IBM

IBM DB2 Universal Database

What's New

Version 6

IBM

IBM DB2 Universal Database

What's New

Version 6

Before using this information and the product it supports, be sure to read the general information under
"Appendix B. Notices" on page 45.

Contents

Welcome to DB2 Universal Database and DB2 Connect Version 6

The need for better ways to access and manipulate data has driven the evolution of database management systems, from simple file processing systems to the newest generation of relational database management systems. In a world that seems to grow smaller every day, it's important to have a database that can embrace as much of that world as possible: a database that is truly universal. With DB2, IBM gives you a database that is:

- **Universally applicable:** to data warehousing, decision support, data mining, online transaction processing (OLTP), and online analytical processing (OLAP).
- **Universally scalable:** from laptops to desktops to workgroups to the largest enterprise systems.
- **Universally accessible:** from a wide range of clients, across computer platforms, and over the Internet.
- **Universally usable:** through graphical tools for controlling database functions.
- **Universally extensible:** with enhanced SQL and DB2 commands, in addition to DB2 Extenders for text, image, audio, video, and more.

DB2 has become synonymous with open, industrial-strength database management for business intelligence, transaction processing, and a broad range of applications for all types of businesses. Each new release of DB2 Universal Database builds on the strong foundation of the previous version. This book describes the new DB2 functions and enhancements available with DB2 Universal Database and DB2 Connect Version 6.

Who Should Read This Book

This book is for current owners of DB2 who are upgrading or considering upgrading from one of these:

- DB2 Version 2 or Database Server Version 4.
- DB2 Universal Database Version 5.
- DB2 Enterprise - Extended Edition Version 5.
- DDCS Version 2 or DB2 Connect Version 5.

If you are considering DB2 Universal Database or DB2 Connect for the first time, you should start by reading the appropriate *Quick Beginnings* book for your operating system to get basic DB2 information.

How This Book Is Structured

This book begins with an overview of some of the major DB2 enhancements for Version 6 and then describes these new features and enhancements.

Chapter 1. DB2 Universal Database and DB2 Connect Upgrades describes the main DB2 product enhancements available with DB2 Universal Database and DB2 Connect Version 6, lists additional platform support for existing products, and describes the migration support we provide to help you migrate from previous versions of DB2 to Version 6.

Chapter 2. Ease of Use Enhancements describes tools that help you perform DB2 administrative and application development tasks. These include extensions to existing tools, like the ability to manage DB2 Universal Database for OS/390 servers from the Control Center, new administrative tools for optimizing database indexes and managing DB2 licenses, and new application development tools, including the Stored Procedure Builder.

Chapter 3. Administration Enhancements describes powerful additions to DB2 administration, including support for the Lightweight Directory Access Protocol (LDAP) directory service, OLE DB table functions for transparent access to non-DB2 data, and load utility improvements.

Chapter 4. Application Development Enhancements describes the Version 6 application development improvements that increase DB2 compatibility with industry, Microsoft, and DB2 Universal Database for OS/390 standards and ease your application development efforts.

Chapter 5. Performance Enhancements describes the Version 6 improvements to the performance of DB2 through additional index and optimizer options and DB2's larger page size support.

Chapter 6. DB2 Connect Enhancements describes DB2 Connect Version 6 improvements, including connection pooling, enhanced monitoring capabilities, and improved ease of use.

Appendix A. How the DB2 Library Is Structured describes the DB2 library, including books and online help.

Appendix B. Notices contains notice and trademark information.

Chapter 1. DB2 Universal Database and DB2 Connect Upgrades

This section provides a brief summary of the enhancements for the latest versions of DB2 Universal Database and DB2 Connect: Version 6, including the support DB2 provides for migrating to Version 6 from previous version of the product.

Year 2000 Ready

DB2 Universal Database Version 6 and DB2 Connect are Year 2000 ready. This means that when used in accordance with their associated documentation, these products are capable of correctly processing, providing and/or receiving date data within and between the 20th and 21st centuries, provided that all products (for example, hardware, software and firmware) used with the products properly exchange accurate date data with them. More information about IBM and Year 2000 readiness can be found at `http://wwwyr2k.raleigh.ibm.com`.

Euro Support

DB2 Universal Database is a EuroReady product. Code page 850 and the Microsoft Windows ANSI code pages have been modified to include the euro. DB2 Universal Database Version 6 uses these definitions by default. If you would like to continue to use the previous definition of these code pages, you should contact DB2 Universal Database Service. For more information on euro support, refer to the *Administration Guide, Design and Implementation*.

New Products

Two new products are available for DB2 Universal Database Version 6: DB2 Query Patroller, for decision support systems, and DB2 Satellite Edition, for mobile and occasionally-connected clients.

DB2 Query Patroller

You can use DB2 Query Patroller to provide query and resource management for decision support systems. As an application, it takes Open Database Connectivity (ODBC) queries from a client, analyzes the queries, and then dynamically distributes the workload across different nodes on the DB2 Enterprise - Extended Edition installation.

DB2 Query Patroller is supported on the AIX, Solaris, and Windows NT operating systems.

For more information on DB2 Query Patroller, refer to the *DB2 Query Patroller Installation Guide*, *DB2 Query Patroller Administration Guide*, or the *DB2 Query Patroller User's Guide*.

DB2 Satellite Edition

Mobile computing can give you the freedom to conveniently access information and easily act on it. With DB2 Satellite Edition, you can connect to your corporate systems to obtain the latest product inventory or client information before visiting your customer. You can also perform business transactions, such as placing orders or selling a new policy, outside of the traditional office.

On a DB2 Satellite Edition system, you can maintain locally persistent data that is easily updated and synchronized with the corporate data. DB2 Satellite Edition provides the backbone for mobile or occasionally connected branch office computing applications.

DB2 Satellite Edition provides the following advantages:

Low deployment costs
To keep deployment costs low when rolling out to a large user community, DB2 Satellite Edition lets you avoid manual tasks such as performing individual installations. With the mass deployment capabilities of DB2 Satellite Edition, you can easily replicate setup and installation for thousands of systems.

Enhanced administration tools
You can use the DB2 Control Center tools to create the control information and build the scripts that the satellites will execute. The new Satellite Administration Center in DB2 Control Center supports the creation and maintenance of batches for groups of satellites. You can also use the Satellite Administration Center to manage the roll out of satellites within a group.

Remote administration
If a problem occurs on a satellite, DB2 provides facilities that help staff can use to fix the satellite. To track the state of an individual satellite, information about it is retained in a central database known as the satellite control database. The information about a satellite includes its last known activity, such as which script it executed. The information also includes the current status of the satellite, such as whether the satellite reported an error. The status information is easily accessible through the Satellite Administration Center.

On-demand replication
> To ensure timely data exchange with transactional integrity and data content flexibility, DB2 includes on-demand, update anywhere replication.

Staged rollout of system updates
> Once you have deployed your satellite application, any updates to the application and the database environment can be implemented first on a test group, so that you can monitor the updates, and make any required modifications. When you are satisfied with the updates, you can promote the changes to the full production group.

DB2 Satellite Edition is currently available for Windows 32-bit operating systems. For more information on DB2 Satellite Edition, refer to the *Administering Satellites Guide and Reference*.

Additional Support by Platform

Linux

DB2 Universal Database Version 6 supports the following products and components for the Linux operating system:

Products
- DB2 Connect Enterprise Edition
- DB2 Connect Personal Edition
- DB2 Universal Database Personal Edition
- DB2 Universal Database Personal Developer's Edition
- DB2 Universal Database Universal Developer's Edition
- DB2 Universal Database Workgroup Edition
- DB2 Universal Database Enterprise Edition

Components
- DB2 Software Developer's Kit
- DB2 Universal Database Administration Client
- DB2 Universal Database Run-Time Client

For information on installing DB2 on Linux, refer to the *DB2 for UNIX Quick Beginnings.* For information on the compilers and precompilers for Linux that DB2 supports, refer to the *Application Building Guide.*

Windows NT

DB2 Universal Database Version 6 adds support for the following products and components on the Windows NT operating system:

DB2 Data Links Manager for Windows NT

DB2 Data Links Manager Version 6 supports the Windows NT operating
system as well as the AIX operating system. You can use DB2 Data Links
Manager to manage data files that are not normally found in a database, for
example, engineering blueprints or medical x-rays. These data files can be on
a file system outside of the database.

For more information on DB2 Data Links Manager for Windows NT, refer to
the *DB2 Data Links Manager for Windows NT Quick Beginnings*.

Single-User Install

To ease the use of DB2 Universal Database Version 6 for Windows NT, DB2
enables a user who does not have administrator authority to install certain
DB2 products on a Windows NT machine. A user without administrator
authority can perform a single-user install of one of the following products:
- a DB2 client
- the DB2 Software Developer's Kit
- DB2 Connect Personal Edition
- DB2 Satellite Edition

For more information on installing DB2 for Windows NT, refer to the *DB2 for
Windows NT Quick Beginnings*.

Migration to Version 6

DB2 provides migration support to allow you to convert back-level DB2
databases and directories to a format usable by DB2 Universal Database
Version 6. The following DB2 database releases are supported by the DB2
Universal Database Version 6 database migration process:

Migration to DB2 Universal Database Version 6
- DB2 for AIX Version 2.x and Version 5.x
- DB2 for HP-UX Version 2.x
- DB2 for HP-UX 10 Version 5.x
- DB2 for HP-UX 11 Version 5.x
- DB2 for OS/2 Version 2.x and Version 5.x
- DB2 for Solaris Version 2.x and Version 5.x

- DB2 for Windows NT Version 2.x and Version 5.x

Migration to DB2 Enterprise - **Extended Edition Version 6**

- DB2 for AIX Version 2.x and Version 5.x
- DB2 for Solaris Version 2.x and Version 5.x
- DB2 for Windows NT Version 2.x and Version 5.x
- DB2 Enterprise - Extended Edition for AIX Version 5.x
- DB2 Enterprise - Extended Edition for Solaris Version 5.x
- DB2 Enterprise - Extended Edition for Windows NT Version 5.x

Note: DB2 migration does not support migration across platforms. You can only migrate from a previous version of DB2 on one platform to DB2 Version 6.1 on the same platform. For example, if your current database server is DB2 for Windows NT Version 5.2, you can only migrate to DB2 for Windows NT Version 6.

For more information on migrating to DB2 Version 6, refer to the *Quick Beginnings* manuals for your platform.

Chapter 2. Ease of Use Enhancements

DB2 Universal Database Version 6 offers new tools and tool support to help you administer your DB2 systems and create new applications, including:

- Administration Ease of Use
  - Administration Client Support for DB2 Universal Database for OS/390
  - Response File Generator
  - Performance Monitor
  - Index Advisor
  - License Management
  - Generate SQL utility
  - Show SQL or Command
- Application Development Ease of Use
  - Stored Procedure Builder
  - Declaration Generator

Administration Ease of Use

Response File Generator

To simplify the task of re-installing or duplicating an existing DB2 system, DB2 Universal Database Version 6 provides the Response File Generator utility. The Response File Generator captures the values of the DB2 registry; database manager and administration configuration parameters; and the products and components installed on an existing system. It then creates a response file that you can use to duplicate the DB2 install on another system.

To invoke the Response File Generator, use the db2rspgn command. For more information on the Response File Generator, refer to the *Installation and Configuration Supplement.*

Performance Monitor

The Performance Monitor helps you administer DB2 Universal Database and DB2 Universal Database for OS/390 servers by monitoring the performance of DB2 objects such as instances, databases, tables, table spaces, and connections. The Performance Monitor alerts you if performance falls outside your defined thresholds. You can also use the Performance Monitor to observe the performance of your system at a point in time or capture performance data over a period of time.

Use the information from the Performance Monitor to:
- Detect performance problems
- Tune databases for optimum performance
- Analyze performance trends
- Analyze the performance of database applications
- Prevent problems from occurring

For more information on the Performance Monitor, refer to the *Administration Guide, Design and Implementation.*

Index Advisor Utility

DB2 Universal Database Version 6 introduces the Index Advisor utility, which helps you improve the performance of your database by suggesting and creating an optimal set of indexes. Use the Index Advisor to help you:
- find the best indexes for a problem query
- determine the best indexes for a set of queries (a workload), subject to resource limits which you can optionally apply
- test an index on a workload without having to create the index

You can invoke the Index Advisor using either:
- a SmartGuide, called the Index Advisor, available from the Control Center
- a command-line program: `db2advis`

For more information on the Index Advisor, refer to the *Administration Guide, Performance.*

License Management

As an addition to the Control Center, the License Center provides a convenient means for you to perform licensing tasks. Using the License Center, you can:
- confirm which DB2 products you have installed
- modify the number of user licenses you have purchased
- configure DB2 to control and monitor access through a list of registered users
- review usage statistics that the License Center collects to determine the number of licenses required by your installation

DB2 Universal Database Version 6 also includes a command line version of the tool, `db2licm`, that enables you to perform basic license management actions including adding, removing and modifying a license.

For more information on the License Center, refer to the *Quick Beginnings* book for your platform. For more information on the `db2licm` command, refer to the *Command Reference.*

Generate SQL

You can display the SQL statements used to define database objects with the **Generate SQL** Control Center command. You can display the SQL used to define all of the objects of a single database, including tables, indexes, views, triggers, and aliases. You can also display the SQL used to define any one of these database objects.

To display the SQL that defines a single database object, perform the following steps:

1. Using the Control Center, browse to the database object
2. Right-click the database object to display a context menu
3. Click the **Generate SQL** menu item to display the SQL used to define the selected database object

Show SQL or Command

With DB2 Universal Database Version 6, you can easily convert Control Center actions into scripts using the **Show SQL...** and the **Show Command...** commands. To display the SQL statements or DB2 commands the Control Center uses to carry out a given database operation, perform the following steps:

1. Prepare to execute a database operation using the Control Center
2. On the panel you normally use to execute the operation, click **Show SQL...** or **Show Command...**

You can then convert the displayed SQL statements and DB2 commands into a regular DB2 script.

Application Development Ease of Use

Stored Procedure Builder

Stored Procedure Builder (SPB) is a graphical application that supports the rapid development of DB2 stored procedures. Using SPB, you can perform the following tasks:

- Create new stored procedures
- Build stored procedures on local and remote DB2 servers
- Modify and rebuild existing stored procedures
- Test and debug the execution of installed stored procedures

SPB provides a single development environment that supports the entire DB2 family ranging from the workstation to System/390. You can launch SPB as a separate application from the DB2 Universal Database program group, or you can launch SPB from any of the following development applications:

- Microsoft Visual Studio
- Microsoft Visual Basic
- IBM VisualAge for Java

For more information on SPB, refer to the Stored Procedure Builder online help.

Declaration Generator

The Declaration Generator (`db2dclgn`) creates embedded SQL host variable declarations for a given table in a database. The Declaration Generator supports the C/C++, Java, COBOL, or FORTRAN languages. For more information on the Declaration Generator, refer to the *Command Reference.*

Chapter 3. Administration Enhancements

Lightweight Directory Access Protocol (LDAP) Support

To ease your client administration workload, DB2 Universal Database Version 6 offers support for Lightweight Directory Access Protocol (LDAP) directory services. LDAP directory services both store, and provide an access method for, detailed information about resources such as users, printers, computers, file servers and application servers. If you take advantage of LDAP by publishing database and server location and configuration in the LDAP directory, you do not have to manually catalog database and node entries on client machines.

DB2 supports the IBM SecureWay Client Version 3.1 and the following LDAP servers:

- IBM SecureWay Server Version 3.1
- IBM eNetwork Directory Server Version 2.1

For more information on DB2 support for LDAP directory services, refer to the *Administration Guide, Design and Implementation.*

OLE DB Table Functions

OLE DB table functions make it easier to access data from an OLE DB-compliant data source. To perform operations including GROUP BY, JOIN, and UNION on data sources that expose their data through the OLE DB interface, define a table function with a CREATE FUNCTION statement. Once you have defined the OLE DB table function, you can use it as a data source in your SQL statements. You do not have to do any programming to take advantage of OLE DB table functions. For more information on OLE DB table functions, refer to the *Application Development Guide.*

Replication of Large Objects (LOBs)

DB2 Universal Database Version 6 provides replication support for large objects (LOBs). You can replicate LOBs between DB2 Universal Database databases, between DB2 Universal Database for OS/390 databases, or between DB2 Universal Database and DB2 Universal Database for OS/390 databases.

For more information on replicating LOBs, refer to the *Replication Guide and Reference.*

DCE and Encrypted SERVER Authentication

To ease migration of your authentication scheme from encrypted SERVER authentication to DCE authentication, DB2 Universal Database Version 6 introduces a new authentication scheme, DCE_SERVER_ENCRYPT, that accepts both DCE authentication and encrypted SERVER authentication. To use this new form of authentication, specify DCE_SERVER_ENCRYPT as the authentication type at the server node.

If you use DCE_SERVER_ENCRYPT, you can create a user on the server which matches the short name mapped from the actual DCE logon name. This provides you with group list support over and above the support that DB2 provides at authentication time. This extra group list support is available because, after authentication time, DB2 assumes that the group lists it requests come from the base operating system rather than DCE. If both client and server resolve to DCE authentication, DB2 continues to get the group list from DCE at authentication time.

For more information on using the DCE_SERVER_ENCRYPT authentication scheme, refer to the *Administration Guide, Design and Implementation.*

Load Utility Enhancements

For DB2 Universal Database Version 6, the load utilities, including LOAD, IMPORT, and AUTOLOAD, offer improved data loading behavior. A brief description of the enhancements to the load utilities follows. For more information on the load utilities, refer to the *Data Movement Utilities Guide and Reference.*

Automatically Rebuild Indexes

When you issue a load command, DB2 detects any indexes defined on the target table and rebuilds those indexes. When you perform loads in insert mode, DB2 rebuilds the indexes using keys extracted from the existing table data. When you perform a load in insert and replace mode, DB2 rebuilds the indexes using keys extracted from the input data file.

Roll Back for Loads Invoked in TERMINATE Mode

In DB2 Universal Database Version 6, load utilities invoked in TERMINATE mode roll back a previously interrupted load to the point in time where it was started. This roll back occurs even if it passes consistency points. The states of

tablespaces involved in the roll back return to normal, and all table objects, with the possible exception of indexes, are consistent.

Automatic Restart for Load Operations

You can use the RESTART option to restart a load operation that was interrupted or terminated abnormally. You do not have to specify extra information for the restart. A LOAD command that uses the RESTART option resumes from the last successful consistency point. An AUTOLOAD command that uses the RESTART option uses the same unmodified CFG file used by the original AUTOLOAD command.

Load With Incremental Indexing

Incremental indexing, a technique available with DB2 Universal Database Version 6, can automatically improve the performance of load operations. Your data loading operations benefit from the performance boost without any effort on your part. The load utilities decide at run time to either rebuild indexes or extend indexes incrementally, depending on the estimated cost of each option.

LOAD With Delimiter Priority

DB2 Universal Database Version 6 enables you to specify the Delimiter Priority (DELPRIORITYCHAR) option for all LOAD, IMPORT, and AUTOLOAD operations. By default, the record delimiter takes precedence over the string delimiter when DB2 loads data from a delimited data file. If, however, you specify the DELPRIORITYCHAR option for a LOAD, IMPORT, or AUTOLOAD operation, the sequence of delimiter priority is:

1. string delimiter
2. record delimiter
3. column delimiter

For more information on the Delimiter Priority option, refer to the *Data Movement Utilities Guide and Reference*.

LOAD INSERT Enhancement

DB2 Universal Database Version 6 improves the performance of LOAD operations that add data to an existing table. In most cases, DB2 only checks the appended portion of the table for violations of constraints created with the SET CONSTRAINTS statement. There are, however, some cases in which DB2 checks the entire table to ensure data integrity.

For more information on LOAD INSERT, refer to the *Data Movement Utilities Guide and Reference*.

Chapter 4. Application Development Enhancements

ADO, RDO, and MTS Sample Programs

To help you develop DB2 applications for Windows 32-bit operating systems, the DB2 Personal Developer's Edition and DB2 Universal Developer's Edition products include:

- ActiveX Data Objects sample programs in Microsoft Visual Basic and Microsoft Visual C++
- Remote Data Objects sample programs in Microsoft Visual Basic
- Microsoft Transaction Server samples in Microsoft Visual Basic

These samples are supplied with the DB2 Software Developer's Kit for Windows 32-bit operating systems only.

Increased SQL Object Identifier Lengths

To enable you to use more informative SQL object identifiers, DB2 Universal Database Version 6 increases the maximum length of table names, view names, summary table names, alias names and correlation names from 18 bytes to 128 bytes. The maximum length of column names has been increased from 18 bytes to 30 bytes. For more information on SQL object identifier lengths, refer to the *SQL Reference*.

Increased Maximum SQL Statement Length

In DB2 Universal Database Version 6, the maximum SQL statement size is 65 535 bytes. You can use longer statements to create more complex SQL statements in your applications. For more information on SQL statement sizes, refer to the *SQL Reference*.

Row Type Enhancements

Object-relational support in DB2 Universal Database Version 6 has been enhanced to enable you to make better use of row types. The following extensions to table and view hierarchies have been introduced. For more information on typed tables and row types, refer to the *SQL Reference*.

Reference Type Representation

Instead of only representing reference types with the underlying type VARCHAR(16) FOR BIT DATA, you can now choose the underlying type from any supported data type. Use the CREATE TYPE statement to name the representation type used for references to the new structured type.

For more information on the CREATE TYPE statement, refer to the *SQL Reference.*

Create Views Without Object Identifier (OID) Checks

DB2 Version 6 makes it easier for you to define object views, also called typed views, on tables. You can use the UNCHECKED option in your CREATE VIEW statement to prevent DB2 from checking for a unique object identifier. This option is useful, for example, when you know that your data conforms to the uniqueness rule but it does not comply with the rules that allows DB2 to prove uniqueness.

Create Views Covering Multiple Hierarchies

You can create typed view hierarchies that range over multiple legacy tables, legacy views, or typed table hierarchies. To create a view covering multiple hierarchies, use the unchecked OID feature previously described in Create Views Without Object Identifier (OID) Checks and declare the view using one of the following techniques:
- use the UNION ALL operator in the subview bodies
- use underlying hierarchies in the subview body that differ from the superview

Drop Table or View Hierarchies

You can drop entire hierarchies of tables or views using the DROP TABLE HIERARCHY and DROP VIEW HIERARCHY statements, respectively.

Improved Security for ONLY Clause

DB2 Version 6 improves the security of your database for SELECT, UPDATE, or DELETE statements with an ONLY clause. To issue such a statement, a user requires SELECT privilege on the target table and all of its sub-tables. This restriction prevents a user who is authorized to access a table but not one of its subtables from discovering which rows in the table are rows of the subtable.

For example, a user who is authorized to access the EMPLOYEE table but not the MANAGER subtable should not be allowed to discover which employees are managers by executing the query (SELECT NAME FROM EMP) EXCEPT (SELECT NAME FROM ONLY(EMP)).

Name Hierarchy Table for Typed Table

You can explicitly name the hierarchy table that implements a typed table using the HIERARCHY clause in the CREATE TABLE statement for the typed root table.

Extended Support for TYPE Predicates

DB2 Version 6 extends support for TYPE predicates by supporting the use of the NOT keyword, as well as the optional phrase OF DYNAMIC TYPE.

Check Constraints for Typed Tables

You can attach check constraints to a typed table. The check constraint is enforced against any action that affects a row of the typed table, even if the action is initiated against a supertable or subtable of the typed table.

Stored Procedure Enhancements

Stored procedures offer improved compatibility both with industry standards and with the DB2 family. When you write DB2 Universal Database Version 6 stored procedures, you can use the CREATE PROCEDURE statement to register the stored procedure in the database and define their behavior. To help you create and debug stored procedures on the AIX, OS/390, and Windows 32-bit operating systems, you can use the Stored Procedure Builder.

Compatibility Enhancements

- DB2 Universal Database supports Java stored procedures that comply with the *SQLJ Routines* specification using either Java Database Connectivity (JDBC) or embedded SQL for Java (SQLJ). This includes the ability to install JAR files which contain one or more stored procedures or user-defined functions into a database instance. When you install a JAR file into a database instance using the CALL SQLJ.INSTALL_JAR command, you can refer to that JAR file in CREATE PROCEDURE statements as the location of stored procedures. For more information on the CALL SQLJ.INSTALL_JAR command, refer to the *Application Development Guide.*
- You can use the CREATE PROCEDURE statement to register stored procedures that can be easily deployed on DB2 Universal Database for OS/390 by using the GENERAL and GENERAL WITH NULLS parameter types. These parameter types are the equivalent of the SIMPLE CALL and SIMPLE CALL WITH NULLS DB2 Universal Database for OS/390

parameter types. For more information on creating stored procedures, refer to the *Application Development Guide* and the *SQL Reference*.

Behavior Enhancements

Some of the ways in which CREATE PROCEDURE allows you to control the behavior of your stored procedures include:

FENCED | NOT FENCED
    specifies whether the stored procedure runs in FENCED or NOT FENCED mode

PROGRAM TYPE SUB | MAIN
    specify whether the stored procedure accepts arguments as a subroutine or as a `main()` function in a C program

DBINFO | NO DBINFO
    specify whether the stored procedure receives additional information as an argument

NO SQL | CONTAINS SQL | READS SQL | MODIFIES SQL DATA
    specifies the SQL operations that the stored procedure is allowed to perform

Host and AS/400 Client Support for Multiple Result Set Stored Procedures

Host and AS/400 clients can invoke a stored procedure and retrieve multiple row result sets from the stored procedure on a DB2 Universal Database Version 6 server. For more information on writing stored procedures that return multiple result sets, refer to the *Application Development Guide*.

Security for Dynamic SQL

DB2 Universal Database Version 6 enables you to specify the privilege model used by a dynamic SQL application via the DYNAMICRULES bind option. If you bind an application using the DYNAMICRULES BIND option, any user with EXECUTE privilege on the package inherits the privileges of your authorization ID. To associate a different authorization ID with the package, you can use the OWNER BIND option.

For more information on dynamic SQL security options, refer to the BIND command in the *Command Reference*.

C Macro Expansion

You can use C macros in a declaration within a declare section of a C/C++ application if you preprocess the source file with an external C preprocessor. For more information on C Macro Expansion, refer to the *Application Development Guide.*

Scrollable Cursors

DB2 Universal Database Version 6 supports the ability to scroll through a cursor using DB2 Call Level Interface (DB2 CLI), Open Database Connectivity (ODBC), Java Database Connectivity (JDBC), or Embedded SQL for Java (SQLJ):

- Forward by one or more rows
- Backward by one or more rows
- Forward from the first row by one or more rows
- Backward from the last row by one or more rows
- From a previously stored location in the cursor

The following table summarizes the two types of scrollable cursor support provided by DB2 Universal Database Version 6:

Table 1. Scrollable Cursor Support

Cursor Type	Description	Application Support
static, read-only	cannot add, delete, or modify any values, and is not affected by other applications that access the same data as the cursor	• DB2 CLI • ODBC • JDBC • SQLJ
keyset-driven	can detect changes to the underlying data, and can use the cursor to make changes to the underlying data	• DB2 CLI • ODBC

For more information on DB2 CLI and ODBC scrollable cursors, refer to the *CLI Guide and Reference.* For more information on JDBC scrollable cursors and SQLJ result set iterators, refer to the *Application Development Guide.*

Chapter 5. Performance Enhancements

Online Index Reorganization

To use system resources efficiently, DB2 Universal Database Version 6 can perform *online index reorganization*. The database manager uses a B+ tree structure for storing indexes where the bottom level consists of *leaf nodes*. The leaf nodes, or pages, are where the actual index key values are stored. After considerable delete and update activity, many leaf pages of an index may have only a few index keys left on them.

Without online reorganization, you can only reclaim space through an offline reorganization of the data and index. Use *online index reorganization* to enable DB2 to dynamically reorganize the pages when database activity creates excess space in the pages. To enable DB2 to perform online reorganization for a specific index, specify the MINPCTUSED option when you create the index with the CREATE INDEX statement.

For more information on online index reorganization, refer to the *Administration Guide, Design and Implementation.* For more information on the CREATE INDEX statement, refer to the *SQL Reference.*

Forward and Reverse Scan Indexes

DB2 Universal Database Version 6 enables you to create an index that allows both forward and reverse scans. These indexes can improve the performance of your database by eliminating the need for the optimizer to create a temporary table for a reverse scan. To create an index that allows scans in both directions, specify ALLOW REVERSE SCANS in the CREATE INDEX statement. To convert an existing index to one that allows forward and reverse scans, you must drop the existing index and recreate it, using ALLOW REVERSE SCANS in the CREATE INDEX statement.

For more information on forward and reverse scan indexes, refer to the *SQL Reference.*

Index Key Length

To help improve the performance of your databases, DB2 Universal Database Version 6 increases the maximum length of index keys to 1024 bytes. The index key can be composed of up to 16 columns.

For more information on index keys, refer to the *Administration Guide, Design and Implementation.*

Optimized Use of Star Join

To improve the query performance for decision support databases, and other databases that use a *Star Schema* design, the DB2 Universal Database Version 6 optimizer takes better advantage of the *star join* plan. A *Star Schema* database keeps the bulk of the raw data in a single large table with many columns. A *star join* is a strategy the optimizer can use to join multiple tables. DB2 automatically uses a star join if the estimated cost of that strategy is less than the estimated cost of other strategies.

For more information on Star Schema databases or star joins, refer to the *Administration Guide, Performance.*

Larger Page Sizes

DB2 Universal Database Version 6 allows you to select the page size that DB2 uses internally to store data on disk. You can select from a 4K, 8K, 16K, or 32K page size. Using a larger page size can:
- increase your database performance
- increase the maximum number of columns in a table
- increase the maximum byte size of a row in a table

If your database typically accesses a considerable quantity of contiguous data that can appear on a single page, increasing the page size can increase your database performance. Also, the maximum number of columns in a table and the maximum byte size of a row in a table are determined by the page size, illustrated in the following table:

Table 2. Limits for Number of Columns and Row Size in Each Table Space Page Size

Page Size	Row Size Limit	Column Count Limit
4K	4 005	500
8K	8 101	1 012
16K	16 239	1 012
32K	32 677	1 012

For more information on page size, refer to the description of CREATE TABLE in the *SQL Reference.*

Chapter 6. DB2 Connect Enhancements

In Version 6, numerous enhancements are introduced that impact various aspects of DB2 Connect, such as:

- Performance
- Ease of Use
- Administration and Monitoring
- Application Development

Some of these topics are covered in other sections of this book, but the following sections highlight the key enhancements for Version 6.

DB2 Connect Server Connection Pooling

Establishing a connection from the DB2 Connect server to the host (referred to as outbound connection) is much more expensive than establishing a connection from a client to the DB2 Connect server (referred to as inbound connection).

In an environment where thousands of clients frequently connect to and disconnect from the host through the DB2 Connect server, a substantial portion of the processing time is spent in establishing outbound connections. Consequently, outbound connection pooling translates into a significant performance improvement for DB2 Connect.

When a client disconnects from the host, the DB2 Connect server drops the inbound connection with the client, but keeps the outbound connection to the host in a pool. When a new client establishes a connection to a host server, the DB2 Connect server reuses an existing outbound connection from the pool. Outbound connection pooling reduces the overall connection time and saves the high CPU connect cost on the host.

Connection pooling is transparent to clients that access the host database server through the DB2 Connect server.

Ease of Use

Numerous enhancements are introduced in Version 6 to improve usability.

23

Large Scale Deployment Made Easy

With its smaller disk and memory footprint and file server install, with no code on the client workstation, it is easy to deploy and maintain DB2 Connect Personal Edition and DB2 Client products on hundreds and even thousands of Windows workstations. If you install DB2 Connect Personal Edition or the DB2 Client component of DB2 Connect Enterprise Edition on a code server, you can easily update the code server and its associated clients. Once you apply a FixPak to the code server, every Windows workstation running from that code server automatically uses the updated version of the DB2 Connect Personal Edition or DB2 Client.

Lightweight Directory Access Protocol (LDAP) Support

The DB2 Connect Version 6 support for Lightweight Directory Access Protocol (LDAP) allows an administrator to store host and AS/400 connection information in an global directory and to make that information available to all users. The information stored in an LDAP directory frees DB2 Connect users from having to catalog information for accessing host and AS/400 database servers.

Host Connection Configuration

For Version 6, the configuration of connections to host systems is simplified in environments where there is at least one DB2 Connect Enterprise Edition server; that is, in the following environments:

- Environments where Run-Time Clients and DB2 Connect Personal Edition clients connect to hosts via a DB2 Connect Enterprise Edition server.
- Environments where Run-Time Clients and DB2 Connect Personal Edition clients connect to hosts via a DB2 Connect Enterprise Edition server, and where DB2 Connect Personal Edition clients connect directly to the host

The Control Center is expanded to help system administrators discover and catalog host and AS/400 database servers.

In addition the Client Configuration Assistant and its Add Database SmartGuide are also expanded to make it easier to manage all aspects of host connection configuration. The expanded Export/Import capabilities make it easier than ever before to configure host and AS/400 database server access from multiple DB2 Connect clients.

Multisite Update Configuration

A new SmartGuide makes it easier to enable multisite update (two-phase commit) by:

- helping you to configure the DB2 Sync-Point Manager

- verifying that you have established the necessary connectivity

Ability to Administer DB2 Universal Database for OS/390 Servers

The DB2 Universal Database Version 6 Control Center enables you to easily perform administration tasks through a graphical user interface on database objects for both DB2 Universal Database for OS/390 Versions 5 and 6, and DB2 Universal Database for the OS/2, UNIX, and Windows 32-bit operating systems. To use the Control Center with DB2 Universal Database for OS/390 database objects, you must install either DB2 Connect Personal Edition or DB2 Connect Enterprise Edition. The Control Center provides complete support for DB2 Universal Database for OS/390's existing database commands, including CREATE, ALTER, and DROP, and utilities such as REORG and LOAD.

The fully integrated Control Center allows the user to manage DB2 regardless of the platform on which the DB2 server runs. DB2 Universal Database for OS/390 objects are displayed on the Control Center main window along with DB2 Universal Database objects. The corresponding actions and utilities to manage these objects are invoked by selecting the object. For example, a user can list the table spaces of a particular database, select one of the table spaces, and perform actions including: alter, drop, copy, run statistics, check data, get a report on a table space, modify table spaces, load data, reorganize, recover, or display the database.

For information on configuring the Control Center to perform administration tasks on DB2 Universal Database for OS/390 objects, refer to the *DB2 Connect User's Guide* and the *Installation and Configuration Supplement.*

Performance Monitoring in the Control Center

DB2 Connect Enterprise Edition Version 6 servers can now be managed and monitored using DB2 Control Center. DB2 Connect administrators can use graphical tools provided by the Control Center to list users and applications that are currently using DB2 Connect Enterprise Edition Server, monitor their performance and obtain statistics on the server usage and performance.

Integration With Windows NT Performance Monitor

DB2 Connect Enterprise Edition Version 6 fully integrates performance information with the Windows NT Performance Monitor. This allows DB2 Connect Enterprise Edition server administrators to use native Windows NT performance monitoring tools and to correlate DB2 Connect server performance information with other system performance data to better understand the cause of potential performance problems.

For example, a DB2 Connect administrator can chart the transaction time of a DB2 Connect server together with network performance and system memory parameters to analyze the impact of memory utilization and network on database transaction times.

In Version 2, DB2 System Monitor counters were added to the NT Performance Monitor for 3 objects: Database Manager, Database and Application. With the addition of these new counters, 2 new objects have been added to the NT Performance Monitor: Host or AS/400 database servers; and Applications which access host or AS/400 servers.

You can select these objects only if there is an active application accessing host or AS/400 database servers through the DB2 Connect server.

Enhanced Security

Password encryption is supported between clients and a DB2 Connect Enterprise Edition server, and between clients and a DB2 Universal Database for OS/390 host.

For more information on DB2 Connect security, refer to the *DB2 Connect User's Guide.*

Building Stored Procedures for DB2 Universal Database for OS/390

Developing stored procedures can be challenging in an environment where DB2 Universal Database for OS/390 is the database server and the application is deployed on the web or Windows 32-bit, UNIX, or OS/2 workstations. The traditional model for developing stored procedures for DB2 Universal Database for OS/390 requires you to use host development tools and to have experience with application development on the S/390.

To help you use familiar tools and environments to develop DB2 Universal Database for OS/390 stored procedures, DB2 Connect Version 6 provides the Stored Procedure Builder. You can integrate the Stored Procedure Builder with Microsoft Visual Studio products, including Microsoft Visual Basic and Microsoft Visual C++, or IBM VisualAge for Java to form a seamless, consistent process for stored procedure development.

The Stored Procedure Builder helps you to build both the client application and the stored procedure whether the database server is DB2 Universal Database for OS/390 or DB2 Universal Database for the OS/2, UNIX, or Windows 32-bit operating systems.

Performance Improvements

DB2 Connect Version 6 provides performance improvements over previous versions. These performance improvements are most significant for applications that use ODBC, DB2 CLI, JDBC and SQLJ APIs. These improvements are achieved through a combination of improved drivers, optimized code, reduced network flows, and the addition of new APIs. Specifically contributing to improved performance is the full support for the Microsoft ADO 2.0 specification, implementation of the SQLDescribeParam ODBC and DB2 CLI API, and improved handling of OPTIMIZE FOR n ROWS with stored procedures.

DB2 Universal Database for OS/390 Version 6 Function Support

DB2 Universal Database for OS/390 Version 6 delivers numerous improvements that make it a truly "Universal Database". DB2 Connect Version 6 provides enhancements that allow web, OS/2, UNIX, and Windows 32-bit applications to fully exploit the new object-relational functions of DB2 Universal Database for OS/390 Version 6. Specifically, DB2 Connect Version 6 provides support for:

- large objects (LOBs)
- user-defined distinct types (UDTs)
- user-defined functions (UDFs)
- triggers

In addition to object-relational functions, DB2 Connect Version 6 also supports DESCRIBE INPUT, Predictive Governor, and DDF Connection Pooling.

Appendix A. How the DB2 Library Is Structured

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

To access product information online, you can use the Information Center. You can view task information, DB2 books, troubleshooting information, sample programs, and DB2 information on the Web. See "Accessing Information with the Information Center" on page 40 for details.

Completing Tasks with SmartGuides

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

Note: Create Database, Index, and Configure Multisite Update SmartGuide are available for the partitioned database environment.

SmartGuide	Helps You to...	How to Access...
Add Database	Catalog a database on a client workstation.	From the Client Configuration Assistant, click **Add**.
Back up Database	Determine, create, and schedule a backup plan.	From the Control Center, click with the right mouse button on the database you want to back up and select **Backup**->**Database using SmartGuide**.
Configure Multisite Update SmartGuide	Perform a multi-site update, a distributed transaction, or a two-phase commit.	From the Control Center, click with the right mouse button on the **Database** icon and select **Multisite Update**.
Create Database	Create a database, and perform some basic configuration tasks.	From the Control Center, click with the right mouse button on the **Databases** icon and select **Create**->**Database using SmartGuide**.

SmartGuide	Helps You to...	How to Access...
Create Table	Select basic data types, and create a primary key for the table.	From the Control Center, click with the right mouse button on the **Tables** icon and select **Create**->**Table using SmartGuide**.
Create Table Space	Create a new table space.	From the Control Center, click with the right mouse button on the **Table spaces** icon and select **Create**->**Table space using SmartGuide**.
Index	Advise which indexes to create and drop for all your queries.	From the Control Center, click with the right mouse button on the **Index** icon and select **Create**->**Index using SmartGuide**.
Performance Configuration	Tune the performance of a database by updating configuration parameters to match your business requirements.	From the Control Center, click with the right mouse button on the database you want to tune and select **Configure using SmartGuide**.
Restore Database	Recover a database after a failure. It helps you understand which backup to use, and which logs to replay.	From the Control Center, click with the right mouse button on the database you want to restore and select **Restore**->**Database using SmartGuide**.

Accessing Online Help

Online help is available with all DB2 components. The following table describes the various types of help. You can also access DB2 information through the Information Center. For information see "Accessing Information with the Information Center" on page 40.

Type of Help	Contents	How to Access...
Command Help	Explains the syntax of commands in the command line processor.	From the command line processor in interactive mode, enter: ? *command* where *command* is a keyword or the entire command. For example, ? `catalog` displays help for all the CATALOG commands, while ? `catalog database` displays help for the CATALOG DATABASE command.

Type of Help	Contents	How to Access...
Control Center Help *Client Configuration Assistant Help* *Event Analyzer Help* *Command Center Help*	Explains the tasks you can perform in a window or notebook. The help includes prerequisite information you need to know, and describes how to use the window or notebook controls.	From a window or notebook, click the **Help** push button or press the F1 key.
Message Help	Describes the cause of a message, and any action you should take.	From the command line processor in interactive mode, enter: ? *XXXnnnnn* where *XXXnnnnn* is a valid message identifier. For example, ? `SQL30081` displays help about the SQL30081 message. To view message help one screen at a time, enter: ? *XXXnnnnn* | `more` To save message help in a file, enter: ? *XXXnnnnn* > *filename.ext* where *filename.ext* is the file where you want to save the message help.
SQL Help	Explains the syntax of SQL statements.	From the command line processor in interactive mode, enter: `help` *statement* where *statement* is an SQL statement. For example, **help** SELECT displays help about the SELECT statement. **Note:** SQL help is not available on UNIX-based platforms.
SQLSTATE Help	Explains SQL states and class codes.	From the command line processor in interactive mode, enter: **?** *sqlstate* or **?** *class-code* where *sqlstate* is a valid five-digit SQL state and *class-code* is 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.

DB2 Information – Hardcopy and Online

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

Cross-platform books
>> These books contain the common DB2 information for all platforms.

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

Cross-platform sample programs in HTML
>> These samples are the HTML version of the sample programs that are installed with the SDK. They are for informational purposes and do not replace the actual programs.

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

On OS/2 and Windows platforms, HTML documentation files can be installed under the doc\html subdirectory. Depending on the language of your system, some files may be in that language, and the remainder are in English.

On UNIX platforms, you can install multiple language versions of the HTML documentation files under the doc/%L/html subdirectories. Any documentation that is not available in a national language is shown in English.

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

View   See "Viewing Online Information" on page 39.

Search   See "Searching Online Information" on page 42.

Print   See "Printing the PostScript Books" on page 42.

Order   See "Ordering the Printed Books" on page 43.

Name	Description	Form Number File Name for Online Book	HTML Directory
	Cross-Platform Books		

Name	Description	Form Number File Name for Online Book	HTML Directory
Administration Guide	*Administration Guide, Design and Implementation* contains information required to design, implement, and maintain a database. It also describes database access using the Control Center(whether local or in a client/server environment), auditing, database recovery, distributed database support, and high availability. *Administration Guide, Performance* contains information that focuses on the database environment, such as application performance evaluation and tuning. You can order both volumes of the *Administration Guide* in the English language in North America using the form number SBOF-8922.	Volume 1 SC09-2839 db2d1x60 Volume 2 SC09-2840 db2d2x60	db2d0
Administrative API Reference	Describes the DB2 application programming interfaces (APIs) and data structures you can use to manage your databases. Explains how to call APIs from your applications.	SC09-2841 db2b0x60	db2b0
Application Building Guide	Provides environment setup information and step-by-step instructions about how to compile, link, and run DB2 applications on Windows, OS/2, and UNIX-based platforms. This book combines the *Building Applications* books for the OS/2, Windows, and UNIX-based environments.	SC09-2842 db2axx60	db2ax
APPC, CPI-C and SNA Sense Codes	Provides general information about APPC, CPI-C, and SNA sense codes that you may encounter when using DB2 Universal Database products. **Note:** Available in HTML format only.	No form number db2apx60	db2ap

Name	Description	Form Number	HTML Directory
		File Name for Online Book	
Application Development Guide	Explains how to develop applications that access DB2 databases using embedded SQL or JDBC, how to write stored procedures, user-defined types, user-defined functions, and how to use triggers. It also discusses programming techniques and performance considerations. This book was formerly known as the *Embedded SQL Programming Guide*.	SC09-2845 db2a0x60	db2a0
CLI Guide and Reference	Explains how to develop applications that access DB2 databases using the DB2 Call Level Interface, a callable SQL interface that is compatible with the Microsoft ODBC specification.	SC09-2843 db2l0x60	db2l0
Command Reference	Explains how to use the command line processor, and describes the DB2 commands you can use to manage your database.	SC09-2844 db2n0x60	db2n0
Data Movement Utilities Guide and Reference	Explains how to use the Load, Import, Export, Autoloader, and Data Propogation utilities to work with the data in the database.	SC09-2858 db2dmx60	db2dm
DB2 Connect Personal Edition Quick Beginnings	Provides planning, installing, and configuring information for DB2 Connect Personal Edition.	GC09-2830 db2c1x60	db2c1
DB2 Connect User's Guide	Provides concepts, programming and general usage information about the DB2 Connect products.	SC09-2838 db2c0x60	db2c0
Connectivity Supplement	Provides setup and reference information on how to use DB2 for AS/400, DB2 for OS/390, DB2 for MVS, or DB2 for VM as DRDA application requesters with DB2 Universal Database servers, and on how to use DRDA application servers with DB2 Connect application requesters. **Note:** Available in HTML and PostScript formats only.	No form number db2h1x60	db2h1
Glossary	Provides a comprehensive list of all DB2 terms and definitions. **Note:** Available in HTML format only.	No form number db2t0x50	db2t0

Name	Description	Form Number File Name for Online Book	HTML Directory
Installation and Configuration Supplement	Guides you through the planning, installation, and set up of platform-specific DB2 clients. This supplement contains information on binding, setting up client and server communications, DB2 GUI tools, DRDA AS, distributed installation, and the configuration of distributed requests and access methods to heterogeneous data sources.	GC09-2857 db2iyx60	db2iy
Message Reference	Lists messages and codes issued by DB2, and describes the actions you should take.	GC09-2846 db2m0x60	db2m0
Replication Guide and Reference	Provides planning, configuration, administration, and usage information for the IBM Replication tools supplied with DB2.	SC26-9642 db2e0x60	db2e0
SQL Getting Started	Introduces SQL concepts, and provides examples for many constructs and tasks.	SC09-2856 db2y0x60	db2y0
SQL Reference, Volume 1 and Volume 2	Describes SQL syntax, semantics, and the rules of the language. Also includes information about release-to-release incompatibilities, product limits, and catalog views. You can order both volumes of the *SQL Reference* in the English language in North America with the form number SBOF-8923.	SBOF-8923 Volume 1 db2s1x60 Volume 2 db2s2x60	db2s0
System Monitor Guide and Reference	Describes how to collect different kinds of information about databases and the database manager. Explains how to use the information to understand database activity, improve performance, and determine the cause of problems.	SC09-2849 db2f0x60	db2f0
Troubleshooting Guide	Helps you determine the source of errors, recover from problems, and use diagnostic tools in consultation with DB2 Customer Service.	S10J-8169	db2p0

Name	Description	Form Number File Name for Online Book	HTML Directory
What's New	Describes the new features, functions, and enhancements in DB2 Universal Database, Version 6.0, including information about Java-based tools.	SC09-2851 db2q0x60	db2q0
Platform-Specific Books			
Administering Satellites Guide and Reference	Provides planning, configuration, administration, and usage information for satellites.	GC09-2821 db2dsx60	db2ds
DB2 Personal Edition Quick Beginnings	Provides planning, installation, migration, and configuration information for DB2 Universal Database Personal Edition on the OS/2, Windows 95, and Windows NT operating systems.	GC09-2831 db2i1x60	db2i1
DB2 for OS/2 Quick Beginnings	Provides planning, installation, migration, and configuration information for DB2 Universal Database on the OS/2 operating system. Also contains installing and setup information for many supported clients.	GC09-2834 db2i2x60	db2i2
DB2 for UNIX Quick Beginnings	Provides planning, installation, migration, and configuration information for DB2 Universal Database on UNIX-based platforms. Also contains installing and setup information for many supported clients.	GC09-2836 db2ixx60	db2ix
DB2 for Windows NT Quick Beginnings	Provides planning, installation, migration, and configuration information for DB2 Universal Database on the Windows NT operating system. Also contains installing and setup information for many supported clients.	GC09-2835 db2i6x60	db2i6
DB2 Enterprise - Extended Edition for UNIX Quick Beginnings	Provides planning, installation, and configuration information for DB2 Enterprise - Extended Edition for UNIX. Also contains installing and setup information for many supported clients.	GC09-2832 db2v3x60	db2v3

Name	Description	Form Number File Name for Online Book	HTML Directory
DB2 Enterprise - Extended Edition for Windows NT Quick Beginnings	Provides planning, installation, and configuration information for DB2 Enterprise - Extended Edition for Windows NT. Also contains installing and setup information for many supported clients.	GC09-2833 db2v6x60	db2v6
DB2 Connect Enterprise Edition for OS/2 and Windows NT Quick Beginnings	Provides planning, migration, installation, and configuration information for DB2 Connect Enterprise Edition on the OS/2 and Windows NT operating systems. Also contains installation and setup information for many supported clients. This book was formerly part of the *DB2 Connect Enterprise Edition Quick Beginnings.*	GC09-2828 db2c6x60	db2c6
DB2 Connect Enterprise Edition for UNIX Quick Beginnings	Provides planning, migration, installation, configuration, and usage information for DB2 Connect Enterprise Edition in UNIX-based platforms. Also contains installation and setup information for many supported clients. This book was formerly part of the *DB2 Connect Enterprise Edition Quick Beginnings.*	GC09-2829 db2cyx60	db2cy
DB2 Data Links Manager for AIX Quick Beginnings	Provides planning, installation, configuration, and task information for DB2 Data Links Manager for AIX.	GC09-2837 db2z0x60	db2z0
DB2 Data Links Manager for Windows NT Quick Beginnings	Provides planning, installation, configuration, and task information for DB2 Data Links Manager for Windows NT.	GC09-2827 db2z6x60	db2z6
DB2 Query Patroller Administration Guide	Provides administration information on DB2 Query Patrol.	SC09-2859 db2dwx60	db2dw
DB2 Query Patroller Installation Guide	Provides installation information on DB2 Query Patrol.	GC09-2860 db2iwx60	db2iw
DB2 Query Patroller User's Guide	Describes how to use the tools and functions of the DB2 Query Patrol.	SC09-2861 db2wwx60	db2ww

Name	Description	Form Number	HTML Directory
		File Name for Online Book	
Cross-Platform Sample Programs in HTML			
Sample programs in HTML	Provides the sample programs in HTML format for the programming languages on all platforms supported by DB2 for informational purposes (not all samples are available in all languages). Only available when the SDK is installed. See *Application Building Guide* for more information on the actual programs. **Note:** Available in HTML format only.	No form number	db2hs/c db2hs/cli db2hs/clp db2hs/cpp db2hs/cobol db2hs/cobol_mf db2hs/fortran db2hs/java db2hs/rexx

Notes:

1. The character in the sixth position of the file name indicates the language of a book. For example, the file name db2d0e60 indicates that the *Administration Guide* is in English. The following letters are used in the file names to indicate the language of a book:

Language	Identifier
Brazilian Portuguese	b
Bulgarian	u
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
Russian	r
Simp. Chinese	c
Slovenian	l
Spanish	z

Swedish	s
Trad. Chinese	t
Turkish	m

2. For late breaking information that could not be included in the DB2 books:
   - On UNIX-based platforms, see the `Release.Notes` file. This file is located in the `DB2DIR/Readme/%L` directory, where `%L` is the locale name and DB2DIR is:
     - `/usr/lpp/db2_06_01` on AIX
     - `/opt/IBMdb2/V6.1` on HP-UX, Solaris, SCO UnixWare 7, and Silicon Graphics IRIX
     - `/usr/IBMdb2/V6.1` on Linux.
   - On other platforms, see the `RELEASE.TXT` file. This file is located in the directory where the product is installed.
   - Under Windows `Start` menu

Viewing Online Information

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

You can view the online books or sample programs with any browser that conforms to HTML Version 3.2 specifications.

To view online books or sample programs on all platforms other than SCO UnixWare 7:

- If you are running DB2 administration tools, use the Information Center. See "Accessing Information with the Information Center" on page 40 for details.

- Select the `Open Page` menu item of your Web browser. The page you open contains descriptions of and links to DB2 information:
  - On UNIX-based platforms, open the following page:

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

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

    `sqllib\doc\html\index.htm`

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

If you have not installed the Information Center, you can open the page by double-clicking on the **DB2 Online Books** icon. Depending on the system you are using, the icon is in the main product folder or the Windows Start menu.

To view online books or sample programs on the SCO UnixWare 7:

- DB2 Universal Database for SCO UnixWare 7 uses the native SCOhelp utility to search the DB2 information. You can access SCOhelp by the following methods:
  - entering the ″scohelp″ command on the command line,
  - selecting the Help menu in the Control Panel of the CDE desktop or
  - selecting Help in the Root menu of the Panorama desktop

  For more information on SCOhelp, refer to the *Installation and Configuration Supplement.*

Accessing Information with the Information Center

The Information Center provides quick access to DB2 product information. The Information Center is available on all platforms on which the DB2 administration tools are available.

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

- Main product folder
- Toolbar in the Control Center
- Windows Start menu
- Help menu of the Control Center

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

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

Web. To access this information, you must have a connection to the Web from your system.

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

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

For a full text search, click the Search button of the Information Center follow the *Search DB2 Books* link in each HTML file.

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

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

Note: Search function is not available in the Linux and Silicon Graphics environments.

Setting Up a Document Server

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

1. Copy all files and subdirectories from \sqllib\doc\html on your local system to a Web server. Each book has its own subdirectory containing all the necessary HTML and GIF files that make up the book. Ensure that the directory structure remains the same.
2. Configure the Web server to look for the files in the new location. For information, see the NetQuestion Appendix in *Installation and Configuration Supplement.*
3. If you are using the Java version of the Information Center, you can specify a base URL for all HTML files. You should use the URL for the list of books.
4. Once you are able to view the book files, you should bookmark commonly viewed topics. Among those, you will probably want to bookmark the following pages:

- List of books
- Tables of contents of frequently used books
- Frequently referenced articles, such as the *ALTER TABLE* topic
- The Search form

For information about setting up a search, see the NetQuestion Appendix in *Installation and Configuration Supplement* book.

Searching Online Information

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

- Click on **Search the DB2 Books** at the bottom of any page in the HTML books. Use the search form to find a specific topic. This function is not available in the Linux or Silicon Graphics IRIX environments.
- Click on **Index** at the bottom of any page in an HTML book. Use the index to find a specific topic in the book.
- Display the table of contents or index of the HTML book, and then use the find function of the Web browser to find a specific topic in the book.
- Use the bookmark function of the Web browser to quickly return to a specific topic.
- Use the search function of the Information Center to find specific topics. See "Accessing Information with the Information Center" on page 40 for details.

Printing the PostScript Books

If you prefer to have printed copies of the manuals, you can decompress and print PostScript versions. For the file name of each book in the library, see the table in "DB2 Information – Hardcopy and Online" on page 32. Specify the full path name for the file you intend to print.

On OS/2 and Windows platforms:

1. Copy the compressed PostScript files to a hard drive on your system. The files have a file extension of `.exe` and are located in the `x:\doc\`*language*`\books\ps` directory, where x: is the letter representing the CD-ROM drive and *language* is the two-character country code that represents your language (for example, EN for English).
2. Decompress the file that corresponds to the book that you want. Each compressed book is a self-extracting executable file. To decompress the book, simply run it as you would run any other executable program. The result from this step is a printable PostScript file with a file extension of `.ps`.

3. Ensure that your default printer is a PostScript printer capable of printing Level 1 (or equivalent) files.
4. Enter the following command from a command line:

```
print filename.ps
```

On UNIX-based platforms:

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

     ```
     zcat filename | qprt -P PSPrinter_queue
     ```
   - For HP-UX, Solaris, or SCO UnixWare 7:

     ```
     zcat filename | lp -d PSPrinter_queue
     ```
   - For Linux:

     ```
     zcat filename | lpr -P PSPrinter_queue
     ```
   - For Silicon Graphics IRIX:

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

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

   For example, to print the English version of *DB2 for UNIX Quick Beginnings* on AIX, you can use the following command:

   ```
   zcat /cdrom/doc/en/ps/db2ixe60.ps.Z || qprt -P ps1
   ```

Ordering the Printed Books

You can order the printed DB2 manuals either as a set or individually. There are three sets of books available. The form number for the entire set of DB2 books is SBOF-8926-00. The form number for the books listed under the heading "Cross-Platform Books" is SBOF-8924-00.

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

You can also order books individually by the form number listed in "DB2 Information – Hardcopy and Online" on page 32. To order printed versions,

contact your IBM authorized dealer or marketing representative, or phone
1-800-879-2755 in the United States or 1-800-IBM-4YOU in Canada.

Appendix B. Notices

Any reference to an IBM licensed program in this publication is not intended
to state or imply that only IBM's licensed program may be used. Any
functionally equivalent product, program or service that does not infringe any
of IBM's intellectual property rights may be used instead of the IBM product,
program, or service. Evaluation and verification of operation in conjunction
with other products, except those expressly designated by IBM, is the user's
responsibility.

IBM may have patents or pending patent applications covering subject matter
in this document. The furnishing of this document does not give you any
license to these patents. You can send license inquiries, in writing, to the

> IBM Director of Licensing
> IBM Corporation, North Castle Drive
> Armonk, NY 10504-1785
> U.S.A.

Licensees of this program who wish to have information about it for the
purpose of enabling: (i) the exchange of information between independently
created programs and other programs (including this one) and (ii) the mutual
use of the information which has been exchanged, should contact:

> IBM Canada Limited
> Office of the Lab Director
> 1150 Eglinton Ave. East
> North York, Ontario
> M3C 1H7
> CANADA

Such information may be available, subject to appropriate terms and
conditions, including in some cases, payment of a fee.

This publication may contain examples of data and reports used in daily
business operations. To illustrate them as completely as possible, the examples
include the names of individuals, companies, brands, and products. All of
these names are fictitious and any similarity to the names and addresses used
by an actual business enterprise is entirely coincidental.

Trademarks

The following terms are trademarks or registered trademarks of the IBM Corporation in the United States and/or other countries:

ACF/VTAM	MVS/ESA
ADSTAR	MVS/XA
AISPO	OS/400
AIX	OS/390
AIXwindows	OS/2
AnyNet	PowerPC
APPN	QMF
AS/400	RACF
CICS	RISC System/6000
C Set++	SP
C/370	SQL/DS
DATABASE 2	SQL/400
DataHub	S/370
DataJoiner	System/370
DataPropagator	System/390
DataRefresher	SystemView
DB2	VisualAge
DB2 Connect	VM/ESA
DB2 Universal Database	VSE/ESA
Distributed Relational Database Architecture	VTAM
DRDA	WIN-OS/2
Extended Services	
FFST	
First Failure Support Technology	
IBM	
IMS	
LAN Distance	

Trademarks of Other Companies

The following terms are trademarks or registered trademarks of the companies listed:

C-bus is a trademark of Corollary, Inc. in the United States, other countries, or both.

HP-UX is a trademark of Hewlett-Packard.

Java, HotJava, Solaris, Solstice, and Sun are trademarks of Sun Microsystems, Inc.

Microsoft, Windows, Windows NT, Visual Basic, and the Windows logo are trademarks or registered trademarks of Microsoft Corporation in the United States, other countries, or both.

PC Direct is a trademark of Ziff Communications Company in the United States, other countries, or both and is used by IBM Corporation under license.

ActionMedia, LANDesk, MMX, Pentium, and ProShare are trademarks of Intel Corporation in the United States, other countries, or both.

UNIX is a registered trademark in the United States, other countries or both and is licensed exclusively through X/Open Company Limited.

Other company, product, or service names, which may be denoted by a double asterisk (**), may be trademarks or service marks of others.

Index

Contacting IBM

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

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

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

Telephone

If you live in the U.S.A., call one of the following numbers:
* 1-800-237-5511 to learn about available service options.
* 1-800-IBM-CALL (1-800-426-2255) or 1-800-3IBM-OS2 (1-800-342-6672) to order products or get general information.
* 1-800-879-2755 to order publications.

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

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

then performing a search using the keyword "handbook".

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

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

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

Anonymous FTP Sites
> ftp.software.ibm.com

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

Internet Newsgroups

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

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

CompuServe

GO IBMDB2 to access the IBM DB2 Family forums

All DB2 products are supported through these forums.

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

IBM ®