DB2 Data Links Manager now supports both the Version 8 and Version 7 Solaris Operating Environments.
- You can now update files while they remain under the control of DB2 Data Links Manager. "Linked files" are files under the control of the Data Links Manager. Before DB2 Version 8, you had to unlink a file, make changes to the file, then relink the file.
- Performance improvements have been made for archive, data recovery, and replication operations on linked files. These improvements:
 - Reduce the time for beginning backups involving linked files
 - Reduce the time for running the Reconcile utility
 - Improve the throughput on replication of linked files using DB2 DataPropagator
- Improved security features for restricting the linking of files to authorized users.

DB2 Data Links Manager

Working with DB2, Data Links Manager provides four key elements of external data control:

- Referential integrity
- Access control
- Recovery capabilities
- Transaction consistency

Data Links Manager allows you to take advantage of the data storage features of both a Relational Database Management System (RDBMS) and a file system. You can continue to store unstructured data, such as images, engineering drawings, and x-rays, in a file system and also use an RDBMS to manage data stored within a database.

Data Links Manager offers a unique opportunity for e-commerce and internet applications, which are based on a file system paradigm, to be managed along with RDBMS data from a single point of administration. Other benefits of Data Links Manager include:

- Minimal or no changes to existing applications
- Maximize application performance and reduced network traffic by strategically putting external files close to applications
- Direct access to linked files through native filesystem APIs
- Works with UNIX[®] and Windows[®] file systems and takes advantage of the inherent benefits of the file system

Data Links Manager product extends the relational DBMS capabilities of referential integrity, value-based security, transactional consistency and coordinated backup and recovery to files that exist outside of your database. Data Links Manager manages these files as though they are logically within the database by extending database functionality to external file systems.

Data Links Manager simplifies and reduces system administration costs and complexities by providing a single administration point for file and database data. Data Links Manager guarantees:

- Referential integrity to external files
- RDBMS data value based access control to external files as an option
- Automatic and coordinated backup-and-restore capability within transactional environments

Related concepts:

- “File system paradigm” on page 7

- “DB2 Data Links Manager and your applications” on page 9
- “DATALINK data type” on page 10
- “DB2 Data Links environment” on page 3
- “DB2 Data Links Manager typical setups” on page 13
- “Data Links server components” on page 4
- “DB2 clients in the Data Links Manager environment” on page 6
- “DB2 servers in the Data Links Manager environment” on page 6

Related tasks:

- “Installing DB2 Data Links manually using the db2_install command (AIX)” on page 51
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)” on page 90
- “Installing DB2 Data Links Manager (Windows)” on page 23
- “Installing DB2 Data Links Manager manually using the db2_install command (Solaris Operating Environment)” on page 91

DB2 Data Links environment

A DB2[®] Data Links environment is composed of:

- A Data Links server, running DB2 Data Links Manager
- A DB2 Universal Database[™] server
- A DB2 client
- (Optional) File archive server — Tivoli[®] Storage Manager or any product supporting the XBSA standard interface.

You can install DB2 Data Links Manager on:

- AIX[®] systems to manage files stored in a Journaled File System (JFS) or Transarc’s DCE Distributed File Service (DCE-DFS).
- Solaris Operating Environments to manage files stored in a UNIX[®] File System (UFS).
- Windows[®] NT or Windows 2000 systems with an NTFS-formatted drive.
- Tivoli Space Manager managed file system on AIX.

Related concepts:

- “DB2 Data Links Manager typical setups” on page 13
- “Data Links server components” on page 4
- “DB2 clients in the Data Links Manager environment” on page 6

- “DB2 servers in the Data Links Manager environment” on page 6

Data Links server components

A Data Links server has the following components:

- Data Links File Manager (DLFM)
- Data Links Filesystem Filter (DLFF) controlling a Data Links File System (DLFS)
- DB2[®] (Logging Manager)

Data Links File Manager (DLFM)

The DLFM tracks all the files on a Data Links server, or all the files in a DCE cell, that are linked to one or more DB2 databases. The DLFM receives and processes *link-file* and *unlink-file* messages arising from SQL INSERT, UPDATE, and DELETE statements that reference a DATALINK column. For each linked file, the DLFM logically tracks the database instance, the fully qualified table name, and the column name referred to in the SQL statement in which the file is referenced.

The DLFM also tracks previously linked files, if they were linked to a DATALINK column for which the *RECOVERY YES* option was specified. This option allows DB2 to provide point-in-time roll-forward recovery for any file that is specified by a DATALINK column.

Data Links Filesystem Filter (DLFF)

The DLFF filters operations to ensure that linked files are not deleted or renamed, and that the file’s attributes are not changed. Optionally, it also filters commands to ensure that proper access authority exists for READ PERMISSION DB and WRITE PERMISSION ADMIN files. AIX and Solaris operating environment file systems under the control of a DLFF can be NFS exported. Windows NT[®] and Windows 2000 file systems under DLFF control can be net shared.

A file system under the control of DLFF is called a DLFS file system.

Data Links File System (DLFS) DMAPP (Data Manager Application)

DLFS file systems include FSM (File System Migrator; the filter file system component of Tivoli[®] Space Manager), JFS, NTFS, or UFS environments; or a Data Links Filesystem Filter (DLFF) DMAPP (Data Manager Application) in DCE-DFS environments.

In DCE-DFS environments, the DMAPP component filters commands to ensure that linked files are not deleted, or renamed, or that the file’s attributes are not changed. The DMAPP component monitors filesets residing in DMLFS aggregates that are Data Links Manager enabled. Once an aggregate has been Data Links Manager enabled, it

can contain filesets that may be brought under Data Links control. The DMAPP can then manage the data within these filesets after the aggregate is exported into the namespace. Data Links Manager enabling an LFS aggregate is part of the Storage Management Toolkit (SMT) provided by Transarc.

DB2 (Logging Manager)

A DB2 database, called DLFM_DB, acts as a logging manager for the Data Links server. This database contains registration information about databases that can connect to a Data Links server. It also contains information about the mount points of the file systems on AIX® or Solaris operating environment, or the sharename of the drives on Windows NT or Windows 2000, that are managed by a DLFF.

Note: It is recommended that you **do not** interact directly with the DLFM_DB database (for example, connecting to it directly, and either querying or *especially* updating any information) except to take backups and perform restore and rollforward operations as necessary for recovery purposes, or to set certain database configuration parameters to ensure adequate space for logging, etc.

The contents of this database are not documented, and this product is not supported if the user has performed undocumented actions against the DLFM_DB, since the contents of this database are considered a product internal.

The DLFM_DB database also contains information about files that have been linked, unlinked, or backed up on a Data Links server or in a DCE cell. The DB2 Data Links Manager installation program creates this database during the installation.

DB2 can provide point-in-time rollforward recovery on the Data Links server for any linked file that is specified by a DATALINK column with *RECOVERY YES*. You can backup these files on disk, using Tivoli Storage Manager, or using an XBSA-conformant backup and archive utility.

The database backup makes sure that all the files on the file server that are linked to this database using a DATALINK column are also backed up. File backup is asynchronous.

To minimize tuning for log file capacity issues in the future, it is recommended that you ensure that there is sufficient disk space available for the following database configuration variables for DLFM_DB: LOGFILSIZ, LOGPRIMARY, and LOGSECOND.

Related concepts:

- “DB2 Data Links environment” on page 3
- “DB2 Data Links Manager typical setups” on page 13
- “DB2 clients in the Data Links Manager environment” on page 6
- “DB2 servers in the Data Links Manager environment” on page 6

Related reference:

- “Configuration Parameters for Database Logging” in the *Data Recovery and High Availability Guide and Reference*

DB2 clients in the Data Links Manager environment

A DB2[®] client will connect as usual to a remote DB2 server and access the database.

The remote client can NFS mount a file system on AIX[®] or Solaris operating environment, or share a drive on Windows, under the control of a Data Links Filesystem Filter that is installed on a Data Links server. This way, the client can access the files on the Data Links server directly.

In DCE-DFS environments on AIX systems, the client uses the DFS[™] client. A DB2 Data Links DFS Client Enabler, also known as the DLFS cache manager or DLFS-CM, is also required to access linked files in DATALINK columns created with READ PERMISSION DB specified.

Related concepts:

- “DB2 Data Links environment” on page 3
- “DB2 Data Links Manager typical setups” on page 13
- “Data Links server components” on page 4
- “DB2 servers in the Data Links Manager environment” on page 6

DB2 servers in the Data Links Manager environment

The Data Links Manager can be registered on a DB2[®] database running on a DB2 UDB server. For Data Links servers using FSM, NTFS, JFS, and UFS file systems, you can register more than one Data Links Manager with a given DB2 database.

Note: Data Links Manager does not support a partitioned DB2 Enterprise Server Edition database.

The database, with tables that include DATALINK columns referencing files stored in a DFS™ filesystem, must register the DCE cell using the ADD DATALINKS MANAGER command. In DCE-DFS environments, the DB2 server can register only one DCE cell. Also, you must install the DFS client on the DB2 server to allow access to configuration information which is stored in DFS.

The AIX® and Solaris operating environments do not require DLFS to be mounted on the DB2 server, and the Windows® environment does not require DLFS to be net shared on the DB2 server. In each of these environments, the DB2 server communicates with the Data Links File Manager using a reserved TCP/IP port on the file server.

Related concepts:

- “DB2 Data Links environment” on page 3
- “DB2 Data Links Manager typical setups” on page 13
- “Data Links server components” on page 4
- “DB2 clients in the Data Links Manager environment” on page 6

File system paradigm

Current e-business trends, such as e-commerce, supply chain management, and customer relationship management require applications that can integrate structured data from various DBMS and unstructured data that reside on file systems. Examples of such unstructured data are audio, video, and images traditionally stored in an assortment of file formats.

DB2® Data Links Manager allows you to use your existing and emerging file system based applications by leaving them untouched. DB2 Data Links Manager enables these same files to be integrated with database systems to meet the rigorous integrity, security, and transactional demands of e-business.

This advantage allows you the freedom to decide what setup best fits your organization. You do not have to disrupt your business or your customers’ access to critical data in order to move it all over to an RDBMS. Moving this data away from the file system paradigm would also require an extensive rewrite of the application you use to access this data.

With Data Links Manager, you can continue using a file paradigm to store, access, and modify files instead of moving these files into a traditional database repository. Continuing to use a file system as a data storage option can provide many benefits.

Performance

The *store and forward* model of data is unacceptable for performance

reasons. For example, it may be unacceptable for the database manager to materialize a Binary Large Object (BLOB) into a file, and the converse, each time the data needs to be accessed as a file. Also, data may be captured in high volumes, and you may not want to store this data in the database.

Data Links Manager does not add any overhead to the file READ and WRITE operations. Data Links ensures referential integrity of file references from the database by intercepting file operations such as OPEN, DELETE and RENAME that could compromise the integrity of the file reference. File READ and WRITE operations do not compromise referential integrity and are not part of the Data Links' scope of operations. Also, given that the number of file READ and WRITE operations generally outnumber the occurrences of OPEN, DELETE or RENAME on a file, the performance degradation, if any, is marginal.

Network considerations

You may be accessing data directly from a file server that is physically close to a workstation. For example, you can configure the file server 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 from a typical SQL query. Network distance between resources is therefore a significant consideration.

Isochronous delivery

You may be using an application that uses a stream server because it has real-time requirements for delivery and capture. This is known as isochronous delivery. An example of isochronous delivery might be a video server that delivers high-quality (or "jitter-free") video to a client workstation in real time. In these kinds of applications, it is likely that such data will not be moved into or out of the database as a BLOB, but rather stay on the file server for immediate access.

Cost If you are considering using a database as a repository, you should consider first the expense of rewriting applications that currently use standard file I/O semantics. Your applications may use existing tools that work with the file paradigm. Replacing these tools can also be expensive. Using Data Links Manager requires little if any modification of existing file system applications.

The cost of administration of a database is reduced as the large objects are outside the database and the size of the database is more manageable. As the database contains only pointers to files (as DATALINK column values) it takes less time to backup the database. During the backup, DB2 checks with DLFM to ensure that the files

linked to this database are backed up. The DLFM starts asynchronous backup of the files after they are linked to the database.

Related concepts:

- “DB2 Data Links Manager” on page 2
- “DB2 Data Links Manager and your applications” on page 9

DB2 Data Links Manager and your applications

DB2[®] Data Links Manager is a candidate for any application that involves processing information from multiple heterogeneous sources that include databases and file systems, where it is required that this information be consistent between the different sources, secure, accurate, and timely.

In addition to e-commerce, customer relationship management, and supply chain management e-business, Data Links Manager can be used effectively in:

- Medical applications, in which a file server stores X-rays and a database stores their attributes.
- Entertainment industry applications that perform asset management of video clips. A file server stores video clips, but a database stores the clips’ attributes. Access control is required for accessing the video clips based on database privileges for accessing the meta-information.
- World Wide Web applications that manage millions of files, and allow access control that is based on database privileges.
- Financial applications, which require distributed capture of check images and a central location for those images.
- CAD applications, where engineering drawings are kept as files and a database stores their attributes. Queries can be run against the drawing attributes.

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. The ability to store a *reference* to such files and parametric data that describes their contents is the approach these applications use to combine the search capabilities of SQL with direct manipulation of raw data.

The DB2 relational extenders for text, voice, image and so on provide this functionality. The extenders allow you to create special indexes on the data and to search this data. This data can be stored either in DB2 or through DB2 Data Links in a file system.

Data Links Manager can provide all these capabilities even if the data is not in a database, and it can be used in conjunction with the DB2 relational extenders' search features to search on this data as well as perform parametric searches. Additionally, the data and the indexes created by the DB2 extenders can be kept synchronized.

Central administration point:

Data Links Manager simplifies many of the tasks associated with managing external files that are logically integrated with database information. For instance, Data Links Manager ensures that a backup of a database is coordinated with a backup of all the files referenced in that database, such as a point-in-time image which can be captured for the combination of database and file data.

Also, restoring the database from a backup results in Data Links Manager automatically restoring the corresponding content of the files, thereby guaranteeing consistency. Contrast this with other systems where the onus of keeping the database and file systems synchronized is left to the database administrator and can be error prone. That setup has a potential of jeopardizing the integrity of the information and the application.

Related concepts:

- “DB2 Data Links Manager” on page 2
- “File system paradigm” on page 7

DATALINK data type

Data Links technology uses the DATALINK data type, implemented as an SQL data type in DB2[®] Universal Database, which references an object stored external to a database. You can use the DATALINK data type just like any other SQL data type to define columns in tables. The DATALINK type is part of the SQL standard and is applicable across standard-conformant database products.

In File System Migrator (FSM), NT File System (NTFS), Journaled File System (JFS) and UNIX[®] File System (UFS) environments the DATALINK values encode the name of a Data Links Manager server containing the file and the filename in terms of a Uniform Resource Locator (URL).

A URL is a text string of the general format:

```
http://www.ibm.com/datalinks/datalinks.txt
```

DB2 validates the DATALINK value (file reference), just as it does for any SQL data value stored in the database. You register a set of known Data Links

Manager servers. The only Data Links Manager server names that you can specify in a DATALINK value are those that have been registered to a DB2 database. Although Data Links uses a URL syntax to reference a file, it does not mean that the Data Links Manager server also functions automatically as a web server.

In DCE-DFS environments, the Data Links Manager is registered for the entire cell. Linked files are referred to in terms of a URL with scheme, "dfs", and the DFS™ path name of the file.

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 store attributes in tables, such as indexes on files containing video, image, text, or other media formats, along with the DATALINK value. With a central repository of files on a file server and DATALINK data types in a database, you can obtain an inventory of its contents and devise strategies to get at the information you need.

An application designer can use Data Links to maintain a reference to an existing operating system file in a column of a DB2 table. This reference is stored through a the DATALINK data type using a URL syntax. Other columns of this table would generally maintain meta data about the linked files.

Typically, the application programmer would insert rows in this table with meta data about the file, and its file reference (URL syntax) in the DATALINK column. The application would then typically use an SQL query against this table on the meta data columns to locate the files of interest, retrieve the file reference in the DATALINK column, and then use that URL to directly access the file using the native APIs of the file system or through a browser.

For the application to update or delete a linked file, it must first unlink the file from the DB2 UDB table in which it is referenced, but only if you are not using the update-in-place methodology to perform the file update. You can choose a variety of methodologies for updating linked files: the unlink/update/relink, the update in place, or the replacement method.

For the application to update or delete a linked file, it must first unlink, assuming you have used the method to link a file that requires you to unlink it, the file from the DB2 UDB table before the operation is allowed to proceed. Multiple DATALINK columns can be defined for a single DB2 UDB table.

Data Links Manager treats information residing in file systems as though it was logically within the database, so you are not required to make any changes to existing applications. DB2 UDB's object-relational capabilities allow

an application designer to write UDFs that process files that are either stored within BLOBs, stored as a reference in a DATALINK column, or stored as a reference in a UDT which is a Distinct Type mapping to the DATALINK type.

If files are stored within BLOBs and are currently used in existing applications, then the potential exists for synchronization problems between the BLOB and native file information if the BLOB is simultaneously updated by different users *outside* of the database when the BLOB is materialized as an external file, and updated through some application which only operates on files. When objects are updated outside of the database *not* part of a single database unit of work, there is always the potential for one update overlaying another. With some of the serialization techniques built into Data Links (for example, using the update in place feature), this problem is avoided.

Therefore, while both the BLOB and DATALINK types support file processing through the database, they address different application requirements, and are complementary in nature. DB2 UDB is unique in the industry in offering the customer these two choices to best serve the custom demands of their application.

Data Links Manager has been designed to support a distributed computing environment, with capabilities that include the following:

- A DATALINK column in a DB2 UDB table can reference one or more file systems spread over one or more file system servers associated with different operating systems such as AIX[®] and Windows[®] 2000.
- A single Data Links Manager can be associated with DATALINK columns in one or more DB2 UDB databases.
- A DATALINK column can reference files residing in Transarc's distributed file system DCE-DFS.
- Uni-directional and bi-directional replication of linked files is supported in an atomic, automatic, and consistent way in conjunction with DB2 UDB's database replication capabilities through DB2 DataPropagator.

Related concepts:

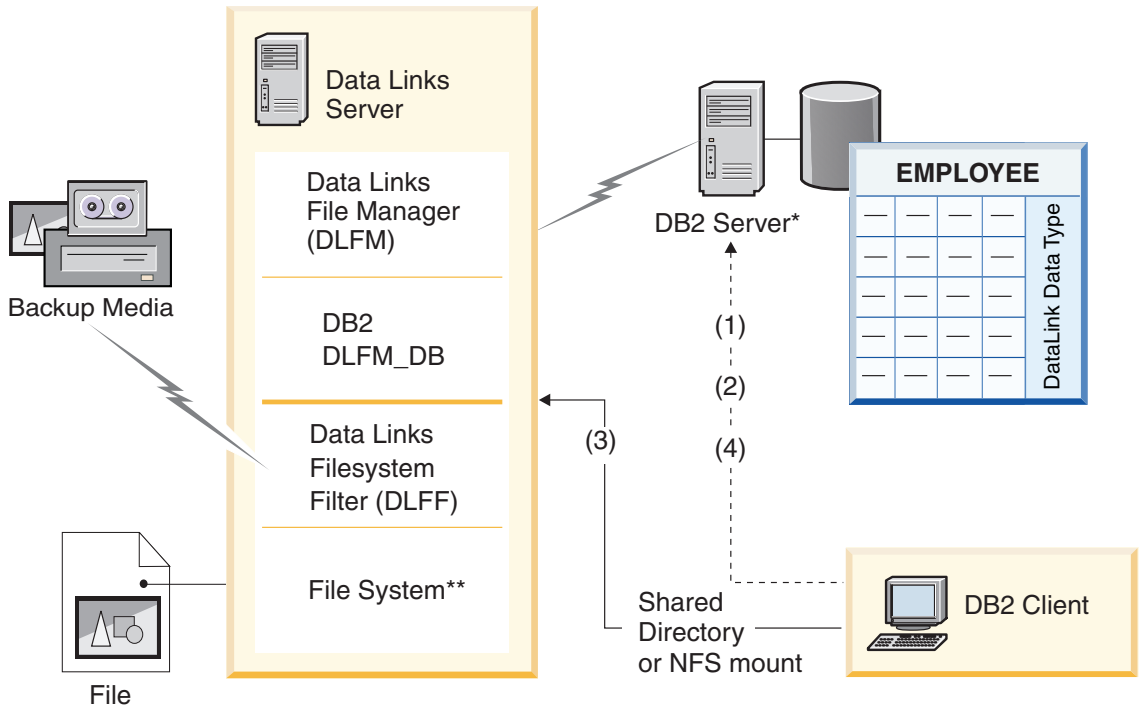
- "DB2 Data Links Manager" on page 2
- "File system paradigm" on page 7
- "DB2 Data Links Manager and your applications" on page 9
- "Updating approaches overview" in the *DB2 Data Links Manager Administration Guide and Reference*

Related reference:

- "Updating approaches summary" in the *DB2 Data Links Manager Administration Guide and Reference*

DB2 Data Links Manager typical setups

Figure 1 shows an overview of the interaction between a DB2[®] server, the DB2 Data Links Manager components, the backup media, and a remote client application in FSM on AIX, NTFS, JFS, and UFS environments.



*Single-partitioned database system

**NTFS on Windows, JFS on AIX or UFS on Solaris

Figure 1. Overview of Data Links Manager Processing (FSM on AIX, NTFS, JFS, or UFS environments)

In this example, a client application connects to a database with a DATALINK data type, selects a DATALINK value from this database, and updates the data file as follows:

1. The client application issues a **CONNECT** statement to connect to a database on a DB2 server.
2. The application then issues a **SELECT** statement that contains a DATALINK column. For example:

```
select dlurlpath(d11) into :var_d11 from EMPLOYEE
```

3. The application then copies the `:var_d11` file to the `new_version` file over a shared drive on Windows[®] or an NFS mount on AIX[®] or Solaris operating environment.
4. Then the application edits the `new_version` file. To save the changes in the database, the application would issue an **UPDATE** statement. For example:

```
update EMPLOYEE set d11=d1value(:new_version)
commit
```

The following diagram shows a Data Links Manager implementation in a DCE-DFS environment on AIX. The numbers in the diagram correspond to the previous steps.

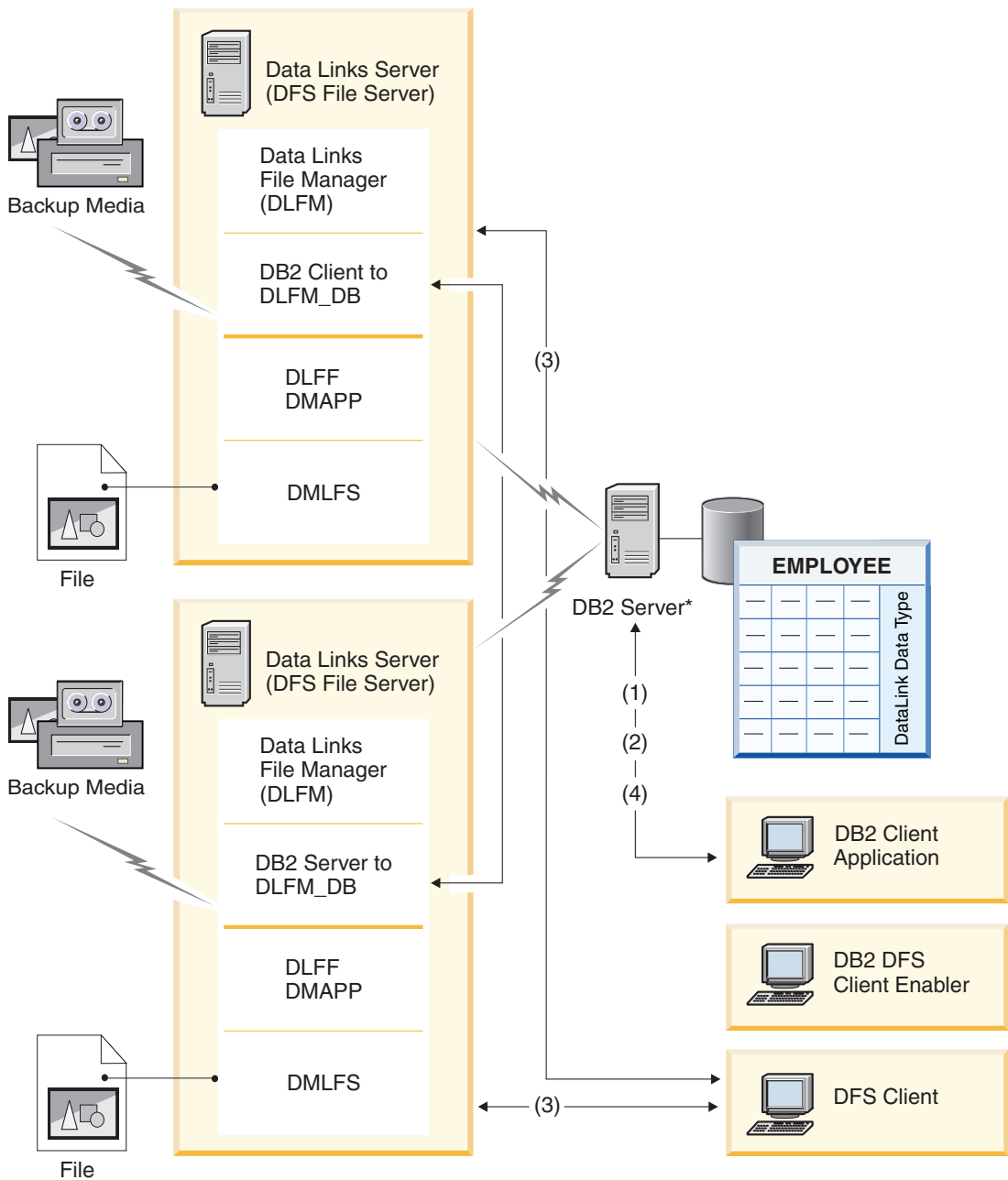


Figure 2. Overview of Data Links Manager Processing (DCE-DFS environments)

Related concepts:

- “DB2 Data Links Manager” on page 2

- “DB2 Data Links environment” on page 3

Chapter 2. Installing Data Links Manager on Windows

Before you install DB2 Data Links Manager (Windows)

Read this information before installing DB2[®] Data Links Manager.

System requirements

- **Windows[®] NT.** You must be running Windows NT[®] Version 4.0 with Service Pack 6 or later.
- **Windows 2000.** You must be running Windows 2000 (5.00.2195) with Service Pack 1 or later, RC 1.1.

To check the level of the operating system, click on **My Computer** and select **Help** → **About Windows** from the menu bar.

NTFS formatted drive

You must have at least one Windows File System (NTFS) formatted drive that will be controlled by a Data Links Filesystem Filter (DLFF). Any drive that a DLFF will control must be an NTFS formatted drive. During the installation, you can select the drives that you want to be controlled by a DLFF. If you do not have a drive that was formatted for NTFS, you will not be able to perform the installation.

A separate NTFS drive is also required if you want to store backups of linked files on a local file system.

To view a list of the NTFS formatted drives on your system:

Windows NT

Click **Start** and select **Programs** → **Administration Tools (Common)** → **Disk Administrator**.

Windows 2000

Click **Start** and select **Settings** → **Control Panel**. Click **Administrative Tools**. Click **Computer Management** and then select **Disk Management**.

You can either convert an existing file system to NTFS, or create one. To convert an existing file system to NTFS, enter the following command:

```
convert x: /fs:ntfs
```

where *x*: represents the drive that you want to convert to NTFS.

Run this command from a command prompt window on a drive other than the one that you are converting to NTFS.

You can create an NTFS partition using the Windows NT Disk Administrator tool or Windows 2000 Disk Management.

Migrating from previous versions

If you have a pre-Version 8.1 Data Links instance on your system, you must migrate the instance to the Version 8.1 format using the **db2imigr** command.

Registry variables offer more function and flexibility than environment variables. However, because of this, it is possible that migration will not be performed exactly as expected. The registry variables should be checked using the **db2set** command after migration.

Data Links server security

In releases prior to DB2 Data Links Version 8.1, there were no security controls on linking a file. If you migrated from a previous release, you will be given the option at DLFM migration time to enable these security controls on your existing DLFM server(s).

Migrating from DB2 Data Links Version 6.1, 7.1, or 7.2 to DB2 Data Links Manager Version 8

To migrate from DB2 Data Links Version 6.1, 7.1, or 7.2 to DB2 Data Links Manager Version 8.1:

1. Prepare your DB2 and DLFM databases for migration. For example, you may wish to backup your existing databases.
2. Install DB2 Version 8 on your DB2 server and Data Links Manager server machines.
3. As the Data Links Manager Administrator, run the **db2dlmmg** command to migrate the existing `dlfm_db` database schema to the new version.

When you migrate to DB2 Data Links Manager Version 8, the following environment variables will be converted to DB2 registry variables:

```
DLFM_INSTALL_PATH
DLFM_PORT
DLFM_LOG_LEVEL
DB2_RR_TO_RS
DLFM_BACKUP_DIR_NAME (1)
DLFM_BACKUP_TARGET (2)
DLFM_BACKUP_TARGET_LIBRARY (3)
```

Notes:

1. This variable is used only if a local file system is the backup target.
2. Used to indicate the type of backup target used. Possible values for this variable are LOCAL, TSM, or XBSA.
3. Used to indicate the XBSA support code library only if the DLFM_BACKUP_TARGET is set to XBSA. The support code library must be fully qualified and must include the shared object name. The name of the shared object is available from the vendor supplying the XBSA compliant shared library.

Enable drive sharing

Each drive that you plan to be controlled by a Data Links Filesystem Filter (DLFF) must be enabled for sharing.

To enable a drive for sharing:

1. Click **Start** and select **Programs** → **Windows Explorer**.
2. Right-click on the drive that you want to share and select **Sharing**. If you are already sharing the drive that you want to be controlled by a DLFF, skip to step 5.
3. Select **Shared As**.
4. Click **New Share**.
5. Enter a share name for this drive in the **Share Name** field and click **OK**.
6. Click **Permissions**.
7. Select the **Everyone** option.
8. Click **Type of Access** and select the **Full Control Option**.
9. Click **OK** to register the new share name.

Memory requirements

There must be at least 64 MB of RAM available to your system. To check the amount of memory available to your system, select **My Computer**, click the right mouse button, and select the **Properties** option.

Synchronize system clocks

The system clocks on the Data Links server and the DB2 server must be, and remain, synchronized for linked files in the DATALINKS columns with the READ PERMISSION DB option. Synchronization of clocks is essential for the Data Links token expiry interval to work correctly. The token expiry interval is a database configuration parameter that controls how long a selected DATALINK value (consisting of a URL with an embedded file authorization token) may be used.

To set the time for a machine's system clock:

1. Click **Start** and select **Settings** → **Control Panel**.
2. Double-click the **Date/Time** icon.
3. Set the local system time using the spin buttons in the **Time** box. Remember to set this time equal to the local system time on the DB2 server.
4. Click the **Time Zone** tab and select the appropriate time zone from the drop down box. Remember to use the same time zone setting on all servers.
5. Click **OK**.

Version levels of DB2 Data Links and DB2 UDB

Version levels of DB2 Data Links and DB2 Universal Database™ can be any combination of Version 6.1, 7.1, 7.2 and 8.1. For example, DB2 can be at Version 6.1 and Data Links Manager can be at Version 8.1.

To check the version of DB2 that resides on a workstation, enter the **db2level** command.

If DB2 is at the higher version, such as Version 8.1, the Data Links Manager features introduced in Version 8.1 will not be available when you connect to a Data Links Manager at Version 6 or 7. You will receive an SQL error if you attempt to use the Version 8 features.

User account rights

To perform the installation of Data Links File Manager, you need to login as a user with following privileges:

1. Defined on the local machine
2. Belongs to the *Local Administrators* group
3. Has the following advanced user rights:
 - Act as part of the operating system
 - Increase quotas
 - Replace a process level token
 - Create a token object
 - Log on as a service

For more information on Windows user rights, refer to the Windows online help.

dldmadmin username

During the installation, you will be asked to provide a user account that will be used as the DB2 Data Links Manager Administrator.

By default, the setup program will set up a user account with the username *dldmadmin* and password *dldmadmin*. You can accept these default values, specify an existing account, or create a different user

account by changing the default values. This user account is also used to run the DLFM as a Windows service.

If you accept the default *dmladmin* user account, you should ensure that you change the **Password** and **Confirm Password** fields. The *dmladmin* user account's password is *dmladmin* for any DB2 Data Links Manager installation and is therefore well-known. Using the default setting for this user account could pose a security risk to your network.

If the *dmladmin* user account already exists on your system, you must use the password that was previously set for this user account.

If you want to specify an existing user account, the account you specify must:

- Be defined on the local machine.
- Belong to the *Local Administrators* group.
- Have the "*Back up files and directories*" and the "*Restore files and directories*" user rights.
- Have the following advanced user rights:
 - Act as part of the operating system.
 - Increase quotas.
 - Replace a process level token.
 - Create a token object.
 - Log on as a service.
- Have a username that is 30 characters or less.

If you want to create a new user account using the setup program, you must ensure that the username you specify is 30 characters or less.

Administrator group privileges

On Windows, the *dmladmin* user account has the same privileges with regard to files linked using Data Links as a root user does on UNIX[®] for most functions.

	Rename	Access file without token	Delete	Update
UNIX (root)	Yes	Yes	Yes	Yes
Windows (dmladmin)	Yes	Yes	No*	No*

Note: * The NTFS does not allow these operations for a read-only file. The *dmladmin* user account can make these operations successful by enabling the write permission for the file.

DLFM user account

In addition to the DB2 Data Links Manager Administrator user account (`dlmadmin`), the DLFM user account is also created during installation for use by the Data Links File Manager. The DLFM user account is the owner of all READ PERMISSION DB files.

The DLFMXGRP group is created for use with the update in place functionality for any file linked to a DATALINK column defined with WRITE PERMISSION ADMIN. You should not add any other users to these groups; the DLFM user should be the only user account in these groups. The DLFM user account should never be used to create a file in a DLFF controlled file system, as this can be misinterpreted as a linked file for a READ PERMISSION DB column reference

TCP/IP port number

Data Links File Manager needs a TCP/IP port to communicate with DB2 servers. By default, the setup program will generate a value for you. You can use this value or provide your own. You will need to know this port number to verify the installation.

To review the TCP/IP ports that are in use on a machine, open the services file. The services file is located in the `x:\winnt\system32\drivers\etc` directory (where `x:` represents the drive where you installed Windows).

Determine hostname

You must determine the names of each of your DB2 servers and Data Links servers. You will need to know these hostnames to verify the installation. When connecting to a Data Links File Manager (DLFM), the DB2 UDB server internally sends the following information to the DLFM:

- Database name
- Instance name
- Hostname

The DLFM then compares this information with its internal tables to determine whether the connection should be allowed. It will allow the connection only if this combination of database name, instance name, and hostname has been registered with it, using the `dlfm add_db` command. The hostname that is used in the `dlfm add_db` command must exactly match the hostname that is internally sent by the DB2 UDB server.

To obtain these hostnames, enter the `hostname` command on your DB2 Data Links and DB2 UDB servers. For example, this command might return `dlmserver` on your Data Links server.

Now enter the **nslookup** *dlmserver* command, where *dlmserver* represents your hostname. This command should return output similar to the following:

```
Server: dnsserv.ibm.com
Address: 9.21.14.135
Name: dlmserver.ibm.com
Address: 9.21.51.178
```

The Name: `dlmserver.ibm.com` entry is your hostname name.

Repeat these steps on each Data Links Manager and DB2 UDB server.

Data Links replication

Data Links Manager Version 8.1 introduces two new registry variables, `DLFM_START_ASCOPYD` and `DLFM_ASCOPYD_PORT`. During installation, you will be prompted to enable the Data Links Manager Replication daemon. If you plan to use Data Links Replication, you should enable the Replication daemon during the installation. You can also enable it after installation by setting the registry variables (`DLFM_START_ASCOPYD` and `DLFM_ASCOPYD_PORT`) and restarting the DLFM.

Related concepts:

- “DB2 Data Links Manager” on page 2
- “Actions performed by the DB2 Setup wizard (Windows)” on page 24
- “Installation overview for DB2 servers (Windows)” in the *Quick Beginnings for DB2 Servers*
- “Introduction to Data Links Manager security” in the *DB2 Data Links Manager Administration Guide and Reference*

Related tasks:

- “Installing DB2 Data Links Manager (Windows)” on page 23
- “Migrating databases” in the *Quick Beginnings for DB2 Servers*
- “Migrating DB2 (Windows)” in the *Quick Beginnings for DB2 Servers*
- “Enabling the Data Links Manager Replication Daemon” in the *Post V8 GA*

Installing DB2 Data Links Manager (Windows)

You can install DB2 Data Links Manager on Windows.

Prerequisites:

Before you install DB2 Data Links Manager, you must

- Read “Before you install DB2 Data Links Manager for Windows”.

- Log on to the system with a user account that belongs to the *Local Administrators* group.
- Shut down any other programs that are currently running.

Procedure:

To install DB2 Data Links Manager:

1. Insert the CD-ROM into the drive. The auto-run feature will automatically start the setup program. If not, run **setup.exe** from the root directory of the CD-ROM.
2. The Launchpad window opens.
3. Click **Install** and respond to the setup program's prompts. Online help is available to guide you through the remaining steps. You can invoke the online help by clicking **Help** or pressing **F1** at any time.
You can click **Cancel** at any time to stop the setup program.

Related concepts:

- “DB2 Data Links Manager” on page 2
- “Before you install DB2 Data Links Manager (Windows)” on page 17
- “Actions performed by the DB2 Setup wizard (Windows)” on page 24

Related tasks:

- “Verifying the DB2 Data Links Manager installation (Windows)” on page 27

Actions performed by the DB2 Setup wizard (Windows)

The setup program performs the following actions:

1. Creates DB2 Data Links Manager program groups and items (or shortcuts).
2. Updates the DB2 registry variables with the following entries (only the most significant variables set during install are listed here):
 - DLFM_START_ASNCOPYD=NO // or YES if you enable the Data Links Manager Replication Daemon
 - DLFM_ASNCOPYD_PORT=*port_number*, where *port_number* represents the port number specified during the install process.
 - DLFM_BACKUP_TARGET=LOCAL // Can also be TSM or XBSA
 - DLFM_PORT=*port_number*, where *port_number* represents the port number reserved for the Data Links File Manager.
 - DLFM_LOG_LEVEL=LOG_ERR
 - DB2_RR_TO_RS=ON
 - DB2_HASH_JOIN=ON

- `DLFM_INSTALL_PATH=x:\sql11b\bin`, where *x*: represents the Data Links Manager installation drive.
- `DB2INSTANCE=DLFM`
- `DLFM_BACKUP_DIR_NAME=x:\dlfmbackup`, where *x*: represents the Data Links Manager backup installation drive.

You can use the **db2set -all** command to view all of the variables.

3. Creates and registered various services.
4. Sets up the Data Links Filesystem Filter driver.
5. Creates a DB2 (or database) instance called DLFM.
6. Creates a user account for the DB2 Data Links Manager Administrator, if specified account does not exist already. If the specified account already exists, then the setup program checks if it has the appropriate privileges.
7. Creates a user account for use by the Data Links File Manager. By default, this user account is created with the username DLFM and you will be prompted for a password. It is recommended that you change this default password after installing DB2 Data Links Manager.
8. Updates the registry with the DLFM user account password that you were prompted for during the installation. However, if you change the password for the default DLFM user account or change the default user account name DLFM, you must update the registry with the new password:

```
dlff set dlfmaccount DLFM
```

Once you perform actions with the DLFM user account or whatever you changed the user account to, you cannot change the username that has to do with this account. You can use this command to periodically change the password for this user account.

9. Creates the special write group, `dlfmxgrp` and updates the registry with this group information. Once any file is linked to this group, you cannot change the group name. You can manually create this new group (and update the registry):


```
dlff set dlfm_write_group newgroup
```
10. Reserves the port number you specified for use by the Data Links File Manager and added an entry to the services file that is similar to the following:


```
db2cDLFM    50100/tcp
```
11. Creates a DB2 database, called `DLFM_DB`. This database is used by the Data Links File Manager, which keeps track of all the files linked from the host DB2 database(s). This database was automatically backed up after it was created.

12. By default, sets link security controls to ENABLED. Use the **dlfm set link security off** command to disable this feature and the **dlfm set link security on** command to re-enable it.

Related tasks:

- “Installing DB2 Data Links Manager (Windows)” on page 23

Verifying the DLFM_DB was successfully created and catalogued (Windows)

Once the setup program has finished installing DB2 Data Links Manager, you must restart your system. After restarting, you should ensure that it successfully created and catalogued the DLFM_DB database.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator

Procedure:

To verify that the DLFM_DB database was successfully created and catalogued:

1. Retrieve the entry for the DLFM_DB database in the System Database Directory by entering the following command:

```
db2 list database directory
```

This command should return output similar to the following:

```
System Database Directory
```

```
Number of entries in the directory = 1
```

```
Database 1 entry:
```

```
Database alias           = DLFM_DB
Database name            = DLFM_DB
Local database directory = C:\DLFM
Database release level   = 9.00
Comment                  =
Directory entry type     = Indirect
Catalog node number      = 0
```

Related concepts:

- “Before you install DB2 Data Links Manager (Windows)” on page 17

Related tasks:

- “Verifying the DB2 Data Links Manager installation (Windows)” on page 27
- “Installing DB2 Data Links Manager (Windows)” on page 23

Verifying the DB2 Data Links Manager installation (Windows)

You will configure a DB2 Data Links Manager environment to control files that are linked to DATALINK columns in a table of a database on a DB2 Universal Database server.

Procedure:

To verify the installation of Data Links Manager on Windows:

1. Create a test environment on the DB2 server.
2. Create a test environment on the DB2 Data Links server.
3. Register the Data Links Server with the DB2 database.
4. Verify the sample file is controlled by DLFF.
5. Verify the sample file is accessible.
6. View the sample file.

Related tasks:

- “Creating a test environment on the DB2 server (Windows)” on page 27
- “Creating a test environment on the DB2 Data Links server (Windows)” on page 29
- “Registering the Data Links server with the DB2 database (Windows)” on page 35
- “Verifying the sample file is controlled by DLFF (Windows)” on page 36
- “Verifying the sample file is accessible (Windows)” on page 37
- “Viewing the sample file (Windows)” on page 39
- “Installing DB2 Data Links Manager (Windows)” on page 23

Installation verification tasks

Creating a test environment on the DB2 server (Windows)

Creating a test environment on the DB2 server is part of the larger task of *Verifying the DB2 Data Links Manager installation*.

Prerequisites:

- A valid DB2 user account that has System Administrative (SYSADM) authority on the VALIDATE instance that you will create. By default, any user account that belongs to the *Local Administrators* group has SYSADM authority on an instance.

Procedure:

To create a test environment on the DB2 UDB server:

1. Log on to the system with a user account that belongs to the *Local Administrators* group.
2. Create an instance on the DB2 server using the **db2icrt** command. This instance will contain a database, which you will create, where tables containing columns of the DATALINK data type will reside.

In our example, we will create an instance called VALIDATE by entering the following command:

```
db2icrt validate
```

3. Ensure that the VALIDATE instance is the current instance by entering the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

4. Set the DATALINKS database manager configuration parameter to *YES* in the VALIDATE instance's configuration file by entering the following command:

```
db2 update dbm cfg using datalinks yes
```

In the event that you want to disable the DB2 Data Links Manager functionality on your DB2 server, you set the DATALINKS database manager configuration parameter to *no*.

5. Start the VALIDATE instance by entering the **db2start** command.

Note: If you change a setting in an instance's database manager configuration file, you must ensure that you stop and restart the instance (using the **db2stop** and **db2start** commands) for the changes to take effect. In our example, we did not start the VALIDATE instance, so we only issued the **db2start** command.

6. Create a database using the **db2 create database** command. This database will contain a table using the DATALINK data type.

For the example, create a database called STAFF by entering the following command:

```
db2 create database staff
```

7. Connect to the STAFF database by entering the following command:

```
db2 connect to staff
```

8. Create a table called EMPLOYEE, in the STAFF database that you just created, that has a column defined with a DATALINK data type by entering the following command:

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

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

```
db2 connect reset
```

10. Log out.

Now you can create a test environment on the DB2 Data Links server.

Related tasks:

- “Creating a test environment on the DB2 Data Links server (Windows)” on page 29

Related reference:

- “CREATE DATABASE” in the *Command Reference*
- “db2icrt - Create Instance” in the *Command Reference*

Creating a test environment on the DB2 Data Links server (Windows)

Creating a test environment on the DB2 Data Links server is part of the larger task of Verifying the DB2 Data Links Manager installation. After creating a test environment on the DB2 server, you must create a test environment on the DB2 Data Links server.

Procedure:

To create a test environment on the Data Links server:

1. Register the drive with the Data Links File Filter
2. Register the DB2 database with the Data Links File Manager.
3. Authorize a DB2 user account to link a file.
4. Create a sample file for Data Links File Manager.

Related tasks:

- “Registering the drive with the Data Links Filesystem Filter (Windows)” on page 30
- “Registering the DB2 database with the Data Links File Manager (Windows)” on page 31
- “Authorizing a DB2 user account to link a file (Windows)” on page 32
- “Creating a sample file for DB2 Data Links Manager (Windows)” on page 33
- “Creating a test environment on the DB2 server (Windows)” on page 27

Registering the drive with the Data Links Filesystem Filter (Windows)

Registering the drive with the Data Links Filesystem Filter is part of the larger task of Creating a test environment on the DB2 Data Links server.

A Data Links Filesystem Filter (DLFF) is created by the setup program on the NTFS formatted drives that you selected during the installation.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To register a drive with the DLFF:

1. Ensure that the Data Links File Manager started successfully as follows:
 - a. Click **Start** and select **Settings** —> **Control Panel**.
 - b. On Windows NT, click **Services**. On Windows 2000, click **Administrative Tools** and then click **Services**. The Services window opens.
 - c. Ensure that the status for the **DB2 Data Links File Manager** service is set to **Started**.
 - d. Open the Windows Task Manager and verify that the following dlff processes are running:

```
dlff_ar_ag.exe
dlff_ar_ag.exe
dlff_archived.exe
dlff_cmgrd.exe
dlff_delgrpd.exe
dlff_gcd.exe
dlff_mon_wd.exe
dlff_upcalld.exe
dlff_wd.exe
```

2. Ensure that the drive you reserved for the Data Links server is under the control of a DLFF by entering the **dlff list** command. This command will list all the drives that are under the control of a DLFF.

For our example, this command should return the following output:

```
LogicalDrives = D:
```

If there are no drives listed by the **dlff list** command, the DLFF will take over the control of the drive by entering the following command:

```
dlff add drivename
```

3. Register the share name of a drive that is under the control of a DLFF by entering the following command:

```
dlff add d:
dlff add_prefix \sharename
```


where *sharename* represents the shared name of the drive that is under the control of a DLFF, and *d:* represents the drive that is under the control of the DLFF.

For example, register the Data Links server to use the DLFF on the *d*drive (which is the share name of the *d:* drive) by entering the following command:

```
dlfm add_prefix \ddrive
```

4. Log out.

Now you can register the DB2 database with the Data Links File Manager.

Related tasks:

- “Verifying the DB2 Data Links Manager installation (Windows)” on page 27
- “Registering the Data Links server with the DB2 database (Windows)” on page 35
- “Registering the DB2 database with the Data Links File Manager (Windows)” on page 31
- “Creating a sample file for DB2 Data Links Manager (Windows)” on page 33

Related reference:

- “dlfm add_prefix command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlff add command (Windows operating system)” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlff list command (Windows operating system)” in the *DB2 Data Links Manager Administration Guide and Reference*

Registering the DB2 database with the Data Links File Manager (Windows)

Registering the DB2 database with the Data Links File Manager is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To register a new database with the Data Links File Manager:

1. Register the remote DB2 UDB database where the DATALINK type column was defined by entering the following command:

```
dlfm add_db database instance hostname
```

where:

- *database* represents the database alias name of the remote database.
- *instance* represents the instance where *database* resides.
- *hostname* represents the hostname of the DB2 UDB server where *database* resides.

The following command will register a database called STAFF, which resides in the VALIDATE instance on a DB2 UDB server with a hostname of db2server.services.com:

```
dlfm add_db staff validate db2server.services.com
```

Do not register the DLFM_DB when you run this command. The DLFM_DB is a local database that is used to keep track of files that are under the control of the Data Links File Manager.

To list the registered database:

```
dlfm list registered databases
```

2. Log out.

Now you can authorize a DB2 user account to link a file .

Related concepts:

- “Before you install DB2 Data Links Manager (Windows)” on page 17

Related tasks:

- “Verifying the DB2 Data Links Manager installation (Windows)” on page 27
- “Creating a sample file for DB2 Data Links Manager (Windows)” on page 33
- “Authorizing a DB2 user account to link a file (Windows)” on page 32

Related reference:

- “dlfm add_db command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm list registered databases command” in the *DB2 Data Links Manager Administration Guide and Reference*

Authorizing a DB2 user account to link a file (Windows)

Authorizing a DB2 user account to link a file is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To authorize a DB2 user account to link a file in the example `\ddrive\pictures` directory:

1. Run

```
dlfm grant link privilege on dir \ddrive\pictures to
user db2-username for db staff inst validate
node db2server.services.com
```

where `db2-username` must be the user account with which you log on when you perform the link operation (for example, using the SQL INSERT statement) on DB2.

2. To verify that your **dlfm grant** command was correctly specified:

```
dlfm list registered users for directory \ddrive\pictures on
db staff inst validate node db2server.services.com
```

This command should return the `db2-username` that was specified above.

3. Log out.

By default, link security controls are ENABLED during installation. Use the **dlfm set link security off** command to disable this feature and the **dlfm set link security on** command to re-enable it.

Your next step is to create a sample file.

Related tasks:

- “Registering the DB2 database with the Data Links File Manager (Windows)” on page 31
- “Creating a sample file for DB2 Data Links Manager (Windows)” on page 33

Related reference:

- “dlfm grant command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm set link security command” in the *DB2 Data Links Manager Administration Guide and Reference*

Creating a sample file for DB2 Data Links Manager (Windows)

Creating a sample file for DB2 Data Links Manager is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system with any user account who is neither a DB2 Data Links Manager Administrator nor the DLFM user account created during

installation for use by the Data Links File Manager. The DLFM user account is different from the DB2 Data Links Manager Administrator user account.

Procedure:

To create a sample file:

1. Create a directory on the drive that is under the control of a Data Links Filesystem Filter, to store files to be controlled by a DB2 server, by entering the following command:

```
md x:\directory_name
```

where

- *x:* represents the shared drive that is under the control of a DLFF.
- *directory_name* represents the name of the directory that you want to create.

The DLFM user account should never be the owner of any files or directories in a shared drive under the control of a DLFF. Linking READ PERMISSION DB files involves changing the ownership of such files to the DLFM user account. As such, the DLFM user account should not be used to manually create files in a shared drive under the control of a DLFF. In our example, we will create a directory called pictures on the d: drive by entering the following commands:

```
d:  
cd \  
md pictures
```

The directory you create must have the **Access Type** set to Full Control. This is the default for any new directory that you create on Windows.

If the directory that you have created does not grant all members of the EVERYONE group Full Control, enter the following command:

```
cacls d:\pictures /p everyone:f
```

2. Create a sample file called psmith.bmp in the d:\pictures directory, to be managed by the Data Links File Manager, by entering the following command:

```
echo "This is a picture of Paul Smith" > d:\pictures\psmith.bmp
```

3. Log out.

The sample file psmith.bmp is a text file, not a bitmap as the .bmp extension implies. For the purpose of verifying your installation, this file represents an employee's picture that will be inserted into a table that was defined with the DATALINKS data type.

Now you can register the Data Links server with the DB2 database.

Related tasks:

- “Verifying the sample file is accessible (Windows)” on page 37
- “Registering the DB2 database with the Data Links File Manager (Windows)” on page 31
- “Registering the drive with the Data Links Filesystem Filter (Windows)” on page 30

Registering the Data Links server with the DB2 database (Windows)

Registering the Data Links server with the DB2 database is part of the larger task of Verifying the DB2 Data Links Manager installation.

Prerequisites:

Log on to the DB2 server with a valid DB2 user account that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user account that belongs to the *Local Administrators* group has SYSADM authority on an instance.

Procedure:

To register the Data Links server with the remote DB2 UDB database where the DATALINK type column was defined earlier:

1. Enter the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

2. Start the VALIDATE instance by entering the **db2start** command.
3. Register a Data Links server that will control the files that are linked by a DATALINK type column:

```
db2 "add datalinks manager for database database_alias
using node hostname port port_number"
```

where:

- *database_alias* represents the database alias name of the database
- *hostname* represents the fully qualified hostname of the Data Links server

- *port_number* represents the port number that you have reserved for communications between the Data Links server and the DB2 server. You specified this port number during the installation of DB2 Data Links Manager.

You should have already registered the database on the DLFM side as well as having started up the DLFM service. Otherwise, this command will fail.

For our example, enter the following command:

```
db2 "add datalinks manager for database staff using node dlmsvr.services.com port 50100"
```

4. Connect to the STAFF database by entering the following command:

```
db2 connect to staff
```

5. Insert an entry into the EMPLOYEE table that you created by entering the following command:

```
db2 "insert into employee values (001,'Paul','Smith',  
dvalue('unc:\\unc_name\controlled_file'))"
```

where:

- *unc_name* represents the fully qualified location of the file that is under the control of a Data Links Filesystem Filter on the Data Links server.
- *controlled_file* represents the filename of the file that you want to control on the Data Links server.

For our example, enter the following command

```
db2 "insert into employee values (001,'Paul','Smith',==>  
dvalue('unc:\\dlmsvr.services.com\drive\pictures\psmith.bmp'))"
```

6. Log out.

Now you can verify the sample file is controlled by the DLFF.

Related tasks:

- “Verifying the sample file is controlled by DLFF (Windows)” on page 36
- “Registering the drive with the Data Links Filesystem Filter (Windows)” on page 30

Verifying the sample file is controlled by DLFF (Windows)

Verifying the sample file is controlled by DLFF is part of the larger task of *Verifying the DB2 Data Links Manager installation*.

Prerequisites:

Log on to the system using any user account other than the DB2 Data Links Manager Administrator or the Data Links File Manager (DLFM) user account.

Procedure:

To verify that the `psmith.bmp` sample file we created earlier is under the control of the Data Links Filesystem Filter (DLFF):

1. Enter the following command:

```
type \\unc_name\controlled_file
```

where:

- *unc_name* represents the fully qualified location of the file that is under the control of a DLFF on the Data Links Manager server.
- *controlled_file* represents the filename of the file that that is under the control of a DLFF on the Data Links Manager server.

For our example, enter the following command:

```
type \\dlmserver\ddrive\pictures\psmith.bmp
```

If the file is being controlled by the DLFM, you will see output similar to the following:

```
\\dlmserver\ddrive\pictures\psmith.bmp  
Access is denied.
```

2. Log out.

Now you can verify the sample file is accessible.

Related tasks:

- “Registering the Data Links server with the DB2 database (Windows)” on page 35
- “Verifying the sample file is accessible (Windows)” on page 37

Verifying the sample file is accessible (Windows)

Verifying the sample file is accessible is part of the larger task of *Verifying the DB2 Data Links Manager installation on Windows*. You will now verify that the `psmith.bmp` sample file can be accessed while it is under the control of the Data Links File Manager.

Prerequisites:

Log on to the system with a valid DB2 user account that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user account that belongs to the *Local Administrators* group has SYSADM authority on an instance.

Procedure:

To verify the sample file is accessible:

1. Ensure that the VALIDATE instance is the current instance by entering the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

2. Start the VALIDATE instance by entering the **db2start** command.
3. Connect to the STAFF database by entering the following command:
4. Select the controlled file by issuing an SQL **SELECT** statement.

For our example, enter the following command:

```
db2 "select dlurlpath(picture) from employee where lname = 'Smith'"
```

This command will return the full pathname with an access token of the form:

```
unc_name\access_token;controlled_filename
```

where:

- *unc_name* represents the fully qualified location of the file that is under the control of a Data Links Filesystem Filter on the Data Links server.
- *access_token* represents a message authentication code (MAC) and is required in order to read the file. The access token is generated by the database manager and is valid for a limited amount of time determined by the *dl_expint* database configuration parameter.
- *controlled_filename* represents the name of the file that is under the control of a Data Links Filesystem Filter.

For our example, the access token that you receive will be similar to the following:

```
\ddrive\pictures\HVJ5NXGC0WQ.I5KKB6;psmith.bmp
```

A valid access token is required to read this file on the Data Links server.

Note: By default, this access token is only valid for 60 seconds. This means that once you enter this command, you have only 60 seconds to complete the remaining steps in this section. You can increase the access token expiry time by updating the *dl_expint* database configuration parameter.

To change the default expiration time for an access token to 10 minutes (the value is entered in seconds), enter the following commands:

```
db2 update db cfg for staff using dl_expint 600
db2 terminate
db2 connect to staff
```

If you change a setting for any database configuration parameter, you must always reconnect to the database for the changes to take effect.

5. Log out.

Now you can view the sample file.

Related tasks:

- “Verifying the sample file is controlled by DLFF (Windows)” on page 36
- “Viewing the sample file (Windows)” on page 39

Related reference:

- “Configuration parameters summary” in the *Administration Guide: Performance*

Viewing the sample file (Windows)

Viewing the sample file is part of the larger task of *Verifying the DB2 Data Links Manager installation on Windows*.

Prerequisites:

Log on to the system using any user account other than the DB2 Data Links Manager Administrator or the DLFM user account.

Procedure:

To view the sample file:

1. Verify that you can access the file that is under the control of the Data Links File Manager.

For our example, enter the following command:

```
type "\\dlmserver\ddrive\pictures\access_token;psmith.bmp"
```

where *access_token* represents the encrypted key.

You should receive the following output from this command:

```
"This is a picture of Paul Smith."
```

If you did not receive an error, you have access to this file and you have installed and configured DB2 Data Links Manager correctly.

Related tasks:

- “Verifying the sample file is accessible (Windows)” on page 37

Chapter 3. Installing Data Links Manager on AIX

Before you install DB2 Data Links Manager (AIX)

Read this information before installing DB2[®] Data Links Manager. The information is common to installations in both JFS and DCE-DFS environments, including the Tivoli[®] Space Manager FSM extension to JFS. Specific JFS and DCE-DFS information have their own topics.

Installing DB2 Data Links using the DB2 Setup wizard or SMIT

It is strongly recommended that you use the DB2 Setup wizard if you are installing DB2 Data Links Manager in JFS or DCE-DFS environments. The DB2 Setup wizard performs almost all Data Links Manager setup and configuration tasks for you. If you want to install DB2 Data Links Manager using SMIT or `db2_install`, you will have to set up and configure your Data Links Manager system manually.

AIX[®] 5L Version 5.1 support

The Data Links Manager (DLFM) and Data Links Filesystem Filter (DLFF) components are now fully supported on AIX 5L[™] Version 5.1. All tools and instructions associated with Data Links Manager and previously supported on prior releases of AIX are fully supported and applicable on AIX 5L Version 5.1.

Disk space requirements

Ensure that there is at least 85 MB of free disk space in the `/usr/opt` directory. To check available free disk space, enter the `df -k /usr/opt` command.

Memory requirements

Ensure that there is at least 256 MB of memory available to your system. To check available memory, enter the `lsattr -l sys0 -E -a realmem` command.

Migrating from previous versions

Different levels of DB2 Data Links Manager instances cannot exist on the same machine. If you have a pre-Version 8.1 Data Links instance on your system, you must migrate the instance to the Version 8.1 format using the `db2imigr` command.

Registry variables offer more function and flexibility than environment variables. However, because of this, it is possible that migration will not be performed exactly as expected. The registry variables can be checked using the `db2set` command after migration.

Data Links server security

In releases prior to DB2 Data Links Version 8.1, there were no security controls on linking a file. If you migrated from a previous release, you will be given the option at DLFM migration time to enable these security controls on their existing DLFM Server(s).

Migrating from DB2 Data Links Version 6.1, 7.1, or 7.2 to DB2 Data Links Manager Version 8

If you are migrating from DB2 Data Links Manager Version 6.1, 7.1, or 7.2 to DB2 Data Links Manager Version 8.1, you should perform the following steps:

1. Prepare your DB2 and DLFM databases for migration. For example, you may wish to backup your existing databases.
2. Install DB2 Version 8 on your DB2 server and Data Links Manager server machines.
3. As DLFM, run the `/usr/opt/db2_08_01/adm/db2dlmmg` command.

When you migrate to DB2 Data Links Manager Version 8, the following environment variables will be converted to DB2 registry variables:

```
DLFM_INSTALL_PATH
DLFM_PORT
DLFM_LOG_LEVEL
DB2_RR_TO_RS
DLFM_BACKUP_DIR_NAME (1)
DLFM_BACKUP_TARGET (2)
DLFM_BACKUP_TARGET_LIBRARY (3)
```

Notes:

1. This variable is used only if a local file system is the backup target.
2. Used to indicate the type of backup target used. Possible values for this variable are LOCAL, TSM, or XBSA.
3. Used to indicate the XBSA support code library only if the DLFM_BACKUP_TARGET is set to XBSA. The support code library must be fully qualified and must include the shared object name, for example `/usr/lpp/Legato/libxdb2.a(bsashr10.o)`. The name of the shared object, in this case `bsashr10.o`, is available from the vendor supplying the XBSA compliant shared library.

TCP/IP port number

You must have a TCP/IP port available for use by the Data Links File Manager. By default, the DB2 Setup wizard will generate a value for you. You can use this value or provide your own. You will need to know this port number to verify the installation.

If you want to specify your own port number, review the TCP/IP ports that are already in use on a machine by opening the `/etc/services` file. You will need to specify this port during the installation.

Once you have selected a TCP/IP port number for use by the DLFM, the value should not be changed.

Synchronize system clocks

Ensure that the system clocks on the Data Links server and the remote DB2 server are synchronized and remain synchronized for linked files in the DATALINKS columns with the READ PERMISSION DB option. Synchronization of clocks is essential for the Data Links token expiry interval to work correctly. The token expiry interval is a database configuration parameter that controls how long a selected DATALINK value (consisting of a URL with an embedded file authorization token) may be used.

To check the system time and date, enter the `date -u` command.

For more information on synchronizing system clocks, refer to your *AIX Administration Guide*.

Data Links Manager Administrator user ID

During installation, you are given the option to create the owner of the DB2 Data Links instance in the **Set user information for the Data Links installation** panel. These installation instructions assume that you selected this option and now want to replace it with an existing user ID.

If you want to specify your own existing user ID, the account you specify:

- Must *not* have its home directory reside on a file system that is using a Data Links Filesystem Filter.
- Must have a username that is eight characters or less.
- Must *not* be a user ID with root authority.

To create a user ID for use as the DB2 Data Links Manager Administrator:

1. Log in as a user ID with root authority.
2. Create the group for the DB2 Data Links Administrator (for example, `dlfmgrp`):

```
mkgroup dlfmgrp
```

3. Create the write group (for example, `dlfmxgrp`):

```
mkgroup dlfmxgrp
```

When a file is linked to a DATALINK column defined with WRITE PERMISSION ADMIN, the file will be changed to be owned by this group.

The DLFMXGRP group is created for use with the update in place functionality for any file linked to a DATALINK column defined with WRITE PERMISSION ADMIN. The DLFMGRP group is also created. You should not add any user IDs to these groups; DLFM should be the only user ID to create a file that's owned by the DLFM.

4. Create the username for the DB2 Data Links Administrator (for example, `dlfm`), using the `/home/dl_fm` directory as the home directory of the Data Links Administrator:

```
mkuser pgrp='dlfmgrp' groups='dlfmgrp dlfmxgrp' home='/home/dl_fm' dlfm
```

5. Assign a password to this username by entering the `passwd user` command, where `user` is the username that you created.

The DB2 Data Links Manager Administrator user ID is not only for the purpose of administrating the Data Links File Manager, but also to own the `DLFM_DB` and files that are in a linked state. The DB2 Data Links Manager Administrator user ID should never own directories on a file system that is under the control of a Data Links Filesystem Filter (DLFF). The DB2 Data Links Manager Administrator user ID should only be used to administer the Data Links File Manager (DLFM). You can have the DB2 Data Links Manager Administrator user ID as the owner of files, but only READ PERMISSION DB linked files. You should not manually create files with the DB2 Data Links Manager Administrator user ID as the owner.

If you create a different username by changing the default values, you must ensure that the username you specify is eight characters or less.

Determine hostname

You must determine the names of each of your DB2 and Data Links servers. You will need to know these hostnames to verify the installation. When connecting to a Data Links File Manager (DLFM), the DB2 UDB server internally sends the following information to the DLFM:

- Database name
- Instance name
- Hostname

The DLFM then compares this information with its internal tables to determine whether the connection should be allowed. It will allow the connection only if this combination of database name, instance name, and hostname has been registered with it, using the `dlfm add_db`

command. The hostname that is used in the `dlfm add_db` command must exactly match the hostname that is internally sent by the DB2 UDB server.

Use the exact hostname that is obtained as follows:

1. Enter the **hostname** command on your DB2 server. For example, this command might return `db2server`.
2. Enter the **host** `db2server` command, where `db2server` represents the name obtained in the previous step. This command should return output similar to the following:

```
db2server.services.com is 9.11.302.341, Aliases: db2server
```

Use `db2server.services.com` for the hostname when registering a DB2 UDB database using the `dlfm add_db` command. The DB2 server's internal connections to the DLFM will fail if any other aliases are used in the `dlfm add_db` command.

A Data Links server is registered to a DB2 database using the DB2 **add datalinks manager for database** `database_alias` **using node** `hostname port port_number` command.

The hostname is the name of the Data Links server. Any valid alias of the Data Links server can be used in this command. DATALINK values that are references to this Data Links server must specify the hostname in the URL value; that is, the exact name that was used in the **add datalinks manager** command must be used when assigning URL values to DATALINK columns. Using a different alias will cause the SQL statement to fail.

Tivoli Space Manager integration with Data Links

DB2 Data Links Manager allows you to take advantage of the functionality of Tivoli Space Manager. The Tivoli Space Manager Hierarchical Storage Manager (HSM) client program automatically migrates eligible files to secondary storage to maintain specific levels of free space on local file systems. It automatically recalls migrated files when they are accessed, and it permits user IDs to migrate and recall specific files.

The prerequisite for this functionality is Tivoli Space Manager Version 4.2.

This feature benefits customers who have file systems with large files that are required to be moved to secondary storage periodically, and in which the space of the file system needs to be managed on a regular basis. For many customers, Tivoli Space Manager provides the means to manage their secondary storage. DB2 Data Links Manager's support of Tivoli Space Manager provides flexibility in managing the

space for DATALINK files. Rather than pre-allocating enough storage in the DB2 Data Links Manager file system for all files that may be stored there, Tivoli Space Manager allows allocations of the Data Links-managed file system to be adjusted over a period of time without the risk of inadvertently filling up the file system during normal use.

Data Links replication

Data Links Manager Version 8.1 introduces two new registry variables, `DLFM_START_ASNCOPYD` and `DLFM_ASNCOPYD_PORT`. During installation, you will be prompted to enable the Data Links Manager Replication daemon. If you plan to use Data Links Replication, you should enable the Replication daemon during the installation. You can also enable it after installation by setting the registry variables (`DLFM_START_ASNCOPYD` and `DLFM_ASNCOPYD_PORT`) and restarting the DLFM.

Depending on the file system (JFS or DCE-DFS) you plan to use with your DB2 Data Links Manager solution, there are additional installation considerations you should take into account before you begin installing DB2 Data Links Manager on your AIX system.

Related concepts:

- “Actions performed by the DB2 Setup wizard (AIX)” on page 53
- “Installation considerations in DCE-DFS environments (AIX)” on page 47
- “Installation considerations in JFS environments (AIX)” on page 47
- “Installation overview for DB2 servers (Windows)” in the *Quick Beginnings for DB2 Servers*
- “Introduction to Data Links Manager security” in the *DB2 Data Links Manager Administration Guide and Reference*

Related tasks:

- “Verifying the installation of DB2 Data Links Manager (AIX)” on page 63
- “Installing DB2 Data Links manually using the `db2_install` command (AIX)” on page 51
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52
- “Migrating databases” in the *Quick Beginnings for DB2 Servers*
- “Migrating DB2 (UNIX)” in the *Quick Beginnings for DB2 Servers*
- “Enabling the Data Links Manager Replication Daemon” in the *Post V8 GA*

Installation considerations in JFS environments (AIX)

If you plan to deploy DB2® Data Links Manager in a Journaled File System (JFS) environment, you should also take the following information into consideration:

Operating system level

Ensure that you are running AIX® Version 4.3.3 or later. To check the level of the operating system, enter the **oslevel** command.

Version levels of DB2 Data Links and DB2 Universal Database™

DB2 Universal Database and DB2 Data Links Manager can be any combination of Version 6.1, 7.1, 7.2, and 8.1. For example, DB2 can be at Version 6.1 and Data Links Manager can be at Version 8.1. To check the version of DB2 that resides on a workstation, enter the **db2level** command.

If DB2 is at the higher version, such as Version 8.1, the Data Links Manager features introduced in Version 8.1 will not be available when you connect to a Data Links Manager at Version 6 or 7. You will receive an SQL error if you attempt to use the Version 8 features.

Disk space requirements for DB2 Data Links Manager Administrator

Ensure that there is at least 70 MB of free disk space in the home directory where the DB2 Data Links Manager Administrator's home directory will reside. To check available free disk space, enter the **df -k INSTHOME** command, where *INSTHOME* represents the home directory of the DB2 Data Links Manager Administrator user ID.

Related concepts:

- “Before you install DB2 Data Links Manager (AIX)” on page 41

Related tasks:

- “Installing DB2 Data Links manually using the `db2_install` command (AIX)” on page 51
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52

Installation considerations in DCE-DFS environments (AIX)

DB2® Data Links Manager supports linked files stored using Transarc's DCE Distributed File System (DCE-DFS) file server Version 3.1.

If you plan to deploy DB2 Data Links Manager in a DCE-DFS environment, you should also take the following information into consideration:

Installation prerequisites

DCE-DFS Version 3.1 must be installed on your system before you install DB2 Data Links Manager. DCE-DFS Version 3.1 requires AIX® 4.3.3 or later. Also, ensure that the DFS™ Storage Management Runtime (dfs.sm.rte) is installed.

A DFS Client Version 3.1 must be installed on any DB2 server which also uses ADD DATALINKS MANAGER to register a DCE-DFS cell. Use of the DCE slim client is not supported on the DB2 server. The DFS Client must be running before you install the Data Links Manager.

You must also install either an e-fix for DFS 3.1, or PTF set 1 when it becomes available. The e-fix is available from:
<http://www.transarc.com/Support/dfs/>

DCE identity

Request that your cell administrator create a new DCE identity which will be used by the Data Links Manager Administrator. Do not use an existing identity. This identity, which involves creating a new DCE group and new DCE user ID, will also own any READ PERMISSION DB files on the DFS nodes. This group ID and user ID should not be used for any other purpose. Also, you should ask your cell administrator to create `/:/DataLinks`.

Operating system level

Ensure that you are running AIX Version 4.3.3 or later. To check the level of the operating system, enter the **oslevel** command.

Version levels of DB2 Data Links and DB2 Universal Database™

If DB2 Universal Database is already installed on any machine that will participate in your Data Links environment, ensure that the version is DB2 Universal Database Version 7.1, Version 7.2, or Version 8.1. For DCE-DFS environments, you can combine DB2 Version 7.1, Version 7.2, or Version 8.1 with Data Links Version 7.1, Version 7.2, or Version 8.1.

DCE-DFS functional restrictions

- DB2 Universal Database is restricted to linking to files stored in one DCE cell.
- DCE-DFS and JFS Data Links Managers cannot coexist on the same system.
- Files on a DCE-DFS file server must be stored in a DMLFS, which is an LFS that has been DM-enabled using the **dmaggr** command.
- A DB2 Data Links Manager must be installed at each node on which a DMLFS fileset that you want to monitor physically resides.
- Fileset move and replication are not currently supported.

- In the DCE cell, the junction to the DFS filesystem must be `/.../cellname/fs`.

Database registration of Data Links servers

A DB2 database on an AIX platform can also register Data Links servers running in the DCE-DFS environment. However, this database cannot, at the same time, register Data Links servers running in native JFS or NTFS environments. For example, if the Data Links server is running on Windows[®] NT, the DB2 client that accesses the files must be running on Windows NT[®] as well. If the Data Links server is running on AIX, the DB2 client that accesses the files must be running on AIX.

Data Links File Manager "servers" and "clients"

In DCE-DFS environments, two separate Data Links components can be installed: the Data Links Manager and the DB2 Data Links DFS Client Enabler. The Data Links server must be installed before any of the Data Links clients.

The **Data Links Manager** can be set up as a server or a client. In a DCE cell, one node will contain the DLFM_DB and is known as the DLFM server node. All other nodes on which Data Links Manager is installed must be configured as DLFM client nodes.

The **DB2 Data Links DFS Client Enabler**, also known as the DLFM Cache Manager or DLFM-CM, is installed on DB2 Universal Database clients and is needed for any DB2 client using a DATALINK data type that has been set up as READ PERMISSION DB. The DFS Client Enabler should not be installed as part of the Data Links Manager.

Backup directory

If the backup method is to a local file system, the directory must be a DFS file set. Ensure that this DFS file set has been created by a DFS administrator. This should not be a DMLFS file set.

Additional documentation

Additional documentation is available on the Transarc web site <http://www.transarc.ibm.com/Library/documentation/> for DFS 3.1.

Related concepts:

- "DFS Client Enabler installation prerequisites (AIX)" on page 79

Related tasks:

- "Configuring DFS Client Enablers (AIX)" on page 81
- "Setting up the DFS disk archive directory after DCE-DFS installation (AIX)" on page 61
- "Installing DFS Client Enablers (AIX)" on page 80

Tivoli Space Manager Hierarchical Storage Manager (AIX)

Adding both Data Links and HSM support to a file system

When registering a file system with Hierarchical Storage Management (HSM), register it with HSM *first* and then with the Data Links File Manager.

1. Ensure that the file system is already mounted as JFS.
2. Register with HSM, using the command `dsmmigfs add /fs`.
3. Register with DLM, using the command `dlfmfsmd /fs`.

Data Links support for a file system is reflected in the stanza in `/etc/filesystems` for an HSM file system via the following entries:

```
vfs = dlfs
mount = false
options = rw,Basefs=fsm
nodename = -
```

Adding Data Links support to an existing HSM file system

Register with DLM, using the command `dlfmfsmd /fs`.

Adding HSM support to an existing Data Links file system

1. Data Links support, using the command `dlfmfsmd -j /fs`.
2. Register with HSM, using the command `dsmmigfs add /fs`.
3. Register with DLM, using the command `dlfmfsmd /fs`.

Removing Data Links support from a Data Links-HSM file system

Remove Data Links support, using the command `dlfmfsmd -j /fs`.

Removing HSM support from a Data Links-HSM file system

1. Remove HSM support, using the command `dsmmigfs remove /fs`.
2. Remove Data Links support, `dlfmfsmd -j /fs`.
3. Register with DLM, using the command `dlfmfsmd /fs`.

Removing both Data Links and HSM support from a Data Links-HSM file system

1. Remove HSM support, using the command `dsmmigfs remove /fs`.
2. Remove Data Links support, using the command `dlfmfsmd -j /fs`.

Restrictions and limitations

- This functionality is currently supported on AIX® only.
- Selective migration (`dsmmigrate`) and recall of a READ PERMISSION DB linked file should only be done by a user ID with root authority. Selective migration can be performed only by the file owner which in the case of READ PERMISSION DB files is the Data Links Manager Administrator (`dlfm`, by default).

To access such files a token is required from the host database side. The only user ID who does not require a token is the root user ID. It will be easier for a root user ID to perform the selective migrate and recall on READ PERMISSION DB files. The dlfm user ID can migrate a READ PERMISSION DB file using a valid token only the first time.

The second time migration is attempted (after a recall), the operation will fail with error message "ANS1028S Internal program error. Please see your service representative." Running **dsmmigrate** on a READ PERMISSION DB file by a non-root user ID will not succeed. This limitation is minor as it is typically the administrators who will access the files on the file server.

- stat and statfs system calls will show VFS-type as fsm rather than dlfs, although dlfs is mounted over fsm. The above behavior is for the normal functionality of **dsmrecalld** daemons, which performs statfs on the file system to check if its VFS-type is fsm or not. You can also use the **lsfs** command to view the filesystem
- Command "dsmls" does not show any output if a file having the minimum inode number is READ PERMISSION DB linked. The **dsmls** command is similar to the **ls** command and lists the files being administered by TSM. No user action is required.

Related concepts:

- "Before you install DB2 Data Links Manager (AIX)" on page 41

Related reference:

- "Tivoli Storage Manager" in the *Data Recovery and High Availability Guide and Reference*

Installing DB2 Data Links manually using the **db2_install** command (AIX)

The DB2 Setup wizard is the recommended method for installing all DB2 products on UNIX-based operating systems. This wizard can perform all of the tasks required to install DB2 Data Links Manager. However, if you want more control of the installation process, you can manually install DB2 Data Links Manager using the **db2_install** command.

Prerequisites:

Log in as a user ID with root authority.

Procedure:

To install DB2 Data Links Manager for AIX using the **db2_install** command:

1. Insert and mount the appropriate CD-ROM.

Note: If you are mounting the CD-ROM drive from a remote system using NFS, the CD-ROM file system on the remote machine must be exported with root access. You must also mount that file system with root access on the local machine.

2. Run the **db2_install** command from the directory where the CD-ROM is mounted.

The **db2_install** command prompts for the following to be installed, and for the base directory where the product files are to be installed:

DB2.DLM

DB2 Data Links Manager for AIX

The command displays the following prompt: Specify one or more of the keywords separated by spaces.

3. Type the keyword of the product to be installed when prompted.
4. The files will be installed in the `/usr/opt/db2_08_01/` directory.
5. Enter Yes to start the product installation.

Related concepts:

- “Actions performed by the DB2 Setup wizard (AIX)” on page 53
- “Before you install DB2 Data Links Manager (AIX)” on page 41

Related tasks:

- “Verifying the installation of DB2 Data Links Manager (AIX)” on page 63
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52
- “Manual post-installation tasks (AIX)” on page 57

Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)

The DB2 Setup wizard is the recommended method for installing all DB2 products on UNIX-based operating systems. This utility can perform all of the tasks required to install DB2 Data Links Manager. However, if you want more control of the install process, you can manually install DB2 Data Links Manager using the **db2_install** command.

Prerequisites:

Log in as a user ID with root authority. In DCE-DFS environments, you will also need to `dce_login` as the Data Links Manager Administrator user ID.

Procedure:

To install and configure DB2 Data Links Manager using the DB2 Setup wizard:

1. Insert and mount your product CD-ROM.
2. Change to the directory where the CD-ROM is mounted by entering the **cd /cdrom** command where **cdrom** is the mount point of your product CD-ROM.
3. Ensure that your X display works.
4. Enter the **./db2setup** command. The Launchpad opens.
5. Select **Install Products**.
6. Select the product you want to and are licensed to install. Click **Next**.
7. Follow the on-screen instructions to begin the installation process.

The DB2 Setup wizard automatically generates an installation log in `/tmp/db2setup.log`. If you want to generate a trace file to record any installation errors in greater detail, enter the **./db2setup -t /tmp/trace.out** command. This generates a trace file in `/tmp/trace.out`.

If you are installing in a DCE-DFS environment, one DFS file server node will contain the DLFM_DB and must be set up as the DB2 server for that database. All other nodes on which Data Links Manager is installed must be set up as DB2 clients for the DLFM_DB.

Related concepts:

- “Actions performed by the DB2 Setup wizard (AIX)” on page 53
- “Before you install DB2 Data Links Manager (AIX)” on page 41

Related tasks:

- “Verifying the installation of DB2 Data Links Manager (AIX)” on page 63
- “Installing DB2 Data Links manually using the `db2_install` command (AIX)” on page 51

Actions performed by the DB2 Setup wizard (AIX)

After installation is complete and before you exit the DB2 Setup wizard, you can select **View Log** to review the installation process. You can also review the `/tmp/db2setup.log` file for more detailed information. If you ran the **./db2setup -t /tmp/trace.out** command to capture any installation errors, you can review the trace log in `/tmp/trace.out`.

The following actions are performed by the DB2 Setup wizard:

Installation directory

DB2 Data Links Manager and DB2® Universal Database are installed in the `/usr/opt/db2_08_01` directory. DB2 Data Links Manager uses DB2 UDB to maintain logged information for the linked files.

Group and user IDs

A group ID (gid) and user ID (uid) are created for the DB2 Data Links Manager Administrator, if you selected to do so during installation. In the DCE-DFS environment, ensure that the uid, user name, gid, and group name match the DCE identity which was created for Data Links Manager Administrator.

Instance creation

An instance for the Data Link File Manager is created. The name of the instance is the same as the user name for the instance owning user. By default a new user named `d1fm` will be created to use as the instance-owning user for the Data Links instance.

Registry variables

The following registry variables are set (only the most significant variables set during install are listed here):

```
DLFM_PORT=port_number
DLFM_LOG_LEVEL=LOG_ERR
DB2_RR_TO_RS=ON
DB2_HASH_JOIN=ON
DLFM_INSTALL_PATH=/home/instance/sqllib/bin
    //where instance is the Data Links Administrator ID
DLFM_INSTANCE_NAME=instance_name
DB2INSTANCE=instance_name
DLFM_BACKUP_DIR_NAME=$HOME/d1fmbackup    //JFS only
DLFM_BACKUP_DIR_NAME=:/d1fmbackup      //DCE-DFS only
DLFM_BACKUP_TARGET=LOCAL
    //You have three choices: LOCAL, TSM, and XBSA
DLFM_FS_ENVIRONMENT=file_system
    //choices are: NATIVE and DFS™
DLFM_START_ASCOPYD=NO //or YES if you enable
    the Data Links Manager Replication Daemon
DLFM_ASCOPYD_PORT=port_number //specified during the install
DLFM_NUM_ARCHIVE_SUBSYSTEMS=2
```

where:

- *port_number* represents the port number reserved for the Data Links File Manager.
- *instance_name* represents the name of the Data Links File Manager instance.
- *file_system* represents NATIVE in JFS environments or DFS in DCE-DFS environments. The default setting is NATIVE.

You can use the **db2set -all** command to view all of the set variables.

PATH variables

The following variables are set in the DB2 Data Links Manager Administrator's `db2profile` or `db2cshrc` script file:

```
(for bash, Bourne, or Korn shell)
export PATH=$PATH:$HOME/sql1ib/bin:$HOME/sql1ib/adm:$HOME/sql1ib/misc
(for C shell)
setenv PATH=${PATH}:${HOME}/sql1ib/bin:${HOME}/sql1ib/adm:${HOME}/sql1ib/misc
```

To run the DB2 Data Links Manager Administrator's `db2profile` or `db2cshrc` script file each time this user ID logs on to the system, add the following entry to the DB2 Data Links Manager Administrator's `.profile` script file:

```
. INSTHOME/sql1ib/db2profile (for bash, Bourne, or Korn shell)
source INSTHOME/sql1ib/db2cshrc (for C shell)
```

where *INSTHOME* represents the home directory of the DB2 Data Links Manager Administrator.

Virtual File System number

In JFS environments, the following entry is added to the `/etc/vfs` file:

```
d1fs 12 /usr/opt/db2_08_01/bin/d1fs_mnthlp /usr/opt/db2_08_01/bin/d1fs_fshe1per
```

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

DB2 database DLFM_DB created

In DCE-DFS environments, a `DLFM_DB` database is not created on the `DLFM` server node and must be created as a post-installation step. On the `DLFM` client nodes, a remote database catalog entry to the `DLFM_DB` is created.

In JFS environments, a `DLFM_DB` database is created on the node containing DB2 Data Links Manager.

DCE-DFS pre-start registration for DMAPP

In a DCE-DFS environment, a data manager application (DMAPP) is installed. This DMAPP prevents file renaming and deletion in the `DLFS` file system. DB2 Data Links Manager can start only if the DMAPP is up and running, and the DMAPP has to be started as part of DFS startup. This is accomplished by installing a DFS prestart script.

The DB2 Setup wizard:

1. Checks if `/opt/dcelocal/tcl/user_cmd.tcl` exists. If it does not exist, the DB2 Setup wizard creates it.
2. Adds commands to `/opt/dcelocal/tcl/user_cmd.tcl` to ensure that the DMAPP is started when DFS is started.

3. Creates a link from `$HOME/sql1lib/adm/dlfsdmap_prestart.dfs` to `/usr/bin/dlfsdmap_prestart.dfs`.

Related concepts:

- “Before you install DB2 Data Links Manager (AIX)” on page 41

Related tasks:

- “Installing DB2 Data Links manually using the `db2_install` command (AIX)” on page 51
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52

Verifying the DLFM_DB was successfully created and catalogued (AIX)

Once the DB2 Setup wizard has finished installing DB2 Data Links Manager on your system, you should ensure that it successfully created and catalogued the DLFM_DB database by listing the contents of the System Database Directory. Once you have verified that this database exists, you need to set up a backup and recovery scheme to aid in data recovery and to protect the data integrity.

Procedure:

To verify that the DLFM_DB database was successfully created and catalogued:

1. Run the **db2profile** or **db2cshrc** script as follows:

```
. INSTHOME/sql1lib/db2profile    (for bash, Bourne or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

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

2. Retrieve the entry for the DLFM_DB database in the System Database Directory:

```
db2 list database directory
```

This command returns output similar to the following:

```
System Database Directory

Number of entries in the directory = 1

Database 1 entry:

Database alias           = DLFM_DB
Database name           = DLFM_DB
Local database directory = /home/dl1m
```

```
Database release level      = 9.00
Comment                    =
Directory entry type       = Indirect (1)
Catalog node number       = 0
```

On the DLFM server node in a DCE-DFS environment, the **db2 list database directory** command returns output similar to the above example. On DLFM client nodes, this command returns output similar to the above example except that Directory entry type is Remote.

Related concepts:

- “Space requirements for log files” in the *Administration Guide: Planning*

Related tasks:

- “Creating a keytab file (AIX)” on page 62

Manual post-installation tasks (AIX)

After manually installing Data Links Manager, you must perform several additional configuration tasks.

Restrictions:

Unless otherwise noted, these tasks apply to Data Links Manager installations in native JFS and DCE-DFS environments.

Note: In DCE-DFS environments, the following tasks assume you have already created a DCE identity for use by the Data Links File Manager. The examples below assume that the DLFM username you created is `dlfmuser`.

Prerequisites:

A user ID with root authority on the DLFM server

Procedure:

To complete your manual DB2 Data Links Manager installation:

For JFS:

1. Run the `/usr/opt/db2_08_01/instance/dlfmcrct` command to create a DLFM instance.
2. Set the `DLFM_PORT` registry variable to an unused port number by entering the following command:

```
db2set DLFM_PORT=port_number
```

where *port_number* is any unused communications port number. It is recommended that you add this entry to your `/etc/services` file so that no other services use this port.

3. Use the `dlfmfsmd` command to convert your JFS or TSM partition to DLFS.

For DCE-DFS:

1. Run the `/usr/opt/db2_08_01/instance/dlfmcrct` command to create a DLFM instance.
2. On the DLFM server and each DLFM client, as the instance owner, set the `DLFM_FS_ENVIRONMENT` registry variable to DFS as follows:

```
db2set DLFM_FS_ENVIRONMENT=DFS
```

3. On the DLFM server and each DLFM client, set up the disk archive directory.

Consider the following scenario:

- Your DCE *cellname* is `dln1.almaden.ibm.com`.
- You have two nodes in the cell: `node1.almaden.ibm.com` (known as *node1*), and `node2.almaden.ibm.com` (known as *node2*).
- There are two prefixes registered with the DFS File Manager:
 - `/.../dln1.almaden.ibm.com/fs/prfx1`. This prefix is native to *node1*. The prefix is `prfx1`. The fileset name is `fileset1`.
 - `/.../dln1.almaden.ibm.com/fs/prfx2`. This prefix is native to *node2*. The prefix is `prfx2`. The fileset name is `fileset2`.

The archive directory must be a DFS fileset. For example, you may use `/.../dln1.almaden.ibm.com/fs/dlfm_backup/` as your archive directory.

In this scenario, you would set the `DLFM_BACKUP_DIR_NAME` registry variable on the DLFM server and each DLFM client as follows:

```
db2set DLFM_BACKUP_DIR_NAME=/.../dln1.almaden.ibm.com/fs/dlfm_backup
```

For files that reside in `prfx1`, the copy daemon running on *node1* will make an archive to the

```
/.../dln1.almaden.ibm.com/fs/dlfm_backup/node1/_prfx1/  
directory. For files in prfx2, the archive will be made to the  
/.../dln1.almaden.ibm.com/fs/dlfm_backup/node2/_prfx2/  
directory.
```

The directories

```
/.../dln1.almaden.ibm.com/fs/dlfm_backup/node* and
```

`../../dlm1.almaden.ibm.com/fs/dl_fm_backup/node*/_prfx1/` will be created when you issue the **dlfm start** command, below.

4. If you are installing a DLFM server or client, edit the `/etc/services` files at each node. Add two consecutive port numbers for the service name, *srv_dlfm*. For example, if the service name is `data1srv`, you would add `data1srv` and `data1srv_i` to `/etc/services`.
5. Set the `DLFM_PORT` registry variable to an unused port number by entering the following command:

```
db2set DLFM_PORT=port_number
```

where *port_number* is any unused communications port number. It is recommended that you add this entry to your `/etc/services` file so that no other services use this port.

6. If you are installing a DLFM server, `dce_login` as the Data Links Manager Administrator user ID and run the **dlfm server_conf** *srv_dlfm* command, where *srv_dlfm* is the service name of the Data Links Manager server. This will create the `dlmnodes.cfg` and `dlfs.cfg` files automatically.

The *dlmnodes.cfg* file contains a header and entries for each node. The header contains the name of the file, version number, number of nodes, entry number of the Data Links Manager server node, and a checksum. The node entries each contain the node name, port number, and node type (either server or client).

The *dlfs.cfg* file contains configuration information about the Data Links Manager Administrator user ID and the DCE cell.

7. Run the **dce_login_root** command. Then run the **dlfm setup** command. The **dce_login_root** must be issued before the **dlfm setup** command. Run this command on the DLFM server only.
8. If you are installing a DLFM *client* on a DCE-DFS node, `dce_login` as the Data Links Manager Administrator user ID and run the **dlfm client_conf** *srv_dlfm node_alias remote_server* command, where:
 - *srv_dlfm* represents the service name of the Data Links Manager client on this node.
 - *node_alias* represents the alias to be used for this node.
 - *remote_server* represents the name of the Data Links Manager server node in this DCE cell.

This will automatically add an entry for this node in the `dlmnodes.cfg` file on the server.

9. If you are installing DLFM clients, edit each client's `/etc/services` file. Add two consecutive port numbers for the service name, *srv_dlfm*, you specified in the previous step. For

example, if the service name is `dataclt`, you would add `dataclt` and `dataclt_i` to `/etc/services`.

10. On the DLFM server, back up all files under `:/DataLinks`.
11. Register the data manager application (DMAPP) in the DFS pre-start script as follows:
 - a. Check if `/opt/dcelocal/tcl/user_cmd.tcl` exists. If it does not exist, create it.
 - b. Append the following line to `/opt/dcelocal/user_cmd.tcl`:

```
set pre_start_dfs "/usr/bin/dlfsdmap_prestart.dfs"
```
 - c. Create a link from `$HOME/sql1lib/adm/dlfsdmap_prestart.dfs` to `/usr/bin/dlfsdmap_prestart.dfs`.
12. Run the **dlfm start** command on each server. In DCE-DFS environments, run this command on each client node as well.
13. Create a keytab file.
14. As root, enter the following commands to start the DMAPP:

```
stop.dfs all
start.dfs all
```

For more information on creating and administering DCE identities, refer to your Transarc DCE-DFS product documentation.

To run the DB2 Data Links Manager Administrator's `db2profile` or `db2cshrc` script file each time this user ID logs on to the system, add the following entry to the DB2 Data Links Manager Administrator's `.profile` script file:

```
. INSTHOME/sql1lib/db2profile (for bash, Bourne, or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

where `INSTHOME` represents the home directory of the DB2 Data Links Manager Administrator.

When you install DB2 Data Links File Manager using the software bundle feature, the DB2 Product Library (HTML) filesets are not installed automatically. Also, the DB2 Product Messages, other than in English, are not installed. You must install these filesets separately.

Related tasks:

- "Installing DB2 Data Links manually using the `db2_install` command (AIX)" on page 51

Workarounds in NFS environments (AIX)

This topic describes workarounds to known problems when running DB2® Data Links Manager for AIX® in NFS environments. These problems are NFS-specific and have nothing to do with DB2 Data Links Manager or DB2 Universal Database.

Additional NFS caching issues

Two different caches are maintained on the NFS client for AIX. The NFS client maintains a cache with attributes of recently accessed files and directories. The client also optionally supports a data cache for caching the content of files on the client.

The attribute caching process sometimes produces an unusual condition on an NFS client after a READ PERMISSION DB file is linked. User IDs are sometimes able to access a READ PERMISSION DB file without an access control token if these user IDs are connected to the machine before the file was linked. Use one of these methods to reduce the likelihood of unauthorized file access:

- Use the **touch** command on the file before executing the SQL **INSERT** statement to set the link.
- Use the **touch** command on the directory containing the file.
- Use the **mount** command with one of the five attribute cache configuration parameters (**actimeo**, **acregmin**, **acregmax**, **acdirmn**, **acdirmx**) to minimize the time that cached attributes are retained after a file or a directory is modified.

You are most likely to observe unauthorized access of READ PERMISSION DB files during Data Links function testing since only one file is linked and there is little NFS activity. You are less likely to encounter this scenario in a production environment since NFS activity is heavy and the NFS attribute cache usually does not retain the attributes for all linked files.

Related concepts:

- “Before you install DB2 Data Links Manager (AIX)” on page 41

Setting up the DFS disk archive directory after DCE-DFS installation (AIX)

The DB2 Setup wizard performs almost every required setup and configuration task needed to get your Data Links Manager system up and running. The only additional task you must perform in DCE-DFS environments is setting up the DFS disk archive directory.

Prerequisites:

A user ID with root authority.

Procedure:

To complete the installation on the Data Links Manager server:

1. Create the keytab file.
2. Enter the following commands to start the DMAPP:

```
stop.dfs all
start.dfs all
```
3. Run "dlfm setup" using dce root credentials as follows:
 - a. Login as the Data Links Manager administrator.
 - b. As root, issue `dce_login`.
 - c. Enter the command: `dlfm setup`.

To complete the installation on the Data Links Manager client:

1. Create the keytab file.
2. As root, enter the following commands to start the DMAPP:

```
stop.dfs all
start.dfs all
```

Related tasks:

- "Installing DB2 Data Links manually using the `db2_install` command (AIX)" on page 51
- "Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)" on page 52
- "Creating a keytab file (AIX)" on page 62

Creating a keytab file (AIX)

DLFM daemons must become DCE network root to access the DFS™ filesets. To be able to do this the DCE network root has to create a DCE keytab file so that the daemons can take on network root privileges and refresh their credentials periodically.

This keytab file, which contains the principal and password information, should be called `data link.ktb` and should be stored under the `$INSTHOME/sql1lib/security/` directory, where `$INSTHOME` represents the home directory of the Data Links Manager Administrator. This file should have its permissions set to read only by the local root user ID and should be created on the DLFM server node and all DLFM client nodes.

Prerequisites:

A user ID with root authority.

Procedure:

To create a keytab file:

1. Enter the **rgy_edit** command. A `rgy_edit` prompt similar to the following should appear:

```
rgy_edit==>
```

2. Enter the **kta** command as follows:

```
kta[dd] -p principal [-r[egistry]] [-a | -pw password] [-f keyfile]
```

For example, you might enter a command similar to the following:

```
kta -p root -f /u/dlfm/sql1lib/security/data1ink.ktb
```

If you enter the **kta** command without the `-pw password` option, you will be prompted to enter a password.

Related tasks:

- “Setting up the DFS disk archive directory after DCE-DFS installation (AIX)” on page 61

Verifying the installation of DB2 Data Links Manager (AIX)

This topic describes how to verify your installation on AIX by configuring a DB2 Data Links Manager environment to control files that are linked to DATALINK columns on a DB2 Universal Database server.

Procedure:

To verify the installation of Data Links Manager on AIX:

- Create a test environment on the DB2 server.
- Create a test environment on the DB2 Data Links server.
- Register the Data Links Server with the DB2 database.
- Verify the sample file is controlled by DLFF.
- Verify the sample file is accessible.
- View the sample file.

Related concepts:

- “Before you install DB2 Data Links Manager (AIX)” on page 41

Related tasks:

- “Creating a test environment on the DB2 server (AIX)” on page 64
- “Creating a test environment on the DB2 Data Links server (AIX)” on page 66
- “Registering the Data Links server with the DB2 database (Windows)” on page 35
- “Verifying the sample file is controlled by DLFF (AIX)” on page 75
- “Verifying the sample file is accessible (AIX)” on page 76
- “Viewing the sample file (AIX)” on page 78
- “Installing DB2 Data Links manually using the db2_install command (AIX)” on page 51
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (AIX)” on page 52

Installation verification tasks

Creating a test environment on the DB2 server (AIX)

Creating a test environment on the DB2 server is part of the larger task of Verifying the installation of DB2 Data Links Manager.

Prerequisites:

- A user ID with root authority
- A valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user ID that belongs to the primary group of the instance owner has SYSADM authority on an instance.

Procedure:

To create a test environment on the DB2 UDB server:

1. Log on to the system as a user ID with root authority.
2. Create an instance on the DB2 server using the **db2icrt** command. This instance will contain a database in which tables containing columns of the DATALINK data type will reside.

In our example, we will create an instance called VALIDATE by entering the following commands:

```
mkgroup testers
mkuser pgrp='testers' groups='testers' home='/home/validate' validate
/usr/opt/db2_08_01/instance/db2icrt -u validate validate
```

3. Log out.
4. Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you

created. By default, any user ID that belongs to the primary group of the instance owner has SYSADM authority on an instance.

5. Ensure that the VALIDATE instance is the current instance by entering the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

6. Set the DATALINKS database manager configuration parameter to *YES* in the VALIDATE instance's configuration file by entering the following command:

```
db2 update dbm cfg using datalinks yes
```

To disable DB2 Data Links Manager functionality on your DB2 server, you would set the DATALINKS database manager configuration parameter to *no*.

7. Start the VALIDATE instance by entering the **db2start** command.

Note: If you change a setting in an instance's database manager configuration file, you must ensure that you stop and restart the instance (using the **db2stop** and **db2start** commands) for the changes to take effect. In our example, we did not start the VALIDATE instance, so we only issued the **db2start** command.

8. Create a database using the **db2 create database** command. This database will contain a table using the DATALINK data type.

For the example, create a database called STAFF by entering the following command:

```
db2 create database staff
```

9. Connect to the STAFF database by entering the following command:

```
db2 connect to staff
```

10. Create a table called EMPLOYEE, in the STAFF database that you just created, that has a column defined with a DATALINK data type by entering the following command:

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

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

```
db2 connect reset
```

12. Log out.

Now you can create a test environment on the DB2 Data Links server.

Related tasks:

- “UNIX Details When Creating Instances” in the *Administration Guide: Implementation*
- “Creating a test environment on the DB2 Data Links server (AIX)” on page 66

Related reference:

- “CREATE DATABASE” in the *Command Reference*
- “db2icrt - Create Instance” in the *Command Reference*

Creating a test environment on the DB2 Data Links server (AIX)

After creating a test environment on the DB2 UDB server, we must create a test environment on the DB2 Data Links server.

Procedure:

To create a test environment on the DB2 Data Links server:

1. Prepare your file system for Data Links Manager
2. Register the file system with the Data Links Filesystem Filter
3. Register the DB2 database
4. Authorize a DB2 user ID to link a file
5. Create a sample file for DB2 Data Links Manager

Related tasks:

- “Preparing your file system for DB2 Data Links Manager (AIX)” on page 66
- “Registering the file system with the Data Links Filesystem Filter (AIX)” on page 69
- “Registering the DB2 database with the Data Links File Manager (AIX)” on page 71
- “Authorizing a DB2 user ID to link a file (AIX)” on page 72
- “Creating a sample file for DB2 Data Links Manager (AIX)” on page 73

Preparing your file system for DB2 Data Links Manager (AIX)

Preparing your file system for DB2 Data Links Manager is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

A user with root authority.

Procedure:

You can choose to create a Journaled File System (JFS) or a DCE-DFS file system to test your Data Links Manager installation.

Creating a Journaled File System (JFS) on the DB2 Data Links server

To create a JFS on the Data Links server:

1. Log in as a user with root authority.
2. Prepare a JFS to use a Data Links Filesystem Filter (DLFF).
Create a Journaled File System (JFS) using the **smit manfs** command and set the **Mount AUTOMATICALLY at system restart?** option to *no*. You can also use an existing JFS file system.
3. Modify the properties of a file system so that it comes under the control of the DLFF, and mount it by entering the following command:

```
/usr/opt/db2_08_01/instance/dlffmsmd dlfm_mountpoint
```

where *dlfm_mountpoint* represents the mount point of the JFS file system you are using.

To continue with the example, enter the following command:

```
/usr/opt/db2_08_01/instance/dlffmsmd /test
```

4. Log out.

Creating a DCE-DFS file system on the Data Links server

To create a DCE-DFS file system on the Data Links server:

1. Log in as root and *dce_login* as a DFS administrator.
2. Create a logical volume by entering the following command:

```
mklv -y aggregate_name -t aggregate_type lfs rootvg 1
```

where

- *aggregate_name* represents the name of the logical volume
- *aggregate_type* represents the aggregate type
- *rootvg* represents the logical volume type, and 1 represents the number of logical partitions.

3. Create an aggregate in the logical volume by entering the following command:

```
newaggr -aggregate /dev/dmtest -block 8192 -frag 1024 -overwrite
```

where */dev/dmtest* represents the aggregate name, given as a device file. If this aggregate name already exists, the *-overwrite* option will delete all data in the aggregate.

4. Initialize and export the aggregate by entering the following command:

```
mkdfs1fs -d /dev/dmtest -n dmtest
```

where */dev/dmtest* represents the device name for the aggregate.

5. Create the filesets in the aggregate by entering the following command:

```
mkdfs1fs -f dmtest1.ft -m /:/dmtest/dmtest1 -n dmtest
```

where */:/dmtest/dmtest1* represents the mount point in the DFS namespace and *dmtest* represents the name of the aggregate.

Note: You must have a valid *dce_login* and the authority to create directories in the DFS namespace.

6. Edit the */opt/dcelocal/var/dfs/dfstab* file and change the entry for the aggregate you just created from *1fs* to *dm1fs*. For example, this file will have entries for each aggregate similar to the following:

```
# blkdev aggname aggtype aggid [UFS fsid]
/dev/aggrdev1 aggrname1 1fs 1
/dev/aggrdev2 aggrname2 1fs 2
```

Change *aggtype* to *dm1fs* for all aggregates that are to be brought under Data Links control. Save and close the file.

Notes:

- a. When you create an aggregate using SMIT, you can also specify an aggregate id. However, the default id is the next available higher integer value.
 - b. If the aggregate has already been exported, you must unexport it before performing this step and step 7.
7. Enable DFS SMT on the aggregate by running the following command:

```
dmaggr -aggregate name [{-on | -off}] [{-needapp | -noneedapp}] [-help]
```

It is recommended you always use the *-needapp* option when running this command.

8. Export the aggregate so that it can be controlled by the DLFF.
9. Register a file system that is under the control of a DLFF by entering the following command:

```
dlfm add_prefix prefix_path
```

where *prefix_path* represents the location of the file system that is under the control of a DLFF.

10. To register a DCE-DFS fileset, you can either use the **dlfm add_prefix /test** command or you can use one of the following variations:

```
dlfm add_prefix for dfs rwpath prefix_path
```

This command specifies a read-only path for DCE-DFS.

```
dlfm add_prefix for dfs rwpath prefix_path localpath local_mount_point
```

where *local_mount_point* represents the native file system mount point of the prefix. The native file system mount point can be used to improve the performance of the archival and retrieval of files.

Note: Issue all **dlfm add_prefix** commands from the node on which the DFS fileset resides. Then issue a **dlfm start** command on the same node.

For more information, refer to your AIX Administration Guide.

Now you can register the file system with the Data Links Filesystem Filter.

Related tasks:

- “Registering the file system with the Data Links Filesystem Filter (AIX)” on page 69

Related reference:

- “dlfm add_prefix command” in the *DB2 Data Links Manager Administration Guide and Reference*

Registering the file system with the Data Links Filesystem Filter (AIX)

Registering the file system with the Data Links Filesystem Filter is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To register the /test file system with the DLFF:

1. Run the db2profile or db2cshrc script as follows:

```
. INSTHOME/sql1lib/db2profile    (for bash, Bourne or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

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

2. Start the Data Links File Manager by entering the **dlfm start** command.
3. Ensure that the Data Links File Manager started successfully by entering the **dlfm see** command.

If the Data Links File Manager back-end processes started successfully and are running, you will receive output similar to the following:

PID	PPID	PGID	RUNAME	UNAME	ETIME	DAEMON NAME
71326	185894	119252	root	dlfm	00:07	dlfm_gcd_(dlfm)
75788	185894	119252	root	dlfm	00:07	dlfm_delgrp_(dlfm)
100280	185894	119252	root	dlfm	00:07	dlfm_cmgrd_(dlfm)
154834	234604	119252	root	dlfm	00:05	dlfm_ar_ag_(dlfm)
185894	1	119252	root	dlfm	00:08	dlfm_wd_(dlfm)
210534	234604	119252	root	dlfm	00:05	dlfm_ar_ag_(dlfm)
226860	185894	119252	root	dlfm	00:07	dlfm_upcall_(dlfm)
234604	185894	119252	root	dlfm	00:07	dlfm_archived_(dlfm)
250654	185894	119252	root	dlfm	00:07	dlfm_mon_wd_(dlfm)

4. To ensure that you successfully mounted and configured the file system that is under the control of a DLFF:
 - a. Enter the **lsfs -v dlfs** command to list the defined DLFS file systems.

For the example, this command returns output similar to the following:

Name	Nodename	Mount Pt	VFS	Size	Options
/dev/d1lv	-	/test	dlfs	--	rw,Basefs=jfs
/dev/lv04	-	/dlinks2	dlfs	--	rw,Basefs=jfs

- b. Enter the **/etc/mount -v vfs | awk '\$3 == "dlfs"'** command to list the DLFS file systems for which the DLFF is loaded.

For the example, this command returns output similar to the following:

node	mounted	mounted over	vfs	date	options
/dev/d1lv	/test	dlfs	Jan 08 16:23	rw,log=/dev/loglv00	
/dev/lv04	/dlinks2	dlfs	Jan 08 16:23	rw,log=/dev/loglv00	

To verify that a DFS file server is under the control of a DLFF, enter the following command:

```
dfsexport | grep dmlfs
```

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

```
/dev/dlfs_test dlfs_test dmlfs 4
```

5. Register a file system that is under the control of a Data Links Filesystem Filter by entering the following command:

```
dlfm add_prefix prefix_path
```

where *prefix_path* represents the location of the file system that is under the control of a DLFF.

For example, register the Data Links server to use the Data Links Filesystem Filter on the test file system by entering the following command:


```
dlfm add_prefix /test
```

To update an existing prefix on DFS:

```
dlfm update_prefix prefix_path for dfs localpath local_mount_point
```

Now you can register the DB2 database.

Related tasks:

- “Registering the DB2 database with the Data Links File Manager (AIX)” on page 71

Related reference:

- “dlfm add_prefix command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm update_prefix command (DCE-DFS)” in the *DB2 Data Links Manager Administration Guide and Reference*

Registering the DB2 database with the Data Links File Manager (AIX)

Registering the DB2 database with the Data Links File Manager is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To register a new database with the Data Links File Manager:

1. Register the remote DB2 UDB database where the DATALINK type column was defined by entering the following command:

```
dlfm add_db database instance hostname
```

where:

- *database* represents the database alias name of the remote database.
- *instance* represents the instance where *database* resides. If you are registering a Windows instance on an AIX Data Links Manager, *instance* must be in uppercase.
- *hostname* represents the hostname of the DB2 UDB server where *database* resides.

The following command will register a database called STAFF, which resides in the VALIDATE instance on a DB2 UDB server with a hostname of db2server.services.com:

```
dlfm add_db staff validate db2server.services.com
```

Do not specify the DLFM_DB when you run this command. The DLFM_DB is a local database that is used to keep track of files that are under the control of the Data Links File Manager.

To list the registered database, enter the following command:

```
dlfm list registered databases
```

2. Log out.

Now you can authorize a DB2 user ID to link a file.

Related tasks:

- “Authorizing a DB2 user ID to link a file (AIX)” on page 72

Related reference:

- “dlfm add_db command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm list registered databases command” in the *DB2 Data Links Manager Administration Guide and Reference*

Authorizing a DB2 user ID to link a file (AIX)

You can authorize a DB2 user ID to link a file. *Authorizing a DB2 user ID to link a file* is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

Procedure:

To authorize a DB2 user ID to link a file in the example */test/pictures* directory:

1. Run:

```
dlfm grant link privilege on dir /test/pictures/ to
user db2-username for db staff inst validate
node db2server.services.com
```

where *db2-username* must be the user ID with which you log on when you perform the link operation (for example, using the SQL INSERT statement) on DB2.

2. To verify that your **dlfm grant** command was correctly specified:

```
dlfm list registered users for directory /test/pictures/ on
db staff inst validate node db2server.services.com
```

This command should return the *db2-username* that was specified above.

3. Log out.

By default, link security controls are set to `ENABLED` during the installation. Use the `dlfm set link security off` command to disable this feature and the `dlfm set link security on` command to re-enable it.

Your next step is to create a sample file.

Related tasks:

- “Creating a sample file for DB2 Data Links Manager (AIX)” on page 73

Related reference:

- “`dlfm grant` command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “`dlfm set link security` command” in the *DB2 Data Links Manager Administration Guide and Reference*

Creating a sample file for DB2 Data Links Manager (AIX)

Creating a sample file for DB2 Data Links Manager is part of the larger task of Creating a test environment on the DB2 Data Links server.

Prerequisites:

- Log on to the system with any user ID that is *not* a DB2 Data Links Manager Administrator. In DCE-DFS environments, use your `dce_login`.
- Ensure that the Data Links File Manager (DLFM) is running.

Procedure:

To create a sample file:

1. Create a directory on the file system that is under the control of a Data Links Filesystem Filter (DLFF), to store files to be controlled by a DB2 server, by entering the following command:

```
mkdir filesystem_name/directory_name
```

where:

- *filesystem_name* represents the name of the file system that is under the control of a DLFF.
- *directory_name* represents the name of the directory that you want to create.

The DB2 Data Links Manager Administrator should never be the owner of any files or directories which are in a file system under the control of a Data Links Filesystem Filter. For example, the following command will create the directory called `pictures` on the file system `/test`:

- ```
mkdir /test/pictures
```
2. Change the permissions for the pictures directory that you just created so that any user ID can create a file in it by entering the following command:  

```
chmod 777 /test/pictures
```
  3. Create a file called `psmith.bmp` in the `/test/pictures` directory, to be managed by the Data Links File Manager, by entering the following command:  

```
echo "This is a picture of Paul Smith." > /test/pictures/psmith.bmp
```
  4. Log out.

The sample file `psmith.bmp` is a text file, not a bitmap as the `.bmp` extension implies. For the purpose of verifying your installation, this file represents an employee's picture that will be inserted into a table that was defined with the DATALINKS data type.

Now you can register the Data Links server with the DB2 database.

**Related tasks:**

- “Registering the Data Links Server with the DB2 database (AIX)” on page 74

## Registering the Data Links Server with the DB2 database (AIX)

*Registering the Data Links Server with the DB2 database* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*.

**Prerequisites:**

Log on to the DB2 server with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user ID that belongs to the *Local Administrators* group has SYSADM authority on an instance.

**Procedure:**

To register the Data Links server with the remote DB2 UDB database where the DATALINK type column was defined earlier:

1. Enter the following command:  

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

2. Start the VALIDATE instance by entering the **db2start** command.
3. Register a Data Links server that will control the files that are linked by a DATALINK type column by entering the following command:

```
db2 "add datalinks manager for database database_alias
using node hostname port port_number"
```

where:

- *database\_alias* represents the database alias name of the database.
- *hostname* represents the fully qualified hostname of the Data Links server.
- *port\_number* represents the port number that you have reserved for communications between the Data Links server and the DB2 server. You specified this port number during the installation of DB2 Data Links Manager.

For our example, enter the following command:

```
db2 "add datalinks manager for database staff using node dlmsvr.services.com port 50100"
```

4. Connect to the STAFF database by entering the following command:
5. Insert an entry into the EMPLOYEE table that you created by entering the following command:

```
db2 "insert into employee values (001,'Paul','Smith',
dlvalue('http://file_location/controlled_file'))"
```

where:

- *file\_location* represents the fully qualified location of the file that is under the control of a Data Links Filesystem Filter on the Data Links server.
- *controlled\_file* represents the filename of the file that you want to control on the Data Links server.

For our example, enter the following command

```
db2 "insert into employee values (001,'Paul','Smith',
dlvalue('http://dlmsvr.services.com/test/pictures/psmith.bmp'))"
```

6. Log out.

Now you can verify the sample file is controlled by the DLFF.

#### **Related tasks:**

- “Verifying the sample file is controlled by DLFF (AIX)” on page 75

### **Verifying the sample file is controlled by DLFF (AIX)**

*Verifying the sample file is controlled by DLFF* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*.

## Prerequisites:

Log on to the system as any user ID *except* as a user ID with root authority or as the DB2 Data Links Manager Administrator. In DCE-DFS environments, log in with your DCE user ID.

## Procedure:

To verify that the `psmith.bmp` sample file we created earlier is under the control of the Data Links File Filter (in DCE-DFS environments, perform these steps from a client node):

1. Verify that the `psmith.bmp` file is now controlled by the Data Links File Manager by entering the following command:

```
cat controlled_file
```

where *controlled\_file* represents the full pathname of the file that is controlled by the Data Links server.

For the example, enter the following command:

```
cat /test/pictures/psmith.bmp
```

**Note:** We are using the `cat` command here because `psmith.bmp` is really a text file. Running the `cat` command on a true binary file would return unreadable output.

If this file is being controlled by the Data Links File Manager, you will receive the following error:

```
Cannot open /test/pictures/psmith.bmp
```

2. Log out.

Now you can verify the sample file is accessible.

## Related tasks:

- “Verifying the sample file is accessible (AIX)” on page 76

## Verifying the sample file is accessible (AIX)

You need to verify that the `psmith.bmp` sample file can be accessed while it is under the control of the Data Links File Manager. *Verifying the sample file is accessible* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*.

## Procedure:

To verify the sample files is accessible, you first need to generate an *access token* on the DB2 Universal Database server.

In DCE-DFS environments, you should perform these steps from a machine where the DFS Client Enabler is installed.

1. Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user that belongs to the primary group of the instance owner has SYSADM authority on an instance.
2. Run the `db2profile` or `db2cshrc` script as follows:

```
. INSTHOME/sql1lib/db2profile (for bash, Bourne or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

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

3. Start the VALIDATE instance by entering the **db2start** command.
4. Connect to the STAFF database by entering the following command:  
`db2 connect to staff`
5. Select the controlled file by issuing an SQL SELECT statement.

For our example, enter the following command:

```
db2 "select dlurlpath(picture) from employee where lname = 'Smith'"
```

This command returns the full pathname with an access token of the form:

```
controlled_filepath/access_token;controlled_filename
```

where:

- *controlled\_filepath* represents the fully qualified path of the controlled file
- *access\_token* represents an encrypted key assigned by the database manager.
- *controlled\_filename* represents the name of the file that is under the control of a Data Links Filesystem Filter.

For example, you will receive an access token that is similar to the following:

```
/test/pictures/HVJ5NXGC0WQ.I5KKB6;psmith.bmp
```

This access token will be used to read this file on the Data Links server.

**Note:** By default, this access token is only valid for 60 seconds. This means that once you enter this command, you have only 60 seconds to complete the remaining steps in this section. You can increase the access token expiry time by updating the *dl\_expint* database configuration parameter.

To change the default expiration time for an access token to 10 minutes (the value is entered in seconds), enter the following commands:

```
db2 update db cfg for staff using dl_expint 600
db2 terminate
db2 connect to staff
```

If you change a setting for any database configuration parameter, you must always reconnect to the database for the changes to take effect.

6. Log out.

Now you can view the sample file.

**Related concepts:**

- “Configuration parameters” in the *Administration Guide: Planning*

**Related tasks:**

- “Viewing the sample file (AIX)” on page 78

## Viewing the sample file (AIX)

You can use the access token to view the `psmith.bmp` file. *Viewing the sample file* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*.

**Prerequisites:**

- In DCE-DFS environments, you should perform these steps from a machine where the DFS Client Enabler is installed.
- Log on to the system as any user ID *except* as a user ID with root authority or as the DB2 Data Links Manager Administrator. In DCE-DFS environments, log in with your DCE user ID.

**Procedure:**

To view the sample file:

1. Verify that you can access the file that is under the control of the Data Links File Manager.

Enter the following command:

```
cat "/test/pictures/access_token;psmith.bmp"
```

where *access\_token* represents the encrypted key that you received in the previous step.

You should receive the following output from this command:



"This is a picture of Paul Smith."

If you did not receive an error, you have access to this file and you have installed and configured DB2 Data Links Manager correctly.

**Related tasks:**

- "Verifying the sample file is accessible (AIX)" on page 76

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## DFS Client Enabler

### DFS Client Enabler installation prerequisites (AIX)

#### DCE-DFS Client Version 3.1

You must install a DCE-DFS Client Version 3.1 on any machine that will run a DFS™ Client Enabler. Use of the DCE slim client is not supported.

#### Should I use the DB2 Setup wizard or SMIT?

We strongly recommend that you use the DB2 Setup wizard you are installing a DFS Client Enabler. The DB2 Setup wizard performs almost all setup and configuration tasks for you. If you want to install the DFS Client Enabler fileset using SMIT, you will have to set up and configure your system manually.

#### Operating system level

DCE-DFS 3.1 will work with AIX® Version 4.2.1, Version 4.3.1, Version 4.3.2, or Version 4.3.3. However, DB2® Version 8 requires AIX Version 4.3.3. To check the level of the operating system, enter the **oslevel** command.

#### Disk space requirements

Ensure that there is at least 2 MB of free disk space in the `/usr/opt` directory. To check available free disk space, enter the **df -k /usr/opt** command.

The DFS Client Enabler is an optional component that you can select during DB2 Universal Database™ client or server installation. You cannot install a DFS Client Enabler without installing a DB2 Universal Database client or server product.

The DFS Client Enabler requires 2 MB of disk space and an additional 40 MB if you are installing the DFS Client Enabler as part of a DB2 Run-Time Client installation. You will need more disk space if you install the DFS Client Enabler as part of a DB2 Administration Client or DB2 server installation.

#### Synchronize system clocks

Ensure that your system clocks are synchronized and remain synchronized. Synchronization of clocks is essential for the Data Links

token expiry interval to work correctly. The token expiry interval is a database configuration parameter that controls how long a selected DATALINK value (consisting of a URL with an embedded file authorization token) may be used. To check the system time and date, enter the **date** command. For more information on synchronizing system clocks, refer to your *AIX Administration Guide*.

**Related concepts:**

- “Before you install DB2 Data Links Manager (AIX)” on page 41
- “Installation considerations in DCE-DFS environments (AIX)” on page 47

## Installing DFS Client Enablers (AIX)

A DFS Client Enabler can be installed using the DB2 Setup wizard, which is the recommended installation method, or it can be installed manually using SMIT. After you have installed a DFS Client Enabler, you need to configure the DFS Client Enabler.

**Prerequisites:**

- Log in as a user ID with root authority.

**Procedure:**

- To install a DFS Client Enabler using the DB2 Setup wizard:
  1. Insert and mount the appropriate CD-ROM.
  2. When the DB2 Launchpad appears, select **Install** to launch the DB2 Setup Wizard.
  3. Select the **Customize** install option.
  4. Select **DFS Client Enabler** from the list of components.
- To install a DFS Client Enabler manually using SMIT:
  1. Insert and mount the appropriate CD-ROM.
  2. Enter the **smit** command.
  3. Select **Software Installation and Maintenance** —> **Install and Update Software** —> **Install and Update from LATEST Available Software**.
  4. Specify the input device or directory for the installation media, or click **List** to display all input devices or directories.
  5. Click **LIST** next to the **SOFTWARE to install** field to display a list of filesets. The Multi-select List window opens.
  6. Select the DFS Client Enabler fileset (db2\_08\_01.dfsc) and click **OK**.
  7. Click **OK** again to begin the installation process.

After installation finishes, you must run the following command:

```
/usr/opt/db2_08_01/bin/dlfsdm_setup
```

You do *not* have to run this command if you used the DB2 Setup wizard to install your DFS Client Enabler.

Now you can configure your DFS Client Enabler.

**Related concepts:**

- “DFS Client Enabler installation prerequisites (AIX)” on page 79
- “Installation considerations in DCE-DFS environments (AIX)” on page 47

**Related tasks:**

- “Configuring DFS Client Enablers (AIX)” on page 81
- “Setting up the DFS disk archive directory after DCE-DFS installation (AIX)” on page 61

## Configuring DFS Client Enablers (AIX)

Configuring DFS™ Client Enablers is part of the larger task of installing DFS Client Enablers. After installing a DFS Client Enabler, you must configure it.

**Procedure:**

To configure your DFS Client Enabler:

1. Inform your DCE administrator that the self DCE identity for the DFS Client Enabler machine needs to be added to the DCE DLMADMIN group.
2. Log in as a user ID with root authority on the machine where the DFS Client Enabler is installed and enter the following commands:

```
dcecp -c secval deactivate
```

```
dcecp -c secval activate
```

To verify that self is now in the DLMADMIN DCE group issue the **klist** DCE command. The DLMADMIN group should be listed under *Local Groups*.

**Note:** Running the **secval** commands will usually complete the configuration. It may be necessary to reboot the machine as well. If problems are encountered in accessing READ PERMISSION DB files, reboot the machine where the DB2® DFS Client Enabler has just been installed.

**Related concepts:**

- “DFS Client Enabler installation prerequisites (AIX)” on page 79
- “Installation considerations in DCE-DFS environments (AIX)” on page 47

**Related tasks:**

- “Setting up the DFS disk archive directory after DCE-DFS installation (AIX)” on page 61
- “Installing DFS Client Enablers (AIX)” on page 80

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## Chapter 4. Installing Data Links Manager on the Solaris Operating Environment

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### Before you install DB2 Data Links Manager (Solaris Operating Environment)

Read this information carefully before installing DB2<sup>®</sup> Data Links Manager.

#### Supported operating systems, kernel levels and kernel architectures

Ensure that you are running one of the following versions with a 32-bit kernel:

- Solaris Version 7
- Solaris Version 8

Kernel architectures sun4d and sun4m are not supported.

To check the operating system level, enter the **uname -r** command. This command is only valid for Solaris Version 7 and later. To check the kernel level, enter the **isainfo -v** command. The **isainfo** command should return 32-bit sparc applications.

To start your system with a 32-bit kernel, enter the **setenv boot-file kernel/unix** command at the **OK** prompt. Then, enter the **boot** command to start the boot process.

#### Disk space requirements

Ensure that there is at least 85 MB of free disk space in the `/opt/IBM/db2` directory. To check available free disk space, enter the **df -k /opt/IBM/db2** command.

#### Data Links Manager Administrator user ID

During installation, you are given the option to create the owner of the DB2 Data Links instance in the **Set user information for the Data Links installation** panel. These installation instructions assume that you selected this option.

When you create the Data Links Manager Administrator user ID, the DB2 Setup wizard adds this user with the username *dlfm* and the password *ibmdb2*. You can accept these default values, specify an existing username, or create a different username by changing the default values. For security reasons, we recommend that you specify your own username and password because the default values are used in every DB2 Data Links installation and therefore are well-known. The Data Links Manager Administrator user ID is also used for the Data Links Manager instance.

If your machine is an NIS client, you will need to specify your own existing username. The existing username you specify:

- Must *not* have its home directory reside on a file system that uses a Data Links Filesystem Filter.
- Must have a username that is eight characters or less.
- Must *not* be a user with root authority.

To create a user ID for the DB2 Data Links Manager Administrator:

1. Log in as a user with root authority.
2. Create the group for the DB2 Data Links Administrator (for example, `dlfmgrp`) :

```
groupadd dlfmgrp
```

3. Create the write group (for example, `dlfmxgrp`):

```
groupadd dlfmxgrp
```

When a file is linked to a DATALINK column defined with WRITE PERMISSION ADMIN, the file will be changed to be owned by this group.

The DLFMXGRP group is created for use with the update in place functionality for any file linked to a DATALINK column defined with WRITE PERMISSION ADMIN. The DLFMGRP group is also created. You should not add any user IDs to these groups; DLFM should be the only user ID to create a file that's owned by the DLFM.

4. Create the user ID for the DB2 Data Links Administrator (for example, `dlfm`), using the `/home/dlfm` directory as the home directory of the Data Links Administrator:

```
useradd -g dlfmgrp -G dlfmxgrp -d /home/dlfm dlfm
```

5. Assign a password to this username by entering the `passwd user` command, where *user* represents the account that you created.

The DB2 Data Links Manager Administrator user ID is not only for the purpose of administrating the Data Links File Manager, but also to own the DLFM\_DB and files that are in a linked state. The DB2 Data Links Manager Administrator should never own directories on a file system that is under the control of a Data Links Filesystem Filter (DLFF). The DB2 Data Links Manager Administrator user ID should only be used to administer the Data Links File Manager (DLFM). You can have the DB2 Data Links Manager Administrator user ID as the owner of files, but only READ PERMISSION DB linked files. You should not manually create files with the DB2 Data Links Manager Administrator as the owner.

If you create a different username by changing the default values, you must ensure that the username you specify is eight characters or less.

### Disk space requirements for DB2 Data Links Manager Administrator user ID

Ensure that there is at least 70 MB of free disk space in the home directory where the DB2 Data Links Manager Administrator's home directory will reside. To check available free disk space, enter the **df -k *INSTHOME*** command, where *INSTHOME* represents the home directory of the Data Links Administrator user ID.

### Memory requirements

Ensure that there is at least 256 MB of memory available to your system. To check available memory, enter the **/usr/bin/dmesg | grep -i "avail mem"** command.

### Updating kernel parameters

Before installing your DB2 for Solaris product using the DB2 Setup wizard or the **db2\_install** and **pkgadd** commands, you may need to update your system's kernel configuration parameters. The values in Table 1 are the recommended Solaris kernel configuration parameters.

**Note:** You must restart your machine after updating any kernel configuration parameters.

Table 1. Recommended Solaris Version 7 kernel configuration parameters values

| Kernel Parameter                   | Physical Memory  |                  |                  |                  |
|------------------------------------|------------------|------------------|------------------|------------------|
|                                    | 64MB - 128MB     | 128MB - 256MB    | 256MB - 512MB    | 512MB+           |
| msgsys:msginfo_msgmax              | 65535(1)         | 65535(1)         | 65535(1)         | 65535(1)         |
| msgsys:msginfo_msgmnb              | 65535(1)         | 65535(1)         | 65535(1)         | 65535(1)         |
| msgsys:msginfo_msgmap              | 130              | 258              | 258              | 258              |
| msgsys:msginfo_msgmni              | 128              | 256              | 256              | 256              |
| msgsys:msginfo_msgssz              | 16               | 16               | 16               | 16               |
| msgsys:msginfo_msgtql              | 256              | 512              | 1024             | 1024             |
| msgsys:msginfo_msgseg              | 8192             | 16384            | 32767(2)         | 32767(2)         |
| shmsys:shminfo_shmmax              | 67108864         | 134217728(2)     | 268435456(3)     | 536870912(3)     |
| shmsys:shminfo_shmseg              | 50               | 50               | 50               | 50               |
| shmsys:shminfo_shmmni              | 300              | 300              | 300              | 300              |
| semsys:seminfo_semmni              | 128              | 256              | 512              | 1024             |
| semsys:seminfo_semmap              | 130              | 258              | 514              | 1026             |
| semsys:seminfo_semnms              | 256              | 512              | 1024             | 2048             |
| semsys:seminfo_semmnu              | 256              | 512              | 1024             | 2048             |
| semsys:seminfo_semume              | 50               | 50               | 50               | 50               |
| d1fsdrv:glob_mod_pri <sup>1</sup>  | 0x100800         | 0x100800         | 0x100800         | 0x100800         |
| d1fsdrv:glob_mesg_pri <sup>1</sup> | 0xff             | 0xff             | 0xff             | 0xff             |
| d1fsdrv:ConfigD1fsUid <sup>1</sup> | UID <sup>2</sup> | UID <sup>2</sup> | UID <sup>2</sup> | UID <sup>2</sup> |
| d1fsdrv:ConfigD1fsGid <sup>1</sup> | GID <sup>3</sup> | GID <sup>3</sup> | GID <sup>3</sup> | GID <sup>3</sup> |

Table 1. Recommended Solaris Version 7 kernel configuration parameters values (continued)

| Kernel Parameter                                                                                                                                                                                                                                                 | Physical Memory |               |               |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|---------------|--------|
|                                                                                                                                                                                                                                                                  | 64MB - 128MB    | 128MB - 256MB | 256MB - 512MB | 512MB+ |
| <sup>1</sup> These values are mandatory.<br><sup>2</sup> UID represents the user ID of the of the Data Links Manager Administrator.<br><sup>3</sup> GID represents the group id of the write group.<br>See the Data Links Manager Administrator user ID section. |                 |               |               |        |

Table 2. Recommended Solaris version 8 kernel configuration parameters values

| Kernel Parameter                                                                                                                                                                                                                                                 | Physical Memory  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|
|                                                                                                                                                                                                                                                                  | 512MB+           |  |
| msgsys:msginfo_msgmax                                                                                                                                                                                                                                            | 65535            |  |
| msgsys:msginfo_msgmnb                                                                                                                                                                                                                                            | 65535            |  |
| msgsys:msginfo_msgmap                                                                                                                                                                                                                                            | 1026             |  |
| msgsys:msginfo_msgmni                                                                                                                                                                                                                                            | 1024             |  |
| msgsys:msginfo_msgssz                                                                                                                                                                                                                                            | 32               |  |
| msgsys:msginfo_msgtql                                                                                                                                                                                                                                            | 2048             |  |
| msgsys:msginfo_msgseg                                                                                                                                                                                                                                            | 32767(2)         |  |
| shmsys:shminfo_shmmax                                                                                                                                                                                                                                            | 0xe0000000       |  |
| shmsys:shminfo_shmseg                                                                                                                                                                                                                                            | 500              |  |
| shmsys:shminfo_shmni                                                                                                                                                                                                                                             | 1024             |  |
| semsys:seminfo_semni                                                                                                                                                                                                                                             | 1024             |  |
| semsys:seminfo_semap                                                                                                                                                                                                                                             | 1026             |  |
| semsys:seminfo_semns                                                                                                                                                                                                                                             | 2048             |  |
| semsys:seminfo_semnu                                                                                                                                                                                                                                             | 2048             |  |
| semsys:seminfo_semume                                                                                                                                                                                                                                            | 50               |  |
| d1fsdrv:glob_mod_pri <sup>1</sup>                                                                                                                                                                                                                                | 0x100800         |  |
| d1fsdrv:glob_mesg_pri <sup>1</sup>                                                                                                                                                                                                                               | 0xff             |  |
| d1fsdrv:ConfigD1fsUid <sup>1</sup>                                                                                                                                                                                                                               | UID <sup>2</sup> |  |
| d1fsdrv:ConfigD1fsGid <sup>1</sup>                                                                                                                                                                                                                               | GID <sup>3</sup> |  |
| <sup>1</sup> These values are mandatory.<br><sup>2</sup> UID represents the user ID of the of the Data Links Manager Administrator.<br><sup>3</sup> GID represents the group id of the write group.<br>See the Data Links Manager Administrator user ID section. |                  |  |

### Version levels of DB2 Data Links and DB2 Universal Database™

DB2 Universal Database can be any of Version 6.1, 7.1, 7.2, and 8.1. Data Links Manager can be any of Version 7.1, 7.2, and 8.1. For example, DB2 UDB can be at Version 7.1 or Version 8.1 and Data Links Manager can be at Version 8.1. To check the version of DB2 that resides on a workstation, enter the **db2level** command. These versions of DB2 UDB and Data Links Manager can be used in any combination.



If DB2 is at the higher version, such as Version 8.1, the Data Links Manager features introduced in Version 8.1 will not be available when you connect to a Data Links Manager at Version 7. You will receive an SQL error if you attempt to use the Version 8 features.

### Migrating from previous versions

Different levels of DB2 Data Links Manager instances cannot exist on the same machine. If you have a pre-Version 8.1 Data Links instance on your system, you must migrate the instance to the Version 8.1 format using the **db2imigr** command.

Registry variables offer more function and flexibility than environment variables. However, because of this, it is possible that migration will not be performed exactly as expected. The registry variables should be checked using the **db2set** command after migration.

### Data Links server security

In releases prior to DB2 Data Links Version 8.1, there were no security controls on linking a file. If you migrated from a previous release, you will be given the option at DLFM migration time to enable these security controls on your existing DLFM server(s).

### Migrating from DB2 Data Links Version 7.1 or 7.2 to DB2 Data Links Manager Version 8

To migrate from DB2 Data Links Manager Version 7.1 or 7.2 to DB2 Data Links Manager Version 8.1:

1. Prepare your DB2 and DLFM databases for migration. For example, you may wish to backup your existing databases.
2. Install DB2 Version 8 on your DB2 server and Data Links Manager server machines. These tasks are detailed below.
3. As DLFM, run the **/opt/IBM/db2/V8.1/adm/db2dlmmg** command.

When you migrate to DB2 Data Links Manager Version 8, the following environment variables will be converted to DB2 registry variables:

```
DLFM_INSTALL_PATH
DLFM_PORT
DLFM_LOG_LEVEL
DB2_RR_TO_RS
DLFM_BACKUP_DIR_NAME (1)
DLFM_BACKUP_TARGET (2)
DLFM_BACKUP_TARGET_LIBRARY (3)
```

#### Notes:

1. This variable is only used if a local file system is the backup target.

2. Used to indicate the type of backup target used. Possible values for this variable are LOCAL, TSM, or XBSA.
3. Used to indicate the XBSA support code library only if the DLFM\_BACKUP\_TARGET is set to XBSA. The support code library must be fully qualified and must include the shared object name, for example  
`/opt/IBM/db2/v8.1/Legato/libxdb2.so(bsashr10.o)`. The name of the shared object, in this case `bsashr10.o`, is available from the vendor supplying the XBSA compliant shared library.

### **DLFM user account**

In addition to the DB2 Data Links Manager Administrator user account, the DLFM user account is also created during installation for use by the Data Links File Manager. The DLFM user account is the owner of all READ PERMISSION DB files.

### **TCP/IP port number**

You must have a TCP/IP port available for use by the Data Links File Manager. By default, the DB2 Setup wizard generates a value for you. You can use this value or provide your own. You will need to know this port number to verify the installation.

If you want to specify your own port number, review the TCP/IP ports that are already in use on a machine by opening the `/etc/services` file. You will need to specify this port during the installation.

Once you have selected a TCP/IP port number for use by the DLFM, the value should not be changed.

### **Determining hostnames**

You must determine the names of each of your DB2 servers and Data Links servers. You will need to know these hostnames to verify the installation. When connecting to a DB2 Data Links File Manager, the DB2 UDB server internally sends the following information to the DLFM:

- Database name
- Instance name
- Hostname

The DLFM then compares this information with its internal tables to determine whether the connection should be allowed. It will allow the connection only if this combination of database name, instance name, and hostname has been registered with it, using the `dlfm add_db` command. The hostname that is used in the `dlfm add_db` command must exactly match the hostname that is internally sent by the DB2 UDB server.

The DLFM then verifies this information to decide if a connection from this particular DB2 server should be allowed. The subroutine that obtains hostname information on the DB2 server, `gethostbyname`, looks for `/etc/resolv.conf`. If this file exists, the subroutine queries the domain name server. If the request to the DNS times out, the `gethostbyname` routine checks the local `/etc/hosts` file. To connect successfully to the DLFM, the name registered on the DLFM must be the one which is obtained by the `gethostbyname` routine on the DB2 UDB server.

Use the output of the `uname -n` command for the hostname when registering a DB2 UDB database using the `dlfm add_db` command. The DB2 server's internal connections to the DLFM will fail if any other aliases are used in the `dlfm add_db` command.

Repeat this on each DB2 Data Links and DB2 UDB server.

A Data Links server is registered to a DB2 database using the DB2 `add datalinks manager for database database_alias using node hostname port port_number` command.

The hostname is the name of the Data Links server. Any valid alias of the Data Links server can be used in this command. DATALINK values that are references to this Data Links server must specify the hostname in the URL value; that is, the exact name that was used in the `add datalinks manager` command must be used when assigning URL values to DATALINK columns. Using a different alias will cause the SQL statement to fail.

### Synchronize system clocks

Ensure that the system clocks on the Data Links server and the remote DB2 server are synchronized and remain synchronized for linked files in the DATALINKS columns with the READ PERMISSION DB option. Synchronization of clocks is essential for the Data Links token expiry interval to work correctly. The token expiry interval is a database configuration parameter that controls how long a selected DATALINK value (consisting of a URL with an embedded file authorization token) may be used. To check the system time and date, enter the `date` command.

For more information on synchronizing system clocks, refer to the *Solaris Administration Guide*.

### Data Links replication

Data Links Manager Version 8.1 introduces two new registry variables, `DLFM_START_ASCOPYD` and `DLFM_ASCOPYD_PORT`. During installation, you will be prompted to enable the Data Links

Manager Replication daemon. If you plan to use Data Links Replication, you should enable the Replication daemon during the installation. You can also enable it after installation by setting the registry variables (DLFM\_START\_ASNCOPYD and DLFM\_ASNCOPYD\_PORT) and restarting the DLFM.

**Related concepts:**

- “DB2 Data Links Manager” on page 2
- “Installation overview for DB2 servers (Windows)” in the *Quick Beginnings for DB2 Servers*
- “Introduction to Data Links Manager security” in the *DB2 Data Links Manager Administration Guide and Reference*

**Related tasks:**

- “Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)” on page 90
- “Installing DB2 Data Links Manager manually using the db2\_install command (Solaris Operating Environment)” on page 91
- “Migrating databases” in the *Quick Beginnings for DB2 Servers*
- “Migrating DB2 (UNIX)” in the *Quick Beginnings for DB2 Servers*
- “Enabling the Data Links Manager Replication Daemon” in the *Post V8 GA*

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## Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)

After updating your Solaris Operating Environment kernel configuration parameters, you can begin installing DB2 Data Links Manager. The DB2 Setup wizard is the recommended method for installing DB2 Data Links Manager for Solaris Operating Environment.

**Prerequisites:**

Log in as a user ID with root authority.

**Procedure:**

To install the DB2 Data Links Manager for Solaris using the DB2 Setup wizard:

1. Insert and mount your DB2 product CD-ROM.
2. Change to the directory where the CD-ROM is mounted by entering the `cd /cdrom` command where `cdrom` is the mount point of your product CD-ROM.

3. Enter the `./db2setup` command. The Launchpad opens.
4. Select **Install Products**.
5. Select the products you want and are licensed to install. Click **Next** to launch the DB2 Setup wizard.

You can choose the product's **Customize** option to view and change the components that will be installed.

Select **Next** to continue the installation process or **Cancel** to go back to a previous window. Select **Help** for more information or assistance during the installation of any DB2 product.

When installation is complete, DB2 Data Links Manager will be installed in the `/opt/IBM/db2/V8.1/` directory.

You can use the DB2 Setup wizard at any time to create another instance or install additional DB2 products or components. Log in as a user ID with root authority and run the `./db2setup` command from your DB2 product CD-ROM.

**Related concepts:**

- “DB2 Data Links Manager” on page 2
- “Before you install DB2 Data Links Manager (Solaris Operating Environment)” on page 83

**Related tasks:**

- “Verifying the installation (Solaris Operating Environment)” on page 96
- “Installing DB2 Data Links Manager manually using the `db2_install` command (Solaris Operating Environment)” on page 91

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## Installing DB2 Data Links Manager manually using the `db2_install` command (Solaris Operating Environment)

The DB2 Setup wizard is the recommended method for installing all DB2 products on UNIX-based operating systems. This wizard can perform all of the tasks required to install DB2 Data Links Manager. However, if you want more control of the install process, you can manually install DB2 Data Links Manager using the `db2_install` command.

**Prerequisites:**

Log in as a user ID with root authority.

**Procedure:**

To install DB2 Data Links Manager for Solaris using the **db2\_install** command:

1. Insert and mount the appropriate CD-ROM.
2. If the Volume Manager is *not* running on your system, enter the following commands to mount the CD-ROM:

```
mkdir -p /cdrom/unnamed_cdrom
mount -F hsfs -o ro /dev/dsk/c0t6d0s2 /cdrom/unnamed_cdrom
```

where `/cdrom/unnamed_cdrom` represents the CD-ROM mount directory and `/dev/dsk/c0t6d0s2` represents the CD-ROM drive device.

**Note:** If you are mounting the CD-ROM drive from a remote system using NFS, the CD-ROM file system on the remote machine must be exported with root access. You must also mount that file system with root access on the local machine.

If the Volume Manager (`vold`) is running on your system, the CD-ROM is automatically mounted as:

```
/cdrom/unnamed_cdrom
```

3. Run the **db2\_install** command as follows:

```
/cdrom/unnamed_cdrom/db2_install
```

The **db2\_install** command prompts for one or more of the following to be installed, and for the base directory where the product files are to be installed. The products are listed by keyword and product description.

### DB2.DLM

DB2 Data Links Manager for Solaris

The command displays the following prompt: Specify one or more of the keywords separated by spaces.

4. Type the keyword of the product to be installed when prompted.
5. Type the name of the base directory when prompted. The default base directory is `/opt`.

If the default base directory is used, all files will be installed in the `/opt/IBM/db2/V8.1` directory.

6. Enter Yes to start the product installation.

### Related concepts:

- “DB2 Data Links Manager” on page 2
- “Before you install DB2 Data Links Manager (Solaris Operating Environment)” on page 83

### Related tasks:

- “Verifying the installation (Solaris Operating Environment)” on page 96
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)” on page 90

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## Actions performed by the DB2 Setup wizard (Solaris Operating Environment)

After installation is complete and before you exit the DB2 Setup wizard, you can select **View Log** to review the installation process. You can also review the `/tmp/db2setup.log` file for more detailed information. If you ran the `./db2setup -t /tmp/trace.out` command to capture any installation errors, you can review the trace log in `/tmp/trace.out`.

The following actions are performed by the DB2 Setup wizard:

### Installation directory

DB2 Data Links Manager and DB2® Universal Database are installed in the `/opt/IBM/db2/V8.1/` directory. DB2 Data Links Manager uses DB2 UDB to maintain logged information for the linked files.

### Group and user IDs

A group ID (gid) and user ID (uid) are created for the DB2 Data Links Manager Administrator, if you selected to do so during installation.

### Instance creation

An instance for the Data Links File Manager is created. The default instance, associated with the default group and user ID, is called DLFM.

### Registry variables

The following registry variables are set:

```
DLFM_PORT=port_number
DLFM_LOG_LEVEL=LOG_ERR
DB2_RR_TO_RS=ON
DB2_HASH_JOIN=ON
DLFM_INSTALL_PATH=/home/instance/sqllib/bin
//where instance is the Data Links Administrator ID
DLFM_INSTANCE_NAME=instance_name
DB2INSTANCE=instance_name
DLFM_BACKUP_DIR_NAME=$HOME/dlfbbackup //UFS only
DLFM_BACKUP_TARGET=LOCAL
//You have three choices: LOCAL, TSM, and XBSA
DLFM_FS_ENVIRONMENT=NATIVE //the only value available on Solaris
DLFM_START_ASCOPYD=NO //or YES if you have enabled it
DLFM_ASCOPYD_PORT=65535
DLFM_NUM_ARCHIVE_SUBSYSTEMS=2
```

where:

- *port\_number* represents the port number reserved for the Data Links File Manager.

- *instance\_name* represents the name of the Data Links File Manager instance.

### **PATH variables**

The following variables are set in the DB2 Data Links Manager Administrator's `db2profile` or `db2cshrc` script file:

```
(for bash, Bourne, or Korn shell)
export PATH=$PATH:$HOME/sql1lib/bin:$HOME/sql1lib/adm:$HOME/sql1lib/misc
(for C shell)
setenv PATH=${PATH}:${HOME}/sql1lib/bin:${HOME}/sql1lib/adm:${HOME}/sql1lib/misc
```

To run the DB2 Data Links Manager Administrator's `db2profile` or `db2cshrc` script file each time this user ID logs on to the system, add the following entry to the DB2 Data Links Manager Administrator's `.profile` script file:

```
. INSTHOME/sql1lib/db2profile (for bash, Bourne, or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

where *INSTHOME* represents the home directory of the DB2 Data Links Manager Administrator.

### **Virtual File System setup**

The directory `dlfs` is created under `/usr/lib/fs/`. The directory `/usr/lib/fs/dlfs` would contain the `dlfs` helpers.

### **DB2 database DLFM\_DB created**

A `DLFM_DB` database is created on the node containing DB2 Data Links Manager.

### **Related concepts:**

- "Before you install DB2 Data Links Manager (Solaris Operating Environment)" on page 83

### **Related tasks:**

- "Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)" on page 90
- "Installing DB2 Data Links Manager manually using the `db2_install` command (Solaris Operating Environment)" on page 91



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## Verifying the DLFM\_DB was successfully created and catalogued (Solaris Operating Environment)

Once the DB2 Setup wizard has finished installing DB2<sup>®</sup> Data Links Manager on your system, you should ensure that it successfully created and catalogued the DLFM\_DB database by listing the contents of the System Database Directory. Once you have verified that this database exists, you need to set up a backup and recovery scheme to aid in crash recovery and protect the integrity of your data.

### Procedure:

To verify that the DLFM\_DB database was successfully created and catalogued:

1. Run the db2profile or db2cshrc script as follows:

```
. INSTHOME/sql1lib/db2profile (for bash, Bourne or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

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

2. Retrieve the entry for the DLFM\_DB database in the System Database Directory:

```
db2 list database directory
```

This command returns output similar to the following:

```
System Database Directory

Number of entries in the directory = 1

Database 1 entry:

Database alias = DLFM_DB
Database name = DLFM_DB
Local database directory = /home/dlfm

Database release level = 9.00
Comment =
Directory entry type = Indirect (1)
Catalog node number = 0
```

### Related concepts:

- “Before you install DB2 Data Links Manager (Solaris Operating Environment)” on page 83

### Related tasks:

- “Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)” on page 90

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## Verifying the installation (Solaris Operating Environment)

This topic describes how to verify your installation on Solaris Operating Environment. It helps you configure a DB2 Data Links Manager environment to control files that are linked to DATALINK columns on a DB2 Universal Database server.

### Procedure:

To verify the installation of Data Links Manager:

1. Create a test environment on the DB2 server.
2. Create a test environment on the DB2 Data Links server.
3. Register the Data Links Server with the DB2 database.
4. Verify the sample file is controlled by DLFF.
5. Verify the sample file is accessible.
6. View the sample file.

### Related concepts:

- “Before you install DB2 Data Links Manager (Solaris Operating Environment)” on page 83

### Related tasks:

- “Creating a test environment on the DB2 server (Solaris Operating Environment)” on page 97
- “Creating a test environment on the DB2 Data Links server (Solaris Operating Environment)” on page 99
- “Registering the Data Links server with the DB2 database (Windows)” on page 35
- “Verifying the sample file is controlled by DLFF (Solaris Operating Environment)” on page 107
- “Verifying the sample file is accessible (Solaris Operating Environment)” on page 108
- “Viewing the sample file (Solaris Operating Environment)” on page 109
- “Installing DB2 Data Links Manager using the DB2 Setup wizard (Solaris Operating Environment)” on page 90
- “Installing DB2 Data Links Manager manually using the db2\_install command (Solaris Operating Environment)” on page 91

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## Installation verification tasks

### Creating a test environment on the DB2 server (Solaris Operating Environment)

*Creating a test environment on the DB2 server is part of the larger task of Verifying the Data Links Manager installation.*

#### Prerequisites:

- Log on to the system with a valid DB2 user ID that has root authority.
- A valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you will create. By default, any user ID that belongs to the primary group of the instance owner has SYSADM authority on an instance.

#### Procedure:

To create a test environment on the DB2 server:

1. Create an instance on the DB2 server using the **db2icrt** command. This instance will contain a database where tables containing columns of the DATALINK data type will reside.

In our example, we will create an instance called VALIDATE by entering the following commands:

```
groupadd testers
useradd pgrp='testers' groups='testers' home='/home/validate' validate
/opt/IBMDb2/V8.1/instance/db2icrt -u validate validate
```

2. Log out.
3. Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user ID that belongs to the primary group of the instance owner has SYSADM authority on an instance.
4. Ensure that the VALIDATE instance is the current instance by entering the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

5. Set the DATALINKS database manager configuration parameter to *YES* in the VALIDATE instance's configuration file by entering the following command:

```
db2 update dbm cfg using datalinks yes
```

To disable DB2 Data Links Manager functionality on your DB2 server, you would set the DATALINKS database manager configuration parameter to *no*.

6. Start the VALIDATE instance by entering the **db2start** command.

**Note:** If you change a setting in an instance's database manager configuration file, you must ensure that you stop and restart the instance (using the **db2stop** and **db2start** commands) for the changes to take effect. In our example, we did not start the VALIDATE instance, so we only issued the **db2start** command.

7. Create a database using the **db2 create database** command. This database will contain a table using the DATALINK data type.

For the example, create a database called STAFF by entering the following command:

```
db2 create database staff
```

8. Connect to the STAFF database by entering the following command:

```
db2 connect to staff
```

9. Create a table called EMPLOYEE, in the STAFF database that you just created, that has a column defined with a DATALINK data type by entering the following command:

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

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

```
db2 connect reset
```

11. Log out.

Now you can create a test environment on the DB2 Data Links server.

#### **Related tasks:**

- “UNIX Details When Creating Instances” in the *Administration Guide: Implementation*
- “Creating a test environment on the DB2 Data Links server (Solaris Operating Environment)” on page 99

#### **Related reference:**

- “CREATE DATABASE” in the *Command Reference*
- “db2icrt - Create Instance” in the *Command Reference*

## Creating a test environment on the DB2 Data Links server (Solaris Operating Environment)

*Creating a test environment on the DB2 Data Links server* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*. After creating a test environment on the DB2 UDB server, you must now create a test environment on the DB2 Data Links server.

### Procedure:

To create the test environment on the Data Links server:

1. Prepare your file system for Data Links Manager.
2. Register the file system with the Data Links File Filter.
3. Register the DB2 database.
4. Authorize a DB2 user ID to link a file.
5. Create a sample file.

### Related tasks:

- “Preparing your file system for Data Links Manager (Solaris Operating Environment)” on page 99
- “Registering the file system with the DLFF (Solaris Operating Environment)” on page 100
- “Registering the DB2 database with the Data Links File Manager (Solaris Operating Environment)” on page 102
- “Authorizing a DB2 user ID to link a file (Solaris Operating Environment)” on page 103
- “Creating the sample file for DB2 Data Links Manager (Solaris Operating Environment)” on page 104
- “Creating a test environment on the DB2 server (Solaris Operating Environment)” on page 97

## Preparing your file system for Data Links Manager (Solaris Operating Environment)

*Preparing your file system for Data Links Manager* is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

You can use an existing file system or create a UNIX File System (UFS) to test your Data Links Manager installation. You can use an existing UFS file system as long as there is no conflict with having it controlled by DLFF.

### Prerequisites:

Log in as a user ID with root authority.

## Procedure:

To prepare a UFS to use a Data Links Filesystem Filter (DLFF):

1. (Optional) Create a UFS file system using the **newfs** command. You can also use an existing UFS file system. For more information on the options for creating a new file system, refer to your Solaris product documentation.

2. Open the `/etc/vfstab` file, record the entries as:

```
/dev/dsk/c0t0d0s6 /dev/rdisk/c0t0d0s6 /dlfs dlfs - yes Basefs=ufs
```

where `c0t0d0s6` represents a sample value for this example.

3. (Optional) If you have not set up your file system using the DB2 Setup wizard during installation, you can modify the properties of a file system so that it comes under the control of the DLFF, and mount it by entering the following commands:

```
/opt/IBM/db2/V8.1/instance/dlffmsmd dlfm_mountpoint
```

where `dlfm_mountpoint` represent the mount point of the UFS you are using.

For our example, enter the following command:

```
/opt/IBM/db2/V8.1/instance/dlffmsmd /test
```

4. Log out.

Now you can register the file system with the DLFF.

## Related tasks:

- “Registering the file system with the DLFF (Solaris Operating Environment)” on page 100

## Registering the file system with the DLFF (Solaris Operating Environment)

*Registering the file system with the DLFF is part of the larger task of Creating a test environment on the DB2 Data Links server.*

## Prerequisites:

Log on to the system as the DB2 Data Links Manager Administrator.

## Procedure:

To register the `/test` file system with the Data Links Filesystem Filter:

1. Run the `db2profile` or `db2cshrc` script as follows:

```
. INSTHOME/sqllib/db2profile (for bash, Bourne or Korn shell)
source INSTHOME/sqllib/db2cshrc (for C shell)
```

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

2. Start the Data Links File Manager by entering the **dlfm start** command.
3. Ensure that the Data Links File Manager started successfully by entering the **dlfm see** command.

If the Data Links File Manager back-end processes started successfully and are running, you will receive output similar to the following:

```
PID PPID PGID RUNAME UNAME ETIME DAEMON NAME
1661 1653 1652 root dlfm 20:40:15 dlfm_mon_wd_(dlfm)
1665 1653 1652 root dlfm 20:40:15 dlfm_upcall_(dlfm)
1666 1653 1652 root dlfm 20:40:15 dlfm_delgrp_(dlfm)
1674 1663 1652 root dlfm 20:40:13 dlfm_ar_ag_(dlfm)
1675 1663 1652 root dlfm 20:40:13 dlfm_ar_ag_(dlfm)
1663 1653 1652 root dlfm 20:40:15 dlfm_archived_(dlfm)
1653 1 1652 root dlfm 20:40:18 dlfm_wd_(dlfm)
1662 1653 1652 root dlfm 20:40:15 dlfm_cmgrd_(dlfm)
1664 1653 1652 root dlfm 20:40:15 dlfm_gcd_(dlfm)
```

4. Ensure that you successfully mounted and configured the UFS that is under the control of a DLFF:

```
/usr/sbin/mount -v | awk '$5 == "dlfs"'
```

For our example, this command, on Solaris Version 7 should return output similar to the following:

```
/dev/dsk/c0t1d0s0 on /dlfstest type dlfs rw/suid/Basefs=ufs on Wed Jan 9 08:39:53 2002
/dev/dsk/c0t2d0s0 on /dlfstest type dlfs rw/suid/Basefs=ufs on Wed Jan 9 08:39:53 2002
```

For our example, this command, on Solaris Version 8 should return output similar to the following:

```
/dev/dsk/c1t1d0s3 on /dlfstest type dlfs read/write/setuid/intr/largefiles/onerr
or=panic/dev=800043 on Wed Jan 9 08:40:28 2002
```

5. Register a file system that is under the control of a Data Links Filesystem Filter by entering the following command:

```
dlfm add_prefix prefix_path
```

where *prefix\_path* represents the location of the filesystem that is under the control of a DLFF.

The following command registers the Data Links server to use the Data Links Filesystem Filter on the test file system:

```
dlfm add_prefix /test
```

To list the registered prefixes, enter the following command:

```
dlfm list registered prefixes
```

Now you can register the DB2 database with the Data Links File Manager.

### Related tasks:

- “Registering the DB2 database with the Data Links File Manager (Solaris Operating Environment)” on page 102

**Related reference:**

- “dlfm add\_prefix command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm list registered prefixes command” in the *DB2 Data Links Manager Administration Guide and Reference*

## Registering the DB2 database with the Data Links File Manager (Solaris Operating Environment)

*Registering the DB2 database with the Data Links File Manager is part of the larger task of Creating a test environment on the DB2 Data Links server.*

**Prerequisites:**

Log on to the system as the DB2 Data Links Manager Administrator.

**Procedure:**

To register a new database with the Data Links File Manager:

1. Register the remote DB2 UDB database where the DATALINK type column was defined by entering the following command:

```
dlfm add_db database instance hostname
```

where

- *database* represents the database alias name of the remote database.
- *instance* represents the instance where *database* resides. If you are registering a Windows instance on a Solaris Data Links Manager, *instance* must be in uppercase.
- *hostname* represents the hostname of the DB2 UDB server where *database* resides.

The following command will register a database called STAFF, which resides in the VALIDATE instance on a DB2 UDB server with a hostname of db2server.services.com:

```
dlfm add_db staff validate db2server.services.com
```

Do not specify the DLFM\_DB when you run this command. The DLFM\_DB is a local database that is used to keep track of files that are under the control of the Data Links File Manager.

To list the registered database, enter the following command:

```
dlfm list registered databases
```



2. Log out.

Now you can authorize a DB2 user ID to link a file.

**Related tasks:**

- “Registering the file system with the DLFF (Solaris Operating Environment)” on page 100
- “Creating the sample file for DB2 Data Links Manager (Solaris Operating Environment)” on page 104
- “Authorizing a DB2 user ID to link a file (Solaris Operating Environment)” on page 103

**Related reference:**

- “dlfm add\_db command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “dlfm list registered databases command” in the *DB2 Data Links Manager Administration Guide and Reference*

## Authorizing a DB2 user ID to link a file (Solaris Operating Environment)

You can authorize a DB2 user ID to link a file. *Authorizing a DB2 user ID to link a file* is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

**Prerequisites:**

Log on to the system as the DB2 Data Links Manager Administrator.

**Procedure:**

To authorize a DB2 user ID to link a file in the example `/test/pictures` directory:

1. Run:

```
dlfm grant link privilege on dir /test/pictures/ to
user db2-username for db staff inst validate
node db2server.services.com
```

where `db2-username` must be the user ID with which you log on when you perform the link operation (for example, using the SQL INSERT statement) on DB2.

2. To verify that your **dlfm grant** command was correctly specified:

```
dlfm list registered users for directory "/test/pictures/ on
db staff inst validate node db2server.services.com
```

This command should return the `db2-username` that was specified above.

### 3. Log out.

By default, link security controls are set to `ENABLED` during the installation. Use the `dlfm set link security off` command to disable this feature and the `dlfm set link security on` command to re-enable it.

Now you can create a sample file.

#### **Related tasks:**

- “Creating the sample file for DB2 Data Links Manager (Solaris Operating Environment)” on page 104

#### **Related reference:**

- “`dlfm grant` command” in the *DB2 Data Links Manager Administration Guide and Reference*
- “`dlfm set link security` command” in the *DB2 Data Links Manager Administration Guide and Reference*

## **Creating the sample file for DB2 Data Links Manager (Solaris Operating Environment)**

You can create a sample file for DB2 Data Links Manager. *Creating the sample file for DB2 Data Links Manager* is part of the larger task of *Creating a test environment on the DB2 Data Links server*.

#### **Prerequisites:**

Log on to the system as any user ID that is *not* a DB2 Data Links Manager Administrator.

#### **Procedure:**

To create a sample file:

1. Create a directory on the file system that is under the control of a Data Links Filesystem Filter (DLFF), to store files to be controlled by a DB2 server, by entering the following command:

```
mkdir filesystem_name/directory_name
```

where:

- *filesystem\_name* represents the name of the file system that is under the control of a DLFF.
- *directory\_name* represents the name of the directory that you want to create.

The DB2 Data Links Manager Administrator should never be the owner of any files or directories that are in a file system under the control of a Data Links Filesystem Filter. Enter the following command to create the directory called pictures on the file system /test:

```
mkdir /test/pictures
```

2. Change the permissions for the pictures directory that you just created so that any user ID can create a file in it by entering the following command:

```
chmod 777 /test/pictures
```

3. Create a file called psmith.bmp in the /test/pictures directory, to be managed by the Data Links File Manager:

```
echo "This is a picture of Paul Smith." > /test/pictures/psmith.bmp
```

4. Log out.

The sample file psmith.bmp is a text file, not a bitmap as the .bmp extension implies. For the purpose of verifying your installation, this file represents an employee's picture that will be inserted into a table that was defined with the DATALINKS data type.

You can now registering the Data Links server with the DB2 database.

#### **Related tasks:**

- "Registering the Data Links server with the DB2 database (Solaris Operating Environment)" on page 105

## **Registering the Data Links server with the DB2 database (Solaris Operating Environment)**

You can register the Data Links server with a DB2 database. *Registering the Data Links server with the DB2 database* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*.

#### **Prerequisites:**

Log on to the DB2 server with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user ID that belongs to the *Local Administrators* group has SYSADM authority on an instance.

#### **Procedure:**

To register the Data Links server with the remote DB2 UDB database where the DATALINK type column was defined earlier:

1. Enter the following command:

```
db2 get instance
```

This command should return the following output:

```
The current database manager instance is: VALIDATE
```

If you do not receive this output, enter the following commands:

```
set DB2INSTANCE=VALIDATE
db2 get instance
```

2. Start the VALIDATE instance by entering the **db2start** command.
3. Register a Data Links server that will control the files that are linked by a DATALINK type column by entering the following command:

```
db2 "add datalinks manager for database database_alias
 using node hostname port port_number"
```

where:

- *database\_alias* represents the database alias name of the database.
- *hostname* represents the fully qualified hostname of the Data Links server.
- *port\_number* represents the port number that you have reserved for communications between the Data Links server and the DB2 server. You specified this port number during the installation of DB2 Data Links Manager.

For our example, enter the following command:

```
db2 "add datalinks manager for database staff using node dlmsvr.services.com port 50100"
```

4. Connect to the STAFF database by entering the following command:
5. Insert an entry into the EMPLOYEE table that you created by entering the following command:

```
db2 "insert into employee values (001,'Paul','Smith',
 dlvalue('http://file_location/controlled_file'))"
```

where:

- *file\_location* represents the fully qualified location of the file that is under the control of a Data Links Filesystem Filter on the Data Links server.
- *controlled\_file* represents the filename of the file that you want to control on the Data Links server.

For our example, enter the following command

```
db2 "insert into employee values (001,'Paul','Smith',
 dlvalue('http://dlmsvr.services.com/test/pictures/psmith.bmp'))"
```

6. Log out.

Now you can verify the sample file is controlled by DLFF.

**Related tasks:**

- “Verifying the sample file is controlled by DLFF (Solaris Operating Environment)” on page 107

## Verifying the sample file is controlled by DLFF (Solaris Operating Environment)

*Verifying the sample file is controlled by DLFF is part of the larger task of Verifying the installation of DB2 Data Links Manager.*

### Prerequisites:

Log on to the system as any user ID except as a user ID with root authority, or as the DB2 Data Links Manager Administrator.

### Procedure:

To verify that the `psmith.bmp` sample file is under the control of the Data Links Filesystem Filter:

1. Enter:

```
cat controlled_file
```

where *controlled\_file* represents the full pathname of the file that is controlled by the Data Links server.

For our example, enter the following command:

```
cat /test/pictures/psmith.bmp
```

**Note:** We are using the `cat` command here because `psmith.bmp` is really a text file. Running the `cat` command on a true binary file would return unreadable output.

If this file is being controlled by the Data Links File Manager, you will receive the following error:

```
Cannot open /test/pictures/psmith.bmp
```

2. Log out.

Now you can verify the sample file is accessible.

### Related tasks:

- “Creating a test environment on the DB2 Data Links server (Solaris Operating Environment)” on page 99
- “Verifying the sample file is accessible (Solaris Operating Environment)” on page 108

## Verifying the sample file is accessible (Solaris Operating Environment)

*Verifying the sample file is accessible* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*

### Prerequisites:

Log on to the system with a valid DB2 user ID that has System Administrative (SYSADM) authority on the VALIDATE instance that you created. By default, any user ID that belongs to the primary group of the instance owner has SYSADM authority on an instance.

### Procedure:

To verify that the `psmith.bmp` sample file can be accessed while it is under the control of the Data Links File Manager:

1. Run the `db2profile` or `db2cshrc` script as follows:

```
. INSTHOME/sql1lib/db2profile (for bash, Bourne or Korn shell)
source INSTHOME/sql1lib/db2cshrc (for C shell)
```

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

2. Start the VALIDATE instance by entering the **db2start** command.
3. Connect to the STAFF database by entering the following command:  
`db2 connect to staff`
4. Select the controlled file by issuing an SQL SELECT statement.

For our example, enter the following command:

```
db2 "select dlurlpath(picture) from employee where lname = 'Smith'"
```

This command returns the full pathname with an access token of the form:

```
controlled_filepath/access_token;controlled_filename
```

where:

- *controlled\_filepath* represents the fully qualified path of the controlled file.
- *access\_token* represents an encrypted key assigned by the database manager.
- *controlled\_filename* represents the name of the file that is under the control of a Data Links Filesystem Filter.

For example, you will receive an access token that is similar to the following:

```
/test/pictures/HVJ5NXGC0WQ.I5KKB6;psmith.bmp
```

This access token will be used to read this file on the Data Links server.

**Note:** By default, this access token is only valid for 60 seconds. This means that once you enter this command, you have only 60 seconds to complete the remaining steps in this section. You can increase the access token expiry time by updating the *dl\_expint* database configuration parameter.

To change the default expiration time for an access token to 10 minutes (the value is entered in seconds), enter the following commands:

```
db2 update db cfg for staff using dl_expint 600
db2 terminate
db2 connect to staff
```

If you change a setting for any database configuration parameter, you must always reconnect to the database for the changes to take effect.

5. Log out.

Now you can view the sample file.

**Related tasks:**

- “Verifying the sample file is controlled by DLFF (Solaris Operating Environment)” on page 107
- “Viewing the sample file (Solaris Operating Environment)” on page 109

## Viewing the sample file (Solaris Operating Environment)

*Viewing the sample file* is part of the larger task of *Verifying the installation of DB2 Data Links Manager*. You will use the access token obtained in the previous step to view the *psmith.bmp* file.

**Prerequisites:**

Log on to the system as any user ID except as a user ID with root authority, or as the DB2 Data Links Manager Administrator.

**Procedure:**

To verify that you can access the file that is under the control of the Data Links File Manager:

1. Enter the following command:

```
cat "/test/pictures/access_token;psmith.bmp"
```

where *access\_token* represents the encrypted key that you received in the previous step.

You should receive the following output from this command:

```
"This is a picture of Paul Smith."
```

If you did not receive an error, you have access to this file and you have installed and configured DB2 Data Links Manager correctly.

**Related tasks:**

- “Verifying the sample file is controlled by DLFF (Solaris Operating Environment)” on page 107
- “Verifying the sample file is accessible (Solaris Operating Environment)” on page 108



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## Appendix A. DB2 Universal Database technical information

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### Overview of DB2 Universal Database technical information

DB2 Universal Database technical information can be obtained in the following formats:

- Books (PDF and hard-copy formats)
- A topic tree (HTML format)
- Help for DB2 tools (HTML format)
- Sample programs (HTML format)
- Command line help
- Tutorials

This section is an overview of the technical information that is provided and how you can access it.

### Categories of DB2 technical information

The DB2 technical information is categorized by the following headings:

- Core DB2 information
- Administration information
- Application development information
- Business intelligence information
- DB2 Connect information
- Getting started information
- Tutorial information
- Optional component information
- Release notes

The following tables describe, for each book in the DB2 library, the information needed to order the hard copy, print or view the PDF, or locate the HTML directory for that book. A full description of each of the books in the DB2 library is available from the IBM Publications Center at [www.ibm.com/shop/publications/order](http://www.ibm.com/shop/publications/order)

The installation directory for the HTML documentation CD differs for each category of information:

*htmlcdpath/doc/htmlcd/%L/category*

where:

- *htmlcdpath* is the directory where the HTML CD is installed.
- *%L* is the language identifier. For example, en\_US.
- *category* is the category identifier. For example, core for the core DB2 information.

In the PDF file name column in the following tables, the character in the sixth position of the file name indicates the language version of a book. For example, the file name db2d1e80 identifies the English version of the *Administration Guide: Planning* and the file name db2d1g80 identifies the German version of the same book. The following letters are used in the sixth position of the file name to indicate the language version:

| Language             | Identifier |
|----------------------|------------|
| Arabic               | w          |
| Brazilian Portuguese | b          |
| Bulgarian            | u          |
| Croatian             | 9          |
| Czech                | x          |
| Danish               | d          |
| Dutch                | q          |
| English              | e          |
| Finnish              | y          |
| French               | f          |
| German               | g          |
| Greek                | a          |
| Hungarian            | h          |
| Italian              | i          |
| Japanese             | j          |
| Korean               | k          |
| Norwegian            | n          |
| Polish               | p          |
| Portuguese           | v          |
| Romanian             | 8          |
| Russian              | r          |
| Simp. Chinese        | c          |
| Slovakian            | 7          |
| Slovenian            | l          |
| Spanish              | z          |
| Swedish              | s          |
| Trad. Chinese        | t          |
| Turkish              | m          |

**No form number** indicates that the book is only available online and does not have a printed version.

## Core DB2 information

The information in this category cover DB2 topics that are fundamental to all DB2 users. You will find the information in this category useful whether you are a programmer, a database administrator, or you work with DB2 Connect, DB2 Warehouse Manager, or other DB2 products.

The installation directory for this category is `doc/htmlcd/%L/core`.

*Table 3. Core DB2 information*

| <b>Name</b>                                                   | <b>Form Number</b> | <b>PDF File Name</b> |
|---------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Universal Database Command Reference</i>           | SC09-4828          | db2n0x80             |
| <i>IBM DB2 Universal Database Glossary</i>                    | No form number     | db2t0x80             |
| <i>IBM DB2 Universal Database Master Index</i>                | SC09-4839          | db2w0x80             |
| <i>IBM DB2 Universal Database Message Reference, Volume 1</i> | GC09-4840          | db2m1x80             |
| <i>IBM DB2 Universal Database Message Reference, Volume 2</i> | GC09-4841          | db2m2x80             |
| <i>IBM DB2 Universal Database What's New</i>                  | SC09-4848          | db2q0x80             |

## Administration information

The information in this category covers those topics required to effectively design, implement, and maintain DB2 databases, data warehouses, and federated systems.

The installation directory for this category is `doc/htmlcd/%L/admin`.

*Table 4. Administration information*

| <b>Name</b>                                                            | <b>Form number</b> | <b>PDF file name</b> |
|------------------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Universal Database Administration Guide: Planning</i>       | SC09-4822          | db2d1x80             |
| <i>IBM DB2 Universal Database Administration Guide: Implementation</i> | SC09-4820          | db2d2x80             |
| <i>IBM DB2 Universal Database Administration Guide: Performance</i>    | SC09-4821          | db2d3x80             |
| <i>IBM DB2 Universal Database Administrative API Reference</i>         | SC09-4824          | db2b0x80             |

*Table 4. Administration information (continued)*

| <b>Name</b>                                                                               | <b>Form number</b> | <b>PDF file name</b> |
|-------------------------------------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Universal Database Data Movement Utilities Guide and Reference</i>             | SC09-4830          | db2dmx80             |
| <i>IBM DB2 Universal Database Data Recovery and High Availability Guide and Reference</i> | SC09-4831          | db2hax80             |
| <i>IBM DB2 Universal Database Data Warehouse Center Administration Guide</i>              | SC27-1123          | db2ddx80             |
| <i>IBM DB2 Universal Database Federated Systems Guide</i>                                 | GC27-1224          | db2fpx80             |
| <i>IBM DB2 Universal Database Guide to GUI Tools for Administration and Development</i>   | SC09-4851          | db2atx80             |
| <i>IBM DB2 Universal Database Replication Guide and Reference</i>                         | SC27-1121          | db2e0x80             |
| <i>IBM DB2 Installing and Administering a Satellite Environment</i>                       | GC09-4823          | db2dsx80             |
| <i>IBM DB2 Universal Database SQL Reference, Volume 1</i>                                 | SC09-4844          | db2s1x80             |
| <i>IBM DB2 Universal Database SQL Reference, Volume 2</i>                                 | SC09-4845          | db2s2x80             |
| <i>IBM DB2 Universal Database System Monitor Guide and Reference</i>                      | SC09-4847          | db2f0x80             |

### **Application development information**

The information in this category is of special interest to application developers or programmers working with DB2. You will find information about supported languages and compilers, as well as the documentation required to access DB2 using the various supported programming interfaces, such as embedded SQL, ODBC, JDBC, SQLj, and CLI. If you view this information online in HTML you can also access a set of DB2 sample programs in HTML.

The installation directory for this category is doc/htmlcd/%L/ad.

*Table 5. Application development information*

| <b>Name</b>                                                                                                    | <b>Form number</b> | <b>PDF file name</b> |
|----------------------------------------------------------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Universal Database<br/>Application Development<br/>Guide: Building and Running<br/>Applications</i> | SC09-4825          | db2axx80             |
| <i>IBM DB2 Universal Database<br/>Application Development<br/>Guide: Programming Client<br/>Applications</i>   | SC09-4826          | db2a1x80             |
| <i>IBM DB2 Universal Database<br/>Application Development<br/>Guide: Programming Server<br/>Applications</i>   | SC09-4827          | db2a2x80             |
| <i>IBM DB2 Universal Database<br/>Call Level Interface Guide and<br/>Reference, Volume 1</i>                   | SC09-4849          | db2l1x80             |
| <i>IBM DB2 Universal Database<br/>Call Level Interface Guide and<br/>Reference, Volume 2</i>                   | SC09-4850          | db2l2x80             |
| <i>IBM DB2 Universal Database<br/>Data Warehouse Center<br/>Application Integration Guide</i>                  | SC27-1124          | db2adx80             |
| <i>IBM DB2 XML Extender<br/>Administration and<br/>Programming</i>                                             | SC27-1234          | db2sxx80             |

### **Business intelligence information**

The information in this category describes how to use components that enhance the data warehousing and analytical capabilities of DB2 Universal Database.

The installation directory for this category is doc/htmlcd/%L/wareh.

*Table 6. Business intelligence information*

| <b>Name</b>                                                                              | <b>Form number</b> | <b>PDF file name</b> |
|------------------------------------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Warehouse Manager<br/>Information Catalog Center<br/>Administration Guide</i> | SC27-1125          | db2dix80             |
| <i>IBM DB2 Warehouse Manager<br/>Installation Guide</i>                                  | GC27-1122          | db2idx80             |

## DB2 Connect information

The information in this category describes how to access host or iSeries data using DB2 Connect Enterprise Edition or DB2 Connect Personal Edition.

The installation directory for this category is doc/htmlcd/%L/conn.

Table 7. DB2 Connect information

| Name                                                                       | Form number    | PDF file name |
|----------------------------------------------------------------------------|----------------|---------------|
| <i>APPC, CPI-C, and SNA Sense Codes</i>                                    | No form number | db2apx80      |
| <i>IBM Connectivity Supplement</i>                                         | No form number | db2h1x80      |
| <i>IBM DB2 Connect Quick Beginnings for DB2 Connect Enterprise Edition</i> | GC09-4833      | db2c6x80      |
| <i>IBM DB2 Connect Quick Beginnings for DB2 Connect Personal Edition</i>   | GC09-4834      | db2c1x80      |
| <i>IBM DB2 Connect User's Guide</i>                                        | SC09-4835      | db2c0x80      |

## Getting started information

The information in this category is useful when you are installing and configuring servers, clients, and other DB2 products.

The installation directory for this category is doc/htmlcd/%L/start.

Table 8. Getting started information

| Name                                                                          | Form number | PDF file name |
|-------------------------------------------------------------------------------|-------------|---------------|
| <i>IBM DB2 Universal Database Quick Beginnings for DB2 Clients</i>            | GC09-4832   | db2itx80      |
| <i>IBM DB2 Universal Database Quick Beginnings for DB2 Servers</i>            | GC09-4836   | db2isx80      |
| <i>IBM DB2 Universal Database Quick Beginnings for DB2 Personal Edition</i>   | GC09-4838   | db2i1x80      |
| <i>IBM DB2 Universal Database Installation and Configuration Supplement</i>   | GC09-4837   | db2iyx80      |
| <i>IBM DB2 Universal Database Quick Beginnings for DB2 Data Links Manager</i> | GC09-4829   | db2z6x80      |

## Tutorial information

Tutorial information introduces DB2 features and teaches how to perform various tasks.

The installation directory for this category is `doc/htmlcd/%L/tutr`.

*Table 9. Tutorial information*

| <b>Name</b>                                                                      | <b>Form number</b> | <b>PDF file name</b> |
|----------------------------------------------------------------------------------|--------------------|----------------------|
| <i>Business Intelligence Tutorial: Introduction to the Data Warehouse</i>        | No form number     | db2tux80             |
| <i>Business Intelligence Tutorial: Extended Lessons in Data Warehousing</i>      | No form number     | db2tax80             |
| <i>Development Center Tutorial for Video Online using Microsoft Visual Basic</i> | No form number     | db2tdx80             |
| <i>Information Catalog Center Tutorial</i>                                       | No form number     | db2aix80             |
| <i>Video Central for e-business Tutorial</i>                                     | No form number     | db2twx80             |
| <i>Visual Explain Tutorial</i>                                                   | No form number     | db2tvx80             |

## Optional component information

The information in this category describes how to work with optional DB2 components.

The installation directory for this category is `doc/htmlcd/%L/opt`.

*Table 10. Optional component information*

| <b>Name</b>                                                                               | <b>Form number</b> | <b>PDF file name</b> |
|-------------------------------------------------------------------------------------------|--------------------|----------------------|
| <i>IBM DB2 Life Sciences Data Connect Planning, Installation, and Configuration Guide</i> | GC27-1235          | db2lsx80             |
| <i>IBM DB2 Spatial Extender User's Guide and Reference</i>                                | SC27-1226          | db2sbx80             |
| <i>IBM DB2 Universal Database Data Links Manager Administration Guide and Reference</i>   | SC27-1221          | db2z0x80             |

Table 10. Optional component information (continued)

| Name                                                                                         | Form number | PDF file name |
|----------------------------------------------------------------------------------------------|-------------|---------------|
| IBM DB2 Universal Database<br>Net Search Extender<br>Administration and<br>Programming Guide | SH12-6740   | N/A           |
| <b>Note:</b> HTML for this document is not installed from the HTML documentation CD.         |             |               |

### Release notes

The release notes provide additional information specific to your product's release and FixPak level. They also provides summaries of the documentation updates incorporated in each release and FixPak.

Table 11. Release notes

| Name                      | Form number                       | PDF file name                     | HTML directory                                                  |
|---------------------------|-----------------------------------|-----------------------------------|-----------------------------------------------------------------|
| DB2 Release Notes         | See note.                         | See note.                         | doc/prodcd/%L/db2ir<br><br>where %L is the language identifier. |
| DB2 Connect Release Notes | See note.                         | See note.                         | doc/prodcd/%L/db2cr<br><br>where %L is the language identifier. |
| DB2 Installation Notes    | Available on product CD-ROM only. | Available on product CD-ROM only. |                                                                 |

**Note:** The HTML version of the release notes is available from the Information Center and on the product CD-ROMs. To view the ASCII file:

- On UNIX-based platforms, see the Release.Notes file. This file is located in the DB2DIR/Readme/%L directory, where %L represents the locale name and DB2DIR represents:
  - /usr/opt/db2\_08\_01 on AIX
  - /opt/IBM/db2/V8.1 on all other UNIX operating systems
- On other platforms, see the RELEASE.TXT file. This file is located in the directory where the product is installed.

### Related tasks:

- “Printing DB2 books from PDF files” on page 119



- “Ordering printed DB2 books” on page 120
- “Accessing online help” on page 120
- “Finding product information by accessing the DB2 Information Center from the administration tools” on page 124
- “Viewing technical documentation online directly from the DB2 HTML Documentation CD” on page 125

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## Printing DB2 books from PDF files

You can print DB2 books from the PDF files on the *DB2 PDF Documentation* CD. Using Adobe Acrobat Reader, you can print either the entire book or a specific range of pages.

### Prerequisites:

Ensure that you have Adobe Acrobat Reader. It is available from the Adobe Web site at [www.adobe.com](http://www.adobe.com)

### Procedure:

To print a DB2 book from a PDF file:

1. Insert the *DB2 PDF Documentation* CD. On UNIX operating systems, mount the DB2 PDF Documentation CD. Refer to your *Quick Beginnings* book for details on how to mount a CD on UNIX operating systems.
2. Start Adobe Acrobat Reader.
3. Open the PDF file from one of the following locations:
  - On Windows operating systems:  
*x:\doc\language* directory, where *x* represents the CD-ROM drive letter and *language* represents the two-character territory code that represents your language (for example, EN for English).
  - On UNIX operating systems:  
*/cdrom/doc/%L* directory on the CD-ROM, where */cdrom* represents the mount point of the CD-ROM and *%L* represents the name of the desired locale.

### Related tasks:

- “Ordering printed DB2 books” on page 120
- “Finding product information by accessing the DB2 Information Center from the administration tools” on page 124
- “Viewing technical documentation online directly from the DB2 HTML Documentation CD” on page 125

### Related reference:

- “Overview of DB2 Universal Database technical information” on page 111

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## Ordering printed DB2 books

### Procedure:

To order printed books:

- Contact your IBM authorized dealer or marketing representative. To find a local IBM representative, check the IBM Worldwide Directory of Contacts at [www.ibm.com/shop/planetwide](http://www.ibm.com/shop/planetwide)
- Phone 1-800-879-2755 in the United States or 1-800-IBM-4YOU in Canada.
- Visit the IBM Publications Center at [www.ibm.com/shop/publications/order](http://www.ibm.com/shop/publications/order)

### Related tasks:

- “Printing DB2 books from PDF files” on page 119
- “Finding topics by accessing the DB2 Information Center from a browser” on page 122
- “Viewing technical documentation online directly from the DB2 HTML Documentation CD” on page 125

### Related reference:

- “Overview of DB2 Universal Database technical information” on page 111

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## Accessing online help

The online help that comes with all DB2 components is available in three types:

- Window and notebook help
- Command line help
- SQL statement help

Window and notebook help explain the tasks that you can perform in a window or notebook and describe the controls. This help has two types:

- Help accessible from the **Help** button
- Infopops

The **Help** button gives you access to overview and prerequisite information. The infopops describe the controls in the window or notebook. Window and notebook help are available from DB2 centers and components that have user interfaces.

Command line help includes Command help and Message help. Command help explains the syntax of commands in the command line processor. Message help describes the cause of an error message and describes any action you should take in response to the error.

SQL statement help includes SQL help and SQLSTATE help. DB2 returns an SQLSTATE value for conditions that could be the result of an SQL statement. SQLSTATE help explains the syntax of SQL statements (SQL states and class codes).

**Note:** SQL help is not available for UNIX operating systems.

**Procedure:**

To access online help:

- For window and notebook help, click **Help** or click that control, then click **F1**. If the **Automatically display infopops** check box on the **General** page of the **Tool Settings** notebook is selected, you can also see the infopop for a particular control by holding the mouse cursor over the control.
- For command line help, open the command line processor and enter:

- For Command help:

- `? command`

- where *command* represents 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.

- For Message help:

- `? XXXnnnnn`

- where *XXXnnnnn* represents a valid message identifier.

For example, ? SQL30081 displays help about the SQL30081 message.

- For SQL statement help, open the command line processor and enter:

- For SQL help:

- `? sqlstate or ? class code`

- where *sqlstate* represents a valid five-digit SQL state and *class code* represents the 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.

- For SQLSTATE help:

`help statement`

where *statement* represents an SQL statement.

For example, `help SELECT` displays help about the `SELECT` statement.

**Related tasks:**

- “Finding topics by accessing the DB2 Information Center from a browser” on page 122
- “Viewing technical documentation online directly from the DB2 HTML Documentation CD” on page 125

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## Finding topics by accessing the DB2 Information Center from a browser

The DB2 Information Center accessed from a browser enables you to access the information you need to take full advantage of DB2 Universal Database and DB2 Connect. The DB2 Information Center also documents major DB2 features and components including replication, data warehousing, metadata, Life Sciences Data Connect, and DB2 extenders.

The DB2 Information Center accessed from a browser is composed of the following major elements:

**Navigation tree**

The navigation tree is located in the left frame of the browser window. The tree expands and collapses to show and hide topics, the glossary, and the master index in the DB2 Information Center.

**Navigation toolbar**

The navigation toolbar is located in the top right frame of the browser window. The navigation toolbar contains buttons that enable you to search the DB2 Information Center, hide the navigation tree, and find the currently displayed topic in the navigation tree.

**Content frame**

The content frame is located in the bottom right frame of the browser window. The content frame displays topics from the DB2 Information Center when you click on a link in the navigation tree, click on a search result, or follow a link from another topic or from the master index.

**Prerequisites:**

To access the DB2 Information Center from a browser, you must use one of the following browsers:

- Microsoft Explorer, version 5 or later
- Netscape Navigator, version 6.1 or later

## Restrictions:

The DB2 Information Center contains only those sets of topics that you chose to install from the *DB2 HTML Documentation CD*. If your Web browser returns a File not found error when you try to follow a link to a topic, you must install one or more additional sets of topics *DB2 HTML Documentation CD*.

## Procedure:

To find a topic by searching with keywords:

1. In the navigation toolbar, click **Search**.
2. In the top text entry field of the Search window, enter two or more terms related to your area of interest and click **Search**. A list of topics ranked by accuracy displays in the **Results** field.

Entering more terms increases the precision of your query while reducing the number of topics returned from your query.

3. In the **Results** field, click the title of the topic you want to read. The topic displays in the content frame.

To find a topic in the navigation tree:

1. In the navigation tree, click the book icon of the category of topics related to your area of interest. A list of subcategories displays underneath the icon.
2. Continue to click the book icons until you find the category containing the topics in which you are interested. Categories that link to topics display the category title as an underscored link when you move the cursor over the category title. The navigation tree identifies topics with a page icon.
3. Click the topic link. The topic displays in the content frame.

To find a topic or term in the master index:

1. In the navigation tree, click the "Index" category. The category expands to display a list of links arranged in alphabetical order in the navigation tree.
2. In the navigation tree, click the link corresponding to the first character of the term relating to the topic in which you are interested. A list of terms with that initial character displays in the content frame. Terms that have multiple index entries are identified by a book icon.
3. Click the book icon corresponding to the term in which you are interested. A list of subterms and topics displays below the term you clicked. Topics are identified by page icons with an underscored title.
4. Click on the title of the topic that meets your needs. The topic displays in the content frame.

**Related concepts:**

- “Accessibility” on page 131
- “DB2 Information Center for topics” on page 133

**Related tasks:**

- “Finding product information by accessing the DB2 Information Center from the administration tools” on page 124
- “Updating the HTML documentation installed on your machine” on page 126
- “Troubleshooting DB2 documentation search with Netscape 4.x” on page 128
- “Searching the DB2 documentation” on page 129

**Related reference:**

- “Overview of DB2 Universal Database technical information” on page 111

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## **Finding product information by accessing the DB2 Information Center from the administration tools**

The DB2 Information Center provides quick access to DB2 product information and is available on all operating systems for which the DB2 administration tools are available.

The DB2 Information Center accessed from the tools provides six types of information.

**Tasks** Key tasks you can perform using DB2.

**Concepts**

Key concepts for DB2.

**Reference**

DB2 reference information, such as keywords, commands, and APIs.

**Troubleshooting**

Error messages and information to help you with common DB2 problems.

**Samples**

Links to HTML listings of the sample programs provided with DB2.

**Tutorials**

Instructional aid designed to help you learn a DB2 feature.

**Prerequisites:**

Some links in the DB2 Information Center point to Web sites on the Internet. To display the content for these links, you will first have to connect to the Internet.

**Procedure:**

To find product information by accessing the DB2 Information Center from the tools:

1. Start the DB2 Information Center in one of the following ways:
  - From the graphical administration tools, click on the **Information Center** icon in the toolbar. You can also select it from the **Help** menu.
  - At the command line, enter **db2ic**.
2. Click the tab of the information type related to the information you are attempting to find.
3. Navigate through the tree and click on the topic in which you are interested. The Information Center will then launch a Web browser to display the information.
4. To find information without browsing the lists, click the **Search** icon to the right of the list.

Once the Information Center has launched a browser to display the information, you can perform a full-text search by clicking the **Search** icon in the navigation toolbar.

**Related concepts:**

- “Accessibility” on page 131
- “DB2 Information Center for topics” on page 133

**Related tasks:**

- “Finding topics by accessing the DB2 Information Center from a browser” on page 122
- “Searching the DB2 documentation” on page 129

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## **Viewing technical documentation online directly from the DB2 HTML Documentation CD**

All of the HTML topics that you can install from the *DB2 HTML Documentation CD* can also be read directly from the CD. Therefore, you can view the documentation without having to install it.

**Restrictions:**

Because the following items are installed from the DB2 product CD and not the *DB2 HTML Documentation CD*, you must install the DB2 product to view these items:

- Tools help
- DB2 Quick Tour
- Release notes

**Procedure:**

1. Insert the *DB2 HTML Documentation CD*. On UNIX operating systems, mount the *DB2 HTML Documentation CD*. Refer to your *Quick Beginnings* book for details on how to mount a CD on UNIX operating systems.
2. Start your HTML browser and open the appropriate file:

- For Windows operating systems:  
e:\Program Files\sql11ib\doc\htmlcd\%L\index.htm

where *e* represents the CD-ROM drive, and %L is the locale of the documentation that you wish to use, for example, **en\_US** for English.

- For UNIX operating systems:  
/cdrom/Program Files/sql11ib/doc/htmlcd/%L/index.htm

where */cdrom/* represents where the CD is mounted, and %L is the locale of the documentation that you wish to use, for example, **en\_US** for English.

**Related tasks:**

- “Finding topics by accessing the DB2 Information Center from a browser” on page 122
- “Copying files from the DB2 HTML Documentation CD to a Web Server” on page 128

**Related reference:**

- “Overview of DB2 Universal Database technical information” on page 111

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## Updating the HTML documentation installed on your machine

It is now possible to update the HTML installed from the *DB2 HTML Documentation CD* when updates are made available from IBM. This can be done in one of two ways:

- Using the Information Center (if you have the DB2 administration GUI tools installed).
- By downloading and applying a DB2 HTML documentation FixPak .



**Note:** This will NOT update the DB2 code; it will only update the HTML documentation installed from the *DB2 HTML Documentation CD*.

**Procedure:**

To use the Information Center to update your local documentation:

1. Start the DB2 Information Center in one of the following ways:
  - From the graphical administration tools, click on the **Information Center** icon in the toolbar. You can also select it from the **Help** menu.
  - At the command line, enter **db2ic**.
2. Ensure your machine has access to the external Internet; the updater will download the latest documentation FixPak from the IBM server if required.
3. Select **Information Center** —> **Update Local Documentation** from the menu to start the update.
4. Supply your proxy information (if required) to connect to the external Internet.

The Information Center will download and apply the latest documentation FixPak, if one is available.

To manually download and apply the documentation FixPak :

1. Ensure your machine is connected to the Internet.
2. Open the DB2 support page in your Web browser at:  
[www.ibm.com/software/data/db2/udb/winos2unix/support](http://www.ibm.com/software/data/db2/udb/winos2unix/support)
3. Follow the link for version 8 and look for the "Documentation FixPaks" link.
4. Determine if the version of your local documentation is out of date by comparing the documentation FixPak level to the documentation level you have installed. This current documentation on your machine is at the following level: **DB2 v8.1 GA**.
5. If there is a more recent version of the documentation available then download the FixPak applicable to your operating system. There is one FixPak for all Windows platforms, and one FixPak for all UNIX platforms.
6. Apply the FixPak:
  - For Windows operating systems: The documentation FixPak is a self extracting zip file. Place the downloaded documentation FixPak in an empty directory, and run it. It will create a **setup** command which you can run to install the documentation FixPak.
  - For UNIX operating systems: The documentation FixPak is a compressed tar.Z file. Uncompress and untar the file. It will create a directory named `delta_install` with a script called **installdocfix**. Run this script to install the documentation FixPak.

**Related tasks:**

- “Copying files from the DB2 HTML Documentation CD to a Web Server” on page 128

**Related reference:**

- “Overview of DB2 Universal Database technical information” on page 111

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**Copying files from the DB2 HTML Documentation CD to a Web Server**

The entire DB2 information library is delivered to you on the *DB2 HTML Documentation CD*, so you can install the library on a Web server for easier access. Simply copy to your Web server the documentation for the languages that you want.

**Procedure:**

To copy files from the *DB2 HTML Documentation CD* to a Web server, use the appropriate path:

- For Windows operating systems:

```
E:\Program Files\sql11b\doc\htmlcd\%L*.*
```

where *E* represents the CD-ROM drive and *%L* represents the language identifier.

- For UNIX operating systems:

```
/cdrom:Program Files/sql11b/doc/htmlcd/%L/*.*
```

where *cdrom* represents the CD-ROM drive and *%L* represents the language identifier.

**Related tasks:**

- “Searching the DB2 documentation” on page 129

**Related reference:**

- “Supported DB2 interface languages, locales, and code pages” in the *Quick Beginnings for DB2 Servers*
- “Overview of DB2 Universal Database technical information” on page 111

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**Troubleshooting DB2 documentation search with Netscape 4.x**

Most search problems are related to the Java support provided by web browsers. This task describes possible workarounds.

**Procedure:**

A common problem with Netscape 4.x involves a missing or misplaced security class. Try the following workaround, especially if you see the following line in the browser Java console:

```
Cannot find class java/security/InvalidParameterException
```

- On Windows operating systems:

From the *DB2 HTML Documentation CD*, copy the supplied `x:Program Files\sql1lib\doc\htmlcd\locale\InvalidParameterException.class` file to the `java\classes\java\security\` directory relative to your Netscape browser installation, where *x* represents the CD-ROM drive letter and *locale* represents the name of the desired locale.

**Note:** You may have to create the `java\security\` subdirectory structure.

- On UNIX operating systems:

From the *DB2 HTML Documentation CD*, copy the supplied `/cdrom/Program Files/sql1lib/doc/htmlcd/locale/InvalidParameterException.class` file to the `java/classes/java/security/` directory relative to your Netscape browser installation, where *cdrom* represents the mount point of the CD-ROM and *locale* represents the name of the desired locale.

**Note:** You may have to create the `java/security/` subdirectory structure.

If your Netscape browser still fails to display the search input window, try the following:

- Stop all instances of Netscape browsers to ensure that there is no Netscape code running on the machine. Then open a new instance of the Netscape browser and try to start the search again.
- Purge the browser's cache.
- Try a different version of Netscape, or a different browser.

#### **Related tasks:**

- "Searching the DB2 documentation" on page 129

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## **Searching the DB2 documentation**

To search DB2's documentation, you need Netscape 6.1 or higher, or Microsoft's Internet Explorer 5 or higher. Ensure that your browser's Java support is enabled.

A pop-up search window opens when you click the search icon in the navigation toolbar of the Information Center accessed from a browser. If you are using the search for the first time it may take a minute or so to load into the search window.

#### **Restrictions:**

The following restrictions apply when you use the documentation search:

- Boolean searches are not supported. The boolean search qualifiers *and* and *or* will be ignored in a search. For example, the following searches would produce the same results:
  - servlets *and* beans
  - servlets *or* beans
- Wildcard searches are not supported. A search on *java\** will only look for the literal string *java\** and would not, for example, find *javadoc*.

In general, you will get better search results if you search for phrases instead of single words.

### **Procedure:**

To search the DB2 documentation:

1. In the navigation toolbar, click **Search**.
2. In the top text entry field of the Search window, enter two or more terms related to your area of interest and click **Search**. A list of topics ranked by accuracy displays in the **Results** field.  
Entering more terms increases the precision of your query while reducing the number of topics returned from your query.
3. In the **Results** field, click the title of the topic you want to read. The topic displays in the content frame.

**Note:** When you perform a search, the first result is automatically loaded into your browser frame. To view the contents of other search results, click on the result in results lists.

### **Related tasks:**

- “Troubleshooting DB2 documentation search with Netscape 4.x” on page 128

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## **Online DB2 troubleshooting information**

With the release of DB2<sup>®</sup> UDB Version 8, there will no longer be a *Troubleshooting Guide*. The troubleshooting information once contained in this guide has been integrated into the DB2 publications. By doing this, we are able to deliver the most up-to-date information possible. To find information on the troubleshooting utilities and functions of DB2, access the DB2 Information Center from any of the tools.

Refer to the DB2 Online Support site if you are experiencing problems and want help finding possible causes and solutions. The support site contains a

large, constantly updated database of DB2 publications, TechNotes, APAR (product problem) records, FixPaks, and other resources. You can use the support site to search through this knowledge base and find possible solutions to your problems.

Access the Online Support site at [www.ibm.com/software/data/db2/udb/winos2unix/support](http://www.ibm.com/software/data/db2/udb/winos2unix/support), or by clicking the **Online Support** button in the DB2 Information Center. Frequently changing information, such as the listing of internal DB2 error codes, is now also available from this site.

**Related concepts:**

- “DB2 Information Center for topics” on page 133

**Related tasks:**

- “Finding product information by accessing the DB2 Information Center from the administration tools” on page 124

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## Accessibility

Accessibility features help users with physical disabilities, such as restricted mobility or limited vision, to use software products successfully. These are the major accessibility features in DB2<sup>®</sup> Universal Database Version 8:

- DB2 allows you to operate all features using the keyboard instead of the mouse. See “Keyboard Input and Navigation”.
- DB2 enables you to customize the size and color of your fonts. See “Accessible Display” on page 132.
- DB2 allows you to receive either visual or audio alert cues. See “Alternative Alert Cues” on page 132.
- DB2 supports accessibility applications that use the Java<sup>™</sup> Accessibility API. See “Compatibility with Assistive Technologies” on page 132.
- DB2 comes with documentation that is provided in an accessible format. See “Accessible Documentation” on page 132.

### Keyboard Input and Navigation

#### Keyboard Input

You can operate the DB2 Tools using only the keyboard. You can use keys or key combinations to perform most operations that can also be done using a mouse.

**Keyboard Focus**

In UNIX-based systems, the position of the keyboard focus is highlighted, indicating which area of the window is active and where your keystrokes will have an effect.

**Accessible Display**

The DB2 Tools have features that enhance the user interface and improve accessibility for users with low vision. These accessibility enhancements include support for customizable font properties.

**Font Settings**

The DB2 Tools allow you to select the color, size, and font for the text in menus and dialog windows, using the Tools Settings notebook.

**Non-dependence on Color**

You do not need to distinguish between colors in order to use any of the functions in this product.

**Alternative Alert Cues**

You can specify whether you want to receive alerts through audio or visual cues, using the Tools Settings notebook.

**Compatibility with Assistive Technologies**

The DB2 Tools interface supports the Java Accessibility API enabling use by screen readers and other assistive technologies used by people with disabilities.

**Accessible Documentation**

Documentation for the DB2 family of products is available in HTML format. This allows you to view documentation according to the display preferences set in your browser. It also allows you to use screen readers and other assistive technologies.

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**DB2 tutorials**

The DB2® tutorials help you learn about various aspects of DB2 Universal Database. The tutorials provide lessons with step-by-step instructions in the areas of developing applications, tuning SQL query performance, working with data warehouses, managing metadata, and developing Web services using DB2.

**Before you begin:**

Before you can access these tutorials using the links below, you must install the tutorials from the *DB2 HTML Documentation* CD-ROM.

If you do not want to install the tutorials, you can view the HTML versions of the tutorials directly from the *DB2 HTML Documentation CD*. PDF versions of these tutorials are also available on the *DB2 PDF Documentation CD*.

Some tutorial lessons use sample data or code. See each individual tutorial for a description of any prerequisites for its specific tasks.

### **DB2 Universal Database tutorials:**

If you installed the tutorials from the *DB2 HTML Documentation CD-ROM*, you can click on a tutorial title in the following list to view that tutorial.

*Business Intelligence Tutorial: Introduction to the Data Warehouse Center*  
Perform introductory data warehousing tasks using the Data Warehouse Center.

*Business Intelligence Tutorial: Extended Lessons in Data Warehousing*  
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## **DB2 Information Center for topics**

The DB2® Information Center gives you access to all of the information you need to take full advantage of DB2 Universal Database™ and DB2 Connect™ in your business. The DB2 Information Center also documents major DB2 features and components including replication, data warehousing, the Information Catalog Center, Life Sciences Data Connect, and DB2 extenders.

The DB2 Information Center accessed from a browser has the following features:

**Regularly updated documentation**

Keep your topics up-to-date by downloading updated HTML.

**Search**

Search all of the topics installed on your workstation by clicking **Search** in the navigation toolbar.

**Integrated navigation tree**

Locate any topic in the DB2 library from a single navigation tree. The navigation tree is organized by information type as follows:

- Tasks provide step-by-step instructions on how to complete a goal.
- Concepts provide an overview of a subject.
- Reference topics provide detailed information about a subject, including statement and command syntax, message help, requirements.

**Master index**

Access the information in topics and tools help from one master index. The index is organized in alphabetical order by index term.

**Master glossary**

The master glossary defines terms used in the DB2 Information Center. The glossary is organized in alphabetical order by glossary term.

**Related tasks:**

- “Finding topics by accessing the DB2 Information Center from a browser” on page 122
- “Finding product information by accessing the DB2 Information Center from the administration tools” on page 124
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